Addis Ababa University, College of Health Sciences,

School of Public Health

Ethiopian Field Epidemiology Training Program (EFETP)

Compiled Body of Works in Field Epidemiology

By:

Mulugeta Asefa

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, 2018

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Mentors:

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Approval by Examining Board

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Table of Contents

ACKNOWLEDGEMENT iii
List of Tables v
List of Figures vi
List of Annex viii
List of Abbreviations and Acronyms ix
EXECUTIVE SUMMARY xii
CHAPTER – I OUTBREAK INVESTIGATION 1
1.1. Dengue fever Outbreak investigation in Kabridahar, Somali Region, Ethiopia: 2017. 2
1.2. Investigation of Human Rabies Exposure and Cases in Dehana Woreda, Wahagimra Zone, Amhara Region, Ethiopia: 2017. 29
1.2 Investigation of Human Rabies Exposure and Cases in Dehana Woreda, Wahagimra Zone, Amhara Region, Ethiopia: 2017 51
CHAPTER - II SURVEILLANCE DATA ANALYSIS 53
2.1 Epidemiology of Measles in Oromia Region, Ethiopia: Surveillance Data Analysis from 2007-2016 54
CHAPTER – III SURVEILLANCE SYSTEM EVALUATION 80
3.1. Surveillance surveillance system evaluation of Anthrax East shewa zone Oromia region 2018. 81
CHAPTER – IV DISTRICT HEALTH PROFILE ASSESSMENT 106
4.1 Health profile description of Lome District, East Shewa zone, Oromia Region 2016 107
CHAPTER - V SCIENTIFIC MANUSCRIPTS FOR PEER REVIEWED JOURNALS 136
5.1 Dengue fever Outbreak investigation in Kabridahar, Somali Region, Ethiopia: 2017. 137
5.2. Epidemiology of Measles in Oromia Region, Ethiopia: Surveillance Data Analysis from 2007-2016. .. 151
CHAPTER – VI ABSTRACTS FOR SCIENTIFIC PRESENTATION 162
..... 162
6.1. Dengue fever Outbreak investigation in Kabridahar, Somali Region, Ethiopia: 2017. 163
6.2. Epidemiology of Measles in Oromia Region, Ethiopia: Surveillance Data Analysis 2007-2016. 164
CHAPTER – VII NARRATIVE SUMMARY OF DISASTER SITUATION 165
7.1. Disaster Need Assessment of IDPs Health, Nutrition and WASH in West and East Hararge zones of Oromia Region, Ethiopia 2018. 166
CHAPTER-VIII PROPOSAL FOR EPIDEMIOLOGIC RESEARCH PROJECT 180
8.1. Challenges associated with malaria parasitological diagnosis, in Hararge zone of Oromia region, 2017. 181
CHAPTER-IX ADDITIONAL OUTPUT 199
9.1. Challenges associated with malaria parasitological diagnosis, in Hararge zone of Oromia region, 2018 200

List of Tables

Table 1: Socio demographic characteristics of community based survey respondents of Dengue Fever outbreak investigation at kabridahar, May 2017. (n=150, cases=50, controls =100)..... 17
Table 2: Potential factors for Dengue fever outbreak spread and control kabridahar Town, May 2017. (n=150, case=50, control =100)..... 18
Table 3: Independent predictors of Dengue Fever, kabridahar Town, Somali Region, may 2017. 19
Table 4: Knowledge status of participants about Dengue Fever, Kabridahar Town, Somali region May 2017. 20
Table 5: Entomological survey at ten kebelles of Kabridahar Town, Qorhay zone, Somali region May 2017. 21
Table 6: Human exposure to Dog bite by age and sex, Dehana woreda, June to August 2017 39
Table 7: Knowledge status of victims about rabies, Dehana district, Wahagimra zone May 2017. 44
Table 9: List of PHEM Disease under surveillance in Ethiopia..... 84
Table 10: Population under surveillance of East Shewa zone and administrative areas by place of residence (Projected population for 2018. 93
Table 11: Availability of materials for preparedness plan in selected districts of east shewa zone. 95
Table 12: Number of districts and their emergency preparedness status East Shewa Zone of Oromia 2018. 96
Table 13: Estimated Population per kebelles of Lome district, East Shewa zone, Oromia, 2016..... 117
Table 14: Types and number of crops in the Lume woreda, East Shewa zone, Oromia Region, Ethiopia, 2008 EFY. 120
Table 15: Number of health facilities by type in Lume Woreda, East Shewa Zone, Oromia Region, 2008 EFY. 121
Table 16: Human resources in Health facility of Lume woreda East Shewa Zone, Oromia, Region, Ethiopia, 2008 EFY. 121
Table 17 : Population and Vital statistics in Lume woreda, Oromia, 2008 E.C. 124
Table 18: Problem Identified and prioritized 132
Table 19: Major health problem identified and action plan with responsible body 133
Table 20: Potential factors for Dengue fever outbreak spread and control kabridahar Town, May 2017. (n=150, case=50, control =100) 143
Table 21: Independent predictors of Dengue Fever, kabridahar Town, Somali Region, may 2017. 144
Table 23: Oromo Population displaced from boarder district of East Hararge zone within Somali region 2018. 170
Table 24: Oromo ethnic population displaced due to conflict from Ethio Somali region as of 2018. 171
Table 25: malnutrition screening and the status of the nutrition of PLW and under five children in IDP sites of East Hararge zone, March, 2018 173
Table 26: Oromo population displaced from ethio somali region and boarders of Oromia woredas with ethio somali region 2017..... 175
Table 27: malnutrition screening and the status of the nutrition of PLW and under five children in IDP sites of West Hararge zone, March, 2018..... 176

List of Figures

Figure 1: Map of Kabridahar Town, Somali region 8
Figure 2: Distribution of suspected Dengue fever cases by age and sex in Kabridahar Town, Qorahay Zones, M ay, 2017..... 15
Figure 3: Epicurve of Dengue fever cases by date in kabridahar Town, Somali region, Ethiopia from 2017. . 15
Figure 4: Distribution of dengue fever cases by place in Kabridahar Town, Qorahay Zone, Somalia Region, Ethiopia 2017. 16
Figure 5: Showing the four critical events in rabies surveillance system..... 34
Figure 6: Map of Dehana woreda..... 36
Figure 7: Human exposure to suspected rabid dog by kebelle, Dehana Woreda, June to August 2017 40
Figure 8: Epicurve of human exposure to dog bite by date of bite in Dehana woreda from July to August 2017. 40
Figure 9: Site exposure of human exposure to suspected rabid dog in Dehana woreda during July 2017..... 41
Figure 10: Ownership status of responsible Dog for human rabies exposure in Dehana woreda 2017. 42
Figure 11: human exposure to dog bite health seeking behavior by educational status of dehana district, 2017. 42
Figure 12: Map of Oromia region 62
Figure 13: Measles incidence, by age category, in Oromia, 2007-2016. 66
Figure 14: Measles sex by year in oromia region from 2007-2016..... 67
Figure 15: Measles CFR, by age category, in Oromia, 2007-2016. 67
Figure 16: Trend of measles cases by year, 2007 to 20016, in Oromia region. 68
Figure 17: Trend of Measles based by months, Oromia region from 2007 -2016. 69
Figure 18: Measles CFR by year in Oromia region during 2007-2016. 69
Figure 19: Incidence rate IR/10000 of Measles cases by zone of Oromia region from 2007-2016. 70
Figure 20: Distribution of measles cases by place of residency in Oromia region from 2007-2016. 70
Figure 21: Measles Cases by Vaccination Status, in Oromia region 2007- 2016. 71
Figure 22: Measles Cases vaccination status by zones of Oromia from 2007- 2016. 72
Figure 23: Measles case final classification, Oromia region, 2007- 2016..... 72
Figure 24: Measles IGM laboratory result in Oromia region from 2007- 2016**.** 73
Figure 25: Measles data type, Oromia Region, 2007-2016. 74
Figure 26: Measles inpatient/outpatient status in Oromia region from 2007-2016..... 74
Figure 27: Surveillance data and information flow chart 87
Figure 28: Map of East Shewa Zone Oromia region as of 2018. 89
Figure 29: Six month Timeliness of woreda by week East Shewa Zone Oromia, Ethiopia 2017..... 100
Figure 30: Six month completeness of woreda by week East Shewa Zone Oromia, Ethiopia 2017..... 100
Figure 31: Administration Map of Lume woreda..... 113
Figure 32: Population pyramid of Lume District East Shewa zone, Oromia Region, Ethiopia 2016. 118
Figure 33: Number of Teachers and their educational level in Lume woreda, East Shewa zone, Oromia, Ethiopia 2008. 119
Figure 34: Top ten causes of adult OPD visit in Lume woreda, East Shewa Zone, Oromia, Ethiopia 2008. . 122
Figure 35: Top ten causes of under 5 years OPD visits of Lume woreda, East Shewa, Oromia Ethiopia 2008. 123
Figure 36: Status of maternal health service of lume woreda 2008EFY 125
Figure 37: New contraceptive acceptors disaggregated by method of Lume woreda east showa zone 2008 EFY. 125

Figure 38: Immunization status of Measles case, Lume woreda, Oromia 2008 EFY 126
Figure 39: Distribution of Pulmonary TB Treatment Outcome Lume woreda enrolled in and Complete Treatment Cohort in 2008 E.C. 127
Figure 40: Performance of VCT, PIHCT and PMTCT Lome district East Shewa zone Oromia Region 2016. 128
Figure 41: Epicurve of Dengue fever cases by date in kabridahar Town, Somali region, 2017. 142
Figure 42: Distribution of dengue fever cases by place in Kabridahar Town, Qorahay Zone, Somalia Region, Ethiopia 2017. 142
Figure 43: Measles age category, average annual incidence rate of Oromia, 2007-2016. 154
Figure 44: Trend of measles cases per 100,000 populations per year, 2007 to 20016, in Oromia region..... 155
Figure 45: Measles case, incidence rate by zone of Oromia region from 2007-2016. 156
Figure 46: Measles case final classification, Oromia region, 2007- 2016..... 157
Figure 47: Malaria Management: Algorithm for Diagnosis 188
Figure 48: Conceptual framework: challenges for Malaria RDT/microscopy 190
Figure 49: Map of West Hararge zone Oromia region as of 2010. 192

List of Annex

Annex 1: questionnaire for Dengue Fever Outbreak-kebridehar, Somali Region, may2017. 201
Annex 2: Questionnaire for human Rabies exposure in Dehana Woreda 204
Annex 3: PHEM Case-based Reporting Format (CRF) 209
Annex 4: Health Office Level Questionnaire for system evaluation 210
Annex 5: Health Facility level Questionnaire for system evaluation 217
Annex 6: Health Post Level Questionnaire for system evaluation 224
Annex 7: Data collection tools for woreda health profile description 229
Annex 8: Questionnaire for IDP Rapid health need assessment 237
Annex 9: Key informant interview planning for regional, zonal and woreda level PHEM focal and community level, West Hararge zone Oromia Region, 2018. 241
Annex 10: Consent Form and Information Sheet 242

List of Abbreviations and Acronyms

AFI:	Acute febrile illness
AFP:	Acute flaccid paralysis
AIDS-	Acquire immunodeficiency syndrome
ANC-	Antenatal Care
AOR	Adjusted Odds Ratio
AR:	Attack Rate
ART:	Anti-Retroviral Therapy
AFRO	Africa Regional Office
ASAR	Age Specific Attack Rate
AURTI	Acute Upper Respiratory Tract Infection
AWD:	Acute watery diarrhea
CAR	Contraceptive acceptance rate
CDC:	Center for Disease Control
CFR:	Case Fatality Rate
CI	Confidence Interval
COR	Crude Odds Ratio
CSA:	Central Statistical Agency
CSM:	Convenient sampling method
DHO:	District Health Office
DHS:	Demographic and Health Survey
EPR:	Epidemic Preparedness and Response Plan
E.C:	Ethiopian Calendar
EFETP:	Ethiopian Field Epidemiology `Training Program
EFY:	Ethiopian fiscal year
EHSDP:	Ethiopia health sector development plan
EHNRI	Ethiopian Health and Nutrition research institut
EMIS	Ethiopia Malaria Indicator Survey
EPHI:	Ethiopian Public Health Institute
EPTB	Extra Pulmonary Tuberculosis
EPI:	Expanded Program on Immunization
FMOH:	Federal Ministry of Health
FP	Family Planning
HC:	Health Center
HEWs:	Health Extension Workers

HH:	House Hold
HIV:	Human Immunodeficiency Virus
HMIS:	Health Management Information and System
HO:	Health Office
HP:	Health Post
HSDP:	Health Sector Development Program
IDSR:	Integrated Diseases Surveillance and response
IDP:	Internally Displaced People
IgM:	Immuno Globulin M
IHR:	International Health Regulation
IMR:	Infant Mortality Rate
IPD:	In Patient Department
IQR	Inter quartile range
IRS:	Indoor Residual Spraying
ITNs:	Insecticide Treated Nets
IUCD	Intrauterine contraceptive device
LBW	Low birth weight
LLINS	Long lasting insecticidal net
MAM:	Moderate Acute Malnutrition
MDR	Multi drug resistance
MCH:	Maternal and child Health Care
MIS	Malaria indicator survey
MOH:	Ministry of Health
NGO:	Non-Governmental Organization
NPW	Non-Pregnant Women
NNT:	Neonatal tetanus
OTC:	Outpatient Therapeutic Center
OPD:	Outpatient Department
ORHB:	Oromia Regional Health Bureau
PEP:	Post Exposure Prophylaxis
P.F	Plasmodium Falcifrum
P.V	Plasmodium Vivex
PHEM:	Public Health Emergency Management
PICT:	Provider Initiated Counseling Testing
PLW:	Pregnant and Lactating Woman
PCV	Pneumococcal Conjugated Vaccine

PMTCT:	Preventing Mather to Child Transmission
PNC	Postnatal care
RDT:	Rapid Diagnostic Test
RRT	Rapid Response Teams
SAM:	Severe Acute Malnutrition
SC:	Supplementary Site
SPH:	School Of Public Health
SARS	Severe Acute Respiratory Syndrome
SD	Standard Deviation
SSAR	Sex Specific Attack Rate
TBC:	Tuberculosis
TSF:	Targeted Supplementary Food
TTBA:	Traditional Trained Birth Attendance
UNICEF:	United Nations Children funds
URTI:	Upper Respiratory Tract Infection
USAID:	United State Agency for International Development
VCT:	Voluntary Counseling and Testing
WASH:	Water and Sanitation Hygiene
WHO:	World Health Organization
ZHO:	Zonal health office

EXECUTIVE SUMMARY

This document contains a two years Field Epidemiology Training Program outputs which is equivalent with thesis to be submitted to graduate school of public health for fulfillment of master's degree in Field Epidemiology. It includes reports of diseases outbreak investigations, public health surveillance data analysis, surveillance system evaluation, narrative summary of disaster situation report, manuscripts, abstracts and research project. The document is organized to nine chapters.

Chapter One: contains disease outbreak investigations. I have conducted two outbreak investigations as first Author and one as a collaborator with other field epidemiology residents. One of the investigations was conducted using case control study design. All investigation report contains abstract, introduction, methods, discussions, conclusion, recommendations, acknowledgement and references separately.

Chapter Two: contains report of surveillance data analysis which was conducted on Analysis of Measles Surveillance Data in Oromia, 2007-2016: ten year data was used in the analysis. The objective of this study was to assess the Epidemiology of Measles in Oromia Region, Ethiopia: Surveillance Data Analysis from 2007-2016.

Chapter Three: addresses surveillance system evaluation entitled "To assess key attributes of Anthrax surveillance system and Performance of the system in line with set objectives and operations of the system to generate evidence based information for the better improvement of the surveillance system" This chapter clearly presents the purpose and objectives of the Anthrax surveillance and its progress towards its objectives. The surveillance attributes: simplicity, flexibility, stability, acceptability, representativeness, timeliness, data quality, sensitivity and predictive positive value were also assessed in the chapter.

Chapter Four: Contains assessment of Health Profile Data Description of East Shewa Zone, Lome Woreda, Oromia Regional State. In the chapter health and health related data of Woreda populations were evidently presented which is very imperative for prioritizing problems. Appropriate public health interventions; and is doorway point for operational public health researches. Stake holders of health and health related issues will access evidence based information from this chapter.

Chapter Five: Scientific Manuscripts for Peer reviewed Journals. The manuscripts were prepared according to Ethiopian journal of health development author's guideline. The first manuscript was data analysis of Measles Oromia Region, Ethiopia and the second was Dengue fever Outbreak investigation in Kabridahar, Ethio-Somali Region 2017.

Chapter Six: Include Abstracts on Epidemiology of Measles in Oromia, 2007-2016, Outbreak Dengue fever in Kebridehar Town Ethio- Somali region 2017 and investigation of Human Rabies exposure in Dehana woreda, Amhara Region, Ethiopia 2017 sent to international conference.

Chapter Seven: Narrative disaster situation report of internally displaced people resided in West and East Hararge zone of Oromia region. The assessment was conducted to identify potential problems which need humanitarian assistance. Based on the report from the assessment humanitarian requirement document was developed and shared with potential partners for response. This chapter presents human health, Wash and nutrition need assessment conducted in IDP found in West and East Hararge zones of Oromia region.

Chapter Eight: Epidemiological projects proposal entitled "Challenge associated with malaria parasitological diagnosis in west Hararge zone, Oromia Region, Ethiopia 2018, was developed for epidemiological project to be submitted to Addis Ababa University School of Public Health.

Chapter Nine: Malaria research project report. Project proposal was sent to President Malaria Initiative program for mini grant. It was accepted and funded to be conducted. It was conducted among health facilities in West Hararge Zone, Oromia region, Ethiopia 2018.

CHAPTER – I

OUTBREAK INVESTIGATION

1.1. Dengue fever Outbreak investigation in Kabridahar, Somali Region, Ethiopia: 2017.

Abstract

Background: Dengue fever (DF) is mosquito born viral disease. About half of world's population is now at risk of DF. The 2014 DF outbreak in Godey Town Ethiopia is the first in Somali Region and similar outbreak was reported in DireDawa Ethiopia in 2013. We investigated suspected DF outbreak to verify the diagnosis and associated risk factors.

Method: Descriptive study followed by (1:2) unmatched case-control study design was conducted. We collected data using structured questionnaires. We isolated DF virus using Polymerase Chain Reaction. We inspected mosquito larva in water container placed in indoors and outdoors of 150 households. We run a Bi variate and Multivariate test to identify risk factors.

Result: we identified 101 cases with attack rate of 17/10,000 population, one death with case fatality rate of 1%. Of cases, (61%) was in males. Highest attack rate (29/10000) was in 15-44 years-old. Among 50 cases and 100 controls, No formal education (AOR= 4.23,95% CI (1.60-11.17), open containers (AOR=3.02, 95%,CI (1.22-7.48),Presence of Larvae in containers (AOR= 4.17, 95%, CI (1.66-10.51), wearing half sleeves shirts (AOR=3.29, 95%, CI (1.29-8.39) were associated risk factors whereas and LLINs usage (AOR= 0.21, 95%, CI (0.05-0.79)*were protective factor. Of calculated larva indices; House Index, Container Index and Brateau indexes were with 66/136(49%), 210/411(51%) and 210/136(154%) respectively.

Conclusion: Epidemiological, entomological and serological investigations revealed dengue fever outbreak. Male sex, 15-45 age groups and Kebelle 07 was most affected. No formal education, presence of larva in the water container, open container and wearing shirts with short sleeves were independent risk factors and using LLINs were protective factor. High Aedes house index indicated high risk of dengue transmission. We educated the community on best practice of preserving water and disposal of water containers to reduce Ae Aegypti densities.

Key words: Dengue, outbreak, risk factor, entomology,

1. INTRODUCTION

Dengue fever, also known as break bone fever, is a mosquito-borne infectious tropical disease caused by the dengue virus. Symptoms include fever, headache, muscle and joint pains, and a characteristic skin rash. In a small proportion of cases, the disease develops into life-threatening dengue hemorrhagic fever called severe dengue, which results in bleeding, thrombocytopenia, and leakage of blood plasma, or into dengue shock syndrome, in which dangerously low blood pressure occurs,(1) There are4 distinct, but closely related, serotypes of the virus that cause dengue (DEN-1, DEN-2, DEN-3 and DEN-4. The disease varies in presentation from asymptomatic infections to dengue hemorrhagic fever (DHF) or dengue shock syndrome (DSS), which are the most serious forms of the disease (2).

The global incidence of dengue has grown dramatically in recent decades. About half of the world's population is now at risk. Dengue is found in tropical and sub-tropical climates worldwide, mostly in urban and semi-urban areas. Severe dengue is a leading cause of serious illness and death among children in some Asian and Latin American countries. There is no specific treatment for dengue/ severe dengue, but early detection and access to proper medical care lowers fatality rates below 1 %. Recovery from infection one serotypes provides lifelong immunity against that particular serotype (3). Dengue is the most rapidly spreading mosquito-borne viral disease in the world. The magnitude of the dengue problem has increased dramatically and has extended geographically to many previously unaffected areas. It remains the most important arthropod-borne viral disease of humans in the last 50 years; incidence has increased 30-fold with increasing geographic expansion to new countries and, in the present decade, from urban to rural settings. An estimated 50 million dengue infections occur annually and approximately 2.5 billion people live in dengue endemic countries (4).

More than 70% of the population at risk for dengue worldwide lives in member states of the WHO South-East Asia Region and Western Pacific Region, which bear nearly 75% of the current global disease burden due to dengue. Since 2000, epidemic dengue has spread to new areas and has increased in the already affected areas of the region. In 2003, eight countries Bangladesh, India, Indonesia, Maldives, Myanmar, Sri Lanka, Thailand and Timor-Leste reported dengue cases. (4).

According to the Center for Disease Control (CDC), more than one-third of the world's population lives in areas at-risk of dengue fever infection, with up to 400 million people becoming infected with dengue annually (5).

