Addis Ababa University, College of Health Sciences, School of Public Health

Ethiopia Field Epidemiology Training Program (EFELTP)

Compiled Body of Works in Field Epidemiology

By: Natnael Teferi Dejene

Submitted to the School of Graduate Studies of Addis Ababa University in Partial Fulfillment for the Degree of Master of Public Health in Field Epidemiology

June, 2019

Addis Ababa

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ADDIS ABABA UNIVERSITY

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Approval by Examining Board

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Examiner

Acknowledgement

I would like to express my deepest gratitude to Almighty God for his invaluable and never-ending support and beneficent me all the way of life. There are many contributors those were directly or indirectly participated in the fruitfulness of this document starting from individuals to institutions and organizations.

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List of Abbrivations and Acronyms

AAU	Addis Ababa University
AFP	Acute Flaccid Paralysis
AFRO	African Region Organization
AHI	Avian Human Influenza
AIDS	Acquire Immune Deficiency Syndrome
ANC	Antenatal Care
AOR	Adjusted Odds Ratio
AR	Attack Rate
ART	Anti-Retroviral Therapy
AWD	Acute Watery Diarrhea
BCG	Bacile calmette Guerin
^{o}C	Degree Centigrade
CAR	Contraceptive Acceptance rate
CBN	Community Based Nutrition
CDC	Communicable Disease Control
CDC	Center of disease control
CFR	Case Fatality Rate
CHA	Community Health Agent
CHD	Community Health Day
CHP	Community Health Promoter
CI	Confidence Interval
CSA	Central Statistical Agency
CSF	Cerebral Spinal Fluid
CTC	Cholera Treatment Center
DHIS	District Health information system
DHS	Demographic and Health Survey
DNA	Deoxyribose Nucleic Acid
E.C	Ethiopian Calendar
ETB	Ethiopian Birr
EDHs	Ethiopian Demographic and Health Survey
EFETP	Ethiopian Field Epidemiology Training Program
EFY	Ethiopian Fiscal Year
EFY	Ethiopian Fiscal Year
e-HMIS	Electronic Health management and information system
EHNRI	Ethiopian Health and Nutrition Research Institute
EPC	Epidemic Prevention and control

EPHA	Ethiopian Public Health Association
EPHI	Ethiopian Public Health Institute
EPI	Expanded Program on Immunization
Epi-	Epidemiologic
EPRP	Emergency Preparedness and Response plan
EPTB	Extra Pulmonary Tuberculosis
EWRR	Early Warning and Rapid Response
FMOH	Federal Ministry of Health
G.C	Gregorian Colander
GAM	Global Acute Malnutrition
HC	Health Center
HEP	Health extension package (or Program)
HEWs	Health Extension Workers
HF	Health Facility
HF's	Health facilities
HH	House Hold
HIV	Human Immunodeficiency Virus
HMIS	Health Management Information System
HPs	Health Posts
ICCM	Integrated Community care management
IDP's	Internal Displaced peoples
IDSR	Integrated Diseases Surveillance and Response
IgM	Immunoglobulin "M"
IHR	International Health Regulation
IMR	Infant Mortality Rate
IPD	Inpatient Department
IRS	Indoor Residual Spraying
ITN's	Insecticide Treated Net/Mosquito Nets
KAP	Knowledge Attitude and Practice
KG	Kindergarten
KM	Kilometer
km^2	Kilometer Square
LLIN	Long Lasting Insecticidal Net
LLITNs	Long-lasting insecticidal treated net
MAM	Moderate Acute Malnutrition
MCH	Maternal and Child Health
MCST	Malaria Control Support Team
MCV	Measles Containing/Conjugating Vaccine

MDG	Millennium Development Goal
MIS	Malaria Indicator Survey
MMR	Measles, Mumps, Rubella
MOP	Malaria Operational Plan
MPDSR	Maternal prenatal death surveillance and report
NGO	Non-Governmental Organization
NMSP	National malaria Strategic Plan
NNT	Neonatal Tetanus
NP-AFP	None-Polio Acute Flaccid Paralysis
ODF	Open defecation free
OPD	Outpatient Department
OPV	Oral polio vaccine
OR	Odds Ratio
ORHB	Oromia Regional Health Bureau
ORS	Oral Rehydration Solution
OTP	Outpatient Therapeutic Feeding Program
P.f	Plasmodium Falciparum
P.v	Plasmodium Vivax
PAB	Protected at birth
PHE	Public Health Emergency
PHEM	Public Health Emergency Management
PICT	Provider Initiated Counseling Testing
PLW	Pregnant And Lactating Women
PMI	President's Malaria Initiative
PMTCT	Prevention of Mother to Child transmission
PNC	Post-natal care
PR	Positivity Rate
PSNP	Productive Safety Net Program
PTB	Pulmonary Tuberculosis
PVP	Predictive value positive
RDT	Rapid Diagnostic Test
RF	Relapsing Fever
RHB	Regional Health Bureau
RRT	Rapid Response Team
RUSF	Ready to use Supplementary Food
RUTF	Ready to Use Therapeutic Food
RVF	Rift Valley Fever
SAM	Severe Acute Malnutrition

SARS	Sever Acute Respiratory Syndrome
SC	Stabilization Center
SD	Standard Deviation
SIA's	Supplementary immunization activities
SNNPR	Southern Nation Nationalities and peoples Region
SPH	School of Public Health
SRS	Simple Random Sampling
TB	Tuberculosis
THO	Town Health office
TPR	Test positivity rate
TSF	Targeted Supplementary Food
TSFP	Target Supplementary Feeding Program
TT	Tetanus Toxoid
TTBA	Trained Traditional Birth Attendant
TTC	Tetracycline
UNICEF	United Nations Children's Fund
UNICEF	United Nations Children and Education Fund
VCT	Voluntary Counseling and Testing
VHF	Viral Hemorrhagic Fever
Vit A	Vitamin A
WASH	Water Sanitation and Hygiene
WHO	World Health Organization
WorHO	Woreda Health Office
ZHD	Zonal Health Department

Executive summary

Field Epidemiology Training Program (FETP) program in field epidemiology adapted from the United States Centers for Disease Control and Prevention (CDC) Epidemic Intelligence Service (EIS) program and designed to assist the Ministry of Health in building or strengthening health systems and improve leadership within Public Health Emergency Management. The EFELTP provides residents a Master of Public Health in Field Epidemiology after complete two years of supervised work in applied or field epidemiology. The program has two main components: Classroom-teaching component (25%) and practical attachment or field placement component (75%). The role of public health practitioners includes ensuring effective health promotion, disease prevention and control activities by conducting surveillance on emerging public health threats and providing continues information to policy makers and public health officials.

From October, 2017 to up today, I have stayed in Field Epidemiology Training Program, School of Public Health-AAU and at both EPHI and Oromia Regional Health Bureau field base. I learned a lot of public health activities during my stay. This document is compiled body of works accomplished during the two years stay at field base of the field epidemiology training program in Addis Ababa University- School of Public Health.

Chapter I: We conducted two epidemiological investigation of outbreak (Malaria and Measles). We used both descriptive and Analytical epidemiology for both outbreaks to describe the pattern and magnitude of the diseases and identify associated risk factors with the outbreak. A total of 348 confirmed malaria cases with no death was identified during February to March 2018 in Darimu Woreda of Iluababora zone, Oromia region. We identify Presence of mosquito's vector/breeding sites, unprotected dam for irrigation, and similar sick patient in the house hold as independent risk factors for malaria outbreak in the woreda. Poor in detection, notification of the outbreak and implementation of larva control measures are a toll for this outbreak. we recommend strengthen malaria surveillance system, identifying potential vector breeding site, Proactive vector control, redistribution of the ITN prior to malaria season and address utilization gaps on bed net through health education.

Measles outbreak in Liben woreda of Guji zone, Oromia region. we investigate from December 12 to 20, 2018. A total of 15 measles cases were identified and 3/5 tested were confirmed by measles specific IgM antibody test. Traveling history to adjacent Woreda, presence of measles cases in the house and being unvaccinated are found to be independent risk factor for this outbreak. Religious exemption is identified as major factor for being not vaccinated, which is opposed the >100% vaccine coverage report of the woreda. Target measles vaccination with vitamin A supplementation amongst under five, Suspension of public collection from suspected measles cases rumour reported, health education on religious area, strengthen cold chain management and furthers study on vaccine acceptance and associated factor with sufficient sample size were recomended.

Chapter II: We conduct Five-year (2013-2017) malaria data analysis at south west shoa zone and describe by person, place and time. Malaria cases in the zone were decreased by 80.5 percent by 2017 compared to the baseline year of 2013. The zone was in line with achieve high level National malaria strategy plan. Burden of malaria cases was still high among three Woredas. Peak malaria case between September and December. We recommend ITN's distribution and IRS for respective high malaria endemic woreda and scale up of malaria prevention and control intervention prior to the respective period and harmonizing HMIS and PHEM system at all reporting level in order to generating reliable and quality data.

Chapter III: We conducted Evaluation of surveillance system from February 01-18, 2019 in Bale zone. (N=43): Measles surveillance was selected and assessed. The system in place found to be simple, flexible and stable in operating well without interruption and helpful in case detection but not useful (fail) to meet objectives of surveillance for action and low in representativeness and acceptable. We recommend widen the surveillance chain among private health facilities, upgrading data management to electronic at all level.

Chapter IV: We conducted description of Health profile in Gindeberet Woreda, West Shoa Zone, Oromia region February 10 to 30, 2018. we found Acute febrile illness, pneumonia and acute upper respiratory tract infection were leading causes of adult morbidity and very low TB and HIV case detection. We recommend, targeted HIV counseling and testing.

Chapter V: We prepared scientific manuscript for peer reviewed journals on Malaria outbreak investigation in Darimu woreda, Iluababora Zone 2018. The manuscript was prepared according to Ethiopian journal of health development authors guideline.

Chapter VI: We prepared two abstracts for submission to scientific conference: - **1.** Measles Outbreak Investigation in pocket area of Liben Woreda, Guji Zone, Oromia Region, Ethiopia-December, 2018. **2.** Malaria Outbreak Investigation Darimu Woreda of Iluababora Zone, Oromia Region, Ethiopia, March 2018.

Chapter VII: We conduct Narrative Summary of Disaster situation report (Meher Assessment) at three Zone of Agro pastoral zone of Oromia Region (Guji, West Guji and Borana) from November 22 to December 12, 2019. There were increased malnutrition case, because of double burden effect of high influx of IDPs and drought in all accessed zones. With this junction, there is emergency nutrition intervention/supply stock out in West Guji and Borana Zone. We recommended the RHB and FMOH should fill the gaps/shortage of nutrition supplies, emergency drug and ensure capacity for timely response.

Chapter VIII: Epidemiological research project was prepared on ITNS Utilization and associated factors among settler's population in Darimu woreda of Iluababora Zone, Oromia Region 2019. Community based cross sectional study will be conducted from April to May/2019. Multi-stage sampling technique will be used to get study subjects. Sample size will be determined by using Epi info by using 80% ITNs utilization from pervious study. Total 541 house hold will be assessed in this study and 37,966.96 ETB estimated budget requiring.

Chapter IX: Training was given for 59 Health professionals working at Woreda and Health facilities of two zones from December 22-25, 2018. The training was organized by Oromia regional health bureau with collaboration of WHO at Ambo Town. The training was addressed overview of PHEM System, Public Health Emergency Preparedness, Epidemiology of 20 Notifiable Diseases, Early Warning Prevention, Health Emergency Response and Recovery. The training was supported by practical demonstration and group work presentation. Lack of printed training manual is a challenge, so we recommend training preparation should de include all necessary format and manual for trainers.

Also I participate in different trainings and conferences in different places, namely: - I have attended AFENET Scientific conference at Addis Ababa June 2018. I have attended the training of Disaster Medical Assistance Team as central DMAT member at Bishoftu town from January 21-27,2019. I participate on Regional semi-annual PHEM review at Adama from February 11-14/2019 and Public Health emergency preparedness and response on public mass-gathering at Kulib-Gebril Celebration December 2018.

Other additional output: I conduct Six Regional public health emergency Weekly bulletin. I including only one of weekly bulletin in this document. Weekly bulletin results were disseminated for all Zones, Administrative Towns, Regional PHEM staff and different stakeholders including governmental and non-governmental organization on weekly bases.

1 Chapter–I Outbreak Investigations

1.1 Malaria Outbreak Investigation in Darimu Woreda of Iluababora Zone, Oromia, Ethiopia, March 2018

Abstract

Background: Malaria epidemics are serious public health emergencies that have a major impact on health and the economy. The aim of this investigation was to verify and identify the determinants of the malaria outbreak and guide intervention measures in the darimu Woreda.

Method: We define malaria cases as any person with fever or fever with headache with plasmodium parasites by slide confirmed with Microscopic and RDT. Five-year malaria data were used to set epidemic threshold level. We conduct descriptive epidemiology and unmatched case control study in 1:1 ratio conveniently selected (112) cases and community (112). Controls. structured interviewed administrated questionnaires used to collect data, data was entered in to Epi-info version 7.2.1.0 and analyzed by SPSS version 23. Environmental risk factors were assessed.

Result: A total of 348 confirmed malaria cases with no death was identified during February to March 2018. P. falciparum was predominant species accounting for 91.7%. The alert threshold (current year data with a third quartile method 2nd largest number) had been reached and crossed in end of February 2018. And the highest peak was between 9 to 12 epidemiological weeks. The median age was 15 years with a range of 0.9-81 years. Age group ≥15 years was affected more AR (181) 17.2/1,000 population. Male accounted for 52.7%. Attack rate was high in Bena 2 Kebele which was (94) 16.3/1,000 population. Presence of mosquito vectors/Mosquitoes breeding sites AOR=5.54; 95%CI: 2.08-14.73, unprotected dam for irrigation AOR = 4.78; 95% CI: 2.09-10.93 and presence of similar sick patient in the house hold AOR = 4.05; 95% CI:1.48-11.09, were independent risk factors for development of the diseases. But, protective clothing and always utilization of bed net was associated with lower odds of malaria infection (AOR: 0.17; 95% CI; 0.04-0.65 and AOR: 0.18; 95% CI; 0.04-0.80) respectively.

Conclusion and recommendation: Presence of mosquito's breeding sites, unprotected dam for irrigation, and similar sick patient in the house hold was independent risk factors for contracting diseases. Always utilization of ITN and protective clothes were lower risk of malaria. We recommend strengthen malaria surveillance system, identifying potential vector breeding site, Proactive vector control measures, redistribution of the ITN prior to malaria season and address ITNs utilization gaps through health education.

Key words: Malaria outbreak, Case-control, Risk Factor, Ethiopia.

1.1.1 Introduction

Malaria is a life threatening caused by infection of red blood cells with protozoan parasites of the genus Plasmodium inoculated into the human host by a feeding female Anopheline mosquito. Human malaria is caused by four different species of plasmodium P. falciparum, P. vivax, P. ovale and P. malariae; but humans occassionaly become infected with plasmodium species that normally infect animals such as P.Knowlesi (1). P.falciparum is the most prevalent malaria parasite in Africa and responsible for most malaria deaths globally but P. vivax is the dominant parasite outside of sub-Saharan Africa (2).

The World Health Organization estimates that in 2016 about 3.2 billion People live in areas at risk of malaria transmission in 106 countries and territories and caused 216 million clinical episodes, and 445,000 malaria deaths occurred globally and the heaviest burden of malaria is in sub Saharan Africa, which constitutes approximately 90 % of total estimated malaria deaths (3). Malaria kills one child every 30 seconds in each year (4). In 2016, there were an estimated 445,000 deaths from malaria globally, compared to 446,000 estimated deaths in 2015, African Region accounted for 91% of all malaria deaths in 2016 (5). About 91% of all malaria deaths in the world today occur in Africa. This is because the majority of infections in Africa are caused by P.falciparum, the most dangerous of the four human malaria parasites (4). Malaria is a major cause of poverty, the cost of malaria control and treatment drains African economies and slowing economic growth by about 1.3 percent a year (6). It is not widely understood that malaria epidemics are serious public health emergencies that have a major impact on health and the economy (7). In addition to the direct health impact, malaria epidemic results in economic losses at the household, community and country levels specially in developing country.

Malaria has been a major challenge to both public health and socio economic development particularly in countries Sub Saharan African. About 301 million ITNs were delivered in sub-Saharan Africa during the period of 2011–2013, Ethiopia was one of 16 countries accounted for more than 80% of deliveries in the period 2014 to 2016 and Ethiopia planned for reduction malaria cases 40% by 2020 and eliminate malaria from Ethiopia By 2030 (8,9). Ethiopia was one country suffering a substantial burden of disease due to malaria, and it courses a very severe illness and death for many years. There are about 565 Woredas with malaria risk in Ethiopia (out of 845 total Woredas), with an estimated at-risk population of 60 million people as per the new stratification, chiefly at altitudes below 2,000 meters (9). Malaria remains a major public health problem and the disease has been consistently reported as the first leading cause of outpatient visits, hospitalization and death in health facilities across the country, being one of the six leading cause of morbidity and mortality (10). Malaria is the most important public health in Oromia region; it is widely distributed in about 82% of the Woreda in the region and account for about 17% of Outpatient visits, 15% of admissions and more than 25% of hospital deaths (11).

The nature of the topography, variations in climatic conditions and concentration of populations in highland, malaria free areas indicates the long history of malaria in Oromia and the country at whole. Recognizing the disease as a priority health problem, organized intervention efforts were initiated during the late 1950s. Since then, strong malaria prevention and control activities have been carried out, and in Ethiopia a significant achievements were made through malaria control (12).

Malaria is mainly seasonal in the highland fringe areas and of relatively longer transmission duration in lowland areas, river basins and valleys. Although historically there have been an estimated 10 million clinical malaria cases annually, cases have reduced since 2006 (12). Ethiopia has achieved MDG targets related to malaria (13).

Malaria parasites are microorganisms that belong to the genus Plasmodium (14). There are more than 100 species of *Plasmodium*, which can infect many animal species such as reptiles, birds, and various mammals. Four species of *Plasmodium* have long been recognized to infect humans in nature. In Ethiopia, the two dominant Plasmodium species known for causes of malaria infection with annual prevalence of 60–70% for P. falciparum and 30–40% for P. vivax (15). Our country goal was to achieve malaria elimination within specific geographical areas with historically low malaria transmission by 2015, near zero malaria transmission in the remaining malarias areas of the country by 2015 and to eliminate malaria from Ethiopia by 2030(16).

Since 1958, major epidemics of malaria have occurred at approximately 5-8 year intervals, though recently, there has been a trend towards smaller scale, more frequent, sporadic epidemics and seasonal case build ups (17). In Ethiopia, populations living in areas below 2,000m above sea level are considered to be at risk of malaria (5).

In Ethiopia Malaria transmission peaks bi-annually, from September to December and April to May, coinciding with the major harvesting seasons and has serious consequences for subsistence economy and for the nation in general (18).

Malaria epidemics are serious public health emergencies that have a major impact on health and the economy. Most of malaria epidemics have occurred in highland and desert fringe areas where malaria transmission is unstable, little population immunity, and increases in temperature and abnormal rainfall have resulted in vector proliferation. Other epidemics have occurred as a result of environmental and social changes as well as of the failure of control measures (7).

While the national malaria control program struggles to control malaria in Ethiopia, outbreaks occurred in some areas of the country. However, while the overall malaria prevalence has decreased, unpredictable outbreaks increasingly occur irregularly in area of previously considered as “malaria free”, which have disastrous consequences on populations (19).

Recently, the occurrence of malaria epidemics has become more common and also, the burden of malaria remains a major public health problem in the Darimu Woreda too. Therefore, the aim of this investigation was to verify the exixtence of malaria epoidemic, identify the responsible species of Plasmodium and determinants of the malaria outbreak in the Woreda.

There were normal trends of malaria cases in the Woreda during the last five years. But, at the mid-last of February, 2018 unusual increment of malaria cases was reported from the Woreda to Iluababora zone and Oromia region respectively. Irrespective of this, the investigation team was deployed to the area and investigated the outbreak. Despite of the outbreak detected and reported lately, the epidemic was detected by using the comparative method of second largest number in the last five-years dataset (the third quarter threshold) and doubling of the recent year weekly cases threshold for the health post with at least single year data.

1.1.2 Objectives of Study

General objective

To describe the magnitude of morbidity and mortality due to malaria epidemic and to investigate factors associated with the epidemics in Darimu Woreda, Iluababora Zone, Oromia Region, March 2018.

Specific Objectives

- To verify existence of malaria epidemic in Darimu Woreda.
- To describe malaria cases and deaths by persons, place, and time.
- To identify malaria species that causes epidemic in the Woreda.
- To identify mosquito breeding site in affected Kebeles.
- To identify risk factors that associated with malaria epidemic in Woreda.

1.1.3 Methods

Study Area

We conducted the study in Darimu Woreda of Iluababor Zone in Oromia Region. Darimu Woreda have an estimated area covering 1,395.79 square kilometers. The projected populations of Darimu Woreda for the 2017 were 202,892 making an estimated population density of 95 people per square kilometer, which is greater than the Zone average of 72.3. Of the total population there were 33,336 under five children and 7,507 pregnant women in the Woreda. The Woreda is further subdivided in to 45 rural and 2 urban kebeles whereas, Darimu Woreda have two geo climatic zones, Weinadega (Mid-land 2000-2500m altitude) which constitutes 54.4% and kola (low land <2000m) accounts for the remaining 45.6% with annual rain fall of 1142mm-1172mm**.** The Darimu Woreda larger town is Dopa, located 64 KMs away from Zonal town Iluababora (Matu) and 664 KM's to the South west from Addis Ababa and that of Darimu Woreda shares border with West Wollega Zone in North, Alge Sachi Woreda in East, Bilonopha Woreda of Ilubabora zone in South and Kellem Wollega zone in west. Majority of the populations in the Woreda were Oromo ethnic (97.36%), and the plurality of the inhabitant's religion in the Woreda were Muslim, with 44.64% of the population. Water bodies such as River and streams are common in the Woreda, which serve as potential breeding site for the malaria. Populations were engaged in agricultural activities and searching for gold mining around Birbir and Golol River especially for Bena kebeles in the Woreda. There are 1 (one) District Hospital, 6 (Six) health centers and 46 (forty-six) health posts in Darimu with potential health service coverage of 86%. All the populations of Woredas were living in malarious areas and 59% of Population at high risk of malaria. Insecticide Treated Bed Nets (ITNs) were distributed to households in the last three years by the coverage of 81%, as well as Indoor Residual Spray (IRS) was also applied prior to the occurrence of the outbreak in 75% kebeles of the Woredas. However, ITN distribution was held as intervention measures during the outbreak.

Study Period:

The study was conducted from March 13 to April 5/2018.

Study Design:

Discriptive study followed by Unmatched case-contrl study design were conducted.

Descriptive Epidemiology

Malaria case was defined as an acute febrile illness with a peripheral blood smear positive for malaria parasite or a positive rapid antigen test in a resident of all Bena kebele of Darimu Woreda during this outbreak.

Also we reviewed the previous five years (2013-2017) data of malaria from Darimu Woreda and health facilities to set epidemic threshold level and compare with similar week of current year (2018). We compare the current year data with a third quartile method (2^{nd} largest number) during the previous 5 years to determine the epidemic. It was shown that; the current case trend line crossed the threshold levels in all Bena site kebeles. Following this, reported number of malaria cases were exceeded the threshold level in WHO week 7, peaks in 11^{th} week and starts to decline after third week of March 2018 (WHO week 13 to 14 /2018). Weekly surveillance reports and facility based patient registration book were reviewed. House to house active case search was conducted to address all febrile cases. The magnitude of this outbreak was described by Age, Sex, Kebele, week and calculated using the 2017 forecasted census data as denominators. An epidemic curve was constructed. Community leaders, patients and health workers were interviewed to collect qualitative information in the area.

Analytical epidemiology

Unmatched case control study was conducted to identify risk factors associated with malaria outbreak from March 13 to April 5/2018. Cases were selected based on the case definition mentioned above and those people's neighbors of case patients with no fever for the last three months were selected as community controls. Confirmed malaria case patients with control in 1:1 ratio basis were conducted. A structured questionnaire was used to collect information about selected practices including; sleeping and staying area during night, use of insecticide bed net, indoor residual spray with Bendiocarb, and presence of stagnant water or any other mosquito breeding area, travel history and presence of any artificial water holding containers close to home. Microsoft Excel, Epi-info version 7.2.1.0 and SPSS version 23 was used to describe the disease and analyze associated risk factors. The significance of risk factors for the outbreak was determined through bivariate and multivariate analysis by calculating both Crude Odds Ratio (COR) at P Value < 0.05 and Adjusted Odds Ratio (AOR) with 95% Confidence Interval (CI).

Sample size estimation and sampling technique

The cases and control were recruited by convenience sampling method irrespective of the variables. 1:1 case-control ratio was used to determine sample size. The formula for the estimation of sample size for an independent case control study was used by assumption taken from previous study conducted in Afar region (20). The assumption taken from the previous study indicates that taking in account a 95% confidence interval (CI) (1.96), 5% level of significance (α), power of 80% proportion of controls exposed was 50% with odds ratio (COR) of 2.25 The sample sizes which were conveniently taken from each group can be determined by the Epi info version 7.2.1.0. Therefore, proposed sample size was 112 cases and 112 controls and total 244 study participants involved in the study.

Laboratory methods

To identify malaria parasite thick and thin smears with a 100 × oil immersion microscopy was conducted at Bena site health centers. Whenever they faced shortage of some reagents and during interruption of electric power, Rapid Diagnostic Test (RDT) was also used in this health center and all health post used RDT to identify confirmed malaria cases at community level during outbreak investigation and active case search.

Environmental assessment

Data was collected on the presence of mosquito breeding sites from the Woreda health office and health facilities. Selected case patients and controls were interviewed about presence of mosquito breeding sites close to their compound and near to home. These sites include unprotected dam for irrigation, Gold mining area (near to Birbir and Golol River), open deep well, intermittent river closer to their house and availability of uncovered plastic water container, old tires and broken glasses in the home or outside the home were also critically assessed beside of this. Similarly, observation of potential mosquito breeding sites and presence of anopheles' larvae at irrigation dam and Birbir River was conducted.

Data collection methods and tools

A structured questionnaire using face to face interviewer administered to collect primary data on socio-demographic characteristics, clinical manifestation (for cases only), potential exposures (risk factors) like environmental data and use of malaria preventive measures were collected from both cases and controls. The information collected directly from a cases and control regarding to their demography information, clinical and treatment history, potential exposure and travel history and knowledge assessment to ward to malaria diseases were collected from adult (above 18 years and who could answer appropriately and for children less than 18 years' parent and care giver were interviewed.Discussing with relevant bodies (RRT), review of weekly data at different level (Zonal health department, Woreda health office and Health facilities), visit of the affected kebeles conducted. Community members on knowledge of malaria transmission and control measures was conducted during investigation.

Data management and analysis

Data was cleaned and cheeked for completeness and consistencies, coded and entered in to Epi info 7.2.1.0 and transported into statistical package for social science (SPSS) Version 23 for analysis and the result were organized, summarized and presented by using table and text. Rate of malaria by age and sex were calculated by using forecasted 2017/18 G.C census data as denominators. Descriptive statistics (Frequency), simple cross-tabulations (Bi-variate) and Multivariate analysis (logistic regression) by calculating Adjusted Odds Ratio and 95% Confidence Interval was done to describe and determine the related to risk factors of the outbreak.

Data dissemination

Written report of both hard and soft copies was prepared and shared to Addis Ababa University/School of Public Health, Oromia Regional Health Bureau, and brief and debriefing was conducted to Iluabora Zone health department, Darimu Woreda health office, and final report summated to AAU, EFETP mentor, resident advisors and ORHB accordingly.

Data quality control

We used line list for describing malaria cases interms of time, place and person. In adition all data completeness were checked before analysis. Orrentation was given for data collectros (investigation team) on data collection tools and techniques of interview with practical exersices on the way of house to house data collection. Pre-test was done at Bena 1 Kebele before one day data collection minor correction and mutual understanding was established within the team day to day cross checking was conducted on data collectors by principal investigator.

Inclusion and exclusion criteria

Case: Any residents of the Bena site kebeles, who experienced symptom of malaria and agreed to participate.

Controls: Any residents of Bena site kebeles during the study; who was a neighbour to a case and who did not develop signs and symptoms of malaria and agreed to participate.

New comers or a person who may not stay in the affected kebeles in the previous three weeks, Participants, unable to provide the required information due to different conditions; like extreme illness and absence of caregivers and refused to participate were excluded from the study.

Ethical considerations

A formal letter was written from Oromia Regional Health Bureau to Iluabora Zonal Health Department, Support latter was written from the Zone to Darimu Woreda health office to investigate the outbreak, and the Woreda health office accepted that and a support letter was also written from the Woreda health office to the respective health facilities (Bena site Health center and Heath posts) accordingly. The purpose of the investigation was briefed to the study participants, health professionals, RRT and kebele administrative before the deployment.

Case definition

Community case definition

Any person with fever or fever with headache, back pain, chills rigor, sweating, muscle pain, nausea and vomiting OR suspected case confirmed by RDT.

Standard case definition

Any person with fever or fever with headache, rigor, back pain, chills, sweats, myalgia, nausea, and vomiting diagnosed clinically as malaria.

***Suspected*:** Patient with fever or history of fever in the last 48 hours and lives in malaria endemic areas or has history of travel within the past 30 days to malaria-endemic areas.

Probable: Any person with fever and one or more of major sign such as headache, rigor, back pain, chills, sweats, myalgia, nausea, and vomiting diagnosed clinically as malaria.

Confirmed: A suspected case confirmed by microscopy or RDT for plasmodium parasites (PHEM Guideline for Ethiopia et al., 2012)

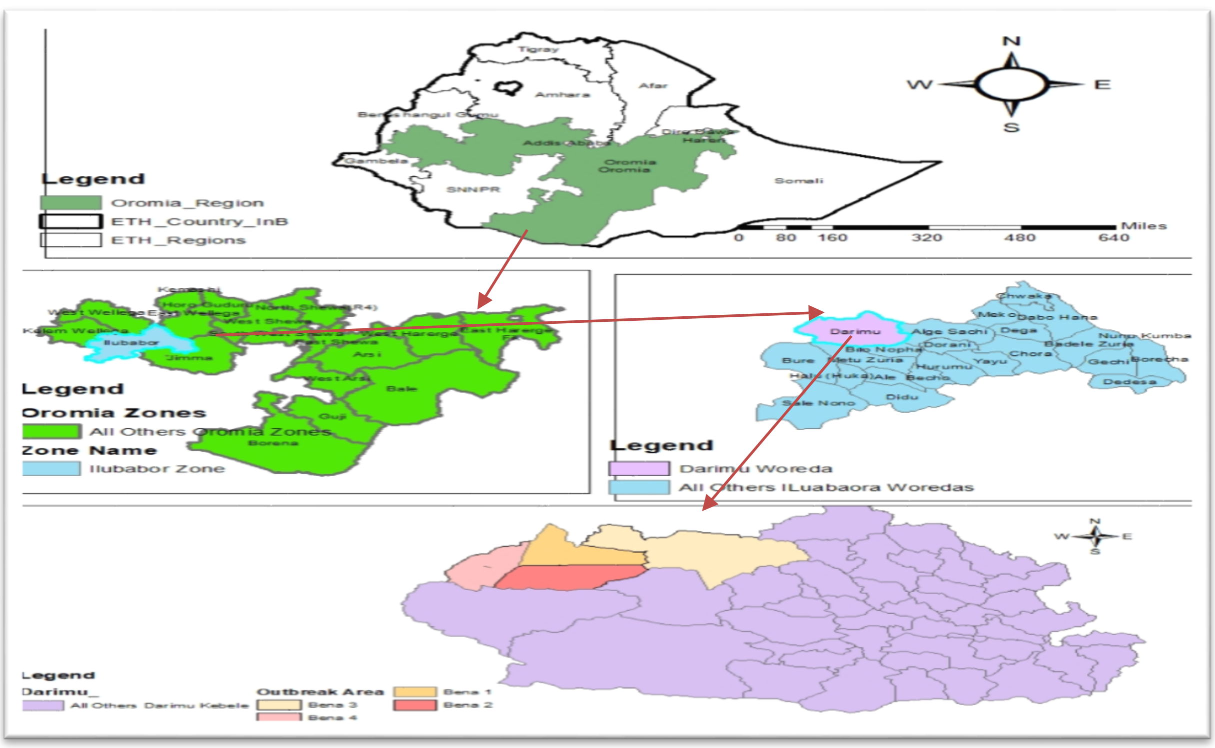
Dependent and Independent variables.

Dependent variable	Independent variable
Malaria infection	Age group
	Sex
	Occupational status
	Family size
	Presence of unprotected dam for irrigation.
	House hold with IRS and ITN (Bed net utilization)
	Presence of intermittent rivers near to the community
	Presence of mosquito breeding sites near House/vicinity
	Sleeping outside home
	Staying outside over night
	Travel history
	Presence of malaria case in house holds
	Types of house
	Wearing protective clothing
	Having knowledge on malaria prevention method
	Presence of similar sick patient in your house hold

1.1.4 Result

Descriptive Epidemiology

An outbreak was verified by comparing the current year data with a third quartile method (2nd largest number) during the previous 5 years. It was shown that the current case trend line crossed the threshold levels in all Bena site kebeles (Bena 1,2,3 and 4 Kebele) of Darimu woreda.



Map 1.1-1:Oromia Region, Iluababora Zone, Darimu Woreda showing Bena site Malaria affected Kebeles, March 2018.

A total 348 malaria confirmed cases identified during the outbreak period (WHO week 7-14) in Darimu Woreda, (February 21-March 28, 2018). The average incidence rate of the diseases in the Woreda was 10.74 malaria cases per 1000 population with 30% positivity rate during the outbreak period (WHO week 7-14). Majority of the cases (91.7%) were plasmodium falciparum species, and 8.3% were plasmodium vivax with 0.02% admission rate and no reported death. The below figure show that, the alert threshold was on week 6 and the normal (Usual trend) was crossed the threshold line at week 7 and then become decline at week 12.

The Woreda monthly malaria data shows the attack rate were increased from 1.2/1,000 population in January 2018 before outbreak, but peaked in March (10 per 1,000 pop) and declined from April 2010 (3 per 1,000 pop). However, the baseline incidence rate for malaria prior to the outbreak was 2/1000 Population but during this study the incidence rate was 14/1000 Population with zero case fatality rate.

Description of Malaria cases by person

From 21th February to 28th March 2018, we identified a total of 348 confirmed malaria cases and Zero death (0.0% CFR) in four kebeles (Bena1, Bena2 and Bena3 and Bena4) of Darimu Woreda. The median age of the cases was 15 years with a range of 0.9-81 years old. The sex wise distribution of cases; Male accounted for 57.2%, 12.2 per 1000 (199 population) and for female 42.8%, 9.8 per 1000(149) population (Table 1.1.1).

Table 1.1-1: Distribution of malaria cases by sex in Darimu Woreda, Oromia Region, Ethiopia, March, 2018

Sex	Number of cases	Number of deaths	Percentage (%)	Population at risk	Attack Rate/1000 population	Case fatality rate
Female	149	0	42.8	16,091	9.26	0.0%
Male	199	0	57.2	16,286	12.22	0.0%
Total	348	0	100	32,377	10.74	0.0%

The overall attack rate (AR) of the cases was 10.7 per 1000 populations with case fatality rate of zero in all age groups. Age group above 15 years were the most affected with an AR of (181) 17.2 per 1,000 populations followed by children under five years (50) 7.8 per 1,000 populations and least in children aged five up to fourteen years' age group (117) 7.6 per 1,000 populations of all notified suspected malaria cases (Table. 1.1.2).

Table 1.1-2: Malaria attack rate per 1,000 pop and Case fatality ratio by age group, Darimu Woreda, Iluababora Zone, March, 2018

Age group	Frequency	Percent %	Population at risk	Age specific attack rate/1,000 populations	Case fatality rate %
≤4 years	50	14.37%	6,379	7.84	0
5 to 14 Years	117	33.62%	15,475	7.6	0
≥15 Yeras	181	52.01%	10,523	17.2	0
Total	348	100%	32,377	10.74	0

Description of malaria cases by place

Malaria epidemic was detected & reported to Iluababora Zone health department on March 9th of 2018. Of total 348 cases, majority (138) 39.7% were from Bena 4 and 96 (27.6%) were from Bena 1 of Darimu Woreda with zero malaria related death reported by the community from all respective kebeles during the period. The frequency of the attack rate was differing among studied kebeles.

The highest attack rate was in Bena 2 Kebele which was 94 (16.3 per 1000) population, 13(11.4 per 1,000 populations in under-fives and 82 (17 per 1,000) populations in>5 years old.

High attack rate were observed in Bena 2 kebele than others kebeles (Table 1.1.3) in fact the (Bena 2 Kebele) reporting the heights attack rate were mining and irrigation site were known as more vulnerable individual visit frequently among all kebeles. The underlying reason was may be due to the aggregation of migrant workers in there kebele.

Table 1.1-3: Malaria attack rate by Kebeles and Age group Darimu Woreda, Iluabora Zone, Oromia Region, Ethiopia, March, 2018

					<5 Years population			≥5 Years population		
Kebeles	Popn.at risk	Num.of Case	Percent	AR / 1000 Popn.	Popn. At risk	Total case	AR / 1000 Popn.	Popn. At risk	Total case	AR /1,000 Popn.
Bena 1	10,400	96	27.6	9.2	2,049	13	6.3	8,351	83	9.9
Bena 2	5,783	94	27.0	16.3	1,139	13	11.4	4,644	81	17.4
Bena 3	6,699	20	5.7	3.0	1,320	1	0.8	5,379	19	3.5
Bena 4	9,495	138	39.7	14.5	1,871	23	12.3	7,624	115	15.1
Total	**32,377**	**348**	**100**	**10.74**	**6,378**	**50**	**7.8**	**25,999**	**298**	**11.5**

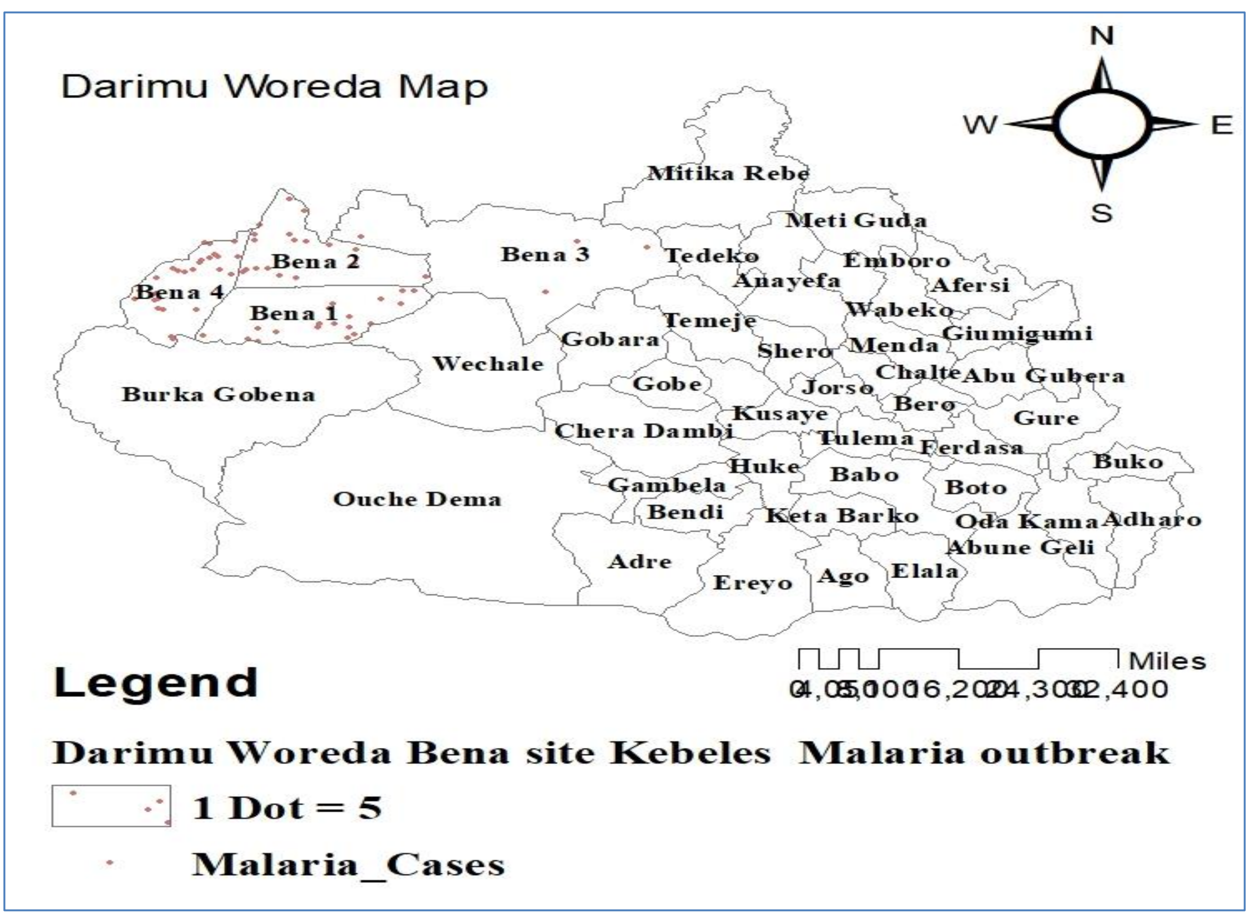


Figure 1.1-1: Spot Map showing Malaria cases Darimu Woreda, Iluababora Zone, Oromia Region, March, 2018

Among the total 348 malaria cases, the most dominant species and responsible for this outbreak were P. falciparum followed by p. vivax in all kebeles account for 91.7% and 8.3% respectively. Plasmodium. falciparum was predominantly affect Bena 4 village (93.47%) (see below table)

Table 1.1-4: Distribution of malaria cases by Kebeles and plasmodium species Darimu Woreda, Iluabora Zone, Oromia Region, Ethiopia, March 2018

Kebeles	Popn.at risk	Total Confirmed	Percent	Plasmodium species Pf N(%)	Pv N(%)
Bena 1	10400	96	28.%	85(88.5%)	11(11.45)%)
Bena 2	5783	94	27.%	89(94.69%)	5(5.31%)
Bena 3	6699	20	6%	17(85%)	3(15%)
Bena 4	9495	138	39.%	129(93.47%)	9(6.5%)
Total	32377	348	100%	319(91.7%)	29(8.3%)

Description of malaria cases by time

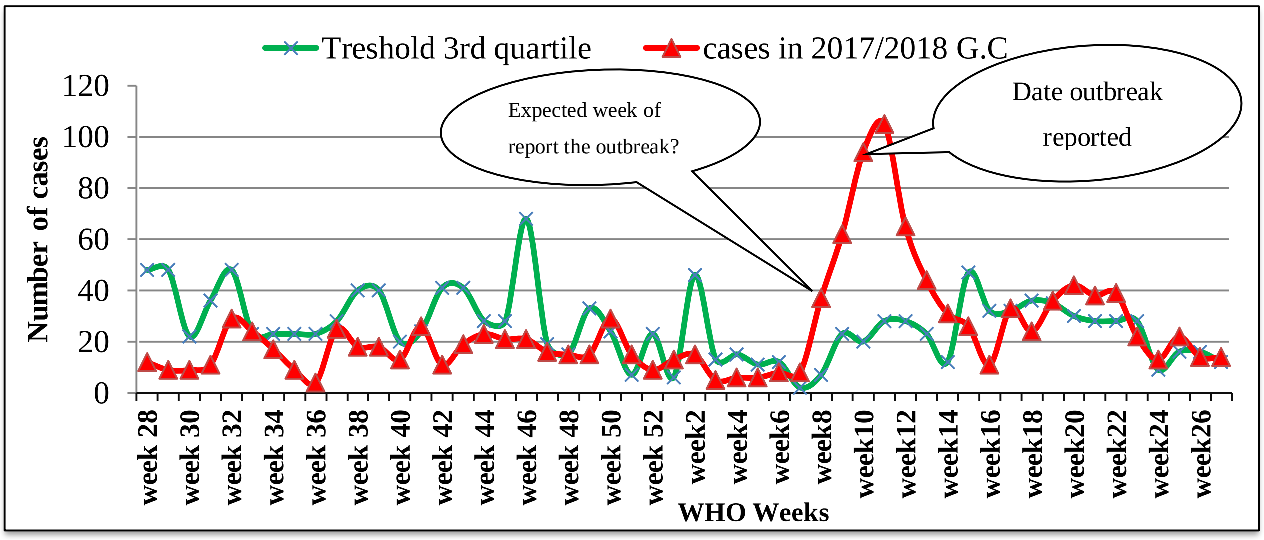


Figure 1.1-2: Trends showing by WHO Weeks Malaria cases crossing thresholds level Darimu Woreda, Iluababora Zone, Oromia Region, March, 2018

According to weekly data, reported number of malaria cases were exceeded the threshold level in week Seven, peaks in week 11th and starts to decline after 12th week of march 2018 (between WHO week 7 to 14/2018). The highest peak was seen at week 11 and the outbreak end up in week 15, 2018 of WHO week. The above weekly malaria reports show that an increase of malaria cases per week from an average of 18 cases in previous five-years data (2013-2017) to more than 56 cases per week of current year (2018) and a continued elevated malaria case load is being observed between the end of February and March 2018 respectively. Throughout this period the Woreda RRT had initiate some awareness campaigns and start to equipping health facilities with RDT, LLITN's and Malaria drugs however it was late.

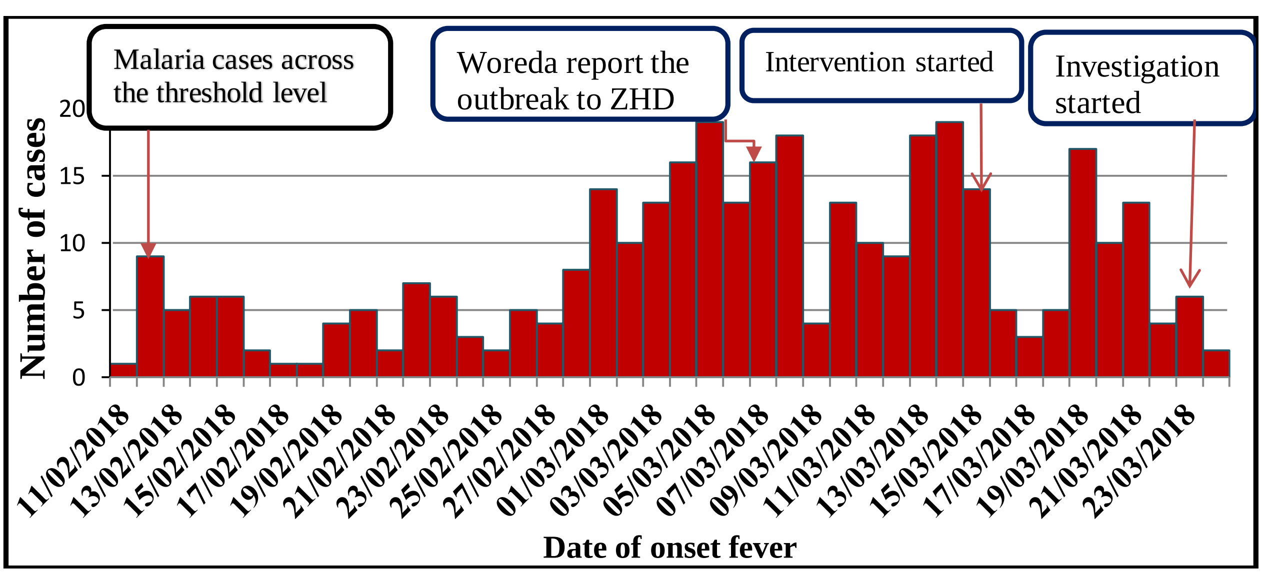


Figure 1.1-3: Epi-curve Showing confirmed malaria cases by date of onset fever in Darimu Woreda, Oromia, Ethiopia, 13th February to 28th March, 2018

Epidemic was started on February 12, 2018 but the Woreda health department was notified on March 09, 2018. Epidemic curve, may help in; confirming the existence of an epidemic and identifying the mode of transmission; determining the possible period of exposure and/or the incubation period of the disease under investigation and identifying outliers in terms of onset of illness, which might provide important clues as to the source (21). Therefore, the above epi curve showed the outbreak is propagated (progressive) which is last longer than common source epidemics in which, one with multiple peaks with a possibility of person to person transmission via an intermediate host (Mosquito). The incubation interval and the reproduction rate determine how fast the epidemic curve can rise, which is much faster in vivax epidemics than in falciparum epidemics. There will be considerable overlap; and also if the conditions exist for a big seasonal increase in vivax, it can be expected that the same may be true for falciparum, with more serious consequences (22). The high numbers of malaria cases were detected from 1st up to 21th March, 2018. Zonal health department and field epidemiology residents departed to the outbreak area lately (3 to 5 week) after the outbreak started and interventions also started lately on March 15/2018. In fact, early detection of outbreaks can have a major impact in reducing the numbers of cases. But during this outbreak intervention was late (started after four weeks) onset of epidemic. Therefore, this late intervention may lead to increase the infection, results for the occurrence of secondary and tertiary cases and limit the opportunity for early control. This was due to late notification of outbreak by health facility to the next levels. The proportion of P falciparum infections was higher than plasmodium vivax during the period.

Environmental assessment

Environmental assessment was conducted in Bena 1 and 4 kebele of Birbir River and Bena 2 irrigation dam where the majority of cases were coming. Multiple sites of breakage irrigation water bodies which serve as breeding site for increase in vector breeding of anopheles' larvae were identified. Birbir river serve as the administration boundary between Kellam Wollega and Iluababora Zones and it was the place where the gold mining search take place by community (self initiated as income) and also there was multiple small water collecting excavated holes, which resulted from dig for mining search which collect the water and serve as breading place for Anopheles mosquito. Additionally, larvae of anopheles' mosquito were found nearby Birbir river and irrigation dam. There was the illegal population settlement take place from deferent area to the place without popularity of local administrations to the area for gold mine search. The irrigation dam was difficult to drain and fill within a short period of time.

We select the more affected kebele and visited to detect new malaria cases and observe the status of LLINs utilization. Majority of house hold was new settlers and they don't have bed net in their house. But among those had LLIN only 17 (12.1%) of the HHs hanged the LLIN's in their ceiling directly to the bedding while the rest were utilizing for other purposes and put other places in the house. Likewise, IRS was not performed for the last one year in 50% HH of visited.

Epidemic preparedness and response

The Woreda and the health facility that we visited had an epidemic preparedness plan and an epidemic preparedness committee in place prior to the outbreak. There is no risk mapping trend seen in all visited health facilities. IRS chemical was not available at Woreda level and in all visited health facilities.

Laboratory

From the onset of the outbreak (Feb 12 to March 28, 2018) a total of 1,533 smear tests were done by microscopy at Bena health center and RDT for suspected malaria cases in catchment health posts. Weekly surveillance Data of the Woreda shows of total 1,533 suspected malaria cases about 446 (29%) of cases were confirmed for malaria and five cases (0.9%) treated clinically and about 319 (89%) case were P. falciparum and 51(11%) were P. Vivax. Over all smear positivity rate were 29.1% during the period

Public Health actions (Interventions)

We distribute more than 1,500 ITNs for affected area among all affected kebeles depending on health post data by prioritizing mining area population frist. Draining and disturbing stagnant water with a participation of total 273 volunteered peoples were conducted. Health education was provided for students and communities to enhancing their awareness on bed net utilization and also community mobilization was conducted on prevention and control measures of malaria disease. Health professionals were mobilized and assigned to affected kebeles for active case search from house to house and early diagnosis and case management at the community and health facility level was conducted.

Table 1.1-5: Summary of intervention taken during Malaria outbreak investigation Darimu Woreda, Iluababora Zone, Oromia Region, Ethiopia, March 2018.

S.no	Response measures taken for outbreak	Whether done or not (Yes/No)	Comments /Performed by
1	Draining and disturbing stagnant water	Yes	Community Participation
2	Community based health education	Yes	Health Profesional, HEW and Investigation team
3	Active case search from house to house and Provide free diagnosis & treatment of malaria	Yes	Health professional and investigation team
4	Identification of Mosquito breeding sites	Yes	HEW,RRT and Investigation team
5	Malaria treatment drug and lab equipment	Yes	RHB and investigation team
6	Distributing LLITN's for community	Yes	WorHO and HF
7	Conducting indoor residual spray (IRS)	No	Resource shortage
8	Larevicidal spray (Abate chemical)	No	Shortage (Lack)

Analytical Epidemiology

Case-control (Risk factor analysis)

In order to identify the risk factor unmatched 112 malaria cases and 112 community controls total 224 study participants were conveniently selected and interviewed from four kebeles (Bena1, 2, 3 and 4) of Darimu Woreda. Of the 112 infected individuals, 102 (91%) and 10 (9%) were diagnosed with P. falciparum or P. vivax malaria respectively.

Table 1.1-6: Socio-demographic and parasitological characteristics of study participant's Malaria outbreak of Darimu Woreda, Iluababora Zone, Oromia Region, March,2018. (N=224)

S. no	Variables	Categories	Frequency (%)	Case No (Col %)	Control No (Col %)	Estimated OR	95% CI	P-value
1	Age group	<5yrs ®	10(4.5%)	6(5.4%)	4(3.6%)			
		5-14 yrs	60(26.8%)	28(25%)	32(28.6%)	0.4	0.14-2.2	0.4
		15-59yrs	147(67%)	76(67.9%)	74(66.1%)	0.5	0.17-2.3	0.5
		>=60yrs	4(1.8%)	4(3.6%)	0(0%)	0.99	----	
2	Sex	Male ®	98(43.8%)	52(46.4%)	46(41.1%)			
		Female	126(56.2)	60(53.6%)	66(58.9%)	1.2	0.7-2.1	0.41
3	Occupational status	Student ®	35(15.6%)	19(17%)	16(14.3%)			
		Farmer or pastoralist	91(40.6%)	40(35.7%)	51(45.5%)	0.66	0.3-1.4	0.29
		Unemployed	98(43.8)	53(47.3%)	45(40.2%)	0.99	0.45-2.5	0.98
4	Marital Status	Married ®	92(41.1%)	50(44.6%)	42(37.5%)			
		Single	127(56.7%)	58(51.8%)	69(61.6%)	1.7	0.41-1.3	1.16
		Divorced or Widowed	5(2.2%)	4(3.6%)	1(0.9%)	3.3	0.36-31.3	0.29
5	Educational status	Illiterates	111(49.6%)	55(49.1%)	56(50%)	1.4	0.59-1.8	0.85
		Non formal	30(13.4%)	17(15.2%)	13(11.6%)	1.02	0.60-3.2	0.42
		Primary and above ®	83(37.1%)	40(35.7%)	43(38.4)			
6	Religious status	Muslim ®	213(95.1%)	103(92%)	110(98.2%)			
		other	11(4.9%)	9(8%)	2(1.8%)	4.8	1.0-22.7	0.48
7	Family size	<5a ®	200(89.3%)	98(87.5%)	102(91.1%)	1.4	0.61-3.4	0.38
		>5	24(10.7%)	14(12.5%)	10(8.9%)			
8	Plasmodium species	P.falciparum	102(91%)	102(91%)	-----			
		P.vivax	10(9%)	10(9%)	-----			
Total			224(100%)	112(50%)	112(50%)			

Note: ® indicate referance group

Demographic characteristics of study participant's result show that; of one hundred twelve cases 68% were between 15-59 years' age group followed by 26.8% of 5-14 age group. The mean age of case-control 22.89 SD$\pm$13.71 by which were mean 22.12 SD$\pm$ 13.80 for cases and 21.10 years SD$\pm$11.60 for controls. The sample contained more Females than males (56.3%) Vs (43.7%), Majority of case 53(47.3%) were unemployed followed by 40(35.7%) of farmer's and pastoralist in occupations.

Majority of case (87.5%) and control (91.1%) participants were from a family with less than 5 members and about 54.4 (N=122) households, 38(33.9% case households and 84(67%) control households had at least one functional insecticide bed net in their house. 102(91%) 10(9%) were diagnosed with P. falciparum and P. vivax. Majority of the interviewed cases 96(86.5%) were treated by Coartem and 10(9%) and 5(4.5%) were treated by chloroquine and Quinine tablet drugs. The mean age of study participants was 22.89(SD $\pm$13.71) years.

Table 1.1-7: Clinical manifestations among Malaria cases in Darimu Woreda, Iluababora Zone, Oromia Region, Ethiopia, March, 2018. (N=112)

Symptom	**Frequency N(%)**
Fever	106(95%)
Sweating	94(84%)
Headache	93(83%)
Anorexia(Appetite loss)	77(69%)
Weakness	74(66%)
Chilling and shivering	70(63%)
Vomiting	57(51%
Diarrhea	10(9%)

Fever, sweating and headache were the three predominant clinical manifestation and accounts for 106(95%), 94(84%), and 93(83%) respectively. Vomiting and diarrhea were less frequent clinical manifestation account for about 51% and 9% respectively (Table 1.1.7).

The clustering of cases in Bena kebeles by which the proximity of the unprotected irrigation dam led to suspect them as breeding sites that could have contributed to the outbreak. Bivariate analysis show that, sleeping outside home, stay outside overnight, presence of similar sick patient in house hold, unprotected dam for irrigation, presence of mosquito vectors/ mosquitoes breeding sites around the home, and unscreened types of house were found to be statistical significant risk factors.

Table 1.1-8: Bi-variate analysis results of independent factors related to malaria outbreak, Darimu Woreda, Iluababora Zone, Oromia Region, Ethiopia, March, 2018.(N=224).

Variables	Category	Cases (N=112) (Col %)	Controls (N=112) (Col %)	COR	95% CI	P-value
Sleeping outdoors at night	Yes	35(31.2%)	13(11.6%)	3.46	1.71-6.99	<0.001*
	No [r]	77(68.8%)	99(88.4%)	1		
Stay outside over night	Yes	64(62.14%)	39(37.86%)	2.49	1.45-4.28	<0.001*
	No [r]	48(39.67%)	73(60.34%)	1		
Travel history in the past 2 weeks to other malaria endemic areas	Yes	35(32.7%)	27(24.1%)	1.53	0.84-2.76	0.150
	No [r]	72(67.3%)	85(75.9%)	1		
Presence of Similar sick patient in House hold	Yes	33(30%)	15(13.5%)	2.74	1.39-5.41	0.002*
	No [r]	77(70%)	96(86.5%)	1		
Have bed net in household	Yes	38(33.9%)	84(75%)	0.17	0.09-0.30	<0.001*
	No [r]	74(66.1%)	28(25%)	1		
Bed net utilization	Always*	9(8%)	61(54.5%)	0.06	0.03-0.14	<0.001*
	Sometimes	25(22.3%)	16(14.3%)	0.70	0.33-1.47	0.34
	Never & not have ITN [r]	78(69.6%)	35(31.3%)	1		
Indoor residual spraying sprayed this year	Yes	32(28.6%)	67(60.9%)	0.25	0.01-0.44	<0.001*
	No [r]	80(71.4%)	43(39.1%)	1		
Unprotected dam for irrigation	Yes	89(79.5%)	52(46.4%)	4.46	2.47-8.05	<0.001*
	No [r]	23(20.51%)	60(53.6%)	1		

Variables	Category	Cases (N=112) (Col %)	Controls (N=112) (Col %)	COR	95% CI	P-value
Presence of mosquitoes breeding sites around the home or vicinity	Yes	100(89.3%)	65(58%)	6.02	2.97-12.21	<0.001*
	No r	12(10.7%)	47(42%)	1		
Types of house	Unscreened	50(44.6%)	31(27.7%)	2.10	1.20-3.67	0.009*
	Screened r	62(55.4%)	81(72.3%)	1		
Wearing protective clothing	Yes	6(5.4%)	15(13.4%)	0.36	0.13-0.98	0.04*
	No r	106(94.4%)	97(86.6%)	1		
Having knowledge on malaria prevention method	Yes	42(37.5%)	55(49.1%)	0.62	0.36-1.05	0.080*
	No r	70(62.5%)	57(50.9)	1		

Note: * indicate statistically significant at P. value < 0.05 & (r, or 1 indicated reference category)

The bi-variate analysis show that habit of sleeping outdoors at night, stay outside overnight, travel history in the past 2 weeks to other malarious area, presence of similar sick patient in house hold, presence of unprotected dam for irrigation and mosquitoes breeding sites around the home or vicinity, unscreened types of house, sick patients (same symptoms) in the place of been(traveled) were associated with risk of development of diseases and statistically significant associated with malaria outbreak at p-value 0.05. Indoor residual spraying sprayed in the year, wearing protective clothing, have bed net in the household and self-reported always bed net use, was protective factors for developing diseases. There was no statistically significant correlation between having knowledge on malaria prevention method and travel history in the past 2 weeks to other malaria endemic areas with having malaria in the woreda. All these variables were included in multivariate analysis, however others variables that had P-value greater than 0.25 in this study were excluded from multivariable regression model. Variables which were significant at p-value 0.05 level and 95% CI considered in the multivariate logistic regression analysis were considered as to be the determinant factors of malaria infection in the study.

Table 1.1-9: Bi-variate and Multivariate analysis of risk factors for Malaria outbreak Darimu Woredas, Iluababora Zones, Oromia, Ethiopia, March, 2018

Risk factors	Category	Cases (N=112) (Col %)	Control (N=112) (Col %)	Crude OR (95%CI)	Adjusted OR (95%CI)	Adjusted P-value
Presence of Mosquito vectors/ breeding sites around the home	Yes	100(89.3%)	65(58%)	6.02(2.97-12.21)*	5.5(2.08-14.73)	0.001**
	No	12(10.7%)	47(42%)	1		
Presence of unprotected dam for irrigation	Yes	89(79.5%)	52(46.4%)	4.4(2.47-8.05)*	4.78(2.09-10.93)	0.000**
	No	23(20.51%)	60(53.6%)	1		
Presence of similar sick patient in the house hold	Yes	33(30%)	15(13.5%)	2.74(1.39-5.41)*	4.05(1.48-11.09)	0.006**
	No	77(70%)	96(86.5%)	1		
Have bed net in their home (household bed net possession)	Yes	38(33.9%)	84(75%)	0.17(0.09-0.30)*	0.35(0.08-1.47)	0.15
	No	74(66.1%)	28(25%)	1		
Wearing protective clothing	Yes	6(5.4%)	15(13.4%)	0.36(0.13-0.98)*	0.17(0.04-0.65)	0.01**
	No	106(94.4%)	97(86.6%)	1		
Bed net utilization	Always***	9(8%)	61(54.5%)	0.06(0.03-0.14)*	0.18(0.04-0.80)	0.02**
	Sometimes	25(22.3%)	16(14.3%)	0.70(0.33-1.47)	2.02(0.46-8.84)	0.35
	Never use + not have ITN [a]	78(69.6%)	35(31.3%)	1		

Note: *Statistically significant at P-value <0.05, bi-variate analysis & multivariate,* ****:** *Statistically significant at P-value <0.05 multivariate analysis & "1" indicate reference category for RF. Crude Odds Ratio (COR) and Adjusted Odds Ratio (AOR).*

Result of comparing each independent variable was adjusted to other variables (multivariable binary logistic regression analysis) show that, Presence of mosquito vectors/ mosquitoes breeding sites, unprotected dam for irrigation, and similar sick patient in the house hold, was independent risk factors for development of the diseases and found to be statistically significant associated with malaria infection when adjusted for all other candidate variables, at 95% CI and a p-value of < 0.05, and also wearing protective clothing and using bed net always (every night) was protective factors against the disease. having bed net in household, indoor residual spray with Bendiocarb, unscreened type of house, having travel history to others malaria endemic area, stay outside overnight, sleeping outdoors, were not statistically significant association with malaria infection when adjusted for all other variables by multivariate binary logistic analysis (Table 1.1.8 & 1.1.9). Among the 13 independent factors included in multivariate analysis individual, the presence of mosquito vectors/ mosquitoes breeding sites around their home Adjusted Odds ratio and Confidence interval (AOR=5.54; 95%CI: 2.08-14.73), presence of unprotected dam for irrigation (AOR=4.78; 95% CI: 2.09-10.93), presence of similar sick patient in house hold (AOR=4.05; 95% CI: 1.48-11.09) more likely to have risk of malaria as compared to those don't have. Likewise, during field visit we observe mosquito's larvae in unprotected dam for irrigations by naked eye in malaria affected kebeles. Protective clothing and always utilization of bed net was associated with lower odds of malaria by (AOR=0.17; 95% CI; 0.04-0.65 and AOR=0.18; 95% CI; 0.04-0.80) respectively. Having bed net (Household bed net possession) and Indoor residual spraying with Bendiocarb was not have statistical associated with lower odds of malaria (AOR=0.35; 95% CI: 0.08-1.47 and AOR=0.63; 95% CI 0.27-1.49) respectively in the study area.

1.1.5 Discussion

Lots factors might be contributing for the occurrence of malaria outbreak. Different risk factors were assessed during the investigation beside intervention activities. Malaria was endemic in Darimu Woreda that is about 54.4% of area found in low land. There was malaria outbreak in the Woreda and there is no prior public study done on malaria epidemic during past five years in the area. Malaria cases occurred occasionally high in this Woreda like others the malaria endemic Woreda of the region and no reported malaria outbreak in the Woreda during last five years. The finding descriptive epidemiology analysis of this study revealed that existent of malaria outbreak based up on five-year malaria data or last one year of epidemiological records by comparing the current year data with a third quartile method (2nd largest number) during the previous 5 years and used to generate hypothesis on the causes of malaria outbreak in the area. There is no universal definition of a malaria epidemic, it is generally accepted that a sharp increase in which the disease is rare or a seasonal increase in clinical malaria in areas of low to moderate transmission and "outbreak" is used when the number of cases observed in a given geographical area is greater than that normally expected in the area during a given period of time (23,24). The outbreak occurred and umber of malaria cases were excelled the threshold level at the mid of February, 2018 and end up at the end of March, 2018 (WHO week 7 to 14), and the event was determined to be an outbreak not a seasonal increase in the number of cases. Malaria epidemic start date in the Woreda was consistent with minor malaria epidemic start month of the national data in which, a minor malaria transmission season occurs between April to May in Ethiopia (25). In the area the outbreak was last for more than one month (February 12 to March 28, 2018) this may due to daily newly migration of non-immune individuals and illegal population settlement regardless of popularity of any administration body to these areas (Bena site kebeles) from different part of high land areas of the region for mining and agricultural work, which result in an increase the vulnerability of peoples to the malaria in the area. Outbreaks of malaria are often complex, and it may have natural and human made determinants, since large group of peoples satteled to the area recently, access to some affected area is very difficult to initiate vector control activities due to lack of accessibility for infrastructures like, road. A lot of dig holes made resulted from mining work near by the irrigation site were detected which is suited for mosquito breeding and water holding. Similarly, in the area a cluster of cases reported (Bena 1,2 and Bena 4 kebeles). In the woreda Bena 1 and 4 are found to be a place where an irrigation dam and community initiated searching for mining was common.

Most of common symptom of case was fever, sweating and headache, and diarrhea were a less frequent clinical manifestation. Theresult was similar with outbreak investigation report from Afar region in which fever and headache were the two predominant and diarrhea were less frequent clinical manifestation (20).

Multiple risk factors were assessed during investigation period beside to intervention activities. Early case detection and proper case management was result for zero complicated malaria and case fatality rate throughout outbreak periods. This study revealed that high proportion P.falciparum in the study area, which is mostly deadly species accounts about 91%, which were higher than those studies conducted many parts of the country (Ethiopia) (5,26–28). and less than study report from Somalia region Ethiopia, World health organization East and Southern Africa malaria epidemiology report (8,29). The difference is may be due to high sensitivity of the malaria rapid diagnostic test which was commonly used in the study area and most of the RDTs used in Ethiopia also were tests that detect plasmodium falciparum only (30). And also altitude of the study area climatologically difference (20). However, Malaria parasite P. falciparum, and its Anopheles vectors has developed resistance to most of the available anti-malarial drugs and classes of insecticides (31). And also in Ethiopia, coexistence of both P. falciparum and P. vivax can create challenge in prevention, control and elimination of the disease (22). The antimalarial drug, Coartem® remains highly effective in the treatment of uncomplicated malaria in the area this may revealed by, in our study, majority of the cases (86.5%) were treated by Coartem®, which agrees with WHO recommendation and study result from Zimbabwe showed; artemesinin based combination therapy for the treatment of patients suffering from P. falciparum responsible specious for the outbreak in the area. Artemesinin derivatives are effective in obtaining a rapid reduction of parasitaemiam (5,32). Our result was revealed the effectiveness of Artemesin first line anti malaria drug since about 91% P.f of cases was treated by Artemesinin and there were no severe case and deaths during this outbreak however the predominant spacious were p. falciparum during the outbreak in the area.

In our study male were predominantly affected than females this trend this may be due to males were more actively engaged on activities that expose them to mosquito bite such as; planting, harvesting and mining work nearby irrigation site in the area. The finding consistent with studies done in Namibia showing being male to be associated with increased risk of malaria (34).

Several studies have found that malaria prevalence is particularly high amongst mobile young adults (15 years+) compared to under five children (19,34). consistently our study revealed that age groups between 15 to 59 years were more affected by malaria; the reason why malaria more affect the productive age group might be, due to adult interacting more with job seeking and malaria transmission peak coincide with the planting and harvesting season, and also it may be due to the practice of bed net use which were children under age 5 years are higher for use bed net among the general population (35).

However malaria based communication tools are designed based on the level of education for community groups and audience, our study show that educational level did not indicate the risk of malaria infection, there is no deference between both case and control groups regarding of knowledge cause and prevention of the diseases, this result supported by the study report from Gambia, estimation of education level did not effectively discriminate risk of disease (36).

In sub Saharan Africa approximately 0.9 million people live near irrigation and large dam sites in unstable malaria transmission areas and whole population assigned to irrigation in malaria endemic areas is at risk of the disease (37). In our study Bena River irrigation dam has a major contribution for breading of anopheles' mosquito; the multiple holes resulted from the searching of mining were remain the major breeding site in the Woreda. In addition to this mosquito larva were detected in the unprotected dam for irrigation by investigation team. But, it was challenging to identify the species of larva and decide their quality due to lack of technical expertise within the investigation team. This may be due to a change in environmental factors un conditional increase temperature, presence of a lot of manmade excavated places, that results from searching for mining; thus a lot of affected population lives around and near to the irrigation site, that serve as mosquito breeding site. Additionally, vectors control measures such as proper ITN utilization, high IRS coverage and environmental management was not done well on the area. The analytical epidemiology result show that; presence of mosquito breeding site and unprotected dam for irrigation are associated with contracting malaria, those that live closer to unprotected dam for irrigation had AOR of 4.78 95%CI 2.09-10.93) of contracting malaria as compared to those, that away from such unprotected dam. Our result was similar with a study report conducted in Chipinge, Zimbabwe showing peoples staying within a radius of 3 km from the river contracting malaria (OR =2.7, 95%CI=1.2;

6.3) and Amhara Region, Ethiopia indicate that; Staying within the radius of 3km from a river or dam was the major precipitating factor for malaria (32,38).

National Malaria Guidelines recommended persons living within 1 km of recent malaria cases should be sleep under their long-lasting insecticidal nets despite of Person to person transmission can be one of malaria outbreak risk factors (14). Our study showed that presence of similar sick patient in the home was risk factors for contracting of malaria (AOR 4.05 95%CI 1.48-11.09). This result lined with Malaria outbreak investigation conducted in Erer Woredas, Ethiopian Somali Region, showing presence of malaria cases in home siginificant risk factor with (OR: 12; 95%CI 4.9:32.5) (29). Wearing protective clothing was resulted associated with a lower risk of malaria, which is consistent with the study report from India (39).

ITNs utilization has been shown to reduce malaria case incidence rates by 50% and reduce malaria mortality rates by 55% (8).The administrative report on LLITN's coverage in the area was accounts about 81% prior to the occurrence of outbreak; which is Less than National ITNs target coverage for malaria endemic area population in which 100% of households in malaria-endemic areas own one LLIN per sleeping space but, the ITNs Coverage was almost the same with WHO malaria reports 80% in 2016 (14,39). In Ethiopia two-thirds (64 percent) of households in malarious areas own, at least one long-lasting insecticide treated net (33). Similarly, in our study about 67% control households had at least one functional insecticide bed net in their house. But regarding to utilization, always use of ITN among case and control group were account for 8% and 54.5% respectively, which is lower than the epidemiology and control WHO survey report in Ethiopia and Uganda and National ITNs utilization target in which at least 80% of people at risk for malaria use LLINs properly and consistently (40,41). Previous study on risk factor analysis in Ethiopia show that sleeping under an ITN did not appear protective against malaria (42). Our study report did not support this finding directly. Our study shows that; always utilization of long last insecticide treated bed net (LLITN's) was associated with lowers the odds of malaria infection OR 0.18 (95% CI; 0.04-0.80, P.value=0.02); which is similar with study conducted in chipinge zimbabuwe and Ethiopia Showes; individual those had insecticide-treated mosquito nets hanged in their rooms were more protected from malaria than those that did not and revealed for ITN's were crucial factors to reduce reduce malaria (32,43). We found majority of control population groups (54.5%) were use ITN always; which is lower than the study conducted Oromia Region in which large proportion of the population (91.7% of controls) slept under a net (17). The deference may be due poor utilization due to inconvenience (type, size and shape) of LLINs distributed to the area; in which community report the short rectangular was not easy to use in study area. Bed net possession and use is the commonest method of the prevention of malaria infection (39). In our study having bed net in house not associated with reduce odds of malaria; which is probably due to improper utilization (26). This justify by during household visit we observe, majority of HH were had LLIN's bed net but placed inappropriately and poorly utilized it. Similarrly the study report from Gambia, North west of Ethiopia and Namibia, show that a lack of association between ownership of ITN and Malaria (33,34,36). Therefore; poor community perception and awareness is one of the main barriers to control and prevent malaria in Ethiopia (10). Yet, ITN's utilizations continue to be an effective tool for malaria prevention, even in areas where mosquitoes have developed resistance to pyrethroids (8).

Indoor residual spraying (IRS), remains one of the long-standing malaria control tools in the Ethiopia involves spraying the interior walls of a dwelling with long lasting insecticide (9,35). However, about 75% of affected kebeles was covered by Indoor residual spray on the month of September 2017; our study finding show that IRS with Bendiocarb was not associated with reduce the risk of malaria. Our finding is consistent with the study report from India and Namibia; demonstrate no association between IRS coverage and malaria (34,39). Our result also supported by report of IRS account longer for more than five months in the study area which it is insufficient to kill resistant mosquitoes and not protective (15). And the majority of newly settler's population houses were not screened and inconvenient for apply IRS and low coverage (only 75%) in the area also may be the reason for lack of assoiciation at study area.

A good surveillance system indicate which populations are most at risk, but surveillance is often absent or deficient in the remote areas where malaria typically occurs (45).Therefore, during this investigation, we observe a gap on data management, proper recording and reporting to monitor the trend of morbidity consistently at health facility level and major gap was observed. Data analysis and interpretation were not conducted on weekly base by Woreda health office; also malaria epidemic surveillance chart is not being properly used at HP level. However, there were written malaria epidemic preparedness plan at Woreda & Health facilities; there is no risk mapping trend seen in all visited health facilities. Those factors were aggravating the outbreak and failure for early outbreak detection and response activities. For the past 6 months all malaria commodities have not been provided to HPs (RDT and ITN) and Artisunate (injection & suppository) stoke out for greeter than 5 months in the area.

1.1.6 Limitation of the study

- We used convenient sampling method due to time and resource limitation.
- The case definition was not based on laboratory confirmation for controls. Some exposed individuals within incubation period may be misclassified under controls circumstances.

1.1.7 Conclusions

Darimu Woreda is one of malaria endemic area. The magnitude of current malaria was higher than the past four years ago. Malaria transmission during the period of Feb to March 2018 in all Bena site kebele was higher. There was malaria outbreak in the Darimu woreda. Surveillance data were not analyzed and interpreted by weekly and monthly manner at both WorHO and health facility level and potential vectors breeding site were not identified prior to the outbreak, these lead to for late detection, notification and implementation of larva control measures prior to the outbreak. This study revealed that the attack rate was high among age group of greater than 15 years. P. falciparum was dominant species in the study area, which deadly and responsible for this outbreak. male were affected more than females and there was high malaria attack rate and case was aggregated at Bena 2 and 4 kebeles (16.3 and 14.5 per 1,000 population) respectively. Similarly, there were Mosquito breeding site in Bena 1, 2 and 4 and peoples living around this breeding site and unprotected dam are mostly affected by malaria infection. Environmental factors such as; presence of mosquito breeding site around home, and unprotected dam for irrigation and, host factors (presence of malaria sick patient in the house hold, improper (poor) utilization of insecticide treated bed net, and intervention gap in the prevention measures were the main risk factors for the outbreak in the Woreda. Delay in early identification potential breeding site and increased migration (illegal settlement) at Birbir River mining area are contributing factors for the occurrence of the outbreak. But, using ITN and wearing protective clothing are found to be at a significant lower risk of contracting malaria infection.

1.1.8 Recommendation

Based the conclusion we recommend that all potential stockholders staring from Oromia Regional health bureau, Iluababora Zonal health department, Darimu Woreda Health office and catchment health facilities and also all others sectors interested in malaria prevention:

- It needs strengthen malaria surveillance system by using weekly surveillance data analysis to detect malaria outbreak early at each level.
- Potential vector breeding site should be identified and Proactive vector control and maximizing vector control activities by effective environmental management through coordinated community effort to reduce malaria epidemic in all Bena villages.
- Despite of these outbreak was localized among local geographic area, community based larva control measures should be sensitized specifically on the mining and irrigation site.
- Appropriate communication program needed to address the utilization gaps on ITN and protective clothes in the community improve ITNs utilization.
- ITNs should be distributed prior to malaria season and use of ITNs in the area is need effective behavioral change intervention (continues health education). Since, few house hold met the target coverage of every day sleeping under ITN and HEW should be monitor and optimize ITNs utilization.
- Regional health bureau and ZHD need to be avail adequate budgets allocated for operational cost of Insecticide spray activities (availing Abate chemicals) for mosquito breeding site.
- All the health facilities should utilize malaria surveillance chart and need to be equipped with adequate RDTs at Health center level and each HPs.
- Prevention and control should be strengthening at mining area (Bena 1 and 4) since there were most vulnerable and new comers from high land area are high.
- Further study needed with sufficient sample size on ITNs utilization and associated factors to evaluate the effectiveness of malaria prevention in the woreda.

1.1.9 Acknowledgements

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Figure 1.1-4: Some pictures during investigation showing; ITN's utilization, irrigation site and Bena 1,2 and 4 mining area visit at Darimu woreda, Iluababora Zone, March, 2018

1.1.10 Reference

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1.2 Measles Outbreak Investigation in pocket area of Liben Woreda, Guji Zone, Oromia Region, Ethiopia, December, 2018

Abstract

Background: Measles is highly contagious, epidemic prone and one of nationally immediately notifiable diseases in Ethiopia. Ethiopia planned to eliminate measles from the country by 2020. On December 28, 2018, Liben Woreda reported Nine suspected measles cases. We investigated this outbreak to verify, identify risk factor and implement prompt control measures in the Woreda.

Method: Descriptive and unmatched case-control study for all (15) line listed cases and randomly selected 45 neighborhood of case patient's; controls was conducted from 12 to 20 December, 2018. Structured questionnaires, line list, Observation of cold chain system and admin report used to collect data. Epi-info and SPSS were used for data entry and analysis. We look risk factor between 15 case patient and 45 community control.

Result: A total of 15 measles cases with no death reported during this outbreak. The outbreak was confirmed by measles specific IgM antibody test. The index had history of travel to Meda-walabu Kebele during her incubation period. Out of five blood sample 3 become +ve for measles IgM. The overall attack rate was 16.2/100,000 populations. ≤1 Years Age group and Female are the most affected 2(67/100,000) populations and 11(24.2/100,000) populations respectively. 66.7%(10/15) of cases were unvaccinated. Being unvaccinated against measles [AOR=17.61, 95%CI (1.80-171.98)], Have travel history 7-18 days' prior the onset of rash [AOR=12.11,95%CI (1.88-78.01)] and Measles case in the house [AOR=28.64,95%CI (3.4-240.32)] were independent risk factor for contracting measles. The administrative vaccine coverage of the Liben Woreda was 105%. Case management, active case searching and health education was conducted during the Investigation.

Conclusion and Recommendations: Being unvaccinated, having history of travel to the adjacent woreda (Mada-Wolabu) and presence of measles cases in the house were independent risk factor for this outbreak. We recommend reach unvaccinated pastoralist community by considering mobile immunization teams, target measles vaccination by considering the importance of adult immunization and remove travel history and contact with measles cases to measles outbreak area, improve cold chain management and furthers study on vaccine acceptance and associated factor with sufficient sample size.

Key words: Measles, Outbreak, Risk factor, Oromia.

1.2.1 Introduction

Measles is a highly contagious and outbreak prone acute viral diseases characterized by fever, and macula papular rash, include, cough, coryza, conjunctivitis. The measles virus is amongst the most person to person transmissible of all microbial agents and can survive at least two hours in evaporated droplets and the airborne spread of these fine particles has been implicated in closed settings (1). Measles transmitted via the respiratory route by direct or indirect contact with nasal and throat secretions of infected persons and particularly contagious, with >90% secondary attack rates among susceptible individuals (2).

Despite the availability of safe, effective and inexpensive vaccines, measles remains an important cause of preventable deaths worldwide. In the pre vaccination era, >90% of individuals were infected by the age of 15 years (3). World Health Organization (WHO) estimated that about 30 million cases and over 700,000 deaths from measles occur annually in developing countries. Most deaths follow complications such as pneumonia, croup and diarrhea, and are also frequently associated with malnutrition and may result in long term health problems including blindness, deafness, chronic lung disease (4).

In developing countries, case-fatality rates among young children may reach 5–10, but In Ethiopia, the expected case-fatality rate is between 3% and 6%; the highest case-fatality rate occurs in infants 6 to 11 months of age, with malnourished infants at greatest risk (5). Measles is one of the five major causes of childhood illnesses, which together contribute to 70% of under-five morbidity and mortality (6,7). Measles is one of the most infectious viruses for humans and frequently results in widespread outbreaks among unvaccinated individuals with no specific treatment (8).

Ethiopia committed to achieve the elimination of measles by 2020 in line with African Region resolution AFR/RC61/ R1. Through implementation of the recommended strategies including strengthening routine immunization activities and accelerated measles control since 2002 and the current routine immunization schedules recommend a dose of measles vaccination at 9 months of age (5). Measles is one of Nationally immediately notifiable diseases(9). Measles outbreaks became more frequent with visible age shift affecting infants and children and or youngsters above the age of 5 to 20 years. In Ethiopia Measles incidence increased from 20 cases per million total populations in 2006 to 194 cases per million in 2015 and declined to 49 per million in 2016 (10). Currently Annually more than 1.5 million cases of measles (all age) and 70,000 deaths occur in Ethiopia (6). The Expanded Program on Immunization (EPI) was established by the World Health

Organization in 1974 to control vaccine preventable diseases. In Ethiopian, EPI program was launched in 1980 with the objective of achieving 100% immunization coverage of all children under two years old by 1990 (11). Since 2004 immunization service coverage of Measles has shown gradual increase reaching 84% by 2014; But Ethiopia is not on track to achieve the measles elimination goal of less than 1 case per million population by 2020 with the current pace of elimination efforts (10). Currently Ethiopia plan to achieve at least 90% national coverage, through provide a second opportunity for measles vaccination, case based measles surveillance, improved case management including provision of vitamin A and 80% in every Woreda with all vaccines by 2020 (11).

Even though considerable improvement in measles immunization coverage in Ethiopia, Measles outbreaks continue to occur in most parts of the country and becoming a cause of major number of under-five mortality and morbidity. Case reporting is important for describing and monitoring the epidemiology, impact and spread of an outbreak, for some communicable diseases like measles, a single suspect case is the trigger for taking action, should be detected, reporting the case to next higher level, and conducting an investigation is mandatory and during an outbreak all cases must be entered on a line list (12,13).

Measles outbreaks are still very common in Ethiopia, as a result of the low Vaccine coverage and high coverage in artifact administrative reports, that buildup of the susceptible population likewise as of November 2019, the second dose of measles vaccination in routine vaccination services (MCV2), has not yet been introduced in the immunization schedule in Ethiopia (10,14,15). In fact two doses of measles vaccine is the most effective method of preventing disease and facilitate for achievement of elimination (16).

Continuing measles outbreaks, despite efforts to implement planned strategies are documented especially in SNNP, Amhara, and Oromia regions. Beginning 2010, outbreaks became more frequent with visible age shift affecting infants and children and or youngsters above the age of 5 to 20 years (17). Oromia Regional State has experienced explosive outbreaks of measles throughout the region as of WHO-Week 05, 2019, (2011 E.C) accounting more than 3,956 cases were reported from the 5 zones and one administrative Town. The outbreak occurred sporadically in Woredas like Liben. The aim of this study was to investigate the magnitude of measles outbreak and identify factors that contributed its incidence and implement public health control measures in Liben Woreda, Oromia Region, Ethiopia, 2018.

Rationale of the Study

Epidemiological surveillance of measles is a major public health strategy in prevention and control of disease in Ethiopia (18). The main reason for this outbreak the Woreda investigation and response is to control the current outbreak and help to prevent like outbreak in. WHO recommend that even if a measles epidemic affects a wide geographical area or is nationwide, it is recommended that outbreaks be investigated in a few locations, e.g. a rural area and an urban area (19). Currently Ethiopia striving to achieve measles cases reduction to 1/1,000 population and eliminate by 2020. This outbreak investigation facilitates rapid implementation of control and prevention measures and to reduce the extent of diseases spread and measles diseases related morbidity and mortality mainly at agro pastoralist area. It also insures that interruption of diseases transmission and contain as soon as possible. Study conducted in Malawi 2018, and Nigeria show that, unable to take quick action and respond to the suspected health events by public health authorities resulted for minimal impact of response for most of the measles outbreaks (20,21). In Ethiopia the proposed annual rate of 2 suspected measles investigation with IgM testing per 100,000 population could serve as a surveillance target (18,22). This outbreak investigation approaches are timely investigation and response to the outbreak is one of the most important measures for reaching reduce measles related morbidity and mortality by predicting potential outbreaks and characterize the current measles cases (Outbreak) in order to understand the reasons for the occurrence of the disease and used to develop and implementing appropriate control measures strategies in order to prevent future outbreaks in the area specially at pocket area and/or pastoral area of the region of where health infrastructure are insufficient and low health service coverage. The result from this investigation used to support immunization programme and input for quality improvement.

1.2.2 Objectives

General objective

To assess the magnitude, contributing factors of measles outbreak, and undertake appropriate public health control measures, in Liben Woreda of Guji Zone, Oromia Region December, 2018.

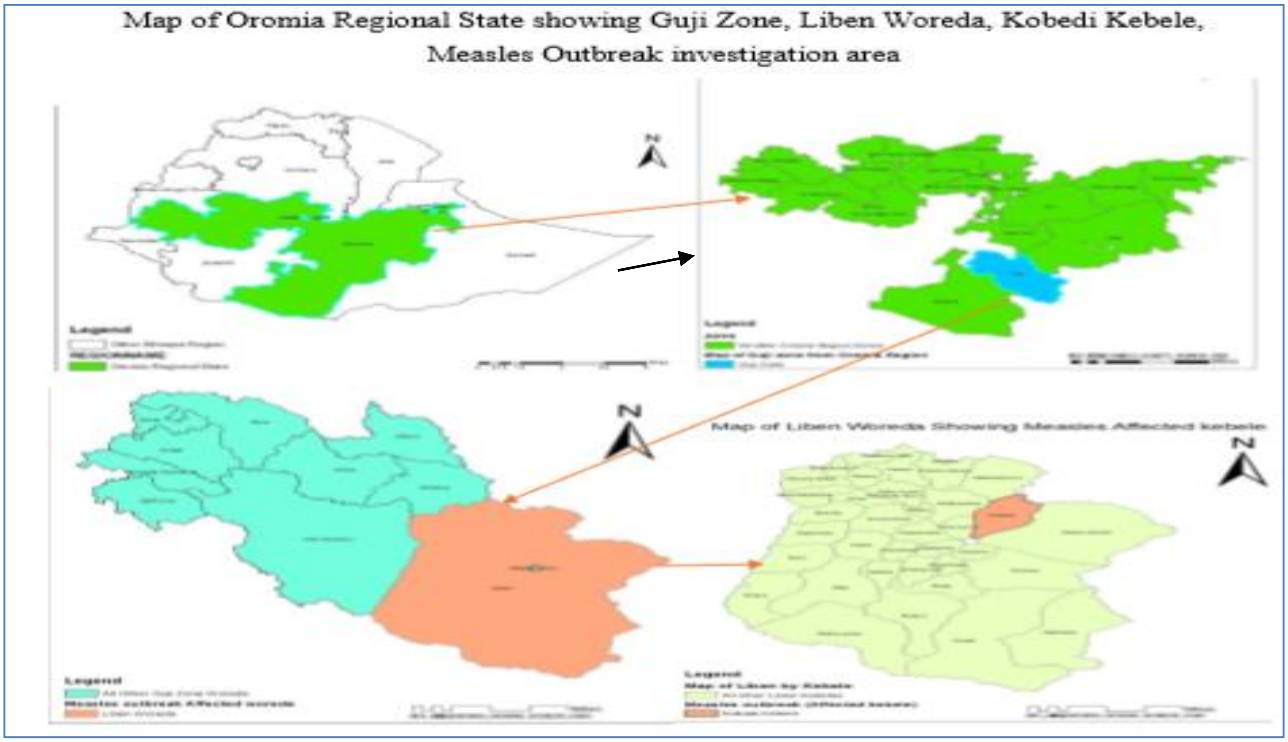
Specific objectives

- To confirm the existence of the outbreak in the Woreda.
- To characterize measles outbreak in terms of person, place and time in the Woreda.
- To identify factors contributing to the occurrence of measles outbreak.
- To implement prompt control measures to measles infection.

1.2.3 Methods

Study area

The outbreak investigation was conducted in Liben Woreda of Guji zone. Liben Woreda Located 550 kM's from Addis Ababa. The Woreda shares boundaries with Somali Regional state to the East and North East, Gumi Eldelo Woreda to the South West, Bale zone to the North West & Gorodola Woreda to the West. Liben Woreda has 12 Kebeles with an estimated total population of 92,731 in 2018 45902 (49.5%) male and 46829 (51.5%) female (Projected from 2007 CSA). The four largest ethnic groups reported in Liben Woreda were the Oromo (71.98%), the Somali (16.21%), the Amhara (8.01%), and the Tigray (0.98%); all other ethnic groups made up 2.82% of the population. Oromiffa was spoken as a first language by 69.37%, 16.08% spoke Somali, and 12.99% spoke Amharic. The majority of the inhabitants were Muslim; with 60.22% of the population reporting they practiced that belief, while 14.75% of the population Ethiopian Orthodox Christianity, 13.35% professed practiced traditional beliefs, 7.94% were Protestant, and 0.95% were Catholic. The altitude Woreda ranges from 1120 to 1600 meters above sea level. According to the national standard the potential health service coverage Woreda by health facilities is 99 %. Currently 16 health posts and 3 health centers were serving the community.



Map 1.2-1: Map of Oromia Region, Guji Zone, Liben Woreda , Showing Measles Affected Kebele, December 2018.

Study design Study period

We conducted Descriptive study followed by unmatched case-control study design to identify risk factors that contributed the measles outbreak in the Woreda from 12 to 20 December, 2018

Study participant

All suspected measles cases registered on line list and selected community controls those neighbors of the case.

Study population

The study population was composed of the populations Liben Woreda.

Sample size and Sampling method

Unmatched case-control study in the ratio of 1:3 by including all suspected and confirmed measles cases (15 cases and 45 community controls by considering those neighbor of cases and being close to the cases without clinical manifestation of measles) was recruited. Three control for one case per a house hold was selected from the neighbors of cases.

Data collection tool and procedure

After clearly defining cases and controls groups, structured questionnaire was used to collect demographic data, exposure status and risk factor information by face to face interview of cases and controls. Additional data was collected using the line list for measles and WHO case definition was used to classify study participants as case or control. Epidemiologic data were obtained by review of secondary data (registry books, case based reports, line list records, surveillance data and related documents from Woreda health office, health center and Mobile health and nutrition team archive. Data was collected by principal investigator and front line field epidemiology trainers upon giving 30-60 minutes on exclusion and inclusion criteria of case and control. The information collected directly from a cases and control regarding to their demography information, clinical and treatment history, vaccination status contact and travel history and knowledge assessment to ward to measles diseases and vaccination, from adult (above 18 years and those could answer appropriately; for children less than 18 years' parent and care giver were interviewed). Cold chain management and case management trend was observed and also selected key informant; surveillance focal person and community leader interview were conducted at each level (Zone to Kebele). Discussion on health seeking behavior with community and active case search was conducted.

Case definition:

A standard case definition (WHO) for both suspected and confirmed cases was used as tool for identifying measles cases and non-measles cases. This cases definition was used at all level including nongovernmental health facilities

Measles suspected cases at community level: A community definition of measles (also called gifira or shifto in Oromiffa and kufign in Amhariffa) was any person with rash and fever and/or having red eye and runny nose.

Suspected case

Any person with fever and maculopapular (non- vesicular) generalized rash and cough, coryza or conjunctivitis (red eyes) OR any person in whom a clinician suspects measles (9).

Probable case

Clinical illness in the absence of appropriate laboratory tests Or/and epidemiologic link to a laboratory confirmed case or in a person who has recently travelled to an area of known measles activity (1).

Confirmed case

A suspected case with evidence of laboratory confirmation of acute measles infection (i.e. measles IgM in blood or oral fluid (OF) in the absence of recent vaccination, or confirmed wild-type measles RNA in any clinical specimen) or epidemiological link to confirmed cases in an epidemic (9,23).

Epidemiologically linked

A suspected measles case that has not had a specimen taken for serologic confirmation and is linked in place, person and time to a laboratory confirmed case (5).

Unlikely case of measles:

A suspected case of measles which does not meet the definition of a likely case, either because it is clinically atypical or not suggestive of measles in epidemiological context.

Data Process and Analysis

Data was cleaned and Epi-info version 7.2.1.0 used for data entry and Exported to SPSS Version 23, for analysis and Descriptive analysis of the disease by place, person and time result was done and presented using tables, graph and charts by using, Microsoft Excel 2016. Attack rate were calculated, then analysis of the risk factors of the outbreak comparing the frequency of the exposure in the case group to the control group was performed by considering factors crude odds ratio (COR) with 95% confidence interval (CI) which didn't include 1 in upper and lower limit and P-value <0.05 used in the process deciding the significance of the associations among variables in the bi-variate and multivariate analysis to statistically associated with contracting the diseases. Factors which showed significant associations in bivariate analysis were proceeded for multivariate analysis to identify independent predictors of measles in Liben woreda as in bivariate analysis by considering factors' adjusted odds ratios with 95% CI.

Data quality control

Line list and case based were checked before analysis and entered to the computer and the data were primarily collected by principal investigator and well trained front line field epidemiologist. Missing variables and consistency of filling of questionnaires and completeness of data were checked out during data collection.

Operational definition

Ventilated house: A house which peoples live in and that have at least one window in addition to door that use for air circulation in the house

Knowing modes of transmission: A person responded for the mode of measles transmission is from infected person to the uninfected individual via droplet during sneezing and/or coughing.

Knowing measles is vaccine preventable: A person who responds as a measles vaccine used for measles disease prevention

Nutritional Status

- **Normal:** Mid-upper arm circumference(MUAC) >= 12 cm (well fed child)
- **Moderate**: Mid upper arm circumference (MUAC) <12 cm (targeted for supplementary feeding programme)
- **Severe malnutrition:** Mid-upper arm circumference (MUAC) < 11 cm (24).

Treatment provided to measles cases: Cases were treated using the national measles outbreak management guideline.

Vitamin A: is an essential nutrient called micronutrient because it's needed in small amounts for the body to function properly. It is a fat-soluble vitamin and the body cannot make it but can store it for up to 6 months.

Incubation period

The time interval between initial contact with an infectious agent and the first appearance of symptoms associated with the measles infection.

Index case: The first case in a family or other defined group to come to the attention of the investigation (25). (The first case who possibly the source of infection for the other cases emerging).

Vaccination status:

A person who have received one or more measles vaccine doses were classified as "vaccinated cases" and those with zero doses and unknown status were classified as "not vaccinated"(10).

Epidemic threshold (Action threshold)

The outbreak confirmed depending on National confirmed measles outbreak: i.e. Occurrence of three or more laboratory confirmed measles cases in one month in a defined geographic area such as a kebele, Woreda or health facility catchment area (5).

Variable list

Dependent variable	Independent variables
	Age of the respondent
	Sex
	Family Size
	Nutritional status
	House condition
Measles infection	Distance from health facilities
	Knowledge on mode of transmission
	Knowledge on Measles is vaccine preventable
	Vaccination status
	Contact history 3weeks before
	Travel history
	Presence of measles case in the house
	Educational status of case and control

Inclusion criteria and exclusion criteria

Inclusion criteria

Cases: Any resident of Liben Woreda who tested positive for IgM and/or epidemiologically linked to laboratory confirmed cases and had symptom of measles from November 21-December 20 and agreed to participate in the study was included.

Control: Any resident of Liben Woreda during the study period (November 21 to December 20, 2018) who was a neighbor to a case and who did not develop sign and symptom of measles and agreed to participate in the study was included.

Exclusion criteria

Cases: Those cases that not meet standard measles case definition.

Controls: Those who refused to participate as well as family members from the same house hold and not eligible **(**children age < 9 months not eligible for vaccination are excluded).

Ethical issue

Support letter was obtained from oromia Regional Health Bureau PHEM Directorate and Zonal health department to Woreda Health office and respective health facilities. As a usual this was an emergency epidemic investigation conducted as part of public health intervention, no ethical approval was obtained. However Oral informed consent was obtained from study participants or from their parents to participate in the study after briefing the objective of the study. All participants agreed to willingly participate in the study with no payment. Confidentiality was guaranteed and no personal details were recorded or produced in these document.

1.2.4 Result

Descriptive Epidemiology

There was the measles suspected report from Kobedi Kebele by Meray Corps mobile nutrition and health team to Liben Woreda Health office. The first identified measles case was notified in 25/11/2018. A 12 month of age unvaccinated female infant who reported for suspected measles case reported that, had a travel to the adjacent Woreda of Mada Walabu of Bale Zone to attain routine nutritional screening for under five and pregnant mother and ration distribution for IDP's community which conducted in every two weeks by mobile health team in mid-November 2018.The second and third case who are also unvaccinated for measles reported on 26 November 2018 and they also had the travel history to the area for the same reason with an index case in the period before one week's onset of rash. Twelve additional cases were reported from kobedi kebele following the first three identified cases from 27 November to 5 December 2018. The outbreak stayed for less than two weeks. Total 15 measles cases (three confirmed and 12 epidemiological linked cases with no death identified. Contact tracing was performed for each case. The index case was not investigated for measles on spot and not isolated immediately. Blood sample was not obtained for first three suspected cases but obtained for those identified after one weeks of the first identified index case and sent for testing to regional laboratory for confirmation (IgM antibody test) and 3 of them are positive for IgM6. The disease transmission has been circulated within households, rather than spread to the community. In order to the absence of measles case in Liben Woreda before the onset of this outbreak and as an index case had a travel history to the adjacent Woreda of Bale zone, the place where ration distribution and routine nutritional screening conducted for IDP's. We consider that it is most likely, the exposure occurs in Mada Walabu Woreda, particularly where a number of under-five and pregnant mother collected together (i.e the place where routine nutrition screening and monthly ration distribution performed). The investigation team undertook an epidemiological investigation, to identify the source infection and recommend appropriate infection prevention and control, since all three first case appear within a day of one an additional. Importation of cases from other Woreda of adjacent kebele was ruled out, because all first cases were relatively within in the same incubation period and majority of case were identified as suspected measles case by mobile health team at within the same week. Based on this, common source of infection was suspected. The first and second case had a rash onset on November 21 and the latest identified case had rash onset on November 29, 2018 and no more case identified case for consecutive three weeks starting from index case onset of rash. All case-patients recovered without severe complications. We learned that majority of case patients had the history of travel same area (to adjacent Woreda) on November 11/2018. Based on this Mada walabu Woreda nutrition screening site was suspected to be the site of exposure for these outbreak. We commit to communicate with adjacent Woreda health office and mobile health team to identify if there were any confirmed and suspected measles case in the Woreda within respective incubation period. According to mada wolabu Woreda health office there were a rumer of suspected Measles cases in the area, but there were no reported confirmed measles cases. unfortunately, we can't be conducting active case search in the area due to ongoing border conflict in the area during investigation period. The mean age of case were 9 years and median 4 years ranging from (1-26) years. Of which total cases, 11(73%) were Female.

Descriptions of Measles case by Person

Majority of cases 7(47%) were among age group 1 to 4 years followed by ≥5 years 6(40%) and under one age group were with the least frequency of measles cases that were only 2(13%).

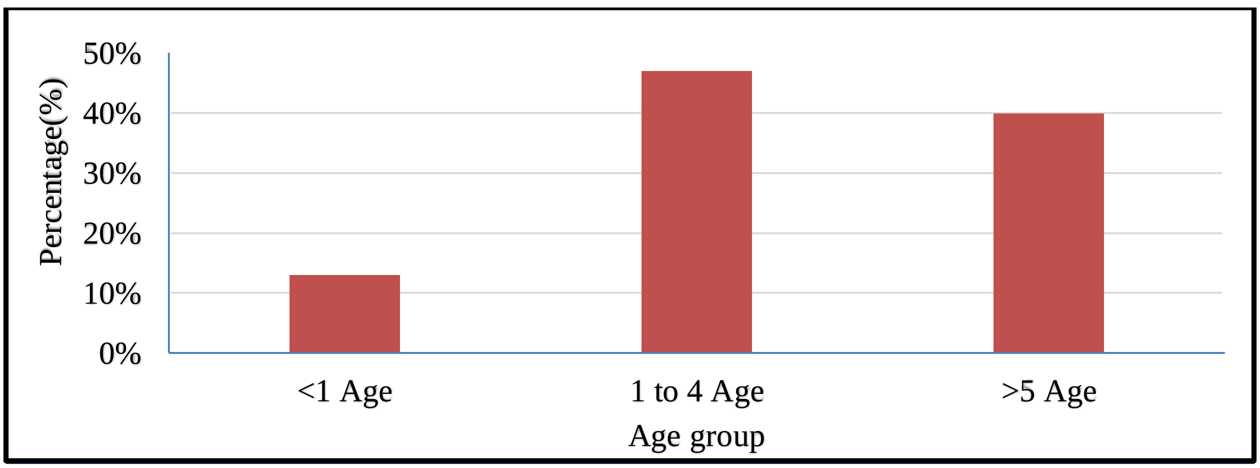


Figure 1.2-1: Frequency distribution of suspected Measles case by age group Liben Woreda, Guji Zone, Oromia Region December, 2018.

Among total N=15 identified cases most of suspected measles cases n=seven (47%) occur among children 1 to 4 years of age. Two cases were reported among infant (under one years of age) and six case occurs in adult ≥5 years. The overall Measles attack rate (AR) in the Woreda was 16.2 per

100,000 populations. Attack rate is three times higher among females 11(24.2 per 100,000) populations than males four (8.5 per 100,000 populations). Age wise attack rate, high attack rate was identified among under 1 year's age group 2(67 per 100,000) populations followed by under five years' age group seven (57.1 per 100,000 populations). Generally, attack rate was high among under one years of Age group and Females in Sex.

Table 1.2-1: Age and Sex specific attack rate of measles cases Liben Woreda Guji Zone, Oromia Region December, 2018. (N=15)

Age Group in Year	Total Population N=92,731	Number of Case Total N=15(%)	Age/Sex Specific Attack Rate per 100,000 Populations
≤1	2,986	2(13.3%)	67.0
1 to 4	12,250	7(46.7%)	57.1
≥5	77,495	6(40%)	7.7
Total	92,731	15	16.2
Sex category			
Female	45,531	11(73.3%)	24.2
Male	47,200	4(26.7%)	8.5

It was reported that few households living in Kobedi kebele of liben woreda were pastoralist community IDPs population those displaced from woreda border due to border conflict with hudet woreda of Somalia region and most of them were not willing to take vaccine due to poor health seeking behavior.

Descriptions of measles cases by Place

All suspected measles case N=15 (100 %) were from kobedi Kebele and all cases were occurred among eigtht house hold at one kebele. The affected individuals were family member's and predominantly of younger age group. There was no reported case except this kebele in the Woreda.

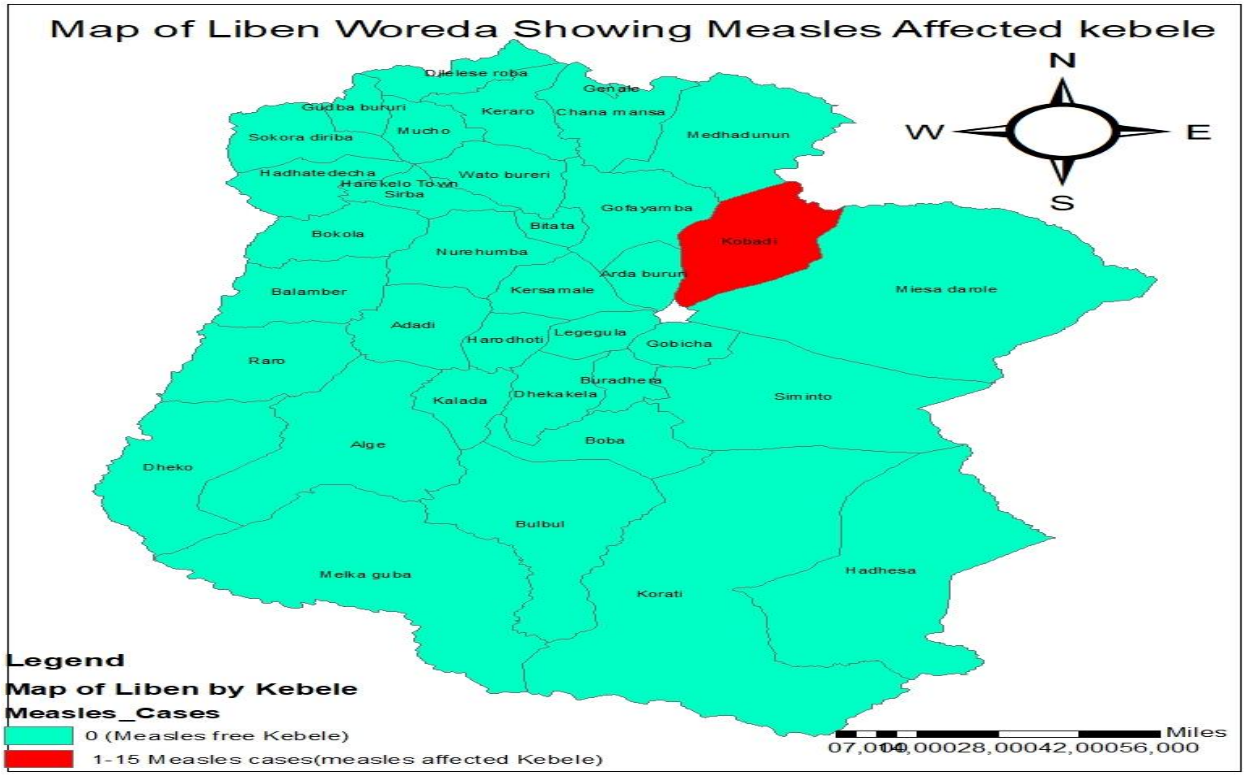


Figure 1.2-2: Area map showing Measles affected Kebele (Kobedi) of Liben Woreda, Guji Zone, Oromia Region, December, 2018.

Description of measles cases by time

The outbreak was stayed for two weeks and the first two cases were notified by Marys corps mobile health and nutrition team to Woreda health office on November 27 (onset rash on 21 Nov, 2018. Woreda Health office reported the case to the zone on 28 November 2018. Woreda health office public health team in collaboration with Marys corps mobile health team immediately activated and start to perform control activity. Five additional measles suspected cases were identified and blood specimen were obtained from cases on December 02/2018 and sent to Regional Laboratory for confirmation. Over all a late five identified cases were epidemiologically linked with first weeks identified cases. In general, this transmission chain was circulated among eight households resulted for three confirmed Measles cases 0.0% CFR. The index case had a rash onset on 21 November and the late case had rash onset on 29 November 2018. Intervention started after one-week of the identification of index case, on 28 November, 2018 by Woreda Health office. To date no further case identified (after December 01/2018) of the late case identified in the Woreda.

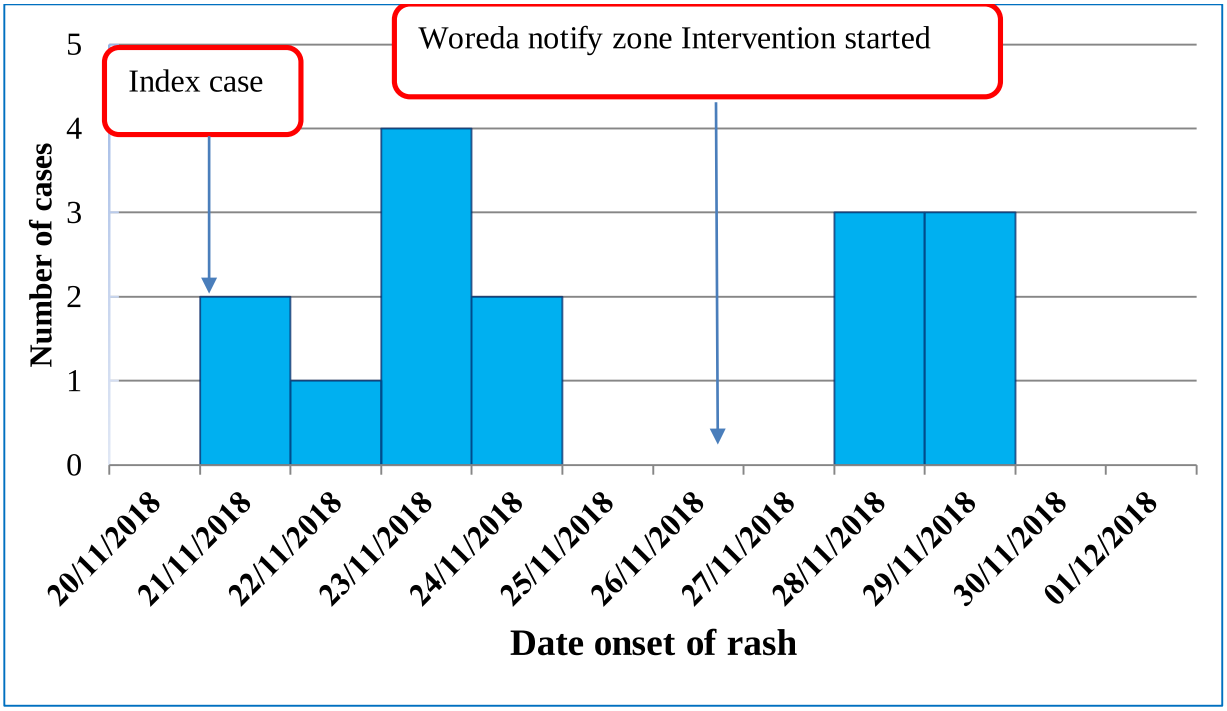


Figure 1.2-3: Epi-curve showed number of measles outbreak cases, by date of rash onset, Liben woreda of Guji Zone, Oromia Region, 21 to 29 November, 2018.

A measles epi-curve shows the number of cases by the date onset of rash, the outbreak starts on 21 November 2018 and ended on November 29/2018. There were no significant peak and the outbreak stayed for about 10 days. The 1st cases were identified and reported early by Mary's corps mobile health team and intervention were start after one week. the outbreak ended with short period (less than two weeks' onset of rash) this may be due to early case identification and management provided at household level by mobile health team which used to as contain the movement of active case in the community and reduced chance of disease transmission in the community. The Liben Woreda annual vaccination coverage was showed 105% but majority of cases were not vaccinated for measles. The index cases had onset of symptoms on the 21th of November and the interventions like (treating the cases, health education, contact tracing and isolation active cases) conducted by RRT to the outbreak started on the 27th November, 2018 (e.i after one weeks of the index cases identification). The epidemic curve, may help in: confirming the existence of an epidemic and determining the possible period of exposure and/or the incubation period of the disease under investigation and identifying outliers in terms of onset of illness, which might provide important clues as to the source (26). Therefore, based on the above epi-curve we suggest that the exposure is common source outbreak, because all infected individual was in between an average of incubation period of the disease in which is 9 days.

Woreda annual measles vaccination report show that coverage of 105% (2017/18, report). But Out of total 15 identified cases only 13.3% (2/15) were vaccinated with one dose of routine measles vaccination program at nine months, 66.7% (10/15) of cases were unvaccinated and 20% (3/15) of cases line listed as unknown status of vaccination (See below figure).

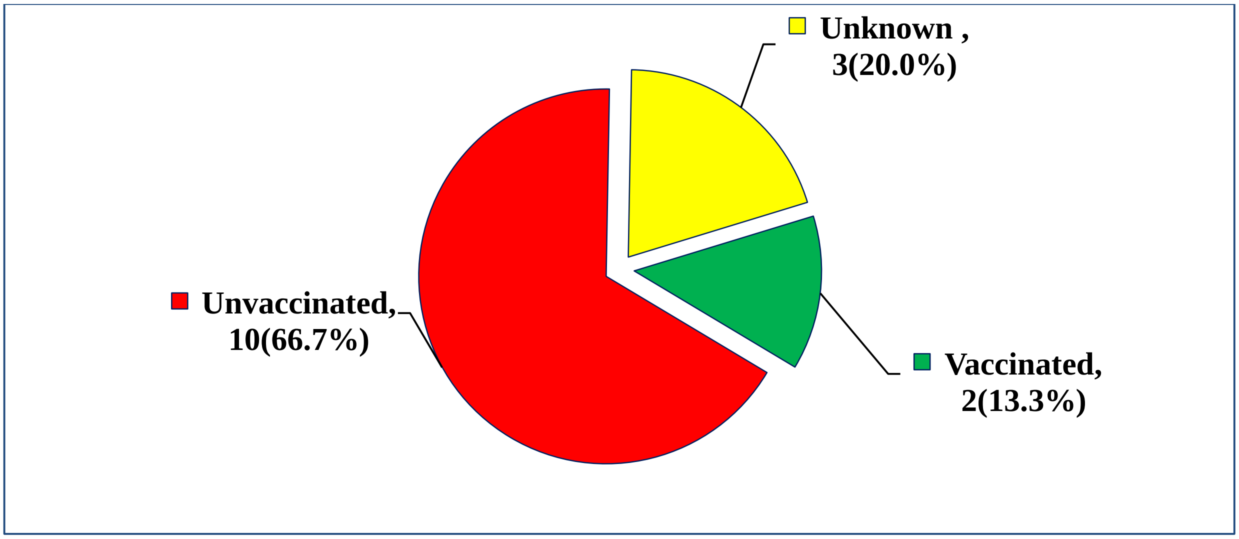


Figure 1.2-4: Previous vaccination status of suspected and confirmed Measles case Liben Woreda Guji Zone, Oromia Region December, 2018

Cold Chain Management

The cold chain management of zonal level was good and periodically monitored, cold chain temperature monitoring chart also updated periodically but in Woreda and Health facility level cold chain management were poor. During our visit we observe (non-functioning temperature monitoring device, non-functioning refrigerator due to electric power shortage and malfunctioning of solar power supply due to lack of maintenance and incomplete installation and no trained cold chain management focal person in visited health facilities including kobedi health center. In general vaccine storage and handling of vaccine among visited in the woreda among majority of health facility was under problematic situation.

Laboratory Investigation

During the suspected outbreak the health worker must make every effort to obtain the basic information, epidemiologic and clinical data, and a blood sample. In Ethiopia, currently blood sample (serum specimen) and nasopharyngeal swab samples are the two sample types collected for measles-specific IgM detection (5). During this outbreak blood sample were collected from five suspected measles cases and sent to Regional lab and three (60%) were Positive for IgM.

Table 1.2-2: Frequency of clinical presentation of Measles in Liben Woreda, Guji Zone, Oromia Region , December, 2018

Clinical Presentation	Frequency & percentage (%) (n=15)
Fever	15(100%)
Conjunctivitis (Read eye)	14(93%)
Rash	14(93%)
Cough	11(73%)
Coryza	9(60%)
Other	1(6%)

All cases had the main sign and symptoms of measles, in which all reported cases 15 (100%), had fever and rash.

Analytical epidemiology

Case-control study

We obtained 1:3 ratio of case to control by including all line listed total 15 cases and 45 community based selected those neighborhood of controls the cases a total (N=60) were recruited into the study to identify the risk factors for measles outbreak in affected kebele of the Liben Woreda of Guji zone. Study participants were comparable in almost demographic characteristics except for age as shown in below table. Conjunctivitis (read eye) and feeding problem are major acute complication reported by the cases patients 93.3% and 46.6% respectively. No more other severe complication or death reported. About 11 (70.3%) cases and 25(55.6%) controls were female. Majority or about eight (53.3%) cases were less than 5 years and 21(46.7%) controls of study participants were between 5-14 years. The mean age for both cases and controls were 10.31 with SD + 8.19 by which (9.13 mean ± 9.17 SD for cases and 10.71 mean ± 7.91 SD for control respectively). About 12(80%) cases and 24(53.3%) controls had no formal education and all the study participants were Oromo by their ethnicity and Muslims in their religion. All The socio-demographic characteristics of the study participants and risk factors for measles outbreak were described in table below.

Table 1.2-3: Demographic characteristics of measles cases and controls, Liben Woreda, Guji Zone, Oromia Region, Ethiopia, 2018

S.no	Demographic characteristic	Category	Cases (%) n=15	Controls (%) n=45	COR	95% CI	P.value
1	Age of the respondent	0-4 years	8(53.3%)	12(26.7%)	1.60	0.40-6.32	0.50
		5-14 years	2(13.3%)	21(46.7%)	0.23	0.03-1.36	0.10
		≥15 years	5(33.4%)	12(26.6%)	1		
2	Sex	Male	4(26.7%)	20(44.4%)	1		
		Female	11(73.3%)	25(55.6%)	2.2	0.60-7.96	0.23
3	Marital status	Not applicable	9(60%)	28(62.2%)	0.64	0.15-2.64	0.54
		Single	2(13.3%)	9(20%)	0.44	0.63-3.11	0.41
		Married	4(26.7%)	8(17.8%)	1		
4	Occupational status case control	Pastoralist	3(20%)	15(33.3%)	1		
		House wife	2(13.3%)	4(8.9%)	2.50	0.30-20.45	0.39
		Not applicable	10(66.7%)	26(57.8)	1.92	0.45-8.10	0.37
5	Religion	Muslim	15(100%)	45(100%)			
6	Ethnicity	Oromo	15(100%)	45(100%)			
7	Educational status of case control	No formal education	12(80%)	24(53.3%)	3.5	0.86-14.11	0.78
		Formal education	3(20)	21(46.7%)	1		
8	Educational status of family	No formal education	7(46.7%)	24(53.3%)	0.76	0.23-2.47	0.65
		Formal education	8(53.3%)	21(46.7%)	1		
9	Family occupation	Pastoralist	13(86.7%)	42(93.3%)	0.46	0.70-3.08	0.42
		Others	2(13.3%)	3(6.7%)	1		
10	Family size	Less than 5	9(60%)	19(42.2%)	1		
		Greater than 5	6(40%)	26(57.8%)	0.48	0.14-1.60	0.23
11	Complications	Conjunctivitis	14(93.3%)	Not applicable			
		Feeding problem	7(46.6%)				

Table 1.2-4: Identified Socio-demographic factors and risk factors for Measles outbreak in Liben Woreda, Guji Zone, Oromia, December, 2018

Variables	Categories	CASES (%) (n=15)	CONTROLS (%) (n=45)	COR(95%CI)	P-value
Presence of measles case in the house	Yes	6(40%)	39(86.7%)	8.1(2.54-37.37)*	0.00
	No	9(60%)	6(13.3%)	1	
Vaccination status	Vaccinated	2(13.3%)	25(55.6%)	1	
	Not vaccinated	13(86.7%)	20(44.4%)	8.12(1.63-40.26)*	0.01
Reason for not vaccinated	Lack of knowledge	2(22.2%)	3(37.5%)	1	
	Absence during vaccination	2(22.2%)	1(12.5%)	3.0(0.15-59.89)	0.47
	Religious exemption	5(55.56%)	4(50%)	1.5(0.15-14.42)	0.72
Have travel history 7-18 days	Yes	10(66.7%)	10(22.2%)	7.00(1.94-25.25)*	0.00
	No	5(33.3%)	35(77.8%)	1	
Have contact with rash person within 2 to 3 weeks	Yes	7(46.7%)	9(20%)	3.5 (1.00-12.21)	0.49
	No	8(53.3%)	36(80%)	1	
Nutritional status	Normal	13(86.7%)	39(86.7%)	1	
	Moderate	2(13.3%)	6(13.3%)	1(0.17-5.57)	1.00
House condition	Ventilated	6(40%)	21(46.7%)	1	
	Not ventilated	9(60%)	24(53.3%)	1.31 (0.40-4.30)	0.60
Distance from health facilities	>5KM	5(33.3%)	14(31.1%)	1.10(0.31-3.84)	0.87
	≤5KM	10(66.7%)	31(68.9%)	1	
know about mode of transmission for measles	Yes	4(26.7%)	18(40%)	1	
	No	11(73.3%)	27(60%)	1.54 (0.15-1.98)	0.34
Have a Knowledge on measles vaccine preventable	Yes	5(33.3%)	21(44.4%)	0.62(0.18-2.12)	0.45
	No	10(66.7%)	24(55.6%)	1	
Family size	Less than 5	9(60%)	19(42.2%)	1	
	Greater than 5	6(40%)	26(57.8%)	0.48(0.14-1.60)	0.23

***Note**: (*) Statistically significant at P-Value <0.05*

The bi-variate analysis some independent variables was show that; the association between developing measles; being being unvaccinatedis identified as the statistically significant risk factor for developing measles diseases with the Odds Ratio (OR) of 8.12 [95% CI 1.63-40.26, P-value =0.01]. Additionally, history of travelling prior to 7 to 18 days of onset and presence of measles case in the house were risk factor for developing the diseases and statistically significant with an OR=7.00 [95%CI 1.94-25.25, P-value=0.00] and (OR) 8.1 [95% CI =2.54-37.37. P-value=0.001] respectively. But have history recent contact (2-3 weeks), house condition, nutritional status of study participants, Educational status of cases and control, Family occupation, having knowledge on mode of transmission for measles and measles is vaccine preventable, and family size of study participants were not statistically significant with measles diseases as shown in (See above table)

In multivariate analysis factors that remained associated with contracting measles in Liben Woreda of Guji Zone outbreak. Those risk factors that are statistically significant associated with illness in the bi variate analysis also remain statistically significant associated with the illness on multivariate logistic regression analysis after computed with candidate variable (those had P-value less than 0.25). Have travel history 7-18 days' prior the onset of rash AOR of 12.1 [95% CI=1.88-240.32, P<0.00] and being unvaccinatedfor measles vaccine, AOR 17.61 [95% CI= 1.80-171.98, P-value =0.01]; presence of Measles case in the household (AOR) of 28.64 [95% CI=3.41-240.32, P-value0.00].

Table 1.2-5: Multivariate analysis, of independent risk factors associated with contracting measles in liben Woreda of West guji Zone, Oromia Region, December, 2018 (N=60)

S.no	Independent Variables	Crude OR (95% C.I)	Adjusted OR (95% C.I)	Adjusted P-value
1	Measles case in the house or neighbor	8.10((2.54-37.37)	28.64(3.41-240.32)	0.001
2	Have travel history prior 7-18 day's	7.00(1.94-25.25)	12.11(1.88-78.01)	0.00
3	Being unvaccinatedfor measles	8.12(1.63-40.26)	17.61(1.80-171.98)	0.01

We asseeses the reason for bing not vaccination. Therefore, among total (n=32) unvaccinated study participants about 19(59.4%) were report religious exemption and 10(31.2%) were report lack of knowledge on vaccination purposes for being unvaccinated

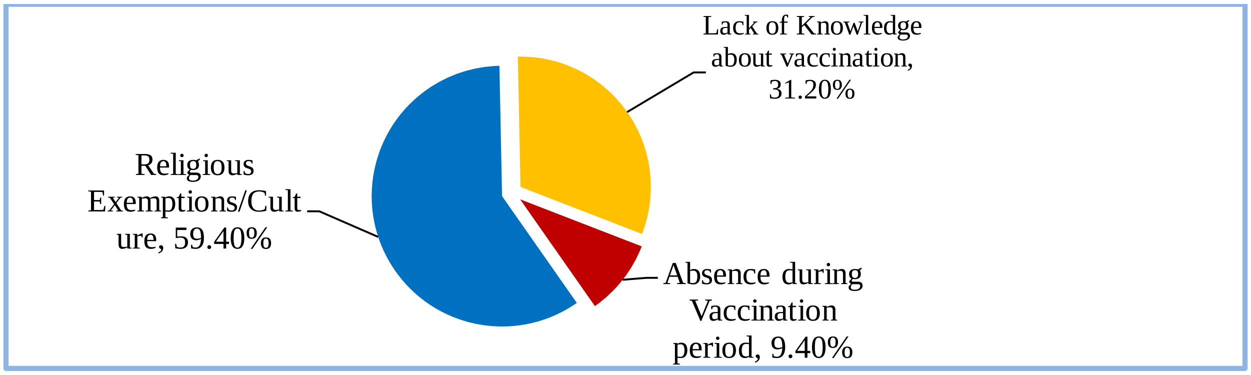


Figure 1.2-5: Proportion of the reason for being unvaccinatedamong not vaccinated for measles study participants Liben Woreda, Guji zone, Oromia Region 2018. (n=32 not vaccinated)

Public health intervention undertaken

The response team mobilized to the area after one week of onset of outbreak to identify and manage the outbreak. Technical advice was given for health works on active case search and epidemiological investigation during the investigation period. Routine surveillance was strengthened and the case patient situation was closely followed at house hold level on a daily bases and all reported suspected measles cases were identified and investigated. Control measures were implemented, like isolation active cases and contact tracing in order to identify those children and family members who traveled to nutritional screening and ration distribution site of adjacent Woreda. Advise for all families to keep the patient at home and to limit the number of visitors of cases to a minimum until the rash disappears. Contact screening was conducted early but immediate isolation of the primary case was not implemented because those had travel history to the site considered as had already included in transmissions chain during the time. Regarding to infection prevention, Woreda public health and mobile health team undertook extensive contact screening and isolation of those suspected to cases and those had travel history, Epidemiological investigation, as well as restrict movement of cases and family members was implemented. We conduct screening for 42 individuals of 8 house hold family members of case patients and 102 persons residing neighborhood of the three confirmed cases who were suspected potentially exposed. No known secondary and tertiary cases were identified among contacts. Additionally, control measures include: enhance public awareness on the importance of vaccination through health education at mosque and health facilities and all patients were received supportive care including oral antibiotics for bacterial infections, tetracycline ointment, oral rehydration solution, anti-pyretic, and vitamin A, to minimize measles related morbidity and mortality at household level. Alarming the community, health extension worker and community leader to strength the community based surveillance system and strengthen communication with adjacent Woreda (Mada wolabu) and health facilities were performed to prevent further spread of the outbreak to nearby community because majority of community were pastoralist in occupation and population movement between the two zones (Bale and Guji) are common and pridicted.

1.2.5 Discussion

Surveillance is a method that can be used to indicate the possible spread of a disease and areas to target for early response (27). According to national measles guide line; three or more laboratory confirmed cases in defined geographic area indicate that, the occurrence of outbreak (18). therefore, we confirmed the measles outbreak by collecting five blood samples and sent to regional laboratory (SNNP) and 3(60%) were IgM positive result. Our investigation confirmed that the presence of measles outbreak in liben Woreda of Guji zone

This outbreak was unpredictable as there were no measles outbreak in the zones and >100% coverage of measles vaccination report by the Woreda. The exposures in the outbreak and the total number of cases were relatively small and transmission was limited in specific local area. This outbreak occurred in the area of were there IDPs community live without overcrowded. rapid public health response is critical to ensuring continued measles elimination (28). A rapid containment of active cases, intensive and early initiation of control and prevention measures by mobile health team, may be attributed for control and minimum number of the cases during the outbreak. This assumption is lined with the study conducted in Nigeria and Measles outbreak in Canada finding had shown that, most of the measles outbreaks were detected early and with minimal impact (16,21). And it may be due to limited transmission might also reflect that, the outbreak occurred in areas of with a high proportion of who are more likely to have natural immunity from previous infection (16). Our investigation suggested that all cases formed the same chain of transmission.

Measles vaccine is the best public health tool for the prevention of the disease (4). In unimmunized populations, most children will have acquired measles by 5 years of age, and almost all infections will result in a well-recognized clinical illness (29). In this study, a 12 month of age unvaccinated infant who reported for suspected measles case reported that, had a travel to the adjacent Woreda of Mada Walabu of Bale Zone in mid-November 2018. Including Index case, second and third case also unvaccinated for measles reported on 26 November 2018 and they also had the travel history to the area for the same reason with an index case in the period of before one week's onset of rash. Unvaccinated persons put themselves and their communities at risk for measles (28). Study shows, even in countries where good immunization coverage has been achieved, measles outbreaks still occur because susceptible population still present (30). In many sub Saharan African countries including Ethiopia routine single dose is administered at 9 months and the vaccination mainly given by government health facilities services. Study showed most outbreaks occurred in unvaccinated populations(30,31). Similarly, during this study, we found a high proportion of affected individuals were not vaccinated for measles (86.7%), which is similar with the study conducted in Western Uganda, which showed there was no vaccination against measles by 94% (15/16) among the case-persons and 54% (26/48) among the controls (32). The Administrative Measles vaccination coverage in Liben Woreda is indicating about (>100%); this is higher than the recommended vaccination coverage of >90% required to achieve population immunity by WHO and FMOH (2,11). The high measles vaccination coverage is may be due to artifact report from service provider level (Health facilities) and there was an outbreak in the woreda. This assumption is supported by EDHS 2011 findings in which coverage survey report of 56% and 68.2 % against FMOH administrative report claim as national measles vaccination coverage of 81% in the same year (17,33). The importation of susceptible peoples from low measles coverage area resulted increased population movement from place to place due to conflict in the area may be contributing factor for occurrence of the outbreak in the woreda. Our investigation revealed that; being unvaccinatedwas associated with contracting measles infection in the area with an AOR=17.61, [95% CI 1.80-171.98]. This result consistent with the outbreak investigation conducted in Kabridahar, Somali Region, 2019 and Zimbabwe in 2012 (34,35). Aditionaly; in fact high vaccination coverage with one dose of measles vaccine does not provide 100% immunity, it can be expected that cases will occur among individuals who have received only a single dose (19). Dispite of a single dose of MMR vaccine induces measles immunity in about 95% of vaccines; however, due to measles extreme infectiousness, 2 doses are recommended (36). Study conducted in Zimbabwe and in Ukraine on rapid risk assessment outbreak of measles and potential for spread in 2012 show that, a likely to be unvaccinated and low immunization coverage attributed to the huge population of religious objectors to immunization (8,35). Similarly, in our study majority of unvaccinated in vaccination status (59.4%) reported a religious exemption for the reason being not vaccinated.

The study conducted in Ukraine and German show that, increased in concentration and movement of people travelers will further increase this risk of measles transmission(8,37). Similarly, our investigation finding show that; have a travel history prior to 7-18 days to other place is independent risk factor to this outbreak (AOR=12.11, [95% CI 1.88-78.01]. Therefore, the history of travel some cases patient to other area of with history of measles cases is suggested as were the exposures occurred (37). Presence of Measles case in the household also a statistically significant risk factor for developing the disease adjusted odd ratio (AOR) of 28.64 [95% CI =3.41-240.32] which is similarly with the study conducted in Somali Region, Ethiopia show that measles case within the household (AOR=9.5, 95% CI (1.8-4.8) remained to be independent predictors of measles outbreak (34). Our result Also supported by the fact Measles transmission is high in congregate settings such as households and workplaces (2). This reveals that living with measles cases was contributing much in measles person to person transmission within the family.

Have contact with rash person previous 2 to 3 weeks had positive (high odds ratios) but not statistically significant associations with contracting measles disease. this finding is not consistent with Measles outbreak investigation in Zaka, Zimbabwe, 2010 in which having contact with a measles case was found to be a risk factor for contracting measles (35). The difference may be due to low number study participant especially case persons during our study and living style of the community in our study area which is scatter.

Regarding to other variables, our investigation finding did not show any evidence of association for Age, Sex, distance from Health facilities, Nutritional status, House condition. Having a Knowledge on mode of transmission for measles also had no evidence of association, this may be due to; since all our study participants were from pastoral area most of families had no formal education and have similar educational level.

The overall attack rate was 16/100,000 populations with zero case fatality rate. In Ethiopia expected Measles case-fatality rate is between 3% and 6% (5). But in our investigation of Liben Woreda measles outbreak the case fatality rate was zero; this may be due to early case identification and good cases management. The outbreak affects all age group this may indicate low and persistent vaccination coverage over several years and accumulation of susceptible individual against high measles vaccine coverage of the Woreda. But the high attack rate (67/100,000 population) was among age group ≤1 years, followed by 1-4 years (57.1/100,000 population). Our result is consistent, which similar with measles investigation and response in in the same zone (Guji zone) of Oromia, Jarar zone of Somali Region Ethiopian 2016 and in Northeastern Region of China 2014, show that high AR was reported from age group ≤ 1 years, followed by 1-4 years of age (15,30,38). But the finding is not similar with the outbreak investigation report conducted in Kabridahar Woreda, in which; the most affected age group was among 5-14 years (34). The difference may be due to by chance and study area

Sex specific attack rate is higher in females (24.2 per 100,000 populations than males, Four (8.5 per 100,000 populations) this finding is similar with the study conducted Guji zone of Oromia region 2015, which showed that more females affected than males (15). In our study children under 5 and females are most affected by measles infection; this may be due to majority of peoples those attended nutritional screening at meda wolabu woreda where ration distribution and nutritional screening conducted conducted by mobile health team were female and under five of age.

Despite many efforts from government and partners, there are still numerous challenges with cold chain equipment maintenance in the woreda. Poor cold chain management system in hard to reach kebele to be a reason for provide potent vaccine in routine immunization service this also contribute to the occurrence of outbreak in the area such remote areas are usually difficult to reach with routine immunization services (with regular schedule and appropriate cold chain system).

Most measles cases presented with clinically apparent measles with rash and fever predominant (27). similarly, during this outbreak all cases had the main sign and symptoms of measles, in which all reported cases had fever and rash. Providing adequate health care for children with measles also decreases the risk that untreated complications will progress to severe complications and ultimately to death (4). During this outbreak no severe measles related complication reported, this may be due to appropriate measles cases management provided in the area by mobile nutrition and health team.

Limitation of study

We used rapid epidemic assessment approach to identify possible causes of measles in area due to epidemics. Regarding to this we collected information from all cases despite of the all line listed case is only 15. Consequently, the precision is weak. In addition, vaccination history was also collected based on individual report (recall) which might be affected by recall bias of the respondents. Absence of child immunization card at household level poses difficult to get exact date of vaccination and other relevant information and lack of immunization coverage data by Kebeles during the period.

1.2.6 Conclusion

Our investigation confirmed that the presence of measles outbreak in liben Woreda, this outbreak confirmed based on laboratory diagnosis. Multiple factors contributing to this outbreak. Being unvaccinated, having a travel history prior to 7-18 days, presence of measles case in the household are potential cause for the outbreak and increased susceptibility of the individuals in the Woreda. The measles outbreak in liben woreda where opposed the high vaccination coverages reported and have raised question over the immunization program of the woreda and indicating the low level of population immunity against high vaccination coverage Woreda report. All age groups are affected by this outbreak. High attack rate were amongst under one followed by 0-4 years' age group this indicate poor routine vaccination coverage and suggested for recent year vaccination practice and vaccine failure. Poor cold chain management system resulted from non-faction refrigerators at health facilities also tool for this outbreak. Religious exemption and knowledge gap on vaccination are the major factors for individual being unvaccinatedin the area. Rapid containment of active cases, early initiation of control and prevention measures by mobile health team were an attributed for contain the transmission and minimum number of the cases in the woreda.

1.2.7 Recommendation

- Woreda health office need to reach unvaccinated pastoralist community and consider other than the routine vaccination through mobile teams needed to reach unvaccinated children especially mobile (pastoralist) by immunization services.
- FMOH needs to develop a new range of vaccination schedules (2nd dose chance) and mobile vaccination team for pocket area population (like pastoralist community as appropriate strategies for delivering immunization services with potent vaccine).
- National Public health policy should be considering the importance of adult immunization to eliminate measles through absolute community participation on vaccination services and achieve heard immunity.
- RHB and Woreda Health office should perform early maintain non function refrigerators and enhance cold chain management and regular monitoring functionality and maintenance system of cold chain equipment should be given due attention.
- Health Extension workers should provide regular community based health education on religious area (i.e Mosques) to enhance community awareness on the purpose of vaccine and improving vaccine acceptance by the community.
- Suspension of public collection from the area where suspected measles cases rumour reported.
- Further study needed to identify the reason for being unvaccinatedin the area with sufficient sample size.

1.2.8 Acknowledgement

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2 Chapter–II Surveillance Data Analysis Report

2.1 Malaria surveillance data analysis, South West Shawa Zone, Oromia Region, Ethiopia, (2013-2017) March 2018

Abstract

Background: Routinely analysis of surveillance data is a key function for describing Malaria epidemiology. the objective study is to describe the magnitude and distribution of the disease in the south west shawa zone over the time period of 2013-2017.

Methods: Descriptive cross-sectional study was used to analyze the five year trends of malaria cases from weekly (PHEM) and monthly (HMIS) data by using MS Excel.

Result: Total 121,817 and 97,670 malaria cases were reported to HMIS & PHEM working sections with a total difference of 24,147 (19.82%) cases during 2013-2017. Male were found to be more affected than female (51.8% and 48.2%) respectively. Plasimodium falciparum was dominant species compared to P Vivax for first two years, but P. vivax becomes dominant species for last 3 years in the area. Prevalence was high among age group >15 years (52.2%) followed by 5 to 14 (30.2%). Confirmed and clinically malaria cases prevalence declined ranges from 43.64 per 1,000 populations in 2013 to 7.4/1,000 populations of 2017. Malaria inpatients and deaths account 2.3/1,000 and 0.01/10,000 populations. Among total 1,169,893 outpatient cases, malaria accounted for 121,817(10.4%) Morbidity 1,326(2.9%) Admission and 8(0.5%) Mortality. Peak malaria cases during September to November followed by from May to July months in all respective five years.

Conclusion and Recommendation: The zone was in line with achieve high level National malaria strategy plan to reduce malaria cases by 75 percent from 2013 levels in 2020 G.C. Significant decresed of malaria prevalence since 2015 in the zone and burden of malaria was decreased by >80% compared to 2013 baseline over the period. But, still high burden of malaria cases among three Woredas in the zone (Goro, Woliso, and Becho). Shifting in plasmodium species in which P. vixax becom dominant since 2015. Peak malaria case was reported between September to October and may to july in all respective five years it needs to scale up of malaria prevention and control intervention prior to the respective period. We recommend intensify ITN's distribution among high malaria endemic woreda (Woliso, Bacho and Goro) and scale up of malaria prevention and control intervention prior to the respective period and harmonizing HMIS and PHEM system at all reporting level in order to generating reliable and quality data.

Key Words: Malaria morbidity, Admission, prevalence, Oromia.

2.1.1 Introduction

Malaria is caused by a protozoan belonging to the genus Plasmodium. Four species: Plasmodium falciparum, P. vivax, P. ovale, and P. malariae infect humans but they each differ in many aspects of their biology and geographic distribution. "P. falciparum is found in most tropical regions throughout the world, and is the most dangerous of the four in terms of both its lethality and morbidity." All undergo two forms of replication: sexual and asexual. The, parasites develop optimally in the vector but cease developing at temperatures 16°C or below. "High humidity prolongs the life of the vector and transmission is extended under these conditions. In the human intermediate host, the parasite must function at 37°C or higher, since the infection induces a significant rise in core temperature during the height of the infection [5].

The World Health Organization estimates that in 2016 about 3.2 billion People live in areas at risk of malaria transmission in 106 countries and territories and caused 216 million clinical episodes, and 445,000 malaria deaths occurred globally. The heaviest burden of malaria is in sub Saharan Africa, which constitutes approximately 90 % of total estimated malaria deaths [1]. Malaria has been a major challenge to both public health and socio-economic development particularly in countries sub-Saharan African. The nature of the topography, variations in climatic conditions and concentration of populations in highland, malaria free areas indicates the long history of malaria in Oromia and the country a whole. Recognizing the disease as a priority health problem, organized intervention efforts were initiated during the late 1950s. Since then, strong malaria prevention and control activities have been carried out, and significant achievements were made through malaria control [2].

Ethiopia is among the few countries with unstable malaria transmission. Consequently, malaria epidemics are serious public health emergencies. In most situations, malaria epidemics develop over several weeks, allowing some lead-time to act proactively to avoid larger numbers of illnesses and to prevent transmission. Approximately 52 million people (68%) live malaria-endemic areas in Ethiopia, chiefly at altitudes below 2,000 meters. Malaria is mainly seasonal in the highland fringe areas and of relatively longer transmission duration in lowland areas, river basins and valleys. Although historically there have been an estimated 10 million clinical malaria cases annually, cases have reduced since 2006 [3].

In Ethiopia, malaria is unstable and commonly occurs as intra annual and inters annual epidemics. Transmission is associated with altitude, temperature, and rainfall, generally peaking twice a year, after the 2 rainy seasons (March– May and July–September) [2, 26].

More than 75% of the total area of Ethiopia is malarious, making malaria the leading public health problem in Ethiopia P. falciparum and P. vivax Anopheles arabiensis mosquitoes are the main vector found in the country [4].

The problem of malaria is very severe in Ethiopia where it has been the major cause of illness and death for many years. According to records from the Ethiopian Federal Ministry of Health, 75% of the country is malarious with about 68% of the total population living in areas at risk of malaria. That is, more than 50 million people are at risk from malaria and four to five million people are affected by malaria annually [7]. The transmission of malaria in Ethiopia depends on altitude and rainfall with a lag time varying from a few weeks before the beginning of the rainy season to more than a month after the end of the rainy season [2].

Malaria has been a major cause of both morbidity and mortality in Oromia Regional State, and primarily occurs in epidemic forms from the months of September to December, peaking in October and November. Rainfall, temperature and humidity play a significant role in the transmission of malaria, and temperature is the most important factor in the highlands while rainfall and humidity determine its transmission in midland and lowland areas of the Region [3].

Malaria prevention and control interventions have recently undergone major scale-up in Africa, and malaria disease burden is reported to be declining in several countries, including Ethiopia and other East African countries. However, there is complexity within countries, including large geographical variation in incidence and differing upward or downward trends between indicators, hospitals or areas. Repeated representative nationwide malaria prevalence surveys are now becoming the norm, and there is a welcome emphasis on improving estimates of the impact of control measures on malaria mortality. However, comprehensive longitudinal data sources measuring several malaria indicators monthly or weekly at multiple sites are relatively few, and more are needed.

As per the NMSP 2014-2020, the FMOH conducted a mass campaign in 2015, distributing 29.6 million long-lasting insecticidal nets (LLINs) to protect all Ethiopians living in areas with ongoing malaria transmission, representing 60% of the total population. The FMOH's NMSP aims to provide 100% IRS coverage as a key malaria prevention measure in areas where malaria burden is high and in highland fringe areas with the potential for malaria outbreaks. According to the NMSP's malaria stratification, which is based upon annual parasite incidence, about 17% of the population in the country will be targeted annually for IRS. Ethiopia has set the following high-level goals for 2020 to Achieve near-zero malaria deaths (defined as less than 1 death per 100,000 populations at risk and Reduce malaria cases by 75 percent from 2013 levels and also to Eliminate malaria (P. falciparum and P. vivax) in selected low-transmission areas [27, 28].

Most countries have routine morbidity and mortality reporting systems, distrust of their quality for malaria surveillance is widespread and may sometimes be justified. However, there are many examples of carefully assessed routine malaria surveillance data making essential contributions to understanding the malaria burden, how it varies over space and time, and the impact of control measures and climate on malaria [8].

It is clear that surveillance could not be carried out for all diseases and conditions. Therefore, priority should be given to those diseases that are of interest at national and international levels. In Ethiopia 20 diseases 13 are immediately reportable whereas 7 are weekly reportable) are selected to be included into the routine surveillance.

According to EPC (Epidemic Prevention and control) guideline, malaria cases should be plotted and reviewed weekly [3]. When the epidemic threshold is reached, the higher level should be notified and more frequently monitoring may be required. Followed over years, the trends in morbidity should show the effects of improved prevention and control efforts. Compared across geographic locations, malaria morbidity can help identify priority areas for intervention. Disaggregated by species, the morbidity patterns can suggest the emergence of increasing drug resistance [9].

This document will be presents and assesses surveillance malaria data from the HMIS and PHEM system at the zone (middle reporting unit) level in Oromia Region, South West Shoa Zone for the period of over a five -year 2013-2017 (2005-2009 E.C).

The goals this data analysis is to stratify malaria risk by to contribute to the information by describe the surveillance data in terms of person, place and time and to determine whether and/or how malaria burden is changing over the time period in the south west shoa zone.

2.1.2 Rationale

Malaria case counts are quite sensitive and specific indicators for probability of an epidemic. So routinely analysis of surveillance data is a key function for describing Malaria epidemiology within the zone. Characterize the disease burden, to detect outbreak timely and predict potential outbreak and recommend appropriate prevention strategies, monitoring disease trends, and evaluating the effectiveness of disease control programs are mandatory. Despite of the national malaria strategy was launched in 2010 and covering the period to 2015 with a renewed emphasis on malaria elimination, it's ambition was to achieve malaria elimination within specific geographical areas with historically low malaria transmission by 2020, near zero malaria transmission in the remaining malarious areas of the country by 2015 and to eliminate malaria from Ethiopia by 2020 [4]. Therefore, Malaria cases should be plotted and reviewed weekly, monthly and followed over years. The trends in morbidity should show the effects of improved prevention and control efforts and compared across geographic locations of malaria morbidity can help identify priority areas for intervention. This study was designed to analysis the five year's Zonal malaria data (2013-2017) to describe the magnitude and distribution of the disease in the zone. The results from this analysis can trigger public health action and help to identify priority areas for intervention recommend appropriate prevention measures in the zone.

2.1.3 Objective

General objective

- To describe magnitude of Malaria by person, time, place in South West Shawa zone, Oromia Region, Ethiopia, 2018

Specific objectives

- To compare magnitude of malaria using PHEM & HMIS data sources.
- To describe distribution of malaria morbidity & mortality in the zone

2.1.4 Methods and materials

Study area

Surveillance data analysis was conducted in South west shoa zone, south west shoa zone is one of Oromia Region Ethiopia. Based on the 2007 Census conducted by the Central Statistical Agency, the forecasted total population 2017 was 1,198,093, of whom 595,454 are Men and 602,642 Female. About 163,060 (13.61%) of population are urban inhabitants. Among total population of the zone More than 730,984 were at risk of malaria. There were about 249,602 households this Zone, which results in an average of 4.8 persons to a household, and 227,102 housing units. The area comprises numerous rivers and streams that drain into the Awash River and also many lakes located in the zone. Land use consists of farmlands interspersed by patches of forests and scattered trees, and lakes. The economy is largely based on rural subsistence-agriculture; a number of irrigated farms and other agro-industrial activities, such as potatoes, maize, fruits and vegetables was produced in the zone. The zone is administratively divided into 11 Woredas and 270 localities known as Kebeles. Except one woreda all woreda and 181(68%) of kebele were at risk of malaria in the zone. There are 3 functional hospitals and 253 Health Posts 75 Clinics and 54 Health Centres in the zone.

Study population

The source population was all people at risk of malaria and study population was any people living in south west shoa zonea that have been sought health care services within the zone 2013-2017.

Study subject

All confirmed and suspected cases and deaths that have been infected by malaria and sought health care services within the zone and all case registered and reported for malaria 2013 to 2017.

Inclusion and Exclusion criteria

- All clinical and confirmed malaria cases including deaths from 2013 to 2017 reported data were included.
- Unrelated data of cases and deaths in the surveillance data were excluded (from both HMIS and PHEM).

Case definition

- **Suspected malaria case:** A patient who has fever or history of fever in the last 48 hours and lives in malaria-endemic areas or has a history of travel within the last 30 days to malaria-endemic areas
- **Confirmed malaria case:** A suspected case of malaria in which malaria parasites have been demonstrated, generally by microscopy or RDT, becomes a confirmed case by laboratory
- **Not malaria (confirmed not to be malaria):** Patients with suspected malaria for whom a diagnostic test was negative would usually be given a diagnosis other than malaria [11].

Study design

Descriptive cross-sectional secondary data analysis was used to analyze five year's weekly and monthly malaria data of South West Shawa Zone, Oromia Region, belong to person, place and time.

Study period

Secondary data of malaria case for the past five years (2013-2017) were collected, analyzed and interpreted from February 20 to March 15/2018.

Data collection methods

Secondary data of malaria for the last consecutive five years was reviewed and collected from weekly and monthly surveillance system of zonal PHEM & HMIS working section (departments) by using structured checklist. Data ITN's coverage was collected from zonal Communicable Disease Control working section.

Data source

Zonal HMIS and PHEM working section were a data source for this secondary data analysis.

Description of data source (HMIS and PHEM)

Currently The FMOH's receives reports from PHEM and HMIS reporting system, but the reporting frequency is weekly for PHEM and monthly for HMIS.

Health Management Information System (HMIS System)

The designed to availing reliable, timely and complete information to make evidence–based decision making possible at each level HMIS has been implemented since 2007 (EFY 2000). The new system is designed to provide one standardized set of health indicators nationally, across all regions and across all health posts, health centers (HC) and hospitals in Ethiopia. Data are to be analyzed and used at all levels down to the health facility. Advantage of the HMIS is, through the efforts made so far, the timeliness, completeness and reliability of data have improved and it has been possible to use the data for planning and performance monitoring purposes. Further, HMIS data are utilized for resource allocation, program activities, policy making at all levels of the health system down to the health post (27).

Public Health Emergency Management/ Surveillance (PHEM System)

PHEM encompasses reporting of morbidity and mortality data from health posts, health centers and hospitals. It is a unique reporting system intended to improve the surveillance and control of

22 diseases which are either epidemic prone, targeted for eradication or of public health importance, including malaria which is one of the weekly reportable diseases. There is a distinction between diseases which are immediately reportable (e.g. polio, measles); those which are reportable weekly and those reportable monthly. Malaria indicators comprise a significant proportion of the PHEM indicators. Malaria cases are reported including clinical malaria (outpatient and inpatient), confirmed malaria by species. The advantage of this system is that it is a simple direct channel reported weekly and there are a clear guidelines and specific targets for timeliness and completeness of reporting (27). The national PHEM surveillance system now reports >80% percent completeness from total expected to report [28].

Study variables

- Sex
- Age
- Place (Woredas)
- Time period (Months and Years)
- ITN's Coverage
- Clinical Malaria cases
- Confirmed P.f Malaria cases
- Confirmed P.v Malaria cases
- Admission due to Malaria
- Death due to Malaria

Data quality control

There are factors that affecting quality of surveillance data for reflecting disease trends includes; accuracy of data in recording and completion of correct summary of the monthly and weekly report forms, submission of the forms to next higher level, timeliness of reporting, and consistency in reporting at all levels. The surveillance data analysis was checked and controlled for inconsistency by triangulated with data from monthly and the weekly surveillance report of malaria under HMIS and PHEM reporting unit before analysis, as well as malaria focal point of the south west shoa zone health department.

Data analysis tolls

The five-year's data were analyzed by Microsoft Office Word and Excel 2007.

Ethical clearance

Written support later was promptly obtained from the Oromia Regional Health Bureau, Public Health Emergency Management and Health Research Directorate. The purpose and objective requirement of data were briefly explained for South west shoa zone health department head and respective expertise prior to asking for data to proceed to data collection.

Data dissemination

Written report (both hard and soft copies) were prepared and shared to Addis Ababa University/School of Public Health, Oromia Regional Health Bureau, Public Health Emergency Management and Health Research Directorate, South west shoa zone health department and Field Epidemiology Training Program accordingly coordinators and mentors.

2.1.5 Result

A total of 121,817 and 97,670 malaria cases were reported to HMIS & PHEM working sections respectively in Five years, of the study comprising 24,147 (19.82%) total difference of cases between respective reporting units (HMIS and PHEM). The average number of cases reported to HMIS per year was 24,363 ranging from 47,269 to 9,187 cases and 34,483 to 9192 of cases per year were reported to PHEM during 2013 and 2017 respectively. Average annual data discrepancy between HMIS and PHEM, 6.06% and ranging from a maximum 17.1% in 2014 to minimum of <0.05% of 2017 between HMIS and PHEM reporting unit.

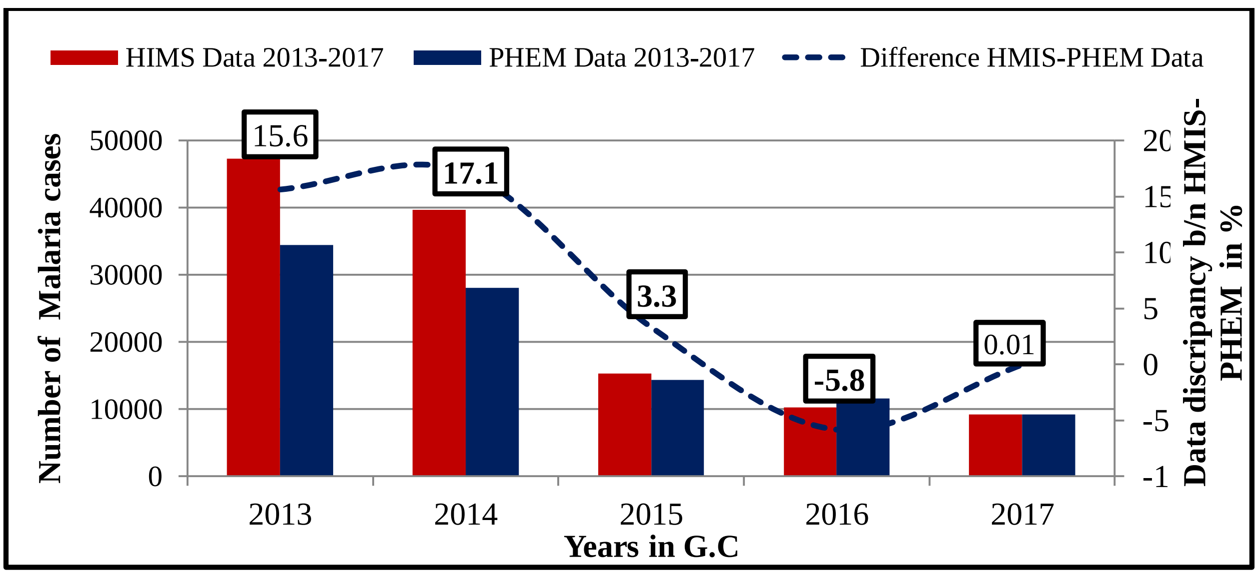

Figure 2.1-1: Total Clinical & Confirmed Malaria Cases and its discrepancy reported between HMIS & PHEM reporting unit of South West Shoa zone, Oromia Region, 2013-2017.

Number of confirmed malaria cases was decreasing throughout the year since 2014 up to 2017. However, the case was high by 2013 that account 47,269 per year, the prevalence was decreasing significantly until 2017 and it decreased by >80% when compared to the 2013 base line data.

Despite of PHEM report lacks variable such as Age, and Sex for analysis whereas HMIS report has incorporated such variables age, and sex due to this we used HMIS surveillance data for analysis. Therefore, the next report is based on the HMIS data.

According to five year HMIS data, however, we would expect the pie chart to be similar in both sexes are at a similar risk for malaria. The below pie chart shot that magnitude of the case was higher in Males than Females, this show that, Male were found to be relatively more affected than female in total confirmed malaria which is (51.8% and 48.2%) respectively.

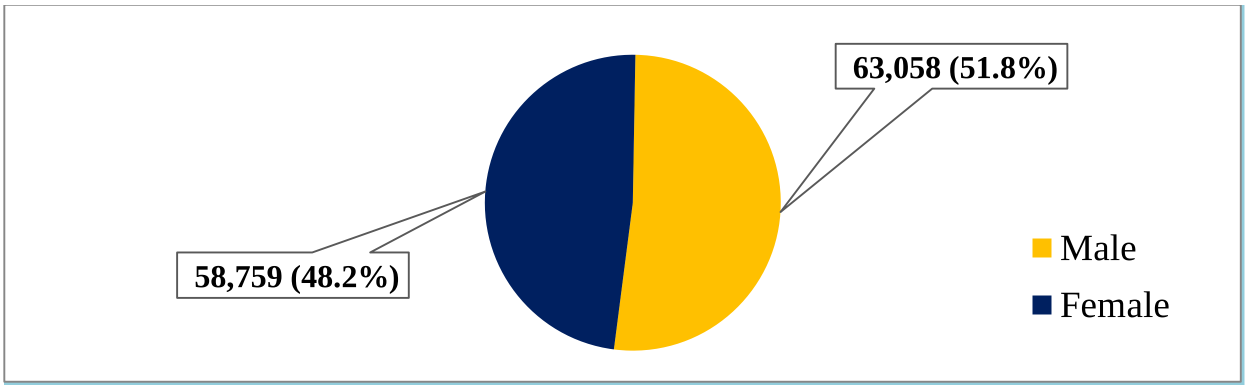

Figure 2.1-2; Proportion of confirmed and clinical malaria cases by Sex South West Shoa Zone, Oromia Region, Ethiopia, 2013-2017.

Malaria was reported in all age groups in the study area, however there were the high prevalence among age group >15 years, account for about 62,601(52.25%) followed by 5 to 14 age groups 36,837(30.2%). However, Malaria affects all age groups magnitude of malaria cases relatively low among age under five years (See below table).

Table 2.1-1: Distribution of malaria cases by Age group South West Shoa Zone, Oromia region 2013-2017

Age group	Years					Total case (2013-2017)	Proportion (%) (2013-2017)
	2013	**2014**	**2015**	**2016**	**2017**		
≤4 yrs	7,706	7,832	2,472	1,725	1,644	21,379	17.6
5 to14 yrs	15,365	12,095	4,012	2,797	2,568	36,837	30.2
≥15 yrs	24,198	19,794	8,858	5,776	4,975	63,601	52.2
Total	47,269	39,721	15,342	10,298	9,187	121,817	100

Of those total was confirmed by either microscopy or rapid diagnostic tests (RDTs); 121,817 reported malaria cases about 71,333(58.55%) and 47,080 (38.64%) was plasimodium falciparium, Plasimodium vivax and 4,018(3.29%) were diagnosed clinically during the study period (2013-2017). However, plasmodium falciparium was dominant species compared to others for first two years' the proportion of P. falcipurium were declined during the 2015 to 2017 period ranging from maximum of 71% by 2013 to minimum of 34% by 2015. In the reverse, the total share of P. vivax increasing from 28.57% to 51% through 2013 to 2017 period. There were no reports other than these two species. However, trend of clinical malaria is decreased, Average five years' clinical malaria found to be 5.25% Ranges from Maximum of 17.30% of 2015 to 0.40% of 2013 compared to the other reporting years during the period; which is higher than the national recommended malaria clinically diagnosis without laboratory confirmation which was 5% (see table below). There is a significant reduction of malaria in 2017, compared to the baseline data 2013, the total confirmation of malaria decreased from 17.3% to 86% in 2014/2015. Average frive years slide positivity rate were 33.20 % ranges from minimum of 11.62% of 2016 to Maximum 58.34 % of 2013 and the >50% slide positivity rate were recorded during 2013 and 2014

Table 2.1-2: Total Malaria cases by Plasmodium Species of South West Shoa Zone, Oromia Region, 2013-2017

Year	Total suspected Fever examined by RDT or Microscopy	Total malaria confirmed and clinical	Slide positivity rate in %	P. falciparium		P. vivax		Clinical Malaria	
				Number	%	Number	%	Number	%
2013	80,643	47,271	58.34	33,577	71.03%	13,505	28.57%	189	0.40%
2014	75,036	39,721	52.42	23,833	60.00%	15,511	39.05%	377	0.95%
2015	71,626	15,340	17.66	5,216	34.00%	7,471	48.70%	2,654	17.30%
2016	84,002	10,298	11.62	4,294	41.70%	5,468	53.10%	535	5.20%
2017	45,209	9,801	21.18	4,571	46.64%	5,002	51.04%	227	2.32%
Total	356,716	121,817	33.20	71,324	58.55%	46,595	38.25%	3,898	3.20%

Different magnitude of malaria cases was observed in different years among woredas in the zone. In 2013 Weliso, Goro, Dawo, Becho woredas are reported the greatest number of malaria cases and

Weliso, Goro, Becho and ilu reported the greatest number of malaria cases in 2014 respectively. Therefore, in 2017 Amaya and Goro Woreda was remain as Woreda having the highest magnitude of malaria cases. The magnitude of five year's malaria trend is show decreased among all woredas in the zone, except in Woliso, Goro and Becho woreda relatively high in 2017 compared to other woredas in the zone reports >1,000 cases per years.