According to WHO Some 50–100 million new infections are estimated to occur annually in more than 100 endemic countries, with a documented further spread to previously unaffected areas; every year

hundreds of thousands of severe cases arise, including 20 000 deaths; 264 disability-adjusted life years per million population per year are lost, at an estimated cost for ambulatory and hospitalized cases of US$ 514–1394, often affecting very poor populations. The true numbers are probably far worse, since severe underreporting and misclassification of dengue cases have been documented (6).

In Africa dengue fever incidence is not much known but incidence of dengue has increased worldwide in recent decades. During 1960–2010, a total of 22 countries in Africa reported sporadic cases or outbreaks of dengue; 12 other countries in Africa reported dengue only in travelers. The presence of disease and high prevalence of antibody to dengue virus in limited serologic surveys suggest endemic dengue virus infection in all or many parts of Africa. Dengue is likely under recognized and underreported in Africa because of low awareness by health care providers, other prevalent febrile illnesses, and lack of diagnostic testing and systematic surveillance. Aedes aegypti mosquitoes, the principal DENV vector, originated in Africa and spread to other countries in Africa and other tropical countries in the 17th and 18th centuries. Several other Aedes species mosquitoes, including, Ae. Albopictus, Ae. Africanus, and Ae. Luteocephalus, are found in Africa and are potential DENV vectors (7).

In Ethiopia for strengthening dengue prevention and control: expand the scope of the existing Malaria Control Program to include Dengue Fever and other Vector-Borne Diseases; initiate dengue surveillance by establishing sentinel sites at health centers and hospitals in the most affected areas of Dire Dawa, Afar and Somali Regions. Dengue is found in tropical and sub-tropical climates worldwide, mostly in urban and semi-urban areas, putting more than 40% of the world's population at risk. Since 2013, Ethiopia has reported more than 12 000 dengue fever cases (8).

In Ethiopia the first confirmed Dengue fever case was reported in Dire Dawa city with more than 12,000 dengue fever cases in mid-September 2013. In 2014 suspected case later reported from Gode town of Ethiopian Somali Region in January 2014 and in Afar Region 2014 (29).

Significance of the study

Health officials from Ethio-Somali region informed EPHI about a sudden and unusual occurrence of febrile illness was associated with myalgia, arthralgia, headache, retro-orbital pain, rash and hemorrhagic manifestations on May 11/2017 in Kebridahar Town. Therefore the investigator planned to assess risk factors associated with an outbreak of dengue fever in the Town. The result of this study may also help as good input for stakeholders by providing area of focus to control Dengue fever.

2. LITERATURE REVIEW

Several factors have contributed for the occurrence of Dengue fever virus in developing countries such as rapid population growth, rural-urban migration, inadequate basic urban infrastructure (e.g. unsafe and in adequate water supply leading householders to store water in containers close to homes) and increase in volume of solid waste, such as discarded plastic containers and other abandoned items which provide larval habitats in urban areas. Increased air travel and breakdown of vector control measures have also contributed greatly to the global burden of dengue and DHF (9).

Study done in Vietnam revealed that living in a rented house, living near open water container and untreated water discharging directly into nearby ponds/lakes were all significantly associated with DF/DHF. Living in a rented house increased risk by 2·2 times (AOR 2·2, 95% CI 1·1– 4·6). Living in an unhygienic house or one directly discharging sewage into ponds increased risk by 3·4 times and 4·3 times, respectively (AOR 3·4, 95% CI 1–11·7; AOR 4·3, 95% CI 1·1–16·9). Detecting mosquitoes in the house or living near an open sewer constituted a very high risk (AOR 6·3, 95% CI 0·7–59; AOR 6·9, 95% CI 0·9–71·9, respectively), but the difference between the case and control groups was not significant (10).

According to report of study done in Pakistan 2013 the presence of indoor stagnant water (OR=3·7 [95% CI=2.5-4.8], p<0·0001), presence of indoor larvae (OR=3·1 [2·3-4·4], p=0·001), and non-use of repellents (OR=2·7 [CI=1·5–3·2], p=0·01) were found to be independent determinants of dengue infection (11).

Dengue was reported in Africa in the late 19th and early 20th centuries. Epidemics were reported in Zanzibar (1823, 1870), Burkina Faso (1925), Egypt (1887, 1927), South Africa (1926–1927), and Senegal (1927–1928) The epidemic in South Africa was confirmed by retrospective neutralizing antibody testing in the mid1950s, but the other reported epidemics were not laboratory confirmed and therefore may not have been dengue. During the 50 years from 1960 through 2010, twenty laboratory confirmed dengue outbreaks were reported in 15 countries in Africa; most were from eastern Africa. Nearly 300,000 cases were reported in 5 large epidemics in the Seychelles (1977–1979), Reunion Island (1977–1978), Djibouti (1992–1993), Comoros (1992–1993), and Cape Verde (2009) (12).

A study in Nigeria determined the prevalence of flavivirus infections among 1,816 children and adults from urban and rural areas in samples obtained mainly during the early 1970s. Virus-specific hem agglutination inhibition testing showed that the prevalence of immunity was 38% for DENV-1 infection, 45% for DENV-2 infection, 43% for yellow fever virus infection, and 49% for West Nile

virus infection (13).

According to study conducted to estimate the Magnitude of a Dengue Outbreak in Mombasa,Kenya,2013 Risk factors significantly associated with having evidence of current or recent DENV infection included report of having windows open at night (OR=2.3;CI=1.1–4.8),travel outside of Kenya in the past month (OR=2.5;CI=1.1–5.4),and failure to use mosquito repellent daily (OR=1.6;CI=1.0–2.8)(Table2).Of those 12 participants who reported travel outside of Kenya in the month before being interviewed,8/12(73%) reported their travel destination and 7/8 (88%) had traveled to Tanzania, an area experiencing a current dengue outbreak. Of 701 participating households, the most common self-reported water containers that could serve as mosquito breeding sites in the yard were buckets (47%), septic tanks (40%), and water cisterns (31%) (14).

Study done in Ethiopia on breeding sites of Aedes aegypti: potential Dengue vector showed results of the commonly used larval indices (House, Container, and Breteau index) are varies HI, CI, and BI ranged between 33.33 and 86.15, between 23.18 and 73.91, and between 56.52 and 188.88, respectively, at different locations in the town. These indices showed that there was high infestation of artificial water containers by mosquito larvae which may cause an outbreak of dengue (15).

Objective

General Objective

- To describe magnitude and assess risk factors associated with an outbreak of dengue fever, Kabridahar town, Somali region may 2017.

Specific Objectives

- To describe the magnitude of the outbreak by person, place, time
- To assess risk factors associated with Dengue Fever outbreak

Methods

Study area

This study was conducted in Kabridahar Town, Somali Region. It is 1000 km from Addis Ababa and 450 km from Jigjiga town capital of Somali region. The climate condition of Kabridahar town is Colla/desert. The total population of the town is 59638 as projected for 2007. There are 1 Governmental Hospital, 5 private clinics, and 1 NGO (SOS) Health center. The town is subdivided into 10 Administrative Kebelles and it is also the Capital of Qorhay Zone. The average elevation in this Town is 706 meters above sea level.

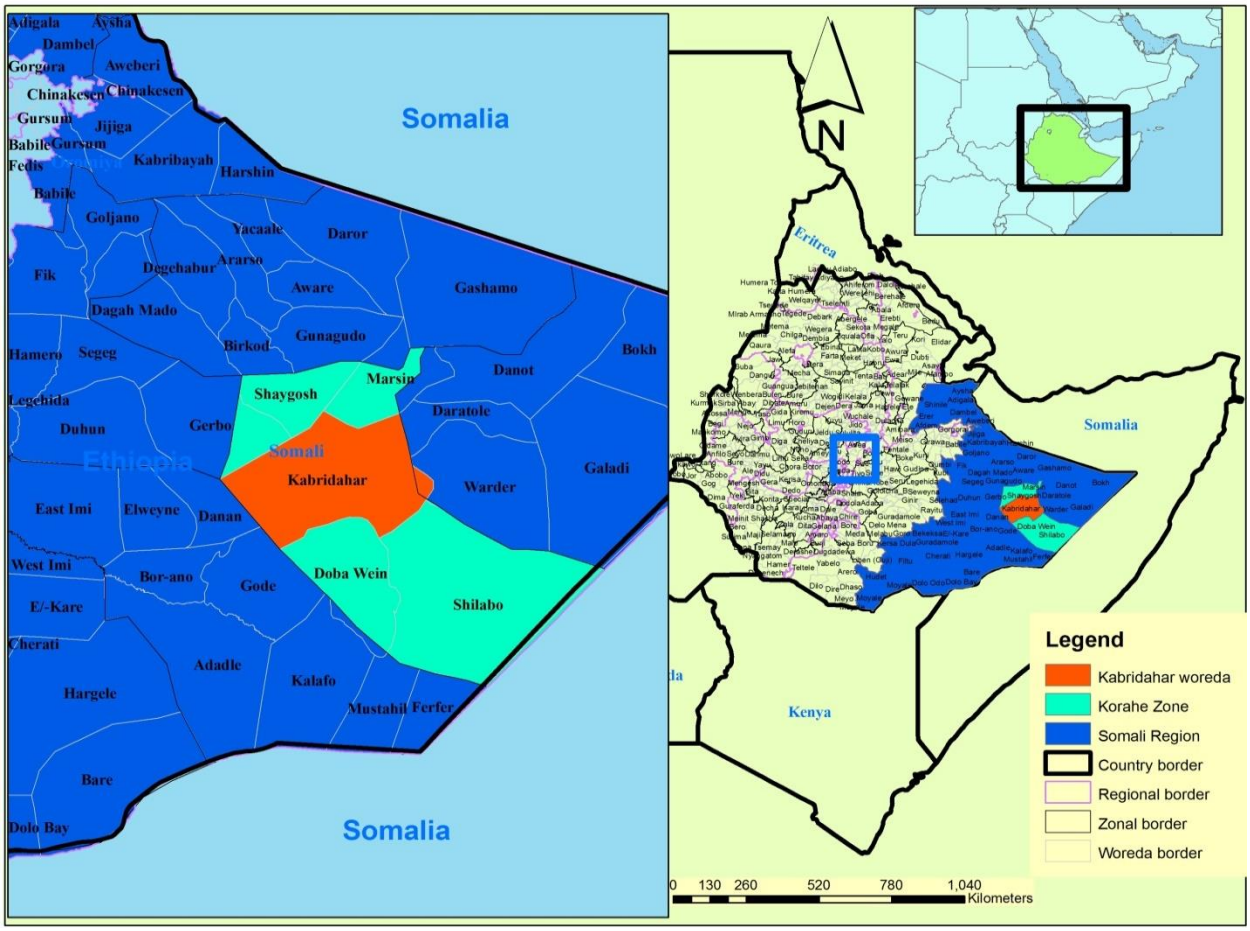

Figure 1: Map of Kabridahar Town, Somali region

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Study period.

The study was conducted from. 5/112017 to 5/31/2017.

Study design

Descriptive cross-sectional followed by (1:2) unmatched case-control study design

Target population: All population in Qorhay Zone Kabridahar Town where cases and controls recruited were our source of study population.

Study population

- ✓ **Cases:** Any person residing in Kabridahar Town, Qorhay zone and who had suffered from Dengue fever (DF) / Dengue Heamorheagic fever (DHF) / Dengue shock syndrome (DSS) during this epidemics period.
- ✓ **Controls**: All people who did not suffer from DF or dengue like illness, was residing in the Kebridahar Town during this epidemic period.

Study Unit

- ✓ **Case:** Fifty selected patients who had suffered from Dengue fever (DF) / Dengue Heamorheagic fever (DHF) / Dengue shock syndrome (DSS).
- ✓ **Control:** One hundred selected person from the same community with cases who did not suffer from DF or dengue like illness.

Inclusion and Exclusion Criteria

Cases and controls were selected from the same population; two controls were selected for each case from the general population of the same community.

Inclusion Criteria

Case: was defined as a person who had suffered from Dengue fever (DF) / Dengue Heamorheagic fever (DHF) / Dengue shock syndrome (DSS) (who was tested for PCR and confirmed to have Dengue fever or clinically suspected to Dengue fever infection) residing in Kebridahar Town during this epidemics period.

Control: was also a person who was neighbor of case and who did not suffer from DF or dengue like illness, was residing in the Kebridahar Town during this epidemic period or Who do not fulfill the above case definition during the study period.

Exclusion criteria

Cases: Those who refused to participate or were unconscious were excluded.

Controls: Those who refused to participate as well as family members from the same household

Variables

Independent variables

- Educational status
- Open water container
- Presence of larvae in the container
- Having LLINs
- Long lasting insecticide net (LLINs) while sleeping
- Kind of clothes you usually wear
- Sleeping inside screened window or door
- Use of mosquito repellents on skin.
- House sprayed for the past 6 month

Dependent variable

Dengue fever infection

Sample size determination

The sample size was calculated using Stat calc function of Epi-info version 7. Using the confidence level of 95%, power of 80% and assuming a 50% prevalence of a not using net and OR 2.98 (16), with 1:2 cases to controls a total of 50 cases and 100 controls.

Sampling procedure

Cases: From all patients who had suffered from DF/ DHF/ DSS were popusively selected and interviewed until the calculated sample size was achieved.

Controls: For every selected cases two controls (neighbor of cases) were selected from similar residency area with cases and interviewed at the same day. Both cases and controls were recruited in similar

Case definition

A patient was defined as a case when she/he fulfills the clinical criteria of acute dengue fever as set by Dengue Fever WHO Guideline:

Suspected Dengue fever case: was defined as acute febrile illness of 2–7 days' duration, with two or more of the following: headache, retro-orbital pain, myalgia, arthralgia, rash, hemorrhagic manifestations, or leukopenia.

Confirmed Dengue fever case: of dengue was also associated with one or more of the following: supportive serology (reciprocal haemoagglutination–inhibition antibody titre, comparable immunoglobulin G (IgG) enzyme linked immunosorbent assay (ELISA) Titre, or positive monoclonal IgM antibody capture (MAC-ELISA) test in a serum specimen (17).

Specimen collection and laboratory confirmation

The basis for laboratory confirmation of Dengue fever infection was the presence of Dengue-specific IgM antibodies by PCR from acute cases in serum taken from cases after 5 days of development of fever and less than 5 days of onset of fever.

Data Collection and Procedure Tools

Descriptive study: Line list of Dengue cases were collected from Health facility. Surveillance report and health service records were reviewed to identify any missed cases. We cleared information concerning any recent change in the case definitions, reporting situations and population size. Cases detection was actively done in the community with the help of health extension workers and health professional from health facility using community case definition. Case definitions used during the surveillance and investigation of the outbreak. Those fulfill the case definition of Dengue fever were included in the descriptive study.

Analytic study: Data were collected by the investigator; through face to face interview with the respondents (community). Structured questionnaire was used to obtain information about demographic variables, clinical status of the cases, possible risk factors, environmental risk variables, Dengue awareness on mode of transmission and control/prevention measures and practices on Dengue for both cases and controls. Data were also collected through observation on Aides mosquito breeding sites at water sources, and household levels, presence of uncovered water container, screening of windows, empty containers in house. Controls were asked similar questions with the cases.

Data Processing and Analysis

The obtained Data was entered and edited using epi info software (Version 7.2) and checked for completeness and consistency. Descriptive statistics like frequency, percentage, rate and ratio were calculated. The outbreak was described in terms of time, place and person, and an epidemic curve was drawn to observe the dynamic of the outbreak. Bivariate and multivariate logistic regression was calculated to compare risk factors among cases and controls. Crude and adjusted odds ratios (OR) and their 95% confidence intervals (CI) were calculated. Odds ratios were calculated for case control study. Variables that showed a *P*-value < 0.2 in bivariate analysis underwent logistic regression, followed by a step-down procedure to remove those factors not contributing significantly (P<0.05).

Entomological investigation

An entomological investigation was carried out to understand the density of vectors responsible for viral transmission. A larval survey was conducted by searching mosquito breeding sites inside and outside houses, using the single larval survey (SLS) technique. Larvae were identified by visual inspection of their appearance and movement in water, by the regional public health specialist and EPHI expert/epidemiologist. Analysis and calculation of the standard Aedes larval indices, such as House Index (HI), Container Index (CI) and Breteau Index (BI), were carried out, to estimate the prevalence and infestation level of vectors in the locality.

House Index (HI) has been widely used to calculate the presence and distribution of Aedes populations in a given locality. However, the HI does not take into consideration the number of positive containers per house. Similarly, the Container Index (CI) only provides information on the proportion of water-holding containers that are positive. On the other hand, the Breteau Index (BI) establishes a relationship between positive containers and number of houses. Hence, the BI is considered the most useful single index for estimating Aedes density in a location.

House index (HI) greater than 5% and/or of Breteau index (BI) greater than 20% for any locality are indications that the locality is prone to dengue. For epidemiological purposes, the HI indicates potential spread of virus through an area once an infected case becomes established (18). Lawns and grounds around the houses were considered as peri-domestic sites. Unused wells, tree holes, discarded tyres, empty coconut shells, broken earthen pots, plastic cups and packets, etc. were considered as breeding sites.

The following three indices are commonly used to record *Ae. Aegypti* infestation levels:

House (premise) index (HI) – i.e. percentage of houses infested with larvae and/or pupae.

$$HI = \frac{Infested\ houses}{Houses\ inspected}\ x\ 100$$

Container index (CI) – i.e. percentage of water-holding containers infested with larvae or pupae.

$$CI = \frac{Containers\ positive}{Containers\ inspected}\ x\ 100$$

Braeteu index (BI) – i.e. number of positive containers per 100 houses inspected.

$$BI = \frac{Number\ of\ positive\ containers}{Houses\ inspected}\ x\ 100$$

Environmental study

The investigation team observed the sanitation practices, water collection habits, water containers for breeding, old tires and broken glasses in the home or outside the home were also critically assessed. Similarly observation of these potential aedes aegipty breeding sites, presence of larvae, drainage systems and personal protection measures against mosquitoes was conducted.

Ethical consideration

Ethical clearance was obtained from Ethiopian Public Health Institute (EPHI). A letter was written from regional health bureau in order to obtain approval on data collection. An informed oral consent was obtained from all study participants. Confidentiality was assured throughout by not writing participant's names. Participants were treated with respect and willingly participated in the study with no payment or cohesion.

RESULT

Descriptive epidemiology

We identified a total of 101 dengue case with crude attack rate 16.4/10,000 population and 1 death with case fatality rate (CFR) 1% in ten kebelles. The index case was 31years old male patient from kebelle 02 of the Town, who has no travel history. The patient had not travelled anywhere beyond Town. The Ethio- Somali Regional Health office informed EPHI about a sudden and unusual increase of fever cases that occurred during May 2017, in all kebelles, of Kabridahar Town.

There was no history of dengue cases over the previous years in this particular Town. Febrile illness was associated with myalgia, arthralgia, headache, retro-orbital pain, rash and hemorrhagic manifestations suggestive of dengue fever. All 101 cases had fever. Other signs and symptoms were: headache (88 patients), myalgia (94), retro-orbital pain (75), vomiting (47), easy fatigability (21), abdominal pain (03), skin rash (23), Vomiting (47), bleeding manifestations (e.g. nose or gum bleeding, petechiae) (38), and altered cognitive function (1). Three patients had complications, of which one had thrombocytopenia and referred to Jigjiga hospital. All the patients recovered, except one male patient aged 41 years.

Description of cases by person

The cases were higher 61 (61%) among males compare to females ratio of 1.5:1. The median age of the cases was 30 years (ranging from 4 to 53 years). The highest 69 (68.3%) cases were observed in the age group of 15-44 years followed by 26 (25.7%) were above 45 years. The sex specific attack rate for male was 18/10,000 population and the highest age specific Attack rate was among 15 to 45 year of age with 30.3 /10,000 population. However, there was no dengue case in less than one year of age in all kebelles see graph.

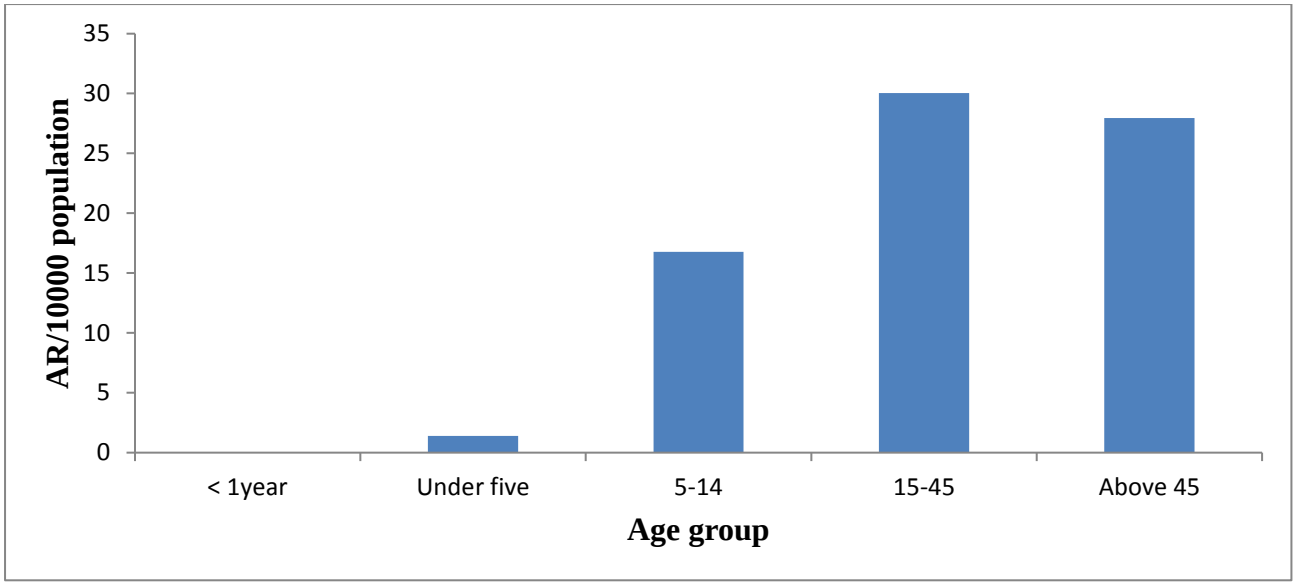

Figure 2: Distribution of suspected Dengue fever cases by age and sex in Kabridahar Town, Qorahay Zones, M ay, 2017.