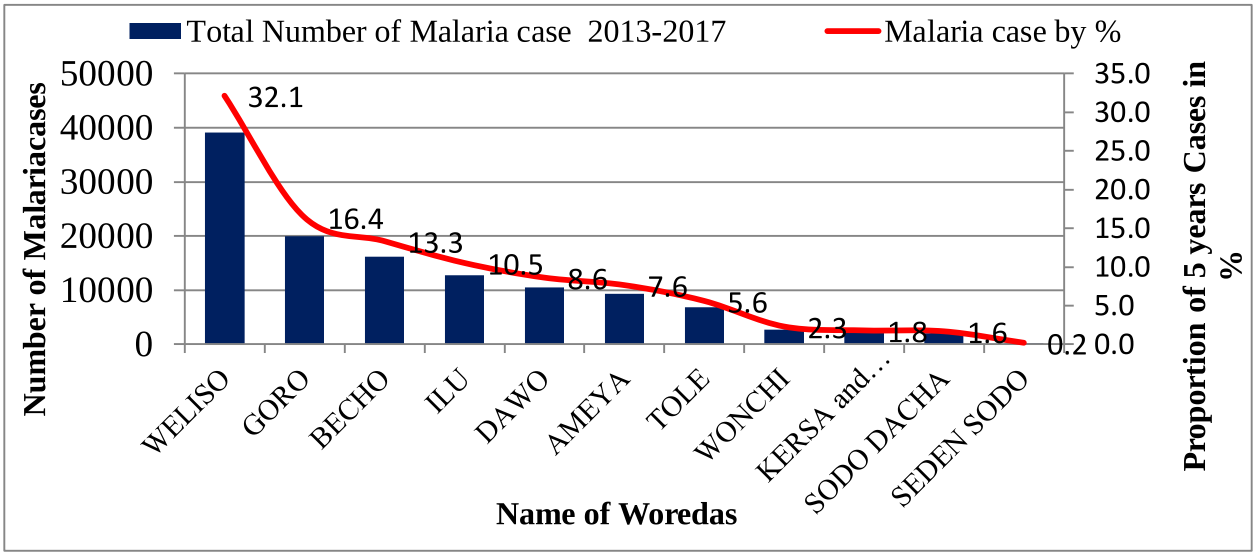

Figure 2.1-3:Distributions of malaria morbidity by reporting woredas of South west Shoa zone, Oromia Region 2013-2017

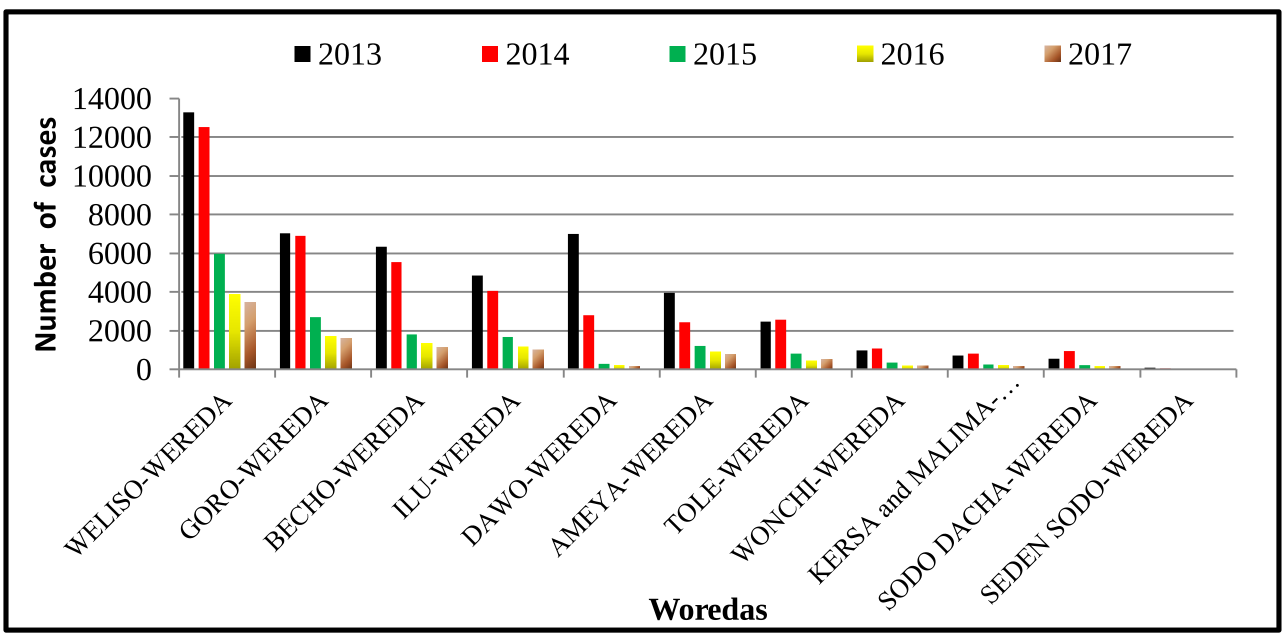

Figure 2.1-4: Distributions of malaria morbidity by years among South West Shoa Zone Woredas, Oromia, 2013-2017

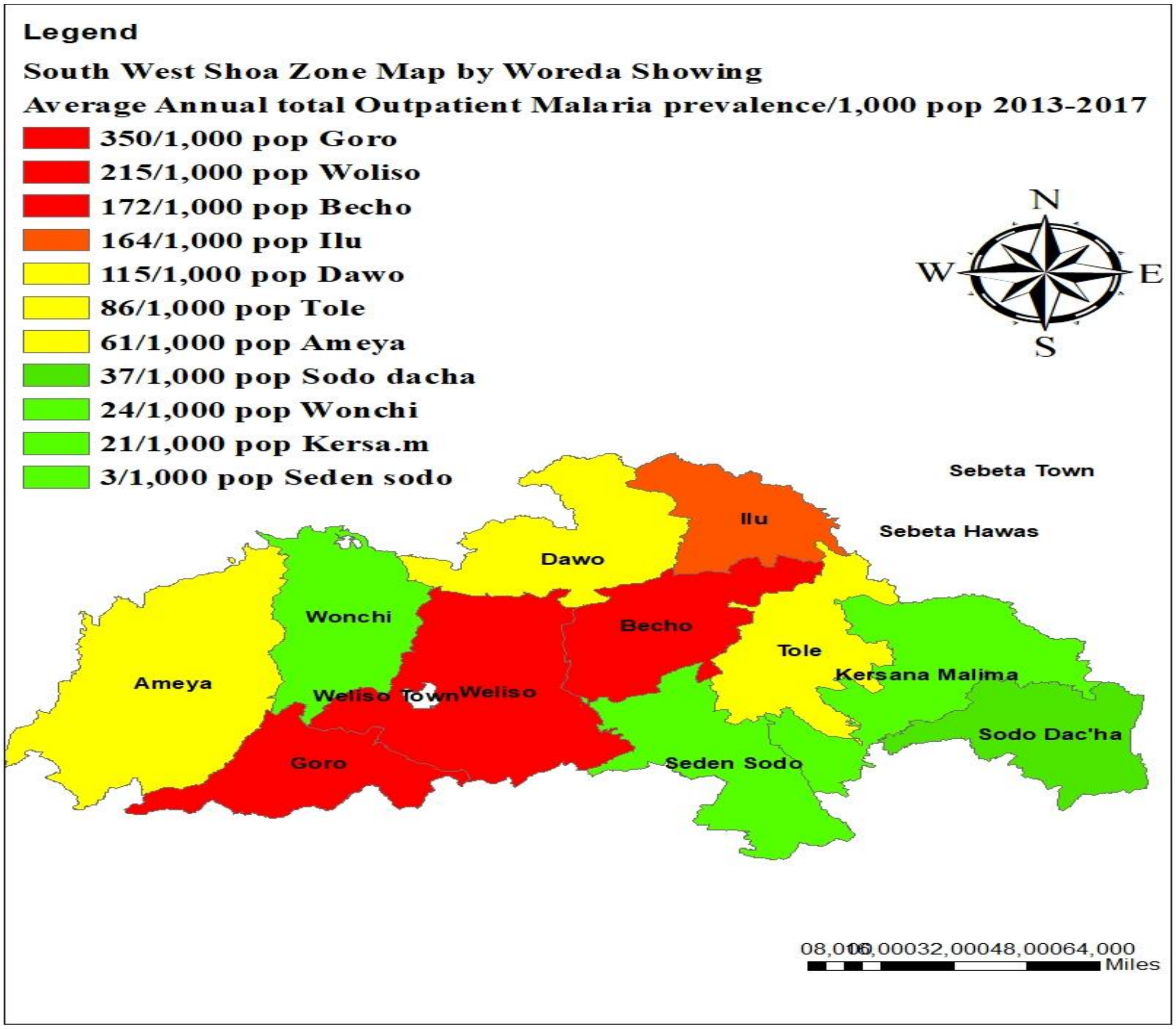

Figure 2.1-5: Average Annual of Malaria prevalence per 1,000 populations by Woreda, South West Shoa Zone, Oromia Region, 2013-2017.

Zonal five years average annual malaria prevalence/1000 population found to be about 21.78/1000 populations. But it was varying among woredas in which very high among four woredas (Goro, woliso, Becho and Ilu) in which account for more than >150/1,000 population and relatively low prevalence among three woredas (Seden sodo, kersa malima, and wonchi woredas) in which account for <25/1,000 populations when compared to those others woredas in the zone.

Average 5 years (2013-2017) malaria data shows, majority of the cases were reported from Woliso followed by Goro and Becho Woreda, which were 39,160, 19,983 and 16,225 cases respectively (figur. Seden sodo Woreda were the least malaria case reported which was 193 cases during the study period. However, majority of cases were reported during 2013 the case was declined in almost all the reported Woreda.

Among total 121,817 reported malaria cases majority of cases (32.1%), were from woliso Woreda followed by Goro and Becho Woreda (16.4% and 13.3%) respectively. Low and stable malaria confirmed case distribution observed in Seden sodo and sodo dachi Woreda, during the study period. But overall tremendous declines were observed in the last three-year data, 2015-2017.

Indicators show that Prevalence of confirmed and clinical malaria, through respective five years. In all indicators the last three years 2015 to 2017 have lower results than the first two year of study period. This may shows strengthen of the prevention and curative program. (see blow table).

Table 2.1-3: Prevalence of Malaria cases by indicator South West Shoa Zone, Oromia Region, 2013-2017

S.no	Indicators	Year in G.C					Average Prevalence 2013-2017
		2013	2014	2015	2016	2017	
1	Total Malaria out-patient cases/1,000 population	43.85	35.75	13.08	8.78	7.41	21.78
2	Malaria in-patients/10,000 pop	3.28	3.08	2.37	1.49	1.43	2.33
3	Malaria deaths/100,000 pop	0.2	0.2	0.1	0.2	0.1	0.16
4	Confirmed malaria cases/1,000 Population	43.64	35.44	11.09	8.16	7.72	21.2
5	Pf cases/1,000 Population	31.11	21.31	4.5	3.66	3.69	12.8
6	Pv cases/ 1,000 Population	12.5	14.13	6.32	4.66	4.03	8.4

The highest malaria prevalence occurred in 2013 (43.85/1,000poulation) and the overall trend shows decline in consecutive fours year by more than 80% compared to 2013 baseline data. The trends of confirmed and clinically malaria cases declined, the declining ranges from the 43.85 per 1,000 populations in baseline 2013 to 7.41/1,000 population in 2017. The average total five years' malaria inpatients and malaria deaths accounts 2.3/10,000 and 0.14/100,000 population respectively and malaria positive report shows an average of 21.2/1,000; with 12.8/1,000 of P-falciparum and 8.3/1,000 population for P. vivax. The overall five-year malaria prevalence was 21.78/1000 populations.

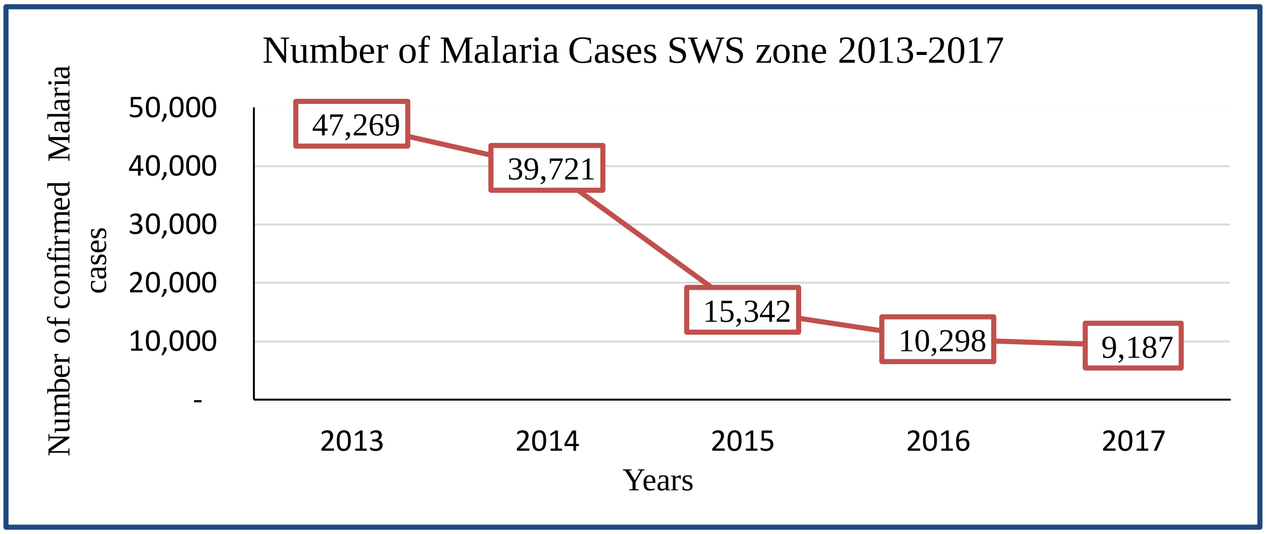

Figure 2.1-6: Trend Confirmed Malaria cases in Number South west shoa zone, Oromia Region 2013-2017

The malaria cases showed decreased in progress within the zone and the rate of decreased were accounts for about 7616 cases per year until 2017 when compared to 2013 baseline data.

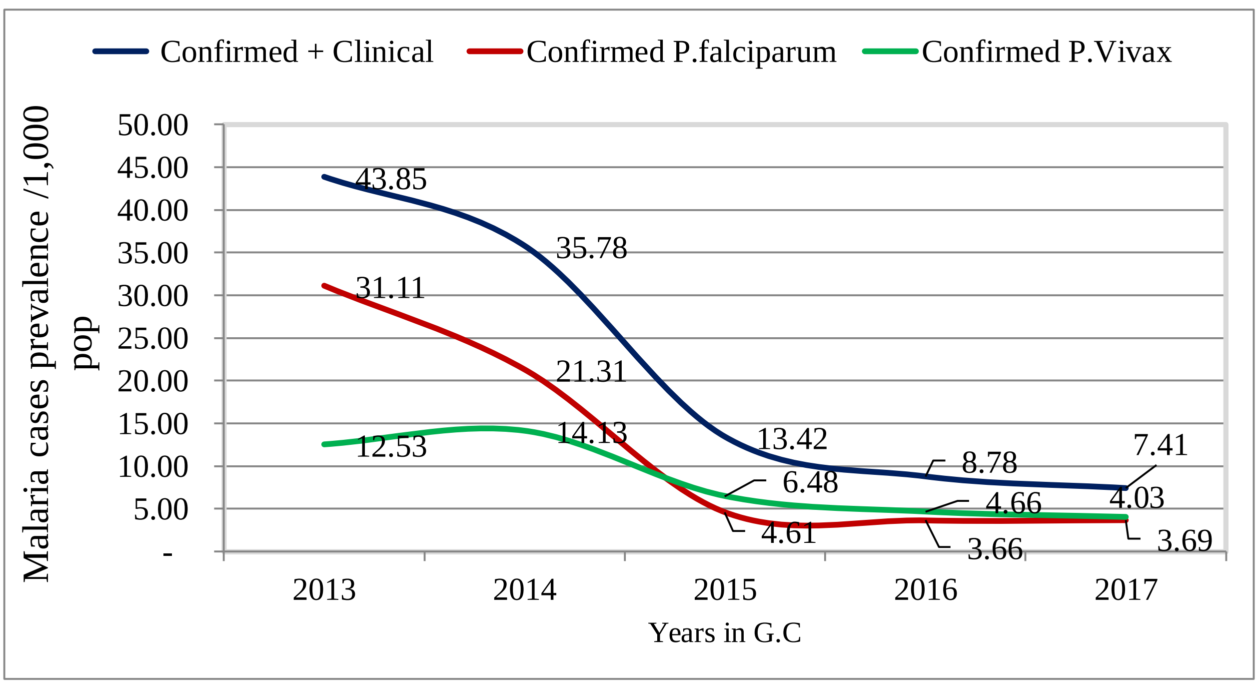

Figure 2.1-7: Five year trend of average annual malaria prevalence/1,000 pop by plasmodium species South West Shoa Zone 2013 – 2017

There were significant changes in the number of malaria case in the years under consideration for trend analysis, which show a significant decrement of confirmed malaria cases in the zone over the last 5 years. The most significant decrement seen in 2015 in which by more than 50% compared to 2014.

Table 2.1-4: Frequency of malaria cases and death South West Shoa Zone, Oromia Region, 2013-2017, February 2018

Years	population at risk	In number		By percentage(%)	
		Cases #	Deaths #	Cases #	Deaths #
2013	1,078,048	47,269	2	4.4%	0.004%
2014	1,110,245	39,721	2	3.6%	0.005%
2015	1,143,404	15,342	1	1.3%	0.007%
2016	1,173,370	10,298	2	0.9%	0.019%
2017	1,240,332	9,187	1	0.7%	0.010%
Total/ five years 2013-2017		121,817	8	2.2%	0.006%

In the period 2013 – 2017 there were 8(2.2%) reported total malaria deaths in the zone. The Annual average number of malaria deaths per year was 2. Annual malaria deaths range between maximum 0.019% in 2016, to minimum 0.004% in 2013. Therefore, we can't talk about the trend of malaria mortality because there were no significant incline or decline. Average five years' case fatality rate was low for all five years' which is 0.006%. This is may be due to early diagnosis and treatment or under report of deaths from health facilities. So it need farther investigation and study in the future. The proportion of malaria cases relative to all the other cases of illnesses diagnosed and treated during outpatient consultations during 2013-2017 is shown in below Figures and Table

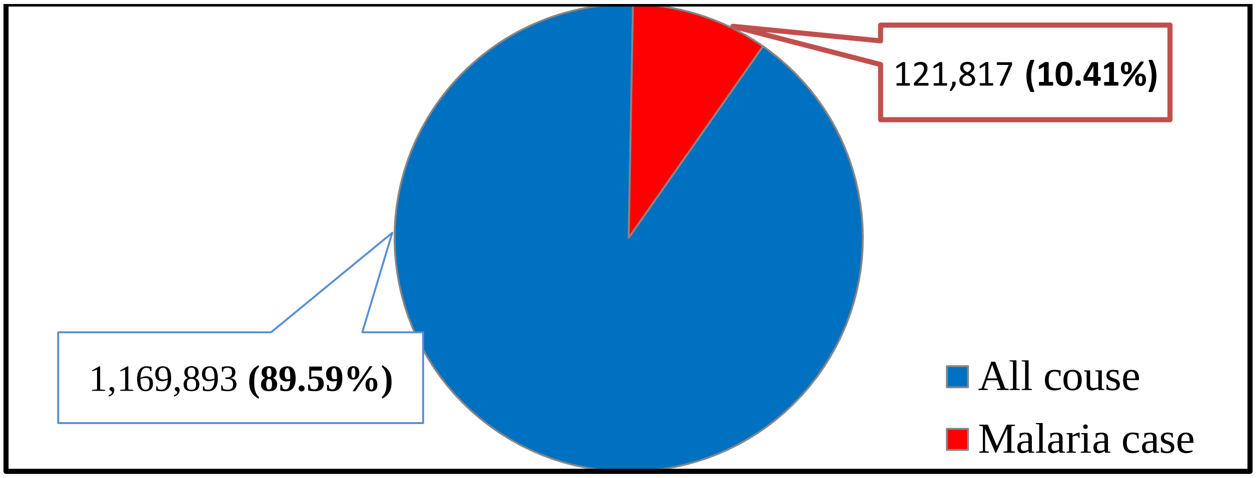

Figure 2.1-8: Proportion of confirmed and clinical malaria cases among total out patients cases South West Shoa Zone, Oromia Region 2013-2017

According to zonal annual administrative reports; Malaria were among ten top leading of outpatient within the zone, out of total outpatient visits during the study period Malaria contributed about 10.41% of total cases reported.

Table 2.1-5: proportion of Malaria among all causes by age group in south west shoa zone, Oromia region, Ethiopia, 2013-2017

Age group	Morbidity			Admission			Death		
	All cause	Malaria	%	All cause	Malaria	%	All cause	Malaria	%
0-4 years	288,320	21,379	7.4	4,655	102	2.2	407	0	0
5-14 years	196,274	36,837	18.8	12,427	396	3.2	492	1	0.2
≥15 years	685,299	63,601	9.3	29,420	828	2.8	563	7	1.2
Total	1,169,893	121,817	10.41	46,502	1,326	2.9	1,462	8	0.5

Among total reported 1,169,893 outpatient cases, 46,502 admissions, and 1462 deaths in last five years, malaria accounted for 121,817(10.41%) morbidity 1,326(2.9%) admission and 8(0.5%) mortality during the study period for all age groups. However, malaria is among ten top leading of outpatient within the zone, malaria deaths were not listed among the ten top causes of inpatient mortality in all age group. Since there were fluctuations in the proportion of malaria morbidity in the age groups, deferent trend was observed in each of the age groups, with high 18.8% among 5-

14 age group followed by 9.3% among ≥15 Age groups. Overall about 82% of outpatient malaria cases and 92% of inpatient malaria admission is among adults and children who are at least five year of age.

Among total 46,502 reported Admissions during five years in the zone malaria contributed for total of 1,326(2.85%) admissions, there was malaria admission in all age groups; malaria case admission is high (3.2%) among 5-14 of age group and low among admission among 0-4 age group of 102 (2.2%) of total admissions in the zone.

Among total 1,462 reported deaths during the five year, malaria contributes for about 8(0.5%) deaths, by which majority of death 7(1.2%) deaths were among >15 years of age groups and zero death or low among 0-4 years' age groups during the Five years of 2013-2017

Table 2.1-6: Proportion of malaria Morbidity, Admission and Mortality by Sex South West Shoa Zone, Oromia Region 2013-2017

Sex category	Morbidity			Admission			Mortality		
	All Cause	Malaria	**%**	All Cause	Malaria	%	All Cause	Malaria	**%**
Male	600,896	63,058	10.5	20,461	555	2.7	837	5	0.6
Female	568,997	58,759	10.3	26,041	771	3.0	625	3	0.5
Total	1,169,893	121,817	10.4	46,502	1,326	2.9	1,462	8	0.5

During the period of 2013-2017 total 121,817 malaria cases were reported. Malaria contributed about 10.4%, 2.9% and 0.5 % morbidity, admission, and mortality among all cases in both sex. since the is no significant trend between male and female proportion of malaria morbidity and mortality among all cause were relatively more in male which accounting about 10.5% and 0.6% in male and 10.3% and 0.5 in female of total morbidity and mortality within the zone during study period.

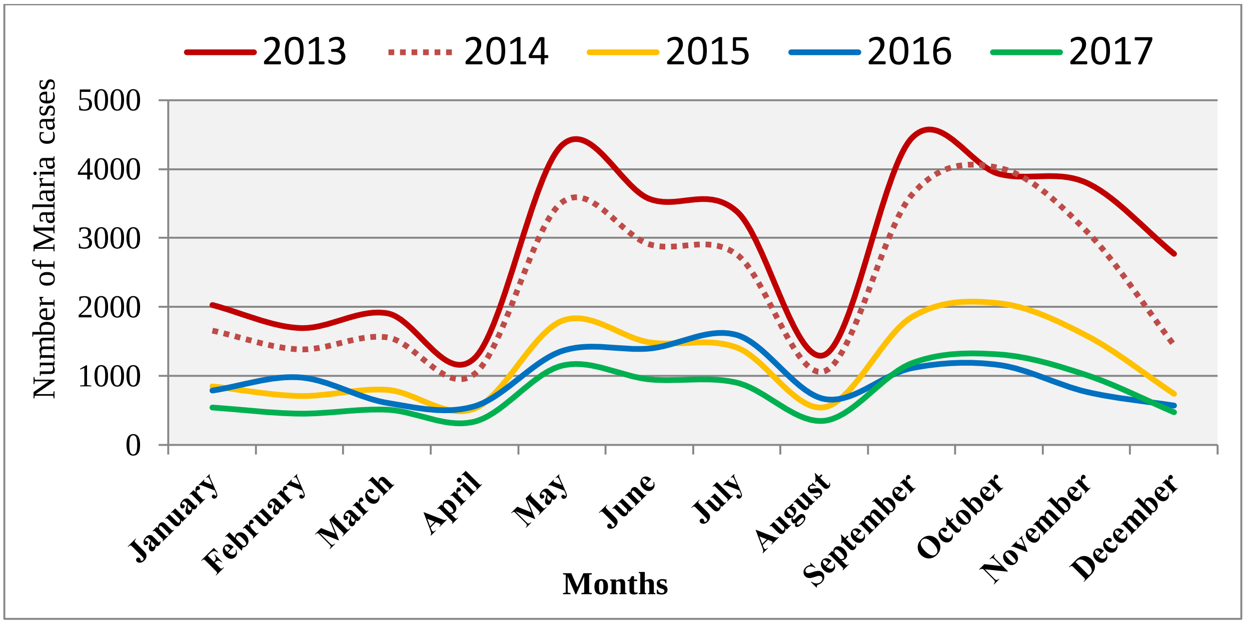

Figure 2.1-9: Malaria trend by month South West Shoa Zone Oromia Region Ethiopia Five Year (2013 to 2017)

Peak malaria case was reported between Septembers to November in all respective five year of study period within the zone followed by the main rainy season from May to July. There was peak malaria transmission during October in all consecutive five years coincides with the planting and harvesting season. It needs to scale up of malaria prevention and control intervention during the respective period.

According to five years' zonal administrative report malaria specific prevention and control intervention were implemented to reduce mortality and morbidity of malaria by considering high malaria woredas. ITN are the most important intervention in prevention and control of malaria. Despite of prevention and control intervention conducted in the zone during last five years, there was tremendous decrement of malaria cases followed by the increment of zonal ITN's coverage in which 67% by 2013 and 78% during 2017. Malaria case and ITN distributed trend during 2013-2017 was shown in figure below.

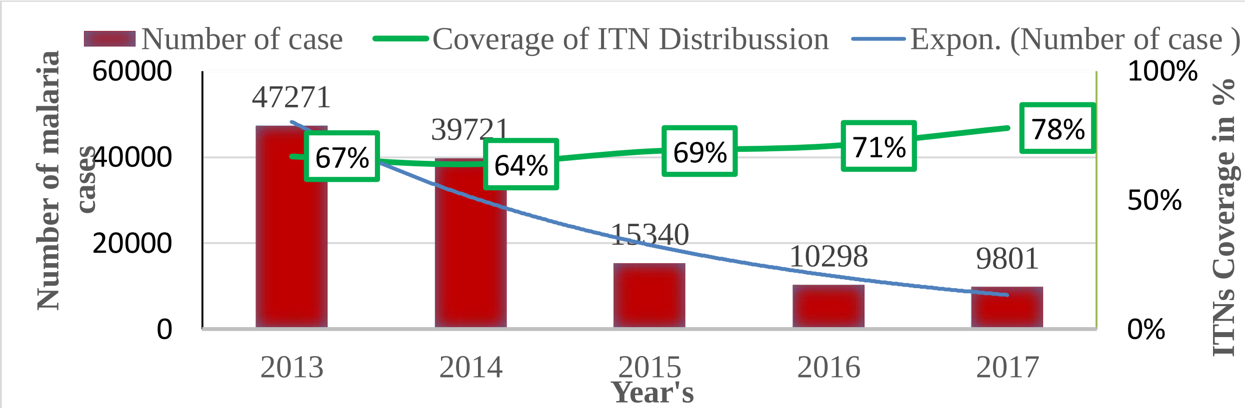

Figure 2.1-10: Malaria case and ITN coverage in South West, Shoa, Oromia region 2013-2017

Total average five-year zonal report completeness and timeliness were 92% and 90% respectively. Examining reporting rates by woreda over time shows, some important differences between them (Figure 11). Majority (55%) of woredas of achieved greater than 90%, but about 45% of woreda reported lower than total five-year Zonal average report completeness which is 90. Average report completeness among woreda ranges from the least 88% of sodo Dachi woreda and the top 100% of Goro woreda. Almost all woredas achieved more than national target set for report completeness and timeliness, which is 90% at all level. Most woredas show the drop off in submitting monthly reports in time, but it was more severe in two woreda (Sodo dachi and Woliso Woreda). In general, the majority report completeness and timeliness rate of woreda was above the expected level of national HMIS guideline >90%.

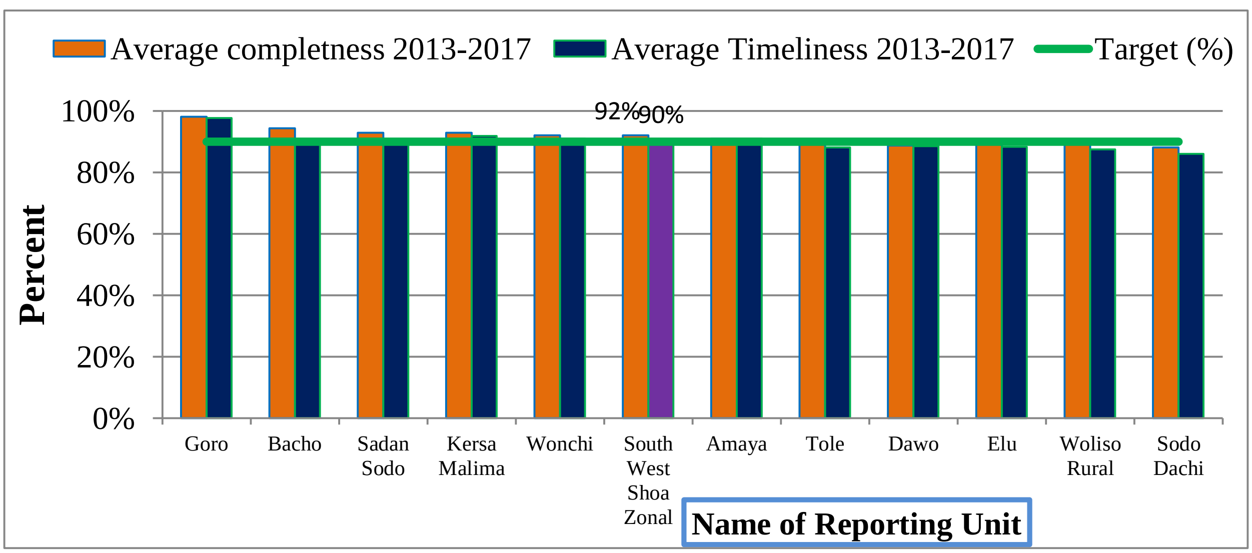

Figure 2.1-11: Average annual HMIS report completeness and timeliness by woreda, South West Shoa zone, Oromia Region 2013-2017

2.1.6 Discussion

Among total 11 Woredas and 270 localities known as Kebeles, except one woreda, about 10 (91%) and about 181(68%) of kebele were at risk of malaria which had the same oromia region by which 90.5% weredas and 64.4% kebeles were found to be partially or completely prove to malaria [12].

The Zone PHEM system receives similar report as HMIS but, our finding has shown data consistency problem in the study area. It has been recognized that even having such quality problem in the data, malaria is the important health problem of the study area. However, it is observed that there were discrepancies of malaria cases reported to PHEM & HMIS sections, which should be almost similar data need to be reported from data sources. HMIS data have shown an increased in malaria transmission relative to PHEM data. While only difference is reporting period (i.e. weekly for PHEM and monthly for HMIS and aggregation of weekly report should have sent monthly data). Our result show that, an inconsistency of data between both HMIS and PHEM reporting unit, this may be due to the reporting time and lack of data verification done routinely like HMIS for PHEM system and lack of integration between reporting channels at health facility level [4].

A total of 121,817 and 97,670 malaria cases were reported to HMIS & PHEM working sections with a total difference of 24,147 (19.82%) cases during 2013 to 2017.the significant decrement observed during 2015 compared to all other five years. However, number of malaria confirmed cases was decreasing throughout study period but, the significant deceremet in malaria prevalence were identified since 2015 up to 2017. High malaria confirmed cases were reported in 2013 and that account 47,269 per year malaria confirmed cases. However, the prevalence of malaria is high by 2013, in 2017, the prevalence was decreased by >80% when compared to the 2013 data and this result supported by Health and health related indictors report from 2003-2007 E.C [9,14]. The trend of malaria cases in the zone were decreased by 80.5% from the baseline years 2013 and Significant decrement in malaria prevalence was observed during 2015. This result if lined with FMOH's PHEM 2014/15 report show that, significant reduction of malaria in 2014/15, compared to the previous year [31]. Therefore, the zone was in line with achieving the high level National Strategic Plan goals and targets by which to reduce malaria cases by 75 percent from 2013 levels [25].

According to our record review of five years HMIS data, male was found to be relatively more affected than female in which (51.8%). This may be due to males are more exposed to anopheles' mosquito bites, which can transmit malaria parasites due to engagement of male more in irrigation site than female in the study area [20]. Malaria affects all age groups in the study area, however there were the high prevalence among age group >15 years, also peak malaria transmission coincides with the planting and harvesting season, majority of malaria burden among older children and working adults within the zone. There may cause heavy economic burden in the community, this results were lined with the study conducted in North Gonder [20].

Among total five year reported confirmed malaria cases plasmodium falciparum and Plasimodium vivax constitute for about 71,333(58.55%), and 47,080 (38.64%) respectively. Our result was consistent with study conducted in oromia region in 2004, show that, the two most important causes of malaria were P. falciparum and P. vivax, comprising of 51.5% and 32.3% of the case respectively [12]. But in our study we found shift of plasmodium falciparium species. By which p. falciparium become decreasing and p. vivax increasing during 2015 to 2017, this shows that, shift in trend of p. falciparium dominance to p. vivax. P. vivax increasing from 28.57% baseline 2013 to 51% during the 2017. This results lined with the study report from North Gondar and Ethiopia show that, the P. vivax Plasmodium species dominant and accounted for 52-68% [20, 23]. But, our result is inconsistent with data review on Malaria epidemiology and interventions in Ethiopia from 2001 to 2016 in which Plasmodium falciparum accounted for ~ 60% of cases (range 55– 69%) and P. vivax 40% (range 31–45%) from 2001 to 2016 and, the total share of P. vivax declined from 69 to 28% from 2010 to 2014 [29]. In our data analysis P. vivax increasing in the reverse, this may due to recovered from the first episode of illness and suffer several additional attacks and the deferent study area in which p.v is common at highland and fridge area of the regions. Aditionaly, the possible reason for reduction of P. falciparium coincides with the increased availability treatment drug for p. falciparium (artemether-lumefantrine) at all level including health post since 2004. There were no reports other than these two species. It is not possible to see data of malaria positivity rate and parasitological test from HMIS data due to lack of total suspected malaria cases included in the out patient reporing format.

The result show that majority of cases were in woliso Woreda (32.1 %), followed by Goro and Becho Woreda (16.4 %, and 13.3 %) respectively, this may due to the low coverage of ITN and mal practice of LLITN's bed net utilization among the community in the woreda and the presence of irrigation site that facilitate of plasmodium breeding site following awash river.

The overall five-year malaria prevalence was 21.21 per 1,000 populations. The result was similar with the study done in the same zone, in Amaya woreda prevalence was 37 per 1,000 populations

[15]. Zonal five years average annual malaria prevalence were 21.78/1000 populations. But it was varying among woredas in which very high among four woredas (Goro, woliso, Becho and Ilu) in which account for more than >150/1,000 population and relatively low prevalence among three woredas (Seden sodo, kersa malima, and wonchi woredas) in which account for <25/1,000 populations when compared to those others woredas in the zone. However, malaria prevalence in the zone were similar with regional reports, but among majority of woreda it found to be higher than the regional Malaria prevalence reported by DHS in 2016 which is 1-50/1000 populations in Oromia region [33].

The trends of confirmed and clinically malaria cases declined in the last three years and the declining ranges from the high 43.64 per 1,000 populations in 2013 to the least 7.4/1,000 population in 2017. The total malaria inpatients and total malaria deaths accounts 2.33 per 1,000 and 0.01/10,000 respectively. The trend shows decline siginificant decrement in malaria cases throught the study period in the zone compared to baseline data 2013. The reason may be due to increased awareness and control and privation activities by different responsible organizations.

In the period 2013 to 2017 there were 8 reported malaria deaths in the zone. Report shows case fatality rate was low for all five years. This is may be early diagnosis and treatment or under report of deaths. So it needs farther investigation and study in the future.

HMIS reports and with other data from the micro-plan and PHEM indicates that more than 80% of the outpatient and inpatient malaria burden in Ethiopia is among adults and children who are at least five years of age [4]. Similarly, our finding show that, about 82% of outpatient and 92% of inpatient malaria burden is among adults and children who are at least Five year of age. In this study among total 1,169,893, reported outpatient cases 46,502 admissions and 1462 deaths, malaria accounted for 121,817(10.4%) morbidity 1,326(2.9%) admission, but malaria deaths were not listed among the ten top cause of inpatient mortality in all age group.

In Ethiopia, the major transmission of malaria follows the June to September rains and occurs between Septembers to December, while the minor transmission season occurs between Februarys to March rains [20]. Study conducted in Ethiopia and WHO Africa region report support show that high malaria Prevalence above normal is observed from September to December with peak during month of October and in which many rural communities of Africa, epidemics occur during planting and harvesting seasons when the demand for labour is greatest [16, 27]. Consistently our finding show that peak malaria case between Septembers to December in all respective five year of study period and pick during the October within the zone followed by the rainy season from May to July. Our find result supported by the fact Peak malaria transmission occurs between September and December in most parts of Ethiopia and malaria transmission coincides with the planting and harvesting season [7,30]. Therefore, it needs to scale up of malaria prevention and control intervention during the following period. Similarly, our result show that, a significant decrements of malaria cases during August in all respective five years. This may be due to the flash out of the mosquito larva and adults resulted from over flow the awash river due to high grade of rainfall during the August and decreases the report from the health facilities specially from health post those are near by the Awash river. This finding consistent with the study conducted in Butajira area, south central Ethiopia show that Prevalence of malaria was higher after the main rainy season, both in lower lying and in highland areas (24).

Among total 1,169,893 outpatient cases, malaria accounted for 121,817(10.4%) morbidity 1,326(2.9%) admission. The finding was similar with study done in oromia region 2004 in which among total number of outpatients registered 11.7% accounted for malaria [12]. And also lower than the study report conducted in the region 2009; found to be malaria accounts 17% outpatient visit 15% admission and 25% hospital deaths [32]. The deference may be due to study period.

MIS survey was conducted in Ethiopia in late 2015 results show sustained LLIN ownership, although still below set targets and continued low prevalence of malaria [4]. The trends in malaria morbidity show the effects of improved prevention and control efforts [9]. Similarly, our result show that, tremendous decrement of malaria cases followed by the increment of ITN coverage, in which of 67% in 2013 and 78% in 2017 in the zone. This may show the effectiveness of malaria prevention and control in the zone.

Total average five-year zonal report completeness and timeliness were 92% and 90% respectively. Examining reporting rates by woreda over time shows, some important differences between them. About 55% of Woredas achieved greater than 90%, but 45% of woreda reported lower than total five-year Zonal average report completeness. Average report completeness among woreda ranges from the least 88% of sodo Dachi woreda and the top 100% of Goro woreda. Majority of the woredas achieved more than national target set for report completeness and timeliness, by which 90% at all level. This study was concise with PHEM reporting completeness which is around 91.5% as of May 2016, and HMIS completeness was 85-95% in 2014/15 [17].

2.1.7 Limitation of the study

- The existing routine report format misses most of the variables of interest of study particularly PHEM doesn't consider variables such as Age, Sex to determine and analyze other socio demographic characteristics of the clients.
- Data inconsistency even in HMIS between Service delivery report and OPD disease repot.
- Lack of five-year data in related to malaria prevention and controls other than ITNs coverageby woreda in the zone

2.1.8 Conclusion

- The zone was in line with achieving the high level National Strategic Plan goals and targets; by which to reduce malaria cases by 75 percent from 2013 levels.
- Malaria prevalence was decreasing significantly until 2017; it decreased by 80.5% when compared to the 2013 base line data this shows strengthen of the prevention and curative program in the zone.
- There were data discrepancy between deferent data sources (PHEM and HMIS) in the zone during all respective five years (2013-2017).
- HMIS monthly report shown relatively high malaria prevalence in the zone when compared with PHEM weekly report.
- Proportion of malaria cases found to be high among young and male populations.
- Burden of malaria cases was still high among three Woredas (Woliso, Goro, and Becho).
- Shifting in the proportion of plasmodium Species was observed (P. vixax becoming a dominant) since 2015.
- Peak malaria case was cases between Septembers to November months in all respective five year of study period followed by from May to July.

2.1.9 Recommendation

It is recommended to South West Shoa Health Department, ORHB and other responsible bodies.

- HMIS and PHEM should be harmonized at all reporting level in order to generating reliable and quality data would help in reflecting the magnitude of the disease burdening the health service
- like HMIS current PHEM reporting format should incorporate the most important variables mainly age, which is a powerful, no modifiable biological determinant for the risk of many health events; sex and place which helps for better data analysis and to take actions.
- Prevention and control measures, should be strengthen against the high malaria prevalence woredas (i.e Woliso, Goro, and Dawo). Which need to be strategic malaria prevention and control effort to achieve target sated by FMOH to eliminate malaria from Ethiopia by 2030.
- LLITN distribution and due attention for high malaria endemic area (i.e Woliso, Goro, and Dawo) need to achieve the target set for malaria prevention strategic plan 2015-2020 (proportion of households in malarious areas own at least one LLITN to be >90%).
- Even though, the malaria transmission is peak September to November and may to June 14; it needs to scale up of malaria prevention and control interventions prior to the respective period.
- Further study on plasmodium species distribution at monthly and weekly base to see the seasonal pattern.

2.1.10 Acknowledgement

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3 Chapter –III Evaluation of Surveillance System

3.1 Public Health Surveillance System Evaluation in Bale Zone, Oromia Region, February 2019.

3.1.1 Abstract

Background: A functional disease surveillance system is essential for defining problems and taking action. in Ethiopia measles case-based surveillance was initiated in 2003, as a critical component of measles control and elimination efforts and is used in the assessment of progress and in making adjustments to programmes as required. periodical evaluating public health surveillance systems is used to ensure monitoring the best use of data collection resources and assures that systems operate effectively. thus, the aim of this study is to determine how surveillance system operate against stated purpose and provide, specific recommendation towards improving surveillance.

Methods: Cross sectional Descriptive evaluative study was conducted from Feb 01 to 18, 2019 in Bale zone. Total forty-three (n=43): One Zone, Six Woredas, Eleven Health centers, One Generral hospital and 24 Health posts were included by purposive sampling technique by considering their achievement in surveillance system and burden of disease in the area during the assessement period. Data was collected by primary investigator, by using structured interviewer administered questionnaires adopted from WHO standard questionnaires guidelines which serve for surveillance system evaluations. Data was analyzed by Microsoft Office excel and word 2016.

Result: Time spent to operating report system is less than 15 minute at all level. 50% of woreda and including zone are faced shortage of medical drugs and supplies for emergency management. Only 33% of HF's had RRT for epidemics and all visited woreda and health facilities have a capacity to collect and transport blood sample for measles for virological test but, all the visited sites fail to analysis weekly surveillance data. Majority (83%) visited woredas achieve the stated target for surveillance by investigated with blood specimen at least two case of measles per 100,000 per year. Both timeliness and completeness at zone and majority4/6 (66%) of woredas above the target (80%). But regarding to response timely, the system was no meet the standard investigated within 48 hours, PVP found to be good (95%); this show that the sensitivity and specificity of measles surveillance case definition. Only 10(6%) Private health facilities involved in public health surveillance system chain in the Zone. The system in place found to be simple, flexible and stable in operating well without interruption. Surveillance system found to be helpful in case detection

and confirmation but, the objectives of surveillance system in the place were not meet (surveillance for action) and found to be not useful (suffered by poor in practicing of data analysis and early response activities) and low in representativeness and acceptable, due to late feedback from higher level or not supported by early initiation of public health action to the outbreak and we identify poor practice in documentation, data analysis, supervision, communication among supportive activities of surveillance.

Conclussion and Recommendation: A low or non-involvement of private health facilities, poor epidemic preparedness and lack allocated PHEM lined budget are a major gap that need to improve and important part of measles control and elimination program in the zone. We recommend that timely and adequate distribution of PHEM guideline and report format, conducting PHEM specific supportive supervision, analyze weekly surveillance data, provide continuous feedback and use surveillance data for action, improve data quality, involve all private health facilities in surveillance chanel and need to widen the surveillance chain among private health facilities, surveillance data management should be upgraded to electronic at all level, allocating PHEM lined budget at all level and gap feeling training needed.

3.1.2 Introduction

Disease surveillance is a critical component in the control and elimination of vaccine preventable diseases and the process of gathering, analyzing, and dissemination of information for the purpose of proper planning, implementation, and evaluation of health services/interventions. A functional disease surveillance system is essential for defining problems and taking action. Proper understanding and use of this essential epidemiological tool (public health surveillance) helps health workers at the woreda and health units to set priorities, plan interventions, mobilize and allocate resources, detect epidemics early, initiate prompt response to epidemics, and evaluate and monitor health interventions; it also helps to assess long term disease trends and also Surveillance data allow the description and comparison of patterns of disease by person, place, and time (1–3). Morbidity and mortality reports are common sources of surveillance data for local health departments. These reports generally submitted by health-care providers, infection control practitioners, or laboratories that are required to notify the health department of any patient with a reportable disease. Surveillance data are used both to determine the need for public health action and to assess the effectiveness of programs (4,5).

PHEM encompasses reporting of morbidity and mortality data from health posts, health centers and hospitals. It is a unique reporting system intended to improve the surveillance and control of 22 diseases which are either epidemic prone, targeted for eradication or of public health importance, including measles which is one of the weekly reportable diseases. The advantage of this system is that it is a simple direct channel reported weekly and there are a clear guidelines and specific targets for timeliness and completeness of reporting (6). Public health surveillance is the cornerstone of public health practice and a tool to estimate the health status and behavior of the populations served by government organization and donors. Because surveillance can directly measure what is going on in the population, it is useful both for measuring the need for interventions and for directly measuring the effects of interventions (7,8)

The FMOH of Ethiopia identified 22 top priority diseases which are epidemic prone, of international concern and diseases on eradication and elimination programs for surveillance activities. These diseases are monitored by a designated body through available means of communication- telephone, paper based reporting etc. These diseases are set to be reported as mandatory notifications which are immediately reportable diseases and routine surveillance which are to be reported weekly. It is clear that surveillance could not be carried out for all diseases and conditions. Therefore, priority should be given to those diseases that are of interest at national and international levels. In Ethiopia 22 diseases (15 are immediately reportable whereas 7 are weekly reportable) are selected to be included into the routine surveillance. Diseases which have high epidemic potential (anthrax, avian human influenza, cholera, measles, meningococcal meningitis, pandemic influenza, smallpox, severe acute respiratory syndrome (SARS), viral hemorrhagic fever (VHF), and yellow fever),Required internationally under IHR2005 (smallpox, poliomyelitis due to wild-type poliovirus, human influenza caused by a new subtype, SARS), Diseases targeted for eradication or elimination (poliomyelitis due to wild-type poliovirus, dracunculiasis, neonatal tetanus (NNT), Diseases which have a significant public health importance (rabies, dysentery, malaria, relapsing fever, typhoid fever, typhus and severe malnutrition); Diseases that have available effective control and prevention measures for addressing the public health problem they pose (1).

Measles is acute illness caused by a virus of the genus Morbillivirus and a highly infectious disease that causes mortality in both developing and industrialized countries and that transmitted in the air, in respiratory droplets, or by direct contact with the nasal and throat secretions of infected persons and after an incubation period that usually lasts for 10-12 days but ranges from 7 to 18 days, prodromal symptoms of fever, malaise, cough, coryza (runny nose) and conjunctivitis and it cause of preventable childhood morbidity and mortality (3,9,10). WHO recommends measles vaccination at 9 months of age in countries at the mortality reduction stage and vaccine provides lifelong immunity in most people. Epidemiological surveillance of measles is a major public health strategy in prevention and control of disease (11). Since the measles case-based surveillance was initiated in 2003 in Ethiopia; is a critical component of measles control and elimination efforts and is used in the assessment of progress and in making adjustments to programmes as required (12). Reports of suspected measles cases should be investigated by local and Regional state health departments(13,14). Purpose of Measles disease surveillance are; to describing the characteristics of measles cases in order to understand the reasons for the occurrence of the disease and develop appropriate control measures, predicting potential outbreaks and implementing vaccination strategies in order to prevent outbreaks, monitoring progress towards achieving disease control and elimination goals and providing evidence that, in area with low measles incidence, the absence of reported cases is attributable to the absence of disease rather than to inadequate detection and reporting. It also, should; provide the information needed to direct the vaccination system; avoid collecting unnecessary information; be sustainable, allow decisions and responses to be made at the most peripheral level and be part of an integrated disease surveillance system (10). The purpose of evaluating public health surveillance systems is to ensure that problems of public health importance are being monitored efficiently and effectively. Public health surveillance systems should be evaluated periodically, and the evaluation should include recommendations for improving quality, efficiency, and usefulness.

The evaluation of a surveillance system promotes the best use of data collection resources and assures that systems operate effectively. Surveillance system evaluation allows us to define whether a specific system is useful for a particular public health initiative and is achieving the overarching goals of the public health program and the data collection objectives. Because surveillance systems vary widely in methodology, scope, and objectives, characteristics that are important to one system may be less important to another. Efforts to improve certain attributes--such as the ability of a system to detect a health event (sensitivity) may detract from other attributes, such as simplicity or timeliness (4).

Following the implementation of the new structure for surveillance system (PHEM) in the sector, the change in the quality of information need to be assessed particularly for diseases which exert high public health stress. Measles, is one of such diseases which can be impacted for the better or worse by the change in the structure.

Therefore, this study will be conducted to evaluate public health surveillance systems in Bale zone of Oromia region, to determine how surveillance system operate to meet the stated purpose and goal and to provide specific recommendation towards identify areas for improvement to improving surveillance quality and usefulness. This study will trigger development action plan for all public health workers at each level and findings of this study will improve the overall surveillance documentations.

Rationale of the study

Measles is the commonest vaccine preventable diseases has been one of the major causes of death and sickness of children in Ethiopia and by which, mothers recognized as a self-limiting common childhood illness of which no medical care is often sought (15). The Africa Region as well as Ethiopia is working towards measles elimination by 2020 (as indicated in Resolution AFR/RC61/WP/1 (11). Although, Public health informatics concerns for public health surveillance systems can be addressed in the evidence gathered regarding the performance of the system. Evidence of the system's performance must be viewed as credible. For example, the gathered evidence must be reliable, valid, and informative for its intended use. Several organizations or institutions have developed their own approaches for conducting evaluations of surveillance systems, and for providing relevant recommendations. Case-based measles surveillance was initiated in Ethiopia in 2003. All surveillance activities should be evaluated periodically to ensure that problems of public health importance are being monitored efficiently, effectively assessment efforts must be intentional and prioritized to address the highest priority problems and problems most amenable to intervention (3,16,17). Case-based measles surveillance is one of strategies for sustained measles morbidity and mortality reduction adopted by Ethiopia to control and ultimately to eliminate measles by 2020 (18). Measles is the major diseases of the Bale zone with high frequency of epidemic and public health concern. Surveillance system evaluation was not done previously; and the recent strength and weakness of surveillance system in the zone is not known. Also according to zonal report; there is relatively poor data consistency among different reporting levels and delay in detection (reporting system) during the last six months. Use of the collected data at the local level as evidence for public health decision making is not well known; the result will have used to trigger actions implementation in all health facilities within the zone to improve the gaps and used to maximize the systems usefulness to achieve the simplest, least expensive system that meets the objectives. We select Measles diseases surveillance activity among under diseases surveillance based on epidemiologically sound criteria. Measles surveillance used to provide evidence that, in area with low measles incidence, the absence of reported cases is attributable to the absence of disease rather than to inadequate detection and reporting. Measles remains major public health concern in the region specifically in Bale zone. Even though, the routine and supplementary immunization activities were undergoing in the place measles outbreaks continuing in Oromia regions (12). During last six months of 2011 Oromia region reported 655 suspected measles cases and 4 deaths (1.3% CFR). Among total reported cases 568(86.7%) suspected measles cases and all or four deaths were reported from Bale zone of 11 woredas. Therefore, we assess the capacity for core functions and support functions of measles surveillance and response at each level of the health care system in the zone (Health post to Zone) to draw possible recommendation based on this evaluation.

3.1.3 Objectives

General objective

- To Assess the level of performance of Measles surveillance supportive functions and attributes in filling the sated standard criteria by National and World Health organization in Bale zone, Oromia Region, Feb 01-18 2019

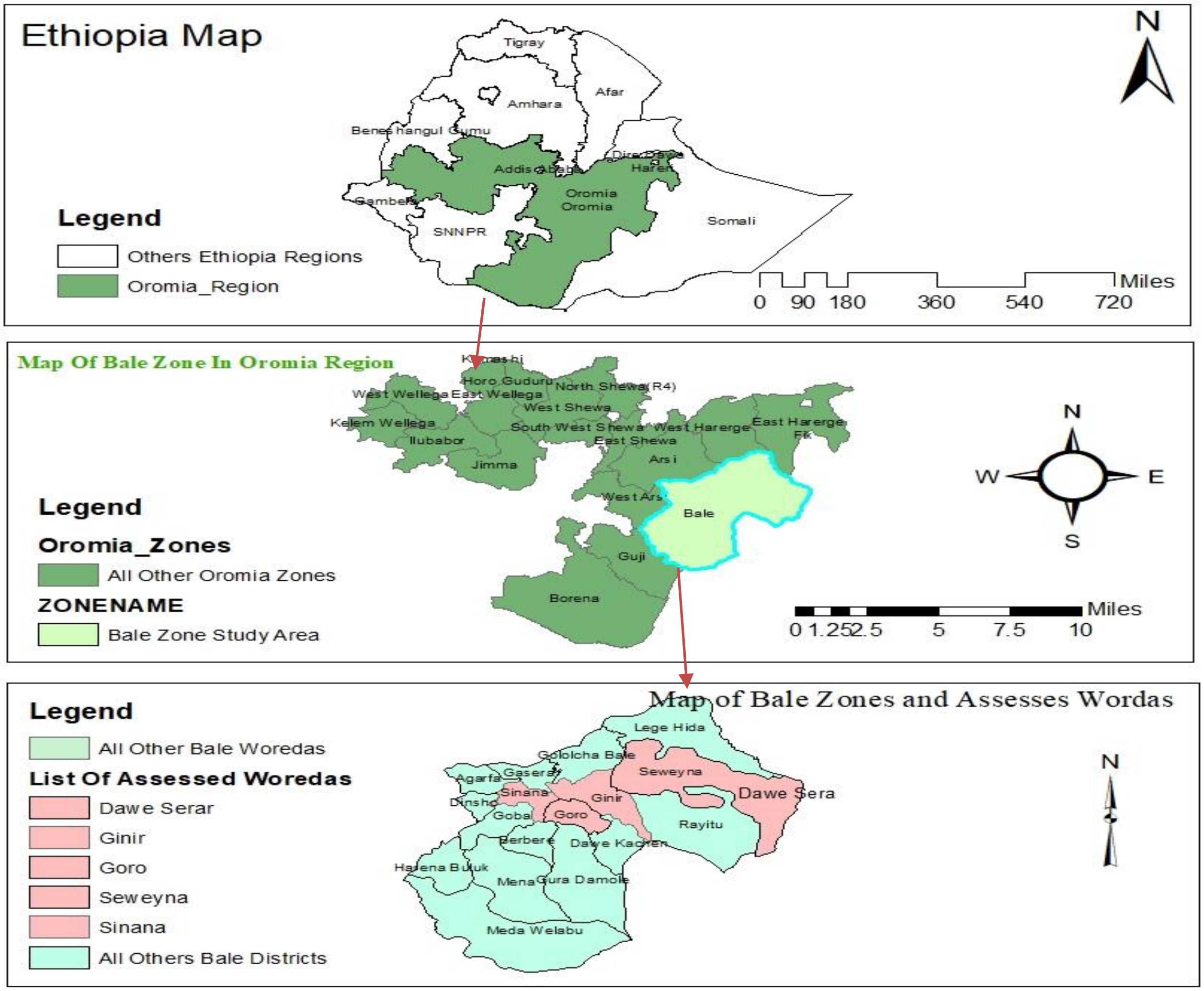
Specific objectives

- To describe core surveillance systems performance in the study area such as, case detection, reporting, analysis and response.
- To assess the availabilities supportive activities of surveillance system such as, supervision, staff training, information feedback, logistics and budget support
- To describe key attributes of surveillance system of the selected diseases (e.g. Usefulness, Simplicity, PVP, representativeness etc).
- To draw possible recommendations for further improvement on quality of surveillance system.

3.1.4 Methods

Study area and populations

The surveillance system was conducted in Oromia Region, Bale zone. The regional health Bureau prioritized this Zone according to high incidence of measles disease and for its relative low performance of surveillance activities in 2018 report. Bale zone found at south part of the country at 450 KM Addis Ababa capital city of the country, Ethiopia. The zone consists of 20 Woredas with a total population estimated to be 1,893,152 (Forecasted census 2007). During the period Bale is bordered on the south by the Genale River which separates it from Guji, on the west by the West Arsi Zone on the north by Arsi, on the northeast by the Shebelle River which separates it from West Hararghe and East Hararghe, and on the east by the Somalia Region. It shares about 17.5% of total area of Oromia Region with an area of 43,690.56 square kilometers. It has 18 Woredas, 2 Urban administrative centers, 361 rural kebeles and 24 urban kebeles. Its health facilities include 5 hospitals, 88 health centers with 392 Health posts. Bale Zone is one and known area in which different outbreaks were occurred repeatedly in Oromiya Region. Namely, Measles, Acute Watery Diarrhea and Scabies outbreaks, were occurred in the zone during the past 3 years. Measles is the most recent outbreak in the zone and brought social, economic and public health problems.



Map 3.1-1: Administrative Map of Oromia Region, Bale Zone showing the Assessed Woredas, February 2019

Study period

The evaluation was carried out from Feb 01 -18, 2019 in Bale zone, Oromiya Region.

Study Subject

The study subjects were the Zonal Health Department, Woreda Health Office and Health Facilities (Hospital, health centers and health posts); which was engaged in measles surveillance system in Bale zone. Surveillance system at zonal level was evaluated in detail. Purposively selected Woredas were covered 30% of the total Woredas of the zone.

Table 3.1-1: List of visited site (Woreda to Health Post) in Bale Zone, Oromia Region, 2019.

Name of Visited Woreda	Name of visited Health Facilities Health Center & Hospital)
Ginir.Woreda	Arda Tare Health Center
	Kara Magane Health Center
Ginir.Town	Ginir Town Health Center
	Ginir Hospital
Goro woreda	Goro Health Center
	Maliyu Health Center
Dawe Sarar Woreda	Hantute Health Center
	Bultu Health Center
Saweena Woreda	Arda galma Health Center
	Micha Health Center
Sinanaa Woreda	Salqaa HC
	Awushoo HC

Study design

Cross sectional Descriptive evaluative study was used in Bale zone. The evaluation was conducted as per the updated guidelines for evaluating public health surveillance systems, published by the Center for Disease Control and Prevention. Secondary and primary Data on attributes of the surveillance system like; (usefulness of the surveillance system, simplicity of the system, flexibility, quality of the data, acceptability, representativeness, timeliness, and stability of the surveillance system) at different level was collected during the assessment.

Sample Size and Sampling procedure

We conducted the assessment in Bale Zone PHEM department, Six Woreda Health office, one hospital, Eleven health centers and 24 health posts. As long as the Regional Health Bureaus prioritized this zone based on relatively low performing of reporting among all zones and high measles outbreak reported Six Woredas were selected by purposive sampling method by considering burden of disease in the area and their involvement in measles surveillance system during last six months. In addition, eleven health centers, One Hospital and Twenty-four health posts were also selected purposively by considering previous surveillance performances, population density and burden of disease during the period of last 6 months. Disease under surveillance was selected based on the public health importance of the study area (Presence of Outbreak and high transmission) and the study area was not evaluated for these diseases previously. Finally, a total of 43 sites were assessed.

Data collection instrument and technique

We have collected Primary data through face to face interview of surveillance focal persons and personal observations of documents for some practical tools for surveillance and secondary data review, was also conducted in all visited sites by using semi structured cheek list adapted from WHO standard questionnaires which serve for surveillance system evaluations (19). Data was collected by the principal investigator: We used different data sources such as; Semi-annual reports of the Zone and Woredas, Public Health Emergency Management Guidelines and recorded data of outpatient registers and laboratory registers (case based measles lab results).

Data analysis tools

Data was entered and analyzed by using the Microsoft Office Excel, Word 2016.

Data quality control

Collected data was cross-checked at different levels (i.e. Zone health department, Woredas health offices and Health facilities) with each other; before summarizing for its consistency.

Data confidentiality

A formal supportive letter was obtained from Oromia regional Health Bureau and provided for Bale zone, woreda health offices and health facilities for their participation on this Evaluation. confidentiality of the information was mentained.

Dissemination of finding

Written report of both hard and soft copies were prepared and shared to Addis Ababa University/School of Public Health, Oromia Regional Health Bureau PHEM directorate, Bale Zone Health department and Ethiopia Field Epidemiology Training Program mentors, resident advisors and coordinator.

Operational definitions

Simplicity: The simplicity of a public health surveillance system refers to both its structure and ease of operation as a surveillance system (Rating of the simplicity of the surveillance system by implementers and users of the system).

Flexibility: Is the ability of the system to adapt to changing needs such as incorporating of a new disease, leave out less important diseases, change reporting frequency, change or modify data source, the collection of additional data, and change in case definition on capacity of the system to cope with the emergence of a new strain, change of disease severity, new legislation, availability of new technology, inclusion of additional diseases or outcomes, changes in case definitions) (20).

Data quality: Is the completeness and validity of the data recorded in the public health surveillance system (weekly and line listed report).

Acceptability: Is a reflection of the willingness of surveillance staff to implement the system, and the end users of the data to accept and use the data generated by the system. Acceptability is linked to completeness of report forms and timeliness of data reporting (20).

Sensitivity: Sensitivity is the capacity of the system to detect the highest proportion of true cases (Sensitivity of the surveillance case definition refers to the ability of the case definition to correctly classify cases to which it is applied).

Predictive value positive: The PVP was defined as the proportion of measles case-patients identified by case based surveillance, who also had a positive measles serological result (IgM +). It was computed by dividing the number of measles case-patients with serum positivity of measles IgM, by the total number of suspected measles case-patients' blood sample taken and sent to regional laboratory for confirmation. (The PPV reflects the probability that a case reported in the surveillance system is indeed a real case).

Representativeness: Is the ability of the system to accurately describe the occurrence of a health related event by place and person over time in a given population.

Specificity: Refers to the proportion of persons without the disease that are considered by the surveillance system as not having the disease. Specificity does not apply to case-based surveillance systems. however, can be applied to event-based surveillance,

Reliability: Is the degree to which the results obtained by a measurement/procedure can be replicated.

Timeliness: Is the ability of the system to trigger appropriate action in time and proportion of surveillance units that submitted surveillance reports (weekly) and/or according to a predefined schedule.

Stability: Refers to the reliability (i.e., the ability to collect, manage, and provide data properly without failure and availability of the ability to be operational when it is needed) of the public health surveillance system.

Usefulness: Refers to the relevance of the system in terms of feeding information for action. A public health surveillance system is useful if it contributes to the prevention and control of adverse health-related events, Usefulness might be affected by all the attributes of a public health surveillance system and data from a surveillance system can be useful in contributing to performance measures (21).

Completeness: Proportion of all expected data reports that were submitted to public health surveillance.

Case-based measles surveillance: One of the four important strategies to quickly identify cases and respond to suspect outbreaks involves case-based measles surveillance. In this system, each case is reported using an individual case-report form, and a blood specimen is obtained to test for measles immunoglobulin M (IgM). Measles case-based surveillance data is collected using the standard case based investigation form (18).

Case detection: Is the process of identifying cases and outbreaks. Percentage of cases recorded in a database with no missing required information (by disease, region, and surveillance unit).

Case registration: Is the process of recording the identified cases.

Case/outbreak confirmation: Refers to the epidemiological and laboratory capacity of public health surveillance for confirmation.

Reporting: Refers to the process by which surveillance data moves through the surveillance system from the point of data generation to higher level.

Epidemic preparedness: Refers to the existing level of preparedness for potential epidemics.

Stakeholders: The organizations or individuals that generate or use surveillance data for promotion of health, prevention and control of diseases.

Case definition: Is a set of criteria used to decide if a person has a particular disease, or if the case can be considered for reporting and investigation.

Standard case definition: Is a case definition that is agreed upon to be used by everyone within the country. Standard case definition can be classified as confirmed, probable, and possible or suspected

Public health emergency: An occurrence, or imminent threat, of an illness or health condition that poses a substantial risk of a significant number of human fatalities, injuries or permanent or long-term disability which can result from a wide range of hazards and complex emergencies like conflict.

Data source: Defined as a place where the initial information on the disease to be reported, collected and from which data are sent to public health authorities (to the higher level). **Populations under surveillance:** Can be defined as the general population or targeted groups and the targets can be based on risk groups.

Geographic coverage: Represents the geographic unit (Woreda, Zone, or any other pre-defined geographic area) where disease surveillance is conducted.

Passive Surveillance: Relies on the physicians, laboratory or hospital staff or other relevant sources to take the initiative to report data to the health departments.

Electronic based reporting system: Is a computerized system hosting medical records on diseases/health events.

Delay to notification: Indicate date of notification (to local health authorities) minus date of diagnosis (by the physician or the laboratory) or date of received from lower reporting level.

Overview of Public Health Emergency Management/ Surveillance:

PHEM is designed to ensure rapid detection of any public health threats, preparedness related to logistic and fund administration, and prompt response to and recovery from various public health emergencies, which range from recurrent epidemics, emerging infections, nutritional emergencies, chemical spills, and bioterrorism (14). It includes reporting of morbidity and mortality data from health posts, health centers and hospitals and others private health facilities. PHEM is a unique reporting system intended to improve the surveillance and control of 22 diseases which are either epidemic prone diseases (Cholera, Dysentery, Measles, Meningitis, Relapsing fever, Typhoid fever…) and diseases targeted for eradication or elimination and public health importance, including AFP, Neonatal tetanus, Dracunculiasis, and including malaria and measles those are one of the weekly and immediate reportable diseases (22). Cases are reported including clinical (outpatient and inpatient), confirmed (positive or negative test). The advantage of this system is that it is a simple direct channel reported weekly. Responsibility for the surveillance system is controlled by Ethiopian Public Health Institute (EPHI) as Public Health emergency management system. There are a clear guidelines and specific targets for timeliness and completeness of reporting (i.e minimum target 80%) and Specific number of diseases and conditions under surveillance (6).

Table 3.1-2: List of diseases/conditions currently under surveillance in Ethiopia

Immediately Reportable	Weekly Reportable
1. Acute Flaccid Paralysis	1. Dysentery
2. Anthrax	2. Malaria
3. Avian Human Influenza	3. Meningitis
4. Cholera	4. Relapsing fever
5. Dracunculiasis / Guinea worm	5. Typhoid fever
6. Measles	6. Typhus
7. Neonatal Tetanus	7. Malnutrition
8. Pandemic Influenza A (H1N1)	8. Scabies
9. Rabies	All the above +
10. Smallpox	
11. Severe Acute Respiratory Syndrome (SARS)	
12. Viral Hemorrhagic Fever (VHF)	
13. Yellow fever	
14. Maternal Death	
15. Prenatal Death	

PHEM system reporting and information flow follows the health system organization structure from the community to national and international agencies (See below figure). At community level, health development army at house hold level and Health extension workers (HEW) are responsible for case identification by using community level measles case definition and report to respective health centers. Health facility and woreda health office are responsible to transfer report for zonal health department within 30 minutes and investigate notified cases within 48 hours with blood sample for confirmation and implement prevention and control activities with integrated community participations. Each Woreda Health Office has a responsibility of overseeing health programmes and the Woreda PHEM focal person also has a responsibility to the process of collecting, documenting, analyzing and providing a feedback on surveillance reports for facilities and notifying or submission for the next level reporting. All and each facility, irrespective of ownership (public or private) are responsible for case identification and reporting (weekly and monthly) 23 notifiable health and health related condition.

Data flow: Data and information of surveillance flow is clearly stated in the system, which comprises from community level to international agencies. Tasks in surveillance system is starts from reporting the occurrence of health-related events and ends with feedback and dissemination of information for public health action (see below figure).

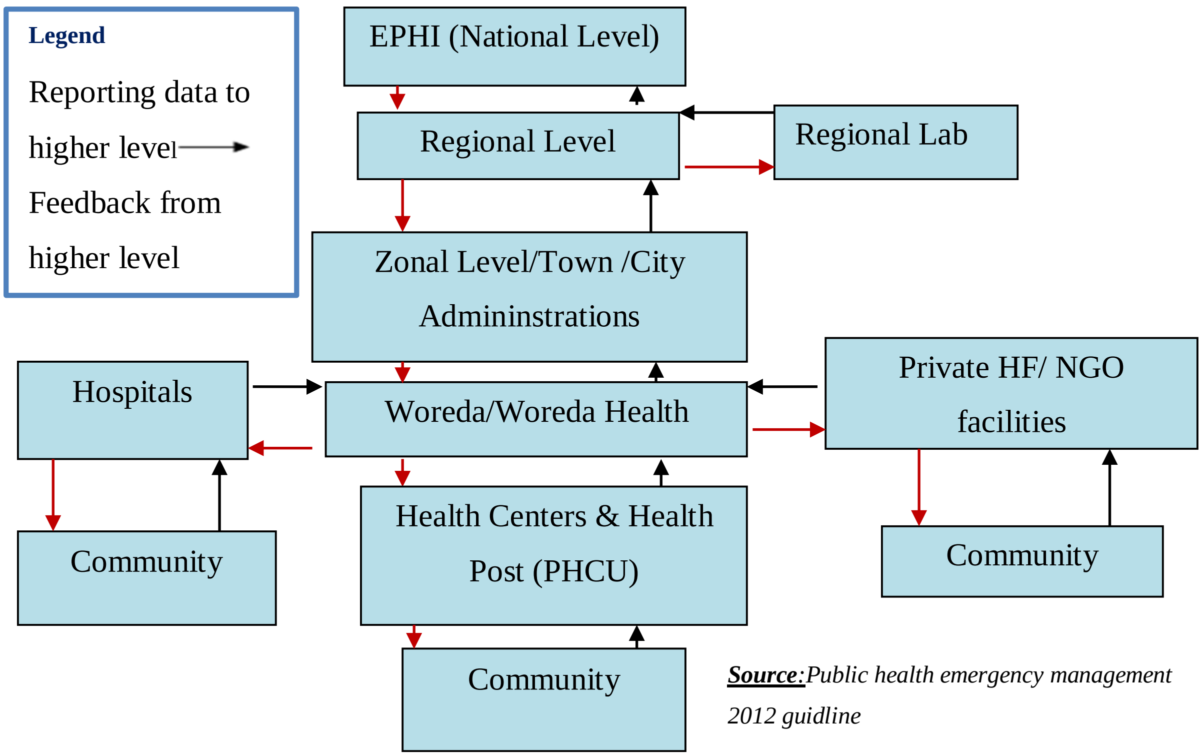


Figure 3.1-1: Diagram illustrating Ethiopia Public Health Surveillance System data flow chart Community to National and WHO level.

3.1.5 Result

Population under surveillance

Table 3.1-3: Shows population under surveillance, number of Hospitals, HCs and HPs Visited site of Bale zone, Oromia region, Ethiopia, February 2019.

Assessed Woreda/Zone	Total Population	Male	Female	Number of Hospital	Number of Health Center	Number H/ Post
Ginnir Woreda	164,702	83,998	80,704	1	8	32
Dawe Sarar	56,137	28,630	27,507	0	4	17
Goro	109,848	56,022	53,826	0	6	26
Sinana	154,170	78,627	75,543	0	4	24
Ginnir Town	25,865	13,191	12,674	0	1	2
Sawena	86,400	44,064	42,336	0	6	34
Bale Zone	1,893,152	965,508	927,644	5	88	392

A total of 43 Health unit (One Zonal Health Department, Six Woreda Health Office, 11 Health Centers, One General Hospital, and 24 Health posts were purposively selected and included in these study.

Description of selected diseases (Measles) in surveillance system evaluation

Measles is highly infectious the most infectious of all diseases transmitted through the respiratory route. Measles can be severe, particularly in immunosuppressed individuals and young infants. The most effective way to control measles is by achieving high uptake of two doses of measles, mumps, rubella (MMR) vaccine. High sustained coverage is key to achieving measles elimination defined by the World Health Organization (WHO) as the absence of endemic measles circulation for at least 12 months in a country with a high-quality surveillance system (23). However, measles vaccination coverage in Ethiopia reached >90% for the first dose by 2016. The outbreak has been occurred sporadically in the different part of the country like Oromia region. The published and unpublished researches document show that; poor cold chain system management, low vaccine potency and not being vaccinate in vaccination status are major contributors for the recurrence of measles outbreaks in the region. Therefore, good epidemiological and virological surveillance becomes an increasingly important element of measles control by establishing the source of sporadic cases.

During last six months of 2011 EFY, 5 Zones and 19 woredas were affected by measles outbreak and total 656, measles cases and 4, deaths were reported to Oromia Region. Among total reported to the region, 568(86.7%) measles cases and 4(100%) of deaths were reported from Bale zone.

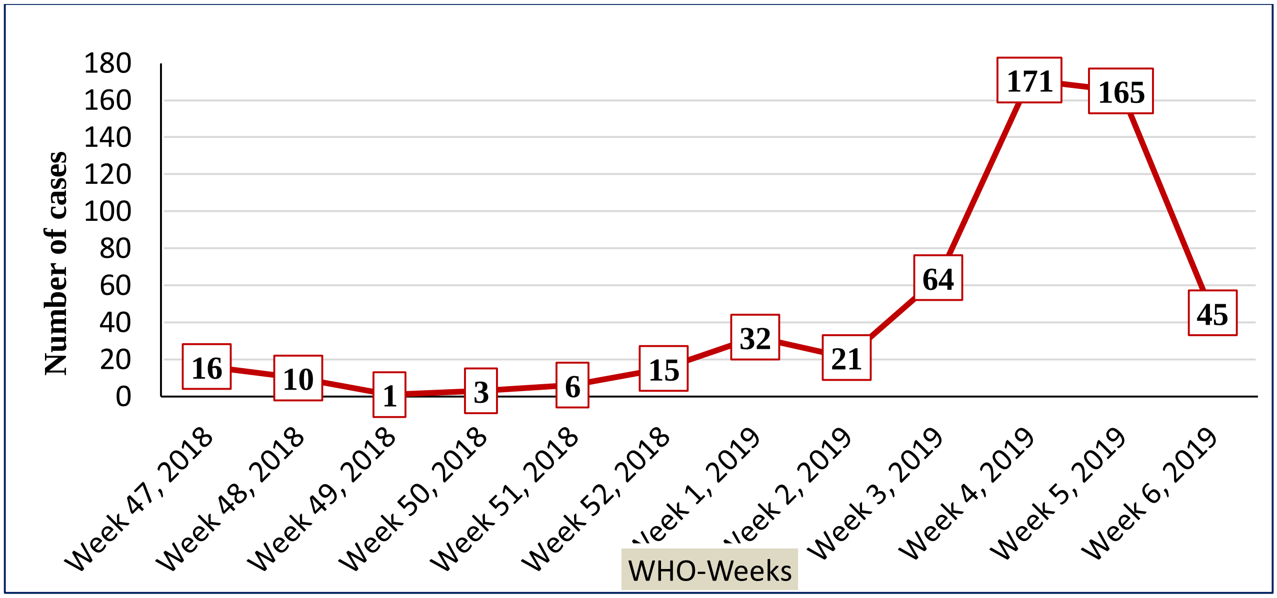


Figure 3.1-2: Weekly Measles cases trend in Bale Zone by Date seen at health facility, WHO Week 47, 2018 to 6, 2019, Oromia Region, Ethiopia.