Description of Dengue fever cases by time

The outbreak started in the 2nd week of May 2017 in kebelle 07. It was further spread to other kebelles of the Town and increased to reach high pick on the same week of May, 2017 and the number of daily cases started dropping in the 4th week of May 2017 until the 1st week of June, 2017. There was no reported case after May, 31, 2017. Epidemic curve was a multi-peak with sharp rise and gradual fall that indicated a propagative type of outbreak. (See Figure 2).

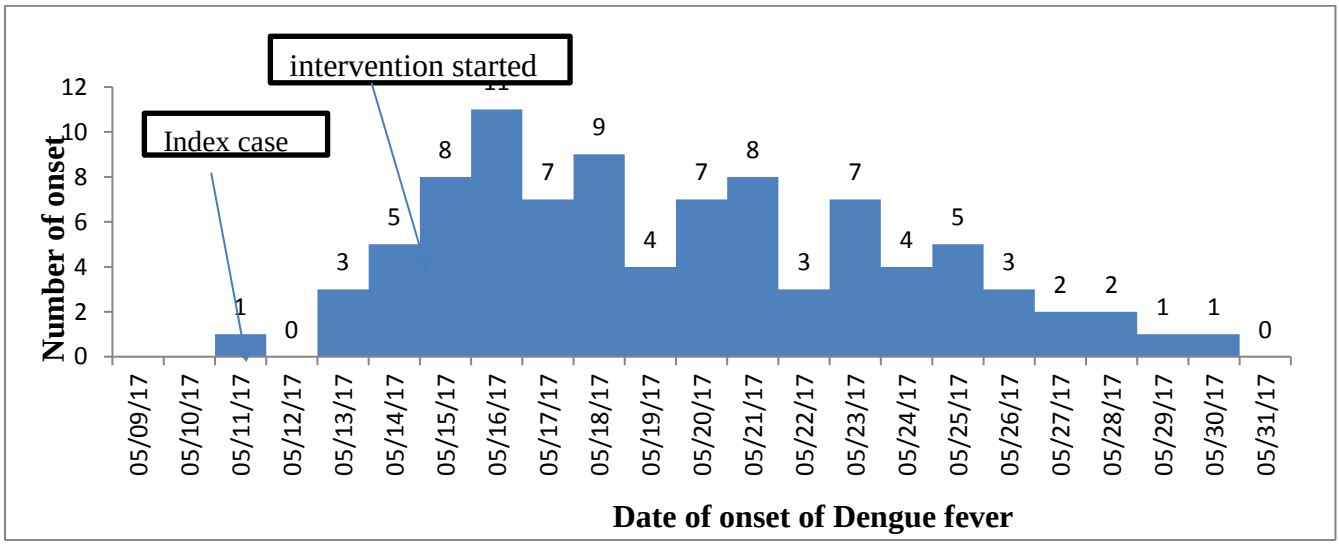

Figure 3: Epicurve of Dengue fever cases by date in kabridahar Town, Somali region, Ethiopia from 2017.

Description of dengue cases by place

The crude Attack rate was 16.4 cases per 10,000 populations with some variation among different affected kebelles. Twenty eight patient (28%) were from Kebelle 07 followed by kebelle 03 with 18%. Kebelle 07 is has highest Attack rate of 34.5/10,000 population while the lowest is from kebelle 08 with the incidence rate of 2.1/10,000 population (figure 3).

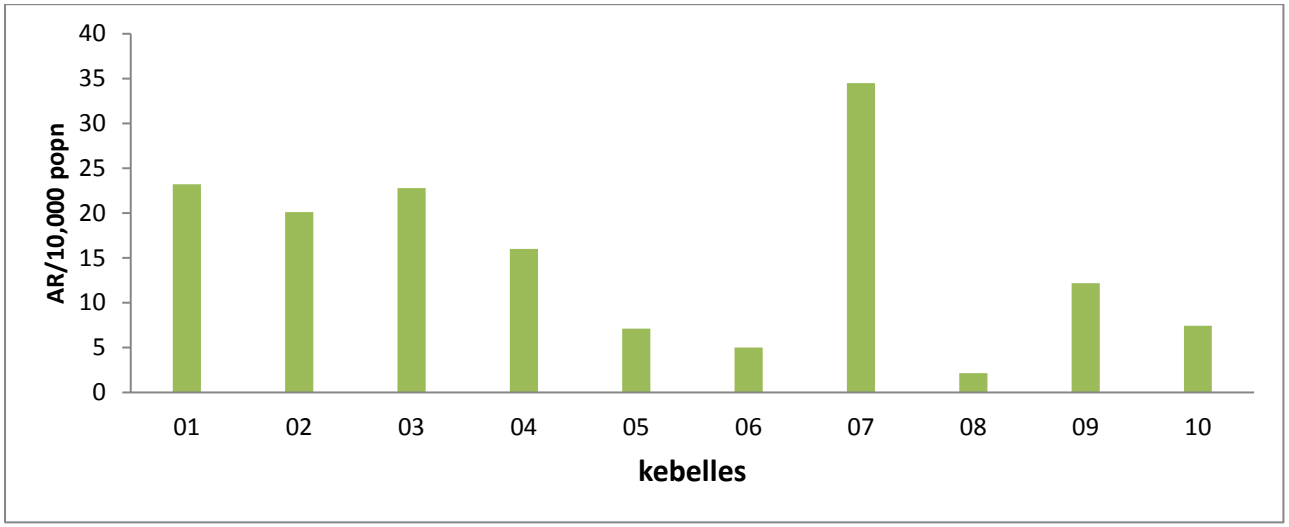

Figure 4: Distribution of dengue fever cases by place in Kabridahar Town, Qorahay Zone, Somalia Region, Ethiopia 2017.

Laboratory result:

Of 101 affected patients, 21 serum blood samples was collected by skilled laboratory professional from ill persons as per the case definition at health facility and referral laboratory. Collected serum blood sample was sent by plane to Ethiopian public health institute for IG test, for confirmation of dengue virus, of this 72% (15/21) were positive for Dengue fever.

Risk factors

Socio-demographic characteristics of respondents

A total of 150 people were enrolled and responded during the case control, of which 50 were cases and 100 were controls. Of the total included respondents, 99 (66%) were males and 51(34%) were females. Of the total 50 cases, 34(68%) and 16(32%) were males and females, respectively, while of the controls 65(65%) and 35(35%) were males and females, respectively. The proportion of males in cases (68%) is higher than the proportion of males in controls (65%). The mean ages of cases were 29.9 and controls were found to 30.4 years.

Table 1: Socio demographic characteristics of community based survey respondents of Dengue Fever outbreak investigation at kabridahar, May 2017. (n=150, cases=50, controls =100)

Variable	Case No (%)	Control No (%)	Total No (%) COR(95CI)
Sex			
Female	16(32)	35(35)	1.14(0.55-2.35)
Male	34(68)	65(65)	
Age			0.5(0.12 – 2.16)
<5 yrs	1(2)	0(0)	
5-14 yrs	3(6)	9(9)	
15-44 yrs	40(80)	74(74)	
≥45 yrs	6(12)	17(17)	
Marital status			
Married	28(56)	57(57)	0.96 (0.48-1.90)
Single	22(44)	43(43)	
Ethnicity			
Somali	35(70)	73(73)	0.86 (0.40-1.82)
Other	15(30)	27(23)	
Educational status			
No formal Education	37(74.0)	54(54.0)	3.34(1.58-7.03)
Had formal Education	13(26.0)	46(46.0)	
Occupation			
Daily laborer	19 (38)	25(25)	0.95 (0.78-1.16)
Farmer/pastoralist	2 (4)	2(2)	
Government employed	10 (20)	15(15)	
Housewife	15(30)	14(14)	
Merchant	1(2)	4(4)	
other		23(23)	
Student	3(6)	17(17)	

Characteristics of respondents in relation to risks and prevention of Dengue fever

From a total of respondent's household, LLINs were available in the households of 87% of total respondents, with 78% among cases and 90% among controls, with reported proper utilization of the available LLINs by 75% of respondents. All respondents reported that their households were not sprayed with IRS in the previous three months. Water holding containers were available in households of (91%) out of the total 150 respondents included, with 94% among cases compared to 89% among controls. Of the total 150 households visited, larvae of Aedes were identified in 67 households (45%), of this identified larva 32(62%) were among cases and 33(36%) of them were among control. Among total of containers observed, 76(51%) of them found to be open and there is great difference among cases and controls which accounted 34(68%) and 40(40%) respectively. With regards to kinds of clothes 33(66%) among cases and 42(42%) among controls usually wear short and T-shirts. while only 17(34%) of cases and 58(58%) of control wear body full dress (Table 2).

Table 2: Potential factors for Dengue fever outbreak spread and control kabridahar Town, May 2017. (n=150, case=50, control =100)

Variables	Case	Control	COR (95%CI)
Status of Containers			
Closed	16 (32)	60(60)	3.18(1.55- 6.52)
Open	34(68)	40(40)	
Having LLINs			
Yes	39(78)	91(90)	0.36(0.134 -0.913)
No	11(22)	9(9)	
LLINs usage			
No	10(26)	7(8)	0.241(0.08-0.693)
Yes	29(74)	84(92)	
Educational status			
No formal Education	37(74.0)	54(54.0)	3.34 (1.58-7.03)
Had formal Education	13(26.0)	46(46.0)	
Existence stagnant water around their residency			
Yes	5(10)	6(6)	1.74 (0.5-6.0)
No	45(90)	94(94)	
Presence of Larvae in the household			
Yes	32(62)	36(36)	3.16 (1.55-6.41)
No	18(38)	64(64)	
Respondents household IRS spray in last six months			
No	50 (50)	100 (100)	1.00
Yes	0 (0)	0 (0)	
Kinds of clothes usually wear			
Trousers/body full dress	17 (34)	58 (58)	2.68 (1.32-5.43)
Short and T-shirt	33 (66)	42 (42)	
Do you use mosquito repellent on your skin			
Yes	8 (16)	27 (27)	0.51 (0.21- 1.23)
No	42 (84)	73 (73)	
Sleeping inside screened window or door			
Yes	23 (46)	53 (53)	0.75 (0.38 – 1.49)
No	27 (54)	47 (47)	

The final model was constructed using backward binary logistic regression method. study subjects with no formal education compared to those who had formal education were more likely to be affected (AOR= 4.23(1.60-11.17), open containers (AOR=3.02, 95%,CI (1.22-7.48), Presence of Larvae in containers (AOR= 4.17, 95%, CI (1.66-10.51), kind of cloths usually wear (AOR=3.29, 95%, CI (1.29-8.39) and LLINs usage (AOR= 0.21, 95%, CI (0.05-0.79)*were found to be protective factor for the occurrence of Dengue Fever (Table).

Table 3: Independent predictors of Dengue Fever, kabridahar Town, Somali Region, may 2017.

Variables	Cases (N=50)%	Controls (N=100)%	AOR(95%CI)
Educational status			
No formal Education	37(74.0)	54(54.0)	4.23(1.60-11.17)*
Had formal Education	13(26.0)	46(46.0)	1:00
Status of Containers			
Open	34(68)	40(40)	3.02(1.22-7.48)*
Closed	16(32)	60(60)	1:00
Presence of Larvae in the household			
Yes	32(64)	36(36)	4.17(1.66-10.51)*
No	18(36)	64(64)	1:00
Kind of cloths usually wear			
Body full dress	17(32)	58(58)	3.29(1.29-8.39)* 1:00
Short T-shirts	33(78)	42(42)	
Having LLIN			
Yes	39(78)	91(90)	0.58(0.14-2.53)
No	11(22)	9(9)	
LLINs usage			
No	41(41)	54(54)	0.21(0.05-0.79)*
Yes	9(9)	45(45)	1:00

*-variables that has significantly associated with p-value less than .05

Respondents were asked about awareness of Dengue fever, only 47 (31%) of all respondents were aware/heard of Dengue Fever, of this only 26% of cases were heard of Dengue fever. From those who heard of Dengue Fever, 30% knew mode of transmission of this 32% of controls knew mode of mode of transmission. 21% knew symptoms, and 61.7% didn't know methods of prevention of Dengue Fever respectively. There is no difference observed between cases and controls on knowledge how to prevent the disease. Among study subjects who have awareness of Dengue fever 40% of them says water is required for mosquito to breed and there is deference within cases 46% and controls 38% (Table 4).

Table 4: Knowledge status of participants about Dengue Fever, Kabridahar Town, Somali region May 2017.

Variables	Case N = 50	Control N = 100	Total
Heard of Dengue fever No Yes	37(74) 13(26)	66(66) 34(34)	103(69) 47(31)
Know mode of Dengue fever transmission No Yes	10(77) 3(23)	23(68) 11(32)	33(70) 14 (30)
Mosquito bite people at what time Night Day Sun rise/sun set	6 (46) 5 (15) 2 (15)	7(21) 11(21) 16(46)	9(19) 16(21) 22(47)
Knows Symptoms of Dengue fever No Yes	10(77) 3(23)	27(79) 7(21)	37(79) 10(21)
Knew prevention methods for Dengue fever No yes	8(61.5) 5(38.5)	21(63) 13(37)	4(61.7) 33(38.3)
Does water required for mosquito to No Yes	7(54) 6(46)	21(61.7) 13(38)	28(59) 19(41)

Entomological survey

Larval survey revealed Aedes aegypgi is present in different proportions in all the kebelles of the Town. Containers for larval survey included Cemented tanks (Birka), tires, jerry cans, drums and buckets. The highest HI, CI and BI were seen in kebelle 07.

Table 5: Entomological survey at ten kebelles of Kabridahar Town, Qorhay zone, Somali region May 2017**.**

Sampled areas/kebelles	Number houses of sampled	Number of house infested with	House index	Number of container with water	No of containers infested with larva	Container index(CI)	Breateu index(BI)
01	18	11	61	60	26	43.3	144.5
02	18	08	44.4	62	30	48.4	166.6
03	17	9	53	56	28	50	165
04	15	07	46	46	22	48	147
05	10	03	30	28	16	57	160
06	12	04	33	27	14	51	117
07	30	19	63.3	86	55	64	183.3
08	05	01	20	11	5	45.4	100
09	05	02	40	15	6	40	120
10	06	02	33.3	20	8	40	133.3
Total	**136**	**66**	**42.4**	**411**	**210**	**49**	**143.7**

Container type

Overall 411 artificial containers were inspected among which 211 containers were found positive for mosquito larvae, of which 60.4% were from large containers: water storage cemented tanks (Birka) 66(31.4%), tires 60 (30%): jerry cans 45(21.4%), drums 29(13.8%) and buckets 10(4.7%). BIRKA were the most favorable container. Overall, each site had specific container types that were most favorable for mosquito. Mostly Mosquitoes breed in water holding Birkas found at all household level.

Environmental study

During the survey visit, it was observed that water accumulated in cemented tanks (Birka), big plastic water container, jerycans, buckets and other containers of water. This favored mosquito breeding. After careful examination, Birka, earthen pots and plastic containers were found to be positive for Aedes aegypti larvae. There was scarcity of water in the town and people stored water for more than 20 days without a covering. Mosquitoes were found to be breeding there. The relative humidity and temperature of the district was and 34–39°C respectively, in the month of May.

Discussion

An epidemic of dengue virus occurred in Dire Dawa in 2013. The last known epidemic of dengue in occurred in Godey Town of Somali region during 2014. Before that, dengue transmission had not been reported in Ethiopia since 2013. Overall, awareness and knowledge of the respondents about Dengue Fever was observed to be low.

This outbreak investigation revealed different factors associated. The study showed that Presences of open containers in a household were 3.52 times more at risk of Dengue fever compared to a house in closed container. This finding is higher than the finding of study done in Sundials, Chakaiser, and Shangla, Pakistan-2008 (19). This could be due to low awareness towards the specific disease and unable to afford to cover the widely available large cemented water container.

According to study done in Vietnam, People living near stagnant water, favorable mosquito breeding places had higher rates of morbidity (10), though our study showed no significance association between stagnant water and Dengue fever outbreak. This may be due to presence of stagnant water around pastoralist area at a distance of more than 100 meter from most of assessed households.

Presence of larvae in household water containers is another independent risk factor for dengue fever outbreak This finding is consistent with study performed on factors associated with spread of dengue fever in urban, Lahore, Punjab, Pakistan, 2013 (11).

In kabridahar, a study found that most families stored their drinking water; only 49% of them covered their water storage containers. This is lower than study done in Sudan, south kordofan state (20). The difference could be due to study design used. Currently residents use water storage containers like mostly stored in cemented tanks (Birka), big plastic bag, jerry cans, and bucket available and this makes difficult to avoid the outbreak.

Aedes aegypti mosquitoes have been shown to enter houses at night to find resting sites, and then they may take a blood meal from household members the following morning (21). In our study usage of LLINs were found to have a protective Effect. This result is supported by studies conducted in Kenya no usage of LLINs significantly associated with having evidence of current or recent DENV infection (14). Not use of Mosquito bed net use were associated with the DF outbreak in our study, this is due to shortage of mosquito bed net available, from a total respondents only 36% of them had mosquito bed net. the use of mosquito repellents on the skin and use mosquito replant in the house were not associated with the DF outbreak in our study, possibly because the repellents were being applied incorrectly and may be the participants often do not afford to buy the repellents.

Regular use of an indoor insecticide spray is believed to protect against DF if a residual effect insecticide is used according to standard guideline (22). In our study indoor insecticidal spray was not associated with dengue fever outbreak in our study; this is because there was no respondent's house sprayed for the last 6 month.

Among the socio-demographic variables, the education level of the participants was an independent predictor of risk level ($P<0.05$) which is consistent with the study conducted on KAP Regarding Dengue Fever in in rural areas of Yemen 2015 (23). The majority of cases were in the age group of 15–44 years; this is similar with study conducted in Sudan (20) (18).

In this study, most of 52% the cases were men and young, in the age group of 15–45 years; this finding was similar to that of a study in West Bengal India (24), but not similar to another study Kanyakumari of Dharmapuri district (25), where more women and children (6–15 years) were affected.

Our study revealed wearing of short T-shirts cloths (sleeve) were significantly associated with Dengue fever outbreak 2.5 times as compared with those who wear body full dress. This may due the weather condition of the town inhabitants prefer to wear short shirts. The Somali region in Ethiopia is usually characterized by high temperatures, throughout the year, that favor the proliferation of DENV and subsequent transmission by Ae Aegypti (26).

Our study showed Breteau index (BI) of town was greater than 145, Container index was 49% and house index was 42.3%.this is not similar with study conducted at Dare s salaam Tanzania in 2014 Breteau 8.2, Container index 70% and House index was 27.5% (27). This dissimilarity could be due to difference in geographical area that favored for mosquito to breed. The Breteau indices in the all kebelles of Kabridahar Town were above 100. Higher Aedes indices, BI in particular, provides indication of geographical areas at high risk for dengue transmission (28). But this is almost similar with study conducted in Ethiopia DireDawa larval indices (house, container, and Breteau index) are depicted in HI, CI, and BI ranged between 33.33 and 86.15, between 23.18 and 73.91, and between 56.52 and 188.88, respectively. The higher Aedes mosquito HI, CI and BI may not be surprising as the study was carried out during an epidemic (15).

No association was found between dengue illness and using mosquito repellent on the skin and not sleeping inside screened door or window by the participants, these results were similar to results of studies conducted in the university of Lahore, but not similar for using mosquito repellent on the skin (16).

Strength and limitation of the study

This study is the first study to identify factors associated with DF in kabridahar Woreda, Qorahay Zone, Somali regional state. The odds ratios for the associated risk factors are a better measure than the odds ratio of the strength of the association. The design of this study is integrated with a simultaneous entomological survey in the study area. Larvae were identified by visual inspection alone and not confirmed by a laboratory.

Conclusion

This finding of study from the epidemiological, entomological and serological investigations revealed that suspected fever outbreaks were due to dengue fever virus infection. Male was the highest affected, majority of cases were among age group of 15-45 years and highest cases were from 07 kebelle. Variables No formal education, presence of larva in the water container, open container, wearing shirts with short sleeves were independent risk factors for the occurrence dengue fever and using LLINs were protective factor. Larva indices calculated showed High Brateau index (BI), indicates that there is high density of aedes aegypty within the Town.

Recommendation

Woreda health office should focus on Dengue prevention campaigns on messages highlighting the risk of contracting dengue and education to increase knowledge about dengue especially health education on utilization of insecticide net during sleeping, and about wearing of full sleeves shirts to reduce aedes aegypty biting.

HEWs under Woreda health office should start Community mobilization through sensitization, public awareness about the disease and the best practices of preserving water and disposal of containers would be key in reducing Ae Aegypti densities.

Regional, zonal and Woreda water and sewerage office should provide a reliable supply of Piped water in every household would reduce the need for water storage containers that also act as aquatic habitats for dengue vectors.

Health office should Organize vector surveillance and control programs against *Ae*. *Aegypti* mosquitoes in Kabridahar, in particular, where currently vector control activities focus on malaria vectors only.

Acknowledgement:

I would like to thank Ethio-Somali Regional Health Bureau, Kabridahar Council Administration, Kabridahar town health office and Kabridahar hospital staff and Health extension workers for their cooperation and assistance on collecting the epidemiological data. We would also like to acknowledge Ethiopian Public Health Institute and National Reference Laboratory: Department of Virology for their support on Strengthening outbreak investigation and response in preventive medicine in kabridahar Town.

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1.2. Investigation of Human Rabies Exposure and Cases in Dehana Woreda, Wahagimra Zone, Amhara Region, Ethiopia: 2017.

Abstract

Background: Dog bites in human are a serious public health problem throughout the worldwide. Rabies is an endemic disease in Ethiopia. Among people who self-presented to Ethiopian Public Health Institute (EPHI) Rabies Diagnosis Center from 2009 to 2011, about 88.2% were exposed to the virus through dog bite. We aimed to investigate existence of human exposure to rabies and their awareness towards human exposure to rabies in the Dehana woreda, Ethiopia 2017.

Methods: We used Cross-sectional descriptive study design and reviewed medical records from health facilities. Structured questionnaire was used to obtain information. Rabies Guide lines used to define human exposure to rabies. All human exposure to rabies were included in the study. Obtained Data was entered and analyzed using Microsoft excel, Descriptive statistics was calculated and result was presented by table, figure and narration.

Result: A total of 75 human exposures to rabies and 04 human deaths. Crude attack rate (AR) was 54/100,000 population. Age groups 5-14 were Highest affected 48/100,000 populations. Male sexes were 71/100,000 population. Highest AR 26/10,000 population was in 02 kebelle. Bites due to unprovoked circumstances were 74%. Of total, 71 (94.6%) received post exposure prophylaxis (PPE). exposures due to stray dog were 73%. Of all 64% (29/75) of them visited health facility after 48 hours. Leg was highest 43% site of bites. Of total 63/75 (84%) suffered from class III exposure. Only (41%) of the respondents were washed the animal bite wound with soap and water. Of responsible dogs for exposure, Only 11(19%) was vaccinated against rabies.

Conclusion: There was human exposure to rabies in district. Male was highest affected. Highest AR was among 5-14 age groups. Kebelle 02 was the highest affected. Vaccination of dogs, PPE management and increasing the awareness of the community about the disease exposure are suggested to reduce burden.

Key word: Human, exposure, Rabies, Dehana.

INTRODUCTION

Dog bites in human are a serious public health problem throughout the worldwide (1). Bites by animals to people, constitute a serious global and national public health problem. They affect transversally children and adults of all ages and socio-economic level. Bites cause a large number of wounds that require medical and surgical attention plus preventive anti-rabies therapy. The consequences of bites for human health depend on factors related to the characteristics of the biting animal (species, size and state of health) and the person bitten (age, size, health status and access to care) (2).

The most feared complication of dog bite is Rabies, though not all dog bite results in rabies however, in Africa and most developing countries where there are preponderances of unvaccinated dogs, every dog bite should be assessed for risk of rabies infection. This is because pet dogs may have contact with stray dogs carrying rabies virus in the recent past. Rabies is universal disease, estimated to be responsible for at least 55,000 human deaths annually, mainly countries of Africa and Asia (3).

Globally at least 55,000 humans die from rabies each year, about 56% of which occur in Asia and 44% in Africa, particularly in rural areas on both continents. Rabies is a significant but neglected disease predominantly transmitted through dog bites and responsible for an estimated 55,000 to more than 70,000 human deaths annually worldwide, but occurring mostly in Asia and Africa (4).

According to the World Health Organization (WHO), every year more than 7 million people in the world are bitten by dogs (5). A survey conducted during 2001–2003 in the USA estimated 4.5 million dog bites each year (an incidence rate of 16.6/1000 in adults and 13.1/1000 in children (6). The world population of domestic dogs is approximately 500 million and it is considered that a substantial number of this population of are stray dogs, owned but free roaming or inadequately supervised (7).

Rabies is a fatal viral disease that causes inflammation of the brain in humans and other mammals. Rabies is 100% fatal, though it is a vaccine preventable disease for which elimination is possible mainly through mass dog vaccination programs and health education (9). Human injuries due to dog bites are very common and are a major worldwide public health problem. Several systemic diseases may be transmitted via dog bite (10).

Diagnosis of rabies is achieved by detection of the antigen in brain smear using the direct fluorescent antibody (DFAT) (11). Pre-exposure Vaccination is the most effective method of preventing rabies infection (12). Once exposure occurs, management constitutes immediate wound cleansing and post-exposure prophylaxis (PEP) which involves local infiltration of rabies immunoglobulin around and in the site of bite and parenteral administration of rabies cell culture Vaccines in multiple doses (13). As

a disease that mostly affects poor communities, rabies is a classic example of a neglected tropical disease. A vaccine preventable disease, most deaths from rabies arise due to lack of awareness and poor access to proper health services. It is estimated that around half of the global human population lives in canine rabies-endemic countries and is at risk of exposure (14).

In Ethiopia Rabies is an endemic disease. Among people who self-presented to Ethiopian Public Health Institute (EPHI) Rabies Diagnosis Center from 2009 to 2011, about 88.2% were exposed to the virus by dog bite. According to the national rabies survey conducted in 2012, about 1440 suspected human rabies deaths and 10,800 Exposure cases were estimated to occur annually in Ethiopia. The Ethiopian Public Health Institute is the only organization responsible for production of human rabies vaccine in the country. In 2012, the Institute has produced and distributed about 31,357 doses of Nerve Tissue Vaccine (NTV) for human use that is prepared from sheep brain (9).

Approximately 10, 000 people were estimated to die of rabies annually in Ethiopia which makes it to be one of the worst affected countries in the world (15). In Ethiopia individuals who are exposed to rabies virus often see traditional healers for the diagnosis and treatment of the disease. Rabies victims especially from rural areas seek PEP treatment after exhausting the traditional medicinal intervention and usually after a loss of life from family members. Dogs are the principal source of infection for humans and livestock. In Ethiopia many households own dogs usually for guarding property. Although there are no formal studies, it is estimated that there is one owned dog per five household nationally (16). In Ethiopia, approximately 76 persons per million of the population receive anti-rabies post-exposure treatments annually due to the widespread nature of dog rabies in the country (17).

In North Gondar of Amhara region significant number 261 human rabies exposure cases were reported to Gondar Health Center from 2011 to 2013.of cases of human rabies exposure was reported to the Gondar Health Centre despite the fact that the majority of victims would have preferred traditional healers for post-exposure management of rabies. Dog bite was the only source of exposure reported. A significant number of people exposed to rabies came to the health center to seek medical attention late (18).

Significance of the study

In july 16/2017 there was a call from Amhara Regional Health Bureau (ARHB) to Ethiopian public health institute (EPHI) which informed about the occurrence of human exposure to suspected rabid Dog and needs of experts to investigate the event in of Dehana, Wahagimra zone. Therefore the investigator plan to assess the existence of human exposure to rabies and describe the magnitude in the woreda.

Literature

Every day a number of people fall victim to dog bites. About 30,000 people die of rabies annually which accounts for 80% of 36,000 deaths reported to the WHO. In India 96% of the rabies is due to bite from dogs which are mostly stray and ownerless. About 1 million people receive post exposure ant rabies vaccine and children constitute 35-40% of these (19).

Dog bites also result in a large monetary expense for treatment, emergency hospitalization and post-exposure treatment for rabies, For instance, the annual medical cost and other expenses associated with dog bites in the USA were estimated to be between $235.6 and $ 253.7 million in 1994 (20). while the French Postal Services reported 58,000 days of sick leave resulting from 3,357 bites to postal workers costing about US $ 2.5 million in 1985 (21). Globally $15 million people receive rabies prophylaxis annually, mainly for dog bite injuries (22).

Reports estimate that more than 10 million victims receive treatment annually due to animal bites, most animal bites reported from Asia and Africa are dog bites (23). In the United States, on an average, dog bites are responsible for the death of 15-20 persons, mostly children. The bite force of large dog breeds can be more than 450 psi, and therefore the injuries caused by these dogs are more severe (24).

In Europe and the United States, in addition to dog bites, victims are also bitten by bats and wild animals. Humans, in comparison with other animals, are more prone to bites induced by domestic animals such as dogs and cats and also by carnivorous animals such as foxes, wolves, raccoons, ferrets, and jackals (25).

In the United States More than 90% of rabies cases are from wild animals. Most reported cases of rabies occur among carnivores, including raccoons, skunks, and foxes, in addition to many bat species. Despite the elimination of canine rabies virus variants in the United States, domestic animals, including cats and dogs, are infected each year from exposures to rabid wildlife. In addition, ≈2–4 human rabies cases are reported each year in the United States (26). Exposure to rabid animals or animals suspected of being rabid is common, with 35,000–38,000 persons receiving rabies post exposure prophylaxis (PEP) each year (26, 27)

Study done in Kenya on Suspected Rabies in Humans and Animals in 2016, a total of 106 bites were recorded by 6 government-run health facilities in Laikipia North during January 1, 2013–February 10, 2014. Median reported bite incidence per month was 24 bites/100,000 persons (range 6–45 bites/100,000 persons). The median age of bite victims was 13 years (range 1–81 years); 61 (58%)

bites occurred in males. Of all bites recorded, 94 (88%) were by dogs, 8 (8%) by scorpions, and 4 (4%) by humans (28).

Retrospective study conducted on Incidence of human rabies exposure and associated factors at Gondar health center showed total 261 cases of human rabies exposure were reported to Gondar health center from 2011 to 2013.the sex and age specific distribution showed majority of these cases were among males (142/226,628%) and children under 15 years of age (87/226,38.5%). A predominant number of cases were observed in individual from rural areas (161/220, 73.2%), and during fall and winter seasons (67/222, 30.18%). A significant number (23.2%) of people exposed to rabies came to the health center for PEP two or more or more weeks after the injury. The incidence of human rabies living in an urban setting was found to be risk factors for human rabies exposure in 2011 (18).

Study done in United Republic of Tanzania showed Findings Predicted human rabies mortality was estimated to be 1499 deaths per year (95% confidence interval 891–2238), equivalent to an annual incidence of 4.9 (2.9–7.2) deaths/100000, when active surveillance data on bite incidence were used, and 193 deaths per year, corresponding to an annual incidence of 0.62 (0.1–1.32) deaths/100000, when national bite statistics were used. The annual mean number of rabies deaths officially recorded for the same period was 10.8 (7.7–14.0). Cases of rabies in humans have been greatly under reported. Dog bite injuries are an accessible source of epidemiological data that may be used to estimate the public health burden of rabies and to monitor epidemiological trends in developing countries (29).

Strategies for control and prevention of rabies

As rabies is a public health issue, it is the mandate of the Ministry of Health to lead this effort. However, successful implementation of a national rabies control programme requires a multi-stakeholder approach with involvement of the local government, department of livestock/agriculture, NGOs and civil society. National strategies should be planned with clear definitions of the roles and responsibilities of each of the different sectors involved. Many rabies-endemic countries have set targets for rabies control and subsequent elimination. The strategies and approaches used in each country vary due to many factors including policy, incidence of disease, geography, religion, attitude of people in the country, etc. It will be necessary to harmonize planning and implementation of rabies elimination activities. Strategies include Sustained and continuous political commitmen, Assigning of roles and responsibilities to each sector, Joint Monitoring Committee/Intersectoral Coordination Committee, Term of reference, Creating awareness in general community, Training of professional, Implementation of cost-effective IDRV, Ensuring availability of safe and effective anti-rabies vaccines and RIG, Strengthening surveillance (36).

Surveillance

Surveillance of both human and animal rabies is essential to detect high-risk areas and outbreaks quickly and to monitor the use of vaccine. The main purpose of surveillance of "rabies" in human health is to early detect any human exposures to suspected rabid animals so that interventions (including vaccination) will be started early.

Ideal rabies control programs will have surveillance systems that are able to detect and monitor four events: animal bites, animal rabies, post-exposure prophylaxis (vaccination), and human rabies. Under an ideal system in which all bites are detected and reported, all offending and suspicious animals assessed, and all PEP appropriately prescribed, all human rabies deaths can effectively be eliminated.

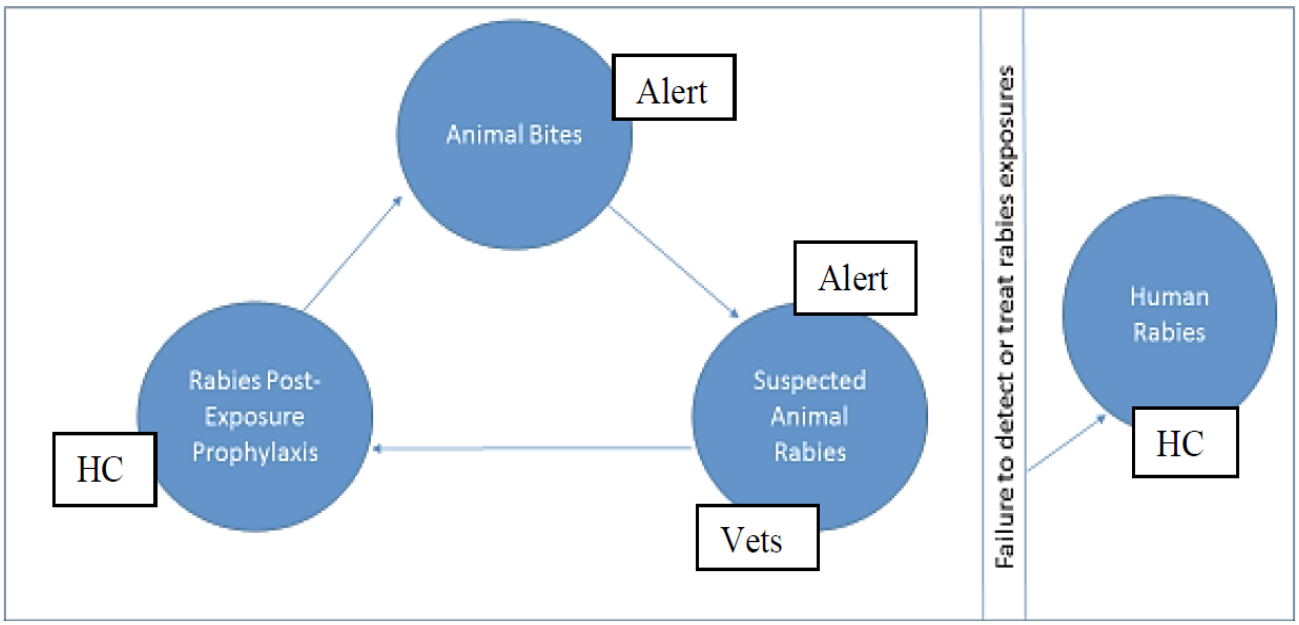

Figure 5: Showing the four critical events in rabies surveillance system

Source: Human rabies surveillance guideline EPHI 2017.

Objectives of investigation

General objectives

- To assess the existence of human exposure to rabies and their awareness towards human exposure to rabies cases in the Dehana woreda, Ethiopia 2017.

Specific objectives

- To identify the existence of the human rabies exposure
- To describe human rabies exposure in terms of time, place and person
- To describe the scenario of death cases
- To describe characteristics of responsible animal for exposure
- To assess the awareness towards human rabies exposure

Methodology

Study area

Dehana woreda is one of the 6 districts in Wahagimra zone of Amhara Region which is situated to the northern part of the Region. It has 76788 km2 area and 785km distances from capital city of the region Addis Ababa. It shares common boundaries with Tekeze River to West, Debub Gondar to the south and Zikuala to the north. Dehana woreda has 3.8 % urban inhabitants and there are 28 Kebeles with total population of 109725, projected from 2007 population census. Ninety six 96% of the population lives in rural areas, and most of the people in the district are subsistence farmers. In the district there are one district hospital 6 health centers and 38 health post.

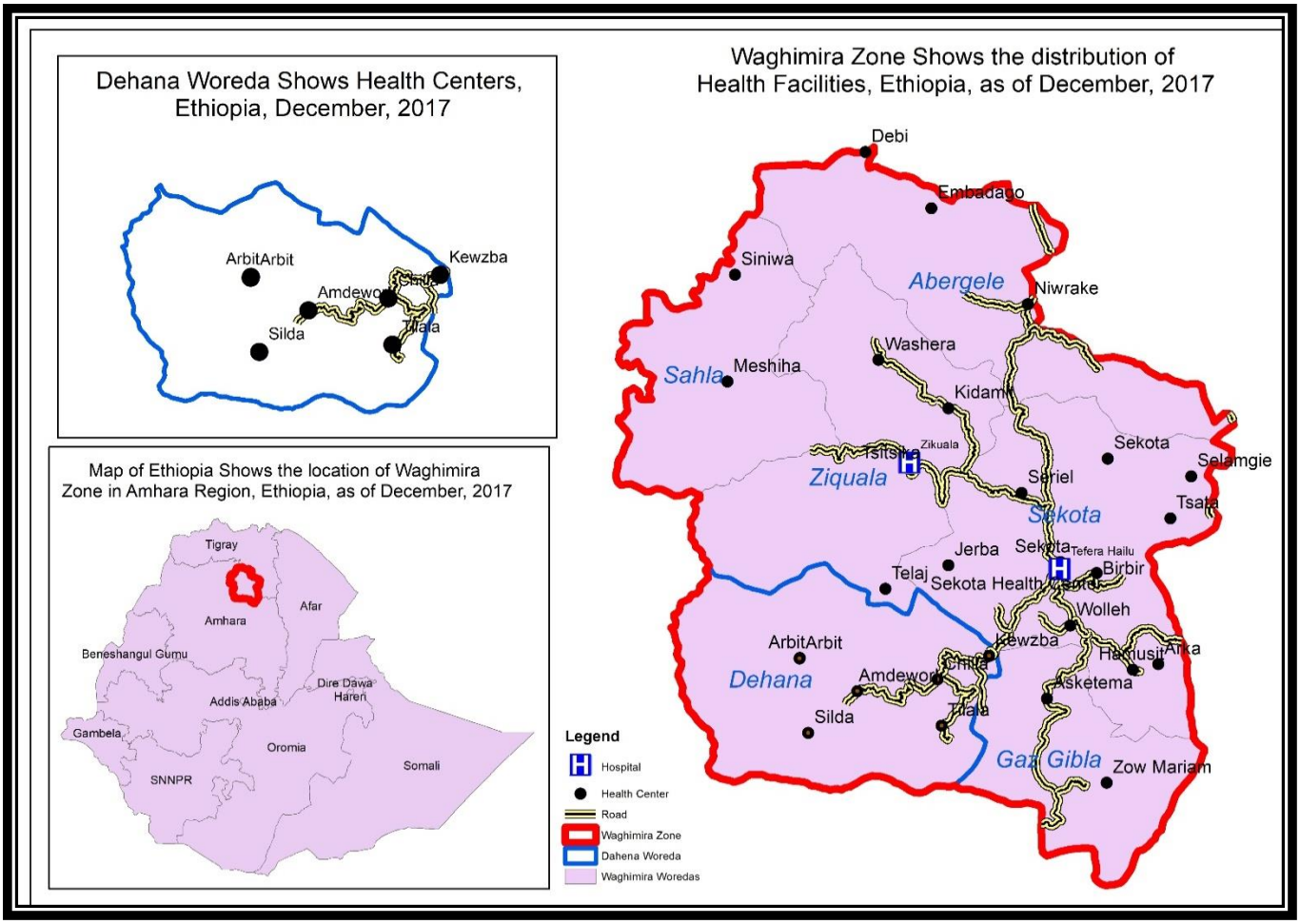

Figure 6: Map of Dehana woreda

Study period

The data collection was undertaken from july18 to August 18 2017.

Study design

Descriptive cross sectional study design was used.

Target Population: All population in Wohagimra zone Dehana woreda where cases recruited were our source of study population.

Study Population: Any person residing in in Dehana woreda Wohagimra zone and who had human exposure to rabies during the period.

Study unit: All human exposure to suspected rabid Dog were included in the study

Sample size and sampling procedure

All human exposure to Dog bites were included during the study period. Line list of human exposure to rabies cases were collected from Health facility. Cases detection was actively done in the community. Cases were selected from the community.

Data collection tool and procedure

Face to face Interview with human exposure to rabies cases and Review of dog bite record and report format from Health Facilities were undertaken. The interview was conducted using structured questionnaire that was developed in English. Discussion with Health facility, veterinary expert and Health extension worker) was conducted to explore the existing challenges with Dog bite in their respective setting. We used Rabies Guide lines for case definition to define human exposure to rabies cases. Active Cases search was done in the community to identify other human exposure to rabies cases with the veterinary health professional. Interviews were conducted among kebelle leaders through field visit to the villages, to understand the movement of stray dogs; the stray dog's movement along the main road was verified through direct observation by repeated travel on alternative days. Information were collected from family about four human deaths secondary to human exposure to rabies to assess contact history, clinical sign and symptoms, and illness related to death of the victims.

Data analysis

We cleaned, entered, edited and analyzed the data using Microsoft excel. Descriptive statistics like mean, median, frequency and percentage was used to analyze human exposure to rabies cases data. The result was presented by graph, table, and figure. The outbreak was described in terms of time, place and person. Age and Specific Attack Rates were calculated by taking population of the district from Health Office and conversion factor for sex and each age group was from the 2007 population and housing census.

Case definition

Standard human Rabies clinical Case Definition

A person who had close contact (usually a bite or scratch) with a rabies-susceptible animal or human and developed headache, fever, malaise, apprehension, hydrophobia, aerophobia and paralysis progressing towards coma, and death, usually by respiratory failure, within 7-10 days after the first symptom if no intensive care is instituted.

Case classification (human)

Suspected: A case that is compatible with the clinical case definition

Probable: A suspected case plus history of contact with a suspected rabid animal.

Confirmed: A suspected case that is laboratory-confirmed Human exposure to rabies

Human exposure to rabies

Possible exposure: A person who had close contact (usually a bite or scratch) with a rabies susceptible animal in (or originating from) a rabies-infected area.

Probable exposure: A person who had close contact (usually a bite or scratch) with an animal displaying clinical signs consistent with rabies at time of the exposure, or within 10 days following exposure in a rabies-infected area.

Exposed: A person who has had close contact (usually a bite or scratch) with a laboratory confirmed rabid animal

Community case definition: A person bitten by any dog or suspected mad dog or other animal.