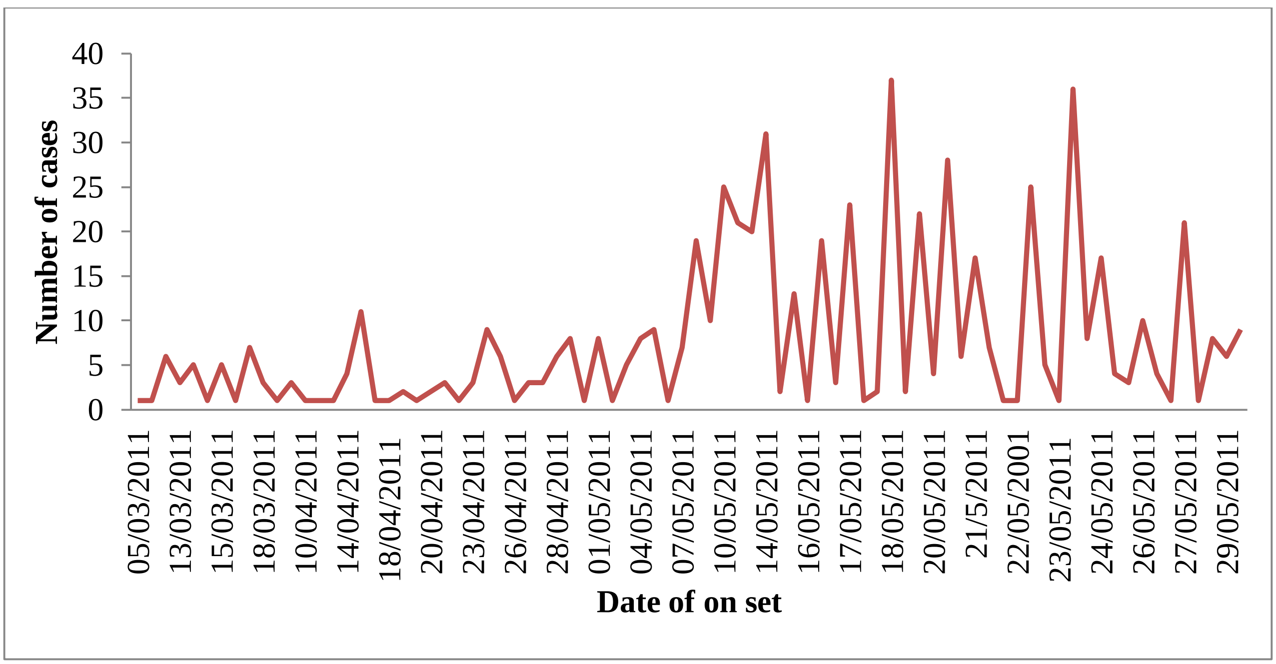


Figure 3.1-3: Trend of ongoing measles outbreak Bale zone, Oromia Region, February 2019

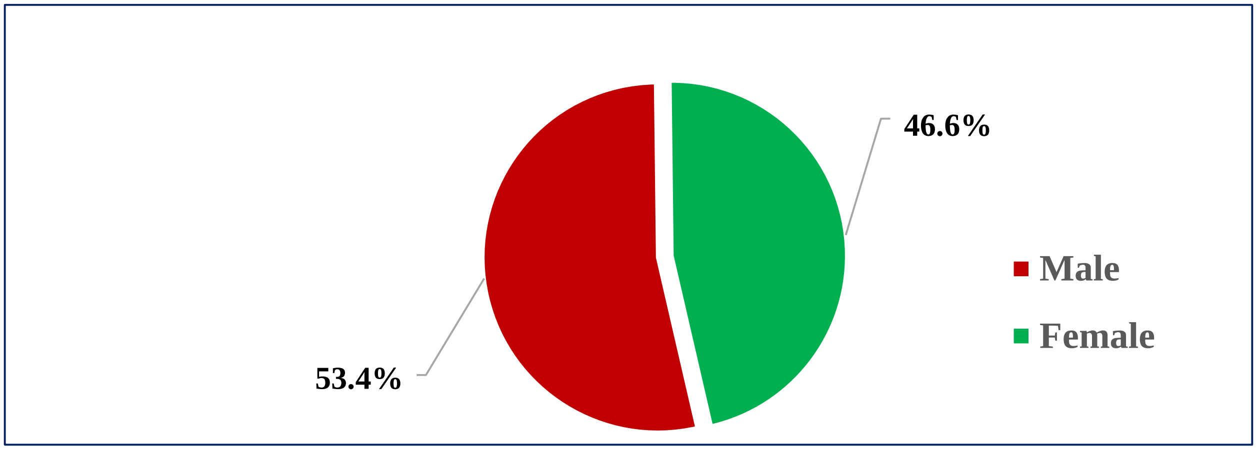


Figure 3.1-4: Proportion of Measles cases by sex categories Bale Zone Oromia Region 2011 EFY

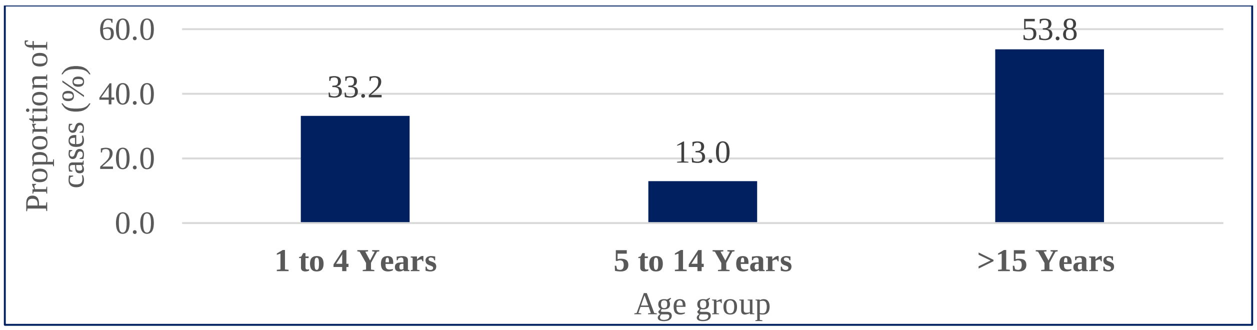


Figure 3.1-5: Proportion of Measles Cases by Age Group, Bale Zone Oromiya Region, 2011 Six Months EFY.

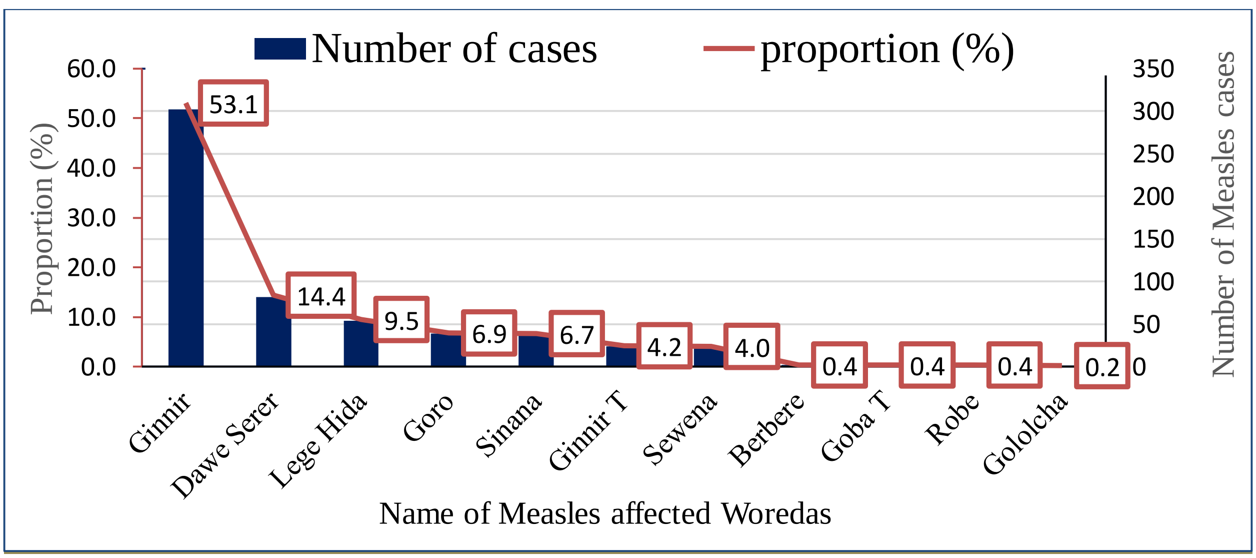


Figure 3.1-6: Proportion of Measles cases among affected Woredas of Bale Zone Six month 2011 EFY.

Table 3.1-4: Measles Outbreak Attack Rate by Woredas, WHO week 28-52 2018/19 G.C, Bale Zone Six Months of 2011 EFY.

Zone Name	Affected Woreda	Total Population	Total Cases	AR/1000	Death	CFR	Status of the Outbreak
Bale	Ginnir	164,702	302	1.83	4	1.3	Active
	Dawe Sarar	56,137	82	1.46	0	0	Active
	Lega Hida	81,704	54	0.66	0	0	Active
	Goro	109,848	39	0.36	0	0	Active
	Sinana	154,170	38	0.25	0	0	Sporadic
	Ginnir Town	25,865	24	0.93	0	0	Active
	Sawena	86,400	23	0.27	0	0	Active
	Berbere	119,033	2	0.02	0	0	No Case
	Goba Town	48,435	2	0.04	0	0	No Case
	Gololcha	132,282	2	0.02	0	0	Active

Note: Status of outbreak 'Active' is show that during system evaluation period conducting

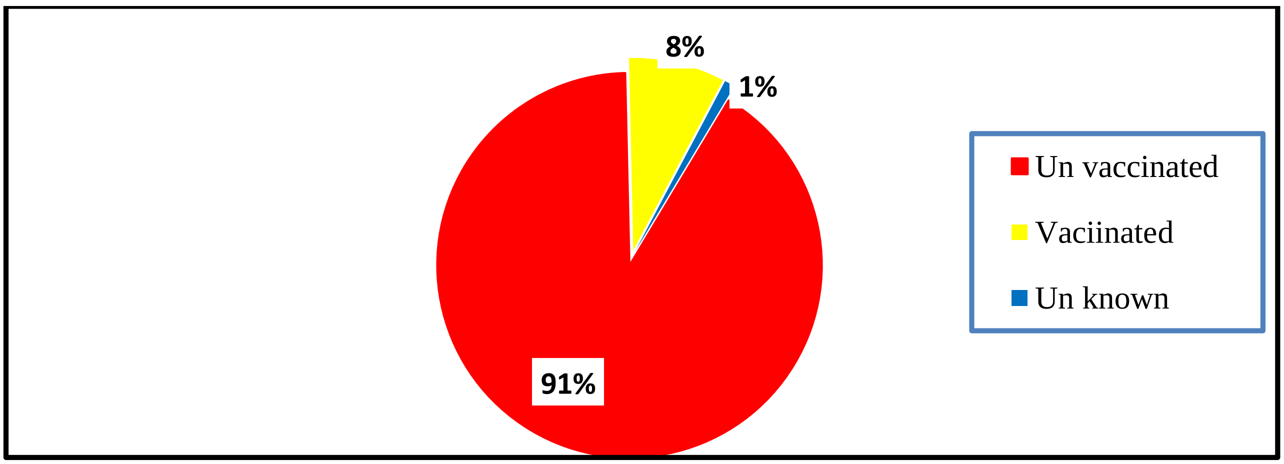


Figure 3.1-7: Proportion (%) of Measles Cases by Vaccination Status, Bale Zone Oromia Region six months of 2011 EFY.

Result on core and supportive surveillance activities

Availability of National PHEM Guideline or Manual

Public Health Emergency Management guideline is distributed for all zones of Oromiya region in 2013. Similarly, all zones had distributed this guideline for their respective Woredas and we found PHEM guideline in only 3 among visited Woredas of Bale zone. In addition, health centers and

Hospitals are supplied with PHEM guidelines but, 50% of health centers did not have National PHEM guideline during this assessment. In General, among all visited site (WorHO and Health facilities [n=19] only 10(52.6%) and 7(36.8%) of assessed woreda and Health facilities have National PHEM guideline and Measles Guideline respectively specifically. **(**see below Table)

Table 3.1-5: Proportion availability of National PHEM guidelines at assessed Health Institutions [n=19] Bale zone, Oromia Region, Feb-2019

Sr.No	Guideline	Zone & Woreda-level in Number (%) (n=7)		Health Facilities (HC & Hosp)-level in Number and % (n=12)	
		Yes N(%)	No N(%)	Yes N(%)	No N(%)
1	PHEM guidelines	4(57%)	3(43%)	6(50%)	6(50%)
2	AFP guidelines	3(43%)	4(57%)	5(42%)	7(58%)
3	NNT guidelines	2(29)	5(71%)	4(33%)	8(67%)
4	Measles Guidelines	1(14%)	6(86%)	5(42%)	7(58%)
5	Cholera guidelines	3(43%)	4(57%)	7(58%)	5(42%)
6	MPDSR guidelines	1(14%)	6(86%)	3(25%)	9(75%)
7	Meningitis guidelines	1(14%)	6(86%)	2(17%)	10(83%)
8	Malaria Guideline	3(43%)	4(57%)	2(17%)	10(83%)
9	Yellow fever guidelines	1(14%)	6(86%)	0(0%)	12(100%)
10	Scabies guidelines	1(14%)	6(86%)	5(42%)	7(58%)
11	Guinea worm guidelines	0(0%)	7(100%)	0(0%)	12(100%)
12	Malnutrition guidelines	6(86%)	1(14%)	10(83%)	2(17%)

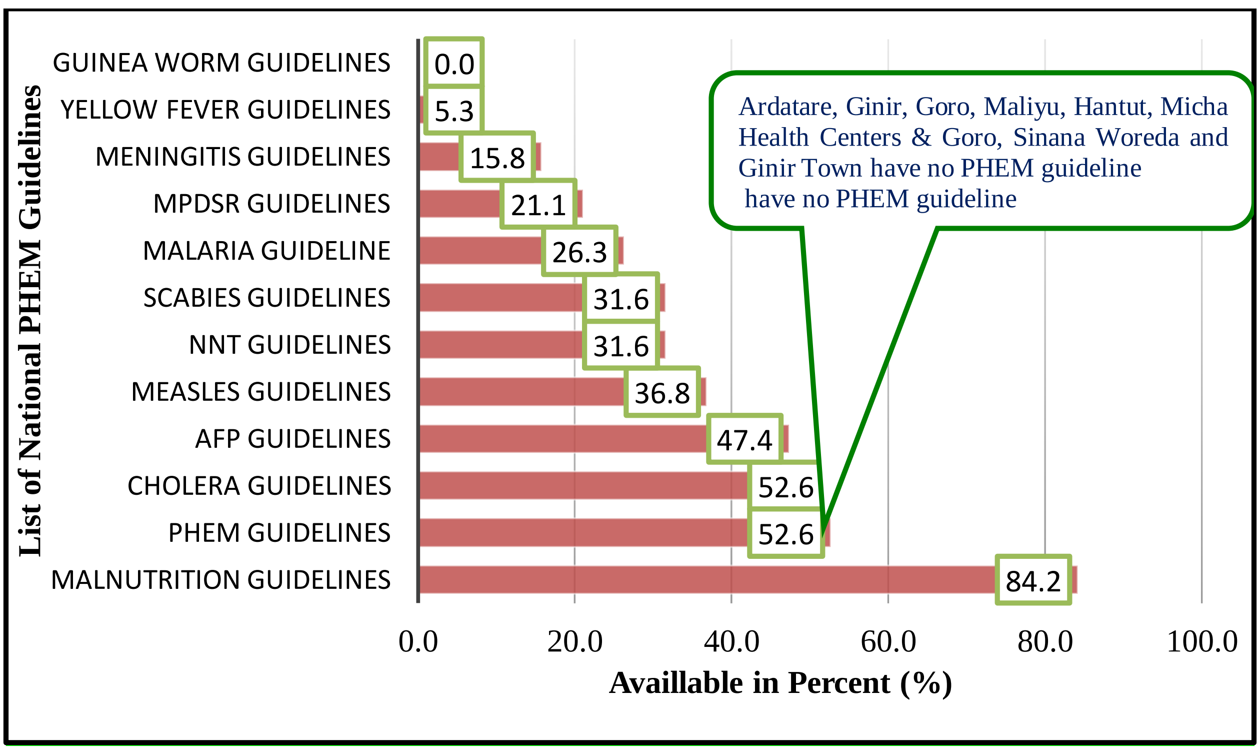


Figure 3.1-8: Proportion Visited sites With National PHEM guidelines [n=19] Bale zone, Oromia Region, February,2019

Case Detection, Registration and Case definitions availabilities

Standard case definitions for all prioritized diseases are available at Zonal, but among visited Woredas and health center in the zone only 4(57%) of Woreda health office and 6(50%) of Health centers and Health post have standard case definition of measles and 6(50%) health centers and Hospital and 13(54%) health posts, have a case definition for Malaria, AFP, NNT and AWD. these case definitions were posted on the wall. The understanding by health care providers on standard cases definitions was satisfactory, as they explaining us while we interviewing them at the time of the field visit. At visited health post, health extension workers were responded correctly on standard case definitions of some diseases such as measles and malaria. At all visited health facilities, there is clinical registration. But inappropriate handling and poor in registering cases were identified in 24(66%) Health facilities (Health centers and health posts); it has no consistency and standard format (standard surveillance forms). Only two (16.6%) of the assessed facilities has reported consistence data with their clinical register records to the next level during the evaluation of one-month period reports (four weekly reports) but the rest ten (83.4%) of health facilities clinical register record were not consistent with their reports even non registered cases were reported.

Case definition: There are two case definitions; standard case definitions and community case definitions used in National surveillance system (PHEM). A standard case definition (WHO) for both suspected and confirmed cases was used as tool for identifying measles cases and non-measles cases. This cases definition was used at all level including nongovernmental health facilities

Measles suspected cases at community level: Gifira or shifto in Afan Oromo and kufign in Afan Amara) was any person with rash and fever and/or having red eye and runny nose.

Community case Definition: Any person with Fever and rash used to assist communities & HEWs in notifying health facilities.

Suspected case : Any person with fever and maculopapular (non- vesicular) generalized rash & cough, coryza or conjunctivitis OR any person in whom a clinician suspects measles (14).

Probable case: Clinical illness in the absence of appropriate laboratory tests Or/and epidemiologic link to a laboratory confirmed case or in a person who has recently travelled to an area of known measles activities (24).

Confirmed case: A suspected case with evidence of laboratory confirmation of acute measles infection (i.e. measles IgM in blood or oral fluid (OF) in the absence of recent vaccination, or confirmed wild-type measles RNA in any clinical specimen) or epidemiological link to confirmed cases in an epidemic (14,23).

Table 3.1-6: List of visited Woreda, Health facilities Population under surveillance of Bale zone, Feb, 2019

Zone Name	Population under surveillance	Visited Woreda and Health facilities	Population under surveillance	Visited Health Facilities (HC & Hosp)	Population under surveillance
Bale	1,893,152	Ginnir Woreda	164,702	Arda Tare Health Center	21,174
				Kara Magane Health Center	27,730
		Dawe Sarar	56,137	Hantute Health Center	13,862
				Bultu Health Center	9,438
		Goro	109,848	Goro Health Center	13,256
				Maliyu Health Center	16,475
		Sinana	154,170	Salqaa Health Center	21,772
				Awushoo Health Center	36,646
		Ginnir Town	25,865	Ginir town Health Center	25,865
				Ginir Hospital	1,893,152
		Sawena	86,400	Arda galma Health Center	24,391
				Micha Health Center	20,595

Table 3.1-7: Measles case detection rate in visited Woreda of Bale zone, Oromiya Region, Feb,2019.

Woreda/ Zone Name	Total Population	Expected Notifiable Measles cases/100,000 pop	Reported suspected Measles Cases	Number (%)Measles Igm+ Cases	Measles Detection Rate from Expected
Sawena	86,400	2	5	3(60%)	>100
GinirWoreda	169,702	3	5	4(80%)	>100
Goro	109,848	2	5	4(80%)	>100
Dawe sarar	56,137	1	10	8 (80%)	>100
Ginir Town	25,865	1	20	20(100%)	>100
Sinana	154,170	3	0	NA	NA
Bale Zone	1,893,152	36	45	39(86.7)	>100

Data Reporting

Zonal Health department and Woreda Health office has provided report format those supplied by Oromia Regional health. During last six months, PHEM report format shortage was happened in 2(33%) woredas, 9(75%) and 18(75%) Health centers and Health posts respectively. However instead of solve their problem all woreda health office uses the format that generated and printed to hard copy from eHMIS reporting system. Bale Zonal Health department use e-mail to transfer report to the next level. But 5(83%) woredas and all visited health facilities using telephone to report weekly PHEM report for transfer to the next level. All the visited woreda used the same reporting formats. But among visited health facilities 30(83.3%) Health facilities not have copy of reported 3 last months in report. Due to this, there is no compiled data at health facilities level for further analysis and also; they don't use the standard report format for PHEM data backup. All 6/6(100%) Visited Woreda have Rumor Log book, but not properly used among 3(50%) woredas like; Ginir Town, Sawena and Dawe serar woreda health office.

Data Analysis

At zonal level, Measles data is analyzed weekly by person, place time during the epidemic period. But in all of the assessed woreda health offices and health facilities, there was no responsible person placed for data analysis except for Zonal health department However, at all level, PHEM and malaria focal persons are responsible for data analysis of selected priority diseases including measles. Moreover, malaria data is analyzed weekly by person place and time at all visited woredas, by using malaria epidemic monitoring chart; even if there are no high malaria cases in the woredas as well as in zonal health department. Regarding to other diseases, all visited woreda Respond that, data analysis is performed once per years when the zone call for review meeting and performance monitoring annually. This may be due to lack of awareness on the purpose of data analysis, low commitment and training (skill gap in using computer due to majority of the woreda health office PHEM focal person were assigned by longevity of service year in the area) and also resource shortage like computer and printer are major challenges in the area. Among 24 visited health posts, only 4(17%) of them are performing only trend analysis for malaria in weekly basis but, in other health posts, analysis of diseases was not done totally.

Presence of action threshold levels

Action threshold of all priority diseases were placed on national PHEM guideline. Therefore, action threshold for malaria AWD, AFP(Polio) and measles was well known and properly understand by Zonal and Woreda PHEM focal persons while they asked for the above diseases action threshold.

But among 36 Health professional facilities PHEM focal and or delegated persons about 16(44.4%) were not understand properly the action threshold for measles disease. This may be due to lack of PHEM national guideline in the health facilities and show that; poor utilization of surveillance manuals at health facility level. All the visited woredas and health facilities have an appropriate denominator (demographic data) (E.g. population by Kebele and under catchment health centers at woredas health office and gots at health post level. But not identified hard to reach groups population at all visited health facilities.

Outbreak investigation

During 2018/19, Measles, Malaria and scabies outbreak were reported from different zones of Oromia region. During last six months of EFY the major outbreak occurred in the region was measles which coved more than seven (7) Zones and 16 Woredas in the region. In Bale Zone Measles and scabies outbreaks were occurred during last six months. Measles outbreak were reported from 11 woredas of Bale zone (Ginir woreda, Ginir Town, Dawe serar, Saweena, Goro, Legahida, sinana, Berbere, Goba, Gololcha woreda) in the last six months and currently the outbreak was active in woredas like (Ginir, Ginir Town, and Goro) and all the outbreak were investigated by WorHO, ZHD, ORHB, and EPHI EFTEP residents.

At 2(33%) woredas the epidemic investigated within 48 hours of notification but in some woredas the trend of utilizing the data for action is poor like Ginir Woreda and Ginir Town due to communication gap between woreda and town health facilities and lack of early isolation in management of active cases, at Ginir Hospital. (i.e. Ginir Hospital identify four suspected measles cases in September 28/2018 those come from Ginir woreda kebeles, and notify for the next level (Ginir Town) during WHO week 40(October 08/2018) but no action (investigation and response activities) taken by Ginir Town; but after additional cases notified from Ginir woreda catchment health post the response activities started at January 01/2019 which is after three months of the hospital notification period. This show that the communication gap between woreda and Town health office including zonal health department however, both town and woreda health office area located in Ginir Woreda in geography. Due to above reason; the epidemic not responded within 48 hours of notification by 4(67%) of woreda as well as zonal health department.

Epidemic preparedness and response

There is written epidemic preparedness and response plan at zonal level. But, the zone experienced shortage of drugs vaccines, and supplies during recent epidemic like TTC, Viatmin A, Antibiotics

(Amoxicillin and ceftriaxone), Iv cannula, for measles and Permethrin 5% cream for scabies outbreak. This problem was mainly observed during epidemic of Measles in the zone. There was no written epidemic preparedness and response plan at all visited Woredas. But, there was a plan during outbreak happened, not in regular basis in 2(33%). In addition, 50% of woreda faced shortage of medical drugs and supplies for emergency management in during the past six months. Regarding existence and activities of epidemic management committee, there are established committee at zonal and 5/6(83%) visited Woredas. During this assessment, it was identified that established committee at these levels is not working regularly and not formulated with all required disciplines and meetings of epidemic management were activated during epidemic period only at Woreda level two (Goro and Sawena) never met after termination of Measles outbreak (Goro and Sawena Woreada) However, in the others woredas, the measles and scabies outbreak is active and they met regularly but, they not working regularly evaluate their activities during epidemic. In addition, there is epidemic rapid period response team at Zone and visited Woreda. But Among total visited Health facilities no RRT for epidemics. This resulted for a major challenge in response actives performed at health facilities level like contain the outbreak at local area and resulted for high prevalence of measles outbreak in the woredas and staying for long period of time in the Zone.

Table 3.1-8: Availability of Epidemic preparedness activities at Zone, Woreda and Health facility level, Bale zone, Oromiya Region, Feb, 2019

Preparedness activities	**ZHD [n=1]**	**WorHO [n=6]**	**HF (HC and Hosp) [n=12]**
Written emergency for epidemic preparedness and response plan for the outbreak	1(100%)	2(33%)	1(8.3%)
Availability of emergency stocks of drugs and supplies	1(100%)	3(50%)	0(0%)
Experienced shortage of drugs vaccines, and supplies during recent epidemic	1(100%)	3(50%)	12(100%)
Presence of budget line for epidemic response	1(100%)	0(0%)	0(0%)
Established epidemic management committee	1(100%)	5(83%)	0(0%)
Presence of rapid response team for epidemics	1(100%)	6(100%)	0(0%)
Epidemic response team evaluated their preparedness and response activities	1(100%)	0(0%)	0(0%)

Budget and material resources available for surveillance activities

There is budget line for epidemic response at zonal level but not at woreda level. However, they use from Woreda warning budget sources and supported by regional health bureau during epidemic. Due to lack of budget allocated for surveillance activities in the woreda early response to outbreak were delayed among all visited woredas and also there were lack of motivations among PHEM focal points for surveillance activities. Even though all visited Woredas had computers and its accessories, they did not have for PHEM activities separately rather they use it for all activities. Stationery is not enough at all woredas and health facilities. In addition, shortage of Personal Protective materials like Glove and mask was observed at some health facilities.

Table 3.1-9: Availability of resources for surveillance activities at Zone, Woreda and Health facility level, Bale zone, Oromiya Region, Feb, 2019.

Visited facilities	**Number /percent (%)**	**List of resources for surveillance activities**							
		Bicycles	**Motor cycles**	**Vehicles**	**Stationery**	**Computer & Printer**	**Telephone service**	**Fax**	**Internet (Computers that have**
Zone (n=1)	No	0	1	1	1	1	1	0	1
	(%)	0%	100%	100%	100%	100%	100%	0%	100%
Woreda (n=6)	No	0	5	3	5	6	6	0	0
	(%)	0%	83%	50%	83%	100%	100%	0%	0%
HF(HC and Hos) n=12	No	0	8		10	3	12		
	(%)	0%	67%		83%	25%	100%		
Health Post n=24	No	0			15		24		
	(%)	0%			63%		100%		
Total Assessed (N=43)	No(%)	0 (0%)	14/19 (73%)	4/7 (57%)	26/43 (60%)	10/19 (52%)	43/43 (100%)	0 (0%)	1/7 (14%)

Resources for PHEM data management and communication are availed at zonal and woreda level. But all appropriate resource become more insufficient at the source of data generation (health facilities), resource like; stationary, computers and printers are more scarce at lower reporting level. None of the assessed facilities (Hospital, HC’s, and health post) has any means of communication like internet and fax for reporting rather than their own phone and even in some HPs, there is lack of access to network and the going to other place to send report for Health center.

Feedback

At zonal level however, there were no trend of weekly data analysis and provide a feedback for WorHO, but there was trend of sharing weekly ORHB bulletin that prepared by region for respective woredas PHEM focal persons by using telegram and their personal email address for those have email account the. Nevertheless, none of the visited woredas health offices had experience of dissemination surveillance specific information feedback to the respective health facilities in written form; but, only 3(50%) of them were disseminated comprehensive (integrated) which consists few indicators of surveillance activities six month activities performance feedback to the health facilities during last 6 months. Moreover, some Woreda report that, they have been giving feedback for health facilities orally.

Supervision

No supportive supervision is conducted for Woreda health office during last six months, due to a lot of challenges to conduct supervision as needed (Monthly bias). Shortage and challenges like; vehicle, budget and logistics and security problem were attributed for incapability of conducting supportive supervision at zonal level. However, integrated supportive supervision was conducted once for health facilities by Woreda health offices but PHEM specific supportive supervision were not conducted. For instance, among 11 visited health centers and 1 hospital 8 (67%) Health center and Hospital had never supervised during the past 6 months by higher levels on surveillance specific activities but, almost all Woredas have conducted integrated supportive supervision for health facilities with limited number of surveillance indicators. Among visited health posts, 16 (75%) were not supervised in the past 6 months by higher levels (by health centers and Woreda health offices).

Training

At zone level all technical staffs working in PHEM unit and one zonal EPI coordinator were trained on PHEM surveillance system.

All PHEM focal persons (representatives) as well as MCH coordinators of the assessed woredas health office had took short term training on surveillance for four to five days on the National PHEM guideline by the regional health bureau and WHO. At each Health Centers level, one and at hospital level two PHEM focal person assigned for surveillance was trained for PHEM. Additionally, on site orientation was given to most of the Health professionals. There is no appropriate formal training given to HEWs on surveillance, rather simple onsite orientation was given to them only on the reporting formats. All visited PHCU directors are trained on national PHEM guideline and surveillance activities. But no refreshment training provided for previously two years trained woreda and health facility level PHEM focal persons; as well as newly assigned surveillance focal person during last six months. However, all assessed health facilities had assigned PHEM focal persons, all woreda and health facilities report that there was high staff turnover at all level. Therefore, frequent updating focal person training status and train the assigned focal person and additionally, train at least one personnel at all health centers and Hospitals is mandatory for better surveillance system.

Case confirmation and Laboratory capacity of Woreda and health facilities.

The role of health facilities in the surveillance of measles disease is collect, transport, the appropriate sample with sufficient quality and quantity for further investigation. All visited woreda and health facilities have a capacity to collect and transport blood sample for measles virological test to Public health research and regional laboratory including case based reporting form for further analysis and confirmation. The regional laboratory is responsible for test and assure the quality of health facilities ability to collect sample and test in respective catchment zone. Therefore, during last six months, all woreda were sent suspected measles blood sample to regional lab and however, it's not in time 5(83%) of woredas was got the result feedback from the regional lab. All Health centers and hospital have the capacity to perform both Microscopy and RDT malaria test and have capacity to collect the sputum and transport to regional lab after they conduct examination for confirmation. Stool examination were performed at all health center and hospital level but CSF test and sample collection for meningitis diseases were performed only at hospital level. In addition, there are trained staffs and good cold chain system in 7/12 (58%) of health facilities to transport specimen of suspected measles.

Communication

Effective Communicable diseases control relies on effective surveillance and response system that promote better coordination and integration of surveillance function. Recognizing this, the initiative to strengthen the disease surveillance system that promotes the integration of surveillance activities in Ethiopia was started in 1996 (22). Efforts of integration and coordination between IDSR with parallel programmes initiated at Zonal level. for example, EPI: integrate data, resources, transport sample and communication and feedback: It should be continued at Woreda up to Health facility and collaboration approach with other sections.

List of Attributes

The evaluation of public health surveillance systems should involve an assessment of system attributes, including simplicity, flexibility, data quality, acceptability, sensitivity, predictive value positive, representativeness, timeliness, and stability (16). The attributes we use to evaluate this surveillance system can be subdivided in to qualitative and quantitative attributes; the quantitative attributes, predictive positive value, timeliness, completeness, representativeness and data quality can be readily defined by numerical measures. Simplicity, flexibility, stability, acceptability and Usefulness: are more subjective measures and those less easily quantified.

Performance of measles surveillance system attributes

Usefulness

The purpose of the system indicates why the system exists, whereas its objectives relate to how the data are used for public health action. The objectives of a public health surveillance system, is to address immediate public health action, program planning, evaluation, formation of research hypotheses and in contributing to performance measures (16,21,25). In our study all visited health facilities and woredas including zones report that the current surveillance system is helpful for early detection at all level. This is confirmed by the ongoing measles outbreak in the zone, that the system helps for early detection of the diseases and generate sufficient data by the surveillance system. For instance, all government and non-government organization used the data for performance measures and to make appropriate measures like resource mobilization. However, the national PHEM guidelines did not distributed as needed among all health facilities and poor utilization among health facilities those had a guideline all respondent at zonal, woredas and health facilities agreed that the system is well enough to estimate magnitude of morbidity and mortality of priority diseases and have an ability to generate sufficient and recent data for initiate public health action and used to evaluate prevention and control measures taken. By using this system from WHO week 40 to 52; total 568 measles cases and 4 deaths were reported to zonal starting from health post level and community. However late feedback from zonal level for the outbreak and resulted for late intervention in the management of outbreak.

The Physical accessibility of the health care assures one health post at each kebeles in all visited woredas with two HEW at each health post. Therefore, stretch of the Surveillance system until health post and presence of passive surveillance system help to detect outbreaks of these selected priority diseases early by creating a good health seeking behavior in the community. Feedback from laboratory and from higher level delay was major challenge for health facilities and woreda level.

Nation and WHO recommended that one of Measles core performance indicators is reporting sites that reported and investigated with blood specimen at least two case of measles per year and non-febrile measles rash of 2/100,000 (18,26). 5(83%) of visited woredas achieve this performance by reporting >2/100,000 and investigated with blood specimen at least two measles cases.

Simplicity

All respondent (100%) of visited sites in the zone agreed that the current standard case definition for measles diseases are easy, simple and helpful to detect cases early by all health profession working at each level and community case definition also easy to understand at community level. This was justified by a good case detection trend seen during ongoing measles outbreak in the zone. All respondent report that the flow chart design of current surveillance system is well understandable and clear to apply transfer of report channel for the next level as well as to give feedback at each level as it was set in the PHEM guideline and the reporting were also simple and understandable. Similarly, all respondent report that, the system also has a good integration with other reporting system like newly initiated DHIS reporting system in which the difference is the frequency, means of reporting lack of some important variables in DHIS, but the same in source of data and report transferring channels. All health centers and Health posts faced shortage of standard weekly reporting format which is prepared by Regional Health Bureau. Due to this, all visited health centers and Health posts report only specific and few diseases, those only identified as a cases by SMS (short message services) and the next level (Woreda Health office) considers the rest of reportable data element as zero report. But only Ginir Hospital transfer data by using standard weekly report format to the next level.

All most all (96%) of asked health professionals report that, weekly PHEM report took an average of 10-15 minutes or less to fill a single report of their catchment data. Lack of standard reporting format, poor network access for reporting to the next level mainly at health post and health centers were a major problem reported by respondent. The case definition of measles was correctly responded among all interviewed health professionals and all respondents at each level were familiar with frequency of report and for whom they send the report.

Flexibility

Flexible public health surveillance system can adapt to changing information needs or operating conditions with little additional time, personnel, or allocated funds (21,27). Since current surveillance reporting format contains additional spaces at the end for both weekly and immediately reportable diseases by naming others, it can helpful for newly occurring health events/disease to report without any difficulty. Therefore, all interviewed PHEM focal persons at all level including zone and woreda health office agreed, the current reporting formats can be used for new events which not listed in the national reportable diseases. Additionally, weekly reporting format can be modified based on current public health concerns. Moreover, health professionals explained that current reporting format is more flexible to report and incorporate other newly happened health events without much difficult. For example, perinatal death is included in 2010 E.C to weekly notifiable health conditions without encountering much more difficulties and without additional allocated funds. In general, the current surveillance systems at all level evaluated were highly flexible. All visited sites underlined the ability to easily edit and use reporting format as needed.

Data Quality

Data quality reflects the completeness and validity of the data recorded in the public health surveillance system. Quality and content of data varies across the multiple data entry and reporting level. At zonal level all variables and inessential information needed to be reported in weekly report format and measles case based was complete including zero report. But at woreda and health facility level, since majority (83%) of Woreda and 72% of health centers receive report by short message service (SMS) from respective reporting facilities, we can't find independently recorded weekly report of each health facilities at woreda and health centers rather than summary of total cases at each level. This has its own challenge during data analysis and data quality assurance at each level. Therefore, we assessed the internal completeness of measles cases based report in health facilities during the outbreak. We identify commonly missed essential variables like address (place of residence), date of seen at health facilities, date of onset of rash, and vaccination status of cases at health facility level (HPs, HCs and Hosp). This may result to data analysis by place, vaccination status and develop epi-curve to see disease pattern. Additionally, we identify number of cases on register and number of cases reported quite diferent. Documenting copies of report of at each health facilities and independently data entry is the major gap at Woreda health office. Therefore, it need to record each reported data for each health centers; similarly, health center also should be follow this principle for respective catchment health posts.

Acceptability

Acceptability reflects the willingness of persons and organizations to participate in the surveillance system. Therefore, active participation of agency in reporting system of surveillance activities in regular pattern is a major attribute for system's acceptability. During six months of 2011 EFY, Bale zone weekly reporting rate was 85% at zonal level. In the zone, the engagement of the reporting agents and active participation in the case detection and reporting among government health facility is satisfactory or accepted by the health staffs with 85% during WHO week 28-52, 2018. But almost all 94% private health facilities not reporting; This means most of private health facilities do not engaged in surveillance system in the zone.

moreover, the low engagement of private health facilities may be resulted for under reporting and lead for fail for surveillance system like; predict outbreaks and increases undetected outbreak in the zone. it can be due to lack of training and low awareness health professional in private and poor relevance of data (utilization) and poor coordination in the woreda. Also, some of Woredas did not send report timely as well as completely. This may be due to week feedback (dissemination of aggregate data back to reporting woredas) and monitoring system at zonal level.

Representativeness

Mature surveillance system shows several years of data and analyzes trends. public health surveillance system should accurately reflect the characteristics of the health related event under surveillance. These characteristics generally relate to time, place, and person. the system that is representative, accurately describes the occurrence of a health related event over time and its distribution in the population. The surveillance system has the capacity to pick all public health emergencies in the whole community be it in the rural and urban areas irrespective of their age, sex, ethnicity, religion other social and economic status. However, currently weekly reporting formats lack some important variables like Age, Sex and other possible risk factors which are very important epidemiological variables that help to generate information in person, but it consists place and time variables. Representativeness can be evaluated by health service access to health services and health seeking behavior of community. Therefore, the physical health coverage of the zone is 95% and among the woredas it ranges from 89% to 99%. In relation to the expansion of health extension program in rural area of the zone and consisting in minimum two HEW at each health posts the health seeking behavior of the community is become good. The recent Measles outbreak confirmed this, about 39 Kebeles of 11 measles affected kebeles were report all appropriate information to the woreda in daily bias. The measles surveillance system is operated by different categories of professionals; Nurses, Laboratories, Environmental Health officers, and Health Extension works, Public health officers, all the government structures including Woreda health office and health facilities (starting from HP to Hospital) involved in surveillance system in the zone. But, among total 167 private health facilities in the zone only 10(6%) Private health facilities involved in public health surveillance system reporting chain. Even though the zone reported there were 167 private health facilities exists in the zone. For instance, in some woreda like Ginir there were high number 123 non registared private health facilities existing in the woreda; which is 73.6% when compared with total registered private health facilities in the zone.

Table 3.1-10: Health service coverage of the visited Woredas, Bale zone, Oromia, Feb-2019.

S.no	Zone/Woreda	Health service coverage (%)
1	Bale zone	92
2	Ginir Woreda	98
3	Ginir Town	99
4	Sawena Woreda	91
5	Sinana Woreda	100
6	Goro Woreda	94
7	Dawe serar Woreda	89

Timeliness and Completeness

The quality of these data depends on their completeness and timeliness. Timeliness reflects the speed between steps in a public health surveillance system. In this evaluation we assess time interval the physician or Health worker reporting the event to a public health agency per standard of National PHEM by which the expected level of report timeliness and completeness at all level is 80% and above. Another aspect of timeliness is the time required for the identification of outbreaks, or the effect of control and prevention measures. The timeliness of a public health surveillance system should be evaluated in terms of availability of information for control of a health related event, including immediate control efforts and prevention of continued exposure. However, during recent measles outbreak time identification of cases were good at health faclities but the lag to give fedback or control and prevention initiation and sent a laboratory result from higher level is not satisfactory that resulted for high number of cases occurrence and tranismision of diseases in the zone. However, effective monitoring of events can contribute greatly in preventing occurrences of PHEs while the early detection of outbreaks can have a major impact in reducing the numbers of cases and deaths (14). Our system evaluation identify that, communication among involved health agencies and organizations (HP to Zonal Health departement) as a major factor that influence the early response initiation and contaiment of cases at local level. This confirmed by the recent measles outbreak in the zone, that the frist measles suspected measles cases was reported from Ginir hospital, notified during WHO week 40 to ZHD and the zone also repoted within the same weeks to the Region, but the outbreak response started during WHO week 47 by zonal health department.

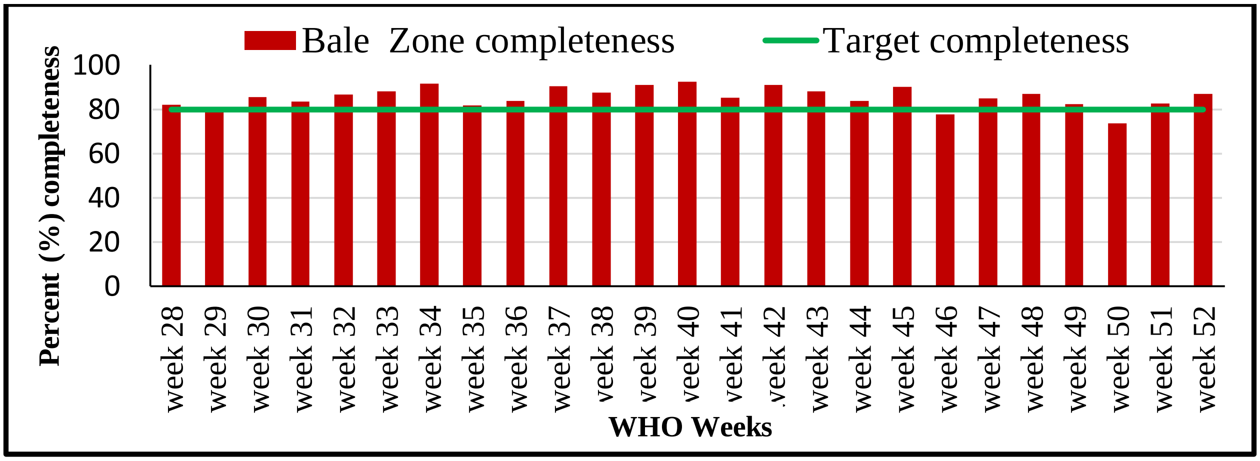


Figure 3.1-9: PHEM Weekly report completeness of Bale zone, Oromia Region WHO week 28 to 52 Feb, 2019.

Bale zone six-month Average report completeness was 85% which is greater national minimum expected level (80%) during WHO week 28-52 2018. The lowest zonal completeness (77%) was reported at week 50 but almost all six-month reporting weeks reporting rate were higher than national standard. The last six month weekly reporting rate (completeness) of the health facilities in the zone was 86.7% relatively low among Health centers (89.6%) and high among Hospital (100%).

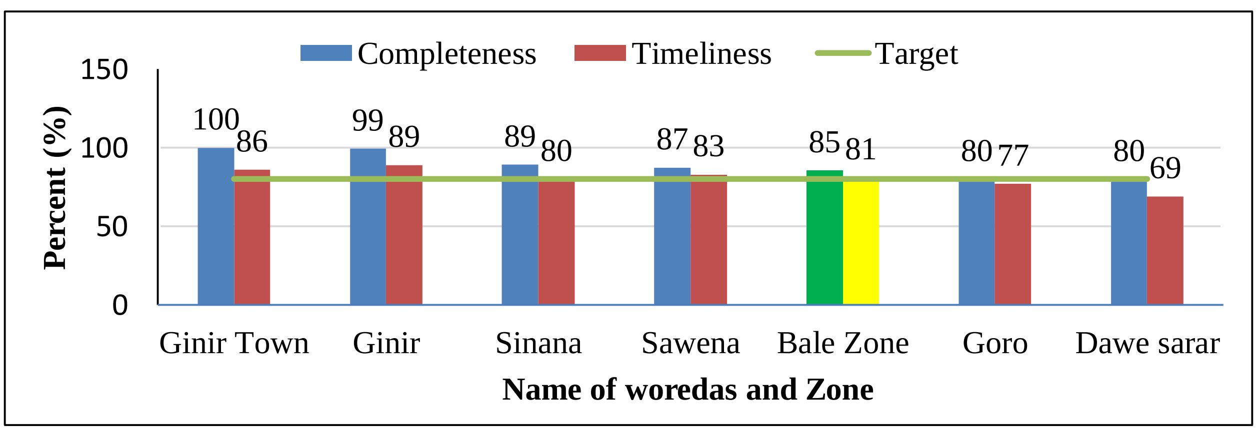


Figure 3.1-10: PHEM Weekly Report completeness and timeliness of visited woredas and Bale zone, Oromia Region, July 18 to January 02, 2018, Feb, 2019.

The timeliness of visited woredas was above the recommended target among (Ginir Woreda, Ginir Town and Saweena by which 89%, 86% and 83% respectively but below the expected standard among Sinana, Goro and Dawe Serar Woreda (79%, 77%, and 69%) during WHO week 28 to 52 2018. In some reported health facilities, date of report sent to next level was not documented at woreda level and was challenging during evaluation of report timeliness for health facilities. Also it was unable to describe weekly PHEM report timeliness and completeness for health centers since date of sent for those number of respective health posts report record was not found at health center level and also not consistent in filling report format properly. The summary report completeness of visited zone and woreda showed below.

Table 3.1-11: PHEM Weekly Report completeness of visited woredas and Bale zone, Oromia Region, WHO week 41 to 52, 2018, Feb, 2019.

Woreda/Zone Name	**WHO Weeks**											
	Wk 41	Wk 42	Wk 43	Wk 44	Wk 45	Wk 46	Wk 47	Wk 48	Wk 49	Wk 50	Wk 51	Wk 52
Sinana	85	96	100	96	100	92	100	88	100	NA	100	100
Saweena	93	93	93	93	93	NA	93	93	93	93	93	93
Ginir W	100	100	100	100	100	100	100	100	100	100	100	100
Goro	88	100	100	100	100	NA	100	84	100	100	100	100
Ginir T	88	100	100	100	100	100	100	100	100	100	100	100
Dawe serar	88	100	100	100	100	NA	100	NA	100	100	100	100
Bale Zone	85	91	88	84	90	78	85	87	82	74	83	87

Sensitivity/Predictive value positive

Sensitivity is defined as the ability of a surveillance system to detect true health events (17). At the level of outbreak (or epidemic) detection, a high rate of erroneous case reports might trigger an inappropriate outbreak investigation. During this evaluation we describe sensitivity by ability to detect outbreaks; the proportion of epidemics identified by the surveillance system that are true epidemics can be used to assess this attribute (Number of suspected measles outbreak reported from the woreda and has to be the true outbreak after investigation). Therefore, during last 3 months there were suspected measles outbreaks reported from 11 woreda of Bale zone and among total reported;

all suspected measles outbreak reported woredas were investigated by EFETP resident and field epidemiology expertise has been true outbreak and fulfill the measles outbreak threshold and criteria sated by FMOH. It was difficult to evaluate sensitivity of the system without presence of local laboratory test for measles in the Health facilities to knowing false negatives and positives that identified by the system and confirmed by Regional lab. Even though; there are false positives among those are sent as suspected measles cases and confirmed as negative by Gold test/IgM and there are no false negatives identified by system and later confirmed by Gold test at regional lab as true negative and measurement of sensitivity requires the validation of information collected through the system to distinguish accurate from inaccurate case reports and a collection of information external to the system to determine the real frequency of the condition in a community (28). Due to this, it was difficult to measure sensitivity of the system at each level. But it's possible to assess predict positive value or proportion of suspected measles cases and sent to regional lab that confirmed as actually a cases by identifying by serology test IgM +ve. predictive value positive (PVP) is the proportion of persons reported as case-patients who actually have the condition being monitored (A/A+B) in assessment of PVP, primary emphasis is placed on the confirmation of cases reported through the surveillance system. WHO and National surveillance guidelines recommend that case based surveillance needed and also every case should be reported immediately (and also included in the weekly reporting system) and laboratory specimens should be collected from every sporadic suspect case for suspected measles outbreaks should be confirmed by conducting serology on the first 5-10 cases only. Therefore, we defined PPV as the proportion of measles case patients identified by case bases surveillance who also had a positive measles serological result (IgM +) and compute by dividing the number of measles case-patients with serum positivity of measles IgM, by the total number of suspected measles case patients sent to regional lab by case based report (9).

Laboratory testing is a major component of measles surveillance in the Ethiopia. The current measles surveillance guidelines in Ethiopia, classify measles cases as confirmed only if confirmed by laboratory tests or epidemiological linkage to a laboratory confirmed case and five suspected measles cases in one month OR 3 confirmed measles cases in one month used as threshold levels for declaring an epidemic for measles (14). therefore, during last six months (WHO week 28 to 52, 2018) predict value positive for measles case based surveillance was deferent between woredas ranges from minimum 80% of Ginir woreda to 100% of Ginir town with the zonal average PPV of 95% (see below table). The PVP also can reflects the sensitivity and specificity of the case definition. In our study, all visited health facilities reported that the current case definitions particularly the Measles case definition is well stated in the way that can pick every measles cases correctly and also, the predictive value positive for all assessed woreda were equal and greater than national levels for declaring an epidemic for measles which is 3 confirmed measles cases in one month.

Table 3.1-12: Positive value predictive of measles case based surveillance with blood samples collected from five visited woreda for confirmation in Bale zone, Oromia Region, Feb, 2019.

Zone Name	Woreda	Total Population	Expected Notifiable Measles Cases/100,000 pop	Number of blood sample sent	IgM +ve Result	PVP (%)	Testing Rate per 100,000 pop
Bale	Ginnir Woreda	164,702	3	5	4	80	3.04
	Dawe Sarar	56,137	1	10	10	100	17.81
	Goro	109,848	2	5	4	80	4.55
	Sinana	154,170	1	0	NA	NA	0.00
	Ginnir Town	25,865	1	20	20	100	77.32
	Sawena	86,400	2	4	Pending	NA	4.63
	Bale Zone	1,893,152	36	44	38	95	2.32

Stability

Stability refers to the reliability and continuity without interruption (i.e., the ability to collect, manage, and provide data properly without failure) and availability (the ability to be operational when it is needed) of the public health surveillance system (21). The Current surveillance system is donor driven at all specially WHO, (Assign one surveillance officer at zonal level to give technical support for overall surveillance activities and funding for different surveillance activities). However, PHEM focal person available at all level (i.e. Zone to Health Post) is a good opportunity for running surveillance system. but in some health facilities the occurrence of trained staff turnover and presence of newly assigned non-trained PHEM focal person and limited resources such as lack of PHEM specific budget and logistics is delaying supervision and capacity building activity a woreda level and this might affect the stability of a public health surveillance system. condition in which the surveillance is full time operating is no need of additional logistics and internet connection, due to personal cell phone was used for reporting system continuously at woreda and health facility level including health posts.

3.1.6 Discussion

Surveillance is a valuable epidemiologic tool that can serve many purposes. When surveillance data is collected, analyzed, interpreted, and reported appropriately; it can provide important information about disease patterns to inform public health practice and policy (2). There are a clear guidelines and specific targets for timeliness and completeness of reporting (i.e minimum target 80%) and Specific number of diseases and conditions under surveillance (6). All surveillance activities should be periodically evaluated to ensure that problems of public health importance are being monitored efficiently, effectively assessment efforts must be intentional and prioritized to address the highest priority problems and problems most amenable to intervention (3,16,17). Public Health Emergency Management guideline is distributed for all zones of Oromiya region in 2013. But among all visited site (WorHO and Health facilities n=19] only 10(52.6%) and 7(36.8%) of assessed sites have National PHEM and Measles Guideline rispectively, this result is low when compared to unpublished six-month Regional assessment report; in which 14/16(87.5%) of Woredas and 12/20(60%) of HC have PHEM guidelines for surveillance. Standard case definitions for all prioritized diseases are available at Zonal level, but only 4(57%) of Woreda health office and 6(50%) of Health centers have standard case definition of measles. Understanding of standard cases definitions by health care providers was satisfactory, as they explaining us while we interviewing them during evaulation. Health extension workers were responded correctly on standard case definitions of some diseases including measles. At all visited health facilities, there is clinical registration. But inappropriate handling and poor in registering cases were identified in 24(66%) Health facilities (Health centers and health posts); it's not consistence with register when compared for one month reports. During last six months, PHEM report format shortage was happened majority of health facilities. However instead of solve their problem; all woreda health office uses the format that printed from e-HMIS reporting system. This is may be due to interrupted supply from national PHEM aswell as region and from partners. Bale Zonal Health department use e-mail to transfer report to the next level. But about 5(83%) woredas and all visited health facilities using telephone to report weekly PHEM report for the next level. All the visited woreda used the same reporting formats. But about 30(83.3%) Health facilities not have copy of archived reported data for last three months. Due to this, there is no compiled data at health facilities level, which can have used for further analysis and they don't use the standard report format for PHEM data backup.

The key actions and or cornerstone of surveillance system are summarized as data collection, analysis, the processing of the information, and the return of the information to all those who need the data received and the local authorities responsible on prevention and control of diseases with evidence of a good data management (26,31). Ideally, an internal evaluation of surveillance activities is an integral step conducted during analysis and interpretation of surveillance data and quality of the initial data may determine the data quality at all stages of the reporting process so monitoring data quality also helps to improve data analysis and interpretation in public health reports at all levels (20,27). In our study, data analysis is not practiced at all visited site, even there were no copies of report document for each health facilities and data was no documented independently for all reporting unit at Woreda health office. This may be due to lack of awareness on the purpose of documentation, data analysis, low commitment of staff, training and resource shortage like computers, printer and skill gap in using of computes are major challenges at woreda. There were Poor mechanisms of feedback from central to peripheral health system by which sharing of weekly Bulletin was only observed from Zone to woredas that not prepared by zone rather by ORHB. But Woredas did not give feedback to the HF. This failure to provide feedback by analysis the reported information may result for failure of data quality and poor data collection method (i.e. report falsification). No PHEM specific supportive supervision is conducted for all Woreda health office and majority of health facilities 7(64%) Health centers, 1(100%) Hospital and 16(75%) Health posts during last six months by higher levels on surveillance specific activities. vehicle, budget shortage, others logistics and security problem were some challenges reported at all level that credited for failure to conducting supportive supervision. Tthis result is the same with findings in surveillance system evaluation conducted on the IDSR in Africa (Nigeria and Malawi), as show poor/no supportive supervision by the national and states staff to health facility (data source level) implement gaps and challenges for timely alert since its very important aspect of surveillance system (26,32).

At 2(33%) woredas the epidemic investigated within 48 hours of notification but in majority of woredas its poor (i.e. Ginir Woreda and Ginir Town). This may be due to communication gap between woreda and town health facilities. Outbreak confirmation refers to the epidemiological and laboratory capacity for confirmation. Capacity for case confirmation is enhanced through improved referral systems, networking and partnerships, this means having the capacity for appropriate specimen collection, packaging and transportation (27). The role of health facilities in the measles surveillance is collect, transport, the appropriate sample with sufficient quality and quantity for further investigation. Therefore, our study showed, all visited woreda and health facilities have a capacity to collect and transport blood sample for measles for virological test to Public health research and regional laboratory including case based reporting form for further analysis and confirmation. During last six months, all (100%) of visited woreda were sent suspected measles blood sample to regional lab and 5(83%) of woredas receive a feedback from the regional lab. But all results were not returned for the woreda according to pre sated schedules result feedback (national guideline) which is within 7 days of sample arrival for regional lab.

Among Measles core performance indicators, we used testing rate (Site that reported and investigated with blood specimen at least two case of measles per year and non-febrile measles rash of 2/100,000. In Ethiopia the proposed annual rate of 2 suspected measles investigation with IgM testing per 100,000 population could serve as a surveillance target (18,26). In our study; 83% visited woredas achieve the stated target for surveillance by investigated with blood specimen at least two case of measles per 100,000 per year. This show that the capacity enhanced through improved referral systems of health facilities in case confirmation.

The existing level of preparedness for potential epidemics and includes availability of preparedness plans, stockpiling, designation of isolation facilities, setting aside of resources for outbreak response are refer to Epidemic preparedness (14). At zonal level there were EPRP but, all visited woredas had no written epidemic preparedness and response plan. however, there was a plan during outbreak happened, not in regular basis. In addition, 50% of woreda and including zone are faced shortage of medical drugs and supplies for emergency management during the past six months' there are established committee at zonal and 5/6(83%) visited Woredas. But, the established committee at these levels is not working regularly and not formulated with all required disciplines and it also activated during epidemic period only in all visited woredas. Only 33% of HF's had fuctional RRT for epidemics. This resulted for weak response performed at health facilities level during epidemics like contain the outbreak at local area which can resulted for high prevalence and staying for long period of time without control of measles outbreak in the woredas.

Smooth functioning of surveillance system will depend on sufficient allocation of resources. These include: training budget, supervision and monitoring budget, resources for reporting information between levels and procurement of materials (e.g. Stationaries) allocation for surveillance activities (27). But except at zonal level, there is no budget line for epidemic response at woreda level. However, they use from Woreda warning budget sources and supported by regional health bureau (donors) during epidemic. Due to lack of budget allocated for surveillance activities in the woreda early response to measles outbreak were delayed among all visited woredas. Resource like; stationary, computers and printers are more scarce at lower reporting level (HF).

Data and information of surveillance flow is clearly stated in the system, which comprises from community level to international agencies. In the same manner, tasks in surveillance system to be starts from reporting the occurrence of health-related events and ends with feedback and dissemination of information for public health action(14,18). Dispite of feedback is a key function of public health surveillance system, there were the trend of sharing the weekly ORHB bulletin that prepared by region by zone. But, the zone by it self and none of the visited woredas health offices had experience of dissemination surveillance specific information feedback to the respective health facilities in written form. This may have a inpact in the future relialable reporting because health staff may think that their reporting is bot important and useful and they can’t unbderstand the health situation of other than their own catchement. All assessed sites had assigned PHEM focal persons but, high staff turnover is reported challenge at majority of visited health facilities (i.e, Health centers).

The purpose or objectives of public health surveillance system indicates why the system exists and used to address immediate public health action, program planning, evaluation, formation of research hypotheses in contributing to performance measures (16,21,25). In our study all visited health facilities and woredas including zones report that the current surveillance system is helpful for early detection at all level. This is confirmed by the ongoing measles outbreak in the zone, that the system helps for early detection of the diseases and generate sufficient data by the surveillance system. For instance, all government and non-government organization used the data for performance measures and to make appropriate measures like resource mobilization (mass vaccination in the zone). Study showed surveillance system is useful if it generates a public health response leading to the control and prevention of adverse health events or to a better understanding of the process leading to an adverse outcome (17). But in Bale zone however, the system generates sufficient morbidity and mortality data, the system suffered with late feedback from higher level for the outbreak (Woreda, Zone and Regional laboratory), which resulted for late intervention and failed to lead early public health action and poor clinical practice like lack to isolate index case identified as gap during hospital visit at Ginir Hospital by which, those suspected measles cases in the hospital were admitted with none measles cases in the same ward, which resulted for more than 50 hospital acquired measles cases during the period. This show that poor data utilization practice to make decision at all level in the zone. Due to this, Measles surveillance in the zone undermines the usefulness of the system (inability to meet the intended objectives of the surveillance system (i.e. surveillance for action). This may due to poor data analysis, interpretation and feedback system from regional lab and public health authorities. Our result is supported by the study conducted in Afar Ethiopia report showed that, the measles surveillance system didn't identify risk factors (put off fire only) rather data use for action (9).

The system is as simple as possible (for structure and ease of operation) while still meeting its objectives. A simple designed system consists a case definition that is easy to apply (i.e., the case is easily ascertained) and in which the person identifying the case(31). In our study, all respondents (100%) of visited sites agreed that the flow chart design of current surveillance system is well understandable and clear to apply transfer of report channel for the next level by using easy, simple and helpful standard case definition for measles diseases to detect cases early by all health profession and community cases definition also easy to understand at community level. Therefore, the current surveillance system finds to be simple for structure and ease of operation. time spent to operating report system is less than 15 minute at all level. This result is similar with Evaluation of Measles Surveillance Systems in Afar Region, 2017 by which time spent to operating surveillance system less than 20 minute (9). The flexibility of a system is better assessed in a retrospective assessment of how the system has responded to a new request (31). In our study health professionals explained that current reporting format is more flexible to report and incorporate other newly happened health events without much difficult, since the reporting format have the ability to easily edit and use as needed to incorporate newly added health events including nonspecific/ local diseases during the specific period of time.

Sources of surveillance information were reviewed. However, all the government structures including Woreda health office and health facilities (starting from HP to Hospital) involved in surveillance system in the zone but among Private health facilities that shared 34.6% of total health facilities in the zone, only 10(6%) Private health facilities involved in public health surveillance system chain. This assumption supported by IDSR surveillance system evaluation in Enugu State, Nigeria and Measles system evaluation in Afar region, Ethiopia show that; Private health facilities that contributed about 60% of health care delivery in Nigeria are contributed only 3% surveillance system and representative suffers from lack of inclusion of private health sector data (9,26). This may can result for decrease the representativeness and acceptability's of surveillance system in the zone by hiding expected number of measles cases to reported, and show low willingness of private health facilities to participate in the surveillance system since, private health facilities practicing priority diseases diagnosis and management at all level in the area. Poor ingagement of Private health facilities in surveillance system in the zone may due to the absence of trained focal persons, resource shortage and poor commitment of the zone to incorporate private Hf's in surveillance chain. In Ethiopia measles surveillance system is a passive reporting system that, when activated by a reported case of suspected measles, triggers a search for additional cases around the reported case. Measles surveillance needs to be highly sensitive to detect sporadic cases and to classify cases as endemic or imported/import-related on the basis of complete epidemiology and the viral sequence information. Sensitivity is defined as the ability of a surveillance system to detect true health events (17). During this evaluation we describe sensitivity by ability to detect outbreaks; the proportion of epidemics identified by the surveillance system, that are true epidemics can be, used to assess this attribute (Number of suspected measles outbreak reported from the woreda and has to be the true outbreak after investigation). Therefore, during last 3 months there were 11 woreda of Bale zone reported suspected measles outbreaks and all suspected measles outbreak reported woredas were investigated by EFETP resident and field epidemiology expertise has been true outbreak and fulfill the measles outbreak threshold and criteria stated by FMOH. This show the system in place is enough sensitive. This assumption is supported by report of Measles system evaluation conducted in USA, 2004 results show that, the sensitivity of the system is increased by reporting and investigation of all suspected measles cases by use of a very inclusive case definition (generalized maculopapular rash and fever) (33). The PVP can be used to assess the efficiency of the system (34). In our study, we defined PVP as the proportion of measles case patients identified by case bases surveillance who also had a positive measles serological result (IgM +) and compute by dividing the number of Measles case-patients with serum positivity of measles IgM, by the total number of suspected measles case patients identified and sent to regional lab by case based report (9). Dispite of assessing PVP, primary emphasis is placed on the confirmation of cases reported through the surveillance system, Laboratory testing is a major component of measles surveillance in the Ethiopia. therefore, during last six months (WHO week 28 and 52, 2018) data was available from five visited woredas and, 44 suspected measles cases reported to regional lab and 38 Suspected cases confirmed to be measles (True Positive), and 2 Suspected cases that were IgM negative (False Positive) and 4 with pending results. Therefore, Predictive value positive in the zone were 38/40 (95%) ranges (Minimum (80%) of Ginir and Goro woreda to maximum 100% of Ginir town and Dawe sarar Woreda) which is well enough to allocate focus resources for control and prevention measures and greater than National recommendation (60%), and also greater than the study conducted in Afar region, Ethiopia 2017; in which Predictive value positive found to be low (59%). Therefore, the current surveillance system used to identify true epidemic and lead for evidence based implementation of control measures and also it shows that, the sensitivity and specificity of case definitions which is (clear and specific for health professionals). Increased predictive value positive enables; public health officials to more accurately focus resources for control and prevention measures and low PVP clinical diagnosis of measles lead to unnecessary implementation of control measures and inappropriate public concerns (waste of resources) (8,29,30). Timeliness and completeness of report is important for timely public health interventions. Federal Ministry of health stated ≥80% for all performance indicators achievement at all level for surveillance activities like; weekly reports received from expected, notified suspected measles cases in ≤48 hours, investigate with house visit in ≤48 hours of notified cases with adequate specimen and laboratory results within 7 days for confirmation cases with identified source of infection (14,18,26). Therefore, the average weekly report completeness of zonal level is 85%; which is greater than expected national standard (80%). It was impossible to assess completeness and timeliness of health facilities at Woredas level. Regarding to evaluation of the time period between the onset of a disease case (index case) and the notification of the case by the responsible surveillance system for establishing appropriate measurements to control and prevent the infectious diseases regarding to response timely, the system was not meet the standard in which any notified suspected measles cases should be investigated within 48 hours and Regional lab results for reporting woreda is not timely. For instance, the recent outbreak in the zone four suspected measles cases are identified by Ginir Hospital in September 28/2018 (those case come from Ginir woreda kebeles), and notify to the next level (Ginir Town) during WHO week 40 (October 08/2018), but the response activities started after January 01/2019 which is after three months of the hospital notification period by public health authorities. This show that the communication gap between Woredas and Town health office including zonal health department since both Ginir town and Woreda are located in same geographic location. This resulted for delay between onset and intervention to the epidemic (not responded within 48 hours of notification) among public health agency (zone and woreda level). this finding is similar with study report on surveillance implementation gaps and challenges for timely alert in Malawi 2018, and Nigeria show that, unable to take quick action and respond to the suspected health events by public health authorities is a general problem to countries in implementing IDSR system and resulted for minimal impact of response for most of the measles outbreaks (7,32). Stability refers to the reliability and continuity without interruption or the ability to collect, manage, and provide data properly without failure (21). Our result show that, the system is operating well without interruption. Because surveillance in place is full time operating and it not need of additional logistics since, personal cell phone was used for reporting system continuously at woreda and health facility level including health posts. But, Dipite of the current surveillance system is donor driven (WHO), this may diminution the stability of the system.

Major gaps

- Lack of periodic analysis of reported data and poor data utilization at all level.
- Lack of PHEM specific supportive supervision and delay feedback system from Public health authorities and regional laboratory.
- Very low participation of private health facilities in surveillance system (poor engagement).
- Poor communication between health facilities and public health authority.
- Shortage of surveillance logistic like; computers, report format, PHEM guideline and budget line for epidemic response.
- Lack of accountability among health personals working in all levels of the health system on information management.
- Lack of well-trained RRT at health facilities.

Limitation of the Study

- Absence of complete data at woreda and HF's. Since the study sites were selected by purposive sampling, the findings presented here may not be representative and generalized for the entire Oromia Regions health facilities. The performance may be overestimated in some attributes, as in the six selected Woreda with measles outbreak were there. Lack of archived data at woreda and health facilities a challenge to assess timeliness and completeness at each level and recorded information external to the system to determine the sensitivity of the measles surveillance system are among major limitation in this study.

3.1.7 Conclusion

- The surveillance core functions not function well and to be improved in the zone. For instance, supportive activities such as; Availing of PHEM guidelines, data quality, supervision, training, epidemic preparedness and response, data analysis, feedback and PHEM lined resource allocation and a system attributes such as; Acceptability, representativeness and timeliness in response to the outbreak.
- Our system evaluation shows that, surveillance system found to be simple, flexible and stable (operating well without interruption).
- Completeness of report is good but lack of timely response to reported outbreak by public health authorities make a system in operation or failed in meet the objectives (i.e. **"surveillance for action")** and the surveillance system was more focused on detection and report than response and prevention.
- Most of health facilities not have National PHEM and Measles surveillance guidelines.
- There were no surveillance (PHEM) specific supportive supervision conducted at all level in the zone.
- Data analysis is limited to sharing of weekly bulletin of ORHB for woreda by Zone, but weekly data analysis is not practiced at all level (including Zone, WorHO and Health facility).
- We identify poor epidemic preparedness in all most all visited site (i.e. drugs and medical equipment stock out during last three months specially for measles and scabies).
- No PHEM lined budget allocated at woreda and health facilities.
- Poor in documentation and data utilization among woreda and health facilities, even no copy of reported data at majority of health facilities.

- Majority of health facilities have good diagnosing capacity of measles (Sample collection, storage and transport to regional lab) but there were a gap or delay in feedback of result from regional lab.
- There was a major gap in forming of epidemic management committee which is not include all required discipline and perform regular meeting.
- There were good in case detection and confirmation at data generating level, but it’s not supported by early initiation of public health action by health authorities (WorHO and ZHD)
- Low engagement of private health facilities in chain of surveillance system at all level.

3.1.8 Recommendation

- ZHD and WorHO should distribute adequate PHEM guideline and reporting formats for health facilities with appropriate refreshment.
- Conducting regular PHEM specific supportive supervision and provide continuous feedback system for respective catchment reporting sites.
- Improve communication gap starting from health post to zonal health department specially within parallel reporting sites (Among Woredas) for good early warning system and response to public health emergencies.
- Zonal Health Department should improve the communication capacity to provide prompt responses to outbreaks in line with health facilities notification.
- Electronic surveillance data management system should be implemented at all level and analyzed at all level (HP to Zone) for public health priority diseases and utilizing data for decision at all levels should practice.
- Zone and woreda health office should involve all private health facilities in surveillance activities and need to widen the surveillance chain among private health facilities to give a better picture of health condition of the community.
- ZHD have to develop action plan (SOP) on Private health facilities engagement to enhance representativeness of the survailance system.
- Woredas health office should constitute and include appropriate Epidemic preparedness plan and response committee (EPRP/C) as standard and committee should meet at least quarterly bases to review and take appropriate measures on surveillance activities and public health important issues in Woreda.

- Strengthening of case based surveillance to ensure that all suspected measles cases have blood samples collected for laboratory confirmation as an important part of measles control and elimination program in the zone.
- Allocating PHEM lined budget at all level from government expenditures and generate local budget (internal funding) for early warning and response activities to sustained the stability of the surveillance system functions.
- Epidemic management committee should be including all required disciplines and conducted regular meeting and evaluate activities.

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4 Chapter-IV Health Profile Description Report

4.1 Health Profile description of Gindeberet Woreda, West Shoa Zone, Oromia Region, February, 2018

Abstract

Introduction: The health profile is a comprehensive compilation of information about a community. The purpose of health profile description is to promote evidence based information for prioritizing and instituting appriopriate public health intervantion.

Method: A descriptive cross-sectional study was conducted in Gindeberet Woreda. structured cheeklist was used to collect data Gindeberet Woreda health office and other relevant respective sectors from February 10 to 30/2018. Microsoft Excel and word 2007 was used for data entry and analysis.

Result: Gindeberet Woreda has thirty-one rural and one town kebeles with total population of 142,440, of which 70793 (49.7%) is male. The older age group (>65) consists 6,752 (4.74%). The main income of the Woreda is agricultural, with cultivated land density of the 50,494 (42.10%) hectares of the total woreda land. Among 32 kebeles only 6(18%) of kebeles had assessed electric power and 2,218(9.5%) households were assessed for electric power supply. The education coverage for the Woreda was 99.7%, with 1.8%. dropout rate. Averagely one health center served for 23,740 populations and one health post served for 4,451 populations. Maternal health service indicated about 59%, 75%, 70%, 46%, and 46% of Family planning, 1st ANC, 4th ANC, Institutional delivery and Early post-natal care service respectively. TB case detection rate of was 23%. Total 7,388 clients tested for HIV with 0.0% HIV positivity rate in 2017. The latrine coverage of the Woreda is 66.2%. School with water and sanitation facilities is 24% and 22 % for water supply and functional latrine. About 14% of rural populations accessed for potable water. Acute febrile illness is leading public health problem 17.10% and ranking 3rd 19% among under 5 years. Pneumonia 16.11 % and Acute upper 14.82% of adult and Pneumonia in 36.2 and diarrhea in 26.41% of under five age leading diseases in the woreda, and no death reported due to those diseases during the period.

Conclusion and Recommendation: Acute febrile illness, pneumonia and acute upper respiratory tract infection were leading causes of adult morbidity in the woreda. Pneumonia, Diarrhea and Acute Febrile Illness is the leading causes of morbidity in under five children. Tuberculosis case detection rate was low and that need serious attention and follow-up, community TB cares and community TB contribution for TB diagnosis should be strengthening. Since there was no HIV tested positive during 2017/18. Therefore, targeted HIV counseling and testing should be implemented for better HIV case detection. All maternal health service found tobe quite low, which need to strengthen the service through supportive supervision and monitoring Latrine coverage and utilization was quite low which can be the source for feco-oral transmission of the diseases. Therefore, prevention and control measure should be strength to reduce morbidity attributed by communicable diseases and specifically the leading diseases.

Key Words: Health profile, Gindebeter Woreda, West Shawa, Oromia.

4.1.1 Introduction

Health profile is a holistic approach of gathering information of health and health related events in the community using epidemiological statistics tools. The health profile is a comprehensive compilation of information about a community. The data in the profile is a mirror of health and wellbeing of a particular community from much different perspective. In this case, community includes an entire county, made up of urban, rural, and villages or clusters. Information presented includes data collected and published, as well as information collected by the organizations involved in creating the profile. The profile has a wide distribution, used by medical and social service providers, legislators, businesses, non-profits, schools, grant writers, and policy makers.

The health profile provides an overview of the situation and trend of priority health problem and the health systems profile, including a description of different institutional frame works, key issues and challenges of the Woredas. It is important to obtain enough accurate and reliable data of particular geographic area (Woreda) in order to develop meaning full developmental plan. Organizing, summering and analyzing of health and health related data of the Woreda is important to prioritize problems of studies area and plan on identified problems. These summarized and prioritized data is important for publication health surveillance official for planning, implementation and evaluation of public health surveillance programs.

The study conducted on health profile of street children in sixteen Africa region showed that specific socio demographic characteristics were collected and the most frequently Health outcome were found growth and nutritional health disorders, physical injuries, parasitic and other community acquired infectious diseases sexual and reproductive health disorder violence and sexual abuse, mental health problems health problem access to health care services and transaction sex practice and its consequences.(3)

The purpose of health profile description is to promote evidence based health policy making through analysis of the dynamics of health situation and health systems in the Woreda. (4) Therefore the main objective of this document is to present compiled information concerning physical and socio demographic condition of the Gindeberet Woreda and communicate the local burden of disease and other health related information also its constraints.

The main source of data used for the preparation of the description are Gindeberet Woreda Administration, Agriculture, health, Education, Water resource, culture and tourism and energy office, Finance office will be used. The document covers almost the data and activities of the period 2016/2017, and all the year are according to the Gregorian calendar.

Statement of the problem

Gindeberet woreda is one of woreda located in West Shawa zone in Oromia Region. Like others woredas in Region, there is problem of data handing and utilizing in appropriate manner to address of community problem. This is due to not having sufficient and reliable health information in summarized and woreda profile with all level of system.

Even if the health service delivery expands, trained man power and health infrastructure increases from time to time still there were problems regarding to find realliable data which can help as we need to indicate precisely where we are and to plan where to reach in the health system. Developing health and health related profile for the woreda with the involvement of all relevant stacke holders is crucial for providing timely, unbiased and reliable information in order to plan and perform accordingly. That is why this study suggests that health profile preparation at the woreda level will result in with real problems and successes of health service at all other levels in order to address the health problems of the population.

Rationale of the study

Health profile assessment is important for prioritizing health and health related problems of the community at any level. Curative and preventive components of health service have shown an improvement, meeting equitable and quality health care components. Indicators and information products considered as adequate, but data management is being challenge at defferent service point. Health information system resources, dissemination and use, as well as data source coverage are also inadequate. Currently epidemiological transition in the country, a double burden of disease is already emerging the mix of persistent infectious disease and increase non communicable disease and injury are common. Non communicable disease and injuries are already major contributors to the high morbidity and mortality burden of the country in related with life style changes that is due to some reasons. The capacity of institution to generate, analyses, disseminate and use health information is differing. Based on this in the previous time there was no prepared, compiled and organized information on the health profile of the Woreda. Therefore, describing the health profile of Gindeberet Woreda is helpful to give evidence based information for prioritizing and instituting appropriate public health interventions as well as for planning purpose for the woreda by summarizing the health information relevant to the woreda.

4.1.2 Objectives

General objective

- To develop Woreda health profile for Gindeberet Worada of West Shoa Zone, Oromia Region 2017/2018

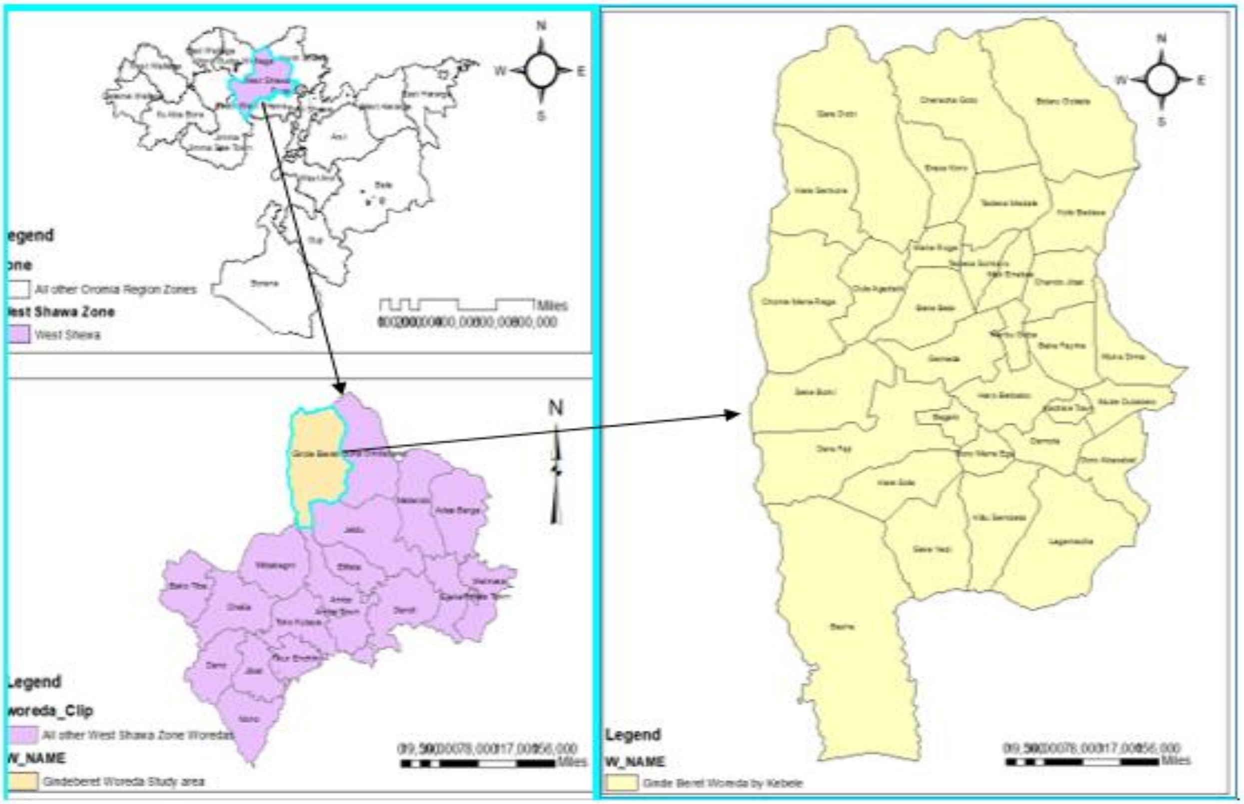
Specific objectives

- To assess health and health related condition of the Woreda.
- To identify health service status of the woreda in 2017/18.
- To summarize health information relevant to the Woreda.
- To suggest the area of action to improved health service in the Woreda.

4.1.3 Method and material

Study Area

This health profile assessment was conducted in Gindeberet woreda, which is one of the West Shoa Zone Woredas in Oromia Region. Gindeberet Woreda was established in 1886 E.C. The Woreda has 1 urban and 31 rural Kebeles and according to the 2017/18 population estimate for the Woreda were 142,440, of which females constituted 71,647 (50.3%) and about 17,350 (12.18%) of the Woreda population living in urban.



Map 4.1-1: Map of Oromia Region and West Shoa Zone Showing Gindeberet Woreda Study area 2018

Study Design

Descriptive cross sectional study was conducted using structured questionnaire. Review of available secondary sources and interview of individuals in charge on health and other health related conditions was conducted.

Study Period

The assessment was conducted from February 10 to 30, 2018.

Study Population

Total population of the Gindeberet Woreda.

Study Unit

Woreda health office and other Woreda sector offices.

Data collection tool and methods

Secondary data was collected from west Shoa Zone Oromia Region, Gindeberet Woreda health office and other respective sectors like; Education office, Water & Energy office, Woreda administrative office, Culture and Tourism office, Agriculture office, Land management office and also available data from those mentioned sectors was reviewed, by using semi-structured questioner and primary data was collected by using face to face interviewing different concerned individual's (i.e Elderly peoples). Additionally, data that could not be collected during the field visit was obtained by phone from the respective focal persons during the study period.

Data analysis procedures

Data was checked and prepared for analysis. Microsoft Excel and Word 2007 were used for data entry and analysis.

Result dissemination plan

Written report (both hard and soft copies) was prepared and shared to Addis Ababa University School of Public Health, Oromia Regional Health Bureau, West Shoa Zonal Zonal Health Department, Gindeberet Woreda Health office, and Ethiopia Field Epidemiology Training Program resident advisors, Mentors and supervisors respectively.

Ethical consideration

Written support letter from the Oromia Regional Health Bureau and Zonal Health Bureau was obtained prior to the arrival to the study area (Gindeberet). Brief about the objective of the study was insured before ask for data for all woreda offices and expertise.

Study variable and operational definition

Antenatal coverage: Proportion of pregnant women attended, at least once during the current pregnancy, by a health professional, for reasons related to pregnancy.