Result

Distribution of human rabies exposure by Age and sex

A total of 75 human exposures to rabies case were occurred in Dehana Woreda. Of total human exposure there was 04 human deaths after exposure. The overall AR for this district was 54/100,000 population. The median age of bite victims was 16 years (range 1–77 years). The highes 64% exposures were among male sex with male female ratio was 1:7. Highest AR was among 5-14 age groups with 48 per 100,000 populations, followed by 15-45 41/100,000 pop, while lowest bites were among above 45 years. Cumulatively age group of 0-20 years accounted 10 (62.5%) exposures (Table 1).

Table 6: Human exposure to Dog bite by age and sex, Dehana woreda, June to August 2017

variables		population	No of cases	Percentage %	AR/100,000 population
Age group	5-14	57387	28	37.3%	48
	15-45	84168	35	46.6%	41
	above45	22955	7	9.3%	30
Sex	Male	66893	48	64%	71
	Female	69704	27	36%	40
	Total	136671	75	100%	54

Distribution of human exposure to Dog bite by kebelle

With regards to the distribution of human exposure to Dog bite; the highest attack rate were in Amdework zuria with 26/10,000 population kebelle followed by Amdework kebelle 18/10,000 population, while the lowest Dog bite cases were occurred in Dura and Birbira, kebelle which is 2/10,000 population. There was no human exposure Dog bite in 15 kebelle. Of total human exposure to Dog bite 51/75 (68%) of them were from rural part of the District.

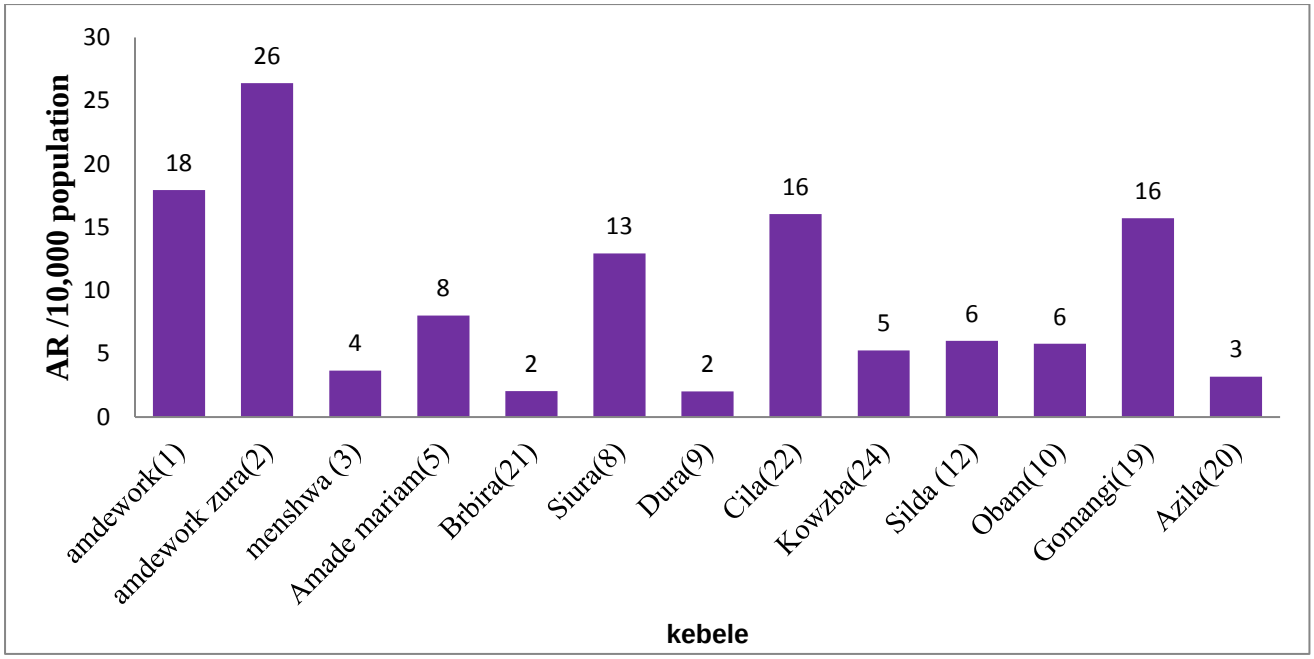

Figure 7: Human exposure to suspected rabid dog by kebelle, Dehana Woreda, June to August 2017

Distribution of human exposure to Dog bites by time

Interventions and response was started 7/24/2017 across the kebelles where the cases were occurred. The outbreak started on July, 16, 2017, peaked on July, 22/2017. There was no reported Dog bite after August, 18 2017. Epidemic curve was a multi-peak with sharp rise and gradual fall that indicated a propagative type of outbreak. (See Figure 2).

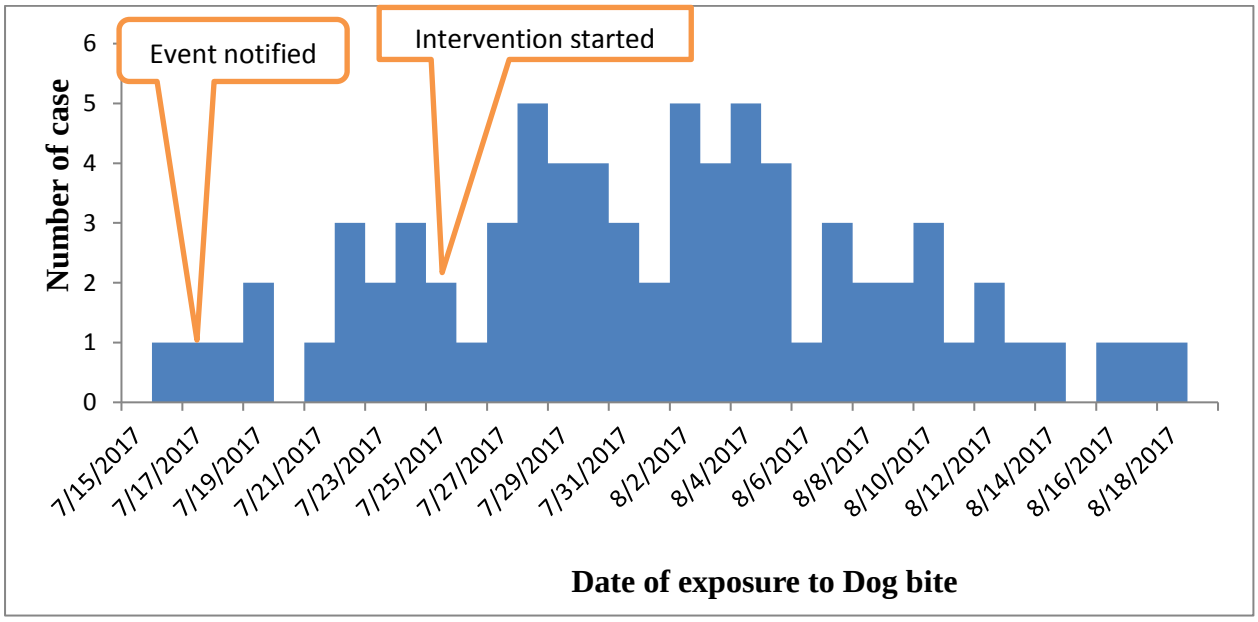

Figure 8: Epicurve of human exposure to dog bite by date of bite in Dehana woreda from July to August 2017.

Site of exposure and exposure classification

From a total of 75 human exposure to suspected rabid dog, 43% site of exposure were on leg followed by 29% on their hand and site of exposure were on their Head/Neck/Face and Arms which is 1% and 3% respectively. Of all dog bites, 63/75 (84%) suffered from class III exposure, while 24 (12%) suffered from class II.

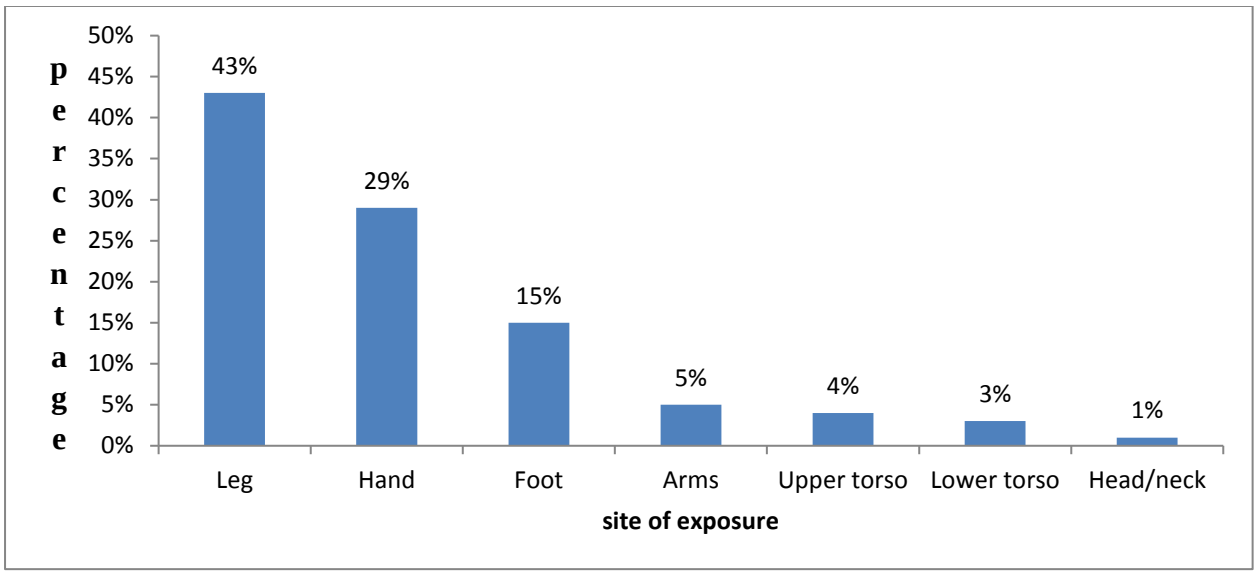

Figure 9: Site exposure of human exposure to suspected rabid dog in Dehana woreda during July 2017.

Characteristics of responsible animal

Of total responsible animal for human exposure dog bite, 55/75 (73%) of dog bites reported were from stray dogs. 27% of Dog not known whether they have owner or not but of owned Dog 54% of them indicated that their dogs were allowed to roam outside the home premises day and night. Of dog owners 78% that their dogs were not vaccinated. From a total of human rabies exposure 84% of them were under category three III (single or multiple transdermal bites or scratches, contamination of mucous membrane with saliva from licks; exposure to bat bites or scratches). All of human rabies exposure was due to Dog bite. Similarly 59 % of responsible Dog was male in sex and 41% of them were female in sex. Of total dogs responsible for rabies exposure, the majority (57%) died at the time of the victim's visit to the health center and traditional healer and the survival statuses of the rest were unknown. This implies that dogs were the potential sources of the rabies infection.

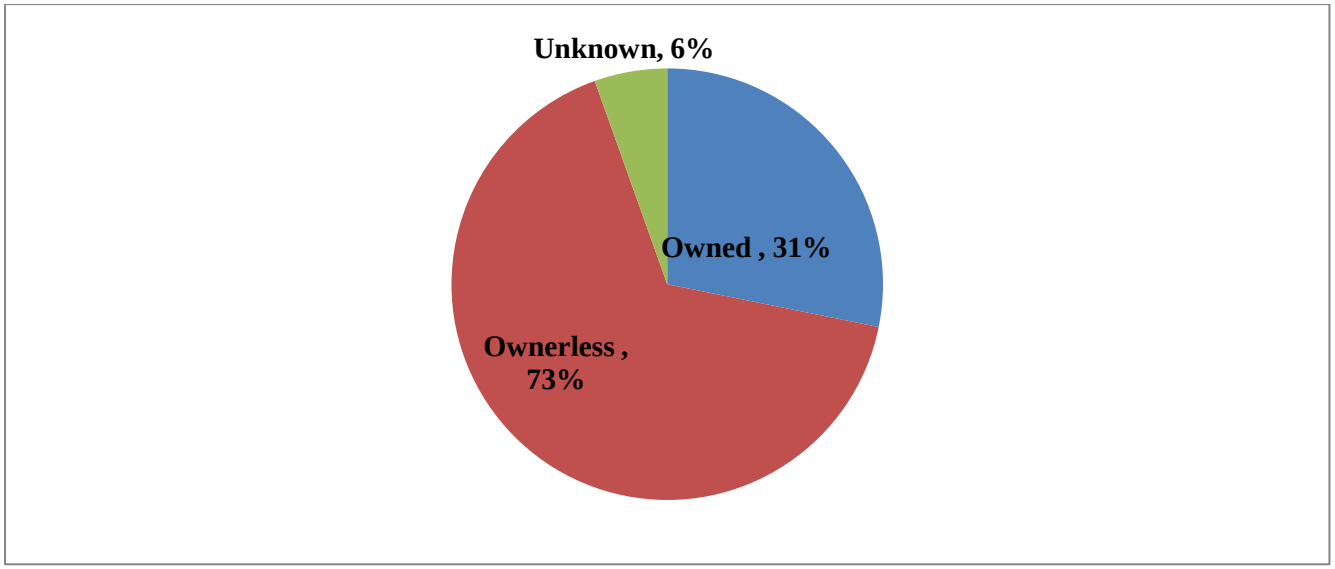

Figure 10: Ownership status of responsible Dog for human rabies exposure in Dehana woreda 2017.

Vaccination history of Responsible animal

Of owned dogs responsible for exposure Only 11(19%) were vaccinated their dogs against rabies. Respondents replied that lack of awareness (54%) about dog vaccination, not knowing where to vaccinate(30%), lack of nearby veterinary clinic(58%) and believing that vaccine is not affordable (25%) were the reasons for not vaccinating their dogs.

Health seeking behavior of exposed person

From a total of human rabies exposure, 63% (47/75) of the cases visited health facility after 48 hours. Of cases visited health facility late after 48 hour, 44% of them gave priority for traditional medicine. Fourty three percent of them delayed because PEP vaccine was not available at nearest facility. The remaining 14% (04 people) do not took PEP died after typical manifestation.

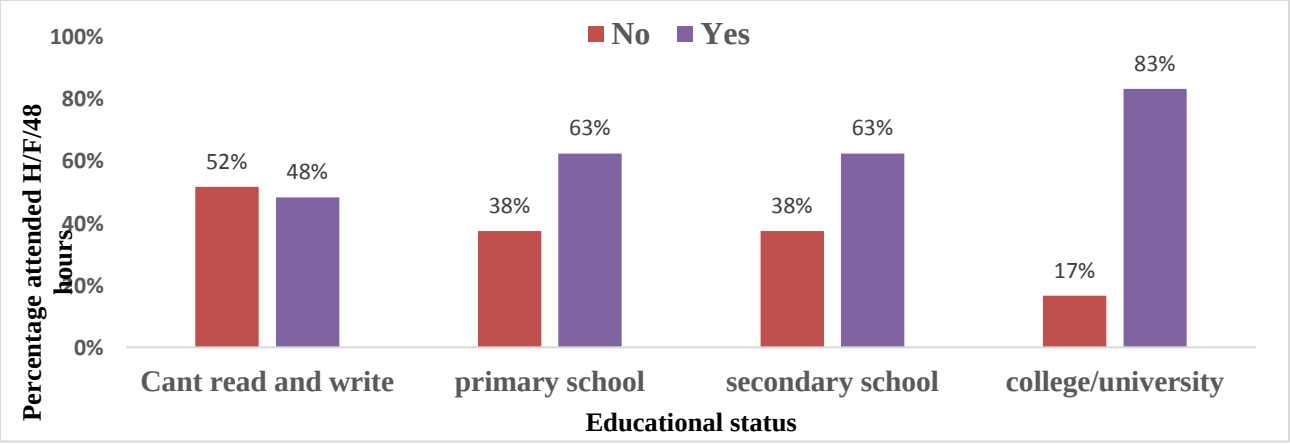

Figure 11: human exposure to dog bite health seeking behavior by educational status of dehana district, 2017.

Case report of deaths secondary to exposure to suspected Rabid dog in Dehana Woreda from 01/July to 30/August 2017.

Case 1: Birtikuwan Emiwedew is a 10 year old girl from Dahna woreda Kebelle 019, "Sere work Got "rural community. She was bitten by suspected rabid dog on her arm on 09/10/2009 E.C. After getting this information the Health Extension Worker of that particular kebelle went to victim house and told ~~to~~ the family to go to hospital and seek medical attention but the family. But after two weeks the victim started to develop symptoms like twitching sensation around the area of the bite, fever, headache, muscle aches and nausea. After noticing this her family took her to nearby clinic and the local clinic referred her to district hospital and then her father her back to the hospital. She was diagnosed (presumptive) with rabies at the hospital and the family was advised to take her back to home. Eventually the patient passed away 5 weeks after the bite Dog was found dead after three days of biting the girl and it is not known whether the Dog has bitten another person or not.

Case 2*:* Case 2: Ayalew wodaje is a 45 years old man from waghimra zone dahna woreda kebelle 22, Kitman Abo Got, who reportedly was bitten by a suspected rabid dog on 11/10/2009 EC. After being bitten by the dog on his left leg, he visited the nearby clinic on the same day. But he was treated only for the wound. After that he went to traditional healer's house and taken unspecified herbal medication for consecutive three days. After five days he started to develop fever, headache, difficulty of swallowing, increased production of saliva followed by agitation abnormal body movement and lastly confusion. After developing this signs and symptoms the family took him to local health center and then to hospital. But, unfortunately the patient passed away on the way to the hospital. The suspected rabid dog also has bitten a donkey and two cows which eventually died.

Case 3: A 19 year old man called Desalegn belay in Kebelle 08 was bitten on 05/11/2009 on his upper torso, by a suspected rabied Dog showing clinical signs typical of rabies and His family reported that as he went for traditional healer and took traditional medicine (herbal medication) and When his family recognized unusual signs and symptoms initially begins as a pain in the throat or difficulty swallowing, hyper salivation, aggressive behavior, such as fear of bright light (photophobia) and he went to district hospital and Health professionals at the district hospital made a presumptive diagnosis of rabies but didn't provide palliative care Then died at home 3 weeks post bite after two days of hospital visits and the dog attempted to bite another people and killed by public 3 days post bite.

Case 4: 18 years old man Awoke Abebaw~~,~~ From Kebelle 02, with behavioral changes and hydrophobia visited a district hospital in the Amdework, His father reported that a dog had bitten him 29/10/2009 on his leg before symptoms developed. The boy visited a local healer, who administered 1 shot of an

unspecified medication. Except for residual pain in the hand, the child boy remained healthy until 1 month. When his father recognized signs of confusion; notably, he was talking, acting and placed common materials in unusual place. During July 11–13/2009, fevers, hyper salivation, agitation, and incoherent speech developed. On January 14, the child accused his mother when she offered him water (presumed hydrophobia). On that day, the father, mother and child traveled to a health center and health professionals immediately referred to the district hospital of the woreda. Healthcare workers at the district hospital made a presumptive diagnosis of rabies but were unable to offer palliative care advised to refer to referral hospital. The father reported that palliative care was denied, and they left the hospital without providing contact information and return to their home. The child died later that night. Dog later died naturally. Neighbors reported that the dog had attempted to bite several persons, but it was killed without further human exposures. The dog had bitten 1 one donkey, and the donkey died 2 weeks post bite after showing the symptom.

Knowledge towards human rabies exposure (victim)

Majority 70% of the respondents were familiar with the disease and gave it slightly different local names Yebed wusha, which mean madness. From those who aware of Rabies disease, 43% knew symptoms, 66% knew mode of transmission and 77% knew methods of prevention of rabies disease respectively. Ninety percent of the respondents who knew the disease mentioned Dog bite as a means of transmission and also 64% them stated any type of contact (irrespective of the skin condition) with saliva of affected individual can transmit the disease. Only 17% have got the information through friends/neighbors and through awareness education conducted by the veterinary and public health officials. Only (41%) respondents were aware and also reported that they would wash the animal bite wound with soap and water and of total human exposure to rabies cases, only 37% of them were would seek medical care after exposur. From a total of victims interviewed 74% (56/75) of them had dog, 46% of them were obtained the Dog through domestication, 28% of them through gift and 26% of dog were obtained from street (Table 2).

Table 7: Knowledge status of victims about rabies, Dehana district, Wahagimra zone May 2017.

Variables	**Victims Response**	**No (%)**
Heard of rabies before exposure	1.Yes 2.No	53/75(70) 22(30)
What is your source of information	Awareness creation of HEW Friends Family other	13/75(17) 45/75(57) 20/75(26) 15/75(20)
Do you know sign and symptom of rabies	1.Yes 2.No	23/75(43) 30/75(56)

Do you know means of disease transmission	1.Yes 2.No	48/53(66) 5/53(34)
What are means transmission	Dog bite Saliva contact to skin Inhalation	43/48(90) 31/48(64) 7/48
Do you know prevention methods of rabies	1.Yes 2.No	41/53(77) 12/53(33)
If yes what are best methods controlling rabies	1.Mass vaccination 2.Destroying dog 3. Devt. Proclamation on No.of dog. 4.there should be alternative creator is not against dog	5(13) 40(53) 13(4) 9(29)
Do you have dog	1.Yes 2.No	53/75(71) 23/75(29)
If yes where do you obtained your dog	1.Domesticated 2.gift 3.i got from street 4.other	43(45) 27(28) 14(15) 11(12)
If yes what is the husbandry system of your dog	1.Confined in cage 2.Released freely and comes at night 3.Released freely at night in the compound 4.Other	16(17) 52(55) 26( ) 1( )
Do you vaccinate your Dog for the past 1 year	1.Yes 2.No	10/53(19) 43/53(81)
If no why	1.Vaccine is expensive 2.Lack of attention 3.Dog is healthy 4.i do not know where to vaccine 5.Lack of near vet clinic	13(25) 29(54) 17(32) 16(30) 31(58)
What do you usually do if your dog becomes ill for rabies?	1.I will kill 2. I will consult Vet clinic 3.I will consult HEW 4. I will treat my self 5. let him die	52/75( ) 11/75( ) 7/75( ) 25/75( )
Do you wash the animal bite wound with soap and water after exposure	Yes No	31/75(41) 44/75(59)

Public health intervention done

- ✓ Evethough, there was No coordination between the Health office at District and animal health (veternary office). Each office was running by their own. Hence, We revised the existing emergency response plan and discussion with Rapid response team (RRT) was undertaken to strengthen the sector collaboration, finally Woreda Administration, health office and veternary clincs of the woreda was playing an important role in controling the event..
- ✓ We tried to assess the places from which most bitted cases were reported & accordingly, the team observed that most of cases were from amdework zuria kebeles (Slaughtering place) area of town.
- ✓ Active case searching of victims and Referring Dog bite cases to Amdework Hospitals for PEP & Strengthening of surveillance were among interventional activities conducted..
- ✓ All 163 naturally dead and intentionally killed dogs were properly collected and dumped to the hole prepared for this purpose by task force established.
- ✓ Nineteen temporary vaccination points were created to conduct mass vaccination program. The dog owners were informed to bring their dogs to the vaccination points. Stray dogs were also captured and vaccinated. A total of 701 dogs were vaccinated against rabies by Rapid Response Team. Of the 211 stray dogs, 69 (33%) were captured by the team for vaccination.
- ✓ Health education through Community mobilization and discussion with health professional was undertaken about wound management and PEP managem

Picture showed on disinfecting the saliva and secretions of and were dead dogs dumped

Discussion

This assessment has tried to examine the human exposure to rabies cases and significant number of human rabies exposure cases 75 was recorded in Dehana woreda. These studies revealed all of human exposure to rabies cases was by dog bite. This finding is similar with another health facility based retrospective study conducted in Gonder Ethiopia (18).