Antenatal care coverage – first visit: The percentage of women that received antenatal care at least once during the current pregnancy.

Antenatal care coverage – four visits: The percentage of women that received antenatal care four or more times during the current pregnancy.

Child mortality rate: The number of births occurring in 2009 per 1000 women in the reproductive ages (i.e. women aged 15-49).

Contraceptive acceptance rate: Proportion of women of reproductive age (15-49 years) who are not pregnant and are accepting a modern contraceptive method (new and repeat acceptors)

Contraceptive prevalence rate: Proportion of women of reproductive age (15-49 years) who are using (or whose partner is using) a contraceptive method

Demography: The study of population and its characteristics, with reference to such factors: size, age structure, density, fertility, mortality, growth and social and economic variables.

Disability is an impairment that may be cognitive, developmental, intellectual, mental, physical sensory or some combination of these. it substantially effects person life activities and may be present from birth or occur during person's life time.

Full immunization coverage (< 1 year): Proportion of surviving infants who receive all doses of vaccines before their first birthday.

Leading causes of morbidity: The frequently occurring causes of morbidity among patients, of which the greatest number of cases have been reported during the year.

Maternal mortality rate: The number of maternal death while pregnant or within 42 days after termination of pregnancy from any cause related to pregnancy or its management per 100,000 populations.

Tuberculosis (TB) case detection rate: Number of new smear positive TB cases detected, among the new smear-positive TB cases estimated to occur in the Woreda.

TB cure rate: Percentage of a cohort of new smear-positive TB cases registered in a specified period that was cured as demonstrated by bacteriologic evidence (a negative sputum smear result recorded during the last month of treatment and on at least on one previous occasion during treatment).

TB death rate: Percentage of a cohort of new smear-positive TB cases registered in a specified period that died during treatment, irrespective of the cause.

TB defaulter rate: Percentage of a cohort of new smear-positive TB cases registered in 2010 that interrupted treatment for more than 2 consecutive months.

TB treatment success rate: Percentage of a cohort of new smear positive TB cases registered in a year that successfully completed treatment. Successful completion entails clinical success with or without bacteriological evidence of cure.

4.1.4 Result

Historical background and culture

Since there are no published resources on Gindeberet, the description of the study area is based on the information obtained from the Woreda offices and personal observations during the fieldwork. The Zonal Atlas of west Shewa and some unpublished sources were also used for background information to describe the study areas. The Woreda town (Kachise) is geographically located approximately at the center of the Woreda 193 Km west of Addis Ababa and 138 Km North of Ambo Town. The total area elevation varies from 1000 to 2604 meters above sea level. The boundaries separating the Woreda from other Region/Zones/Woredas in most cases have natural features, mainly rivers. For instance, Blue Nile River is the boundary between Amhara National Regional State and Gindeberet Woreda.

Gindeberet Woreda is one of the Woreda found in West Shoa Zones, Oromia Region. Historically, before 1880 E.C the Woreda was known by Kutaye, kutaye was one of Maca Oromo Ethnic group and the Woreda was known by this ethnic groups name. But, according to Culture and Tourism office and elder's Shambel Nekatibeb Begna explanation; the name Gindeberet came from the geographical setup of the woreda, which was bounded by River and gorges and the name was given by Adal Tesema, Besides, there was a conflict between Adal Tasama (the leader of Gojam) and Beyen Huluka, who was Abuna, Dogoma Leader which started 1883 (EC). The c was ended by Beyen Huluka, but after three years Adal Tasama won the battle by strengthen his solder capacity in 1886 (E.C). At that time, Adal Tasama (the Leader of Gojam) observes the topography of the Woreda and he gives the name "**Gindebert**" which means "Metal pale" (Yebiret Atir)**.** Because, at a time, the Woreda has only one entry point, which called "Shawa bar" and the rest was bounded by Blue nile and Guder River and gorges. Gindeberet is bordered on the South by Abuna Gindeberet woreda, on the South West by Dendi Ambo woreda, on the West by Guder River, which separates it from the Horo Guduru Welega zone, on the North by the Blue nile river which separates it from the Amhara Region, on the East by the Abuna Gindeberet Woreda. The major town in Gindeberet is Kachise (also called Kachisi) (9). There is historical place and potential historical places by nature in the Woreda such as; "**Holqa Gode Moorree**" (water fall) which is found in Kare Dobi kebele, South West direction, about 27 km from kachise and "**Lafto Seenaa"**, which is found in Mudhi Ula Baro kebele which is the place where the slave trade **("DALDAALA GARBAA)** in Afan Oromo or **YEBARIYA NEGDI** in Amharic" take place in Ethiopia during last 20 centuries (9).

Geography and climate

The Woreda is divided into two agro-ecological zones, locally called badda-daree (43 %) and gammojjii (57 %), which called midland and lowland respectively. The Woreda covers about 1,238.75 square kilometers including kachise town, with altitude ranging from 1000-2640m above sea level. The geographic coordinates of the Woreda are 10.2^0 North latitude & 37.1^o East longitudes. The mean annual rain fall is 1200 mm with the range of maximum 1400 to minimum 1000mm; and the monthly temperature ranges from 5^0C to 30^0C. In 1999 E.C, 55 kilometers of gravel road were built in Gindeberet by students, farmers and civil servants from the Woreda, from Addis Ababa by which of 88 KM asphalt and 105 KM were gravel road.

Administrative and political structure

Administratively, the Woreda has thirty-one (31) rural and one (1) town kebeles. The Woreda has its own council and representative in the Federal Parliament, also there are about 478 villages in the Woreda. All Woreda's administrative offices are found in kachise town. There are supporting NGOs working together with the Woreda Health Office, namely "Menschine fiir Menschine" and United Nations Children's Fund (UNICEF). These non-governmental organizations mainly support the wereda on malnutrition, hygiene and sanitation, maternal and child health, trachoma, road construction to health facility, safe water supply, and agriculture. They provide material and financial support for health facility as well as community during study period (2017/2018).

Demographic information

The total population of a Woreda is estimated to be 142,440 of which 70,793 (49.7%) is Male and 71,647 (50.3%) were Female in 2017/2018. Among these total population 10.5 % (14,956) of them are residing in urban areas. The majority of the population lives in the rural areas, depending on crop farming which is profoundly influenced by environmental factors. Among the total population Under 1year, less than 5 and less than 15 years constitute 4,416 (3.2%), 23,360(16.4%), and 68,371(47.6%), respectively. The older age group (>65) consists 6752 (4.74%) of the total population. The reproductive age groups child bearing women (15-49 years of age) accounts for 31,479 (22.1%) of a total population. Gindeberet has an estimated population density of 84.5 people per square kilometer, which is less than the Zone average of 152.8. The sex ratio of the Woreda was almost equal. The Oromo people mainly inhabited Gindeberet (97.28%), and the Amhara (2.1%); all other ethnic groups made up 0.71% of the population. The population distribution of the Woreda is forecasted based on the population and housing census, which was conducted in 2007 by Ethiopian Central Statistical Authority. Regarding to religion distribution, most Woredas' populations are protestant, with 55.96% followed by Orthodox 34.12%, while 9.18% of the population was follow traditional religion (Wakefata). The average household size was estimated to be 4.8. Most of the kebeles have variable distance from Gindeberet Woreda, in average all Woreda kebeles far from the woreda city by 18.5 KM by which the nearest kebele was

3 kilometers from kachise and the farthest was 38 kilometers away from kachise. About 54.5% of the kebeles were 13-38 kilo meters far from the Woreda capital (Kachisi).

Table 4.1-1: Population distribution by Kebele, Gindeberet Woreda, Oromia, Ethiopia, Feb, 2018

S.N	Name of kebeles	Total population	Total HH (4.8)	Male (49.7%)	Female (50.3%)	Total live births (3.5%)	PW (3.7%)	NPW (18%)	Distance From capital city of woreda(kachise) in KM
1	Bakkee Balaa	5,910	1,231	2,937	2,973	201	219	1,064	16
2	Bake Feyina	9,164	1,909	4,555	4,610	312	339	1,650	10
3	Bagallo	2,048	427	1,018	1,030	70	76	369	12
4	Bashe	2,835	591	1,409	1,426	96	105	510	30
5	Bidaaru Gobat	2,789	581	1,386	1,403	95	103	502	30
6	Cando Jibat	2,920	608	1,451	1,469	99	108	526	13
7	Cando Gato	2,200	458	1,093	1,107	75	81	396	38
8	C/Mana Erga	2,411	502	1,198	1,213	82	89	434	29
9	Damota	4,668	972	2,320	2,348	159	173	840	3
10	Dirre Faji	7,179	1,496	3,568	3,611	244	266	1,292	16
11	Gamada	7,900	1,646	926	3,974	269	292	1,422	12
12	G/Abbaa Sanbat	7,908	1,647	3,930	3,978	269	293	1,423	10
13	Goro Mana Erga	2,966	618	1,474	1,492	101	110	534	12
14	Harbu Guba	2,335	486	1,160	1,174	79	86	420	8
15	Haro Berbabo	6,676	1,391	3,318	3,358	27	247	1,202	5
16	Iresa Kono	1,695	353	842	852	58	63	305	32
17	Kalo Badasa	1,895	395	942	953	64	70	341	25
18	laga Maca	3,341	696	1,661	1,681	114	124	601	10
19	Mexii Inabsee	1,565	326	778	787	53	58	282	15
20	M/Ulaa Baro	4,100	854	2,037	2,062	139	152	738	4
21	Muka Dima	5,193	1,082	2,581	2,612	177	192	935	10
22	Qare Dobi	6,091	1,269	3,027	3,064	207	225	1,096	27
23	Qare Shankori	2,419	504	1,202	1,217	82	90	435	31
24	Qare Sole	4,079	850	2,027	2,052	139	151	734	14
25	Qare Sanbata	4,653	969	2,313	2,341	158	172	838	10
26	Saqa Borki	3,032	632	1,507	1,525	103	112	546	23
27	Saqa Yadi	2,901	604	1,442	1,459	99	107	522	15
28	Ula Abbaa Dadi	5,076	1,058	2,523	2,553	173	188	914	24
29	Wune Rogge	3,178	662	1,579	1,598	108	118	572	24
30	Xaphisa Madale	3,271	681	1,626	1,645	111	121	589	30
31	X/ Shankori	2,694	561	1,339	1,355	92	100	485	25
32	kachise	17,350	3,615	8,623	8,727	590	642	3,123	NA
Total Woreda		142,440	29,675	70,793	71,647	4,843	5,270	25,639	-

The Woreda population pyramid was predominantly young population, with 67,790.00 (47.59%) of the population being <15 years old. The population in the productive age group (15-64 years) constituted about 70,145 (49.24 %) of the total population. Population > 64 years was only 4,505 (3.16%). Population density among the kebele were quite deffer ranging from the highly populated Kachisi (Capital of the woreda) 17,350 peoples to the minimum of mexi inabse (1,565 peoples) per kebele in the woreda

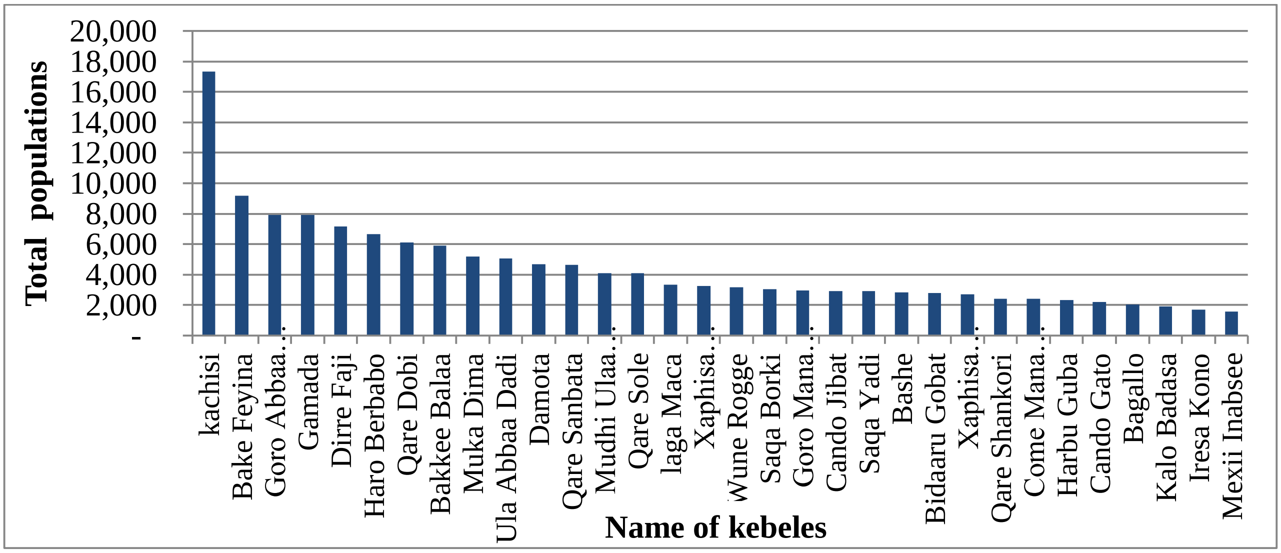


Figure 4.1-1: Population distribution by kebele Gindeberet Woreda, West Shoa Zone, Oromia Region, 2017/2018

The population pyramid shows that different gender dominance between deferent age groups, as showed below figure. Male were more dominant for age group of 0-19 and above 40 Years of age, however Female were more dominant for the young population (20-39) years of age this may indicate high fertility rate during the period. Upper age group was more Male than Female, this showing that male tends to live longer compared to females. The pyramidal age structure of the population has remained predominately young with 47.19% under the age of 15 years.

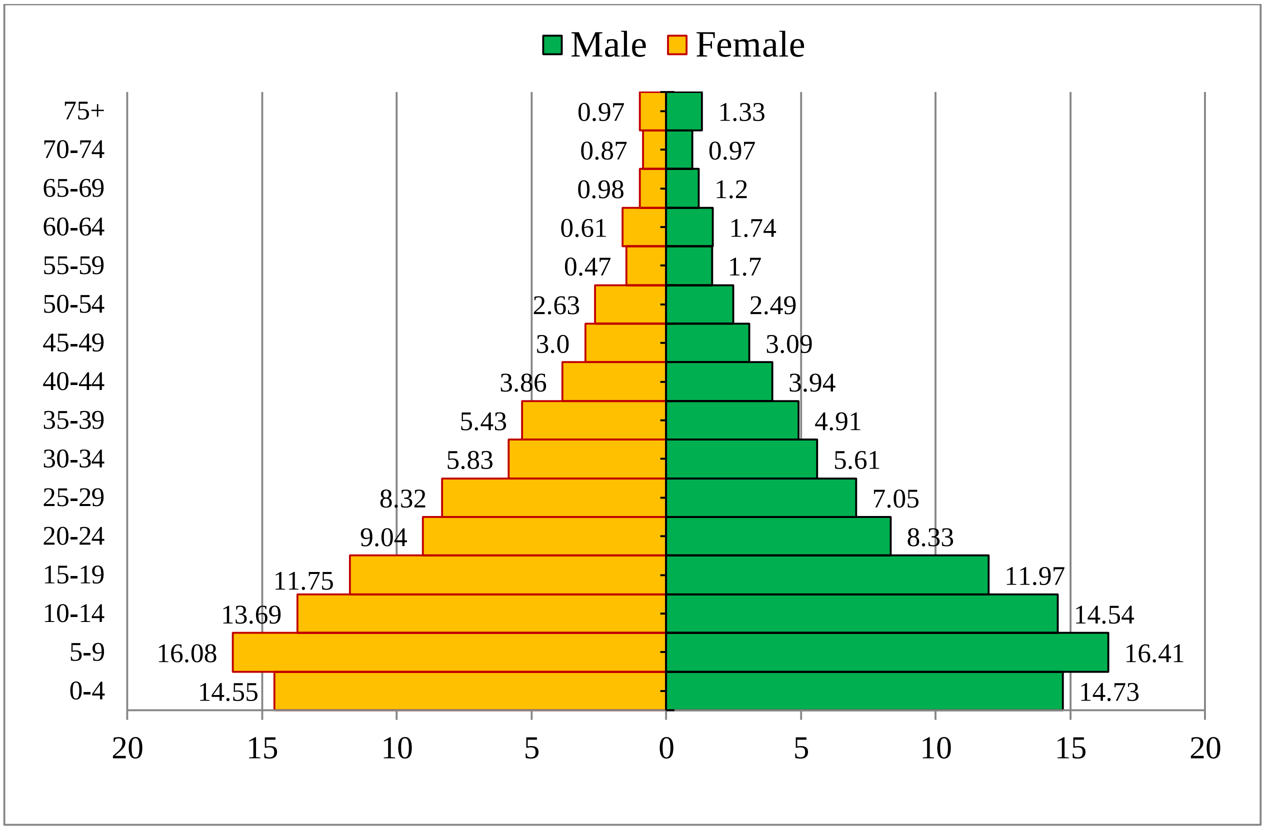


Figure 4.1-2: Population Pyramid of Gindeberet Woreda, West Shoa Zone, Oromia Region, 2017/2018.

Productivity and income

The Woreda has fertile land which is suitable for agriculture. The main income of the Woreda is agricultural. The agricultural density of the Woreda was 50,494 (42.10%) hectares of the total land in 2017/18. In the Meher season of 2017/18, from 50,494 hectares of cultivated land, 1,150,409.37 quintals of yields were produced. The major annual crops grown in the Woreda are cereals like Tef, Maize, Sorghum, Barley, and Wheat, and oil crops like Guzotia abyssinica (noug) are widely productive crops in the Woredas. In 2017/18, the highest productive yields were Teff, Maize, Sorgum, wheat, Nug, and pulses with 517,704.5, 334,156, 87,888.37, 66,750, 36,105.5, 26,504 and 21,860 quintals respectively**.** The average monthly or yearly income of individual in the Woreda is not known.

Table 4.1-2: Areas of land use and land cover type in Gindeberet Woreda, West Shoa Zone, Oromia Region, Ethiopia 2018

Land use type	Land use in hectare	Percent
Cultivated land	50,494.00	42.10%
Pasture land	39,791.00	33.20%
Shrub land	7,509.00	6.30%
Non-arable land	6,972.00	5.80%
Residential area	5,315.00	4.40%
Forest land	4,248.00	3.50%
Others (e.g. water body)	2,880.00	2.50%
Potential arable land	2,670.00	2.20%
Total	119,879.00	100%

Education

In 2018, there are 2 non-governmental kindergartens, 1 first cycle (Grades 1-4), 44 second cycle primary (Grades 5-8), 5 secondary (Grades 9-10) school and 1 preparatory school in the Woreda. First cycle has a total student population of 3,737 with 2,122 (56.78%) females. Elementary schools (grades1-8) had a total student population of 29,209 of which about 13,968 (47.82%) were females. In high schools there were a total of 4,606 students of which 2081 (45.18%) were females and preparatory school (11-12) had a total 2,545 student population of which 1,186 (46.60%) were female. Generally, the Woreda had total 40,731 school populations of which 19,673(48.30%) were female and 21,058 (51.70%) Male in 2017/2018. In first cycle (1-4 grade), there were a total of 66 teachers of which 56 (84.84%) were TTI (Teacher teaching institutes) graduates. In elementary schools (grade1-8) there were 102 teachers of which 87 (85.29%) were first Degree level. in secondary schools there were 64 teachers of which 64 (100%) were first degree level and in preparatory (11-12) there were a total of 54 teachers of which 44(81.48%) of them are Degree level and 10(18.51%) are different dicipline Masters of sciences level. School dropout rate for grades 1-8 students was 5.16% and for girls it was 2.8%, but for grades 9-10 it was 11% and for girls it was 12% therefore the highest dropout was seen in high 9-10 grade. However, the overall dropout rate was 1.8% showing higher than the national target (1.5%). The education coverage for the Woreda was 99.7%, and the literacy rate was not known.

Table 4.1-3: Distribution of schools, teachers and students in Gindeberet Woreda,West Shoa zone, Oromia Region, Ethiopia, 2018.

Grade	No schools	Number of teachers				Number of students			Ratio teacher to student
		TTI	Dip	Dig +	Total	Male	Female	Total	
KG	2	1	5	0	6	176	193	369	1:62
1 to 4	1	55	5	0	60	1615	2122	3737	1:63
5 to 8	44	10	5	87	102	15,241	13,968	26,637	1: 261
9 to 10	5	0	0	64	64	2525	2081	4606	1:72
11 to 12	1	0	0	54	54	1359	1186	2545	1:47
TVET	1	0	4	10	14	142	123	265	1:19
Total	54	66	19	217	302	21,058	19,673	140,731	1:465

Facilities/Infrastructures

Gindeberet Woreda has 56 kilometers of dry-weather and 144.8 Kilo meter all-weather road. The average daily flow of the Woreda transportations per day is 13 (thirteen) cars from Addis Ababa, Ginci, Ambo and neighbor woredas.

The Woreda Capital (kachise) had 24-hour electric power supply, mobile and cable based telephone, however among 32 kebeles only 6 (18%) of which kebele had assessed electric power and 2218 (9.5%) households were assessed for electric power supply within the Woreda. Among 31 rural kebeles and one urban kebele of the Woreda, both the urban and 23 rural kebeles have road access to woreda town in all weather and the rest 10 rural kebeles were only in dry season. All the 32 kebele of the Woreda have wireless telecommunication systems which accessed by mobile telephone network. Only one urban kebele kachise 01 had fixed telephone service and only 12 rural kebeles and 1 urban kebele had 24-hour electric power supply. Among all Health facilities in the Woreda, only three health center and one hospital had safe water supply. The Woreda also had services, like postal service and bank (such as; Commercial Bank of Ethiopia, Awash International Bank and Oromia International Bank) in the capital of the woreda (kachisi).

Table 4.1-4: Utilization and distribution of energy in urban kebeles of Gindeberet Woreda, West Shoa Zone, Oromia, Ethiopia, February, 2018

S.no	Urban Kebele	Total house hold in the kebele	Number of HH access for Electric Power	Percent (%)
1	kachise	3,615	1,620	44.81
2	Gemeda	1,646	174	10.57
Total		25250	1,794	7.10

Table 4.1-5: Distribution of Energy rural kebeles in Gindeberet Woreda, West Shoa zone, Oromia, February, 2018

S.no	Rural Kebele	Total House Hold of the kebele	Number of House Hold access For Electric Power	Percent (%)
1	Qare Sole	850	124	15%
2	Dire Faji	1496	90	6%
3	Wune Roggee	662	84	13%
4	Kare Dobi	1296	126	10%
Total		4,304	424	10%

Table 4.1-6: Distribution of Energy in Gindeberet Woreda, West Shoa Zone, Oromia, Ethiopia, February, 2018

Utilization and distribution of energy	Eligible kebele	Achievement(Accessed for service)	Percent (%)
Total electric power Distribution by kebele	33	6	18%
Total electric power utilization by House Hold	23,360	2,218	9.5%

Drinking water supply

The Woreda Water Resource and sewerage office was working to supply safe drinking water for the community in collaboration with different stakeholders and partner i.e "Menchine fiir menchine". Among all kebele in the Woreda Only 5(15.6%) of kebeles and 2210(7.4%) of House hold were access for the safe drinking water. There were different water source in the woredas.

Table 4.1-7: Water sources in Gindeberet Woreda, West Shoa Zone, Oromia Region, 2017/18

S.no	Types of water sources	Number	Proportion (%)
1	Protected spring	16	7.58%
2	Un protected spring	14	6.64%
3	Protected well	11	5.21%
4	un protected well	114	54.03%
5	Stand pipe	56	26.54%
Total		211	100.00%

Among total 211 water source found in the Woreda, majority of the water source were unprotected well, that account for 114(54.03%) and 56(26.54%) of stand pipe respectively (Table 4.1.7).

Woreda Health System

Country health system

The recently implemented Ethiopian Health tiers system introduced, a three-tier health care delivery system, characterized by a first level of a Woreda health system comprising of a primary hospital (with a catchment population coverage of 60,000-100,000 people), health centers (1/15,000-25,000 population) 40.000 for Urban and their satellite Health Posts (1/3,000-5,000 population) that are connected to each other by a functional referral system. The Primary Hospital, Health Centers and Health Posts form a Primary health care unit (PHCU) with each health center having five satellite health posts. The second level in the tier is a General Hospital with population coverage of 1-1.5 million people; and the third a Specialized Hospital that covers population of 3.5-5 million indicated in figure 4 below.

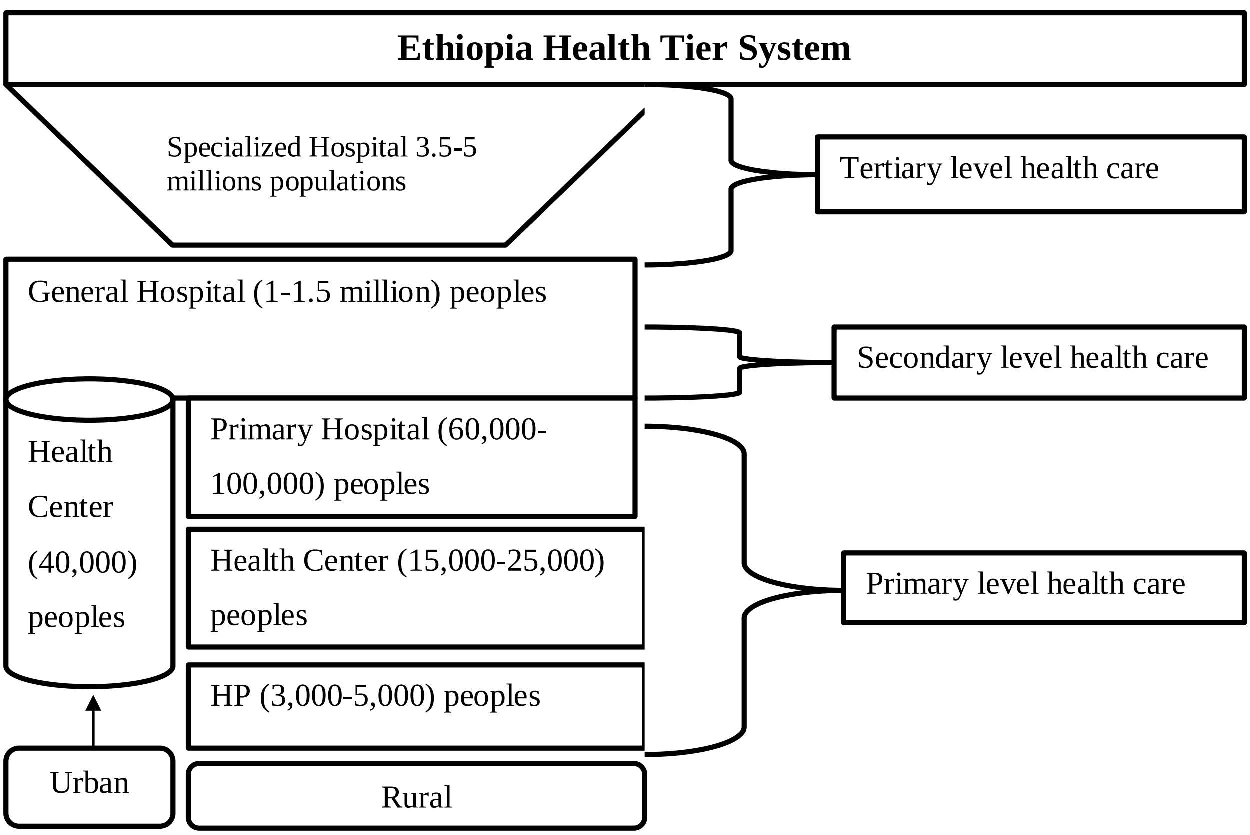


Figure 4.1-3: Ethiopia Health tier System (*Source: HSDP- IV; 2010/11 – 2014/15)*

Organization of Woreda health office (Oregano gram)

The currently revised Woreda health office structure after BPR is organized in to seven technical team and two supportive teams. These technical teams are monitoring and evaluation, human resource & administration, communicable disease control, health promote and prevention core process, health and health related, health insurance, health service quality regulation and follow up teams. The two supportive teams at woreda health office are secretary and recording and documentation. The district heath office is the basic administrative unit of health system and leads Health sectors of the district. They are responsible for planning, financing, monitoring and evaluating of all health program and service deliveries in the District.

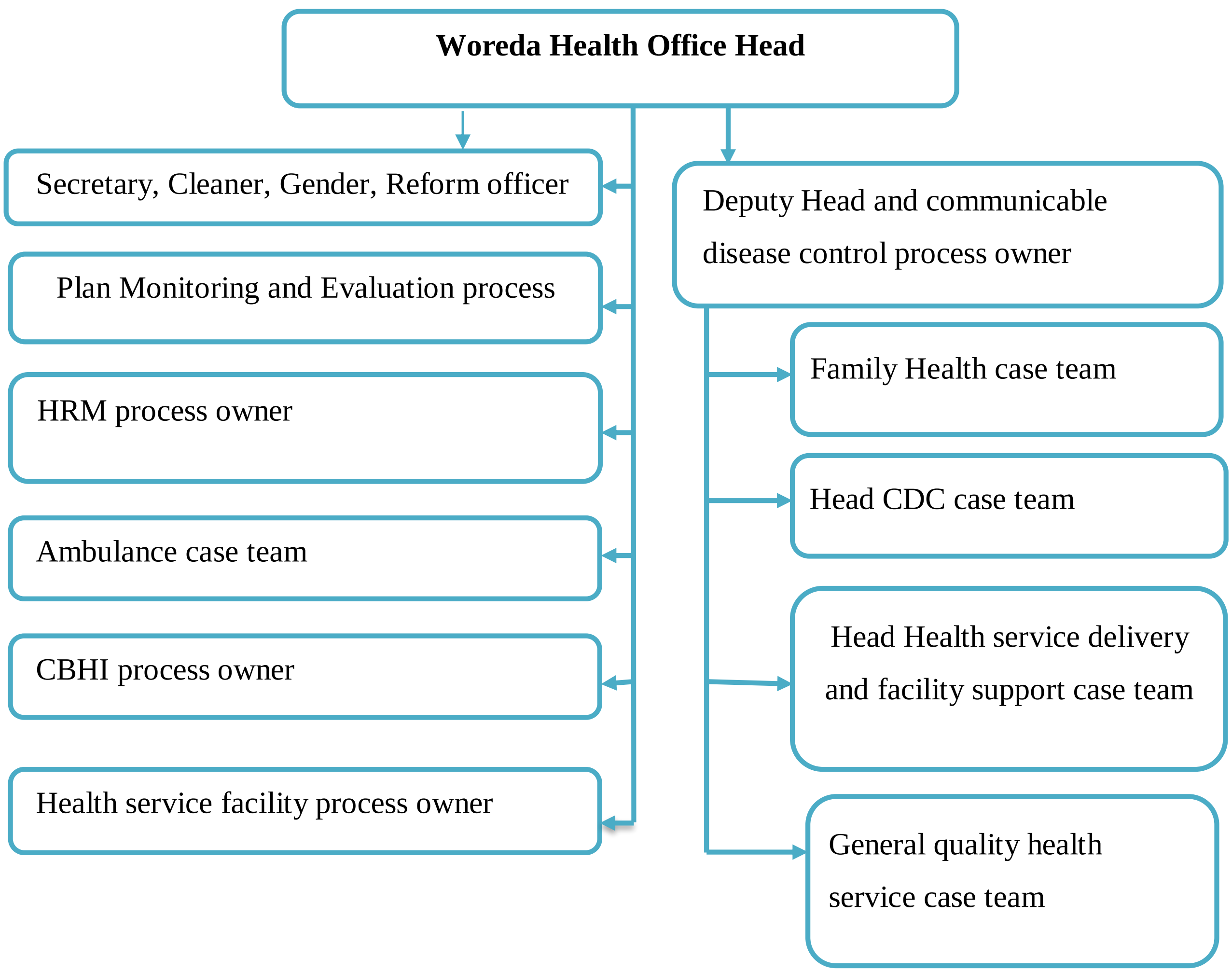


Figure 4.1-4: Organizational structure of Gindeberet Woreda, Oromia, 2017/18.

Health facilities and their services:

The Woreda has one Woreda Hospital, two type “B” functional health centers namely Kachise, Muka dima, and Four type “C” health centers, Culuxe, Kare dobi, Gura jarjara, Abuye rogee and thirty-two health posts in the Woreda. All the health centers were giving both inpatient and outpatient services. There were no health centers that provide ART service in the Woreda. The health service coverage of the Woreda 99.9% by Hospital 99.5 % by health center and 99.9% by health post. Estimated from, one Woreda Hospital, Six functional health centers and 33 health posts. Only hospital provides ART follow up services. There were six health centers with average of 5 satellite health post under their catchments. Among 6 Woreda health centers 5(83%) health center had gravel road (all weather type road) transportation access to Woreda (kachise). Among 32 health post there were 12 (38%) had all weather and 20 (62%) had only dry season road transportation access to Woreda (kachise).

Table 4.1-8: Types of health facility found in Gindeberet Woreda, Oromia, February 2018.

S.no	Type of health facilities		Number of health facilities
1	Hospital(Woreda Hospital)		1
2	Health Center		6
3	Health posts (HPs)		32
5	Pharmacy		0
6	Drug stores		2
7	Rural drug venders		1(Private HF)
8	Clinics	Primary	8(Private HF)
		Medium	0
		Higher/Specialized	0
Total			50
Type of Health facilities		National Standard ratio	Gindeberet Woreda Ratio
Hospital to Population ratio		1:100,000	1:142,440
Health Center to Population ratio		1:25,000	1:23,740
Health post to population ratio		1:5,000	1:4451
Physical health service coverage			99.8%

Source: Gindeberet district health office, 2017/2018.

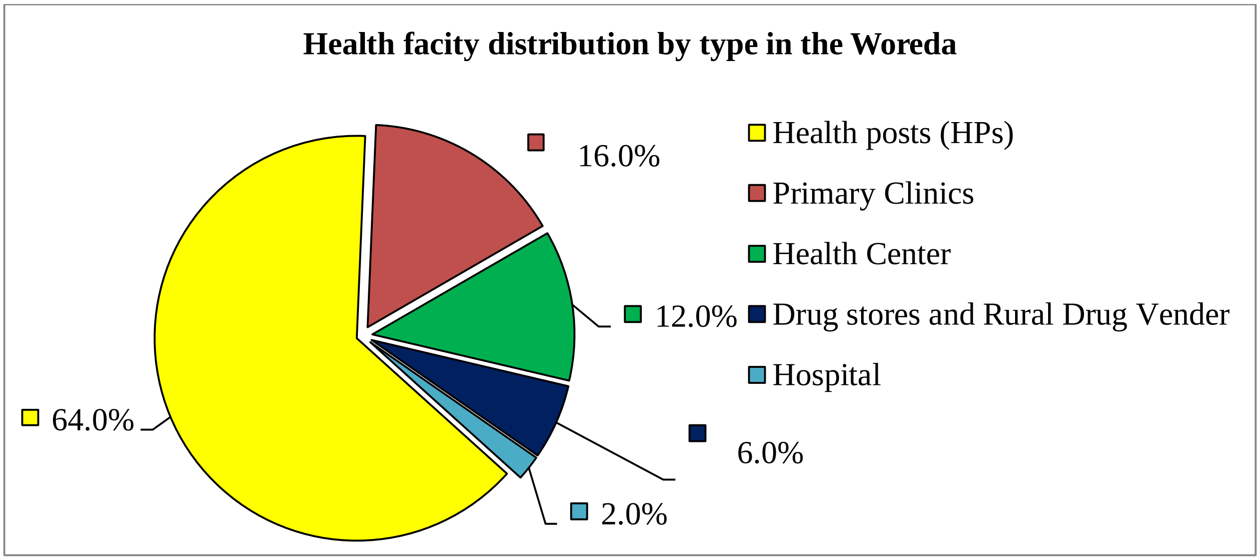


Figure 4.1-5: Health facility distribution by type Gindeberet Woreda, Oromia, Feb, 2018.

The Woreda Health coverage were 99.8% by consisting about 64% of health facilities is Health post, followed by 16% non-governmental primary clinics and 12% of health center in the woreda.

Table4.1-9: Proportion of Health facility with water supply, electric power, telecommunication, road access Gindeberet Woreda, West shoa Zone, Orimia Region 2018.

Facility type	Total number of HF in the Woreda	Number of facilities with			
		Water supply	Electricity Power	Telecommu nication service	Road transportation access to Woreda (kachise)
Hospital	1	1(100%)	1 (100%)	1(100%)	1(100%)
Health Center	6	3(50%)	5 (83%)	6(100%) Mobile	5(83%) gravel road
Health Post	32	0	0 (0%)	32(100%) mobile	12 (38% all weather), 20(62% only dry season
Total Health facilities	39	4(10.25%)	6(15.38%)	39(100%)	18(46.15%)

Among total number of health facility in the Woreda only 4(10.25%), were access to water supply, 6(15.38% were with electric power supply and 18(46.15%) were with all season access road transportation to Woreda capital.

Table 4.1-10: List of health centers with their respective number of catchment health posts Gindeberet Woreda, West Shoa Zone, Orimia Region 2018.

S.N	Name of health center(Catchment)	Type (A,B,C)	Number of health posts supported by the catchment
1	Kachise	B	6
2	Muka dima	B	5
3	Culuxe	C	5
4	kare dobi	C	4
5	Abuye roge	C	5
6	Gura jarjara	C	7

Of six health center in the Woreda, two of them are type “B” with 11 respective health post supported by their catchments and majority of the health facilities were type “C” Health center with 21 Health post supported by their catchments. On average there were 5 atchement health posts under oene health center.

Cold chain system

Cold chain management system is essential for vaccine efficacy and prevents the occurrence of vaccine preventable Disease. In Gindeberet Woreda all health centers (Six) and three health posts have functional refrigerators. All these refrigerators are working with both kerosene and electricity power. Except one all refrigerators were functional.

Primary health care unit

Primary health care unit is a system designed by Ministry of Health to enhance the linkage between Hospital, health center and health posts. In this system all health center staff is expected to support technically the health posts under their catchment. According to the principle of primary health care unit one health center should be included at least five satellite health posts under it based on the availability of health center in the Woreda. The referral linkage also the main core process of the system.

Health indicators and vital statistics

Health indicators and vital statistics are crucial for estimation of the Woreda’s or country’s development. Females in the reproductive age group (15-49 years) were estimated about 31,479 (22.1%) and non-pregnant women were estimated to be 25,639 (18%) of the total population in the Woreda. Children <1 year of age constituted about 4,416 (3.2%) and children <5 years of age constituted about 23,360 (16.4%) of the total population. Vital statistics like total death, total births, less than 1 and < 5 years’ child deaths were not recorded in the Woreda.

Table 4.1-11: Population and Vital statistics in Gindeberet Woreda, West shoa Zone, Orimia Region 2018.

S.no	Indicators	Number	Percent (%)
1	Total population	142,440	-
2	Male	70,793	49.7%
3	Female	71,647	50.3%
4	Urban	11,395	8%
5	Rural	131,045	92%
6	Total live births	4,985	3.5%
7	Under 1 years old	4,558	3.2%
8	Under 5 years old	23,360	16.4%
9	Women 15- 49 years old	31,479	22.1%
10	Pregnant women	5,270	3.7%
11	IMR/1,000	No data	-
12	Neonatal Mortality Rate	No data	-
13	Under 5 Mortality Rate	No data	-
14	Maternal Mortality Rate	No data	-
15	Crude Birth Rate/1,000	No data.	-
16	Crude Death rate	No data	-
17	Average House hold size	4.3	

Mothers and Child health services

Vaccination status:

Immunization is one of methods used in disease prevention and control in cost effective way .it is process of inducing immunity against specific disease. The expanded Program on Immunization is focused on vaccine preventable diseases. Currently it reaches about 10 diseases vaccine. Woreda health department and health facility collaboration both static and outreach vaccination services was conducted. Among annual 4,803 targeted populations the vaccination coverage for children under one years of age was 89.2% for BCG, 100.2% for Penta one, 96.3% for Penta three, 100% for PCV one, 96% for PCV three, 96% and 85%, for measles vaccine and fully vaccinated respectively. Among total targeted 4,803 under 1-year children, 1,094(22.8% of them were protected at birth by which, their mother was vaccinated two or more doses of TT vaccination during their pregnancy by three or more doses before she gives birth. Of 25,789 targeted non-pregnant women only 1,739 (7%) were vaccinated for TT2+ during 2017/2018.

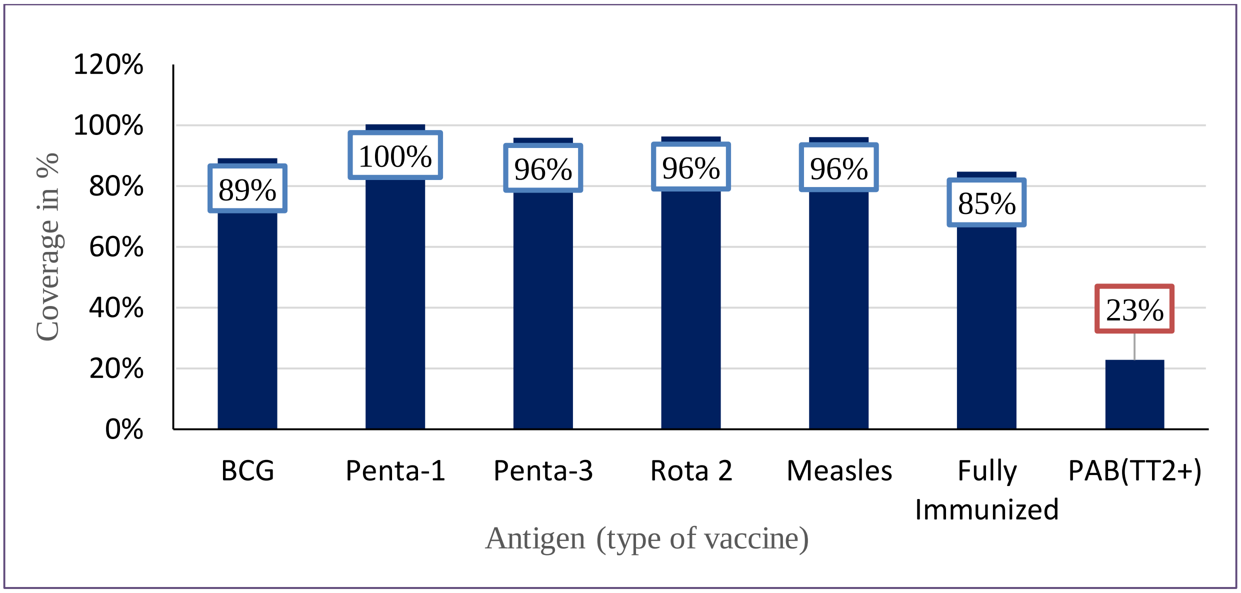


Figure 4.1-6: Vaccination coverage of under 1 year children in Gindeberet Woreda, Oromia Region, 2017/18.

Maternal health services status:

Antenatal care (ANC) has been found to be effective in the treatment complication that raised after confirmation pregnancy. it enables in early identification and treatment of anaemia in pregnancy, hypertensive diseases in pregnancy and the management of sexually transmitted diseases (STDs). Antenatal care (ANC) from a skilled provider is important to monitor pregnancy and reduce morbidity and mortality risks for the mother and child during pregnancy, delivery, and the postnatal period (within 42 days after delivery) (7).

In 2017/18 among 4,803 targeted ANC service achievements, at least one visit was 3,592 (75%), but at least 4 visits were 2,839 (70%). Proportion of skilled delivery was 2,190 (46%) and 2,214 (46%) of early post-natal service were provided; family planning acceptance rate was 15,136 (59 %) (see below table). Almost all achievements of mother Health service were low, which were 59%, 75%, 70%, 46%, and 46% of family planning, 1st ANC, 4th ANC, Institutional delivery and early post-natal care service respectively. This may be due, low awareness of the community and lack of transportations to health facility, shortage of drug, medical equipments and weak program based (maternal Health service) monitoring and evaluation conducted by Woreda health office for health facilities.

Table 4.1-12: Coverage of mothers' health services Gindeberet, West Shoa Zone, Oromia region, Ethiopia, 2017/18.

S.No	Service Type	Target	Achievement in Number	Coverage in Percent (%)
1	Family planning (CAR)	25,789	15,136	59
2	First Antenatal Care (ANC 1st)	4,803	3,592	75
3	Fourth Antenatal care (ANC 4th)	4,083	2,839	70
4	Institutional delivery	4,803	2,190	46
5	Post-natal care service (PNC)	4,803	2,214	46
6	TT2+ for pregnant mother	4,803	1,094	22.7
7	TT2+ for Non pregnant mother	25,789	1,739	7

Water supply and sanitation Status:

Depending on the data obtained from Gindeberet Woreda Water Resource and sewerage Office, among total rural population of the Woreda only 14% was supplied with potable water. In this Woreda, there are16 protected spring, 14 unprotected spring, 11 protected well, 56 stand pipes of water sources in 2017/18.

Latrine coverage and utilization status:

Among 29,675 households, about 19832(66.83%) were contruct latrine in which about 9,863 (32.2%) improved and 9,969 (33.6%) are unimproved latrine in 2017/18. The latrine utilization rate in the Woreda was 61%. There were 9 (28%) free from open defecation (ODF) kebeles in the same year in the Woreda, other two villages of the Woreda are on progress to become open defecation free.

Health education status:

Health Education has a crucial role on prevention and control of communicable diseases. In the Woreda Health education was given at health facilities by health professional at morning and afternoon time and house to house by health care providers and the health extension workers (HEW) mainly on the priority health problems of the Woreda i.e. Communicable disease, personal & environmental hygiene, latrine preparation and utilization to enhance the health care seeking behavior of the community.

Ten top leading causes of outpatients visit (Morbidity)

Acute febrile illness and pneumonia is a top leading cause of outpatient morbidity in adults and pneumonia and diarrhea is among five top leading pediatrics morbidity in the Woreda, which is account about 3,304 (17.10%) and 3,112(16.11%) of adult and 3,561 (36.2%) and 2,597 (26.4%) pediatrics cases respectively in 2016/17. Acute upper respiratory infection, Helminthiais and Diarrhea are among top ten diseases that cause outpatient morbidity in the Woreda as illustrated in figure below.

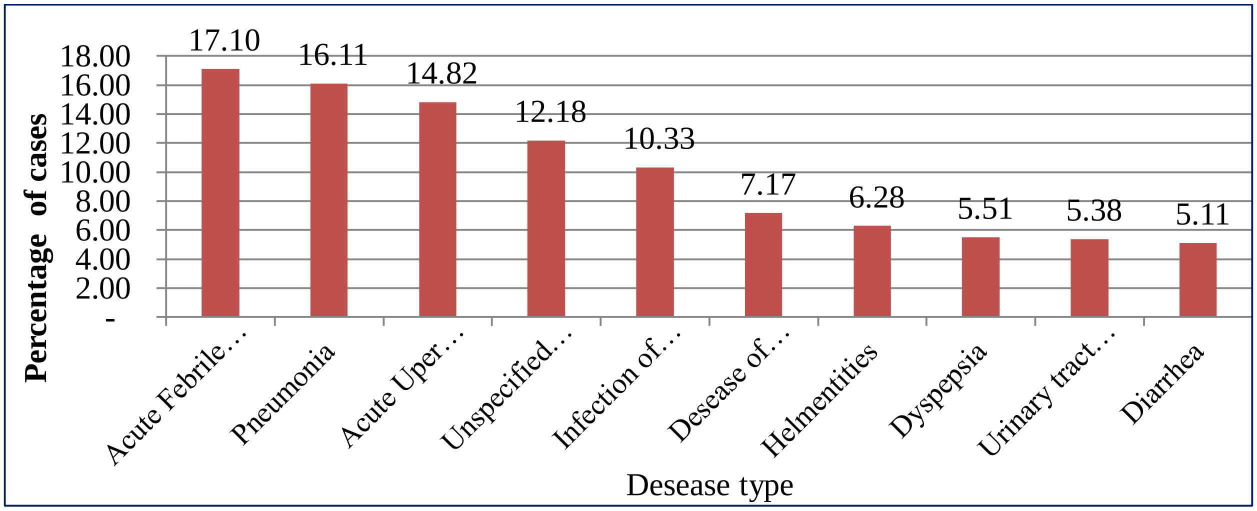


Figure 4.1-7: Top 10 causes morbidity among Adult outpatients department visit Gindeberet Woreda, West Shoa Zone, Oromia, 2016/2017.

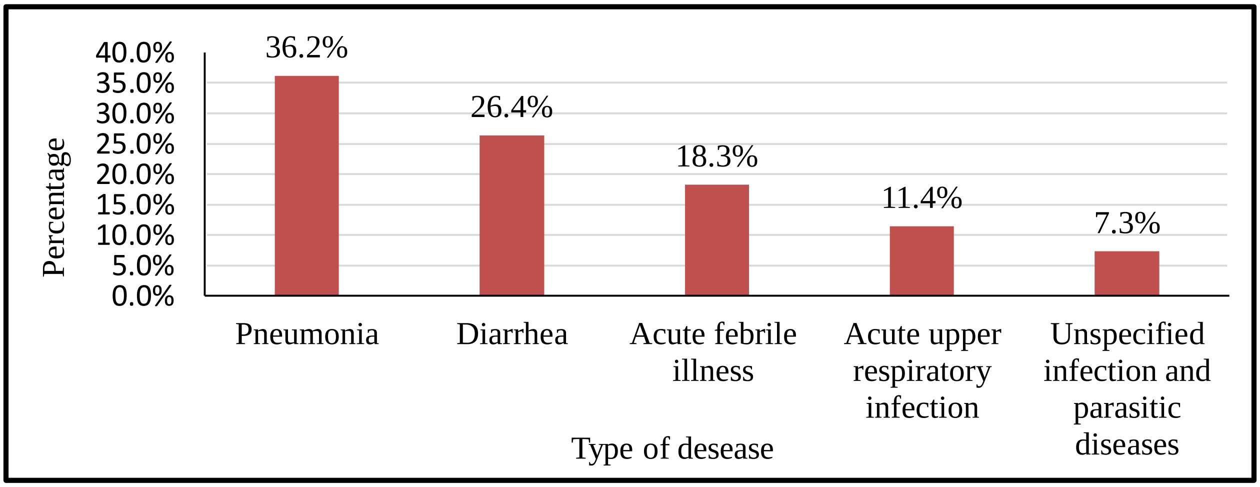


Figure 4.1-8: Top five causes of under 5 outpatients department visit in Gindeberet Woreda, Oromia, Ethiopia, 2016/2017

Endemic diseases

Malaria

Malaria was prevalent throughout the year in Gindeberet Woreda and there was all 21 kebeles are Malarious with 7 Kebeles hot spot malaria prevalent. Among total woreda population 80,944(60%) population are at risk for malaria. Since 2016 until 2017/18, all households in the malarious kebeles (50,196) were supplied with ITNs (99.8% in coverage). But, there is no clear data on utilization coverage of ITNs among supplied households in the Woreda. Indoor residual spray (IRS) was done for 7 kebeles with 4,232 houses in 2017. Total 329 cases of malaria with no death were reported in the same period. During the year there was shortage of malaria supplies such as Coartem, Rapid diagnostic Test kit (RDT) and lab reagents in the Woreda. There was high malaria transmission in 2013 and there were the decrement observed in 2017 respectively in the Woreda, this may due to increased ITN and indoor residual spray (IRS) Coverage.

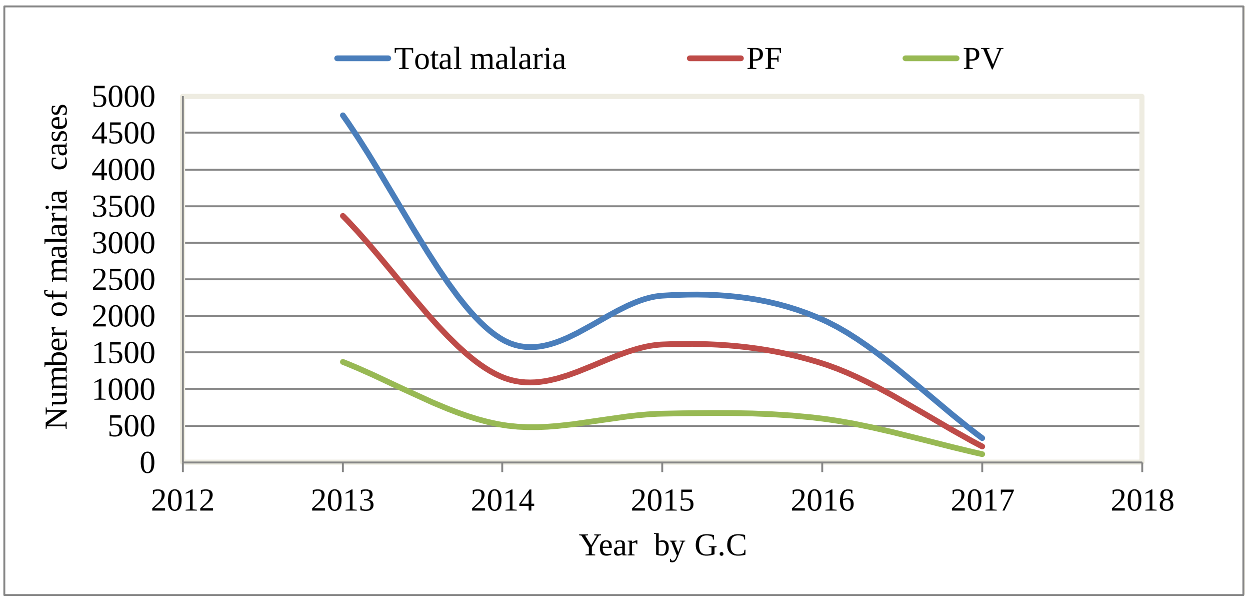


Figure 4.1-9: Trends of Malaria in Gindeberet Woreda, West shoa Zone, Oromia Region, Ethiopia, 2013-2017.

Tuberculosis and Leprosy:

Total 114 tuberculosis cases (All form of tuberculosis) were reported from health facilities to the Woreda in 2009 EFY. Among the total 114 all forms of TB cases about 57(63%) PTB negative, 140(27%) PTB positive and 11(5%) extra PTB. The TB detection rate of the Woreda was 23% with 97% and 100% of TB cure rate and TB treatment success rate respectively. There was no TB defaulter and deaths of TB patients in the Woreda. There were no MDR Tuberculosis patients in the Woreda in the study period. Among 114 TB detected 57(50%) of TB patients were screened for HIV. There were no leprosy cases detected in the Woreda.

HIV/AIDS:

About 7,388 people were screened for HIV/AIDS in 2009 EFY. Among these clients, there is no confirmed as HIV test positive result. However, there was no data for HIV prevalence and incidence. There were About 273 HIV patients currently on ART service in the Woreda. None of health centers provides ART service in the Woreda. But, the service was provided by the Woreda Hospital. Community conversation is undertaking in all kebeles of the Woreda to enhance awareness of the community on prevention and control of HIV/AIDS. The Woreda has planned to provide PMTCT service for 4,803 mothers but achieved only 3,265 (68%) by 2017.

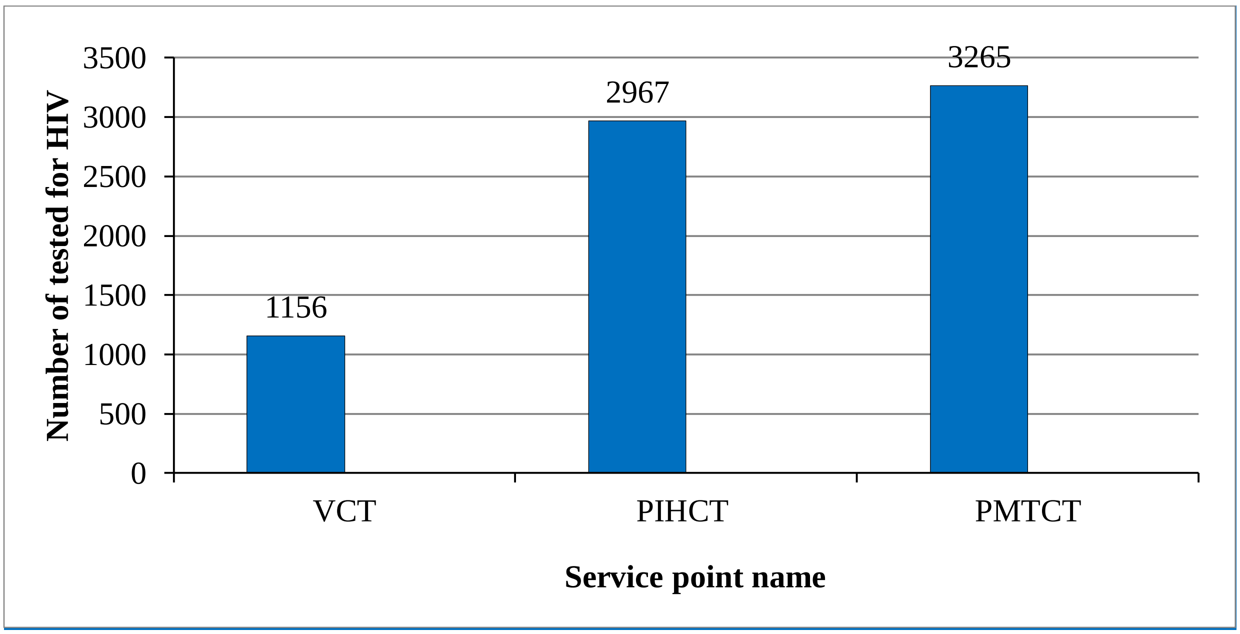


Figure 4.1-10: Number of HIV testing by service point tested in Gindeberet Woreda,West shoa Zone Oromia, 2017/18.

Among total 7,388 tested clients, 1,156(15.6%) of them were tested based at VCT, 2,967(40.15%) were tested at PICT and 3,265(44.20%) were tested at PMTCT service point with zero positivity rate in all service points.

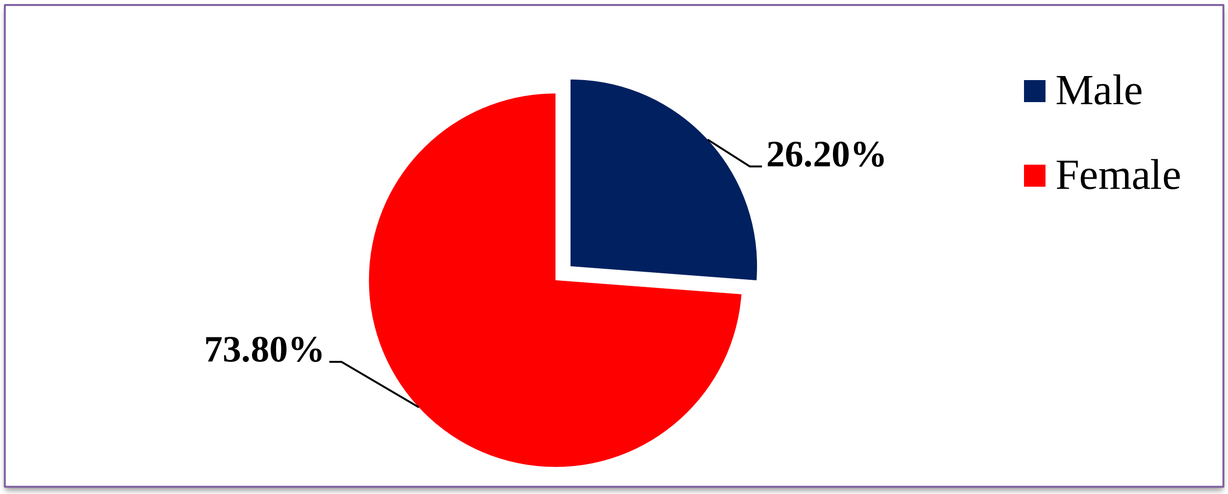


Figure 4.1-11: proportion of HIV testing clients by sex in Gindeberet Woreda, Oromia, 2017.

Among total tested clients of 7388 at different service delivery facilities in the Woreda, majority of 5,452 (73.80%) tested were female and 1,936 (26.20%) were male. The reason for more tested among females were due to PMTCT service in the woreda doesn't include Partner testing during ANC service visite.

Severe Acute Malnutrition (SAM):

Severe acute malnutrition is not major public health problem of the Woreda. There was thirty-one OTP and no SC sites were established in 2017/18. One hundred twenty-three new admissions were reported at OTP in the Woreda. There were CBN programs working on nutritional activities in 13 kebeles and there was no TSF (Targeted Supplementary Feeding) program in the Woreda 2017/18.

Outbreak and other disaster situations:

In this Woreda, there are no any outbreak or disaster situations that happened/occurred within the last two consecutive years.

Budget allocation for Woreda health office:

Among total 41,500,334.10 budget allocated for the Woreda about 8,120,970.00 ETB (19%) of woreda budget were allocated for Health (Woreda Health Office, including health facilities) for the year 2017/18. During the same year, 612,353.40 ETB sourced from different donors were distributed to this Woreda from Regional Health Bureau for different activities such as prevention and control of, malaria, HIV/AIDS TB, PHEM, hygiene and sanitation promotion, supplemental immunization activities, nutrition programs and others.

Human Resources:

In this Woreda, 161 health professionals, 63 Health Extension Workers and 164 supportive staff have been working in the Woreda health office and different governmental and nongovernmental health institutions. There were 16 physicians and 4 EOS (Emergency Obstetric surgery) working in Woreda hospital. The HEWs to population ratio was almost equal to the current oromia Regional status standard. But as compared to national standards of health professionals to population distribution ratio, by which in almost all pop to Health professional ration were achived national target. But Health officer ratio yet not met the national standard.

Table 4.1-13: Distribution of health workers in Gindeberet Woreda, West shoa Zone, oromia Region, Ethiopia, 2017/2018

S/N	Category	Governmental	Non-Governmental	Total Employee of the Woreda Health Office	National standard ratio professional to Population	Gindeberet Woreda Ratio of professional to Population
1	Physicians	16	0	16	1:10,000	1:8,778
2	EOS	4	0	4	-	1:35,111
3	Health officers	10	0	10	1:10,00	1:14,044
4	Nurses (all type)	85	15	100	1:5,000	1:1,404
5	HEWS	63	0	63	1:2500	1:2,229

Essential drugs and other supplies:

The Woreda reported that there was shortage of essential drug supply and diagnostic kits are not easily assessable and purchased and not supplied by PFSA (Pharmaceutical fund and supply Agency) as needed. The Woreda complain PFSA supply the drug which had recent Expiry date and it lead us for the shortage of drug and lab reagents in the Woreda.

4.1.5 Discussion

Population pyramid in age structure show that large number of children were under 14 years of age in the future it can be resulted for high population fertility rate and also it shows that male was tend to long live than female this may be due to low maternal health coverage in the woreda and low health seeking behavior among female. The Health center to population ratio is 1: 1:23,740 which is above the regional and National standard. The potential health coverage of the woreda were reached 99.8%.

Acute respiratory infection (ARI), fever, and dehydration from diarrhea are important contributing causes of childhood morbidity and mortality in developing countries (WHO 2003). This study shows that leading cause of outpatient visit is communicable disease in outpatient department. Acute febrile illness is leading outpatient visits at adult outpatient visited and among top three leading under 5-year outpatient department. Pneumonia and Acute upper respiratory, Helminthiais and diarrhea are among ten top diseases in the woreda, and accounted for 3,112 (16.11%), 2,864 (14.82%), 1,214 (6.28% and 987(5.11%) respectively. But, there was no death reported due to those diseases in the past one year, it may be because of expansion of health service to the community levels and improved clinical diagnosis and existence of the referral linkage within health facility in different stages with ambulance services.

Pneumonia (16.11%) was taking the 2nd rank in the adult outpatient and leading causes of morbidity in (36.2%) in pediatrics followed by diarrhea accounted 2,597 (26.4%) Acute upper respiratory infection disease in adult OPD (14.82%) and (11.4%) in pediatrics OPD which are placed in the third and fourth level adult and pediatric OPD respectively. Acute febrile illness is being the leading causes of adult OPD and 3rd level in Pediatric OPD visits; this might be due to endemic of fever like diseases in the Woreda. Therefore, treatment of acute febrile illness should be supported with specific laboratory diagnosis to rule out malaria, typhoid fevers or other diseases with fever like symptoms to minimize the unspecificity of AFI case diagnosis.

There were sustainable immunization coverage immunization programs in the year targeted to children less than one-year-old to prevent suffering from vaccine preventable diseases. This might be due to increased visits of the health facilities and the expansion of the vaccination post until health post with equipped EPI logistics (i.e Solar instalasion for HF). The status of measles immunization was 4,284 (96%) with 3775 (85%) for fully immunized in under one year children which seems well matched with absence of measles and vaccine preventable cases/outbreak, also there were no food shortage/malnutrition cases in the Woreda. Disite of PCV three, vaccination coverage was 96% but pneumonia were among top five the leadind morbidity in ther children. This may raise the question on vaccination program in the woreda.

Antenatal coverage is an indicator for maternal access for health care during the pregnancy and used to early identification and preventing pregnancy related outcomes when received during early the pregnancy and continued through delivery. The fourth antenatal care visit is an indicator of quality and use of health care during pregnancy. Based on this four focused antenatal care visits increases the likelihood of receiving effective maternal health interventions during ANC visits. Despite of ANC is an MDG indicator Ante-natal follow up performance in the Woreda was quite low, which was 3592 (75%) for 1st and 2839(59%) 4th ANC. This achievement was less than EDHS 2016 report which is 62%. Institutional delivery also low only (46%), however the achievement is above the 2016 Ethiopian DHS report; which was 28%, but below the 2016/2017 unpublished Regional annual report which is 82%. This low performance may be due to lack of awareness of mothers & traditional malpractices by the community, poor management of health workers at health facilities during ANC and lack of transport to Health facility. Almost all achievements of mother Health service were low by which 59%, 46%, and 46% of family planning, skilled Delivery, Early post-natal care service when we compared with regional report 2017.

Tetanus toxoid injections are given during pregnancy to prevent neonatal tetanus, a major cause of early infant deaths in many developing countries (9). In this Woreda 22% TT2^{+} vaccine were reported this was low when we compared with 2016 EDHS and National Expanded Program on Immunization, 2014 Report which is 48 and 80 percent respectively (15).

Tuberculosis case detection rate of the woreda was 23% which lower than the national case detection rate of 2017 which was 58%, and below 70% which is recommended by WHO. Generally, in 2017, there were a total of 114 all forms of tuberculosis 80/100,000 population cases were diagnosed and reported in the Woreda which is below 192/100,000 Estimated TB Incidence in 2015.

Ethiopia is among the countries extensively affected by HIV. In addition to the overriding hetero-sexual transmissions, vertical transmission from mother to child accounts for greater than 90% of pediatric HIV cases. Among 7,388 clients tested for HIV 5,452 (68%) of them were female. This may show that there was poor awareness creation by health professionals particularly during PMTCT services for partner testing to maximize male testing. HIV incidence of Woreda is not known. Among the total clients registered at OPD level (34,882), only 12 % of them were screened for HIV particularly at VCT and PICT service which is below the expected 85% with regional plan. The explanation for this may be low initiation and commitment of health workers who worked at OPD rooms or the refusal of clients for HIV testing due to poor awareness. Among total planned HIV screening for pregnant mother 4803 (68%) of targeted were screened for HIV and know their result before delivery which is very low when compared with regional target 100% by 2017. Prevalence of HIV among women was 0%, which is low as compared to 1.9% of the EDHS 2011 (8). The proportion of pregnant women counseled and tested for PMTCT was 68% which is low when we compared with national which is 74%. Overall positivity rate among HIV tested individual was 0% this is low when compared with 1% of Regional prevalence (8).

All Vital statistics like total death, total births, <1 yrs and under five deaths were not recorded in the Woreda. The latrine coverage and utilization rate in the Woreda was 66.8% and 61% respectively. The latrine coverage of the Woreda where low (66.2%) when we compared with EDHS (2016) report indicates that only 32.3% of the Ethiopian population didn`t have latrine. Helminthiais and Diarrhea are still in the lists of top 10 leading causes of morbidity in both adults and under 5 children OPD. This suggests that, there were improper utilizations and low awareness of sanitation and hygiene practices in the Woreda.

Hand hygiene is the most important measure of prevention and control of infection and can reduce the burden of diseases. However due to low access of water supply in the school, children cannot wash their hands exposing/risking them for fecal-oral diseases. There was low school with water and sanitation facilities which is 24% and 22 % for water supply and functional latrine respectively, which is very low when compared with regional coverage or target 85%. Also poor water quality monitoring by WorHO. Among total rural population of the Woreda, 14% was supplied with potable water; this is low when compared with EDHS 2016 which was 65% (9). More than 80% of the Woreda population uses unprotected water source, this might contribute to the higher rate of intestinal parasites (Helminthiais) and diarrhea in the Woreda, which was 1214(6.28%) and 987 (5.11%) of the adult outpatient visits respectively. Factor in considering the accessibility of water sources is that the burden of going for water often falls disproportionately on female members of the household and may related to female school dropout.

As National target, one health center to serve 5 kebeles or 25,000 populations and one health post to be serve for 5,000 populations (5). However, the woreda met the national health institution proportion to population by health center and health post the population to Hospital ratio were not met yet in which one District hospital forced to be serve for more than 142,000 populations but the national standard was designed to be 1 hospital to serve for 100,000 populations. Regarding to health service infrastructure none of health posts have water and electric power supply and only 50% of health centers have water and electric power supply in the Woreda.

According to the Woreda Health departments, the main problems of the Woreda were low accessibility of the road especially during summer season shortage of health budget, delayed medical supplies with short expiry date from PFSA, Shortage of water and electric power supply for the health facilities, mainly for health posts and lack of office for Woreda Health, especially drug and medical equipment store room.

Limitation of the study

- Absence of mortality and birth records and reports in the Woreda i.e Lack of important health indicators such as: - IMR, CMR, CDR, CBR, and FR and baseline data.
- Absence of sufficient data due to failure of e-HMIS computer Lack of some data from Woreda office & absence of concerned bodies from their work place during data collection.

4.1.6 Conclusions

The main stay of woreda economy was agriculture. Only 10.25% and 15.38% Health facilities in the woreda were access to water supply and electric power supply. The health coverage was 100% with sated standard and the ratio health professional to population was lower in Health officer. Relating power supply, only 82% kebeles had no power supply and similarly 84.4 % of the population have no access to safe water supply. Health facilities were meets as the national target plan except in hospital to population ration (below than national standard). High school drop-out among adult (9-10 grade) about (11%). Acute febrile illness (AFI), pneumonia and AURTI are a top leading cause of outpatient morbidity in adult. Pneumonia, diarrhea and Acute Febrile illness are five top leading cause of pediatric OPD. Immunization service was performed well but there is problem in availing tetanus toxoid vaccination for eligible women below the national and WHO recommendation. Low maternal health service like; contraceptive acceptance rate (CAR), ANC and PNC, institutional delivery, which was less than regional coverage report. Tuberculosis case detection rate was very low and below the national and WHO recommendation. HIV test positivity rate were found to be very low (0.0%) and male clients test for HIV also found to be very low when compared to females. Latrine coverage and utilization was quite low which can be the source for feco-oral transmission of the diseases. Majority of Woreda population uses unprotected water source, this might contribute to the higher rate of intestinal parasites (Helminthiais) and diarrhea in the Woreda.

4.1.7 Recommendation

- Important health indicators and vital statistics should be organized at all levels. Appropriate handling on recording and data utilization should be strengthened.
- Health facilities should be equipped with water pipe, electricity supply, etc. for better quality health service.
- Sensitization (awareness creation) for community on the latrine preparation and utilization through expanded health extension programs.
- Give emphasis on tetanus toxoid vaccination in availing for eligible women.
- The Woreda health office should give emphasis for community awareness about safe delivery and should have proper records on births and deaths.
- AFI diagnosis should be supported by laboratory test at all level to identifiy the specific diseases.
- Tuberculosis case detection rate need serious attention and follow-up by the Woreda health office. Community TB cares and Community TB contribution for TB diagnosis should be strengthened.
- Targeted HIV counseling and testing should be implemented for better HIV case detection and expansion of ART site to health center other than Hospital in the Woreda.
- Improve the male partner's awareness, positive attitude and perception towards PMTCT service is through health education is mandatory.
- Strict follow up and continues support is needed to towards maternal health service and health extension programm.
- Regular monitoring and evaluation especially for services which was low in coverage and Providing training and capacity building for health care provider on identified gaps needed to improvements for the better health of the community.
- Improve water coverage and avail access to kebeles which has no current supply by Government, local and concerned stakeholders and NGOs.

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5 Chapter-V: Scientific Manuscripts for Peer reviewed Journals

5.1 Malaria Outbreak Investigation Darimu Woreda of Iluababora Zone, Oromia Region, Ethiopia, March, 2018

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Abstract

Background: Malaria epidemics are serious public health emergencies that have a major impact on health and the economy. The aim of this investigation was to verify and identify the determinants of the malaria outbreak in the Darimu Woreda.

Method: We define malaria cases as any person with fever or fever with headache with plasmodium parasites by slide confirmed with microscopic and RDT. Five years' malaria data was reviewed to set epidemic threshold level. Descriptive epidemiology and unmatched case-control study by 1:1 ratio conducted. Conveniently selected cases and community controls interviewed and structured questionnaire used. Data was entered in to Epi-info and analyzed by SPSS. Environmental risk factors were assessed.

Result: A total of 348 malaria confirmed cases with no death was identified during February to March 2018. P. falciparum was dominant species accounting for 91.7%. Alert threshold had been reached and crossed in end of February 2018. Highest peak was seen between epidemiological weeks of 9 to 12/2018. Age group ≥15 years was more affected (181) AR 17.2/1,000 population. Male case accounted for 52.7%. attack rate is high in Bena 2 Kebele 16.3 per 1,000 populations. Presence of mosquito Vectors/breeding site AOR= 5.54; 95%CI: 2.08-14.73, Unprotected dam for irrigation AOR = 4.78; 95% CI: = 2.09-10.93 and sick patient in the house hold AOR = 4.05; 95% CI: 1.48-11.09 are independent risk factors for development of the diseases. Protective clothing and always utilization of bed net was associated with lower odds of malaria (AOR: 0.17; 95% CI; 0.04-0.65 and AOR: 0.18; 95% CI; 0.04-0.80) respectively.

Conclusion and recommendation: Presence of mosquitoes breeding sites, unprotected dam for irrigation, and presence of sick patient in the house hold was independent risk factors for contracting malaria disease. Always use ITN's and protective clothes had protective association of contractive malaria. We recommend strengthen malaria surveillance system, identifying potential vector breeding site, proactive vector control, redistribution of the ITN's prior to malaria season and address ITN's utilization gaps.

Key words: Malaria outbreak, Risk factor, Case-control, Ethiopia.

5.1.1 Introduction

Malaria is a life threatening caused by infection of red blood cells with protozoan parasites of the genus Plasmodium inoculated into the human host by a feeding female Anopheline mosquito. There are five human Plasmodium species that can transmitted from person to person, e.i, P. falciparum, P. vivax, P. ovale and P. malariae. P.falciparum is the most prevalent malaria parasite in Africa and responsible for most malaria deaths(1).

Malaria epidemics are serious public health emergencies that have a major impact on health and the economy. World Health Organization estimates that, in 2016 about 3.2 billion People live in areas at risk of malaria transmission and caused 216 million clinical episodes, and 445,000 malaria deaths occurred globally. African Region accounted for 91% of all malaria deaths(2). Malaria is a major cause of poverty, the cost of malaria control and treatment drains African economies, slowing economic growth by about 1.3 percent a year (3). The problem of malaria is very severe in Ethiopia, Approximately 52 million people (68%) live malaria endemic areas in Ethiopia, in Oromia region 82% of the Woreda is malaria malarious and account for about 17% of Outpatient visits, 15% of admissions and more than 25% of hospital deaths (4). Our country ambition was to achieve malaria elimination within specific geographical areas with historically low malaria transmission near zero malaria transmission in the remaining malarious areas of the country by 2015, and eliminate malaria from Ethiopia by 2020 (5).

Since 1958, major epidemics of malaria have occurred at approximately 5-8 year intervals (6). In Ethiopia, populations living in areas below 2,000m above sea level are considered to be at risk of malaria(2). The overall malaria prevalence has decreased, but unpredictable outbreaks increasingly occur irregularly even though previously considered as "malaria free". Such outbreaks have disastrous consequences on populations (7). Malaria is mainly seasonal in the highland fringe areas. Ethiopia has achieved MDG targets related to malaria (8). But recently, the occurrence of malaria epidemics has become more common and the burden of malaria remain a major public health problem in the darimu Woreda. There were normal trends of malaria cases in the Woreda during the last five years. At the mid-last of February, 2018 unusual increment of malaria cases was reported from the Woreda to Iluababora zone. The aim of this investigation was to verify the outbreak and identify the determinants of the malaria outbreak in the darimu Woreda.

5.1.2 Methods

Study area

The outbreak investigation conducted in Darimu Woreda of Iluababor Zone in Oromia Region. Woreda have an estimated area covering 1,395.79 square kilometers and have two geo-climatic zones, Weinadega (Mid-land 2000-2500m altitude) which constitutes 54.4% and kola (low land <2000m) accounts for the remaining 45.6%. The larger town is Dopa. which is located 64 KMs away from Zonal town Iluababora (Matu) and 664 KM's to the South west from Addis Ababa and share border with West Wollega Zone in North, Alge Sachi Woreda in East, Bilonopha Woreda of Ilubabora zone in South and Kellem Wollega Zone in west. Water bodies such as River and streams are common in the Woreda, which serve as potential breeding site for the malaria. Potential health service coverage was 86%.

Study Period

The study was conducted from March 13 to April 5/2018.

Study Design

Descriptive Epidemiology

Malaria case was defined as an acute febrile illness with a peripheral blood smear positive for malaria parasite or a positive rapid antigen test in a resident of all Bena kebele of Darimu Woreda during this outbreak. The previous five years of malaria data was reviewed for 2013-2018 from darimu Woreda and catchment health facilities to set epidemic threshold level and compare with similar week of current year (2018). We compare the current year data with a third quartile method (2^{nd} largest number) during the previous 5 years to determine the epidemic. The current case trend line crossed the threshold levels in all Bena site kebeles. The number of malaria cases was collected from health facilities on daily and weekly basis. Facility based patient registration book was reviewed and house to house active case search was conducted to address all febrile cases. The magnitude of this outbreak was described by age, sex, kebele, week, month and year calculated using the 2017 forecasted census data as denominators. An epidemic curve was constructed. Community leaders, patients and health workers were interviewed to collect malaria relative qualitative information.

Analytical epidemiology

Unmatched case-control study was conducted to identify risk factors associated with malaria outbreak from March 13 to April 5/2018. Cases were selected based on the case definition; those people's neighbors with case with no fever for the last three months and healthy for the recent months were selected as community controls. Confirmed malaria case patients in 1:1 ratio basis were conducted. Controls were defined as having no malaria signs and symptoms for the last three months. A structured questionnaire was used to collect information about selected practices including sleeping and staying area during night, use of insecticide bed net, indoor residual spray, and presence of stagnant water or any other mosquito breeding area, travel history and presence of any artificial water holding containers close to home. Microsoft Excel, Epi-info version 7.2.1.0 and SPSS version 23 was used to describe the disease and analyze associated risk factors. The significance of risk factors for the outbreak was determined through bivariate and multivariate analysis by calculating Odds Ratio (OR) and 95% Confidence Interval (CI).

Sample size estimation & sampling technique

The cases and control were recruited by convenience sampling method irrespective of the variables. 1:1 case and control ratio was used to determine sample size. The formula for the estimation of sample size for an independent case control study was by assumption taken from previous study conducted in Afar (9). The assumption taken from the previous study indicates that the taking in account a 95% confidence interval (CI) (1.96), 5% level of significance (α), power of 80% proportion of controls exposed was 50% with odds ratio (OR) of 2.25 The sample sizes which were conveniently taken from each group can be determined by the Epi info version 7.2.1.0. Hence the proposed sample size was 112 cases and 112 controls needed for the study was 224.

Laboratory methods

To identify malaria parasite thick and thin smears with a 100 × oil immersion microscopy was conducted at Bena site health centers. Whenever they faced shortage of some reagents and during interruption of electric power Rapid Diagnostic Test (RDT) was also used in this health center and health post to identify confirmed malaria cases at community level during outbreak investigation and active case search.

Environmental assessment

Data was collected on the presence of mosquito breeding sites from the Woreda health office and health facilities. Selected case patients and community members were interviewed to collect qualitative information about presence of mosquito breeding sites close to their compound and near to home. Similarly, we visit the area potential mosquito breeding sites and potential presence of anopheles' larvae in

Bena 2 and 4 kelebe and stagnant water around irrigation dam Bena 1 kebele were verified.

Data collection methods and tools

A structured questionnaire using face to face interviewer administered to collect primary data on socio-demographic characteristics, clinical manifestation (for cases only), potential exposures (risk factors) like environmental data and use of malaria preventive measures were collected from both cases and controls. Discussing with relevant bodies (RRT), review of weekly data at different level (Zonal health department, Woreda health office and Health facilities), visit of the affected kebeles conducted. Community members on knowledge of malaria transmission and control measures was conducted during investigation the outbreak.

Data management and analysis

Data was cleaned and cheeked for completeness and consistencies, coded and entered in to Epi info 7.2.1.0 and transported into statistical package for the social science (SPSS) Version 23 for analysis and the result were organized, summarized and presented by using table, figure and text. Rate of malaria by age and sex were calculated by using forecasted 2017/18 G.C census data as denominators. Descriptive statistics (Univariate analysis or Frequency), simple cross-tabulations (Bi-variate) and Multi-variate analysis (logistic regression) by calculating Adjusted Odds Ratio and 95% Confidence Interval was done to describe and to determine the risk factors of the outbreak. Data collectors and supervisors were trained for half days on the data collection tools. The result was prepared and shared to Addis Ababa University/School of Public Health, Oromia Regional Health Bureau, Iluabora Zone health department, Darimu Woreda health office, and EFETP mentor, resident advisors and coordinator.

Data quality control

line list was used to describe malaria cases interms of time, place and person and all data completeness were checked before analysis. Orrentation was given for data collectros (investigation team) on data collection tools and techniques of interview with practical exersices.

Inclusion and exclusion criteria

Case: Any residents of the Bena site kebeles, who experienced symptom of malaria and agreed to participate.

Controls: Any residents of Bena site kebeles during the study who was a neighbour to a case and who did not develop signs and symptoms of malaria and agreed to participate.

New comers or a person who may not stay in the affected kebeles in the previous three weeks, Participants, unable to provide the required information due to different conditions; like extreme illness and absence of caregivers and refused to participate and did not fulfil the criteria were excluded from the study.

Ethical considerations

A formal letter was written from Oromia Regional Health Bureau to Iluabora Zonal Health Department, Support latter was written from the Zone to Darimu Woreda health office to investigate the outbreak, and the Woreda health office accepted that and a support letter was also written from the Woreda health office to the respective health facilities. The purpose of the investigation was briefed to the study participants, health professionals, RRT and kebele administrative before the deployments.

Case definition

Community case definition

Any person with fever or fever with headache, back pain, chills rigor, sweating, muscle pain, nausea and vomiting OR suspected case confirmed by RDT.

Standard case definition

Any person with fever or fever with headache, rigor, back pain, chills, sweats, myalgia, nausea, and vomiting diagnosed clinically as malaria.

Suspected: Patient with fever or history of fever in the last 48 hours and lives in malaria endemic areas or has history of travel within the past 30 days to malaria-endemic areas.

Probable: Any person with fever and one or more of major sign such as headache, rigor, back pain, chills, sweats, myalgia, nausea, and vomiting diagnosed clinically as malaria.

Confirmed: A suspected case confirmed by microscopy or RDT for plasmodium parasites (10).

5.1.3 Result

Descriptive Epidemiology

Darimu Woreda reported a total of 348 malaria confirmed cases during WHO week 7-14 (February 12-March 28, 2018). The baseline incidence rate for malaria prior to the outbreak was 2/1000 Population. During our study the incidence rate was 14/1000 Population with 0 case fatality rate.

Malaria cases by person

Of a total of 348 confirmed malaria cases. 199 (57.2%) and 149 (42.8%) were male and female (Table 1). The overall attack rate (AR) of the cases was 10.7 per 1000 populations with case fatality rate of zero in all age groups. The most common affected age group was age ≥ 15 years with an AR of 17.2 per 1000 (181) followed by children's < 5 years (7.8 per 1000 (50) least in children aged five up to fourteen years' age group (7.6 per 1000 (117) population) of all notified suspected malaria cases (see below table).

Table 5.1-1: Distribution of malaria cases by sex Darimu Woreda, Oromia Region, Ethiopia, 2018

Sex	Number of cases	Number of deaths	Percent (%)	Population	Attack rate/1000 population	Case fatality rate (%)
Female	149	0	42.8	16,091	9.26	0
Male	199	0	57.2	16,286	12.22	0
Total	348	0	100	32377	10.8	0

Table 5.1-2: Malaria attack rate per 1,000 pop and case fatality ratio by age group Darimu woreda, iluababora zone, march,2018.

Age group	Frequency	Percentage (%)	Population at risk	Age specific attack rate/1000 population	Case fatality ratio (%)
≤4 yrs	50	14.37%	6,379	7.84	0
5 to 14	117	33.62%	15,475	7.6	0
≥15	181	52.01%	10,523	17.2	0
Total	348	100%	32,377	10.74	0

Description of Malaria cases by place

Reported number of case was high at Bena 4 kebele 138/348 but attack rate was exceeded in Bena 2 Kebele, which was 94 (16.3/ 1000 population) when compared to other affected kebeles. Of the total 348 positive malaria cases, most of them were from Bena 4 (39%) followed by Bena 1 kebeles (28%) but Bena 3 were less affected kebele 5.7%, (3per 1000 population). The most dominant species and responsible for this outbreak were P. falciparum followed by p. vivax in all kebeles account for 91.7% and 8.3% respectively. Both malaria species (P. falciparum and p. vivax) were predominantly affect Bena 4 village 40.4% and 31% respectively.

Table 5.1-3: Malaria attack rate by kebeles and Age group Darimu Woreda, Iluabora Zone, Oromia Region, Ethiopia, 2018

Kebeles	Popn.at risk	Number of cases	Percentage%	Plasmodium species		**AR /1000 Popn.**
				Pf N (%)	**Pv N (%)**	
Bena 1	10,400	96	27.6	85(26.6)	11(37.9)	9.2
Bena 2	5,783	94	27	89(27.8)	5(17.2)	16.3
Bena 3	6,699	20	5.7	17(5.3)	3(10.3)	3
Bena 4	9,495	138	39.7	129(40.4)	9(31)	14.5
Total	32,377	348	100	319(91.7)	29(8.3)	10.7

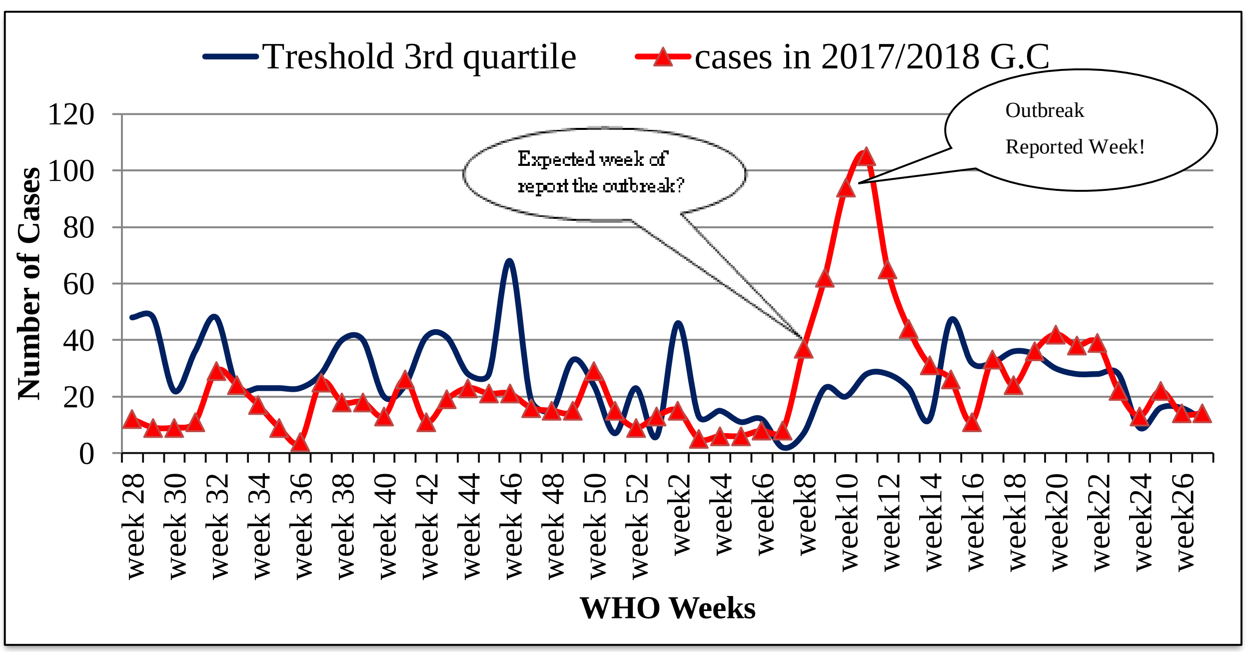

Figure 5.1-1:Trend of malaria cases crossing threshold level in darimu Woreda, Iluababora zone, Oromia region, 2018

Malaria cases were exceeded the threshold level in week Seven, peaks in week 11th and starts to decline after 12th week of march 2018 (between WHO week 7 to 14/2018) in Darimu Woreda. The highest peak was occurred in week 11 and the outbreak end up in week 15, 2018. The case was increased from an average of 18 cases in previous year (2017) to more than 56 cases per week of current year 2018 (Figure 1). Throughout this period the Woreda health team had initiate awareness campaigns and start to equipping health facilities with RDT, LLITN's and malaria drugs.

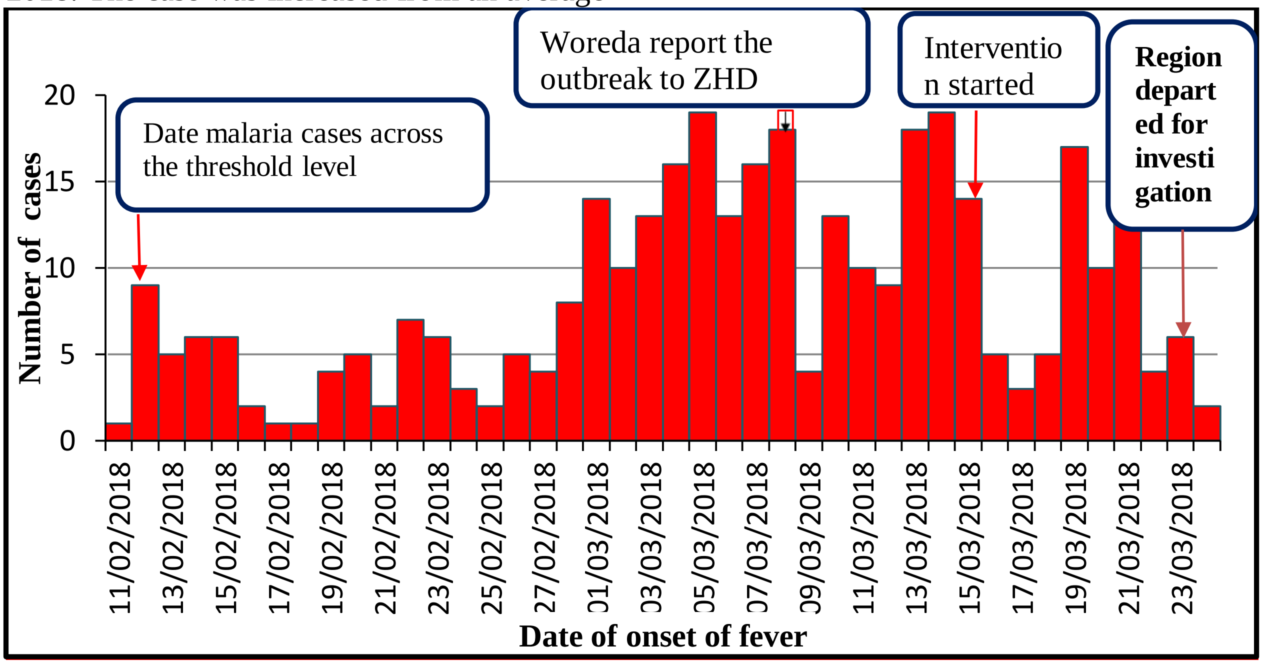

Figure 5.1-2: Confirmed malaria cases by date of onset in Darimu Woreda, Oromia, Ethiopia, from 13th February to 28th March 2018

Epidemic was started on February 12, 2018, but the Woreda health department was notified on March 08, 2018. The epi-curve showed that the outbreak is a progressive which is last longer than common source epidemics in which, one with multiple peaks with a possibility of person to person transmission. The high numbers of malaria cases identified during March 1st to 21th 2018. Zonal health department and field epidemiology residents departed lately to the outbreak area after 3 to 5 weeks of outbreak started. The interventions also started lately after one month the onset of epidemic (15, March, 2018. Late notification and initiation of the intervention may lead to increased risk of infection and results for the occurrence of secondary cases.

Epidemic preparedness and response

Woreda health department and the health facility had an epidemic preparedness plan and epidemic preparedness committee in place prior to the outbreak. But there is no risk mapping. epidemic preparedness committee was not functional and not full in all visited health facilities. IRS chemical was not available at Woreda level and in all visited health facilities.

Laboratory

From (Feb 12 to March 28, 2018) a total of 1,533 smear tests were done by microscopy at Bena health center and RDT for suspected malaria cases in catchment health posts. Among total 1,533 suspected for malaria about 446 (29%) of cases were confirmed for malaria and five cases (0.9%) treated clinically and about 319 (89%) case were P. falciparum and 51(11%) were P. Vivax.

Environmental assessment

We conduct environmental assessment in Bena 1 and 4 kebele of Birbir River and Bena 2 irrigation dam where the majority of cases were coming. Multiple sites of breakage irrigationwater bodies were identified which serve as breeding site for increase in vector breeding of anopheles' larvae. There were multiple small water collecting excavated holes, which resulted from dig for mining search which collect the water and serve as breading place for Anopheles mosquito, Larvae of anopheles' mosquito were found nearby Birbir river and irrigation dam. There was the illegal population settlement from deferent area to the place without popularity of local administrations to the area for gold mine search. The irrigation dam was difficult to drain and fill within a short period of time conduct active case search and LLINs utilization practice at HH level. Majority of HH was new settlers and they don't have bed net in their house. But among those had LLIN 12.1% (17) of the HHs hanged the LLIN's in their ceiling directly to the bedding while the rest were utilizing for other purposes and put other places in the house. IRS was not performed for the last one year in 50% HH of visited.

Public Health Interventions

We identified Mosquito breeding sites more than 1,500 ITN distributed, draining and disturbing stagnant water at Irrigation site 273 volunteered peoples participated, health education was provided at school, health facilities, and community level on control and prevention method. Health professionals were mobilized and assigned to affected kebeles for active case search from house to house and early diagnosis and case management at the community and health facility level

Analytical Epidemiology

In order to identify the risk factor unmatched 112 malaria cases and 112 community controls total 224 study participants interviewed from four kebeles (Bena1, 2, 3 and 4) of Darimu Woreda. Of the 112 infected individuals, 102 (91%) and 10 (9%) were diagnosed with P. falciparum or P. vivax malaria respectively. Demographic characteristics of study participant's result show that; of one hundred twelve cases 68% were between 15-59 years' age group followed by 26.8% of 5-14 age group. The sample contained more Females than Males (56.3%) Vs (43.7%), Majority of case 53(47.3%) were unemployed followed by 40(35.7%) of farmer's/pastoralist.

Interims of family size majority of case (87.5%) and control (91.1%) participants were from a family with less than 5 members and about 54.4% (N=122) households, (33% case households and 67% control households had at least one functional insecticide bed net in their house. 102(91%) 10(9%) were diagnosed with P. falciparum and P. vivax. Majority of the interviewed cases 96(86.5%) were treated by Coartem and 10(9%) and 5(4.5%) were treated by chloroquine and Quinine tablet drugs. the mean age of Participants was 22.8(SD 13.7) years, case 24 (SD 14.79) controls 21.7(SD 12.5) respectively. The median age of both case and control were 20. Fever and Sweeting is the three predominant clinical manifestation accounted for about 106(95%), 94 (84), and 93(83%) respectively diarrhea and vomiting were less frequent clinical manifest

Table 5.1-4: Clinical manifestations among malaria cases in Darimu Woreda, Iluababora Zone, 2018. (N=112)

Symptom	Frequency's N (%)
Fever	106(95%)
Sweating	94(84%)
Headache	93(83%)
Anorexia	77(69%)
Weakness	74(66%)
Chilling and shivering	70(63%)
Vomiting	57(51%
Diarrhea	10(9%)

Table 5.1-5: Socio deographic and parasitological characteristics of study participants malaria outbreak darimu woreda, iliababora zone, Oromia region, Feburarly 12to march 24,2018. (N=224)

S.no	Variables	Categories	Frequency (%)	Case No (Col %)	Control No (Col %)	Estimated Odds Ratio	95% Confidence Interval	P-value
1	Age group	<5yrs ®	10(4.5%)	6(5.4%)	4(3.6%)			
		5-14 yrs	60(26.8%)	28(25%)	32(28.6%)	0.4	0.14-2.2	0.4
		15-59yrs	147(67%)	76(67.9%)	74(66.1%)	0.5	0.17-2.3	0.5
		>=60yrs	4(1.8%)	4(3.6%)	0(0%)	0.99	----	
2	Sex	Male ®	98(43.8%)	52(46.4%)	46(41.1%)			
		Female	126(56.2)	60(53.6%)	66(58.9%)	1.2	0.7-2.1	0.41
3	Occupational status	Student ®	35(15.6%)	19(17%)	16(14.3%)			
		Farmer & pastoralist	91(40.6%)	40(35.7%)	51(45.5%)	0.66	0.3-1.4	0.29
		Unemployed	98(43.8)	53(47.3%)	45(40.2%)	0.99	0.45-2.5	0.98
4	Marital Status	Married ®	92(41.1%)	50(44.6%)	42(37.5%)			
		Single	127(56.7%)	58(51.8%)	69(61.6%)	1.7	0.41-1.3	1.16
		Divorced &Widowed	5(2.2%)	4(3.6%)	1(0.9%)	3.3	0.36-31.3	0.29
5	Educational status	Illiterates	111(49.6%)	55(49.1%)	56(50%)	1.4	0.59-1.8	0.85
		Non formal	30(13.4%)	17(15.2%)	13(11.6%)	1.02	0.60.3.2	0.42
		Primary and above ®	83(37.1%)	40(35.7%)	43(38.4)			
6	Religious status	Muslim ®	213(95.1%)	103(92%)	110(98.2%)			
		other	11(4.9%)	9(8%)	2(1.8%)	4.8	1.0-22.7	0.48
7	Family size	<5a ®	200(89.3%)	98(87.5%)	102(91.1%)	1.4	0.61-3.4	0.38
		>5	24(10.7%)	14(12.5%)	10(8.9%)			

®: Reference group

Table 5.1-6: Bi-variate Vs multivariate analysis of risk factors for malaria outbreak Darimu Woredas, Iluababora Zones, Oromia, Ethiopia, February - March 2018.

Risk factors	Category	Cases (N=112) (Col %)	Control (N=112) (Col %)	Crude OR(95%CI)	Adjusted OR(95%CI)	Adjusted P-value
Presence of Mosquito vectors (mosquitoes breeding sites around the home or vicinity)	Yes	100(89.3%)	65(58%)	6.02(2.97-12.21)*	5.54(2.08-14.73)	0.001**
	No	12(10.7%)	47(42%)	1		
Presence of unprotected dam for irrigation	Yes	89(79.5%)	52(46.4%)	4.4(2.47-8.05)*	4.78(2.09-10.93)	0.000**
	No	23(20.51%)	60(53.6%)	1		
Presence of similar sick patient in the house hold	Yes	33(30%)	15(13.5%)	2.74(1.39-5.41)*	4.05(1.48-11.09)	0.006**
	No	77(70%)	96(86.5%)	1		
Have bed net in their home (household bed net possession)	Yes	38(33.9%)	84(75%)	0.17(0.09-0.30)*	0.35(0.08-1.47)	0.15
	No	74(66.1%)	28(25%)	1		
Wearing protective clothing	Yes	6(5.4%)	15(13.4%)	0.36(0.13-0.98)*	0.17(0.04-0.65)	0.01**
	No	106(94.4%)	97(86.6%)	1		
Always bed net utilization (Every night)	Always***	9(8%)	61(54.5%)	0.06(0.03-0.14)*	0.18(0.04-0.80)	0.02**
	Sometimes	25(22.3%)	16(14.3%)	0.70(0.33-1.47)	2.02(0.46-8.84)	0.35
	Never use + not have ITN [a]	78(69.6%)	35(31.3%)	1		

*Statistically significant at P-value <0.05, bi-variate analysis & multivariate, ****:** Statistically significant at P-value <0.05 multivariate analysis "1" indicate reference category for RF crude odds ratio (COR) and adjusted odds ratio (AOR).

multivariable binary logistic regression analysis show that, presence of mosquito vectors/ mosquitoes breeding sites around their homeAOR=5.54;95%CI:2.08-14.73), presence of unprotected dam for irrigation (AOR = 4.78; 95% CI: 2.09-10.93), presence of similar sick patient in house hold (AOR = 4.05; 95% CI: 1.48-11.09) more likely to have risk of malaria as compared to those don't have. While we visit affected kebeles mosquito's larvae was detected in unprotected dam for irrigations by naked eye. Protective clothing and always utilization of bed net was associated with lower odds of malaria (AOR: 0.17; 95% CI; 0.04-0.65 and AOR:0.18;95%CI;0.04-0.80) respectively. Having bed net (Household bed net possession) and Indoor residual spraying with Bendiocarb was not have statistical associated with lower odds of malaria (AOR: 0.35; 95% CI: 0.08-1.47 and AOR:0.63; 95% CI 0.27-1.49) respectively (Table 7).

5.1.4 **Discussion**

Several factors might be contributed for the occurrence of malaria outbreak. The magnitude of current malaria was higher than the past five years ago. The finding descriptive epidemiology analysis of this study revealed that existent of malaria outbreak based up on fact five-years malaria data or last one year of epidemiological records by comparing the current year data with a third quartile method (2nd largest number) during the previous 5 years and used to generate hypothesis on the causes (risk factor) of malaria outbreak in the area. however, there is no universal definition of a malaria epidemic, it is generally accepted that a sharp increase in which the disease is rare and disturbance of a previously existing epidemiological equilibrium and caseload exceeding the capacity of the existing health care facilities to handle it (11). The outbreak was occurred and excelled the threshold level at the mid-February, 2018 and end up at the end of March, 2018. In Ethiopia, a minor malaria transmission season occurs between Aprils to May following the February to March rains (12). In the area, the outbreak was last for more than one month (February 12 to March 28, 2018) this may be due to late conducted notification and daily newly migration of non-immune individuals and high number of population settlement regardless of popularity of any government body the area (Bena site kebeles) from different part high land area of the country for mining and agricultural works, which result in an increase the vulnerability of peoples to the malaria in the area. Fever, sweating and headache, are common symptom of case and diarrhea were less frequent clinical manifestation accounts only for 9%, this finding was similar with outbreak investigation in Afar region, fever and headache were the two predominant and diarrhea were less frequent manifestation (9).

This study revealed that high proportion P.falciparum in the study area, which is mostly deadly species accounts about 91%, this higher than those studies conducted many parts of the country (Ethiopia) (2,13–15). However it was less than study report from Somalia region Ethiopia and World health organization East and Southern Africa malaria Epidemiology report (16,17). This difference is may be due to high sensitivity of the malaria rapid diagnostic test which was commonly used in the study are and sometimes the clients who get cured from malaria have also the chance to be positive for malaria if tested by the RDT within 14 days of treatment and the altitude of the study area, climatologically difference (9,18). In Ethiopia, coexistence of both P. falciparum and P. vivax can create challenge in prevention, control and elimination of the disease (19). The antimalarial drug, Coartem® remains highly effective in the treatment of uncomplicated malaria, similarly in our study, majority of the cases (86.5%) were treated by Coartem®, this finding were consistent with the high prevalence of p.falciparum in the area and write treatment recommended by World Health Organization (WHO) and study result from Zimbabwe; artemesinin based combination therapy for the treatment of patients suffering from P.falciparum specious during outbreaks, and Artemesinin derivatives are effective in obtaining a rapid reduction of parasitaemiam (2,20).

In our study case were predominantly females were more affected by malaria than males, this may be due to, the sample contains more female and Ethiopian population had more females. Also females were more actively engaged on activities that expose them to mosquito bite such as; bathing, washing, planting, harvesting and mining work nearby irrigation site in the area. This result was consistent with finding in Zimbabwe and North West Ethiopia (20,21). In contrary to this, other study finding shows, being male to be associated with increased risk of malaria (22).the difference may be due to the study area and study design.

Several studies have found that malaria prevalence is particularly high amongst mobile young adults (15 years+) compared to under five children (7,22), consistently our study revealed that age groups between 15 to 59 years were more affected by malaria; the reason why malaria more affect the productive age group might be, due to adult interacting more with job seeking and malaria transmission peak coincide with the planting and harvesting season, and also it may be due to the practice of bed net use which were children under age 5 years are higher for use bed net among the general population (23).

Vectors control measures such as proper ITN's utilization, high IRS coverage and environmental management was not done well on the area. The analytical epidemiology result show that presence of mosquito breeding site and unprotected dam for irrigation are associated with contracting malaria, those that live closer to unprotected dam for irrigation had odds of 4.78 of contracting malaria as compared to those, that those away from such unprotected dam. Similarly the result was consistent with a study report conducted in Chipinge, Zimbabwe and Amhara Region, Ethiopia indicate that, staying within the radius of 3km from a river and dam was the major precipitating factor for breeding anopheles mosquitoes (20,24).

Person to person transmission can be one of malaria outbreak risk factors for malaria disease. Similarly, our study showed that, presence of similar sick patient in the home was risk factors for contracting of malaria. this result lined with study conducted in Ethiopian Somali Region (17). But wearing protective clothing was resulted associated with a lower risk of malaria, which is consistent with the study report from India (25).

Bed net possession and use is the commonest method of the prevention of malaria infection (25). The previous risk factor analysis by Yukich.J in Ethiopia show that, sleeping under an ITN did not appear protective against malaria (26), our study report did not support this finding directly. in this case control study one of the practice in human; always utilization of long last insecticide treated bed net (LLITN's) was associated with lowers the odds of malaria infection OR 0.18 (95% CI; 0.04-0.80, P.value = 0.02) which is similar with study conducted in Ethiopia, reported that ITN's were crucial factors to reduce malaria (27). Also we found majority of population control groups (54.5%) were use ITN always; which is similar with the WHO 2017 report and study conducted in Madagascar 55% (16,28), and lower than the study conducted Oromia Region in which large proportion of the population (91.7% of controls) slept under a net (6). the deference may be due to type, size and shape of LLINs distributed to the area; hard, short rectangular was not easy to use. ITNs utilization has been shown to reduce malaria case incidence rates by 50% and mortality rates by 55% (16). In our study having bed net in house was associated with reduce odds of malaria in univariate analysis, but not significant protective effect in the multivariate analysis, which is probably due to the similar level of net coverage in the community. The other possible reason was lack of association may be due to attributes to low awareness on use of ITN in the area which need effective behavioral change intervention and due to few house hold met the target coverage of every day sleeping under ITN in the area. This finding is lined with Study in Gambia ,North west of Ethiopia and Namibia, show that, a lack of association between ownership of ITN and Malaria (21,22,29). Moreover, study in Afar Region, Ethiopia has demonstrated the strong association between ITN coverage and reduce risk of malaria. Addition to this Poor community perception and awareness regarding to ITN is one of the main barrier to control and prevent malaria in Ethiopia (8). Yet ITNs continue to be an effective tool for malaria prevention, even in areas where mosquitoes have developed resistance to pyrethroids (16).

Indoor residual spray (spraying the interior dwelling walls with long lasting was also another vector control intervention (23). According to Woreda health office report about 75% of affected kebeles was covered by Indoor residual spray on the month of September 2017, which is not covered all malarious area and account for more than 6 months after spray, consequently it was not protective. Similarly; in our study IRS with Bendocarb was not associated with reduce the risk of malaria. The result was consistent with the study report from India and Namibia; demonstrate no association between IRS coverage and malaria (22,25). This may be due to few house hold had IRS in the previous six months and majority of population were newly settlers and not had a convenient house for spray. The other reason may be due the quality of spray, and coverage. Also, if the spray was more than 5 months IRS is insufficient to kill resistant mosquitoes (30). During house hold level visit, majority of HH were had LLIN's bed net but placed inappropriately and poorly utilized. Additionally, we observe a gap on data management, proper recording, reporting and monitor the trend of morbidity consistently at health facility level and also data analysis and interpretation were not conducted on weekly base by Woreda health office; malaria epidemic surveillance chart is not being properly used at HP level. However, there were written malaria epidemic preparedness plan at Woreda & Health facilities; there is no risk mapping trend seen in all visited health facilities. Those factors were aggravating the outbreak and failure for early outbreak detection and response activities. For the past 6 months all malaria commodities have not been provided to HPs (RDT and ITN) and Artisunate (injection &, suppository) stoke out for greeter than 5 months.

Limitation of the study

- We used convenient sampling method due to time and resource limitation.

5.1.5 Conclusion

Our result indicates, the magnitude of current malaria was higher than the past four years ago. Potential vectors breeding site were not identified prior to the outbreak; surveillance data was not analyzed on weekly based. These lead to for late detection, notification and implementation of larva control measures prior to the outbreak. The attack rate was high among age group of greater than 15 years (17.2 per 1000 populations). P. falciparum was dominant species in the study area, which deadliest and responsible for this outbreak. High malaria attack rate and majority of case was from Bena 2 and 4 kebeles (16.3 and 14.5 per 1000 population) respectively. Presence of mosquito breeding site, unprotected dam for irrigation, malaria sick patient in the house hold and improper (poor) utilization of insecticide treated bed net, and intervention gap in the prevention measures were the main risk factors for the outbreak in the Woreda. Additionally, lack of identification potential breeding site and an increased number of vulnerable populations to the area were contributing factors for the occurrence of the outbreak. But, using ITN and wearing protective clothing are at a significant lower risk of contracting malaria.

5.1.6 Recommendation

Based the conclusion we recommend that all potential stockholders, e.i, Oromia Regional health bureau, Iluababora Zonal health department, Darimu Woreda Health office and catchment health facilities and others sectors interested in malaria prevention:

- Strengthen malaria surveillance system and conduct weekly surveillance data analysis.
- WorHO should identifing potential vector breeding site and community based larva control measures should be sensitized specially at irrigation site.
- Proactive vector control and effective environmental management was needed to reduce malaria epidemic in all Bena villages.
- Appropriate communication program needed to address the utilization gaps on ITN
- Newly settler's people's due attention at mining area to enhance the utilization of ITNs ITN should be distribute prior to malaria season (every 6 months) and should be considering.
- Woreda Health department should be monitored and optimized ITN utilization.
- ITN should be distribute prior to malaria season (every 6 months) and should be considering newly settler's peoples.
- ITN Distribution should be based on identified risk area and shifting of excess LLIN's from low risk kebele to high affected kebele's
- Targeted measures on malaria prevention and control should be conducted to improving the vectors control activities, on irrigation dam, through coordinated community effort.
- Regional health bureau and zonal health department need to be avail adequate budgets allocated for operational cost of Insecticide spray activities (availing Abate chemicals) for mosquito breeding site.
- All the health facilities should utilize malaria surveillance chart
- Proper data handling, documenting and reporting from right sources.
- Further study needed to evaluate the effectiveness and appropriate malaria prevention and control method for the area.

5.1.7 Acknowledgements

I would like to acknowledge School of Public Health at Addis Ababa University, Oromia Regional Health Bureau Public Health Emergency Management directorate staffs, Iluababora Zonal Health department, Darimu Woreda health office, Bena site Health Center staff and all EFETP residents for their unlimited contribution during this malaria epidemic investigation.

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6 Chapter-VI Abstracts for Scientific Presentation

6.1 Malaria Outbreak Investigation Darimu Woreda of Iluababora Zone, Oromia, Ethiopia, March, 2018

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Background: Malaria epidemics are serious public health emergencies that have a major impact on health and the economy. We investigated malaria outbreak in Darimu Woreda to verify cases and identify risk factors.

Method: We define malaria cases as any person with fever or fever with headache with plasmodium parasites by slide confirmed with Microscopic and RDT. Five-year malaria data were used to set epidemic threshold level. We conduct descriptive epidemiology and unmatched case control study in 1:1 ratio conveniently selected (112) cases and (112) controls. Structured questionnaires were used to collect data, data was entered in to Epi-info version 7.2.1.0 and analyzed by SPSS version 23.

Result: A total of 348 malaria cases with no death was identified during February to March 2018. P. falciparum was predominant species accounting for 91.7%. The alert threshold (current year data with a third quartile method 2nd largest number) had been reached and crossed in end of February 2018.Age group ≥15 years was affected more AR (181) 17.2/1,000 population. Male accounted for 52.7%. Attack rate was high in Bena2 Kebele (94) 16.3/1,000 population. Presence of Mosquitoes breeding sites AOR=5.54; 95%CI:2.08-14.73, unprotected dam AOR=4.78;95% CI:2.09-10.93 and presence of sick in the house hold AOR=4.05;95%CI:1.48-11.09, were independent risk factors. But, protective clothing and utilization of bed net was associated with lower odds of malaria infection (AOR: 0.17; 95% CI; 0.04-0.65 and AOR=0.18; 95% CI; 0.04-0.80) respectively.

Conclusion: Presence of mosquito's breeding sites, unprotected dam, and sick patient in the house hold was independent risk factors. Always utilization of ITN and protective clothes were lower risk of malaria.

Recommendation: We recommend strengthen malaria surveillance system, identifying potential vector breeding site, Proactive vector control measures, redistribution of the ITN prior to malaria season and address ITNs utilization gaps through health education.

Key words: Malaria outbreak, Case control, Risk Factor, Ethiopia.

Word Count: 298

6.2 Measles Outbreak Investigation in pocket area of Liben Woreda, Guji Zone, Oromia Region, Ethiopia- November 2018

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Abstract

Background: Measles is a nationally immediately notifiable an outbreak prone acute viral diseases; characterized by fever and maculopapular rash, include; cough, conjunctivitis and cough. On December 28, 2018, Liben Woreda reported suspected measles outbreak. We investigated the outbreak to verify, identify risk factor and implement prompt control measures in the district.

Method: Descriptive followed by unmatched 1;3 ratio case-control study was conducted by including all line listed 15 cases and purposefully selected 45 neighborhood of case patient controls from December 12 to 20, 2018. Structured questionnaires, line list, observation of cold chain system used to collect data. Epi-info and SPSS version were used for data entry and analysis. We look for risk factor between 15 case patient and 45 community control.

Result: A total of 15 measles cases with no death reported during this outbreak. The outbreak was confirmed by measles specific IgM antibody test. The index had history of travel during her incubation period. 3/5 blood sample become measles IgM +ve The overall attack rate were 16.2/100,000 populations. Children ≤1 Years and Female in sex are most affected 2(67/100,000) populations and 11(24.2/100,000) populations respectively. 66.7%(10/15) of cases were unvaccinated. Being unvaccinated against measles AOR 17.61, 95%CI (1.80-171.98), Have travel history 7-18 days' prior the onset of rash AOR=12.11, 95%CI (1.88-78.01) and Measles case in the house AOR=28.64 95% CI (3.41-240.32) were independent risk factor for contracting measles. The administrative vaccine coverage of the Woreda was 105%. Case management, active case searching and health education was conducted during the outbreak.

Conclusion: Being unvaccinated, traveling to the adjacent woreda (Mada-Wolabu) and presence of measles cases in the house were independent risk factor for this outbreak. We recommend Reach unvaccinated pastoralist community by considering mobile immunization teams target measles vaccination by considering the importance of adult immunization and Remove travel history and contact with measles cases to measles outbreak area, improve cold chain management and furthers study on vaccine acceptance and associated factor with sufficient sample size.

Key words: Measles, Outbreak, postural area, Oromia Region.

Word count: 321

7 Chapter- VII Narrative Summary of Disaster Situation Visited

7.1 Emergency Need Assessment Report of Health and Nutrition in Agro pastoral Zone (Guji, West Guji and Borana zones) of Oromia Region, Ethiopia, December, 2018

Summary

Humanitarian need assessment/community risk assessment is a participatory process for assessing hazards, vulnerabilities, risks, ability to cope, preparing coping strategies and finally preparing a risk reduction options implementation plan by the local community. The goal of this assessment is to promote vulnerability assessment, risk mitigation, disaster prevention, preparedness, effective response and recovery in a manner that integrates disaster risk management. 2018 Meher assessment was conducted to identify areas where emergency assistance (health, nutrition) and come up with reasonable needing of emergency assistance for the upcoming 6 months' period in 3 zones Assessment conducted from November 22 –December 12, 2018 in the selected woredas of Guji, West Guji and Borana agro pastoral Zones.

The main objective of the assessment was to develop emergency requirements and to contribute in ensuring appropriate and effective humanitarian planning that helps to reduce morbidity and mortality related with malnutrition and other communicable disease outbreak

Cross-sectional study design conducted at 3 zones; we selected and visited 7 (Seven) a specific woredas and Semi-structured questionnaire was used to collect the required information additionally document and reports was reviewed. Meetings and discussions with woreda and zonal preparedness and response task forces officials and program managers was conducted. Field visits in selected woredas and kebeles and discussion with community and at the end debriefing was made on assessment findings for visited woredas and zones.

Multi sectorial PHEM coordination forum established at zonal and most visited woredas. But, it is not active at all level and not represented by all respective government sectors. All zone and woreda have a trained Rapid Response Team (RRT) and public health emergency preparedness and response plan except Gumi-Eldelo Woreda. Unfortunately, there is no emergency response fund posing fear to timely responding any public health emergencies in more than 85% of Visited Woreda.

There was confirmed outbreak of diseases in Liben Woreda of Guji Zone. Total 15 Suspected Measles cases identified and 5 cases were sent to Regional lab for confirmation from Liben woreda (3/5 were confirmed for IgM test) and Malaria and Dysentery cases were increased in Guji Zone

Liben Woreda, in last three months. However, there is no ongoing outbreak; Malaria, Measles, Acute watery diarrhea (AWD), Malnutrition are anticipated epidemic in all assessed woredas.

Assessment findings shows that, Malaria, Diarrhea, pneumonia, upper respiratory tract infections (URTI), Helmentiasis and skin disease are the leading cause of morbidity in both under five and above five years of age during frist six mointh of 2011 EFY. Diarrhea (non-bloody) was found to be the leading cause of morbidity in most visited woredas of Gumi Eldelo, Liben, Goro dola, and Arero. Safe water shortage was the major problem of all respective woreda during the period.

In all zone, there were a high malnutrition case due to of double burden effect of high influx of IDPs and drought effect. The trend of severe acute malnutrition cases admission show that increased during the period especially in Gorodola, Gumi-eldelo, Liben and Moyale Woreda. But the MAM case admission show relatively the same with the 2017 of the same period except in Liben and Gorodola woreda which was increased. With this junction there is emergency nutrition intervention/supply stock out in West Guji and Borana Zone. There was also shortage of emergency drugs and Kits including Coartem, Artesunate Injection, Quinine, Doxcycline, Ringer lactate, F100 and 75, RUTF, Amoxicillin capsule, Gloves, Syringe, RDT for Malaria and CTC kits: (for AWD) in respective zones and it can be a challenge for the next one month. Generally, malnutrition, Measles and diarrhea can be a major problem in all visited woredas for next six months.

The RHB and FMOH fill the gaps identified as shortage of budget, drugs especially emergency drug and Adequate emergency nutrition and drugs supplies at all level will ensure capacity for timely response in case of event occurrence.

7.1.1 Introduction

Disaster is the serious disruption of societal functioning causing widespread human, material, or environmental losses that exceed the local response resources, triggering calls for external assistance (1). Disaster risk is increasingly of global concern and its impact and actions in one region can have an impact on risks in another, and vice versa (2). As human populations grow and societies become increasingly interconnected and complex, the damages from natural and human-induced disasters have become more and more extensive. Socioeconomic, political, cultural, geographical, and other factors combine and compound to increase the scope of a disaster's consequences (3).

Humanitarian need assessment/community risk assessment is a participatory process for assessing hazards, vulnerabilities, risks, ability to cope, preparing coping strategies and finally preparing a risk reduction options implementation plan by the local community. Humanitarian need assessments use scientific information and predictions and participatory debates to identify, analyze and evaluate risk environment of a particular community, reach consensus amongst the community on actions that are needed to manage the risks.

Early warning requires putting together very different kinds of information to make a specific prediction about how many people, where, when, and for how long, may be seriously affected by an event. The early warning system in Ethiopia goes back farther than any other in Africa, to the aftermath of the Wollo famine of 1973 (4). Disaster loss and damage is on the rise in Ethiopa with serious consequences for the survival, dignity and livelihood of our citizens, particularly the poor. Currently the government of Ethiopia has been dedicating substantial resources to the response to Public Health Emergencies including epidemics of diseases, widespread malnutrition and internal conflict, which resulted from drought and current political and socio economical situations. The country is also exposed to potential natural disasters like floods and internal conflict which resulting to displacement of high number of population caused related health and social problems with various degree of impact on the health sector; (e.i Health care service provision and health care finance system).

The goal of this assessment is to promote national vulnerability assessment, risk mitigation, disaster prevention, preparedness, effective response and recovery in a manner that integrates disaster risk management with development planning and programming. This approach will ensure people of the postural areas to build capacities that would enable them minimize serious social and economic disruptions as a result of disaster events. The assessment creates an integrated and multi-sectoral systems approach to planning, preparedness and management of disasters which is fundamental to sustained productivity and socio-economic growth.

Ethiopia has been conducting human health and nutrition emergency needs assessment twice a year following Meher and Belg seasons in condition with food security assessment led by Disaster Risk Management and Food Security Sector. the assessments incorporate both government and non-governmental organizations (e.i Ministry of Agriculture, Disaster Risk Management and Food Security Sector, Ministry of Health, Ministry of Water and Energy, Ministry of Education, National Metrology Agency and respective Regional Bureaus, WHO, UNICEF, OCHA, MSF, Plan International, IRC and etc. at all level) have been participating. During the assessment, possible human health and nutrition risks were expected to be identified and numbers of beneficiaries were estimated based on HEA. Finally, using the results of the assessment humanitarian document are developed and distributed to all partners to fill the gaps identified, to avert and minimize public Health consequences.

The information generated from this Meher assessment can produce timely and reasonably accurate information about morbidity and mortality caused by disasters and the factors that put populations at risk for illness and death. This information is essential to inform decisions about how to prioritize response efforts and where to direct relief supplies, equipment, and personnel.

Therefore, vulnerability assessment and providing necessary of resource for at risk population is very important to in order to minimize loss of health budget, school dropout rate and production loss due to health consequence of natural and manmade disasters and epidemic diseases. Hence, as usual 2018 Meher assessment was conducted to identify areas where emergency assistance (health, nutrition) might be needed due to acute problems and come up with reasonable estimates of the size of the population needing emergency assistance for the upcoming 6 months' period in 3 zones.

7.1.2 Background

Oromia Region is the largest of Ethiopia's nine regions, both in terms of population and area, covering 353,690 square kilometers. It borders all the other regions in Ethiopia except for Tigray and shares an international boundary with Kenya and South Sudan. The estimated 2017 population is 32,815,995 there are all three general modes of economy: farming, pastoralist and agro-pastoralist. And within each of these modes, because of ecological and economic differences, there are numbers of separate livelihood zones. Around 28 million of the area's population is farmers; there are just over 1.2 million agro-pastoralists in lowland areas, especially the foothills of Bale and Harerge; and there are some 970,000 pastoralists, the vast majority of whom are Borana and Guji herders on the extensive rangelands in the far south of Oromia (4). The Borana and Gujii Zones Annual rainfall averages 450-600mm. There are two rainy seasons: the long rains or gana from mid-March to May and the short rains or hagaya from mid- September to October. Temperatures are hot, reaching highs of 38-40 centigrade and lows of 25-30 centigrade. The soils are sandy and have moderate production potential. The main highway from Addis Ababa via Moyale town to Nairobi crosses the zone as does the feeder road connecting Moyale and Negele. Moyale, Negele and Bule Hora are the major towns. Natural gum is a major natural resource in the area and is being exploited, gold and greenstone are also found, but are not yet exploited. The main limiting factor on crop production is low and erratic rainfall. This is a food deficit livelihood zone every year and is chronically food insecure. Households in the lower two groups depend on cereals distributed as part of the Productive Safety Net Programme (PSNP) to meet their minimum food requirement. Livelihoods depend on livestock, the sale of firewood and charcoal, casual urban labor and petty trade (5). The majority of the rural population is pastoralists followed by agro – pastoralists and limited traders.

Based on the projection of 2007 census conducted by the CSA, these three zones have 39 woredas with a total population of 3,950,423 and among those, 1,975,212 (50%) of them are male and 647,896 (16.4%) are under five children. There were 8 hospitals, 168 health centers and 784 functional health posts within these agro pastoral Guji, West Gujii and Borana zones.

7.1.3 Objectives

General Objectives

To contribute in ensuring proper and effective humanitarian planning and responses that leads to reducing morbidity and mortality in the most at risk areas of the assessed zones.

Specific Objectives

- To assess the extents, types, magnitude, severity and likely of the different hazards (Drought, human epidemics, conflict, floods, etc.)
- To assess the occurrence of different public health emergencies in the most vulnerable Woredas (including to identify the most vulnerable populations).
- To assess the existing capacity of the health services to address the health and nutrition emergencies likely to occur during the first six months of 2019.

7.1.4 Methods

Study design

We used a cross-sectional study design to assess and identify human health and nutrition emergency needs in the next six upcoming months of the Borana, Gujii and West Gujii zones. From Those zones; we selected and visited 7(Seven) woredas. We used different methods to collect a pertinent data and information. However; due to time constraints, the team was required to divide into two sub-teams to achieve the objectives efficiently. During the assessment we follow and used:

- The teams were briefed by Zonals/ Woredas DRMC officials before visiting selected woredas and kebeles.
- Semi-structured questionnaire was used to collect the required information.
- Document and reports was reviewed from woredas and zonal health offices.
- Complementary information was also collected through field observations.
- Formal discussion and key informant interviews was made with respective sector offices.
- Debriefing was made on assessment findings on visited woredas and zones

Study Area

These assessment is conducted on agro pastoral zones Borana, Guji and West Gujii which are among a 20 Administrative zone of Oromia regional state bordering Somali Region and Kenya in the far south of Oromia. The main highway from Addis Ababa via Moyale town to Nairobi crosses both zones as does the feeder road connecting Moyale, Negele and Bule Hora the major towns. Natural gum is a major natural resource in the area; this is a food deficit livelihood zone every year and is chronically food insecure. Households in the lower two groups depend on cereals distributed as part of the Productive Safety Net Programme (PSNP) to meet their minimum food requirement. Livelihoods depend on livestock, the sale of firewood and charcoal, casual urban labor and petty trade (5). The majority of the rural population is pastoralists followed by agro pastoralists and limited traders.

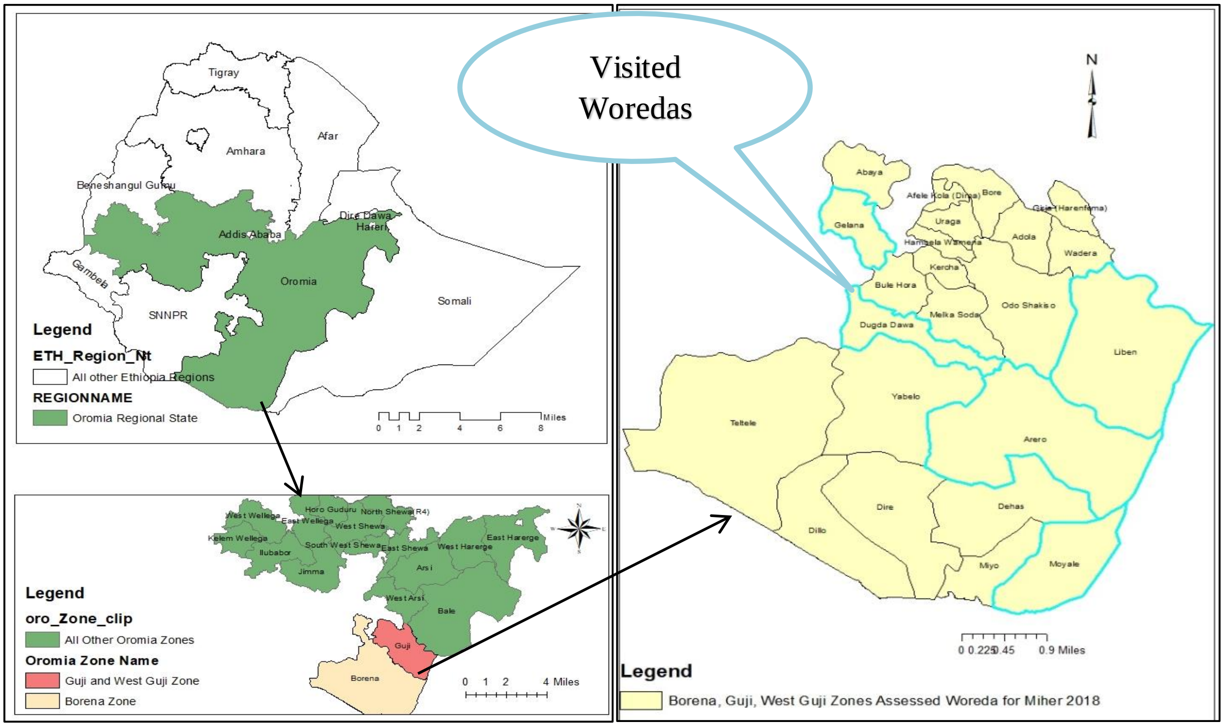
Based on the projection of 2007 census conducted by the CSA, these zones have 39 woredas with a total population of 3,950,423 and among those, 1,975,212 (50%) of them are male and 647,896 (16.4%) are under five children. In terms of health services there were 8 hospitals, 168 health centers and 784 functional health posts within these zones. Seven Woredas were selected and visited. In addition, there are presently 11 mobile health teams that are providing health & nutrition services to rural community's resident in remote areas and IDP sites.

Sampling and sampling methods

Woredas was selected porposefully by Zonal and Regional Meher Assessment team, considering representativeness of drought hazards and agro-ecology of the zonal performance.

Selection procedures on assessment area

After discussion made with Zonal task force committee 8 woredas with relatively high risk of public health emergency were identified and selected. And 7 woreda were assessed and 1 (Galana Woreda of west Gujii Zone) was not assessed due to security problem during the period. Hot spot Woredas were identified by respective regional team by considering the representativeness of both natural and manmade disasters and disease trends in the area (e.i. drought, shortage of normal rain, internal displacements, outbreaks, floods, landslides, conflict etc)



Map 7.1-1: Administrative maps of Emergency need assessment zones, Guji and Borena, Oromia, Ethiopia, October 2018.

Study period

Assessment conducted from November 22 to December 12, 2018.The assessment team was collaborated from different government sectors and Partners and Humanitarian organization participated in a one-day workshop held in West Guji Zone on 23 November 2018.

Assessment tools

Semi-structured questionnaires used to collect data using face to face interviewer administered and also quantitative data were collected. The questioners addressed socio demographic profile, health profile, status of epidemic prevention and control; ongoing epidemic situation and check availability of emergency drug at all levels. Complementary information was also collected through field observations, 1-2 focus group discussions per woreda (including community leaders and key informants) and where feasible through discussions conducted.

Data source

Both secondary and primary data was collected from all woredas of the visited zones; we used the checklist already prepared by the Ethiopian Public Health Institute. Interviewing responsible persons from different units of health sector (Woreda Health office heads, experts/officers, selected household members) as well as reviewing secondary health and nutrition data using the questionnaire developed by EPHI and reviewing woreda meher assessment reports was conducted

Data entry and analysis

We used Microsoft excel and Word 2016 to compile, and Analyze data.

Result dissemination

Written report of both hard and soft copies was prepared and shared to Addis Ababa University/School of Public Health, Oromia Regional Health Bureau, Oromia Regional DRM commission, Visited Zonal health department, EFETP mentor, resident advisors and coordinator accordingly. Debriefing also made on assessment findings to visited Woredas and zones.

Operational definition

Out break: One of the public health concerns following a disaster is the potential for the spread of communicable diseases or new illness outbreaks. The break to water systems, sanitation facilities, food supply systems, health infrastructure, and other basic infrastructures can increase the risk of an outbreak following a disaster. The gathering of large numbers of displaced people within shelters or refugee camps provides increased opportunity for disease transmission(3)

Displacement: The forced movement of populations of people or animals from the area where they live, usually due to sudden impact from natural disasters, threat or conflict.

Response: The response phase is the actions taken to save lives and prevent further damage in a disaster.

Household: A household includes all the individuals who occupy a housing unit as their usual place of residence.

Incidence: The occurrence of new cases of disease or injury or events in a population over a specified period.

Human impact: Injury, mortality, increased disease morbidity rates for a variety of illnesses, subsequent displacement, and a lack of necessities, such as food and water.

Morbidity: The state of being ill or diseased or the incidence of illness in a population.

Mortality: The incidence of death in a population.

Surveillance: The ongoing systematic collection, analysis, and interpretation of injuries, illnesses, and deaths, for the use in planning, implementation, and evaluation of public health practice.

Passive surveillance: A system in which a health jurisdiction receives reports from hospitals, clinics, public health units, or other sources

Active surveillance: Surveillance that employs staff members to contact regularly health care providers or the population to seek information about health conditions.

Indirect health effect: Caused by unsafe/unhealthy conditions that develop due to the effects of the disaster or events that occur from anticipating the disaster (e.g., carbon monoxide poisoning from improper generator use)

7.1.5 Result

Health profile

The health situation in all woreda has been stable during the last six months. There was no confirmed disease outbreak currently and in the near past one years. But there is a fear that malaria, measles, and AWD outbreak may occur following this Gana rain season due to lack of safe water for drink. Malaria cases become increased when compared to 2017 the same periods of current year, Especially the high case was reported from Gumi Eldelo and Liben Woreda of Gujii zone during May and October 2018; for instance, the presence of malaria breeding sites and interrupted rivers in the zone also increases the risk. On the contrary the zone engaged on preventive activities like distributing ITN of which zone coverage is 92%, indoor residual spray (IRS) with 100% coverage. Additionally, other preventive and control methods environmental management, social mobilization and source reduction measures are being taken.

Coordination

There is a functional multi-sectoral PHEM coordination forum in Guji and Borana zones which conducts meeting every month but in West Guji zone it is not functional and not represented by all respective government sectors. But all woreda reported that meeting is not expected if there is no emergency in the area. PHEM officer was assigned to coordinating emergency activities at all level woreda and Zones except West Guji zone zonal Health Department has no official PHEM officer except one professional delegated, PHEM report was also reported regularly as scheduled dates at all assessed woreda. Public Health Emergency preparedness and response plan is available except in Gumi-Eldelo Woreda and used to forecasting the dynamic nature of the area health situation. Unfortunately, there is no emergency response fund posing fear to timely responding any public health emergencies. But not available at all assessed woreda except liben.

Also except in Leben, there is no specific fund allocated for public health emergency response purpose in all woredas, additionally there is no NGO or UN agency represented to assist emergency activities whenever emergency happen in most of assessed woredas and zones except Gujii zone. There is organized and trained rapid response team except in West Guji Zone.

Table 7.1-1: Presence of Woreda Level coordination and management Systems in visited woredas of Gujii, West Gujii and Borana Zone, Oromia, Ethiopia, 2018

S.no	Indicator of coordination and management system	Presence of Woreda Level Coordination and Management Systems (Yes/No)						
		Liben	G/ Dola	G/ Eldelo	D/ Dawa	Dirre	Arero	Moyale
1	Presence of PHEM officer at woreda health office level	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	Presence of RRT in woreda health office	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	Presence of factional RRT at Health Center	No	No	No	Yes	Yes	Yes	Yes
4	PHEM Officer/Focal persons at health center	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	Does Woreda regularly reporting PHEM report as scheduled date	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	Health facilities regularly reporting PHEM report as scheduled date	Yes	Yes	Yes	Yes	yes	Yes	Yes
7	Multi sectoral health emergency PHEM coordination forum in the woreda	No	No	No	No	No	Yes	No
8	Presence of Public Health Emergency Preparedness and Response plan for 2011 EFY	Yes	Yes	No	Yes	yes	Yes	Yes
9	Accessed for emergency Response fund	Yes	No	No	No	No	No	No

Population

Seven Woreda are selected and assessed for Humaniterial and Emergency health need from 3 zones (Guji, West Guji and Borana) of Oromia region. Moyale and Dugda Dawa are highly populated woreda which account for 28% and 20% respectively and also moyale woreda of Borana Zone and Gumi Eldelo of Guji Zone contributing for high proportion of

Internal Displaced peoples which constitute for 62 % and 23 % respectively among total 141,530 (Table 6.1.2).

Table 7.1-2: Population compositions of woredas visited for Meher assessment in oromia region agro-pastoral, 2018

Assessed Woreda Name	Total Population	Male	Female	Under 5 Years	Lactating and PW	Special Population	
						IDP's	Pastoral
Liban	92,731	46,922	45,809	11,236	3,218	5,500	No data
Goro Dola	91,967	45,064	46,903	15,110	3,679		No data
Gumi Eldelo	12,740	12,740	12,537	25,277	877	32,302	No data
Dugda Dawa	114,699	56,432	58,267	18,845	3,940		No data
Dirre	47,487	23,933	23,554	7,802	1,648	-	No data
Arero	47,534	23,339	24,195	57,796	1,649	15,557	No data
Moyale	165,059	84,180	80,878	27,119	5,727	88,171	No data
Total	572,217	292,610	292,143	163,185	20,738	141,530	No data

Ongoing Outbreak

There was confirmed outbreak of diseases Total 15 Suspected Measles cases indentified and 5 cases were sent to Regional lab for confirmation from Liben woreda (3 of Five suspected cases were confirmed fo IgM antibody test). Additionally, number of malaria and dysentery cases also increased in Guji Zone Liben Woreda, in last three months.

Anticipated epidemics

Even though there is no ongoing outbreak; Malaria, Measles, Acute watery diarrhea (AWD), Malnutrition are anticipated epidemic and acute hemorrhagic diseases like yellow fever, Rift valley Virus (RVF) and Ebola are specifically anticipated in addition to the above diseases by Boran Zone. Malaria is highly anticipated in Guji and west Guji Zone because majority of kebele was malarious. Additionally, Presence of malaria breeding sites and interrupted rivers also increases the risk in the area. On the contrary the both zone engaged on preventive activities like distributing ITN, by which zonal ITN coverage is

>90%, indoor residual spray (IRS) with 100% coverage. Also other preventive and control methods environmental management, social mobilization and source reduction measures are being taken.

Public health emergency management

All zones have public health emergency preparedness and response plan as well as emergency response budget but at Woreda level only one woreda (Liben Woreda) have Emergency preparedness response plan and accessible emergency response budget. Even though there were staff turnover rate all assessed woreda have trained PHEM officers there is no trained man power on PHEM at Guji zone health department. All three zones and woredas have a trained Rapid Response Team (RRT) and EPRP.

Preparedness

All zone faced shortage of Emergency drugs and Kits including Coartem, Artesunate Injection, Quinine, Doxcycline, Ringer lactate, F100 and 75, RUTF, Amoxaciline capsule, Gloves, Syringe, RDT Malaria and CTC kits: (for AWD) it can be a challenge for the next one month and no budget allocated for emergency Rapid response by the woreda

Table 7.1-3: List of emergency drugs and supplies in Guji and West Guji and Borana Zone, Oromia, Ethiopia, 2018

Description		Guji Zone			West Guji Zone			Borana Zone		
		Requirement	Available	Stock out	Requirement	Available	Stock out	Requirement	Available	Stock out
Drugs	Coartem (box)	250 box of 30	0	2 month	250 box of 30	0	2 month	200	6	0
	Artesunate Rectal	150	0	2 month	110	0	2 month	100	0	3 month
	Artesunate Injection	200	0	2 month	140	0	2 month	150	0	0
	Artesunate IM	150	0	2 month	150	0	2 month	100	0	3 month
	Quinine (PO) (pack)	300PK	0	2 month	200PK	0	2 month	52	32	0
	Quinine (IV) (box)	150 PK	0	2 month	150 PK	0	2 month	100	0	3 month
	Chloroquine (tin)	200PK	0	2 month	200PK	25 PK	0	530	170	0
	Ceftriaxione (vial)	1000	0	3 month	1000	300 vial	0	10000	0	0
	Oily CAF (box)	500	0	2 month	500	0	2 month	0	0	0
	Doxcycline (box)	300	0	1 month	300	0	2 month	200	0	1 month
	Ringer lactate (ctn)	500	0	1 month	500	5000 bag	0	5000	0	1 month
	ORS (ctn)	3000	0	1 month	3000	10,000 st	0	5000	7000	0
	Vit A.	500	0	1 month	500	106	0	1000	293	0
Nutrition supplies	F100 (ctn)	200PK	0	0 month	200PK	504 tin	0	500	92	0
	F75 (ctn)	200PK	0	0 month	200PK	96 tin	0	700	203	0
	RUTF (ctn)	3000 of 150	10000 of 150	0 month	3000 of 150	987	0	600	420	0

Description			Guji Zone			West Guji Zone			Borana Zone		
			Requirement	Available	Stock out	Requirement	Available	Stock out	Requirement	Available	Stock out
	Resomal (ctn)		100	0	0	100	1	0	200	140	0
	Routine antibiotics at SC/OTP	Amoxaciline capsule	100 Box of 500	0	0	100 Box of 500	192	0	500	2pk	0
		Sc Rx Kit(First and second line drugs)	50		50	50	11	0			0
			20	0	20	20	1	2 month	2	2	0
		Sc Opening kit	50	0	1 month	50	0	2 month	45	0	1 month
		CSB ++	200	0	2 month	200	0	3 month	0	0	2 month
		RUSF	0	1 month	300	0	2 month	200	0	1 month	
Laboratory supplies	RDT Malaria		300	0	1 month	100	0	2 month	0	0	
	Pastorex (meningitis)		100	0	1 month	100	0	2 month	0	0	
	LP set (box)		100	0	1 month	400	0	2 month	0	0	
	TI bottle		400	0	1 month	10	10	0	10	10	0
Kits	CTC Kit (AWD)		10	0	2 month	200 box	0	2 month	400	0	2 month
Medical supplies	Gloves (box)		200	0	2 month	200 box	0	2 month	200	0	2 month
	Syringe (box)		200	0	2 month	150	50	0	100	0	2 month
	PPE (box)		150	0	2 month	140	0	2 month	5000	0	2 month

Five top cause of morbidity in children and adult

According to six-month report of 2011 EFY, the top 5 cause of morbidity of among under five children and above 5 years were different as indicated in table5 below. Among children under five age Diarrhea, Pneumonia, Malaria were the most three morbidities affecting children in all woredas. Additionally, Helmentiasis, AURTI, skin infection also reported from majority of assessed Woredas. Severe acute malnutrition (SAM) was mentioned only in Gorodola woreda as top five cause of morbidity. Pneumonia, Diarrhea, Acute febrile infection, acute upper respiratory infection and Malaria are the top five cause of morbidity among above 5 years in all assessed woreda. even though the latrine coverage and utilization rate report of assessed woreda were below 80%, diarrheal disease and Helmentiasis was among the top five causes of morbidity among all age groups. It needs maximize latrine coverage and utilization rate and consistent water rationing of each woredas is due attention.

Table 7.1-4: Under five children causes of morbidity in visited woredas of Guji,West Guji and Borana Zones, Oromia, 2018.

		Woreda Visited						
	Rank	Liben	Gorodola	Gumi eldelo	Dugda Dawa	Dirre	Arero	Moyale
Top five cause of morbidity	1	Diarrhea (non bloody	Diarrhea (non Bloody	Diarrhea (non Bloody	Pneumonia	AURTI	Diarrhea(non Bloody	Pneumonia
	2	Pneumonia	Pneumonia	Pneumonia	Diarrhea (non bloody	Diarrhea (non bloody)	Pneumonia	AURT
	3	Diarrhea with DHN	SAM	AURTI	AFI	Pneumonia	AFI	Diarrhea (non Bloody
	4	Helmenthiasis	Skin infection	Malaria	Malaria	AFI	Malaria	skin infection
	5	AURTI	malaria	Intestinal Parasite	Helmenthiasis	Other unspecified infectious Diseases	Helmenthiasis	Helmenthiasis

Table 7.1-5: Above five years age causes of morbidity in visited woredas of Guji,West Guji and Borana Zones, Oromia, 2018

	Rank	Woreda Visited						
		Liben	**Gorodola**	**Gumi eldelo**	**Dugda Dawa**	**Dirre**	**Arero**	**Moyale**
Top five cause of morbidity	1	Pneumonia	Pneumonia	Pneumonia	Pneumonia	AFI	Pneumonia	AURTI
	2	Diseases of MSS	Diarrhea	Malaria	AFI	Trauma	Diarrhea	Pneumonia
	3	Diarrhea	Dyspepsia	Diarrhea	Trauma(Injury)	AURTI	AFI	Urinary tract infection
	4	UTI	AURTI	Dyspepsia	Typhoid Fever	Pneumonia	Helmenthiasis	Diseases of MSS
	5	AFI	UTI	AURTI	Malaria	Dyspepsia	AURTI	AFI

Malaria

All visited woreda was endemic to malaria Based on obtained data from assessed Woreda, Malaria cases increased in Liben and Gumi eldelo from June to October 2018, but not reach epidemic threshold. A total of 2,379 cases were reported from June to October 2018 from all assessed woredas (Figure 7.1.1)

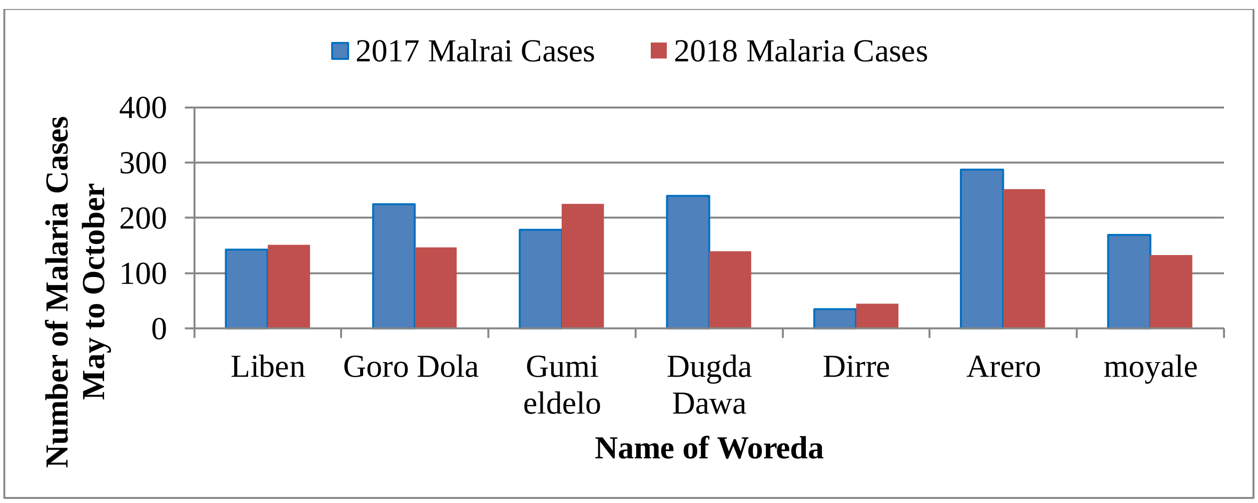


Figure 7.1-1: Total Malaria cases by Woredas, Guji,West Guji and Biorana Zones, oromia, Ethiopia, May – October 2017&2018

Generally monthly Malaria cases trend shows decreasing when compared to total malaria cases of the same period of 2017 in all month (May to October) among all assessed woredas. all woreda had malaria treatment drug but zonal health department of Guji and West Zone had no stock balance of those malaria treatment supplies including Coartem and Artesunate for the next one month where as Borana Zone has only 6 packet of coartem drug.

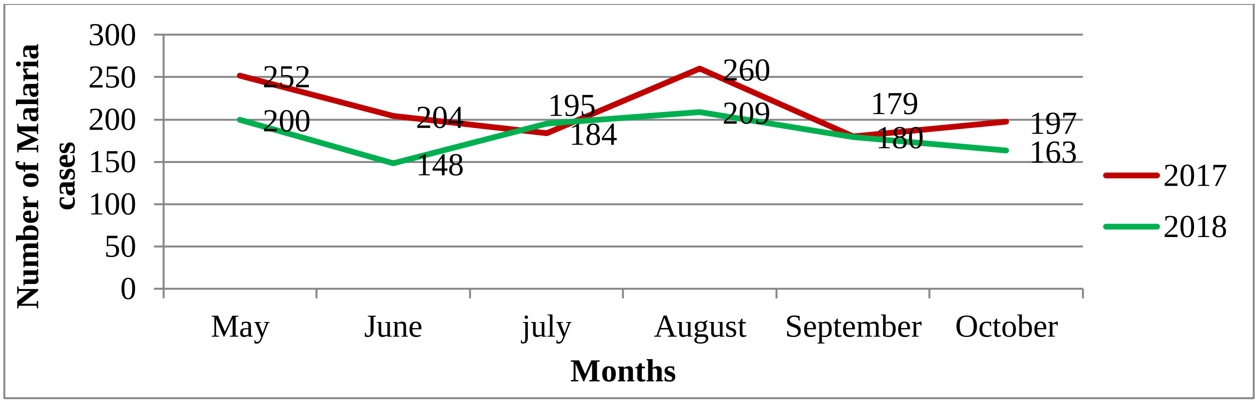


Figure 7.1-2: Trend of Malaria cases in the assessed woredas, during 2017 and 2018 Meher assessment from May to October, Oromia, Ethiopian, 2018.

Measles

Suspected Measles cases were reported in Guji Zone liben woreda. Total 15 suspected Measles cases have been reported in the period of October 2018. 3/5 Measles cases confirmed. There was no measles death reported. The outbreak occurred in Liben kobedi kebele. According to the woreda health office report those suspected cases had a travil history to adjacent kebeles of Bale zone for ration. There was no case reported for two weeks prior to visit. The woreda reports showed 105% measles vaccination coverage. SIA was not conducted in all woredas during the study period (May to October 2018). Routine measles vaccination was not the same in all assessed woredas (ranges from the list 67% of Dire Woreda to Highest 105% of Liben Woreda of Gujii Zone in coverage) for less than one age in all assessed woredas.

Acute water diarrhea (AWD) and Meningitis

There was no any reported Acute Watery Diarrhea and Meningitis case in the seven Meher beneficiary woredas during the meher season (May- October, 2018). Majority of woreda have no data on latrine coverage and utilization and safe water coverage.

Other diseases

A total of 22 food poisoning and 16 Animal Anthrax cases with 1 death were reported from Gumi eldelo Woreda and no animal bites (Rabies suspected case) reported from assessed woreda

Table 7.1-6: List of cases and deaths for major epidemic prone diseases in Gujii, West Gujii and Borana Zone, Oromia, Ethiopia, May to October 2018

Zone Name	Woreda Name	Months	Malaria		Measles		Meningitis		AWD		Rabies	
			Case	Death	Case	Death	Case	Death	Case	Death	Case	Death
Guji Zone	Liben Woreda	May	6	0	0	0	0	0	0	0	0	0
		June	18	0	0	0	0	0	0	0	0	0
		July	28	0	0	0	0	0	0	0	0	0
		August	47	0	0	0	0	0	0	0	0	0
		September	24	0	0	0	0	0	0	0	0	0
		October	28	0	15	0	0	0	0	0	0	0
	Goro Dola Woreda	May	18	0	0	0	0	0	0	0	0	0
		June	18	0	0	0	0	0	0	0	0	0
		July	32	0	0	0	0	0	0	0	0	0
		August	29	0	0	0	0	0	0	0	0	0
		Septem	27	0	0	0	0	0	0	0	0	0
		October	23	0	0	0	0	0	0	0	0	0
	Gumi Eldelo Woreda	May	57	0	0	0	0	0	0	0	0	0
		June	40	0	0	0	0	0	0	0	0	0
		July	41	0	0	0	0	0	0	0	0	0
		August	37	0	0	0	0	0	0	0	0	0
		September	25	0	0	0	0	0	0	0	0	0
		October	26	0	0	0	0	0	0	0	0	0
West Guji Zone	Dugda Dawa Woreda	May	32	0	0	0	0	0	0	0	0	0
		June	24	0	0	0	0	0	0	0	0	0
		July	28	0	0	0	0	0	0	0	0	0
		August	22	0	0	0	0	0	0	0	0	0
		September	24	0	0	0	0	0	0	0	0	0
		October	10	0	0	0	0	0	0	0	0	0
Borana Zone	Dirre Woreda	May	6	0	0	0	0	0	0	0	0	0
		June	10	0	0	0	0	0	0	0	0	0
		July	8	0	0	0	0	0	0	0	0	0
		August	8	0	0	0	0	0	0	0	0	0

Zone Name	Woreda Name	Months	Malaria		Measles		Meningitis		AWD		Rabies	
			Case	**Death**	**Case**	**Death**	**Case**	**Death**	**Case**	**Death**	**Case**	**Death**
		September	5	0	0	0	0	0	0	0	0	0
		October	8	0	0	0	0	0	0	0	0	0
	Arero Woreda	May	40	0	0	0	0	0	0	0	0	0
		June	19	0	0	0	0	0	0	0	0	0
		July	38	0	0	0	0	0	0	0	0	0
		August	49	0	0	0	0	0	0	0	0	0
		September	53	0	0	0	0	0	0	0	0	0
		October	53	0	0	0	0	0	0	0	0	0
	Moyale Woreda	May	41	0	0	0	0	0	0	0	0	0
		June	19	0	0	0	0	0	0	0	0	0
		July	20	0	0	0	0	0	0	0	0	0
		August	17	0	0	0	0	0	0	0	0	0
		September	21	0	0	0	0	0	0	0	0	0
		October	15	0	0	0	0	0	0	0	0	0
Total all assessed Woredas		6 month	1094	0	15	0	0	0	0	0	0	0

Nutrition

The national level demographic and health Survey (EDHS) show a decreasing trend in the proportion of children who are stunted and underweight. But, malnutrition is still one of the main health problems occurred among children and women in Ethiopia. According to the 2016 EDHS report underweight (Low Weight for age) Wasted (Low weight for height or acute malnutrition) and stunted (Low height for age or chronic malnutrition rate are, 24, 10 and 38 respectively). Malnutrition is the main cause of morbidity too in assessed zones and woreda during the assessment period. from the total facilities (hospitals and health centers) 95.7% have functional SC and all (100%) of the HP in the Borena Zone have Functional OTP and two hundred one OTPs and 42 stabilization centers are available in the West Guji Zone Two hundred five (86%) of health worker and 288 (69%) of the HEW are trained on community based acute malnutrition management (CMAM). According to the recent data (October) all SC and 200 (99.9%) OTPs are regularly reporting their performance and in Guji zone out of sixty-two functional health centers, 28 (45%) of them have functional SC and reporting regularly and 272 (92.5%) OTP centers are available zone which is very low when compared to other assessed zones and national target. And also still as the zone is stocked out of therapeutic and supplementary feeding. All woredas have at least one Stabilization center (SC) except in Gujii zone. In addition to this, all woredas health workers identified, trained and assigned for acute malnutrition case management except Gumi eldelo woreda of Guji zone. All trained health worker Assign on nutrition under OPD case team for work. IDPs are included in the emergency nutrition response either by nearby health facilities or Mobile health and nutrition teams in only Guji zone.

According to the all zonal report all MAM cases are being enrolled to TSFP even if there is current stock out of both therapeutic and supplementary feeding. However, the visited health post (Bitata Health post) reports that there is stock out of therapeutic and supplementary feeding in the last two months as a result there is no enrollment of MAM cases to TSFP in Guji zone. This report is inconsistence with zonal report testifying discrepancy in handling data.

Nutritional screening conducted routinely in all assessed zones and respective woredas (Every day). The aggregate global acute malnutrition rate and the CHD screening coverage of the West Guji zone is 7.3 and 72% and 7.4 percentage of proxy GAM for children, moderate (84.5%) screening coverage in Guji zone respectively and which not below the normal cut-off indicate that poor based nutritional status of the community since it was no need for population intervention, but it needs critical attention and close follow-up for the next six months. Dispite of the screening modality of the Zone were not routine and the coverage also below the WHO recommendation (>85%), there is a potential aggravating factor in the community, the nutrition problem of West Guji zone can fall below the serious level (in alert stage of malnutrition alert).

Generaly the trend of Severe Acute Malnutrition cases admission show that increased during the period specially in four Woredas (Gorodola, Gumi eldelo, Liben and Moyale). But the MAM case admission show relatively the same with the 2017 of the same period except in Liben and Gorodola woreda which was increased (See below figure).

All woreda health office made efforts to open new SC sites in health centers and health posts at IDP sites. But nutritional screening at IDP site was not conducted regularly as standard and (Monthly) based. While All Woreda had health Workers which was trained on SAM management at SC and OTP sites.

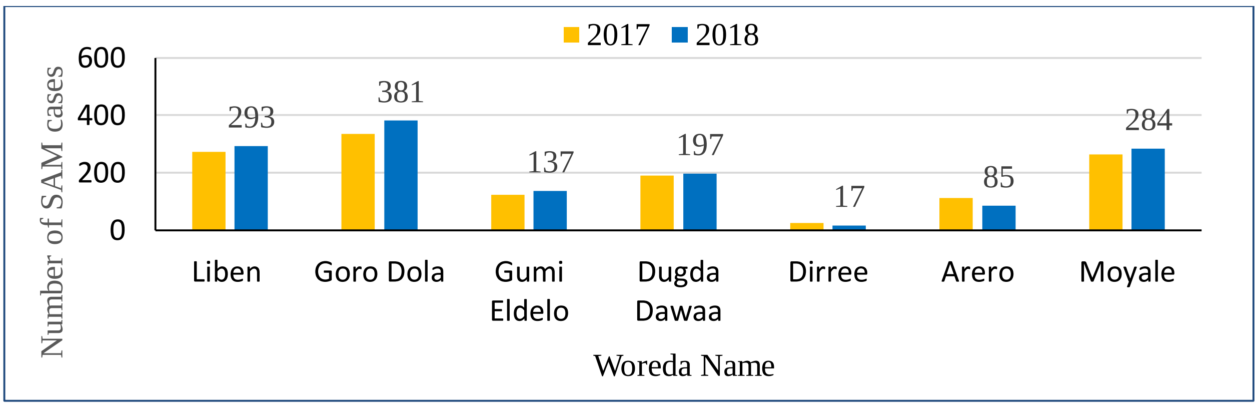


Figure 7.1-3: Trend of SAM Cases admission in Meher emergency needs assessement 2017 and 2018 Borana, Guji and West Guji, Oromia Region.

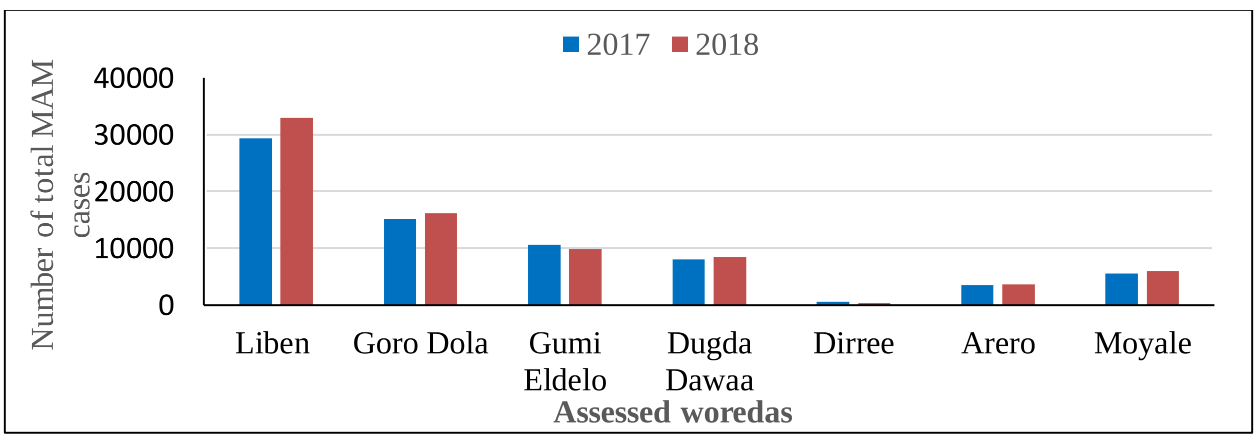


Figure 7.1-4: MAM cases admission trend in Maher emergency needs asssesement woreda meher season 2017 and 2018 Guji, West Guji and Borana Zone, Oromia region Dec, 2018.