The sex specific distribution showed that the majority (62.8%) of the rabies cases were among males. This finding was supported by study conducted in Jima Ethiopia (14). This might be explained by the activities males are frequently involved in outdoor activity: they might do more nightly and outdoor activities while females are more likely to remain indoors due to cultural and religious reasons.

Highest attack rate 48/100,000of human rabies exposure cases were reported among children under 15 years of age. This finding is in line with studies done in Tanzania (30). However, the result was discordant with study conducted at north western Tigray Ethiopia (31). This could be due to the fact that children are more likely to provoke dogs and are also less likely to be able to protect themselves, thereby being more exposed to dog bite injuries.

Majority (69%) of the dogs involved in a bite could not be traced to a particular owner by the bite victims. About 31% Dog has identified owners and this is different from study conducted in Nigeria 92% of has owners (32). these differences could be due to the regulation domestic animal differences between the two countries.

The AR of human exposure rabies cases were 54 per 100,000 populations for the 2017 study years. This finding is by far lower than reports from studies in Kenyan active surveillance report (234/100,000) (34). These differences might be explained by multiple socio-cultural factors and methodological differences.

In this study 44% of victims gave priority first for traditional medicine and spiritual practices. Similarly, studies conducted in Gondar zuria, Ethiopia, reported 35 % participants of the study participants prefer in traditional medicine (34). The preference for traditional practices might be arise from many factors including easy access to traditional medicine, lack of awareness, long duration of treatment and potential side effects of the Fermi type vaccine widely available and used as anti-rabies post exposure treatment in Ethiopia. This contributed to late initiation of anti-rabies vaccine. Modern health care systems were least cited as the location where bitten people would be taken first. Reliance on traditional medicines with unproven efficacy is very risky in that nothing can be done to save one's life after the first symptoms of the disease occur.

Dog vaccination practice was generally very low and totally nonexistent in rural district of Dehana where there was lack of awareness, access and cost of vaccine was raised as problem. Most victims remained healthy up to 1 month after exposure. This could probably be due to all exposed peoples started PEP and could be due to minor degree of exposure. It is also possible that the suspected exposing animal might not shed the virus at the time of exposure (due to intermittent shedding).

Legs were the main bitten organ in 45% of our cases. Study conducted Animal Bites in Sweden showed that the most common site of injury was on the legs as much as 56.6% (35).

Study limitation and strength

A laboratory confirmation of the virus from dog was not carried out due to not availability of plane terminal to that area and the distance from study area to EPHI by Car will take two days. Diagnosis of human rabies is not performed in Ethiopia due to limitations in diagnostic capacity and cultural aversion to collection of postmortem samples; it is difficult to be sure of peoples died of rabies.

Conclusion

A considerable number of cases of human exposure to rabies occurred in Dehana woreda. Children are the most frequent victim of dog bite. Males were more exposed than females. The highest human exposure to rabies cases were occurred in Amdework zuria kebelle, while the lowest exposure cases were occurred in kebelle 21. Dog bite was the only responsible animal of exposure reported. Small proportion responsible dogs were vaccinated. Most of human rabies exposures were due to stray dog. Majority of victim were visited health facility late and not aware of animal bite complication and wound management. Dog vaccination practice was generally very low and totally nonexistent in rural district of Dehana. There was lack of knowledge of rabies attributed to low awareness.

Recommendation

- ✓ Infants and young children should never be left unsupervised around any dog no matter how friendly the dog may appear.
- ✓ Efforts should be made to educate the community about the hazards of dog bite and its consequences and management of such a wound at home.
- ✓ Raising awareness about dog vaccination and improving access and affordability of the vaccine should be considered in control of the disease as dogs are the main reservoir of the disease.
- ✓ High number of injuries involving dogs who were freely roaming suggests that such legislation which includes an increased effort to remove stray dogs Discussion should be implemented.

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CHAPTER - II SURVEILLANCE DATA ANALYSIS

2.1 Epidemiology of Measles in Oromia Region, Ethiopia: Surveillance Data Analysis from 2007-2016

Abstract

Background: Measles is the leading vaccine preventable childhood disease designated for elimination by WHO. More than 20 million people are affected by measles each year, particularly in Africa and Asia. Outbreaks of measles are reported in the Oromia region of Ethiopia each year. We analyzed to assess the epidemiology of measles in the Oromia region of ten years (2007-2016) GC.

Method: : We collected and reviewed Oromia Measles Secondary data of ten years (2007-2016) from case based and line lists of EPHI PHEM department. We analyzed using Microsoft Excel and Epi-Info version 7.2, we performed descriptive statistics and the result is presented by figure tables and narration. Odds ratio used to assess associated variables with measles death.

Result: A total 26,908 suspected cases and 288 deaths (CFR=1.07%) measles were reported from 2007–2016. Median age was 6.0 years. Majority 14253 (53%) were male. Majority of cases were from Guji zone 27/10,000 population. The highest incidence 27 per 100,000 populations with 1- 4 years. The highest cases were reported in 2014 which is 13/1000 population. Highest 45% of cases were reported during first quarter (January – March). Of cases 64% reported by case based and from total tested samples 36% were positive for Measles Igm. Only 24% of measles cases were known as vaccinated. High proportion of deaths was reported among age group < 5year and during 2012 -2016 year (77.2%) as compared to the 2007 -2011 year period.

Conclusion and recommendation: Measles is public health concern in Oromia region. Large proportion of measles cases were among unvaccinated and living in rural areas. Under the age of 5 was the most affected population. Measles surveillance and increasing coverage of supplementary immunization activities is recommended. Early detection of cases and specificity of reporting suspected measles cases should be improved.

Key word: Data, Measles, Surveillance, Oromia.

Background

Measles is one of the most infectious viral diseases caused by measles virus. The virus is a member of the genus Morbillivirus of the Paramyxoviridae family. There is no finding that the viral antigens have significantly changed over time. Hence, it appears to be antigenic ally stable. Humans are the only natural hosts of measles virus. Person to person transmission is primarily by airborne spray or respiratory droplets to mucous membranes in the upper respiratory tract or the conjunctiva (1).

This virus is often characterized by fever, which increases, often peaking as high as 103°F –105°F, Followed by cough, coryza and conjunctivitis Within 2 - 4 days of the prodromal symptoms, a rash made up of large, blotchy red spots (Maculo-papular rash) typically lasts 3-7 days. Incubation period ranges from 7 to 21 days from exposure onset of fever, rash usually appear about 14 days after exposure (2, 5). Many children experience uncomplicated measles. However, in about a third of the cases, measles is followed by at least one complication caused by disruption of epithelial surfaces and immunosuppression. (2).

In the year 2000 WHO estimated that 535 000 children died of measles, the majority in developing countries, and this burden accounted for 5% of all under-five mortality (3). In developing countries, measles case-fatality rates for among young children may reach 5–6% .In developed countries, approximately 10–30% of measles cases require hospitalization, (4). Twenty million and above people are affected by measles each year, mainly in parts of Africa and Asia.

In year 2015 approximately 134 200 people died from measles– majorly children under the age of 5. Maximized immunization activities have had a major impact on reducing measles deaths. During 2000-2015, measles vaccination prevented an estimated 20.3 million deaths. Worldwide measles deaths have declined by 79% from an estimated 651 600 in 2000* to 134 200 in 2015. In the same year, 85% of the world's children received one dose of measles vaccine by their 1st year through routine health services – up from 73% in 2000 (5).

Greater than 600,000 deaths yearly due to Measles virus (MV) infection the disease worsen because of severe immunosuppression facilitating secondary infections. Regions of Africa and south east Asia had 70% of incident cases and 84% of measles-related deaths (6). European CDC detected more than 28 000 measles cases in the EU and EEA/EFTA countries through reports and epidemic intelligence in 2011. More than half of all cases has been reported in France in 2011 (7) .

Member states of the World Health Organization (WHO) African (AFR) and Eastern Mediterranean (EMR) regions have set goals for measles elimination by 2020 and 2015, respectively. The two WHO

regions include AFR member states Ethiopia and Kenya, and EMR member state Somalia (8). WHO recommends 2 doses of measles vaccine for all children and giving focus on-time delivery of the first dose at age 9 months in countries with ongoing measles virus transmissions. The World Health Assembly endorsed targets to be met by 2015 as milestones toward eventual global measles eradication (9).

In Ethiopia, Kenya, and Somalia, MCV1 is provided in the routine childhood vaccination schedule at age 9 months, and a second dose of MCV is provided through supplemental immunization activities (10). Providing MCV2 from 2000 to 2013 through routine immunization services increased from 96 (50%) to 148 (76%) among Member states. during supplementary immunization activities conducted in 34 member states in 2013 approximately 205 million children received MCV (11).

From 2000 - 2012, measles vaccine coverage increased to reach more than 8 in 10 children globally, and deaths decreased by another 78 per cent to just in 2012. in the same time period, the number of countries providing a second dose of measles vaccine through routine immunization services increased from 96 (50 per cent) to 145 (75 per cent). Routine immunization is regularly provided with mass immunization campaigns, with approximately 145 million children in 33 countries vaccinated in 2012 (12).

Measles is one of public health important disease and it is one of the weekly reportable diseases in Ethiopia. In 2013, measles incidence was 7.2 cases per 100,000 populations. Totals of 243 measles outbreaks were confirmed In 2013 compared to 146 in 2012. Occurrence of measles has been observed in Ethiopia with a seasonal pattern over the years, with increased number of measles cases during the late-early part of the year (December to February). Insufficient routine measles coverage , increased poor nutritional conditions, increased not vaccinated children in highly populated areas accompanied by seasonal hot weather between December and February have contributed for the frequent measles outbreaks occurring in different parts of the country (13).

In Ethiopia in 2016, 4,395 measles cases had been reported, including 3,597 confirmed cases (469 laboratories confirmed, 2,889 Epi---linked and 239 clinically compatible). All regions are affected by the outbreak; the top three regions are SNNPR (49%), Oromia (29%) and Somali region (8%) (14). Based on studies done in Oromia 3507 suspected cases of measles were reported from 2005–2009 of which 1112 (32%) cases were laboratory confirmed. Almost half (49%) of the reported measles cases occurred in children that were unvaccinated or whose vaccination status was unknown, (15).

1.2. Statement of the problem

Measles has been one of the major causes of death and sickness of children in Ethiopia (2). Measles is one of the public health priority diseases with the potential to occur both as an epidemic and endemic disease in different parts of Ethiopia including Oromia region. It is among the notifiable lists of diseases in the country. Outbreaks of measles are reported in the Oromia region of Ethiopia each year. During 2005-2009 3507 suspected cases of measles were reported (15).

Rationale of the study

Despite the endemicity and frequent occurrence of the disease as outbreak in Oromia, there are insufficient scientific works reflecting its burden and distribution. Therefore, the objectives of this analysis were to assess epidemiology of measles within the region and to describe its distribution in Oromia from 2007-2016. The information generated from the analysis of ten years (2007-2016) surveillance data of measles is important to understand trends of the disease in the region. In addition it helps to identify the available gaps in the surveillance system and provide recommendations based on the findings. Results from data analysis can help public health authority to take appropriate action.

2. Literature Review

Following the introduction of measles – rubella (MR) catch- up vaccination in 2001 and two dose measles – mumps rubella (MMR2) keep up program in 2002, the incidence of measles, mumps and rubella was not evaluated systematically. To describe the recent changes in epidemiology, a population based incidence study from 2001 to 2015 using national notifiable disease surveillance data was conducted. Between 2001 and 2015 there was decreased in the incidence of measles and rubella, where as a steady increase in mumps incidence was noted (17).

In Nijer A total of 92 of the 945 case patients died within 30 days after rash onset, corresponding to an overall CFR of 9.7% (95% CI, 7.9%–11.5%). Most deaths occurred soon after rash onset, with nearly 75% occurring in the first 2 weeks and only 5% occurring during the fourth week. Mortality was inversely associated with the age of the case patients. The highest CFR was among infants (15.7%), and CFR decreased with increasing age. The CFR for children aged 5–14 years was 5.4%. No significant difference by sex was observed for CFR (18).

According to WHO comprehensive review of community-based studies of measles, the result of search consistently document that measles CFRs are highest in unvaccinated children under age 5 years; in outbreaks; the lowest CFRs occur in vaccinated children regardless of setting. The broad range of case and death definitions, study populations and geography highlight the complexities in extrapolating results for global public health planning (4).

The expected case-fatality rate is between 3% and 6% in Ethiopia, majority of case-fatality rate occurs in infants 6 to 11 months of age, increased risk with malnourished infants. These rates may decrease the true lethality of measles because of incomplete reporting of outcomes of measles illness. In certain high-risk populations, case-fatality rates as high as 30% have been reported in infants aged less than 1 year of age (1).

During early 2015, a total of 2,190 suspected measles cases were reported in 61 separate outbreaks in Ethiopia. Of total reported cases, 929 have been positively confirmed. Children under 5 years of age made up 28% of the cases, whereas those over 15 years of age represented 33% of the measles cases. According to World Health Organization (WHO) on 11 February 2015, Ethiopia had the highest number of suspected and confirmed measles cases in Africa in 2014. There were 16,028 suspected measles cases in 2014 and 14,100 confirmed measles cases in the same year. This represents increased number on the data for 2013, when there were 6,137 confirmed measles cases in Ethiopia (19).

Based on studies conducted on Measles Virus Infection among Vaccinated and Unvaccinated Children in Nigeria, Children presenting with symptoms of measles infection in general hospitals and health centers in the states of southern and western Nigeria were recruited for this study. Vaccination history, clinical details, and 5 mL of blood were obtained from the children. From a total children (56.8%) had previously been vaccinated against measles virus, while (39.7%) had not been vaccinated (20).

Ethiopia set strategic plan for measles elimination in line with the recent target set by the Regional Office, planning to achieve measles elimination by 2020 (Resolutions AFR/RC52/R2). To work towards this elimination goals, Ethiopia developed, a strategic approach that includes: 1, conducting a high quality wide-age range campaign to boost immunity for persons aged up to 15; 2, building on improvements in routine immunization to achieve high coverage with first dose of MCV; 3, supplementary immunization in the context of outbreak response as needed and 4) Introduce second dose of MCV in 2017. Expanded program on immunization of Ethiopia was launched in 1980 with the objective of increasing the coverage by 10% annually. However, the coverage in the first 20 years was very low although during the 1990's good progress was observed through Universal Child Immunization (UCI) (21).

According to the National Public Health Emergency Management (PHEM) guide line, every suspected measles case should be detected, reported using the cases based form and undergo laboratory investigation (or the first five cases in the situation of outbreaks), and during an outbreak all cases must be entered on a line listing, investigated and reported to next higher level (22).

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. PHEM 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 (23).

Objectives

3.1. General Objective

- To assess the epidemiology of measles in Oromia region for the last ten (2007-2016) years.

3.2. Specific Objectives

- To assess the distribution of measles cases and death by person, place, time
- To assess socio-demographic characteristics
- To describe vaccination status of measles case

4. **Method and materials**

4.1. Study area and Period

Measles surveillance data was reported from Oromia region at different times during 2007-2016. Oromia is one of ethnically based regional state of Ethiopia. The Region has 18 administrative zones, 304 woredas (out of which 39 are towns structured with the level of woredas and 265 rural woredas), more than 6,342 farmer and 482 urban dwellers. According to the population and housing census report of central statistics (2016), the projected total population of the Region is 35, 127213; the total area of the Region is 363,136 km2, accounting for about 34.3 percent of the total area of the country (24).

Figure 12: Map of Oromia region

4.2. Study Design

Cross-sectional descriptive design was used to collect and analyze ten years measles surveillance data.

4.3. Source of data

Measles surveillance data reported from Oromia region to Ethiopian Public Health Institute (EPHI) department of PHEM at different time during 2007 to 2016 through line list and case based format was used.

4.4. Study Unit

All individuals case of measles in Oromia Region, in a ten year time from (2007-2016).

Sample size

All measles cases that is 26, 908 cases reported during 2007-2016 years period.

Sampling procedure

First permission was obtained from public health emergency management (PHEM) then after a ten year Oromia region Measles data accessed to carry out this analysis. Variables; Name, ID number, reporting district and reporting health facility of the cases were excluded and 26908 measles cases found in all zones and towns Oromia were extracted.

4.6. Data Collection Procedure and Tool

Measles Secondary data for the last ten years (2007-2016) from EPHI PHEM department were reviewed and collected from case based and line lists of EPHI PHEM department. All ten year surveillance reports sent to EPHI PHEM from Oromia region was analyzed to describe the burden and distribution of measles in the region.

4.7. Measles Case Definition

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.

Laboratory confirmed: A suspected case with laboratory confirmation (positive IgM antibody) or epidemiologically linked to confirmed cases in an epidemic. All suspected cases of measles are finally classified based on the adequacy of the blood specimen collected, and sample taken or not in to the following categories;

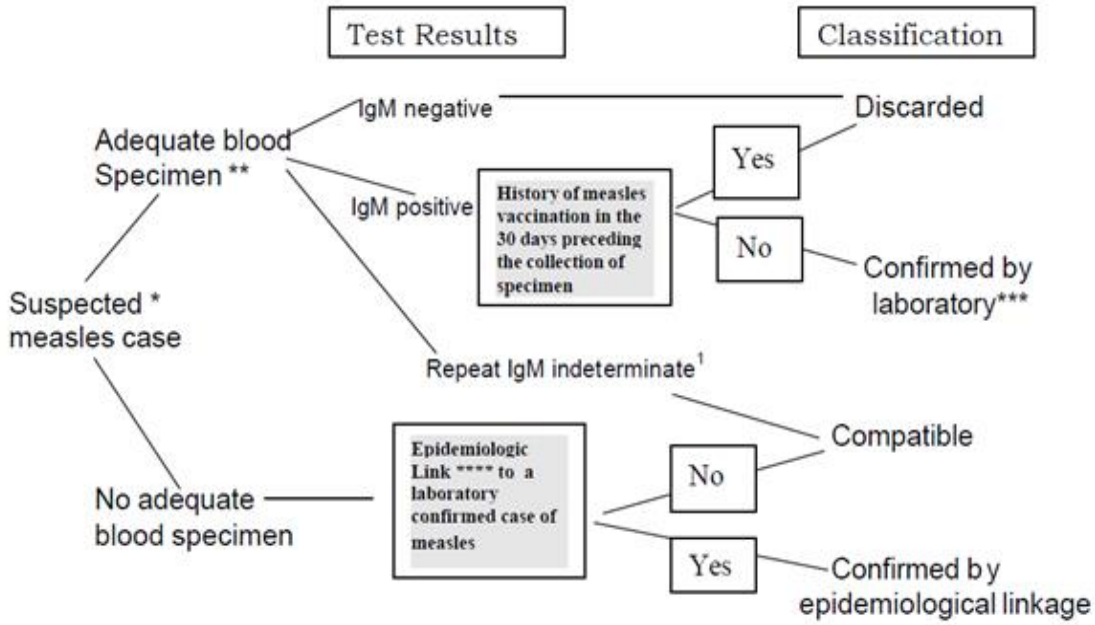
Epidemiologically linked: A suspected measles case that has not had a blood specimen taken for serologic confirmation, but is linked to a laboratory confirmed case (definitive serologic evidence of recent measles virus infection). Linked is interpreted as being in the same geographic area (place) during the infectious period (time) of a laboratory-confirmed case (person), that is, in the same district within 30 days.

Discarded: A suspected measles case that has been completely investigated, including the collection of adequate blood specimen (5 ml), but lacks serologic evidence of recent measles virus infection (that is, IgM negative).

Clinical / Compatible: A suspected measles case that has not had a blood specimen taken for serologic confirmation, and cannot be epidemiologically linked to a laboratory-confirmed case.

Measles cases flow chart

For surveillance purposes, WHO AFRO recommends the following scheme for the classification of measles cases



4.8. Data processing and analysis

The obtained data was entered, edited, cleaned and analyzed using Microsoft Excel and Epi-Info version 7.2. Descriptive statistics like mean, frequencies, and percentages was done to analyze ten years collected measles surveillance data during 2007—2016. The result was presented by graph, table and figures.

4.9. Ethical Issues

An official letter was written for the EPHI /PHEM, from Addis Ababa university school of Public Health and First permission was obtained from public health emergency management / EPHI then after a ten year Oromia region Measles data accessed to carry out this analysis. Confidentiality was assured and maintained. (Ensuring that information is accessible only to those authorized to have access).