There is varying number of SAM admission each month in all woredas showing slight increment as a zone in general when compared to last year of the same months. The average proxy GAM for children ranges from 5% - 8.6 % and for PLW 7.1% of Guji to 31% of West Gujii Zone. Additionally, the average proxy SAM for children varies from 0.3% to 0.7% each month in all zones which is not critical and no need of population based intervention during the months.

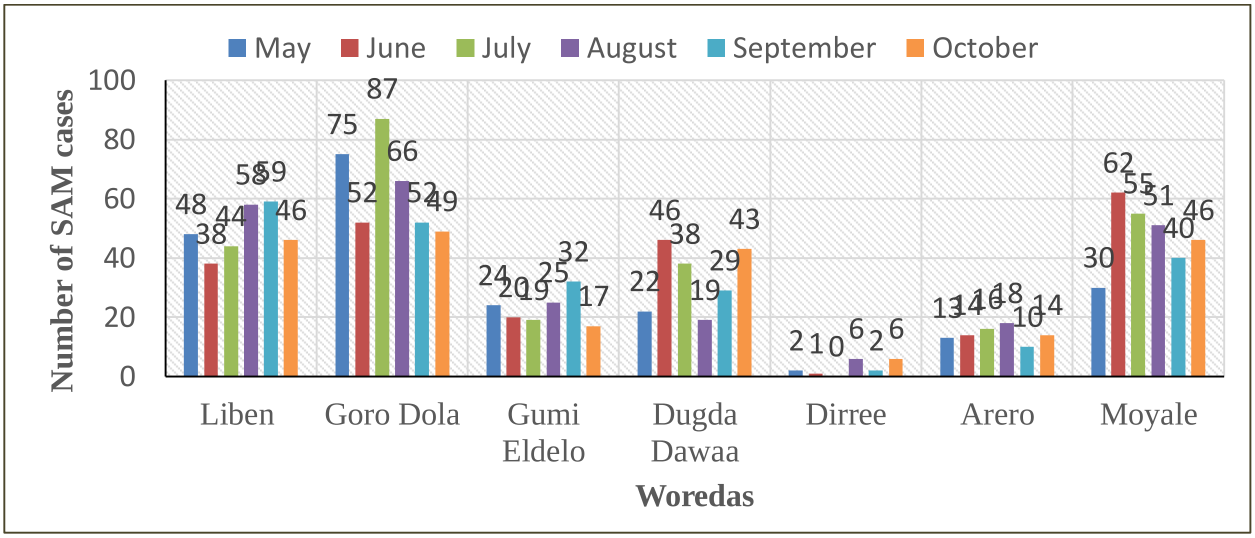


Figure 7.1-5: Trends of New Admission SAM cases by assessed woreda of West Guji, Guji, Borana Zone, Oromia Region, May-Oct 2018.

In all zone, there is a high malnutrition case because of double burden effect of high influx of IDPs and drought effect. With this junction there is emergency nutrition intervention/supply stock out especially in West Guji and Borana. The below Figure 7 indicates high SAM cases are recorded in this year especially through the months of July to September, where it was low in the respective months of 2017. The increment was result from the interruption of emergency food supply for the community due to conflict and track shortage in the zones. However, the aggregate zonal proxy SAM rate is 1.3 which falls below the normal. It seems MAM cases are being well treated (TSFP) before complicated.

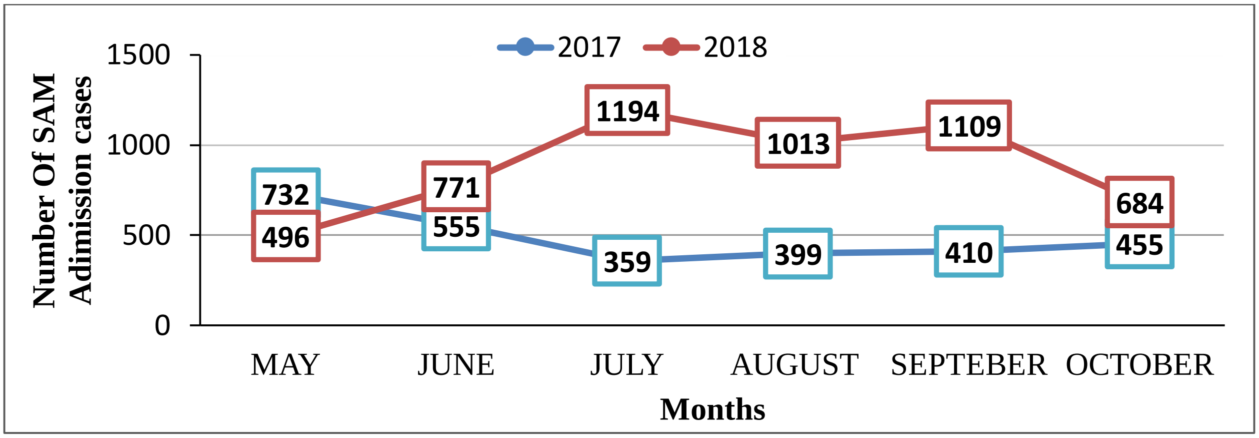


Figure 7.1-6: Shows SAM admission during six months (May to October) of two consecutive years of 2017 and 2018 in assessed Zones.

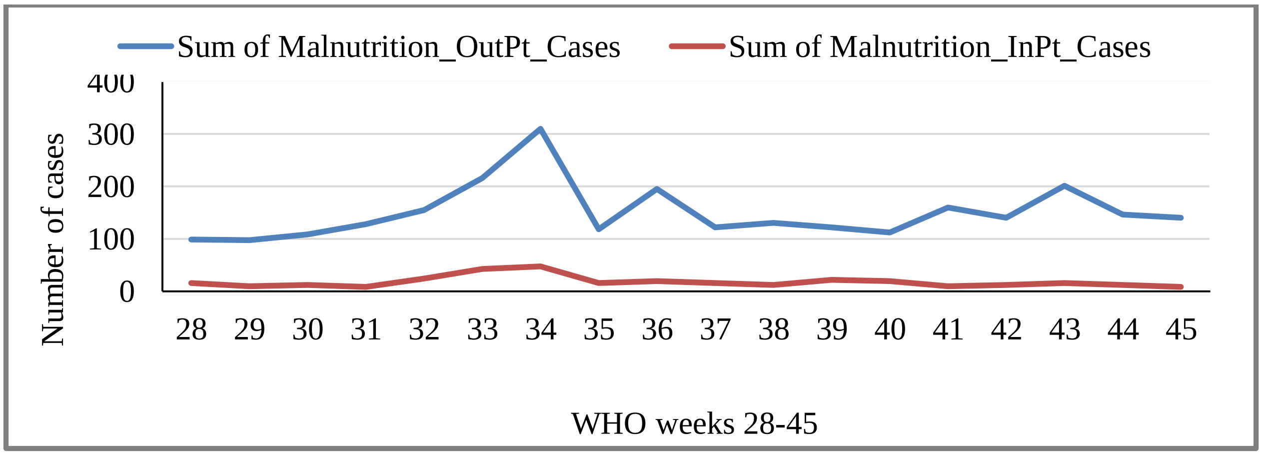


Figure 7.1-7: Trend of MAM and SAM malnutrition cases by WHO Weeks in last six month Guji Zone 2018

Generally, there is the fear that malnutrition cases will rise due to the following reasons for the next six months: -

- Presence of Ongoing border conflict (in all Zone Hosts More than 143,298 IDPs those are prone for malnutrition)
- Unsatisfactory early detection of malnutrition as the recent screening which is less than WHO Recommendation (85%).
- Nutrition sensitive and specific interventions are getting lower attention as the zone boldly focusing on humanitarian interventions
- Shortage of Hagaya season rain (mild September to mild November) at all Visited zones (100% production loss resulted from lack of rain).

- The production was decreased because of community displaced from previously high crop productive and irrigation area.

There is almost all shortage of therapeutic feeding supplies and emergency drugs for three months for Gumi-Eldelo and Moyale woreda and additionally CTC Kit for AWD budget allocated for RR, reported as a challenge (shortage) in all visited woreda. Other shortages include Doxycycline and Amocaciline syrup (Table:6.1.7). Also the zonal health department of Guji Zone had no stock balance of those therapeutic supplies for the next one month, whereas West Guji and Borana Zone has enough stock of those Nutrition supplies. But the woreda under Borana Zone like moyale and Dirre were complain the shortage of both therapeutic feeding and Emergency drug during the same period. This may due to lack of early request and zonal delay to supply for those woredas

Table 7.1-7: Availability of Sufficient therapeutic feeding supplies and emergency drugs for three months by woreda Guji, West Guji and Borena Zones, Oromia, Ethiopia, 2018.

	Therapeutic feeding Supplies (Yes/No)																	
Name of assessed woredas	**RUTF**	**F100**	**F75**	**CSB++**	**RUFS**	**2nd line drugs**	**Ringer Lactate for AWD**	**ORS to Rx AWD**	**Doxycycline**	**Syringe and Gloves**	**Amoxil susp(Measles)**	**TTC ointment (Measles)**	**Vitamin A for measles**	**Coartem**	**RDT for Malaria**	**RDT for meningitis**	**CTC Kit for AWD**	**Budget allocated for RR**
Liben	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**No**	**Yes**
Goro Dola	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**No**	**No**
Gumi Eldelo	**No**	**No**	**No**	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**
Dugda Dawaa	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**No**	**No**
Dirree	**No**	**Ye**	**Ye**	**No**	**No**	**Ye**	**No**	**No**	**No**	**Ye**	**Ye**	**Ye**	**Ye**	**Ye**	**Ye**	**No**	**No**	**No**
Arero	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**No**
Moyale	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**

Risk factors

Malaria

Malaria is endemic in all assessed woredas and highly anticipated because there were 166,160 and 142 malarious kebeles in West Gujii, Borana and Gujii zone respectively. However, preventive measures like LLINs distribution, drainage of breeding site, social mobilization and source reduction measures are being taken. ITN distribution coverage is good (92% in both Guji and West guji Zones) but in Borana Zone 54%b which is below the WHO recommendation and less than national target (80%). also Indoor residual spray (IRS) is conducted only in only five kebeles because most of the kebeles are pastoral in Borana but in Guji and West Guji 100% covered by IRS during the period which is greater than World Health Organization (WHO) recommendation (90%). The new malaria treatment guideline is distributed not distributed for all health facilities in assessed woredas. None of the woredas conducted formal training for health workers on new malaria treatment guideline. Additionally, other preventive and control methods environmental management, social mobilization and source reduction measures are being taken

Acute watery diarrhea, measles

There was AWD epidemic in the last two years in some assessed Zones (Borana and Guji) zones. But there was no recent AWD outbreak in all assessed Woreda. However, most are at risk of outbreak due to history of AWD outbreak at the adjacent Regions, low safe and adequate water supply, and low latrine utilization rate in all assessed woreda. Woredas such as Dire, Arero, Moyale in Borana zone reported Low Latrine coverage and utilization Less than 75% and 65% respectively. Safe Water coverage is in the range of the list 26% of Gumi-Eldelo and the top 59% of Dire Woreda. However, the is no Measles Ongoing measles outbreak reported in all visited woredas measles outbreak predicted because of the presence of measles outbreak in adjacent zones and region, such as Bale zone, Sumale and Afar Region. But 15 sespected measles cases identified and 5 cases sent to regional lab for confirmation from Liben woreda. Low measles vaccination coverage is reported by Gumi-eldelo and Dire woreda 72% and 67% respectively, which is less than WHO Recommendation. The assessment also identified that there was no SIA in all the assessed woredas in the year 2017/2018.

Table 7.1-8: Latrine construction, utilization and safe water coverage Health indicator Coverage, by Woreda, Guji,West Guji and Borena Zones, Oromia, , 2018.

S.N	Woredas	Latrine coverage in %	Latrine utilization in %	Safe water coverage in %	LLIN's Coverage in %	IRS Coverage in %	Measles Vaccine Coverage in %
1	Liben	No data	No data	31	87	93	105
2	Goro Dola	No data	No data	29	No data	95	Unknown
3	Gumi Eldelo	No data	No data	26	89	76	72
4	Dugda Dawa	No data	No data	35	100	0	99.6
5	Dirree	72	62	59	100	0	67
6	Arero	76	42	35	100	0	100
7	Moyale	64	50	39	100	0	96.3

Internal Displaced Population's (IDP's) Situation

Table 7.1-9: Proportion of Population Displaced among visited woredas during Meher assessment in Guji and Borana Zone, Oromia Region, 2018.

Zone Name	Assessed Woreda Name	Total Population	Special Population(IDP's)	proportion of Displaced Population in %
Gujii	Liban	92,731	5,500	5.9
	Gumi Eldelo	12,740	32,302	253.5
Borana	Arero	47,534	15,557	32.7
	Moyale	165,059	88,171	53.4
Total		318,064	141,530	44.5

IDPs are one of the major humanitarian crises in the three zones resulting in displacement of 322, 386 individuals due to border conflict. Death and injury are the most common direct impact of conflict during the period. Malnutrition and inadequate protection, lack of shelter, dignity kits, cloth, supplementary food, latrine problem, Health service problem, distress, lack of medical treatment supply violence also among indirect causes of the conflict in all assessed zones. In agro pastoral area on-and-off violent conflicts between the Borana, Garre, Guji and Konso, Guji and Gedio have become commonplace. Although occurring at local levels, these conflicts have involved complex legal, political and economic dynamics that extend to national and even regional dimensions, encompassing the communities and their settlers elsewhere in Ethiopia and across the border in Kenya. Competition over land and water has been identified as a potential trigger for conflict, as loss of land and livelihood resources, worsening labour conditions and environmental degradation negatively affect and threaten household and community livelihoods. Currently Among Total Populations 381,064 Generally about 44.5% of visited woreda population was displaced due to border conflict. Majority of population were displaced from Moyale worada which is more than 53.4% of woreda population similarly Sources estimate that over the past 60 years, 40 percent of civil wars have been associated with natural resources (5). Since the IDPs are living in a sophisticate manner due attention should be given to follow their health situation. At IDP Shortage of nonfood items, water supply, ration distribution mismatch, Incomplete food basket distribution and inequitable (which is 25 Kg and 1 Littre food oil per house hold per a month) additionally costing IDPs host community for emergency transportation from woreda to kebele level, lack of health care service, nutritional screening service and overcrowding is a major problem identified during the site visit the problem was worsen on Gumi -eldelo and Moyale Worada.IDP communities were urged to pay the transport cost of relief food dispatched up to the distribution centres at Gumi Eldello (budget Shortage) and due to increased number of IDP host community Sharing of relief food was reported which has an impact on food consumption and utilization that could result poor Calorie requirement for households. (25 kg /HH)

Major challenges in IDP's site

The zonal health department complain that the face out of IDP supporting NGO's (MERCY CORPS and UNICEF) the interruption of service like the two cars rented by UNICEF and given for both IDP woredas Liben and Gumieldalo were taken back which makes difficult for the woredas to travel and provide health service and also the mobile health team by MERCY CORPS is stopping service claiming the six months contract is finished and incentive which was used to pay for woreda health workers when they travel to IDP stopped and this makes some lack of commitment among Health care providers. Generally, shortage of transportation for mobile health team and emergency drugs are main challenges that faced many woredas of the three zones. Resource scarcity due to community come together in to one area or abnormal population movement from place to place result from irregular conflict that resulted from food and water shortage and community exposed for diarrheal diseases, Lack of budget and logistics were others challenge of woredas in IDP's site. Particularly in West Guji Zone coordination among sectoral teams was poor; there was critical shortage of emergency drugs, safe drinking water, water treatment chemicals and operational cost.

Challenges/ gaps

- Security problem at some part of zones make difficult to visit the situation of some IDPs sites
- Difficulty to get the right persons/experts for the information during woreda visiting
- Incompleteness and poor quality of available data & time constrain to collect data at all levels from concerned officers (West Guji Zone and Borana Zone including some visited Woredas)
- Zones and Woreda health offices have raised the following challenges
  - Lack of training for RRT on basic PHEM.
  - Shortage of some drugs, safe water supply and Shortage of water purification chemicals (community level and IDP Site)
  - Irregular food delivery, incomplete package and under entitlement of targeted number of beneficiaries supply by Region DRM.
  - IDP communities were forced to pay the transport cost of relief food dispatched up to the distribution centres (Woreda level budget shortage).

7.1.6 Conclusion

- There is no functional multi-sectoral PHEM coordination forum in majority of the addressed woredas including zonal health department except Guji Zone.
- No emergency response fund (budget) in all assessed woredas except Liben woreda.
- Diarrhea and pneumonia is the leading cause of morbidity in both under five children and above in all assessed woredas.
- Increased diarrheal cases despite low supply of ORS and WTC (Gumi eldelo G/Dola, Liban)
- Outbreaks of Malnutrition, Measles, and AWD are the most anticipated risk in all zones dispite of the existence of measles outbreak in the zone and adjacent zones and increased SAM cases and water shortage and water treatment chemical shortage in the zones.
- There was confirmed Measles outbreak, 15 suspected Measles cases indentified 3/5 cases confirmed from Liben woreda.
- 100% loss of crop production resulted from conflict and lack of Hagaya rain in all assessed woreda.
- Interruption of emergency nutrition supply for the woreda for more than 3 months in all woredas and shortage of NFI supply for IDP sites (specilly in Gumi Eldelo, Liben and Moyale)
- Weak emergency coordination across sectors (Example West Guji Zone)

- Budget/fund shortage for health and nutrition in all assessed woredas
- Stock out of most of emergency medicines and medical supplies at zone and assessed woredas (Guji zone, Moyale and Gumi eldelo Woreda)
- Household water treatment chemicals shortage in assessed Woredas; warns related human disease outbreak risks especially AWD and other water borne diseases.
- Low measles immunization performance (Dire and Gumi eldelo) woredas.
- Nutritional problems in majority of visited Woredas and increased SAM cases compared to 2017 of the same period.
- Almost half of the woreda total population (44.5%) of Four woreda (Liban, Gumieldelo, Arero and Moyale) are displaced and need for urgent food and non food support

7.1.7 Recommendations

- Activating emergency preparedness and response meeting forum by engaging all stake holders
- Strengthen zonal and woreda multi-sectorial health and nutrition coordination forums and support the EPRP by allocated budget and capacity building both at woreda and zone level.
- Strengthening and integrate IDP disease surveillance to routine woreda surveillance channel.
- Regional Health bureau should be plan measles SIA among Dire and Gumi-Eldelo and Liben Woreda (where 15 suspected Measles cases reported and low Rutine vaccination coverage)
- The RHB and FMOH fill the gaps identified as shortage like budget, drugs (especially emergency drug) and should insure adequate stock of emergency drugs and medical supplies at all level to facilitate capacity for timely response.
- Woreda Health office should anticipate public health emergencies, strengthen a surveillance at all level specially at IDP site
- Data management and reporing should improve and strengthen at zone and woredas.
- RHB and FMOH should Allocate budget for emergency preparedness and response at zone and woreda level and also budgeting for anticipated health risk such as AWD, Malaria and malnutrition.
- Region should be supply emergency shelter and non-food items and water purification chemicals for displaced people and host community.
- Establish mobile health team or temporary clinic at IDP site.
- Urgent dispatching nutritional and therapeutic supplies from zone to stock out woredas aswell as from region to the zone.

- Provide adequate TFP supplies and establishing mobile health team for IDPs host community and close monitoring nutrition satus of childrens.
- Returning of displaced community to their usual residence place were due attention specilllay Liban, Gumieldelo, Arero and Moyale Woredas.

7.1.8 Reference

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8 Chapter –VIII: Protocol/Proposal for Epidemiologic Research Project

8.1 Insecticide Treated Nets Utilization and Associated Factors Among Settlers of Darimu Woreda of Iluababora Zone, Oromia, Ethiopia, 2019

Summary

Background: Ethiopia is one of the most malaria epidemic-prone countries in Africa. about 52 million people (68%) the county poples lives in malaria risk areas. Malaria is responsible for over one million people death each year in the world. Insecticide treated net (ITN) is an effective tool for preventing the transmission of malaria. Currently Ethiopia established a plan to ensure universal coverage by distributing ITNs for peoples living in malarious areas, and improve utilization and care through behavior change communication. Persons living within 1 km of recent malaria cases advised to sleep under their long-lasting insecticidal nets (LLINs) in Ethiopia. But the utilization of ITNs has been found to vary with seasons of the year. Research indicates that while households receiving ITNs through purchase or free distributions, the utilization was remains low. Even though various predictors were studied, certain household practice on ITNs utilization among settler's population have not been addressed well and recently. The occurrence of malaria epidemics has become more common and the burden of malaria remain a major public health problem in Oromia. Darimu is the leading malaria reporting woreda among malaria hot spot woredas in Iluababora zone in the region that has many gold mining sites and settler's population following birbir and golol river.

Objective: The objective of this study is to determine ITNs utilization and associated factors among settler's population in Darimu woreda of Iluababora Zone, Oromia Region, South-West Ethiopia, 2019

Methods: Community based cross-sectional study will be conducted from April/2019 to May/2019. A total 541 Sample size HHs estimated by using Epi info version 7.2.1.0 statistical software. The assumptions taken are: an expected proportion (ITN utilization) of 80% with a 95 % CI, 5% margin of error and 2 design effect and by adding 10% for non-response. The heads of houses or any family members aged ≥18 years and lived for more than 3 months in the selected kebeles will be included. The sampling will be accomplished in two stages. Initially all malarious kebeles that has gold mining sites and have a settlement population will be listed (22), and then twelve kebeles will be selected randomly using the lottery method. Next, Participant households will be selected by systematic random sampling method by using computer generated random

number from family folder list households of with freely ITNs supplied list from the chosen kebeles. Study participant will be households proportional to households in the selected Kebele. Data on socio-demographic, socio-cultural, Environmental factors, individual related factors and programmatic factors will be collected by the use of pre-tested English questionnaire adapted from related literatures and translated to local language (Afan Oromo). Data will be entered into Epi-Info version 7.2.1.0 then; it will be exported to SPSS version 23 for statistical analysis. Univariate analysis will be conducted to see frequency distribution, central tendency, variability (dispersion) and shape of the overall distribution of independent variables. Bivariate analysis will be done to measure the association of each indicator variable with ITNs utilization. To identify the predictors of ITNs utilization multiple logestic regression will be computed.

Work plan and Budget: The study will be conducted from April/2019 to May/2019.The total budget required to conduct the study is 37,966.96 ETB.

8.1.1 Introduction

Malaria is a life threatening caused by infection of red blood cells with protozoan parasites of the genus Plasmodium inoculated into the human host by a feeding female Anopheles mosquito. (1).There are more than 100 species of *Plasmodium*, which can infect many animal species such as reptiles, birds, and various mammals. Four species of *Plasmodium* have long been recognized to infect humans in nature. In Ethiopia, The Plasmodium species which have epidemiological importance are Plasmodium falciparum and Plasmodium vivax; these two dominant Plasmodium species known for causes of malaria infection with annual prevalence were 60–70 % P. falciparum and 30–40 % P. vivax (2,3). The five human Plasmodium species that transmitted from person to person are P. falciparum, P. vivax, P. ovale (two species) and P. malariae. (4). P.falciparum is the most prevalent malaria parasite in Africa and responsible for most malaria deaths globally but P. vivax is the dominant parasite outside of sub-Saharan Africa (5). Plasmodium falciparum accounted for ~ 60% of cases (range 55– 69%) and P. vivax 40% (range 31–45%) from 2001 to 2016 (6). Federal ministry of health conduct ITNs distribution through mass campaigns in 2015/16 covered 32.96 million people in 442 Woredas through the of 18,327,668 ITNs. Continuous distribution was not implemented as originally planned, the Ministry has endorsed on-going rolling mass campaigns and private sector sale of ITNs to ensure ITN coverage (7). Currently Ethiopia established a plan on National strategy for LLIN coverage by 2020 to ensure universal coverage by distributing 1 LLIN per 1.8 persons living in malarious areas, and improve utilization and care through behavior change communication activities and continuous distribution of LLINs through HEWs in communities to replace worn out/deteriorated or lost nets and cover new household members in targeted LLINTs (8).

Malaria morbidity and mortality have been significantly decreased in worldwide; in the past decade many countries have achieved substantial reductions in their malaria burden. In some of these countries, malaria is now limited to remote, forested areas, and malaria cases among migrants and mobile populations represent a high percentage of the total number of cases (6,9).

The World Health Organization estimates that in 2016 about 3.2 billion People live in areas at risk of malaria transmission in 106 countries and territories and caused 216 million clinical episodes and 445,000 malaria deaths occurred globally. The heaviest burden of malaria is in sub Saharan Africa; which constitutes approximately 90 % of total estimated malaria deaths (10). Malaria kills one child every 30 seconds, about 3000 children every day and Over one million people die from malaria each year (9). In 2016, there were an estimated 445,000 deaths from malaria globally, African Region accounted for 91% of all malaria deaths, followed by the South East Asia Region (6%) (11). This is because the majority of malaria infections in Africa are caused by P.falciparum, the most dangerous of the four human malaria parasites (9). Malaria is a major cause of poverty and the cost of malaria control and treatment drains African economies, slowing economic growth by about 1.3 percent a year (12). It is not widely understood that malaria epidemics are serious public health emergencies that have a major impact on health and the economy (13). Globally, reductions in malaria mortality have led to an increase in life expectancy of 0.26 years in malaria endemic countries, representing 5% of the overall gain of 5.1 years (14).

At the beginning of 2016, malaria was considered to be endemic in 91 countries and territories, down from 108 in 2000. Much of the change can be attributed to the wide-scale deployment of malaria control interventions. Despite this remarkable progress, malaria continues to have a devastating impact in Sub Saharan Africa. Between 2013 and 2015, a total of 510 million insecticide-treated mosquito nets (ITNs) were reported by manufacturers as having been delivered to countries in Sub-Saharan Africa, which exceeds the minimum amount required to achieve universal access to an ITN in the household (491 million) (14).

Ethiopia is also one of the most malaria epidemic-prone countries in Africa and about 52 million people (68%) the county peoples residing in malaria risk areas and it continues to be a major health concern results in economic losses at the household, community and country levels (1,14).

Ethiopia reported a total of 1,755,748 in which 1,530,739 (87.18%) confirmed malaria illnesses 1,059,847 (69.23%) P. falciparum and 470,892 (30.27%) P. vivax), 225,009 (12.82%) clinical malaria cases reported for malaria cases with 356 (0.02%) deaths reported due to malaria annually by 2017. the number of malaria cases has declined and the proportion of cases confirmed using laboratory tests has increased (15).

Ethiopia was one of 16 countries accounted for more than 80% of cases contrubuting in the period 2014 to 2016 and also planned for a 40% reduction by 2020 (16). Dispite of, Ethiopia was one country suffering a substantial burden of disease due to malaria, the problem of malaria is very severe in Ethiopia, major cause of illness and death for many years. Approximately 52 million people (68%) live malaria endemic areas in Ethiopia, chiefly at altitudes below 2,000 meters (17). The nature of the topography, variations in climatic conditions and concentration of populations in highland, malaria free areas indicates the long history of malaria in the country at whole. Recognizing the disease as a priority health problem, organized intervention efforts were initiated during the late 1950s. In Ethiopia Since, a strong malaria prevention and control activities have been carried out, a significant achievements were made through malaria control (18).

Malaria is mainly seasonal in the highland fringe areas and of relatively longer transmission duration in lowland areas, river basins and valleys. The best available proxy for local malaria transmission risk in Ethiopia is household altitude below 2,000 meters above sea level, since malaria is rarely transmitted at higher elevations (unless there are weather abnormalities and widespread epidemics). Therefore, Populations living in areas below 2,000m above sea level are considered to be at risk of malaria in Ethiopia (11,15).

Our country ambition was to achieve malaria elimination within specific geographical areas with historically low malaria transmission by 2015, near zero malaria transmission in the remaining malarias areas of the country by 2015 and to eliminate malaria from Ethiopia by 2030 (15,19).

Ethiopia's fight against malaria started many years ago and transmission of this infectious disease significantly decreased. Since 1958, major epidemics of malaria have occurred at approximately 5-8 year intervals, though recently there has been a trend towards smaller scale, more frequent, sporadic epidemics and seasonal case build ups (20).

In Ethiopia, malaria is highly seasonal in many communities, but may have nearly constant at the Woreda level and malaria outpatient caseloads may vary several-fold from year to year in an "unstable" epidemic-prone transmission pattern. The transmission peaks bi-annually; from

September to December and some areas experience a second minor malaria transmission period from April to June, following a short rainy season from February to March coinciding with the major harvesting seasons and result for serious consequences economy (6,15,21).

Malaria epidemic are serious public health emergencies that have a major impact on health and the economy. The epidemic have occurred as a result of environmental and social changes as well as of the failure of control measures (13).

Malaria interventions are highly cost-effective and demonstrate one of the highest returns on investment in public health. Vector control is an essential component of malaria control and elimination. Currently long-lasting insecticidal nets and indoor residual spraying are core and broadly applicable vector control interventions in the world, therefore WHO recommend that, all people living in areas where the risk of malaria is high are protected through the provision, use and timely replacement of long-lasting insecticidal nets (22). According to the FMOH's NMSP 2017-2020 malaria risk stratification based on API from 2015 micro- plan data, 60 percent of the population is residing in malaria risk areas (i.e., below 2000 meters); this translates to 60 percent of the population in the country that needs to have access to ITNs (15). 75 % of the Oromia land is considered malarious, accounting for over 17 million people at risk of infection (23). The distribution and use of ITNs is one of the main interventions for Malaria infection prevention in developing countries (24). Therefore, as per the National Malaria Strategic Plan (NMSP) 2014-2020, the Ethiopian Federal Ministry of Health (FMOH) conducted a mass campaign in 2015-2016, distributing 29.6 million long-lasting insecticide-treated mosquito nets (ITNs) to protect all Ethiopians living in areas with ongoing malaria transmission, representing 60 percent of the total population (15). Before 2011 LLIN coverage targeted all age groups in endemic areas below 2000 m altitude and long lasting insecticidal nets have been provided free in all malaria endemic areas since 2011 (6).

The Ministry does not have a specific continuous distribution strategy to prioritize pregnant women and children. However, all households in malarious areas are targeted for ITNs, so pregnant women and children will be covered under the campaigns (15). National malaria guidelines recommended that persons living within 1 km of recent malaria cases should be advised to sleep under their long-lasting insecticidal nets (LLINs) (1). But the utilization of ITNs has been found to vary among the community with seasons of the year and the acceptability of the nets also under the question also found to be under question (25).

Malaria is the most important public health in Oromia region; it is widely distributed in about 82% of the woreda in the region and account for about 17% of Outpatient visits, 15% of admissions and more than 25% of hospital deaths (17). Malaria is the most common disease in Iluabaora zone with frequent occurrence of epidemics both in the past and present. The transmission is seasonal and normally peaks during September to December after the summer rainy season and April to May in short rain seasons. Malaria epidemics of variable degree had affected Darimu Woreda during last year (2018) in Bena site kebeles.

8.1.2 Statement of problem

In Ethiopia, the interaction of mountainous terrain with variable winds, seasonal rains, and ambient temperatures create diverse micro-climates for malaria transmission. Malaria is highly seasonal in many of the country areas, but may have nearly constant at the Woreda level and malaria outpatient caseloads may vary several-fold from year to year and transmission peaks bi-annually, from September to December and some areas experience a second minor malaria transmission period from April to June, following a short rainy season from February to March coinciding with the major harvesting seasons and result for serious consequences economy (15,21).

It is expected that the role of forecasting, early warning and early detection range will diminish through time as the fight against malaria moves towards universal coverage of all effective interventions (1). Ethiopia is one of the countries that have implemented the revised strategies to control malaria. Despite the massive efforts to implement these strategies, malaria continues to cause significant morbidities and mortalities in the endemic areas of country (26).

Distribution of nets to communities without health education on the importance of ITNs in prevention of malaria, as well as how to use nets, may not bring about the desired result and lead for economic crisis in the country. The National Strategic Plan 2017-2020, plan for malaria control in Ethiopia is to provide reliable information on sustaining malaria control and accelerating progress towards elimination by strengthening surveillance data management capacity, supporting routine surveillance in 42 Woredas and 7 town administrations in Oromia Region and also monitoring ITN durability (15). The goal is that 100% of households in malaria-endemic areas own one LLIN per sleeping space and protected by ITNs/LLINs and that at least 80% of people at risk of malaria use LLINs. (27,28). The goal of the new National strategic plan is to reduce malaria morbidity by at least 40% against the baseline level of 2016, maintain near zero malaria deaths (no more than 1 confirmed malaria death per 100,000 populations at risk) by 2020 and eliminate malaria from Ethiopia by 2030 by achieving all households living in malaria endemic areas will have the knowledge, attitudes and practices towards malaria prevention and control by 2020, through HEWs, health development armies (HDAs), and model family households to deliver malaria BCC interventions (15).

While the national malaria control program struggles to control malaria in Ethiopia, outbreaks occurred in some areas of the country. However, while the overall malaria prevalence has decreased, unpredictable outbreaks increasingly occur irregularly in area of previously considered "malaria free". Such outbreaks have disastrous consequences on populations (29).

Most studies in Ethiopia depicted that despite high percentages ITN owner-ship the rate of ITNs utilization is very low, there was still a gap between ownership and use of ITNs, which is against to the national target (23,25). Data suggests that; its use by the population, especially vulnerable groups remains low. Most households were using ITNs for unintended purposes like raping over mattress to protect from bugs, for grain and fruit carrying, to spread grains on the sunshine, using as screen/curtain, for fishing, and other similar purposes (23,24). Even though there is a scarcity of information about factors influencing its use, so we focuses on community behaviors and stresses the central importance of socio-cultural factors, knowledge, and beliefs concerning utilizing ITNs for malaria control (30).

Even though various predictors were studied, but certain sociodemographic and household practices on ITNs utilization among settler's population have not been addressed well and also recently, the occurrence of malaria epidemics has become more common and the burden of malaria remain a major public health problem in the Iluababora zone. Therefore, scientific evidence is needed to uncover and support possible associations between these selected socio-demographic, socio-cultural factors, knowledge and local practice characteristics on ITNs utilization among settler's population in Darimu woreda to prevent malaria. The objective of this study is to identify ITNs Utilization and associated factors among settler's household's population in Darimu Woreda, Iluababora Zone, South-Western Ethiopia.

Research Questions:

- Are there any demographics, social reasons, cultural factors and household practice related with the use of treated mosquito bed nets?
- Is any ITNs Structure and color associated with the use of ITNs in the Woreda?
- Are there any ITNs structure factors associated with use of bed net?

8.1.3 Literature Review

Insecticide Treated Nets (ITNs) are a common and powerful means of malaria prevention that serve as a main component for many existing programs. Use of ITNs is one of the major vector control measures in Ethiopia (23). Research indicates that while households may be receiving ITNs through purchase or free distributions, the utilization was remains low. Study in Gambia ,North west of Ethiopia and Namibia, show that a lack of association between ownership of ITN and Malaria (31–33). Previous research has shown that barriers such as finances, knowledge, and family structure can hinder ITN use (15) .

ITN programmes, more than other vector control methods, depend to a large extent on the acceptance and active involvement of individuals and communities. Therefore, the emphasis in this study will be on the human factors and on the human and social aspects of the more technical factors (34). Use of ITNs is reported only for Sub-Saharan Africa, where malaria vectors are most amenable to control with use of ITNs intervention. it is estimated that 53% of the population at risk slept under an ITN in 2015 increasing from 5% in 2005 and from 30% in 2010 (14).

A cross-sectional study conducted in, North Gondar, Amhara region, Ethiopia on Utilization of insecticide treated bed net and associated factors among households showed that prevalence of ITN utilization among the 260 net-owner households, utilization of ITN by household members was 91.9% (95% CI 88.5–95%) the night preceding resumption of the study and (88.5%) have knowledge about the transmission of malaria of whom 228 (99.1%) know that malaria is transmitted by the bite of a female anopheles' mosquito suggesting a higher awareness and sufficient knowledge about transmission of malaria and ITNs, and household structure are found to be significant (35).

However, ITNs was freely provided with at least one ITN by the Woreda for House holds the utilization was low due to lost or stolen, used for other purposes (e.g. storage of sorghum, to make fences, protect bulls from insect bites), and thrown away as old, Home construction used as bond, fear of its toxicity and perception that ITN could not prevent malaria (23).

The study knowledge, attitude and cultural factors towards utilization of insecticide treated nets (ITNs) conducted in Myanmar showed only 3.6% of respondents had good knowledge level, 19% good attitude level and 38.8% good practice level towards utilization of ITNs, and Female participants were 8 times had good practice level than male (p-value <0.001, AOR 8.015, 95% CI=3.395-18.923). High school level participants likely to use ITNs for 14.518 times than lower education level (p-vale<0.001, AOR 14.51, 95% CI=4.64-45.40). Married participants were 13.75 times done good practice (p-vale<0.001,AOR=13.753, 95%CI=4.37-43.26) and widowed participants were 5.4 times done good practice than singles (p-vale 0.03, AOR 5.403, 95% CI= 1.085-26.909) (36).

The cross sectional study on Factors influencing the use of malaria prevention strategies by women in Senegal showed the use of ITNs was not significantly different among women of different age groups (p value 0.108). However, the uptake was higher among women in the middle and the richer wealth quintile. Interestingly the most significant difference was observed between the highest wealth quintile and partial uptake (37).

An Institutional based study conducted on Utilization and Associated Factors of Insecticide Treated Bed Net among Pregnant Women Attending Antenatal Clinic of Addis Zemen Hospital, North-Western Ethiopia showed: Among a total 226 subjects, 160(70.8%) of mothers had good utilization of insecticide bet net. Mothers who had an educational status of college and above were 2.8 times more likely to utilize insecticide-treated bed than mothers who could not read and write (AOR;2.8: 95%CI; 1.9-6.5). Mothers whose age was >30 were 70% times less likely utilized insecticide-treated bed net than mothers whose age was 30 and less (AOR;3: CI;.2-6) (38).

The Knowledge, Attitude and Practice (KAP) about Insecticide Treated Net (ITN) usage against Malaria study on Kolla Tembien Woreda, Tigray, Ethiopia showed, knowledge of household heads about the role ITNs, 82.34% of respondents reported that they use the nets for protection from mosquito bites. Only 1.09% of the respondents claimed ITNs to protect them from malaria, the disease. More than 57% of the interviewees have also reported that they sleep under ITNs every night. Regarding groups who are given priority to sleep under ITNs in the household, 76.63% of the respondents indicated children bellow five years of age to be given priority (39).

A community-based cross-sectional study conducted in Wonago woreda, Southern Ethiopia, showed that 68.8% were reported to have been used by the houses It was also reported that about 42% of under-five children did not sleep under ITNs in the previous night before the survey and Availability of separate bed room (Adjusted OR=1.98, 95% CI:1.24-3.16), possession of two or more ITNs by households (Adjusted OR=2.03, 95%CI:1.19-3.45) and respondents that ITN prevents from of perception mosquito bite (Adjusted OR=6.74, 95%CI:4.38-10.39) were associated to the use of at least one of their ITNs by households (25).

A cross-sectional, cluster randomized household survey in specific Woredas of Southern province of Zambia show that, number of sleeping spaces in household and number of people were both positively correlated with number of mosquito nets used. These correlations are both significant (r = 0.325, P < 0. 001 and (r=0.467, P< 0.001) respectively Correlation co- efficient measures the strength of the two variables. Thus for every increase in number of sleeping spaces or people in household there was significant increase in number of mosquito nets used in household (40).

The study conducted on (KAP) about Insecticide Treated Net (ITN) usage against Malaria in Kolla Tembien Woreda, Ethiopia showed the imbalance between family size and number of ITNs owned by the households (39).community-based cross-sectional study was conducted in Mirab Abay, Ethiopia show that Households with family size of ≤5 members were more likely to utilized ITNs than those with >5 members. only 37.2% of under 5 years of age children utilized ITNs the previous night prior to the survey(24,41).

ITN Utilization linked to some demographics:

A community based cross-sectional study conducted in the Chewaka Woreda settlement area of southwest Oromia among settlers and among under-5 Years Old Children in Mirab-Abaya Woreda, Gamo-Gofa Zone, Ethiopia and in Rural area of Cameron on Insecticide treated nets use and its determinants showed that, Age and sex of respondents were not significantly associated with ITN utilization. Married appeared to be the main category of ITNs users 69.05% and there is a pronounced discrepancy with the issue of ITN utilization among different age groups. the ages 26-40 years appeared to be the ultimate category of individuals that adhere to the use of ITNs 75%, followed by individuals >50years 72.7% while those 18-25yrswere observed from findings to be on the bottom in scale of ITN users 32.26 %(23,30). A questionnaire survey and qualitative direct observation of household's study conducted in Kachin Special Region II, northeastern Myanmar show that, high rate 98.6 % of bed net used by females (42).

Linking educational levels and the use of nets:

The study conducted in Cameron and Ethiopia showed that Following respondents' educational levels, ITN utilization was not progressive and education levels of respondents, and ever heard education messages about ITN were not associated with the use of ITNs Individuals with no formal education and secondary level of education accounted for 76.92% and 77.78% respectively used ITNs while Degree and Masters Holders used ITNs the least 26.32% and 33.33% respectively. Standing on these evidences, it can therefore be assumed that respondents' adherence to the use of

ITNs decreases with increase educational status (23,30). But the study conducted in Maynmar and Selected Woredas of Southern Province of Zambia are showed that participants, moderate and good knowledge level were 5.125 times had good practice level than lower knowledge level participants in ITNs Utilization (p-vale <0.001, AOR 5.125, 95% CI=1.062-6.429) and Education of head of household was found to have an association with ITN use OR=0.67, p. value=0.001 (36,40). People may be knowledgeable about malaria prevention but if they don't implement preventive measures the battle can never be won.

Factors related to source of information

The study on Factors That Influence Ownership and Use of Insecticide Treated Nets and the Role of Community Health Workers in Selected Woredas of Southern Province of zambia and impact of malaria related messages on insecticide-treated net (ITN) use for malaria prevention in Ghana found a strong association between IEC from Community Health Workers and ITN use p.value 0.006, OR=1.2, 95%CI 1.2-3.2 and the messages delivered by a health worker or a dedicated radio programme had the highest effect for one or more children sleeping under a net the night before the survey OR adjusted =1.65; 95%CI =1.44 to1.88 (40,43).

A cross-sectional study design involving analysis of secondary data from community-based malaria survey conducted in Myanmar result showed, source of information on ITNs, health personnel including private providers were the major informers to (72.4%) followed by leaf-lets/brochures (8.5%), friend's/family members/neighbors (8.2%), and posters (5.6%) (44).

Factors Related to ITNs Shape and Weather

A study in Amhara, Ethiopia found that shape preference was more or less evenly split, with ease of use and more compatible with sleeping arrangements with house style the main reason for preferring conical nets and better fit with bed and reduces body contact with the net were the main preference for rectangular net (45). But, a review of literature and data on Effect of user preferences on ITN use by Hanna conclude that the shape and colour do not significantly influence net use to degrees that would require action by programme planners. Other study conducted in Zambia show that, no significant association between shape of the net and use (OR=1.01, 95% CI 0.98 – 1.04, p = 0.632) (40). People are using the nets they receive, and when they do not, it is for reasons unrelated to shape and size (46).

The study conducted on factors in association with use or nonuse of ITNs in Rural Cameron and on use and retention of long lasting insecticidal nets (LLINs) in the Brazilian Amazon malaria risk area show that, hotness (heat) resulted a discomfort of body is the main reason reported by locals for not using mosquito nets (30,47).

Cultural and occupations Factors:

The study conducted in Rural Cameroon Show Currently, no tribe was investigated to have any cultural limiting factor associated with ITNs utilization and 68.42% of farmers appeared to use nets, even though they have low knowledge about the sickness while, medical doctors had a 25.00% remained the least users on the scale of ITNs utilization (30). A cross-sectional, cluster randomized household survey in specific Woredas of Southern province of Zambia show that Respondents in the wealthiest households were more likely to use ITNs as opposed to respondents living in the poorest households (52.8% vs 41%) (40).

8.1.3.1 Justification

Ethiopia's fight against Malaria started more than half a century ago. Use of ITNs is widely recognized as a main effective intervention to prevent malaria. High use rates of ITNs are an important goal of many malaria programmes (48). Data on the number of ITNs distributed within countries were as reported to WHO by 39 countries including Ethiopia where ITNs are ITNs are the primary method of vector control (49). ITNs utilization has been shown to reduce malaria case incidence rates by 50% and reduce malaria mortality rates by 55% (16). Ethiopian National malaria guidelines recommended that persons living within 1 km of recent malaria cases should be advised to sleep under their long-lasting insecticidal nets (LLINs) (1).

The design of effective ITN programs has to be based on good knowledge of local perceptions and customs. Number of individuals who slept under an ITN the previous night used to define the behavioral gap in use of ITNs (i.e. the population with access to an ITN, but not using it) and distinguishes it from the ownership gap (i.e. non-use because there are not enough nets in the household) (12).

Free distribution of ITNs/LLINs in areas of high malaria transmission is one of the key interventions for malaria elimination (30,44). Many countries across Sub-Saharan Africa, are increasing insecticide-treated net (ITN) coverage to control malaria. Many study conducted in the Africa revealed that knowledge on the use of ITNs and utilization was noticeably very low and The study shows that a big number of people may own ITNs and still not use, which is as good as not having at all (3,25,40,41,50). Therefore, community based research is essential in the development and strengthening of ITN programs by identifying the major factors for ITNs utilizations in the country and sensitizations against the negative approaches on ITNs is still very necessary. Observations showed that many ITNs were placed incorrectly and some were used for purposes other than as a bed net. The study such us; observation, structured interviews and focus group discussions can yield valuable, in-depth data on behaviours related to bed nets utilization needed (34). Despite of, there had been malaria outbreak in forest and mining areas of this Woreda, during March 2018 and we observe during outbreak investigation ITNs utilization by which most observed HH assessed for ITNs were using ITNS for unintended purposes like rapping over mattress to protect from bugs for grain and fruit caring and using for screening houses and fence construction and others similar purpose were observed during field visit. Therefore, the initiates for the need to study and characterize ITNs utilization and determine associated factors in related to utilization in malaria-endemic kebeles of Darimu that known to be mandatory. Based on the study findings, evidence based recommendations were explored for better ITN utilization for effective implementation of information, education and behaviour change communication activities to maximize the impact of ITNs in reducing malaria morbidity and mortality and support malaria elimination target sated by ministry of health by 2030.

8.1.3.2 Conceptual frame work

The conceptual framework below shows several factors that influence ITN use. Malaria knowledge has a huge impact on ITN ownership and use. Personal factors; knowledge, belief, attitude, perceptions and habit of People and Socio Economic, demographic and environmental factors are importance in ITNs utilize. Information importance of ITNs during provisional; number and frequency of distributions are also a crucial in promoting ITN ownership and use. Net characteristics, house conditions also play a role in ITN use. ITNs in bad shape are less likely to be utilized and are not effective. Other factors that result in low ITN use are number of people in a household number of ITNs in a household and occupational of peoples can play a siginificant role in the utilization of ITNs (40).

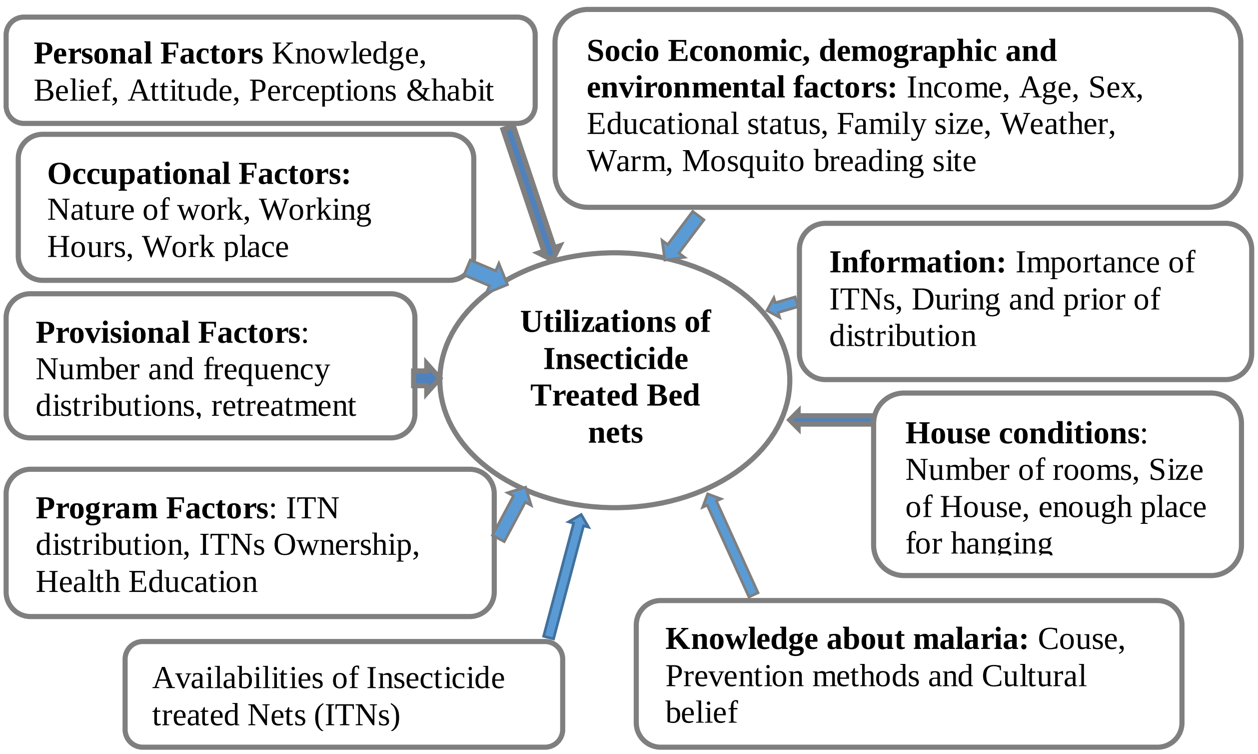

Figure 8.1-1: Conceptual framework for factors affecting Insecticide Treated Nets utilization.

8.1.4 Objectives of the study

General objective

- ITNS Utilization and associated factors among settler's population in Darimu woreda of Iluababora Zone, Oromia Region 2019

Specific objective

- Characterize the pattern of ITN's utilization in Darimu Woreda;
- Determine associated factors on ITN's utilization in Darimu Woreda.

8.1.5 Methods and Materials

Study Area

Darimu Woreda is one of Iluababor Zone in Oromia Region. Darimu Woreda have an estimated area covering 1,395.79 square kilometers. The projected populations of Darimu Woreda for the 2017 were 202,892 making an estimated population density of 95 people per square km, which is greater than the Zone average of 72.3. Of the total population there were 33,336 under five children and 7,507 pregnant women in the Woreda. the Woreda is further subdivided in to 45 rural and 2 urban kebeles whereas, Darimu Woreda have two geo climatic zones, Weinadega (Mid-land 2000-2500m altitude) which constitutes 54.4% and kola (low land <2000m) accounts for the remaining 45.6% with annual rain fall of 1142mm-1172mm**.** The Darimu Woreda larger town is Dopa. which is located 64 KMs away from zonal town Iluababora (Matu) and 664 KM's to the South west from Addis Ababa and that of Darimu Woreda shares border with West Wollega Zone in North, Alge Sachi Woreda in East, Bilonopha Woreda of Ilubabora zone in South and Kellem Wollega zone in west. Majority of the populations in the Woreda were Oromo ethnic (97.36%), and the plurality of the inhabitant's religion in the Woreda Were Muslim, with 44.64% of the population. Water bodies such as River and streams are common in the Woreda, which serve as potential breeding site for the malaria. Populations were engaged in agricultural activities and searching for gold mining around Birbir and Golol River. The presence of small scale irrigation schemes to sustain crop production throughout the year and community initiated gold mining area and malaria outbreak in Forest and mining areas of this Woreda There are 1 (one) Woreda Hospital, 6 (Six) health centers and 46 (forty-six) health posts in woreda with potential health service coverage of 86%. All the populations of Woredas were living in malarious areas and (59%) of Population at risk of malaria. Insecticide Treated Bed Nets (ITNs) were distributed to households in the last three years by the coverage of 81%, as well as Indoor Residual Spray (IRS) was also applied dispite of this woreda has gold mining sites in different places of kebeles many people came to this woreda (illegal population settlement) from different directions of the country for the search of labor gold and mixed farming crop production.

Study Design

A community-based cross-sectional study will be used for this study.

Study Period

Data collection will be started on April/2019 and ends in May/2019. The study will be completed in June 2, 2019.

Sample size determination and Sampling procedures

The sample size will be determined by using Epi info version 7.2.1.0 statistical software. The utilization of ITNs based on the history of sleeping under a net on the previous night was 80% in a previously done study in North Gondar, Ethiopia (23). With a 95 % CI, 5 % margin of error and 2 design effect resulting sample size required for this study is 492 households. Finally adding 10% for non-response resulting the grand total sample size required will be 541 households. The Woreda has a total 47 Kebeles (including 2 Urban and 45 Rural). The households in the malarious kebeles and had settler's peoples will be constituted as the source population. The sampling technique will be accomplished multistage sampling with kebeles and households as primary and secondary sampling unit respectively. Twenty-two of the forty-five rural malarious kebeles those have to be a settlement population and gold mining sites will be listed out and then twelve kebeles will be selected randomly using the lottery method drawn from where the households will be selected systematically. The allocation of the sample households to the kebeles was proportional to the kebele size (24,51). The lists of households in each of the study kebeles with ITNs will be obtain from health posts before undertaking systematic sampling to draw the study households. Participant households will be selected by systematic random sampling method by using computer generated random number from family folder list households of with freely ITNs supplied list from the chosen kebeles. Sampling interval was established based on the total number of households with ITNs in the kebeles. Households will be substituted with the nearest neighbor in cases of refusal to participate or if the house was not inhabited. Unique identification numbers will give for selected households in each kebele. ITN utilization data will be collected considering vulnerable groups, including non-immune immigrants coming there for search of gold mining purpose, children under five years and pregnant women. Two data collectors will be recruited for each selected kebeles having minimum of college level diploma and health background. Kebeles or villages with no settlement and/or non-gold mining sites will not be included in the study.

Data collection instrument

A Semi-structured and pre-tested questionnaire household questionnaire will be administered to individuals in households. This tool is taken from Ministry of Health/Ethiopian Public Health Institute prepared by Malaria Indicator Survey Technical Working Group team members. The questionnaire will be composed of variables for socio-demographic, culture, environmental, knowledge about the transmission and prevention of malaria, attitude and practice to ward of ITNs utilization. Additionally, the status of ITNs was also inspected during day time by using structured check lists and additional data will be collected by using photograph.

Data collection Procedure

The study team will consist of two field supervisors based on qualification that have BSc in health, one data clerk and twelve data collectors who have good experience of data collection with similar study experiences and able to speak Afan Oromo will be recruited. Experienced data collectors preferably who have health background will be recruited, trained for two days (theoretical and field training) and deployed at the site. The major sources of data will be household heads/house wifes/persons and health facilities whose age is above or equal to 18 years.

Data entry and Analysis

Data entry and cleaning will be done by principal investigator Data will be coded and entered in to designed template in EPI-Info version 7.2.1.0. Cleaned data will be exported to SPSS (statistical package for social sciences) software version 23 for statistical analysis. Data will be presented using descriptive statistical methods; with frequency distribution tables, percentages and graphs. Furthermore, inferential statistics will be done to look into factors that influence the major outcome variables of LLIN’s Utilization and other issues related to household knowledge and reasons for not use. 95% confidence intervals will be used. Both bivariate and multivariable analysis will be computed. Odds ratio with 95% CI, and P-value less than 0.05 were used for both bivariate and multivariate analyses to determine the association between factors.

Data quality Assurance Measures

The questionnaire was pretested in 27 households (5% of the total sample) at Dopha Kebele, which is not included in the study. Questionnaires will be checked for completeness at the time of data collection. Data collectors and supervisors will review every questionnaire for completeness and for logical consistency, and counter checked will be conducted by the principal investigator at the end of each day in the field. Feedbacks on previous day activities will be provided for both data collectors and supervisors on daily basis during data collection. The questionnaire will be prepared originally in English and then will be translated in to Afan Oromo and back to English to ensure reliable information and final data cleaning will be conducted at the end of data entry.

Operational definition

Insecticide Treated Nets (ITNS Bed nets): Defined as all long-lasting insecticide-treated and other insecticide-treated nets (ITN). Therefore, all insecticide- treated nets, whether long-lasting insecticide-treated nets or re-treated nets are referred to here as net or bed net (43).

An insecticide-treated net is a mosquito net that repels disables and/or kills mosquitoes coming into contact with insecticide on the netting material. There are two categories of ITNs: conventionally treated nets and long-lasting insecticidal nets:

A conventionally treated net is a mosquito net that has been treated by dipping in a World Health Organization (WHO) recommended insecticide. To ensure its continued insecticidal effect, the net should be re-treated after three washes, or at least once a year.

A long-lasting insecticidal net is a factory-treated mosquito net made with netting material that has insecticide incorporated within or bound around the fibers. The net must retain its effective biological activity without re-treatment for at least 20 washes under laboratory conditions and three years of recommended use under field conditions (WHO standard).

Net utilization is defined as having slept under a net during the night preceding the survey.

Household Ownership of ITNs and ITNs Utilization defines as:- Households are considered as ITNs owners if they have at least one ITN at the time of the interview (24).The utilization of ITN was measured by considering those who slept under an ITN a night before the interview as being utilizers of nets (52).

Inclusion and exclusion criteria

Inclusion criteria:

Study participants will be including all women, men and children of all ages. The heads of houses or any family members aged ≥ 18 years and lived for more than 3 months in the selected kebeles and able to provide necessary information will be included.

Exclusion criteria:

All participants who had no bed nets and those are not able to provide necessary information such as a respondent critically ill, unable to communicate will be exclude from the study.

Variable of the study

The outcome variable for this study is LLIN utilization defined as the use of at least one LLIN by the households during the night prior to the interview. The main research question is whether selected characteristics of the head of the household are associated with ITN use. The association of each possible independent (explanatory) variable with the dependent variable (ITN use during the prior night) will be tested. The study will be including the following independent variables: -

Sociodemographic Characteristics

- Age (<5, 5-14, 15–24, 25–34, ≥35 years) or above, & Occupation (Employed or Unemployed)
- Education (no education, primary, Second and above), Religion (Catholic, Protestant, Muslim, or other)

Intra-household factors

- Family size, Number of bed rooms, and number of beds/sleeping space, distance of vector breeding site from living house, type of housing structure and indoor residual spray
- Wealth index was derived from measurements of household ownership. The weighted scores were categorized into three levels (poor, middle, or rich) depending on national welth category.

Health-related factors

Number of ITNs in the household (< 2, ≥ 2) or household ITN density (number of ITNs owned divided by number of household members) Media exposure was measured by access to newspapers, radio, and television. Access to media will be defined as those participants who reported to listening to radio at least once a week, watching television at least once a week, and reading newspaper at least once a week. Knowledge about malaria and ITNs, knowledge on mosquitoes as the malaria vector, knowledge on fever/chills as a key sign of malaria; perceptions on the safety of ITNs for young children and pregnant women.

Characteristics of the ITN:

- General condition (tear and wear); Age, Size, Shape, Source
- Occurrence of malaria in the household during the prior year;
- Source of ITNs (bought obtained a government facility or store, or received free of charge in the past two years).

Ethical clearance

Ethical clearance will be obtained from School of Public Health-Addis Ababa University ethical committee. Permission will be also obtained from the all concerned bodies including; Oromia Regional Health Bureau PHEM and Research directorate, Iluababora Zonal Health Department and Darimu Woreda Health Office respectively. The data collectors will be oriented during the training so that they would provide proper advice for the respondents regarding any malpractice they might have come across. Interview will be carried out only with full consent of the person being interviewed. Before each interview, clear explanation will be given about the aim of the study that it will not neither to evaluate the performance of the individual nor to blame anyone for weakness but to gather information and opinions that may lead to eventual improvement in the utilization of ITNs. Each respondent will be assured that the information provided by them would be confidential and used only for the purpose of research.

Dissemination plan

The final results will be submitted to Addis Ababa University school of public health. After commented by the university, the result will be communicated to Ethiopia Public Health Institute (EPHI), Oromia regional health bureau, Iluababora Zone zonal health department and Darimu woreda health office., partners and others. One-day conference will be arranged at woreda level to present the study results at Darimu woreda. In addition, efforts will be made to publish the paper and disseminate it via presentation on different national and international conferences.

Expected outcomes

Factors that may influence people against use of ITN's will be clearly identified and all appropriate recommendation will have provided.

Limitation

- Being a cross-sectional survey, causality will not be inferred from a findings of study.
- Respondents can be report ITN use, while there is a possibility that some people reported having used an ITN the night prior to the survey, when they actually didn't use ITN.

8.1.6 Work Plan and Budget break down

Table 8.1-1: Tentative work plan and implementation time of the project in Darimu.

Activities	Periods in Months (November to June)								Responsible person
	Nov	Dec	Jan	Feb	Mar	April	May	June	
Proposal development and translation of data collection tool to local language									Principal investigator
Proposal presentation and approval									Principal investigator
Obtaining ethical clearance									Principal investigator
Recruiting and training data collectors									Principal investigator
Pretesting data collection instrument Check for the validity of data collection tools									Principal investigator and data collectors
Data collection (Field visit) Data cleaning and entry									Principal investigator, supervisors and data collectors
Data analysis and write up									Principal investigator
Incorporating comments from advisors and Finalizing report writing									Principal investigator, Advisors
Final report submission defense and dissemination of the result									Principal investigator

Budget Break down

Table 8.1-2: Budget Break down Of Darimu woreda ITNs utilization and associated risk factors Study

S.no	Item	Unit		Quantity	Unit price	Number of days	Total price in Birr	Remark
1	**Personnel cost**							
1.1	Translator	Person		3	200	1	600	
1,2	Data Collector	Person		12	100	10	12,000.00	
1.3	Supervisor	Person		2	200	10	4,000.00	
1.4	Guider	Person		12	50	10	6,000.00	
Sub-total A							**22,600.00**	
2	**Stationeries**							
2.1	Note pad	Each		15	12		180	
2.2	Pen	Each		15	4		60	
2.3	Pencil	Each		36	1.5		54	
2.4	Sharpener	Each		15	5		75	
2.5	Photocopy	Page		4,220	0.5		2110	
2.6	Printing and binding	Pcs		6	80		480	
Sub-total B							**2,959.00**	
3	**Training**							
3.1	Training hall rent	Number		1	800		800	
3.2	Perdium	Supervisor	Person	2	200	2	800	
		Data Collectors	Person	12	100	2	2,400.00	
3.3	Refreshment	Person		15	50	2	1,500.00	
Sub-total C							**5500.00**	
4	Communication	Mobile card		15	100	1	1,500.00	
5	Transportation to study site	Trip		2	300	6	3600	
Sub-total D							**5,100.00**	
Contingency= 36,159.01* **5%**							**1,807.95**	
Grand Total Budget ETB (A+B+C+D							**37,966.96**	

8.1.7 Reference

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9 Chapter–IX Other Additional Output Reports

9.1 Narrative summary report of training given for Woreda and Health facilities PHEM focal persons from West Wollega and West Shawa zone December 2018

9.1.1 Introduction

The lack of human resources with appropriate knowledge and skills has been a major challenge in Ethiopia (1). Disease Surveillance implemented within the framework for Integrated Disease Surveillance and Response (IDSR) strategy; the strategy that was adopted by the FMoH in 2001. After the restructuring of the FMoH in 2009, the country adopted IDSR as part of Public Health Emergency Management (PHEM) and vaccine preventable disease surveillance became a component of the PHEM core process, at the federal level within the Ethiopian Public Health Institute (EPHI). PHEM guidelines have been developed in 2012 for the 21 diseases under surveillance, and specific guidelines for diseases and disease conditions such as AFP, Measles, MNT and Cholera surveillance have been finalized and PHEM trainings were conducted Since PHEM's establishment, there has been a steady increase in completeness of PHEM reporting. Community level data is captured by Health Extension Workers (HEWs) through community based surveillance volunteers. Recently, the establishment of the Health Development Army (HDA) has provided an additional source of community based data. Other community based surveillance structures have been established by PHEM and partners (including WHO) (2).

In Ethiopia the ability to detect problems and respond to health emergencies through proper surveillance system has been largely limited. As a result, prevention and control of epidemics was weak and this was partly due to lack of skilled personnel (3).

Since PHEM is designed to ensure rapid detection of any public health threats, preparedness related to logistic and fund administration, and prompt response to and recovery from various public health emergencies in Ethiopia. It is the process of anticipating, preventing, preparing for, detecting, responding to, controlling and recovering from consequences of public health threats in order that health and economic impacts are minimized. In view of this, PHEM guideline was developed as a working document

Based on the supervision and routine surveillance system analysis some Zones in the region achieved poor performance in some indicators of surveillance and others Public health emergency response during the last six months. Therefore, Oromia Regional Health Bureau as well as zonal health department there were a need to train all PHEM focal persons in the woreda and health facilities to feel the gap and skill regarding to achieve effective disease surveillance system, improve case management and strengthen the surveillance of maternal and prenatal death (MPDSR) and the 20 priory diseases in both regions.

The additional training and refreshment training were provided for two zones (west Showa zone and West Wollega). After the training The trainees will equip and extend opportunities to obtain knowledge and skills of PHEM through sharing knowledge by this training and able to use the data they collect from the system, detect and respond to priority diseases, risks, conditions and events and thereby contributing to reduction of the burden of illness, death and disability in their respective woreda and Health facilities in the zone.

9.1.2 Objectives

General Objectives

To strengthen knowledge and skills of PHEM focal persons on the surveillance of priority diseases and overall PHEM activities

Specific objectives

- To familiarize participants on PHEM overview.
- To strengthen capacity in recognizing and responding to public health emergencies
- To strengthen the early warning & surveillance system and effective surveillance activities
- To Improve the use of information for detecting, investigating and responding to public health threats and recovery on priority diseases
- To improve the flow and use of surveillance information throughout the health system

Training components (List of Topics coved by this training)

The training covered the topics like; Overview/ Introduction to PHEM, Early warning and Surveillance, Public Health Emergency Preparedness, AFP Surveillance (Overview of Poliomyelitis and its Eradication Process), Measles Prevention, Control and Surveillance and Measles Outbreak Investigation & Management, NNT Epidemiology and surveillance, AWD Epidemiology, AWD case management and CTC, Malaria Epidemiology prevention and Control, Scabies prevention and control, Meningities Epidemiology and surveillance, Guinea Worm prevention, control and surveillance, Public Health Emergency Response and Recovery, Public Health Emergency Response and Recovery continue, Outbreak investigation.

9.1.3 Methods

Training period and venue

The training was conducted from December 22 to 24, 2018, at Ambo Town

Training participants

The training is intended to build the skills and knowledge of the Public Health Emergency Management teams PHEM staff, surveillance officers/focal points and health facilities and woreda level in two zones (West Wollega and West Shoa Zone). Total 60 trainees participated on this training.

9.1.3.1 Training Method

- Lectures (detail presentation on each topic with discussion)
- Group discussion and Exercise
- Brainstorming
- Recapping the previous
- Exercises followed by group presentation
- Pre and post-test
- Questions and answers

9.1.3.2 Training Resources

- Specific reference material
- Power point slides
- Video films
- Pictures
- Computer
- Flip chart
- Marker
- White board
- LCD projector
- Notebook and pen

9.1.3.3 Trainers

- Two Field epidemiologist (From West Shoa Zonal Health Departement)
- One Field epidemiology resident
- Two Oromia region staff and Three WHO staff (zonal coordinators)

9.1.4 Result

Total 60 trainees woredas and health facilities PHEM focal persons were planned and about 59(93%) have attended the training was successfully for consecutive three days. Among 59 trainees 50(85%) were males and 9(15%) females. The mean score for pre-test and poste test were 29.9 and 52.5 respectively with mean deference of 22.6 between the tests. There was a difference between two test results; (8 and 20) minimum score and 67 and 100 was the maximum score in pre and post-test respectively.

Training Evaluation Result

Table 9.1-1. Statistical description of pre and post-test results, Woreda and Health facilities PHEM Focal Person Training, Ambo, Oromia, December 22-24, 2018

Tests	Number of trainees	Mean	SD	Median	Mode	Minimum	25 %	Maximum	75 %
Pre-test Result	59	29.9	1.6	30	30	8	20	67	36
Post-test Result	59	52.5	2.3	52	56	20	39	100	68

Trainers with list of topics

Table 9.1-2:public Health Emergency management Basic Level Training Schedules- Ambo Town December 22-24, 2018

Day	Parallel Sessions	Time	Responsible	Facilitators
Day-1	Registration	2:30 to 3:00	Facilitators/ORHB staff	Alemayehu/ Tesfaye
	Opening Remark	3:00 to 3:10	Gemechu Shumi	
	Pre test	3:10 to 3:30	Facilitators	
	Introduction to PHEM	3:30 to 4:00	Bokona/Birhanu	
	Early warning and Surveillance	4:00 to 4:30	Bokona/Birhanu	
	Tea break	*4:30 to 4:50*	***Facilitator***	
	Public Health Emergeny	4:50 to 6:30	Bokona/Birhanu	Natinael/Bir hanu
	Lunch	*6:30 to 8:00*	***Self***	
	AFP Surveillance	*8:00 to 9:30*	Dr.Abrahim/Dr.Taye	
	Measles Prevention, Control and Surveillance	9:30 to 10:00	Dr.Abrahim/Dr.Taye	
	Tea break	*10:00 to 10:20*	***Facilitator***	
	Measles Prevention, Control and Surveillance continue	10:20 to 11:00	Dr.Abrahim/Dr.Taye	
	NNT Epidemiology and surveillance	11:00 to 11:30	Dr.Abrahim/Dr.Taye	
Day-2	Recap of Day1	2:30 to 2:45	Participants	Natinael/ Dr. Taye
	AWD Epidemiology, AWD case management and CTC	2:45 to 4:30	Tesfaye/Bokona	
	Tea break	*4:30 to 4:50*	***Facilitator***	
	Malaria Epidemiology prevention and Control	4:50-6:30	Natineal	
	Lunch	*6:30 to 8:00*	***Self***	Dr. Abraham/ Alemayehu
	Scabies prevention and control	*8:00 to 9:00*	Bokona	
	Meningities Epidemiology surveillance	*9:00 to 10:00*	Alemayehu/Tesfaye	
	Tea break	*10:00 to 10:20*	***Facilitator***	
	Guinea Worm prevention, control and surveillance	*10:20 to 11:30*	Bokona/Birhanu	
Day-3	Recap of Day2	2:30 to 3:00	Participants	Bokona/Tes faye
	Public Health Emergency Response and Recovery	3:00-4:30	Natineal	
	Tea break	*4:30 to 4:50*	***Facilitator***	
	Public HE Response& Recovery continue	4:20-6:30	Natineal/Alemayehu	
	Lunch	*6:30 to 8:00*	***Self***	
	General Discussion	8:00-10:00	***Gemechu Shumi***	Facilitators
	Tea break	*10:00 to 10:20*	***Facilitator***	
	Post Test Closing Remarks	10:20-10:50	Gemechu Shumi and Fac	

9.1.5 **Discussion**

Training for strengthen public health emergency management at Woreda and Health facilities was implemented in the period of December 22-24, 2018. The training was implemented for 59 total trainees (woreda and health facilities from West Wollega and West Shoa zone of Oromia region). The training was successful, this confirmed by high marks scored during the post-test compared to the pre-taste the score was improved from (67) of the highest score in pretest and (100) in post-test. Dispite of the security problem during the training period Effective message from the region and zone was contributed for almost all 93% achievement of participation of trainees attain the training from all woredas

All planed training topics were delivered for training participants according to pre assigned time frame and trainers. All trainees attend the training all days without absent. Significant improvement was identified among the training participants in which the mean of pre-test score was 29.9 in pretest and 52.5 in post-test. And this may have expressed by the number of participants scored ≥50 were increased from 8.5% in pre-test to 52.4 in post-test. At the end of each topics detail question and answer were made by the group and printed test were distributed for the trainees and all trainees were participated on the answering the questions. During the group exercise some practical exercises as well as oral feedback was given at the end of the training

Challenges and gaps faced during the training

- Lack of printed training material for participants
- Shortage of Training time
- Inconvenient training hall (Very Wide and not appropriate for participants)

9.1.6 **Conclusion and Recommendation**

The training Evaluation show that significant improvement in knowledge test result among participants and the training were successful since almost all expected trainees attended the training. The training was successful since all expected participants were attended. Also, the analysis of post-test documented that there was significant improvement among participants after the training. Generally, it can be concluded that the predicted objective has been achieved. More over preparing suitable training hall with sufficient printed training materials and time were needed to achieve effective training is recommended. Therefore, training preparation should de include all necessary Format and manual for trainers and more practical session were needed in fact that one training in duration of four days is not enough for participants to take a close look into more complex and greater than 25 in one training room.

9.1.7 Acknowledgement

May thanks go to Oromia Regional Health bureau PHEM and Research Directorate and WHO for their financial and technical support during this interesting training. I would like to acknowledge the West Shawa Zone PHEM staff for facilitating the training and all training participants, trainers and facilitators from Oromia regional health Bureau and WHO surveillance officers.

9.1.8 References

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3. Ethiopian Health and Nutrition Research Institute Emergency. Basic Level Public Health Emergency Management Training Module October 2012. 2012.

9.2 Oromia Regional Health Bureau PHEM Weekly Bulletin, WHO-Epidemiological Week-12, 2019.

Highlights of the Week

- Both Regional surveillance report completeness and timeliness were 89%.
- SAM cases were increased by 138(6.8%) as compared to week 11.
- scabies cases were decreased by 339(11.2%) as compared to week 11.
- Confirmed malaria cases were increased by 132 (12.6%) as compared to Week 11.
- Measles case were increased by 32.1%

9.2.1 Introduction

This bulletin serves to summarize weekly surveillance data and performance of ORHB/PHEM on epidemic prone diseases and other public health emergencies. It comprises completeness, timeliness, trends of priority diseases and response activities. It also provides feedback on surveillance activities for WHO week 12, 2019 (Table: 9.2 1).

9.2.2 Method and Materials

Study Design: Discriptive Secondary data were analysed

Study Period: WHO week 12

Data sources: Zonal and Woreda Heath Departemet

Data Anaysis toll: Microsoft word and Exel 2016 used

Table 9.2-1: Key Indicators/diseases/conditions Reported in week 12, March,2019

Indicators	Week 12 Reported
Total suspected malaria Cases	20,434
Confirmed malaria (PF+PV)	1,180
Sum of SAM	2,146
Scabies Cases	2,673
Completeness %	89%
Timeliness %	89%
Dog/Animal bite	59
Suspected Meningitides cases	21
Suspected Measles Cases	358
Maternal Death notification	22
Cholera/AWD Cases	0
Dracunculiasis Cases	0
Suspected Anthrax	0
Relapsing Fever	0
AFP Suspected cases	4
Perinatal Death	9

9.2.3 Weekly Surveillance Reporting status

Regional surveillance report in both completeness and timeliness of government health facilities were 89%. Report completeness of three zones (East Hararge, Guji and west Guji zone) and Four adminstrative towns (B/Guracha, Batu, Madjo and Burayu town) was below target. But all other the expected zones and towns was report complete and timely report.

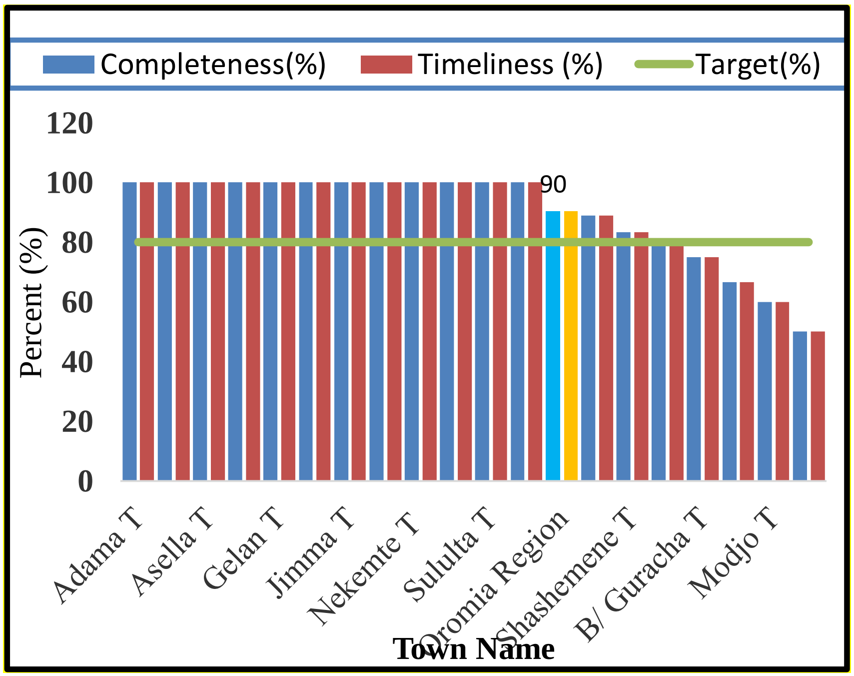

Figure 9.2-1: Report compltenes and timeliness by Towns, Oromia as of WHO week 12, March,2019

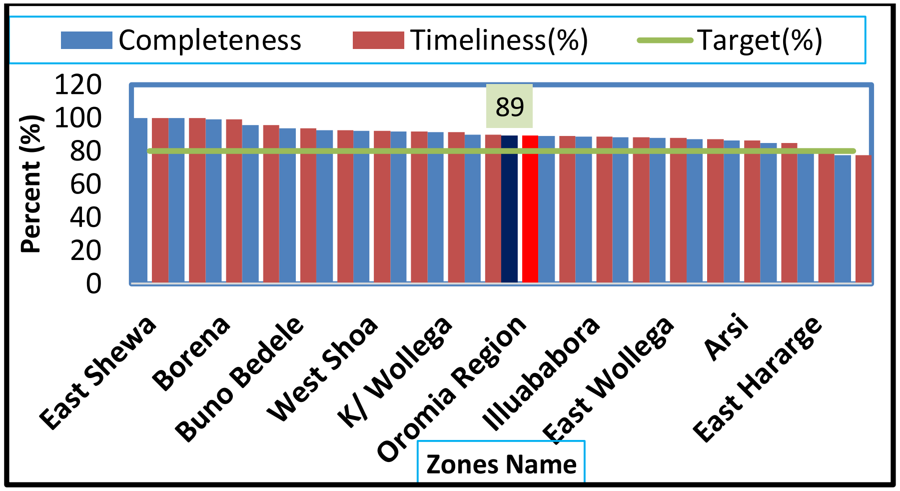

Figure 9.2-2: Report completeness and timeliness by Zones, Oromia as of WHO week 12, March 2019

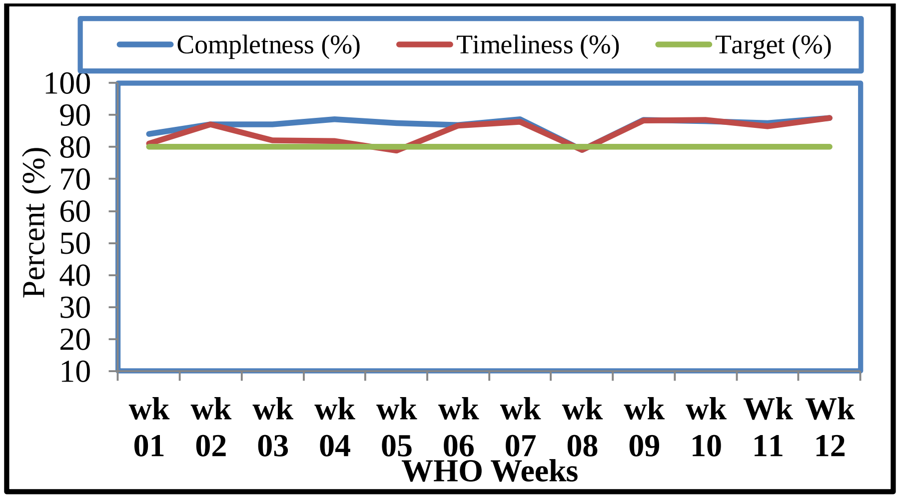

Figure 9.2-3: Trends of Regional surveillance report completeness and timeliness of 12 consecutive weeks, (WHO weeks 01–12) March,2019

9.2.4 Diseases or conditions

Malaria

In this week, 1185 clinical and confirmed malaria cases were reported. Among the total clinical and confirmed malaria cases 1180 (99.6%) of them were confirmed cases. Of the total confirmed cases, 785(66.52%) of them were plasmodium falciparum and 5 inpatient case and no death in this week. Confirmed malaria cases were increased by 132 (12.6%) as compared to Week 11. A total of 20,434 febrile cases were laboratory tested, yielding a positivity rate of 1185(5.7 %) this week.

The highest number of confirmed malaria cases were reported to region from zones and woredas as depicted in (Table -9.2.2)

Table 9.2-2: Malaria Positivity rate by zones/ woredas of Oromia Region, week 12, March,2019

Zone/Woreda name	Exam.by RDT/Microscopy	PF+PV	SPR	% from Region or Zones
East Shoa	2518	124	4.9	10.5
Gimbichu	362	38	10.5	30.6
Olaniciti Hosp	321	29	9.0	23.4
Kell/Wollega	963	122	12.7	10.3
Kake Hosp.	242	62	25.6	50.8
Dale Wabera	158	21	13.3	17.2
West Wollega	2351	113	4.8	9.5
Kondala	99	36	36.4	31.9
Mana Sibu	145	27	18.6	23.9
West Guji	490	110	22.4	9.3
Abaya	277	39	14.1	35.5
Gelana	120	63	52.5	57.3
West Shoa	765	88	11.5	7.3
Nono	178	37	20.8	42.0
Guji	671	82	12.2	6.9
Shakiso Town	241	33	13.7	40.2
Odo Shakiso	61	25	41.0	30.5
Borana	363	63	17.4	5.3
Teltele	207	45	21.7	71.4
West Arsi	604	60	9.9	4.9
Arsi Nagele	139	40	28.8	66.7
Batu Town	778	29	3.7	2.5
Woliso Town	421	29	6.9	2.5

A trend of regional confirmed malaria cases for the last 12 consecutive weeks is indicated below (Figure: 9.2.3).

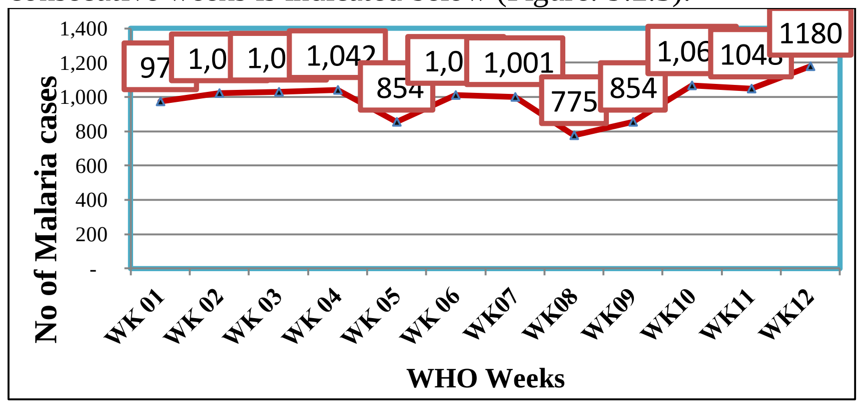

Figure 9.2-4: Trends of confirmed malaria cases by week, Oromia Region, 01-12 Week, March,2019

Dysentery

In this week, a total of 2,071 dysentery caseswere reported to the region. There were 16 admitted dysentery cases in this week. Cases were increased by 211(11%) as compared to week 07. The highest number of cases were reported from East Hararge 179(8.7%) West Arsi 169(8.2%),Jimma 143(6.9%), Arsi 134(6.5%), North Shoa 122(5.9%) and Guji 112 (5.4%).

Trends of dysentery cases for the last 12 consecutive weeks are shown below

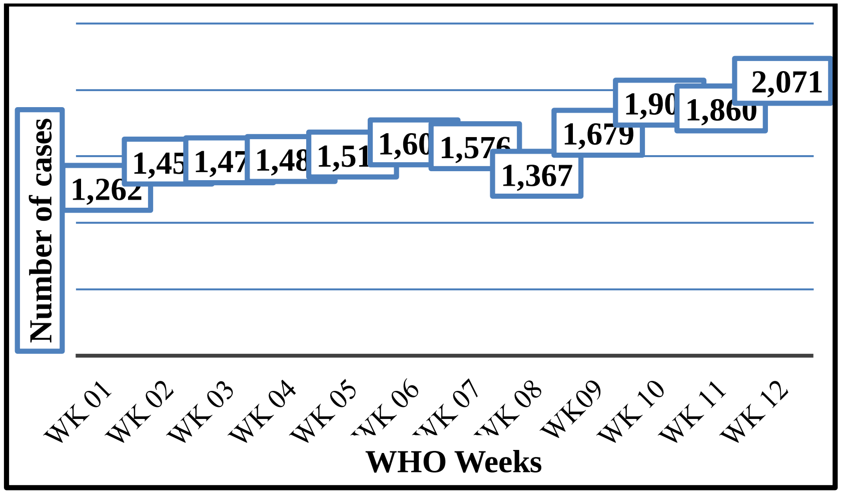

Figure 9.2-5. Trends of Dysentery cases by weeks, Oromia Region, 01 to 12 weeks, March,2019

Measles

In this week, a total of 358 suspected measles cases were reported to the region. Suspected cases were reported from different Woredas and health facilities of Oromia Zones and Towns (Table: 9.2.3).

Table 9.2-3: Distribution suspected Measles cases by Woredas and reporting health facilities of Oromia region in week 12, March,2019

Name of Zones	Name of woreda	Number of cases	Total cases in the zones	(%) from the region
East Hararge	Babile Town	31	117	32.7
	Kumbi	21		
Name of Zones	Name of woreda	Number of cases	Total cases in the zones	(%) from the region
	Bisidimo Hospital	15		
	Gursum	11		
	Gola Oda	10		
	Midaga	9		
	Babile Woreda	6		
	Jarso	4		
	Girewa	3		
	Mancho	3		
	Garemuleta Hop	2		
	Haramaya Hop	2		
Arsi	Seru	82	89	24.9
	Diksis	4		
	Bekoji Town	1		
	Hetosa	1		
	Merti	1		
West Shawa	Jaldu	29	42	11.7
	Cobi	7		
	Gojo Hosp.	5		
	Ejere	1		
Bale	Dawe Serar	14	40	11.2
	Ginir Town	7		
	Lege Hidha	7		
	Gololcha	5		
	Goba Town	3		
	Berbere	2		

Name of Zones	Name of woreda	Number of cases	Total cases in the zones	(%) from the region
	Agarfa	1		
	Rayitu	1		
West Harerge	Daro Labu	14	22	6.1
	Hawigudina	7		
	Gelemso Hos	1		
North Shoa	Fitche Hosp	6	11	3.1
	Jida	2		
	Kuyu Hosp	1		
	Fitche Town	1		
	kimbibit	1		
Robe Town	Robe Town	9	9	2.5
West Arsi	Gambo Hosp	2	6	1.7
	A/Nagele T	1		
	Dodola, Kore &shashamane	1,1,1		
Batu Town	Batu Town	5	5	1.4
Jimma T	Jimma Town	4	4	1.1
Adama T	Adama Town	3	3	0.8
Jimma Zone	Mancho	3	3	0.8
Woliso T	Woliso Town	3	3	0.8
Sebeta town	Sebeta town	2	2	0.6
Borena	Yabelo Town	1	1	0.3
Burayu T	Burayu Town	1	1	0.3
Kellem W	D/Dollo Hos.	1	1	0.3
Shasheme	Shashemen	1	1	0.3
SW/Shewa	St.Luke Hos.	1	1	0.3

Trends of the past 12 consecutive weeks of suspected Measles cases were shown below Figure.

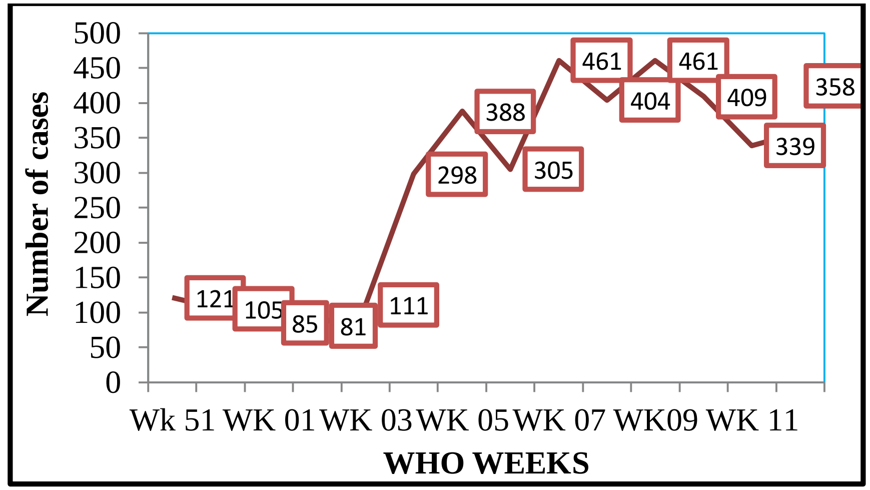

Figure 9.2-6: Trends of suspected measles cases by time,Oromia Region, Week 51-12, March,2019

Acute Flaccid Paralysis (AFP)

In this week, 4 AFP cases were reported to the region.Cases were reported from Assella Town (1) mulo of FSZSF (1) D/Dollo Hospital of Kellam Wollega (1) and Boji Dirmaji of West Wollega (1).

Malnutrition

In this week 2,146 new severely acute malnutrition (SAM) cases were reported to the region. Of the total cases, 332(15.5%) of them were treated at stabilization center. SAM cases were increasedby 138(6.9%) as compared to week 11. Most of the cases were reported from East Hararge 518(24.13%), followed by

West Arsi 314(14.63%), West Hararge 286(13.32%), Bale 171 (7.9%), Jimma 122(5.6%) and East Shewa 118(5.5%) Zones.

Among Woredas; Bedeno 62(14.2%), Fedis 58(13.3%) and Gursum 39(8.9%) of East Hararge; Shalla 85(33%), shashamane 64(25.1%) and Siraro 52 (20.5% of West Arsi and Oda bultum 43(18%) of west Hararge, Bora 38(38.7%) of East Shoa and Dolo Mena 23(16%) of Bale zone were among high SAM cases repoted in a week

Note: Percentage of Malnutrition in the Woredas was calculated from their respective zones.

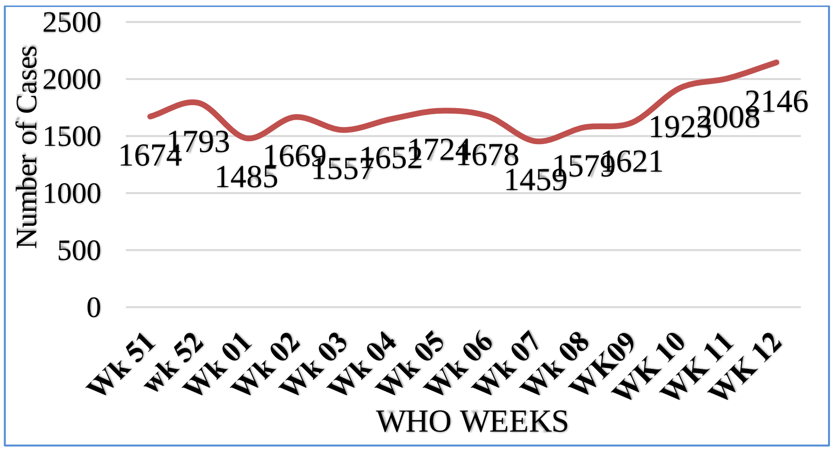

Figure 9.2-7: Trends of regional SAM cases by time, Oromia Region, week 51 to week 12, March,2019

Meningococcal Meningitis

In this week, 21 suspected meningococcal meningitis cases and no death were reported to the region. the case was decreased in this week by 7(25%). Cases were reported from Borana (5), Guji (3), West Shoa (2), East harage Zone (2), Bale (2),West Harage (1), North Shoa (1), H/Guduru wollega (1), Iluiababora (1), Jimma (1), Kellam Wollega (1), Arsi (1) and Asalla.Town(1).

Anthrax

In this week, no suspected anthrax case reported to the region from all reporting Zones and Towns.

Relapsing Fever

In this week there is no suspected Relapsing Fever cases reported to the region.

Maternal deaths

In this week,22 suspected maternal deaths were notified. Cases were reported from Nekemte Town (5), Arsi (3),East Hararge (3), Jimma Town (2), Kellam Wollega (2), West Arsi (2), Adama (2), Guji (1), Jimma (1) and Modjo Town (1).

Acute Watery Diarrhea (AWD) Cases

In this week, no suspected Acute Watery Diarrhea (AWD) case reported to the region.

Guinea Worm (GW)

In this week, no suspected guinea worm case was reported.

Scabies

Regionally, since the occurrence of Scabies outbreak a total of 200,822 cases were reported to date of which 42,775 cases were reported in 2009 EFY while the rests were in the 2010 and 2011 EFY. Seventyn zones, Seven towns and 76 woredas were affected up to now. In this week 2673 scabies cases were reported to the region. Case were decreased by 339(11.2%) as compared to the previous week (Week 11).

Table 9.2-4Scabies cases by Zones/Towns of Oromia Region, week 12, March,2019

Zone Name	# Scabies cases	Percentage from Region
East Hararge	1297	48.5
East Shewa	556	20.8
West Harerge	209	7.8
Arsi	197	7.4
West Arsi	103	3.9
West Guji	74	2.8
East Wollega	50	1.9
H/G/Wollega	38	1.4
West Shoa	36	1.3
S/West Shewa	20	0.7
Jimma	18	0.7
Bishoftu Town	14	0.5
Jimma Town	13	0.5
lege Tafo town	12	0.4
North Shoa	12	0.4
OSZSF	8	0.3
Kellem Wollega	6	0.2
Asella Town	3	0.1

Other cases

In this week, a total of 81 other cases reported to the region, were 72 Dog or Animal bites and 9 Perinatal deaths were reported.Among Dog/Animal bites reported Zones in this week, high of report were from Horo guduru Wollega 23(31.9%), West Shawa 13(18%), Jimmaa 10(13.8%) and West Wollega 9(12.5%)

9.2.5 Response Activities

Based on weekly surveillance report, feed-back is often given to all zones and towns timely. Health and nutrition taskforce meeting is conducted with our partners every two weeks. Any rumors have been received, verified and risks have been communicated early and timely.

Contact us:

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About this newsletter:

This bulletin is weekly Public Health Emergency Management and Health Research Directorate of Oromia Regional Health Bureau. It is prepared and disseminated on a weekly basis. Your comment & suggestion will play a great role in improving our bulletin.

Declaration

I, the undersigned declare that this thesis is my original work output in partial fulfillment of the requirement for the degree of Master of Public Health in Field Epidemiology. I also declare that it has never been presented in this or any other university and that all resources and materials used in the thesis have been duly acknowledged.

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This thesis has been submitted with my approval as a University advisor.

Advisor Name: _______________________

Signature: _______________

Date of submission: ___________

10 List of Annexes

Annex 10-1: Malaria Outbreak Investigation Questionnaire, Darimu Woreda of Ilu Ababora Zone, Oromia Region Ethiopia, March, 2018.

I. Socio-demographic information:

1. ID number of respondent______
2. Age in years_____
3. Sex: M☐ F ☐
4. Address: Region _______Zone_____ Woreda______ kebele _____village (Got)______
5. Occupation: Employed ☐ unemployed ☐ Student ☐ Pastoralist ☐ Farmer
6. Total family members ___________
7. Ethnicity: ___________
8. Religious: Orthodox, ☐ Protestant, ☐ Muslim ☐ other ☐
9. Marital status : Married, ☐ single ☐ Widowed ☐ Divorced ☐
10. Education status: Illiterate ☐ Primary, ☐ Secondary ☐ tertiary ☐, non-formal ☐
11. Case status
    a) Case Yes ☐
    b) Control yes ☐

II. Clinical presentations: **<u>*(For case only)</u>**

12. What was the first symptom? _____
13. When was the 1st symptom started (date of onset of symptoms) DD/MM/YY__________
14. What were others symptoms?
    a) Fever: Yes ☐ No☐,
       If yes duration of fever____
       Was it constant fever? Yes ☐ No☐
       Every other day's fever? Yes ☐ No☐
    b) Vomiting : Yes ☐ No☐
    c) Diarrhea : Yes ☐ No☐,
    d) Anorexia (appetite loss): : Yes ☐ No☐,
    e) Headache: Yes ☐ No☐
    f) Sweating,: Yes ☐ No☐,
    g) Chilling and shivering : Yes ☐ No☐,

h) Weakness : Yes ☐ No☐,

i) Cough: : Yes ☐ No☐,

j) Back pain : Yes ☐ No☐,

k) Muscle pain : Yes ☐ No☐,

l) Rigor: Yes ☐ No☐,

➧ ***Ask the following signs (M to Y) <u>for complicated malaria only</u>***

m) Altered consciousness (e.g. confusion, sleepy, drowsy, comma) Yes ☐ No☐,

n) Not able to drink or feed Yes ☐ No☐,

o) Severe dehydration, Yes ☐ No☐,

p) Persistent fever, Yes ☐ No☐,

q) Frequent vomiting Yes ☐ No☐,

r) Convulsion or recent history of convulsion Yes ☐ No☐,

s) Unable to sit or stand up Yes ☐ No☐,

t) pallor (Anemia) Yes ☐ No☐,

u) No urine output in the last 24 hours Yes ☐ No☐,

v) Bleeding Yes ☐ No☐,

w) Jaundice (yellowish coloration) Yes ☐ No☐,

x) Difficult breathing Yes ☐ No☐,

y) Other conditions that cannot be managed at this level______________________

15. Did you visit health facilities? Yes☐ No☐, if yes, when did you visit health facilities? DD/MM/YY_________

16. Did you get any treatment 1.Yes ☐ No☐, If yes, what treatment did you get?

(a) Coartem Yes ☐ No☐, was it for PF Yes ☐ No☐,

(b) Chloroquine? Yes ☐ No☐, was it for PV Yes ☐ No☐,

(c) Quinine tablets Yes ☐ No☐, was it for pregnant and <5 Kg? Yes ☐ No☐,

(d) Artusinate/Quinine injection Yes ☐ No☐, was it for sever malaria Yes ☐ No☐,

(e) Other treatment given ____

17. Did you recover completely after the treatment: Yes-☐ No ☐

18. Place of residence during 2 weeks before onset of illness; _________

19. Blood samples taken: Yes-☐ No ☐

20. If yes Q19, what was the result : Positive ☐ negative ☐

III. Risk Factors:

(For both cases and controls)

21. Specific living areas ____________________
22. Sleeping areas in side home ___________outside home_________
23. Do you stay outside over night? Yes-☐ No☐
24. Is there anybody in your home with similar sign and symptoms? Yes-☐ No☐
25. Did you travel outside your village in the past 2-3 wks.? Yes-☐ No ☐
26. If yes Q 25, indicate
    (a) date of travel DD/MM/Y_____________
    (b) the place of travel
    (c) date when you returned back DDMMYY_______
27. If Q 24 is yes, Is there sick patients (same symptoms) in the place where you have been Yes-☐ No☐
28. is there a similar sick patient in your house hold Yes-☐ No☐
29. Do you have bed net in your household Yes-☐ No☐, If is yes, how often do you use Always☐ Sometimes ☐Never ☐
30. If yes for Q 29 do mothers and children given priority of using bed nets? Yes-☐ No☐
31. If yes Q 29 the number of bed nets ______
32. Was Bendiocarb sprayed this year? Yes-☐ No☐
33. If yes Q32 when? _____
34. If yesQ32 how many per year? Once ☐ twice ☐

IV. Environmental investigation

35. Is there any artificial water -holding containers close to your home? such as:
    a. old tires: Yes-☐ No☐,
    b. Plant in the containers /flower –pots Yes-☐ No☐,
    c. plant with temporary water pools Yes-☐ No☐,
    d. Open deep well: Yes-☐ No☐,
    e. Broken glass bottles Yes-☐ No ☐,
    f. Cans Yes-☐ No☐,
    g. Plastic container Yes-☐ No☐,

h. Gutter to collect rainwater: Yes-☐ No☐,

i. Uncovered water storage/ septic tank Yes-☐ No☐,

j. Stagnant water pool Yes-☐ No☐,

k. Unprotected Dam for irrigation Yes-☐ No☐,

36. Presence of mosquito vectors/ mosquitoes breeding sites around the home or vicinity? Yes-☐ No☐,

37. Types of house:- screened Yes-☐ No ☐, unscreened Yes-☐ No ☐,

38. Do you use repellents Yes-☐ No☐,

39. Protective clothing Yes-☐ No☐,

40. Presence of Intermittent rivers cloths to the community Yes-☐ No☐,

41. Presence of tick grass Yes-☐ No☐,

V. Awareness assessment

42. Do know malaria? Sign and symptoms ---

43. How it transmitted? --

44. How it can be prevented? ---

Annex 10-2: Questionnaires for case-control study on Measles Outbreak Investigation Liben Woreda of Guji Zone, Oromia Region, Ethiopia, December, 2018

Respondent Category_____________________ Case _________Control____________
Date of Data collection._____________ Data Collector Name_____________________
Region________ Zone_______ Woreda______ Kebele _______ Got _______
Location: Longitude:_________________ Latitude:______________________

I. Socio-demographic Characteristics

S. No	Questions	Alternatives
1.1	Sex	1. Male 2. Female
1.2	Age	years________ Months________
1.3	Occupation of the patient/Control	1. Farmer 2. House wife 3. Gov.employ 4. Other (specify)_________
1.4	Family Occupation	1. Farmer 2. House wife 3.Gov.employ
		4. Other (specify)_________
1.5	Religion	1. Muslim
		2. Orthodox
		3. Protestant
		4. Catholic
		5. Other (specify)_________
1.6	Ethnic group	1. Oromo 2. Tigre 3. Ahmara 4. Gurage 5. Other (specify)
1.7	Educational level of the patient /Control	1. KG 2. Primary 3. Secondary 4.Tertiary 5.Not applicable
1.8	Educational level of the family	1. Illiterate
		2. Read and write
		3. Elementary
		4. Secondary
		5. Above secondary
	What is the respondent's marital status?	1. Single 2. Married 3. Widowed 4. Divorced 5. Not applicable
1.9	Family size	_____________
1.1	Is there any sick person with rash, fever, running nose In the family?	1. Yes 2. No
1.11	If yes, number of sick person	____________________
II. **Clinical History of Diseases:**		
2.1	What was the symptom?	1.fever 2.Rash 3.cough,
		4.coryza (runny nose) 5. conjunctivitis (red eyes)
		6. Others_________
2.2	Is there complication? What ?	a)Pneumonia:☐ yes no ☐

		b) Conjunctivitis: ☐ yes no ☐
		c) Blindness : ☐ yes no ☐
		d) Convolution ☐ yes no ☐
		E) Otitis media (ear discharge): ☐ yes no ☐
		f) diarrhea : ☐ yes no ☐
		g) Feeding problem☐ yes no ☐
2.3	Date on set of fever	___/___/
2.4	Date seen at health facility	___/___/
2.5	Illness duration before visiting the health facility	_____________ in days/hours
2.6	Did you (he/she) take treatment?	1.Yes
		2.No
2.7	If yes, treatment taken	1.ORS
		2.Antibiotics
		3.Vitamin A
		4.Supplementary food
		5. TTC ointment
		6.Anti pyretic
		7.Others given______
2.8	Treatment Outcome?	1.Alive
		2.Death
2.9	Location when rash started?	Woreda_________________ Kebele___________________
2.10	Do you have any travel history four days before and after rash onset	1.Yes
		2. No
		If yes where _______________
2.11	Do you have any contact history with someone else four days before and after rash onset	1.yes
		2.No
		If yes with whom_________________
	III. Risk factor (for case and control)	
3.1	Did you ever vaccinate for measles?	1.Yes
		2.No
		3.Unknown 4.Not applicable
	Is there vaccination card	Yes No
3.2	Number of vaccine doses received	1.one dose
		2. two doses
		3.three and above

3.3	Age of vaccination at first Visit of health facility during child hood.	____________
3.4	If being unvaccinatedwhy?	☐ lack of knowledge about vaccination campaign,
		☐ absence during vaccination campaign,
		☐ other, specify
		Religious exemptions
3.5	Did you have any travel history 7-18 days to other areas?	1.Yes
		2.No
		If Yes where ____________
3.6	Did you contact with a person with Rash symptoms within the last 2-3 weeks?	☐ yes ☐ no
3.7	If Yes to question 3.5 place of travel	1.School
		2.Neighbor
		3.Market
		4.Other________
3.8	Nutritional status of the cases	1.Normal
		2.Moderate
		3.Severely malnourished
3.9	House condition	☐ ventilated ☐ not-ventilated
3.10	Distance from house to HC	☐ greater than 5 km ☐ equal or less than 5 km
3.11	Do you know modes of transmission for measles?	1.Yes
		2.No
		3. If yes specify________________________
3.13	Do you Know measles is vaccine preventable?	1. Yes
		2. No
		3. Don't Know

Thank You!

Annex 10-3: Insecticide Treated Nets utilization and associated factors among settlers population in Darimu Woreda of Iluababora Zone, Oromia, Ethiopia, 2019

Instruction: - Circle the responses for questions with alternatives and write for open ended questions on the space provided.

No.	QUESTION	CATEGORIES
1.1	Region and Zone	1. Iluababora Zone of Oromia region
1.2	Woreda	2.Darimu
1.3	Kebele	------___________
1.4	House Number if any	------
1.5	What is your Ethnicity?	1. Oromo 2. Amhara 3. Gurage 99.Other(Specify)___________
1.6	What is your religion?	1. Orthodox 2. Protestant 3. Muslim 4. Other (specify)
1.7	Age	Year
1.8	Sex	1.Male 2.Female
1.9	What is your occupation	1.Farmer 2. House wife 3. Government Employee 5.Merchant 6.Student 7.Daily Laborers 8.Other____
1.10	What is your level of education	1.Illiterate 2. Primary(grade1-8) 4. Secondary 5. Tertiary (College diploma and above)
1.11	How many years are you residing in this village?	__________________
1.12	How many family members residing with you?	1-5years ____ 5-14 years ____15-24 ________25 and above
1.13	Family monthly income in birr	-----
1.14	What is your socio-economic class in the community?	1. Poor 2. Middle 3. Rich
2.1	Main material of the floor RECORD OBSERVATION	NATURAL FLOOR 1. Earth/Sand 2. Dung RUDIMENTARY FLOOR 1. Wood planks 2. Palm/Bamboo FINISHED FLOOR 1. Parquet/Polished wood 2. Vinyl or asphalt strips 3. Ceramic tiles 4. Cement 5. Carpet 6. Other (specify)
2.2	Main material of the wall RECORD OBSERVATION	NATURAL WALL 1. No walls 2. Cane/trucks/bamboo/reed RUDIMENTARY WALL 1. Bamboo/wood with mud 2. Stone with mud 3. Uncovered abode 4. Plywood 5. Carton FINISHED WALL 1. Cement 2. Stone with lime/cement 3. Bricks

No.	QUESTION	CATEGORIES
		4. Cement blocks 5. Covered Adobe 6. Wood planks/shingles 7. Other (Specify)
2.3	Main material of the Roof RECORD OBSERVATION	NATURAL ROOF 1. Thatch/Leaf 2. Sticks and mud RUDIMENTARY ROOF 1. Rustic mat/plastic sheet 2. Reed/bamboo 3. Wood FINISHED WALL 1. Corrugated iron 2. Wood 3. Calamine/cement fiber 4. Cement/concrete 5. Roofing shingles 6. Other (Specify)
2.4	Windows RECORD OBSERVATION	Yes, Total # of windows---- No
2.5	Type of windows RECORD OBSERVATION.	Any window Windows with glass Windows with screens Windows with curtains/shutters
3	How many separate rooms are in this household? INCLUDE ALL ROOMS, INCLUDING KITCHEN, TOILET, SLEEPING ROOMS, SALON, etc.	Number of rooms------
3.1	How many rooms in this household are used for sleeping? INCLUDE ONLY ROOMS WHICH ARE USUALLY USED FOR SLEEPING.	Number of sleeping rooms ------------
3.2	How many separate sleeping spaces are there in your household? INCLUDE ALL SLEEPING SPACES, INCLUDING IF THERE IS MORE THAN ONE SLEEPING SPACE IN EACH ROOM USED FOR SLEEPING	Number of sleeping spaces -----------
4	How many of the following animals / birds does your household own? Cattle? Goats? Sheep? Pigs? Chickens? Dogs? Cats?	Cattle------- Goats-------- Sheep-------- Pigs---------- Chickens--------- Dogs---------- Cats-----------
4.1	Does any member of your household own? A bicycle? A motorcycle or motor scooter? A car or truck?	YES, NO Bicycle --------------------- Motor cycle/Scooter ------------- Car/Truck ----------------
5	At any time in the past 12 months, has anyone sprayed the interior walls of your dwelling against	Yes No Don’t know

No.	QUESTION	CATEGORIES		
	mosquitoes?			
5.1	How many months ago was the house sprayed against mosquitoes? IF LESS THAN ONE MONTH, RECORD # MONTHS AGO.	Months ago………………….		
5.2	Who sprayed the house against mosquitoes?	Government worker/Program Private company House hold member Other (specify) Don't know		
5.3	At any time in the past 12 months, have the walls in your dwelling been plastered or painted?	Yes No Don't know		
ASK RESPONDENT TO SHOW YOU THE NET(S) IN THE HOUSEHOLD. *IF MORE THAN THREE NETS, USE ADDITIONAL QUESTIONNAIRE*		NET #1	NET #2	NET #3
		OBSERVED NOT OBSERVED	OBSERVED NOT OBSERVED	OBSERVED NOT OBSERVED
6.1	How long ago did your household obtain the mosquito net?	Months ago More than 3 years ago Other---------------------	Months ago More than 3 years ago Other -------------------	Months ago > 3 yrs ago 95 Other ----------------
6.2	Observe or ask the brand of mosquito net *IF BRAND IS UNKNOWN, AND YOU CANNOT OBSERVE THE NET, SHOW PICTURES OF TYPICAL NET TYPES/BRANDS TO RESPONDENT*	PERMANENT 'NET1 Permanent Olyset Safenite Interceptor Other/Don 't Know PRETREATED 'NET2 Salam Enkilfe KO Nets Other (specify)---- Don't Know	PERMANENT 'NET1 Permanent Olyset Safenite Interceptor Other Don 't Know PRETREATED 'NET2 Salam Enkilfe KO Nets Other Don't Know	PERMANENT 'NET1 Permanent Olyset Safenite Interceptor Other Don 't Know PRETREATED 'NET2 Salam Enkilfe KO Nets Don't know

No.	QUESTION	CATEGORIES		
6.3	Where did you obtain the net?	Government -----1 Clinic/Hospital-----2 Neighborhood------3 Health committee-----4 Health Extension Worker--5 Community HealthWorker/Agent ----6 Retail Shop----7 Pharmacy-----8 Workplace----9 Other (specify)	Government -----1 Clinic/Hospital----2 Neighborhood----3 Health committee-4 Health Extension Worker---5 Community Health Worker/Agent ----6 Retail Shop----7 Pharmacy-----8 Workplace-----9 Other (specify)	Government -----1 Clinic/Hospital-----2 Neighborhood----3 Health committee--4 Health Extension Worker--5 Community Health Worker/ Agent ----6 Retail Shop----7 Pharmacy-----8 Workplace-----9 Other (specify)
6.4	Did you purchase the net?	Yes........1 No (skip to 21) .... 2 Not sure... 3	Yes................. ....1 No (skip to ....2 Not sure...........3	Yes............ ....1 No (skip to.........2 Not sure.........3
6.5	How much did you pay for the net when it was purchased?	< 50 Birr ....1 50 – 100 Birr.... 2 > 100 Birr- 3 Not sure.... 4	< 50 Birr.............1 50 – 100 Birr....... 2 > 100 Birr----- 3 Not sure.......... 4	< 50 Birr ....1 50 – 100 Birr... 2 > 100 Birr---- 3 Not sure...... 4
6.6	PLEASE RECORD OR ASK THE GENERAL CONDITION OF THE NET	Good (no holes) ……. 1 Fair (no holes that fit a torch battery) … 2 Poor (1-4 holes that fit a torch battery) … 3 Unsafe (>5 holes that fit a torch	Good (no holes) ……. 1 Fair (no holes that fit a torch battery) ………… 2 Poor (1-4 holes that fit a torch battery) ………… 3 Unsafe (>5 holes that fit a torch battery……… 4 Unused (still in package……. 5 Unknown……… 6	Good (no holes) ……. 1 Fair (no holes that fit a torch battery) ………… 2 Poor (1-4 holes that fit a torch battery) ………… 3 Unsafe (>5 holes that fit a torch battery………

No.	QUESTION	CATEGORIES		
		batter…… 4 Unused (still in packag. 5 Unknown... 6		4 Unused (still in package……. 5 Unknown… 6
6.7	Did anyone sleep under this mosquito net last night?	Yes........... 1(skip to 6.9) No............. 2 Not sure... 8	Yes... 1(skip to 6.9) No............. 2 Not sure........ 8	Yes.... 1(skip to 6.9) No............. 2 Not sure........ 8
6.8	Why did no-one sleep under this mosquito net last night?	No malaria……1 No nuisance/insects….2 No space for net….3 Irritation….4 Suffocation/too hot….5 Difficult hanging net…6 Shape….7 Absence from home….8 Other___ 9 Don't know……10	No malaria……1 No nuisance/insects…. 2 No space for net….3 Irritation….4 Suffocation/too hot….5 Difficult hanging net…6 Shape….7 Absence from home….8 Other_____________ 9 Don't know……10	No malaria……1 No nuisance/insects ….2 No space for net….3 Irritation….4 Suffocation/too hot….5 Difficult hanging net…6 Shape….7 Absence from home….8 Other___________ 9 Don't know……10
6.9	When your bed net is torn or gets a hole, how likely are you to mend it out to have a tailor mend it? READ THE RESPONSE OPTIONS TO THE PARTICIPANT AND ASK HIM OR HERTO CHOOSE THE BEST RESPONSE	VERY LIKLEY, I mend all holes in my net…….1 SOMEWHAT LIKELY, I sometimes mend holes in my net…………. 2 SOMEWHAT UNLIKELY, I rarely mend on holes in my net…………. 3 VERY UNLIKLEY, I never mend holes in my net ………………..4		
6.10	How often do you wash your net(s)? DO NOT READ THE RESPONSE OPTIONS	When it gets dirty………………. 1 1 time a year……………………. 2 2 – 3 times a year…………………3 4 – 5 times a year………………… 4		
6.11	Will insecticide treated nets still be effective against mosquitoes if you wash them	Yes... 1 No.. 2 Don't know...................................... 8		

No.	QUESTION	CATEGORIES
6.12	If there are not enough nets for everyone in a household, who should be given priority when deciding who can sleep under a net? DO NOT PROVIDE ANSWERS MULTIPLE RESPONSES POSSIBLE PROBE ONCE (Anything else?)	Elderly people……………………. 1 Head of house hold………………. 2 Young children………………….. 3 Pregnant women…………………. 4 People who contribute the most money to the household………………… 5 Person who obtained/bought the net………6 Other(specify)___________________ 7 Don’t know……………………. 8

1. What is the distance of nearest mosquito breeding site from living house in meters?.............
2. What type of breeding place was common in near your living area? ……………………..

For health facility

1. Did you ever distribute ITNs for the community? ……… Period …………………
2. If **yes**, number of ITN distributed per house hold? ……………………………………
3. Coverage of ITN per kebeles?..
4. If **No** to Q.1, why? ---------------------------------
5. Interviewer’s observations
6. To be filled in after completing interview
7. Comments about respondent…………………………………………
8. Comments on specific questions: ………………………………………
9. Any other comments relevant to the interview: ……………………………
10. Supervisor’s observations ……………………………………………………

Name of the supervisor: ___________________ date: _________________

Thank you for your participation

Annex 10-4: **District Health Prifile data collection tools**

1. General Information

1.1. Woreda at the gland: where it is: -____________________________
1.2. Woreda area in KM2____
1.3. The Name (How and why): - __________________________________
1.4. How the woreda was formed: - ________________________________
1.5. Any other historical aspect: - _____________________________________

2. Geography and Climate (including map, altitudes, Agro ecological zones etc.)

2.1. Woreda Map
2.2. Location (distance from capital city and direction) ___________________ ______
2.3. Altitude ________________ Latitude _______________
2.4. Agro Ecological zone _________________________
2.5. Annual rain falls (average)_______ Maximum __________Minimum_________
2.6. Annual temp(average)_________High __________Low_____________
2.7. Climatic zones Highland_______% mid land ____________% Lowland ___________%
2.8. Accessibility to main roads______________________________________

3. Administrative setup

3.1. Total no. of kebeles: _________Rural ________Urban___________
3.2. Woreda boundaries North _____ South_____ East____________ West________

4. Population and Population structure (Demographic information)

4.1. Population: Total__________ Urban________. Rural_________ Urb: Rur___:___
4.2. Male Popn _________Female Popn ___________ Sex ratio M ____: F_____
4.3. < 1yrs_________, < 5 yrs_________, < 15 years______, >64 years_______Women 15-49 yrs of age _______. Pregnant Women ________ lactating Women ________
4.4. Total population by kebele (each kebele pop) ________
4.5. **Ethnic composition/language**
- Oromo__________Amhara________Gurage___Tigre____ Other specify______

4.6. Religion: Muslim______Orthodox______ Protestant______Catholic___Other_____

5. Economy (mainstay of the economy, average income levels etc)

5.1. Main source of the economy___
5.2. Live stock ______________
5.3. Tourism ________________
5.4. Trade ____________________
5.5. Land density __________ Hectare
5.6. Cultivated __________________
5.7. Farming ___________________
5.8. Grazing __________________
5.9. Main crops ____, _____, _____
5.10. Fertilizer utilization __________

6. House hold income source (average) Economy

6.1. Government Employees_______ (No)_____
6.2. Agriculture______ (No.)
6.3. Different business_____(No.)
6.4. Employee_______(No.)
6.5. Jobless ______(No.)
6.6. Average income per HH/year______

7. Education and school Health

7.1. Distribution of Schools:
7.2. Primary (1-8) __ (1st Cycle (1-4) ___ 2ndCycle (5-8) ____) Secondary (9-10) ______

7.3. Preparatory schools (11-12) _________,
7.4. TVET/colleges ________
7.5. K.G ___________

8. Educational status of the community

8.1. Total School Age Children (target) ____________________
8.2. Total Enrolment ______________ (_____ %)
8.3. School dropout in 6 months or year 2009 ______________
8.4. If there is school dropout, why ___________________
8.5. Total Educated people as a whole, ________ Male ___________ Female ________

9. Transport

9.1. Accessibility (Main road) ____________________________
9.2. Type of road ____
9.3. Access to transportation_____________________________
9.4. Flow of transportation per Day ______________________

10. Telecommunication

10.1. Access to Fixed telephone (No__________ %______________
10.2. How many people have access to mobile phone (Coverage) No_____ %_______?

11. **School health activities**:

11.1. Water supply: schools with water supply Total _____With water ______ %____
11.2. Toilets: schools with functional latrines (Male& Female) Total ___ latrine _____%___
11.3. Schools with HIV/other Health Clubs Total _____ with club ______ % _______

12. Facilities (Transport, Telecommunication, Power supply, Water supply…)

12.1. How many of the health posts have access to?
12.2. Transportation for (Summer and Winter) ______ (____%),
12.3. Telecommunication_____ (____coverage _____%)
12.4. Electric power___________ (________% Coverage____________),
12.5. Water supply _________ (______%)______Coverage _________)

13. **How many of the health centers have access to transportation (Summer and Winter)** _________ (______%), Telecommunication________(________%) ,Electric power______________(________%) ,Water supply ______________(______%)

14. Health delivery system (District Health Structure)

14.1. Health Facility

Type of Health facility	Number	HF to Pop Ratio	Standard ratio
Hospital			
Health center			
Health posts			
Private health Fs (clinics/diag.lab/drug stores)			

13.2.Health institution to population ratio: 2017 G.C
13.3.Hospital: Pop _________.
13.4.Health Center: Pop __________
13.5.Health post: Pop _____________
13.6.Health service coverage ________________
13.7.By Service ______________ By health infrastructure (Physical)_________

14. Sanitation 2017 G.C

14.1. Sanitation Coverage No_______ %__________
14.2.Water Supply Coverage No_______ %__________
14.3.Latrine Coverage No_______ %__________
14.4.Latrine Utilization Coverage No_______ %_______
14.5.ODF Kebele No_______ %__________
15. Human resource for health (all type) 2017 G.C

S.No	Type of Profession	Quantity	Ratio of Profession to Population
1	Physician/GP		
2	Health Officers		
3	Nurses Diploma + Nurses BSC		
4	EnvironmentalHealth(BSC Diploma)		
5	Laboratory Tech. (BSC +Diploma)		
6	Pharmacist (BSC + Diploma)		
7	Midwifery Nurse (BSC + Diploma)		
8	Health Information (HIT)		
9	Health Extension Workers		
10	Supportive staff		
Total			

15.1.Doctor: pop ratio ______, ___
15.3.HEW: pop ratio______, ______
15.2.Nurse: pop ratio______, ______
16. Top causes of morbidity and mortality 2017 G.C
16.1.Top ten leading causes of OPD visit (morbidity): 2017 G.C

S.no	Adult OPD Visit	Pediatrics OPD Visit
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

16.2. Top ten causes of admissions 2017 G.C

S.no	Adult Diseases	Pediatrics Diseases
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

16.3. Top ten causes of deaths (mortality). 2017 G.C

S.no	Adult Diseases	No (%)	Pediatrics Diseases	No(%)
1				
2				
3				
4				
5				

17. Vital Statistics and Health Indicators

17.1. Infant Mortality Rate (IMR) ___________ (total <1 yr deaths in 2005 yr_______)
17.2.Total live births 2009______
17.3.Total still births 2009 ________
17.4.Total neonatal deaths 2009 ______
17.5.Child Mortality Rate_______________ (total <15 yr deaths in 2005 yr______)
17.6.Crude Birth Rate__________
17.7.Crude Death Rate___________ (total deaths 2005 yr____
17.8.Maternal Mortality Rate____________ (total maternal deaths in 2005______)
17.9.Contraceptive Prevalence rate _______________
17.10. Contraceptive acceptance rate ¬¬¬¬¬¬¬¬__________
17.11. ANC rate (how many of the total expected pregnancies attended 1st ANC) No__%_
17.12. ANC rate (how many of the total expected pregnancies attended 4th ANC) No_ (%
17.13. Percentage of deliveries attended by skilled birth attendants No_____ (%) ______
17.14. Percentage of deliveries attended by HEWs No_____ (%) ______
17.15. Percentage of deliveries attended by TBA No_____ (%) ______
17.16. Maternal and Child Health Coverage 2017 G.C
17.17. Number of ANC case registered No_____ (%) ______
17.18. Number of pregnant women provided at least TT2 No_____ (%) ______
17.19. PNC case Visited No_____ (%) ______
17.20. Number of Children <5 years treated for Diarrhea at Public HF No_____ (%) _____
17.21. ANC coverage No_____ (%) ______
17.22. PNC coverage No_____ (%) ______
17.23. Delivery care coverage No_____ (%)______
17.24. Family planning Coverage No_____ (%)______

18. Immunization Coverage (for children); 2017 G.C

18.1.BCG (No) _____ (%) ______

18.2.OPV-0 (No) _____ (%) ____ OPV -1 (No) _____ (%) ____ OPV-3 (No) ____ (%) _____

18.3.Penta-1 (No) _____ (%) ______ Penta-3 (No) _____ (%) ______

18.4.PCV10 -1 (No) _____ (%) ______ PCV10 -3 (No) _____ (%) ______

18.5.Rota Virus Vaccine No_____ (%) ______

18.6.Measles (No) _____ (%) ______

18.7.Fully immunized (No) _____ (%) ________

18.8.PW TT2+ (No) _____ (%) ______, NPW TT2+ (No) _____ (%) ______

19. Health budget allocation: 2017 G.C

19.1.Government

19.2.Total budget allocated for the district ______________ 2009 E.C

19.3.Total budget allocated for health ________ (____ %) 2009 E.C

19.4.Total budget allocated for the PHEM? (GV + NGO) __________________

19.5.Funds from NGO 2017 G.C

19.6.Total ___________ list (purpose/programs) ____________________

20. Disaster situation in the woreda 2017 G.C

20.1.Was there any disaster (natural or manmade) in the District in the last one year? ________

20.2.Any recent disease outbreak/other public health emergency in the District last one Year? _________ If yes, Number, cases________ deaths__________

21. Community Health Services: 2017 G.C

21.1.Status of services provided by community health workers namely

21.2.No. of TBAs/TTBA ________and their responsibility ________________

21.3.No. of CHWs/CHPs__________ and their responsibility ______________

21.4.Responsibility of HEWs____

21.5.Others____

22. Status of Primary Health Care Components – with focus on the eight PHC elements

22.1. MCH (Delivery, ANC, PNC) ____

22.2.FP (by Methods) ____

22.3.EPI (outreach service, cold chain, vaccine) ________________________________

22.4.Environmental Health, Sanitation Hygiene. (WASH)_______________________

22.5.Latrine coverage _______ (____ %) & utilization rate__________ (_____ %)

22.6.Total safe water supply coverage _________ (_______ %)

22.7.Safe water supply coverage by kebele with its population ___ ____ ____ ___ _____

22.8.Main source of water supply _________________ for each Kebele _______

22.9.Others____________________________________

22.10. Health education_______________________

23. Endemic diseases; (in No & % for all questions)

23.1.Malaria: 2017 G.C

23.2.Total malarias kebeles (No)_______ %_________

23.3.Population at risk(No) ____________ %________

23.4.ITNs coverage (including current distribution) (No)_________ %_________

23.5.Is there IRS this year (No of kebeles) (No)_________ %_________

23.6.If yes, no of kebeles undertaking IRS (No)_________ %________

23.7.Population covered (No)______________ %_________HHs covered

23.8.Total malaria cases/year ____________ Deaths/year______________,

23.9. <5yr cases_________________ deaths___________________
23.10. Malaria supplies (Coartem, RDT, etc) shortage _________________(month)
23.11. If, Other issues____

24. TB/Leprosy: 2017 G.C

24.1.Total TB cases (No)__________ %_________
24.2.PTB negative (No)__________ %__________
24.3.PTB positive (No)__________ %__________
24.4.Extra PTB (No)__________ %__________
24.5.TB detection rate (No)__________ %__________
24.6.TB Rx completion rate (No)__________ %__________
24.7.TB cure rate (No)__________ %__________
24.8.TB Rx success rate (No)__________ %__________
24.9.TB defaulter (No)__________ %_________
24.10. Death on TB Rx (No)__________ %__________
24.11. Total TB patients screened for HIV (No)__________ %__________
24.12. Total Leprosy cases__________ on Rx__________

25. HIV/AIDS: 2017 G.C

25.1.Total people screened for HIV (last one year) (No)__________ %__________
25.2.VCT (No)__________ %__________
25.3.PITC (No)__________ %__________
25.4.PMTCT (No)__________ %__________
25.5.HIV prevalence (No)__________ %__________
25.6.HIV Incidence (new cases/yr) (No)__________ %__________
25.7.Total PLWHA_________________________
25.8.On ART (No)__________ %__________
25.9.On Pre-ART (No)__________ %__________
25.10. Other HIV prevention activities_______________________

26. Nutrition (malnutrition related OTPs, SC, TSF, CBN activities)/HO & Early warning.

26.1. Total OTP sites_______,
26.2.Total admissions to OTP/yr ________,
26.3.Total SC (stabilizing Center) sites, ________ SC admission No______ (%)_______
26.4.Total admissions to SC/yr_________,
26.5.Is there TSF (Targeted Supplementary Feeding) program in the woreda? _____, If yes children in the program, ________________ (No__________ & %_____________)
26.6.CBN program________ If yes children in the program, ______ (No____ & %_____)

27. General food security condition __________

28. Shortage of Essential drugs ____

29. What do you think the major Health problem/s of the District? ____________________.

30. Discussion of the highlights and the main findings of the health profile assessment and description ____

Annex: 10-1 Surveillance System Evaluation Data Collection tools

A. Zonal Level Questionaries'

Regional/Zonal Level Questionnaire (Surveillance System Evaluation)					
S.no	**Identifiers:**				
1	Region ____________________ Zone ____________________ Woreda ________________				
2	Health facility:______________ Date:_____________________ Interviewer:____________				
3	Respondent:_________________				
	General				
1	Total pop.________________ Male ______________ Female________________				
2	Rural pop._____________ urban pop.______________				
3	Total Kebeles _____________ Urban ___________ Rural ___________				
4	Hosp.________ H.Cs______________ H.Ps_______________ All types of private clinics ____ e. GOV clinics ______________ other private health facility __________ NGOs H.F.__________				
5	Total pop. At risk for Measles_________________________				
	General Information	**Yes**	**No**	**N/A**	**Observe/Remark**
1	Is there a national manual for surveillance?	PHEM,AFP,NNT, Measles, Cholera, MPDSR, Meningitis, Malaria, Yellow fever, Scabies, Guinea worm, Malnutrition guidelines			
2	If yes, describe (last update, diseases included, case definitions, surveillance and control, Integrated or different for each disease)				
3	Do you have standard case definitions for the Country's priority diseases like AWD, AFP polio), malaria, RF, typhoid fever, Epidemic fever and measles?				
4	If yes, Obs [1 to priority diseases] is the standard case definition for each Priority disease				
5	Is the central level responsible for providing surveillance forms to the health facilities?				
6	If yes, have you lacked appropriate surveillance forms at any time during the last 6 Months?				

7	What are the Reporting health facilities for the surveillance system	1. Public health facilities 2.NGO health facilities 3.Military health facilities 4 Private health facilities5.Others_______________				
8	Number of reports in the last 3 months compared to expected number	Weekly:___/12 times the number of districts				
		Immediately: -------/times the number of districts				
9	Number of weekly reports received on time: ____/12 times the number of districts					
10	Was there any report of the immediately reportable diseases in the past 1 month?					
11	If yes, with in what time is the report received after detection of the Case/diseases?					
12	How do you report to the next high level?	1. Mail 2. Fax 3. telephone 4. Radio 5. Electronic 6. Other				
13	Does the zone level describe data by person (case based, outbreaks, and sentinel)? If yes, (Obs) Observed description of data by age and sex					
14	Describe data by place, time and person					
15	Perform trend analysis If yes, Obs, line graph of cases by time and list disease(s) for which line graph is performed.	Observed a._________b.__________				
16	Does the zone have an action threshold defined for AWD, Measles, AFP (polio), and malaria?					
17	Who is responsible for the analysis of the collected data? _________					
18	How often do you analyze the collected data	1. Daily 2. Weekly 3. Every 2 weeks 4. Monthly 5. Quarterly 6. As needed				
19	Do you have an appropriate denominators establish the threshold? If yes, Obs presence of demographic data (E.g. population by district and hard to reach groups)					
	Outbreak Investigation					
20	Is there any outbreak in the zone in the last year? If yes, number of outbreaks investigated. List of diseases:____________________					

21	Number of outbreaks investigated and in which risk factors were looked for				
22	Number of outbreaks in which findings were used for action: ________. [Observe report]				
23	Number of districts that looked for risk factors [observe in reports]				
24	Number of districts that used the data for action [observe in final report]				
	Epidemic preparedness (relevant for epidemic prone diseases				
25	Dose the zone established epidemic management committee?				
26	Do you have plan for epidemic preparedness and response? If yes, Obs, a written plan of epidemic preparedness and response				
27	Has the zone had emergency stocks of drugs, vaccines, and supplies at all times in past 6 months?				
28	Has the zone experienced shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)?				
29	Doses the standard case management protocol for measles and others exists in all health facilities?				
30	Is there a budget line for epidemic response? If yes, Obs. minutes (or report) of meetings of epidemic management committee				
31	Does the Zone have a rapid response team for epidemic?				
	Response to epidemics				
32	Dose the epidemic responded within 48 hours of notification from zone level? If yes, Obs (from written reports with trend and intervention)				
	Feedback				
33	Dose a report is regularly produced to disseminate surveillance data from the zone? If, yes Obs: the presence of a report of surveillance data				
34	How many feedback reports has the zone level produced in the six months?____				
	Supervision				

35	Did you conduct supportive supervision last 6month? If yes, how many supervisory visits have you made in the last 6 months? ____ If no, what is reasons for not making all required supervisory visits. (Text)_____				
	Training				
36	Have you received any post-basic training in epidemic management? If yes, specify when, where, how long, by whom?				
37	How many of your staffs trained in surveillance? ____				
	Resources For data management				
38	Computer & Printer				
39	Photocopier				
40	Data manager				
41	Statistical package				
	Communications availability				
42	Telephone service				
43	Fax				
44	Radio call				
45	Internet				
	Surveillance				
46	Is there a budget line for surveillance in at zone If yes, is it sufficient				
47	If No, what option did you use at zonal level? How could surveillance be improved?				
48	What opportunities are there for integration of surveillance activities and functions (Core activities, training, supervision, guidelines, resources etc.)?______	1.____ 2_______3.________			
	Describe each system attributes:				
	Usefulness:				
49	Total population under surveillance in the zone_____________				

50	How many cases and deaths reported in the zone last year?	Measles cases _Deaths_			
51	Does the surveillance system help to detect outbreaks of these selected priority diseases early				
52	Does the surveillance system help to estimate the magnitude of morbidity, mortality and factors related to these diseases?				
53	Does the surveillance system help to Permit assessment of the effect of prevention and control programs?				
	Simplicity:				
54	Is the case definition of the priority diseases (Measles) easy for case detection by all level health professionals?				
55	Does the surveillance system help to record and report data on time?				
56	Do you feel that additional data collected on a case are time consuming				
57	How long it takes to fill the format?	1. Less than ten minute 2.10-15 minuts 3. Greater than15 minutes			
58	How long does it take to have laboratory confirmation of Measles?	1. Less than five days 2.10-5 Days 3. Greater than15 days			
	c) Flexibility:				
59	Do you think that the current reporting formats used for other newly occurring health event (disease) without much difficulty?				
60	Do you think that any change in the existing procedure of case detection, reporting, and formats will be difficult to implement? If yes, how				
61	Is the system easy to add new variables?				
62	Is the surveillance system easy to integrate with other systems?				
	d) Data Quality:				
63	Are the data collection formats for these priority diseases clear and easy to fill for all the data collector's/ reporting sites?				

64	Are the reporting site / data collectors trained/ supervised regularly? If yes, Obsrb: Review the last months report of these diseases				
65	Average number of unknown or blank responses to variables in each of the reported forms _________				
66	Percent of reports which are complete(that is with no blank or unknown responses) from the total reports ____________				
67	Percent of woredas that send report of each week in 6 Months of 2011 EFY.				
68	Total weekly reports received from woredas/Hospitals (including late reports, from July 2018 December 2018 G.C)				
	e). Acceptability:				
65	Do you think all the reporting agents accept and well engaged to the surveillance activities? Y/N				
66	If yes, how many are active participants (of the expected total)? __				
67	If No, what is the reason for their poor participation in the surveillance activity? 1. Lack of understanding of the relevance of the data to be collected				
	2. No feedback / or recognition given by the higher bodies for their contribution i.e. no dissemination of the analysis data back to reporting facilities				
	3. Reporting formats are difficult to understand				
	4. Report formats are time consuming				
	5. If Others: __________________________________.				
	F. Representativeness:				
68	What is the health service coverage of the district/ zone? ____%				
69	Do you think, the populations under surveillance have good health seeking behavior for these diseases?				
70	Who do you think is well represented by the surveillance data? The urban/ the rural and what is the reason?				

71	Was the surveillance system enabled to follow the health and health related events in the whole community				
72	If answer for Above Q is no, who do you think is well benefited by the surveillance system? 1. Urban 2. Rural 3. Both				
73	If yes for above Q, do you think that rural and urban communities are equally benefited in surveillance system? Y/N if no why				
	G). Timeliness and completeness:				
74	Timeliness of reporting in the past Six months (by Zone and Woreda) 1. on time-____2. Late___. What proportion of districts reports in acceptable time? _____%				
75	Percent of woredas that report on time. --------------				
76	Percent of HF that report on time. --------------------------------				
	H) Stability:				
77	Was the new restructuring affected the procedures and activities of the surveillance of these diseases? Y/N				
78	Was there lack of resources that interrupt the surveillance system?				
79	Was there any time /condition in which the surveillance is not fully operating?				
80	Is there a surveillance officer or focal person (PHEM unit)? Yes/No Number ___				
	I). Strength and Weakness				
81	How do you work with other departments and other sectors?___				
82	What are the strengths of your surveillance system				
83	What are the weaknesses of your surveillance system? (Major Gaps)				
	Thank You!				

B. Woreda Level Questionaries'

	Woreda Level Questionnaire (Surveillance System Evaluation)				
S.no	**Identifiers:**				
1	Woreda _______________				
2	Health facility:______________ Date:____________________ Interviewer:____________				
3	Respondent:_________________				
	General				
1	Total pop.________________ Male ______________ Female________________				
2	Rural pop._____________ urban pop.______________				
3	Total Kebeles _____________ Urban ___________ Rural ___________				
4	Hosp.________ H.Cs______________ H.Ps_______________ All types of private clinics ____ e. GOV clinics ______________ other private health facility _________ NGOs H.F.__________				
5	Total pop. At risk for Measles_________________________				
	General Information	**Yes**	**No**	**N/A**	**Observe/Remark**
1	Is there a national PHEM /IDSR Guide line or manual at this site? If yes, Obs national PHEM /IDSR Guide line/manual:________	PHEM,AFP,NNT, Measles, Cholera, MPDSR, Meningitis, Malaria, Yellow fever, Scabies, Guinea worm, Malnutrition guidelines			
2	Do you have a standard case definition for: Measles				
3	Does the district have the capacity to transport specimens to a higher level lab? If No, Reason ______				
4	Does the district have guidelines or SOP for specimen collection, handling and transportation to the next level?				
5	Have you lacked forms recommended for the country at any time during the last 6 months?				
6	Number of reports received in the last 3 months compared to expected number	1. Public health facilities 2.NGO health facilities 3.Military health facilities 4 Private health			

		facilities 5. Others_______________			
7	Weekly: ________ /12 times the number of health facilities	Weekly:___/12 times the number of districts			
8	Immediately: _____/ times the number of health facilities	Immediately: ------/times the number of districts			
9	Number of weekly reports received on time: ____/12 times the number of HF(On Monday)				
10	Number of immediately reports submitted on time: ____/3 times the number of Health facilities (within 30minutes of events)				
11	How do you report to the next high level?	1. Mail 2. Fax 3. Telephone 4. Radio 5. Electronic 6. Other			
12	How can reporting system be improved?				
13	Did you analysis PHEM data				
14	If yes, Is data describe by person for any case based, outbreaks or sentinel If yes, Obs description of data by age and sex				
15	Is description of data by place (locality, village, work site etc.)?	Observed description of data by Place a._________ b._____________ c.__________			
16	Does the Woreda have an action threshold defined for AWD, Measles, AFP (polio), and Malaria?				
17	Who is responsible for the analysis of the collected data? _____				
18	Is the description of data by time? If yes, Obs observed description of data by time?				1. Daily 2. Weekly 3. Every 2 weeks 4. Monthly 5. Quarterly 6. As needed……..
19	Is there a trend analysis for the following disease?				If yes, Obs. line graph of cases by time
	Malaria				If yes, Obs. line graph of cases by time
	AWD				If yes, Obs. line graph of cases by time

	Measles				If yes, Obs. line graph of cases by time
	Polio				If yes, Obs. line graph of cases by time
20	Do you have an action threshold for any of the country priority diseases? Y/ N If yes, what is it? ____cases _____% increase ________rate				Obs for priority diseases (i.e. measles)
21	Did you have appropriate denominators? If yes, Obs. demographic data at site (E.g. total population by village, <5 yrs.)				
22	Who is responsible for PHEM data analysis?				
23	How often do you analyze the collected data				1. Daily 2. Weekly 3. Every 2 weeks 4. Monthly 5. Quarterly 6. As needed
	Outbreak Investigation	**Yes**	**NO**	**N/A**	
24	Is there any outbreak in the Woreda in the last year? If yes, number of outbreaks investigated. List of diseases:_______.				1. __________ 2. __________
	Epidemic preparedness (relevant for epidemic prone diseases	**Yes**	**NO**	**N/A**	
25	Dose the Woreda established epidemic management committee?				
26	Do you have plan for epidemic preparedness and response? If yes, Obs, a written plan of epidemic preparedness and response				
27	Has the District had emergency stocks of drugs, vaccines, and supplies at all times in past 6 months?				
28	Has the district had emergency stocks of drugs and supplies at all times in past 6 Months? If yes, Obs, Observed the stocks of drugs and supplies at time of assessment				
29	Has the district experienced shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)?				
30	Is there a budget line for epidemic response? If yes, Obs. minutes (or report) of meetings of epidemic management committee				

31	Does the district have a rapid response team for epidemics? If yes, Obs Observed minutes (or report) of meetings of epidemic management				
31	Did epidemic response team evaluated their preparedness and response activities during the past year If yes, (observe written report to confirm)				
	Response to epidemics	**Yes**	**NO**	**N/A**	
32	Has the district implemented prevention and control measures based on local data for at least one reportable disease or syndrome?				
	Present of epidemic that responded by districts within 48 hours of notification of most recently reported outbreak?________				
	Feedback				
33	How many feedbacks written reports has the district produced in the last 6 months? __. Observed the presence of a written report that is regularly produced to disseminate				
	Supervision				
35	Did you supervise the health facilities in the last 6 months? If yes, how many times have you been supervised in the last 6 months?_______(Obs supervision report)				
36	If No, the most usual reasons for not making all required supervisory visits. (Text)	Reason 1___________________________________ Reason 1___________________________________			
	Training	**Yes**	**NO**	**N/A**	
37	Have you trained PHEM/IDSR disease surveillance? If yes, specify when, where, how long, by whom?				
38	What percent of your staffs in the district trained on PHEM/IDSR surveillance?				
	Resources For data management Logistics Available	**Yes**	**NO**	**N/A**	
39	Bicycles				
40	Motor cycles				
41	Vehicles				

42	Stationery				
43	Computer & Printer				
	Communications availability	**Yes**	**NO**	**N/A**	
44	Telephone service				
45	Fax				
46	Radio call				
47	Internet (Computers that have modems)				
	Information education and communication materials	**Yes**	**NO**	**N/A**	
48	Posters				
49	Megaphone				
50	TV Screen				
51	Projector (Movie)				
	Availability of hygiene and sanitation materials	**Yes**	**NO**	**N/A**	
52	Spray pump				
52	Disinfectant				
	Surveillance				
54	Is there assigned focal person for surveillance activities?				
55	Is there a PHEM focal person in the district epidemic management committee?				
56	Are you satisfied with the current surveillance system? If no, why?				1.____ 2. ________
	Describe Each System Attributes:				
	Usefulness:				
57	Total population under surveillance in the District_____________	**Yes**	**NO**	**N/A**	
58	How many cases and deaths reported in the district from the following disease past 6 months?				Measles cases ___Deaths ___

59	Does the surveillance system help To detect outbreaks of these selected priority diseases early				
60	Does the surveillance system help to estimate the magnitude of morbidity, mortality and factors related to these diseases?				
61	Does the surveillance system help to Permit assessment of the effect of prevention and control programs?				
	Simplicity:				
61	Is the case definition of the priority diseases (measles) easy for case detection by all level health professionals?				
62	Do you feel that additional data collected on a case are time consuming				
63	How long it takes to fill the format?				1. Less thanten minute 2.10-15minuts 3.Greater than15 minutes
64	How long does it take to have laboratory confirmation of Measles?				1. Less than five days 2.10-5 days 3. Greater than 15 days
	c) Flexibility:				
65	Do you think that the current reporting formats used for other newly occurring health event (disease) without much difficulty?				
66	Do you think that any change in the existing procedure of case detection, reporting, and formats will be difficult to implement? If yes , how				…………………………… …………………
	d) Data Quality:				
67	Are the data collection formats for these priority diseases clear and easy to fill for all the data collector's/ reporting sites?				
68	Are the reporting site/data collectors trained/ supervised regularly? If, Obsve: Review the last months report of these diseases				

69	Average number of unknown or blank responses to variables in each of the reported forms				
70	Percent of reports which are complete(that is with no blank or Unknown responses) from the total reports				
71	Total weekly reports received from HF (including late reports, from July 2018 December 2018)				
	E. Acceptability:				
72	Do you think all the reporting agents accept and well engaged to the surveillance activities? If yes, how many are active participants (of the expected to)?				
73	If No, what is the reason for their poor participation in the surveillance activity?	1. Lack of understanding of the relevance of the data to be collected 2.) No feedback / or recognition given by the higher bodies for their contribution i.e. no dissemination of the analysis data back to reporting facilities 3.) Reporting formats are difficult to understand 4.) Report formats are time consuming 5.) If Others: ____________			
	F. Representativeness:				
74	What is the health service coverage of the district? ___(#) __%				
75	Do you think, the populations under surveillance have good health seeking behavior for these diseases?				
76	Who do you think is well represented by the surveillance data? Urban/rural				
	G. Timeliness:				
77	What proportion of health facilities reports in acceptable time? -----%Number of Expected ____ Number of Reported ____				
78	Percent of HF that report on time. ---				
	H. Stability:				

79	Was there lack of resources that interrupt the surveillance system? If yes, how did you manage it				
80	What do you suggest to overcome such problems?________				
	I. Strength and Weakness				
81	How do you work with other departments and other sectors?___				
82	What are the strengths of your surveillance system				
83	What are the weaknesses of your surveillance system?				
	Thank YOU				

C. Health facilities level (Health Center and Hospital) Questionnaire

	Health Facilities level (HC/Hosp) Questionnaire (Surveillance System Evaluation)				
S. no	**Identifiers:**				
1	Woreda Name _______________				
2	Health facility Name:______________ Date:____________________ Interviewer:____________				
3	Respondent:_________________				
	General				
1	Total pop.________________ Male ______________ Female________________				
2	Total pop. At risk for Measles__________				
	General Information	**Yes**	**No**	**N/A**	**Observe/Remark**
1	Is there PHEM/IDSR national Guide line or manual at this site? If yes, Obs; for the existence PHEM/IDSR national guide line or manual	PHEM,AFP,NNT, Measles, Cholera, MPDSR, Meningitis, Malaria, Yellow fever, Scabies, Guinea worm, Malnutrition guidelines			
2	Is there a clinical register in health facilities? If yes, Obs the existence of a clinical register				
3	Is there the health facilities correctly register cases during the previous 30 days?				
4	Do you have a standard case definition for: (each priority disease)				

5	Do you have a standard case definition for: (each priority disease If yes, Obs the standard case definition for: (each priority disease)				
	Malaria				
	AWD				
	Measles				
	AFP/Polio				
6	Dose of health facilities use standardized case definitions for the country's priority diseases. If yes, Obs; the respondent correctly diagnosing one of the country's priority diseases using a standard case definition (Interview about of these)				
7	Dose the health facilities have the capacity to collect the following specimens?			If yes, Obs the presence of materials required to collect Stool, blood/serum and CSF	
8	Sputum				
9	Stool				
10	Blood				
11	CSF				
12	Do you have the capacity to handle sputum, stool, blood/serum and CSF until shipment at this facility? If yes, Obs presence of status cold chain at health facility.				
13	Dose the health facility that have the capacity to ship specimens to a higher level Lab? If yes, Obs presence of transport media for stool at health facility				
14	Have you lacked appropriate surveillance forms at any time during the last 6 months? If yes, what the reason?_______				
15	Observed that the last monthly report agreed with the register for 4 diseases (1 for each Targeted group [eradication; elimination; epidemic prone; major public health Importance)				
	Malaria Y/N				

	AWD Y/N				
	Measles Y/N				
	Polio Y/N				
16	Number of reports in the last 3 months compared to expected number				
17	Obs Weekly: _________ /12 times the number of health post sites				
18	Obs immediately: ________/--- times the number of health post sites				
19	On time (use national deadlines)				
20	Obs Number of weekly reports submitted on time:-______ /12 times the number of sites				
21	Obs Number of immediately reports submitted on time: ___/__ times the number of sites				
22	How do you report?				1) Mail 2) Fax 3) Telephone 4) Radio 5) Electronic 6)Other
23	How can reporting be improved? Your suggestion	………………………………………………………			
24	Describe data by person, place and time (outbreaks) If yes, Obs data				
25	Is there trend analysis Performed? If yes, Obs line graph of cases by time				
26	Do you have an action threshold for any of the priority diseases? If yes, what is it (Ask for 2 priority diseases)?, Measles cases____ % increase				
27	Who is responsible for data analysis?				
28	How often do you analyze the collected data?	1. Daily 2. Weekly 3. Every 2 weeks 4. Monthly 5. Quarterly 6. as needed			
29	Presence of demographic data at site (E.g. population <5 yr., population by village, total Population)				
	Epidemic preparedness				

30	Is there standard case management protocol for epidemic prone diseases at health Facilities? If yes, Obs the existence of a written case management protocol for 1 epidemic prone Disease				
	Outbreak Investigation				
31	Is there any outbreak in the District in the last 6 months? If yes, number of outbreaks investigated. List of diseases:______________________				
	Response to epidemics				
32	Has the health facility implemented prevention and control measures based on local data for at least one epidemic prone disease?				
	Feedback				
33	Have you received feedback report in the last year from higher level? Yes/No If yes, how many feedback reports has the health facility received in the last year? ___ Obs; at least 1 report received				
34	Have you conduct meeting with community in the last 6 month?				If yes, how often? a) weekly b)every two weeks c) monthly d) quarterly e) as needed
	Supervision				
35	Did you supervise health posts in the last 6 months?				
36	If yes, how many times have you been supervised in the last 6 months?___Obs; supervision report or any evidence of supervision in last 6 months				
37	Did you get any supportive supervision from higher level in the last 6 months? If yes, Obs; supervision report or any evidence for appropriate review of surveillance				
	Training				
38	Have you trained in disease surveillance and epidemic management? If yes, specify when, where, how long, by whom?				

39	Number of Staffs trained in disease surveillance and epidemic management				
	Resources For data management Logistics Available				
40	Bicycles				
41	Motor cycles				
42	Vehicles				
43	Electricity				
	For data management				
44	Stationery				
45	Calculator				
46	Computer				
47	Software				
48	Printer				
	Communications available				
49	Telephone service				
50	Fax				
51	Radio call				
52	Computers				
	Information education and communication materials				
53	Posters				
54	Megaphone				
55	TV Screen				
56	Projector (Movie) Others __________				
	Surveillance				
59	Is there assigned focal person for surveillance activities?				

60	Is there a PHEM focal person in the HF epidemic management committee?				
61	List Personal Protection materials (PPE) available in health facility				1.______ 2.______
	Describe Each System Attributes:				
	Usefulness				
62	Total population under surveillance in the catchment area____________				
63	How many cases and deaths reported in the district from the following disease past 6 months?				Measles cases ___Deaths ___
64	Does the surveillance system help to detect outbreaks of these selected priority diseases early				
65	Does the surveillance system help to estimate the magnitude of morbidity, mortality and factors related to these diseases?				
64	Does the surveillance system help to Permit assessment of the effect of prevention and control programs?				
	Simplicity				
65	Do you feel that data collections on a case report form are time consuming?				
66	How long it takes to fill the format?				1. Less than five minute 2.10-15minuts 3. Greater than15 minutes
67	How long does it take to have laboratory confirmation of Measles?				1. Less than five minute 2.10-15minuts 3. Greater than15 minutes
	Flexibility				
68	Do you think that the current reporting formats used for other newly occurring health event (disease) without much difficulty?				
69	Do you think that any change in the existing procedure of case detection, Reporting, and formats will be difficult to implement? If yes, how____________.				……………………………………… ……………..……………………… …………

	Data Quality				
70	Are the data collection formats for these priority diseases clear and easy to fill for all the data collector's/ reporting sites?				
71	Are the reporting site / data collectors trained/ supervised regularly? If, Obe: Review the last months report of these diseases				
72	Average number of unknown or blank responses to variables in each of the reported forms				
73	Percent of reports which are complete(that is with no blank or Unknown responses) from the total reports				
74	Total weekly reports received from HF (including late reports, from July 2018 Dec 2018)				
	Acceptability				
75	Do you think all the reporting agents accept and well engaged to the surveillance activities? If yes, how many are active participants (of the expected to)?				
76	If No, what is the reason for their poor participation in the surveillance activity?	1. Lack of understanding of the relevance of the data to be collected 2.) No feedback / or recognition given by the higher bodies for their contribution i.e. no dissemination of the analysis data back to reporting facilities 3.) Reporting formats are difficult to understand 4.) Report formats are time consuming 5.) If Others: ________________________________.			
	Representativeness				
77	What is the health service coverage of the Catchment area? _____(#) ____%				
78	Do you think, the populations under surveillance have good health seeking behavior for these diseases?				

79	Who do you think is well represented by the surveillance data? urban / rural				
	Timeliness:				
80	What proportion of health facilities reports in acceptable time? ---------------%Number of Expected _____________ Number of Reported				
	Stability				
81	Was there lack of resources that interrupt the surveillance system? If yes, how did you manage it				
82	What do you suggest to overcome such problems?_________.				
	Strength and Weakness				
83	How do you work with other departments and other sectors?___				
84	What are the strengths of your surveillance system				
85	What are the weaknesses of your surveillance system?				
	Thank YOU				

Health Post Level Questionnaires

	Health Post Level Questionnaire (Surveillance System Evaluation)				
S.no	Identifiers:				
1	Woreda Name _______________				
2	Health Post Name:______________ Date:____________________ Interviewer Name:____________				
3	Respondent:_________________				
	General				
1	Total pop.________________ Male ______________ Female________________				
2	Total pop. At risk for Measles__________				
	General Information	Yes	NO	N/A	Observe/Remark

1	Is there PHEM/IDSR national Guide line or manual at this site? If yes, Obs; for the existence PHEM/IDSR national guide line or manual				
2	Is the Health Post having a clinical register?				
3	Is there the health facilities correctly register cases during the previous 30 days?				
4	Is a case correctly registered in the health post? If No, state the reason; ___________ If yes, Obs; the correct filling of the clinical register during the previous 30 days				
5	Do you have a standard case definition for: (each priority disease)	If yes, Obs; the standard case definition for: (each priority disease)			
	Malaria				
	AWD				
	Measles				
	AFP/Polio				
6	Do you use standardized case definitions for the priority diseases? If yes, Select one of the priority diseases in the facility's clinical register and ask how they diagnosed it — interviewer should have the standard case definition from MOH)				
7	Have you lacked appropriate surveillance forms at any time during the last 6 months?				
8	Dose the health post reported accurately cases from the registry into the summary report to go to higher level?				
9	If yes, the last monthly report agreed with the register for 4 diseases (1 for each targeted group [eradication; elimination; epidemic prone; major public health importance])				
10	Observe Malaria Y/N				
11	Observe AWD Y/N				
12	Observe Measles Y/N				
13	Observe Polio Y/N				
14	Number of reports in the last 3 months compared to expected number				
15	Obs Weekly: _____ /12 times the number of health post sites				
16	Obs immediately: ___/_ times the number of health post sites				
17	On time (use national deadlines) schedules (Monday)				

18	Obs Number of weekly reports submitted on time:-_____ /12 times the number of sites				
19	Obs Number of immediately reports submitted on time: ___/__ times the number of sites				
20	How do you report?	1) Mail 2) Fax 3) Telephone 4) Radio 5) Electronic 6)Other			
21	How can reporting be improved? Your suggestion	……………………………………			
22	Describe data by person, place and time (outbreaks) If yes, Obs data				
23	Presence of demographic data at site (E.g. population <5 yr., population by village, total Population)				
	Epidemic preparedness				
24	Is there standard case management protocol for epidemic prone diseases at health facilities? If yes, Obs the existence of a written case management protocol for 1 epidemic prone Ds (Measles)				
	Outbreak Investigation				
25	Is there any outbreak in the area in the last year? If yes, number of outbreaks investigated. List of diseases:__.				
	Feedback				
26	Have you received feedback in the last 6month?				
27	Have you conduct meeting with community in the last 6 month?				
28	Have you conduct meeting with community members in the 6month?				
29	If yes, how many meetings has this health post conducted with the community members in the past six months? ____ Obs Observed the minutes or report of at least 1 meeting between the health post and the community members within the six months		If No, list the reason ____		
	Supervision				
30	Have you supervised by higher level in the last 6 months?				
31	If yes, how many times have you been supervised in the last 6 months? _____ Obs; supervision report or any evidence of supervision in last 6 months				

32	Did you get any supportive supervision from higher level in the last 6 months? If yes, Obs; supervision report or any evidence for appropriate review of surveillance				
	Training				
34	Have you trained in disease surveillance and epidemic management?				
35	Number of staffs trained If yes, specify when, where, how long, by whom				
	Resources for data management logistics available				
36	Bicycles				
37	Motor cycles				
38	Electricity				
	For data management				
39	Stationery				
40	Calculator				
41	Computer and Printer				
	Communications available				
42	Telephone service				
43	Fax				
44	Radio call				
45	Computers that have modems				
	Information education and communication materials				
46	Posters				
47	Megaphone				
48	Flipcharts Image box				
49	Others _____________				
	Availability of hygiene and sanitation materials				
50	Spray pump				

51	Disinfectant				
52	List of Personal Protection Equipment (PPE)				
53	Satisfaction with surveillance system				
54	Are you satisfied with the surveillance system? If no, how can the surveillance systems will be improved? Suggest				
55	What opportunities are there for integration of surveillance activities and functions (core activities, training, supervision, guidelines, resources etc.)				
	Describe Each System Attributes:				
	A. Usefulness:				
56	Total population under surveillance in the catchment area_____________				
57	How many cases and deaths reported in the district from the following disease past 6 months?	AWD cases ____Deaths ___ Malaria cases ____Deaths ___ Measles cases ___Deaths ___			
58	Does the surveillance system help To detect outbreaks of these selected priority diseases early				
59	Does the surveillance system help to estimate the magnitude of morbidity, mortality and factors related to these diseases?				
60	Does the surveillance system help to Permit assessment of the effect of prevention and control programs?				
	B. Simplicity:				
60	Do you feel that data collections on a case report form are time consuming?				
61	How long it takes to fill the format?	1. Less than five minute 2.10-15minuts 3. Greater than15 minutes			
	C. Flexibility:				
62	Do you think that the current reporting formats used for other newly occurring health event (disease) without much difficulty?				

63	Do you think that any change in the existing procedure of case detection, Reporting, and formats will be difficult to implement? If yes, how____________.				....
	D. Data Quality:				
64	Are the data collection formats for these priority diseases clear and easy to fill for all the data collector's/ reporting sites?				
65	Are the reporting site / data collectors trained/ supervised regularly? If, Obe: Review the last months report of these diseases				
66	Average number of unknown or blank responses to variables in each of the reported forms				
67	Percent of reports which are complete(that is with no blank or unknown responses) from the total reports				
68	Total weekly reports received from HF (including late reports, from July 2011 May 2018)				
	E. Acceptability:				
69	Do you think all the reporting agents accept and well engaged to the surveillance activities? If yes, how many are active participants (of the expected to)?				
70	If No, what is the reason for their poor participation in the surveillance activity?				
	F. Representativeness:				
71	What is the health service coverage of the Catchment area? _____(#) ____%				
72	Do you think, the populations under surveillance have good health seeking behavior for these diseases?				
73	Who do you think is well represented by the surveillance data? urban / rural				
	G. Timeliness:				
74	What proportion of health facilities (Month) reports in acceptable time_____?	Time in notifying suspected Measles cases at HP Level			
	H. Stability:				
75	Was there lack of resources that interrupt the surveillance system? If yes, how did you manage it				

76	What do you suggest to overcome such problems?________.				
	I. Strength and Weakness				
77	How do you work with other departments and other sectors?___				
78	What are the strengths of your surveillance system				
79	What are the weaknesses of your surveillance system?				
	Thank YOU				