4.9.1. Dissemination of findings

The result of Measles surveillance data trend analysis was communicated to EPHI (PHEM) Oromia Region health Health bureau, and Addis Ababa university school of public Health Field Epidemiology Training Program.

5. Result

5.1. Measles case distribution by age and sex

A total of 26908 Measles cases were reported in Oromia region from 2007 -2016 with case fatality (CFR) rate of 1.07%. The median age of measles cases were 6.0 years (ranging from --- month to 71 years). Overall 53% of measles cases were male with male to female ratio of 1.1:1 and Male sex has highest incidence rate throughout all age group. Of total reported measles cases 41% 0f cases were among age group of 5-14 years old. The highest incidence were recorded among age less than 1-4 year followed by age group less than 1years with 27/100,000, 26/100,000 populations respectively whereas the lowest incidence rate were recorded among greater than 44years.

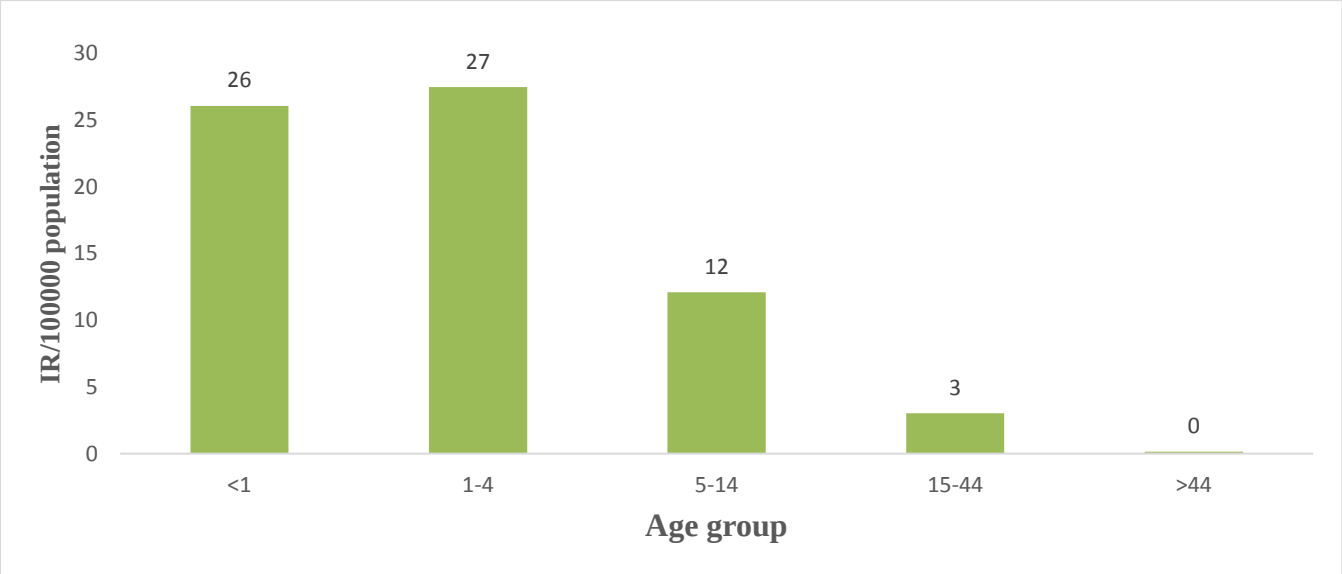


Figure 13: Measles incidence, by age category, in Oromia, 2007-2016.

Of total reported measles cases, sex specific incidence rate was calculated and the highest incidence rate was among female throughout ten years with slight difference to males. Over the entire incidence showed that measles is declining from year to year. Female to male ratio was 1:1.1

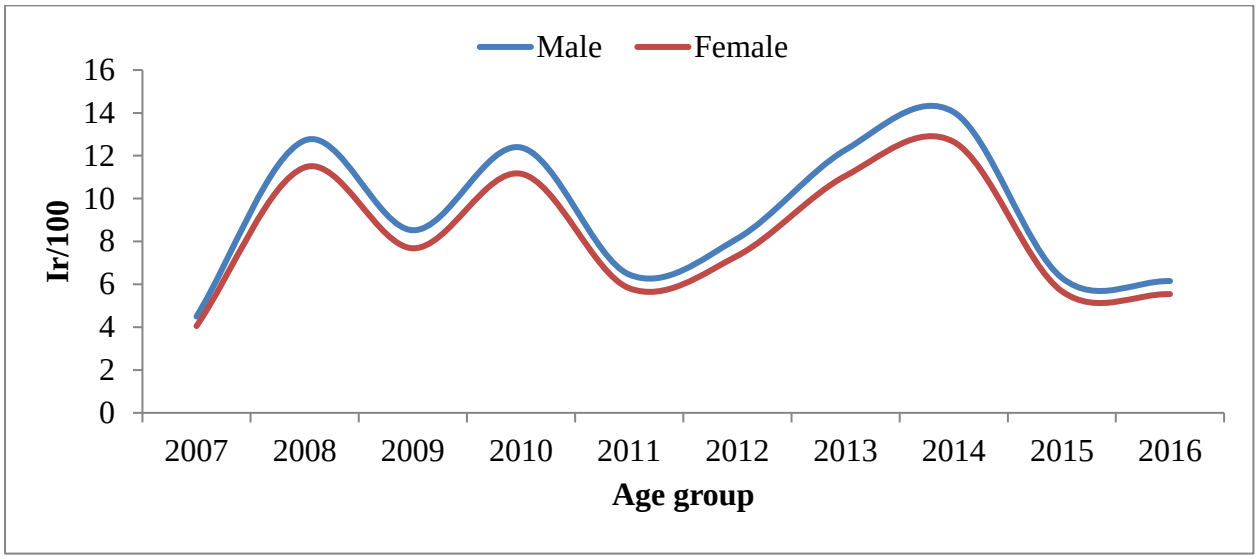


Figure 14: Measles sex by year in oromia region from 2007-2016.

The crude CFR was 10.7/1000 population (1.07%) with some variations among age category and sex. The highest CFR was among age group 1-4 age group followed by less than 1 year with 13/1000 and 14/1000 population. Female has the highest CFR among age group of 1-4 year with 16/1000 population.

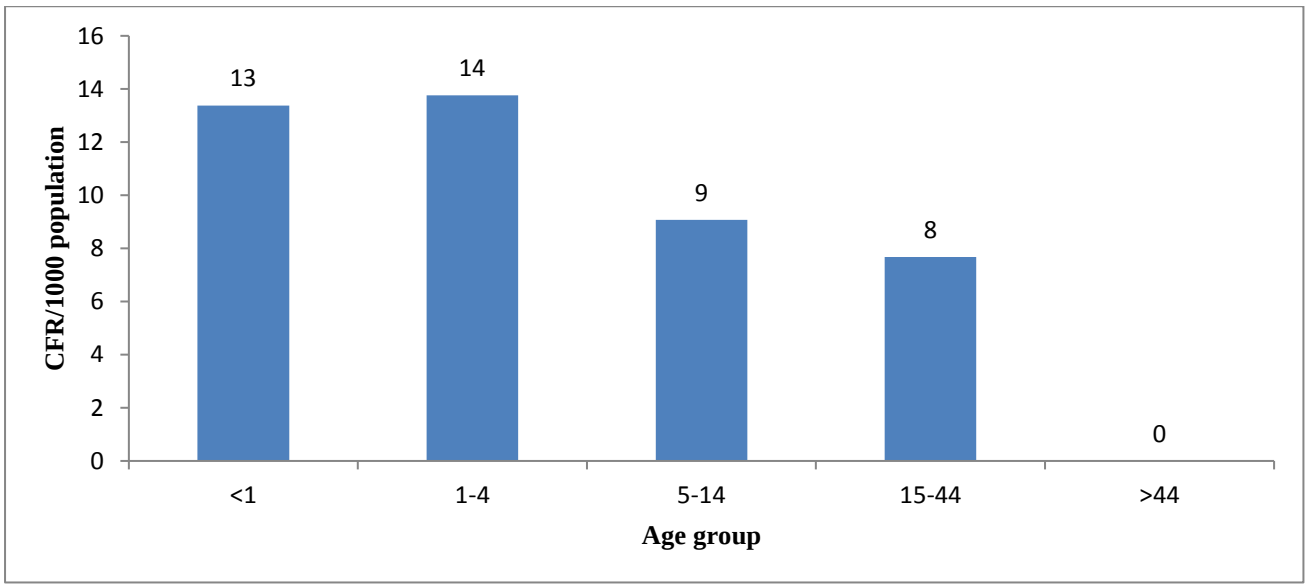


Figure 15: Measles CFR, by age category, in Oromia, 2007-2016.

5.2. Distribution of measles cases by time

Figure 16 showed the trend of measles cases. The highest suspected measles cases attack rates were seen in 2014 and 2008 accounted for 13 per 100,000 and 12 per 100,000 populations respectively. While remarkable decrement of suspected measles case were reported in year 2007 which is 4 per 100000 and 6 per 100000 populations in year 2015 and 2016.

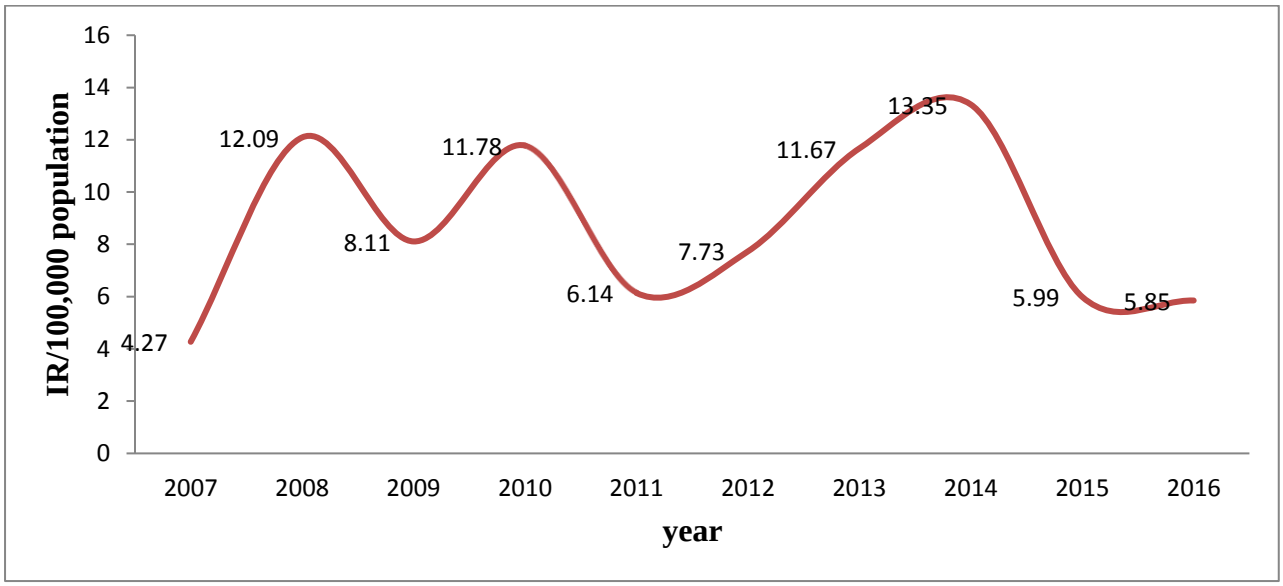


Figure 16: Trend of measles cases by year, 2007 to 20016, in Oromia region.

Figure 17 shows the trend of Measles cases by years and months. About 45 %(12116) of measles case were reported during the first quarter (January to March) of the year, followed by 23.4% (6305) during the second Quarter (April-June), 19.8% (5320) during last/fourth quarter (October-December) and 12.7% (n=3167) during the third quarter (august-September) of the year.

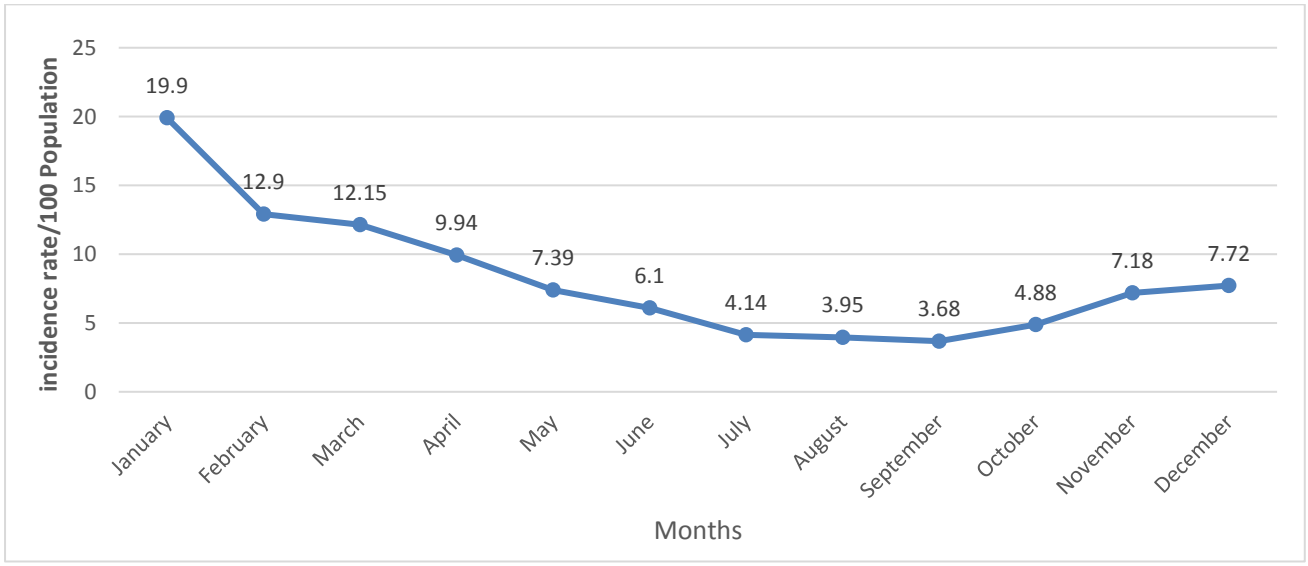


Figure 17: Trend of Measles based by months, Oromia region from 2007 -2016.

During 10 years period (2007-2016), there were a total of 288 reported deaths, making the overall case fatality rate of 1.07% and the highest deaths were reported in age group 1-4 years with the average annual CFR of 1.357% per 100 population. The highest CFR 30/1000 population was recorded during 2014 followed by 20/1000 population in 2013 whereas there was no death report during 2011, 2015 and 2016 see figure7.

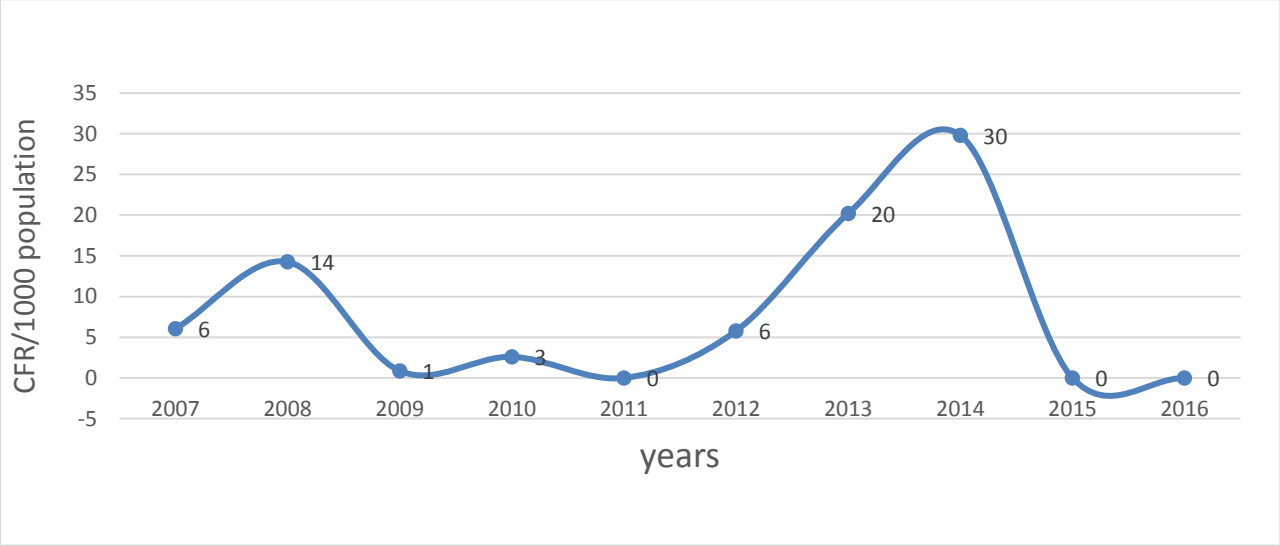


Figure 18: Measles CFR by year in Oromia region during 2007-2016.

5.3. Distributions of measles case by place

Regionally 17 zones and 6 towns were reported suspected measles case, From a total of reported measles case the highest incidence rate were from, GUJI followed by WEST ARSI, accounted 2989 19/10,000 and 3788 17/10,000 population respectively, while the minority of reported cases were from Adama town and Nekemte town which is 2/10,000 population in the last ten years period.

Figure 19: Incidence rate IR/10000 of Measles cases by zone of Oromia region from 2007-2016.

With regarding geographical distribution from a totally recorded 26908 measles cases, majority of reported measles cases were from rural setting which is 21240 (79%). While 5668 (21%) of reported measles cases were from urban setting.

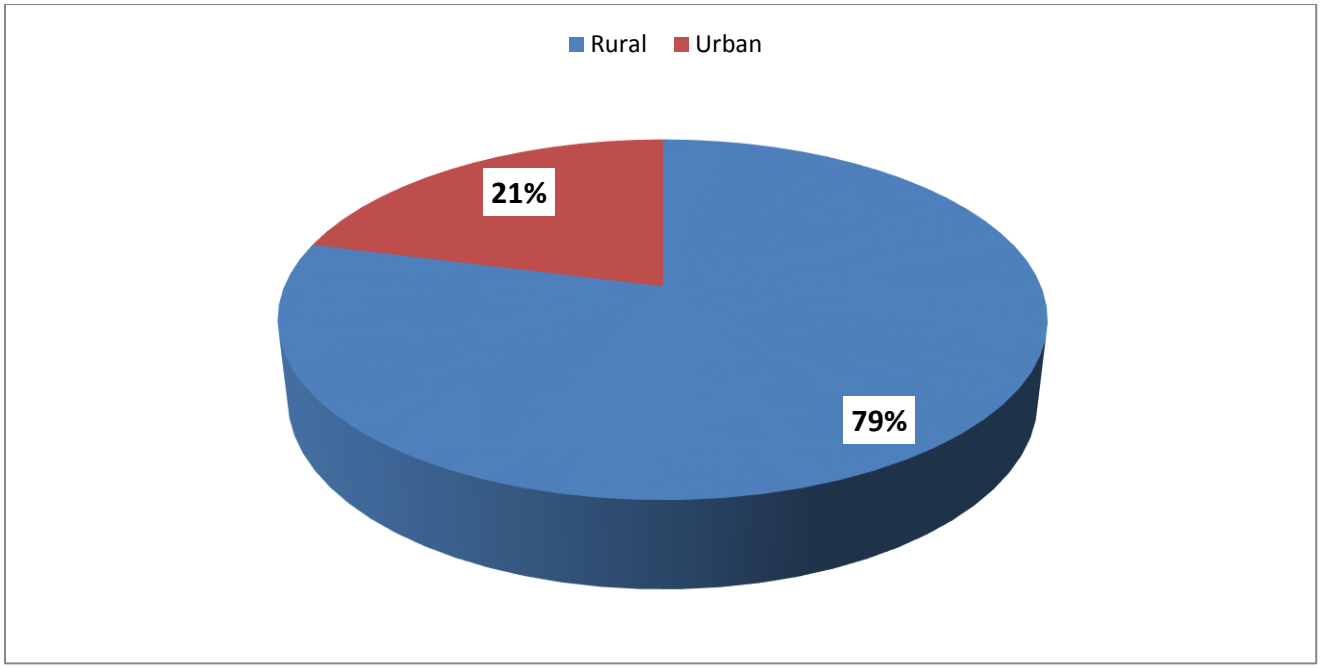


Figure 20: Distribution of measles cases by place of residency in Oromia region from 2007-2016.

5.4. Vaccination status of measles case

Forty six percent (n=12495) of the case patients have unknown vaccination status, 29% (7814) has no vaccination history. Over all, only 24% of measles cases were known to be vaccinated. Of this, 19%

(4995) have received single dose vaccine, 4% (1088) has received two dose of vaccine, and 2% (516) have received ranging from 3three to seven doses.

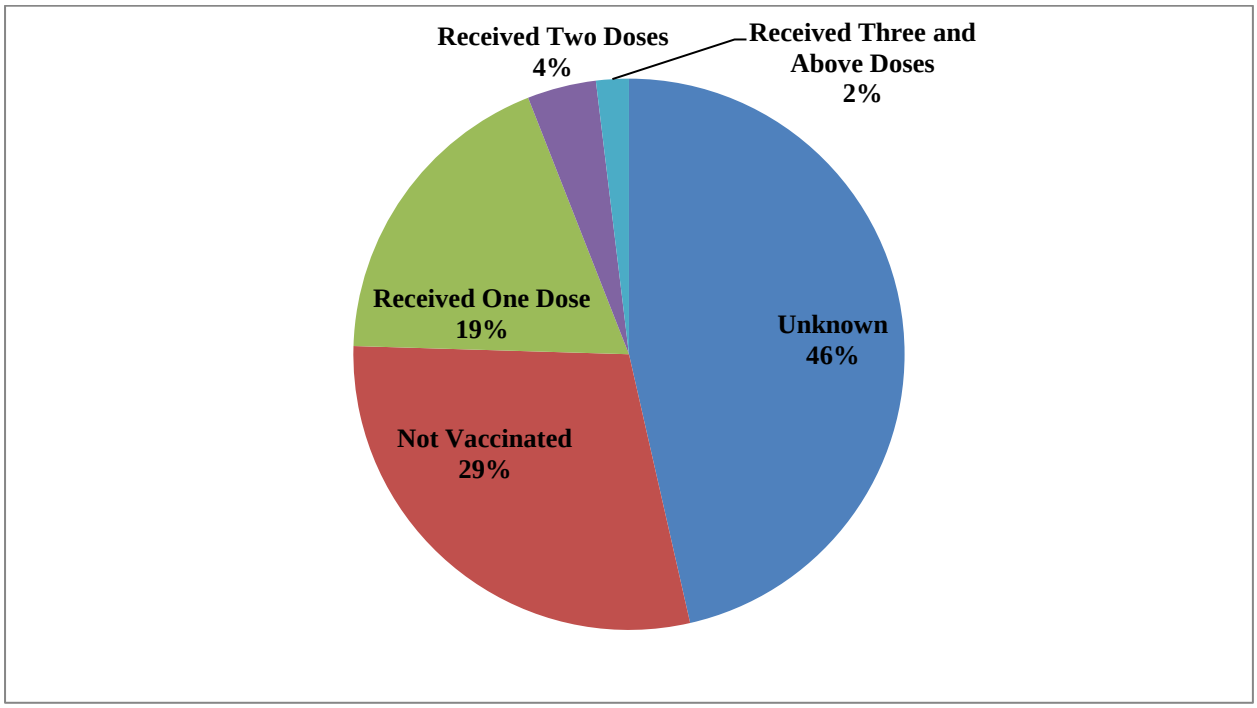


Figure 21: Measles Cases by Vaccination Status, in Oromia region 2007- 2016.

The data recorded showed the vaccination status by zones; from over all 12495 unknown vaccination status of measles cases 19.5% cases were reported from West Arsi zone, from a total of 7814 not vaccinated measles cases 20% cases were from Guji zone, followed by West Hararge and South West Shewa which is (10.8%) and (10.7%), while from 4995 cases of received one dose of measles vaccine 17.1% cases were reported from Guji zone, from 1088 cases of received two dose of measles vaccine Borena and West Arsi had highest measles vaccine coverage which is (9.43%) and (9.43%) respectively.

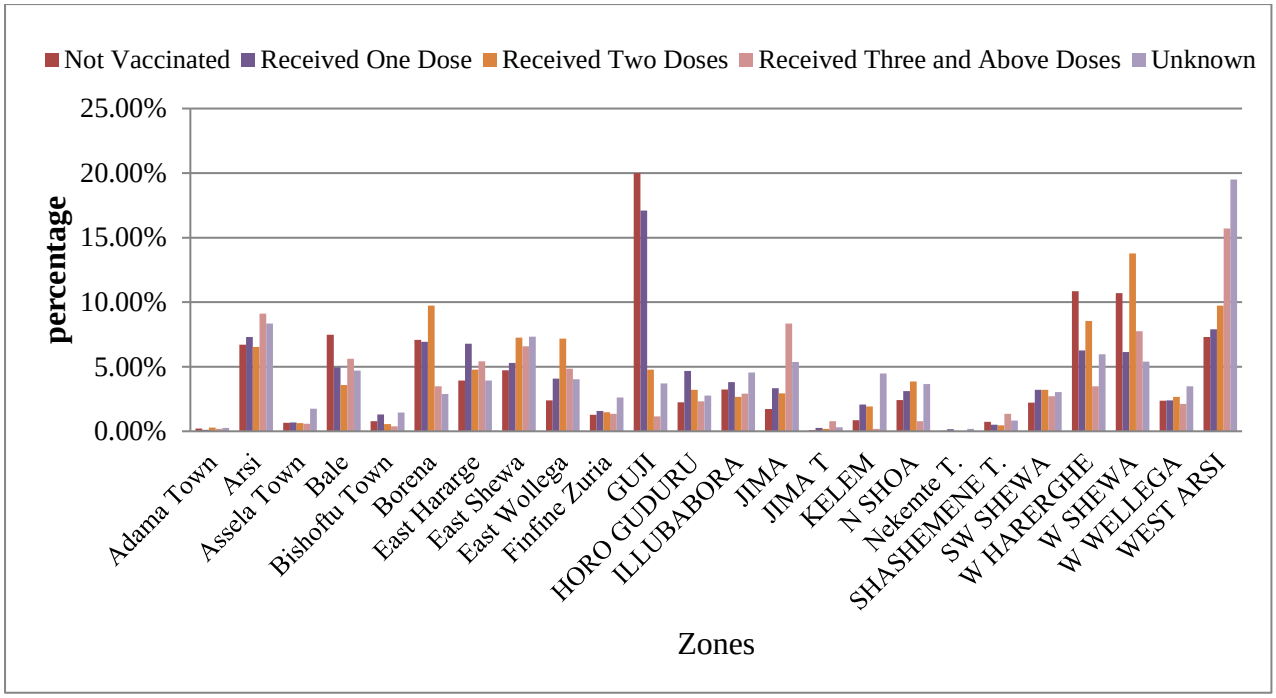


Figure 22: Measles Cases vaccination status by zones of Oromia from 2007- 2016.

5.5. Final classifications of measles cases

With regards to measles classification, from a total of 26908 measles cases, eight thousand one hundred forty five (30.3%) measles cases were epidemiologically linked, six thousand one hundred forty eight (23%) were confirmed by laboratory, two thousand nine hundred fifty two (11%) of measles cases were clinically compatible,. While nine hundred seventy eight (3.6%) were suspected, and eight thousand six hundred eighty five (32.3%) were discarded measles cases.

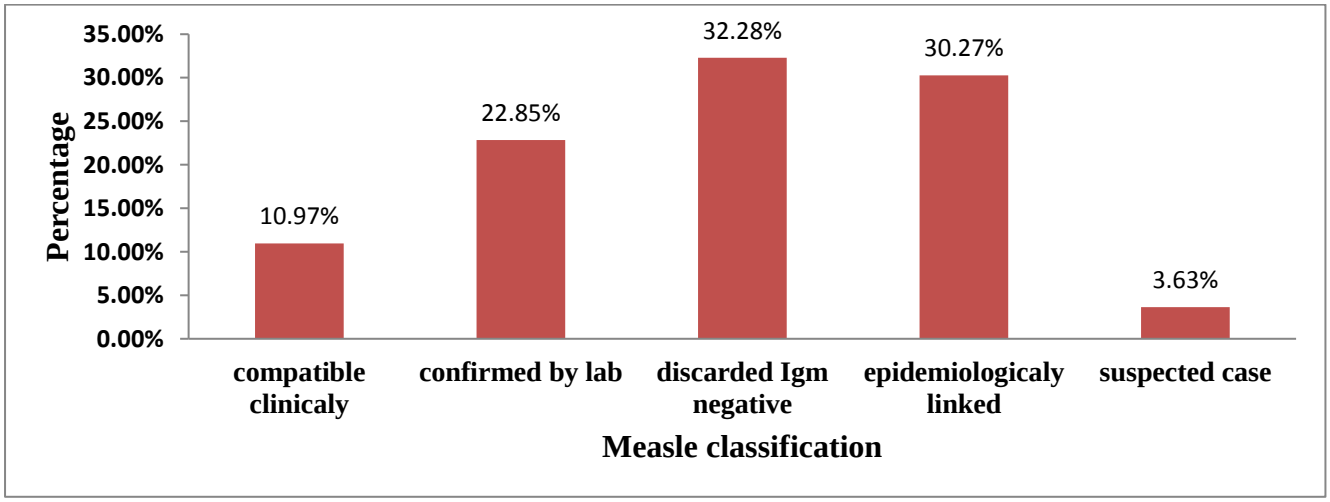


Figure 23: Measles case final classification, Oromia region, 2007- 2016.

5.6. Laboratory result

Of totally tested samples for measles during ten years period 36% samples were positive for Measles Igm and the highest positivity rate (27%) were recorded in 2015. From a total of 50.39% negative samples 55.63% were reported in 2012, 399(2.32%) were indeterminate for measles Igm, 2002 (7.44%) cases were not done for measles. sample were not collected for 35% measles cases during ten years period. During this period 33% Measles Igm Negative result were recorded, high percentage of negative result were during 2008 and 2012g.c contributing 760 (24.61%) and 1348(34.44%). in addition measles Igm positive result increased during 2015g.c which is 1136 (18.5%). From samples of (8484 negative and 366 indeterminate for Measles Igm) 8850 of them were tested for Rubella Igm. Of them 81.1% (7179) were negative for Rubella Igm, while 918(3.4%) cases were positive for rubella Igm.

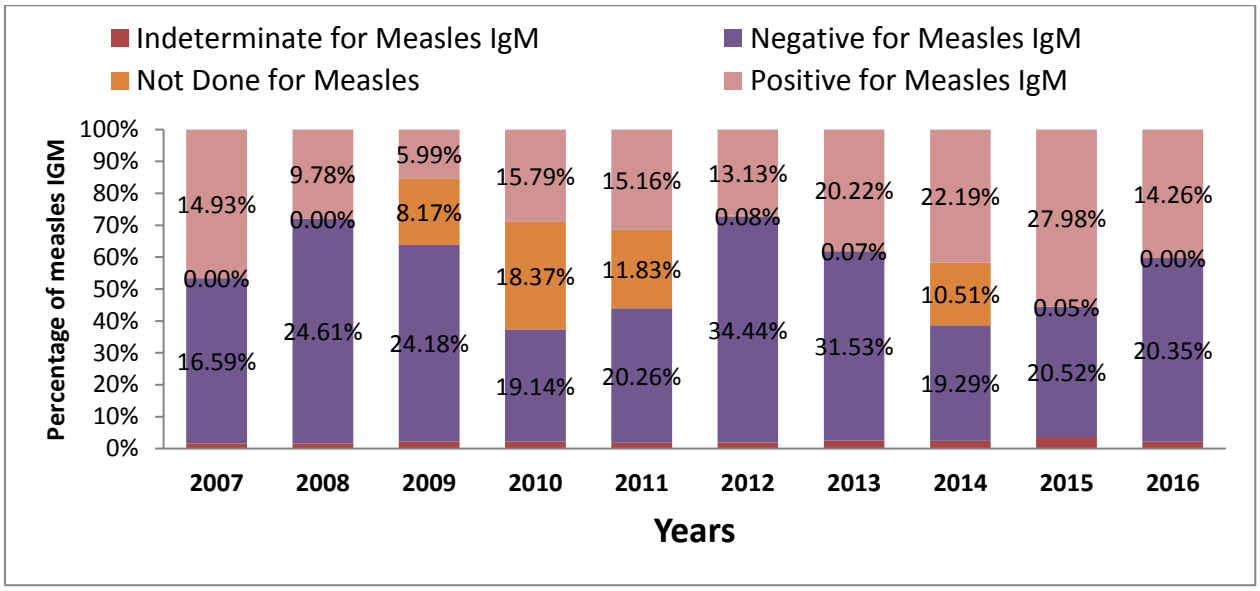


Figure 24: Measles IGM laboratory result in Oromia region from 2007- 2016**.**

5.7. Measles cases data type

Over all from 26908 suspected measles cases were reported, 17236 (64%) of suspected measles cases were reported by case based. while nine thousand six hundred seventy two (36%) were reported by line list. there was no reported measles cases by line list during 2011 and 2015 year, this may be because of strengthened surveillance activities performed.

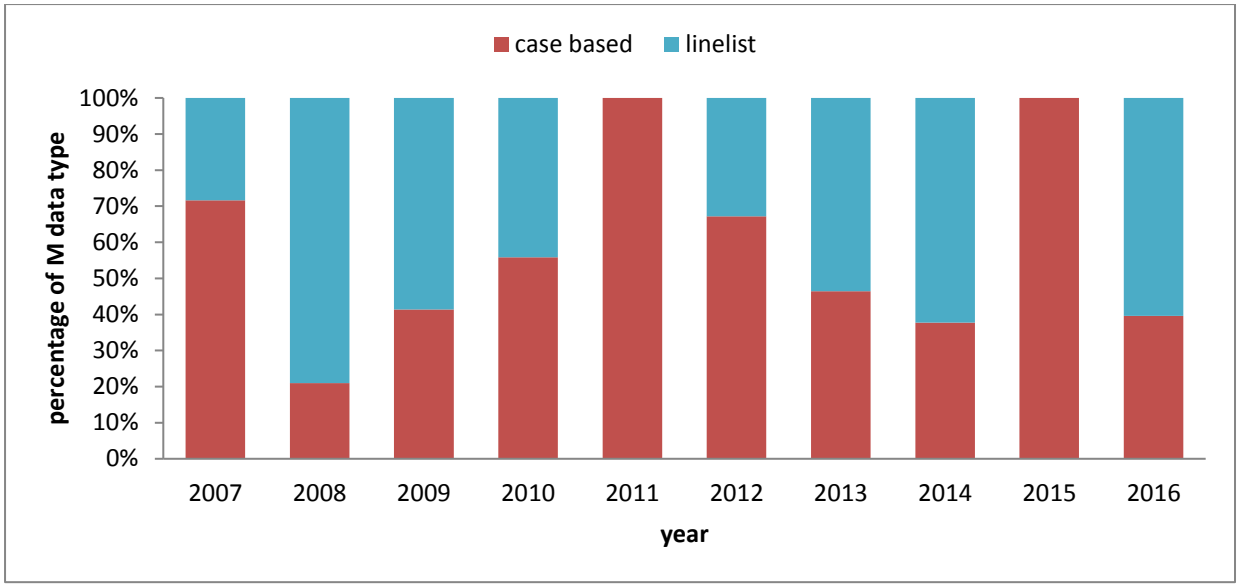


Figure 25: Measles data type, Oromia Region, 2007-2016.

5.8. Inpatient and outpatient status of measles cases

From 2007-2016 years periods 3246 (12%) measles cases were admitted. While 23328 (88%) suspected measles cases were treated as an outpatient level. Unknown measles cases were reported during the ten years period. The overall admission rate was 12%.

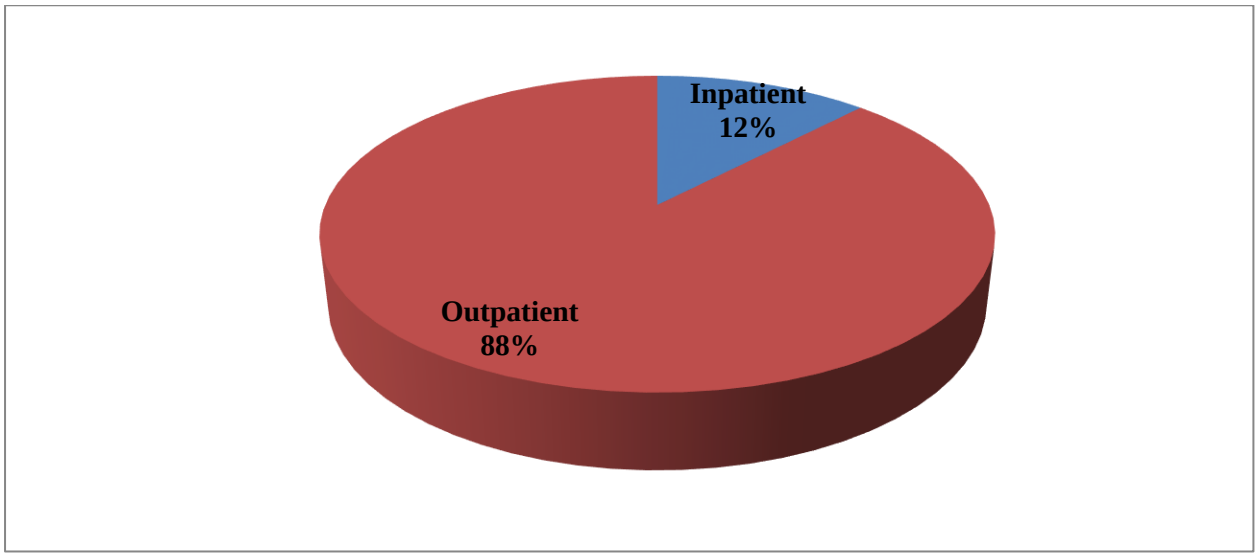


Figure 26: Measles inpatient/outpatient status in Oromia region from 2007-2016

6. Discussion

This analysis has tried to look at the epidemiology of measles cases, deaths and vaccination coverage. The vaccination coverage is relying on the administrative report. The analysis showed that the disease mainly affected children less than five years age groups. Similar results were reported in Uganda indicating a 64% measles cases in less than five children (25). The incidence of suspected measles cases has shown a slight upward trend for the first two years (2008 – 2009) and remarkable drops down trend in 2011, the rate decreased from 11.7 per 100,000 populations in 2010 to 6.14 per 100,000 populations in 2011. The incidence again progressively increased to 13.3 per 100,000 populations in 2014. This was due to a disease epidemic that occurred in most zone of the region during this period. The same trend has been observed in the mortality rate of suspected measles as that of the incidence during ten years.

The overall case fatality rate in ten years period was (1.07%). WHO estimate the CFR of measles would be 3% to 6% in developing countries. These rates may underestimate the true lethality of measles because of under reporting of measles death. Similarly this finding is lower than CFR study conducted in districts of Bale Zone CFR of 15.7% (30). The highest average CFR occurred in children aged 1 to 4 years. This is different from the study conducted in Ethiopia which shows the highest case-fatality rate occurs in infants 6 to 11 month of age, with malnourished infants at greatest risk (1).

It was further observed that a high proportion of deaths was reported during 2012 -2016 year period (77.2%) as compared to the 2007 -2011 (22.9 %). this could be due to the time of strengthened performance of surveillance activity and it could be due to improved previously underreported death.

During the ten years period the incidence showed seasonal patterns as reported. the peak incidence of suspected measles cases were during first quarter of the year (January to march) started to rise on December and peaked on January, which is the peak cases were mostly occurred during the dry season and the incidence dropped during the rainy season. This is similar to the study done in Ethiopia, Amhara regional state in 2016 (26).

The age specific attack rate was highest 37 cases per 100,000 populations in those aged <1 year. Cumulative incidence decreased with increasing age to low levels (0.003/100,000) in person's ≥45 years. This finding was similar with a survey done in South Africa and France (13, 27). The national surveillance system performed above the recommended WHO target of 2 cases/100,000 populations year for 2013 (28). Simultaneously, this study revealed death was higher among age group less than five as compared to greater than five year, this could be due to the fact there is weak immunity at this age.

Our study revealed that most (0.19%) 19/1000) of the cases were reported from Guji zone region followed by West Arsi (0.17%) 17/1000). The reason for this could be due to the fact that these zones have a high population density and experiences relatively high rates of immigration from other areas. The numbers of reported case-patients differed between zones.

In this study 29% measles cases were not vaccinated and 46.4% of cases were unknown for vaccination status this finding was not Similar to study done at Oromia Zone in 2011 which is 83 % not received the measles vaccine (29). This finding was lower than the finding in the states of southern and western Nigeria, 56.8% of cases had received the measles vaccine and 39.7% of cases were not vaccinated (20).

With regards to measles laboratory result, of total tested samples for measles during ten years period 36% samples were positive for Measles Igm. This is similar to 36.7% of positivity rate studies done in Amhara region (26), in contrary this finding was lower than Analysis of National Measles Surveillance Data in Ethiopia during 2015 (30). Measles Igm positivity rate showed improvement starting from except for the year 2013 and 2016, this could be due to strengthened surveillance system and increased capacity laboratory confirmation.

The success of prevention and control programmers in reducing morbidity and mortality from vaccine preventable disease can only be measured if there is a reliable disease surveillance system in place. The case based surveillance was put in place to detect cases and outbreak of measles and taking as important steps to control measles. Of reported suspected measles cases, (64%) of measles cases were reported by case based during ten years period. This can be an indicator for strengthened surveillance from time to time.

Strength of the study

The data obtained from EPHI/ PHEM office was complete with important variables and it can help us to, determine the distribution of illness, generate hypotheses, stimulate research, assess the disease trend, evaluate control measures, monitor changes, facilitate planning and estimate the magnitude of specific problems.

Limitations of the study

Due to the nature of study design in that we were relying on already collected data and could not come up with definitive reasons as to why there were certain trends and differences in our findings. The rate may underestimate the case fatality of measles due to under reporting of measles death.

7. Conclusion

Measles is still public health problem in Oromia region of Ethiopia, A large proportion of measles cases occur among unvaccinated individuals and those living in rural areas. The burden of the disease was remarkably in most of oromia zones with some variation and highest in Guji zone followed by West Arsi zone. Under the age of 5 was the most affected population. Seasonal occurrence of Measles has been observed with increased number of Measles cases during the first quarter of the year. Majority of (CFR) were significantly occurred age less than 5 years and 2012-2016 reporting year. Male were the most affected than female by the disease. Over all from total measles cases majority of cases were epidemiologically linked.

8. Recommendation

Oromia health bureau should work on Maximizing vaccination campaign with wide age group in the region as there is more case in the age group <15 years. Early preparedness and supplementary immunization activities should be started before the late-early part of the year (Dec to Feb) to overcome changes in seasonal patterns of measles cases. We suggested further investigations for understanding the incidences rate disparities across zones and the lower case detection rate. The surveillance activities need improvement in early detection of cases and specificity of reporting suspected measles cases.

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CHAPTER – III SURVEILLANCE SYSTEM EVALUATION

3.1. Surveillance surveillance system evaluation of Anthrax East shewa zone Oromia region 2018.

Abstract

Background: The purpose of evaluating public health surveillance systems is to ensure that problems of public health importance are being monitored efficiently and effectively. The aim is evaluate core functions, support functions and key attributes of the Anthrax surveillance system in East Shewa zone, Ethiopia 2018.

Methodology: We used cross-sectional descriptive study design. Structured questionnaires used to collect information and surveillance documents were reviewed. Study area was selected based on the gaps they have during reporting or used purposive method and study units were selected on a simple random sampling. Data was collected from one zonal, six woreda health office, six health center and six health post. Descriptive statistics were calculated and result was presented by graph and narration.

Result: National manual for surveillance was available at Zonal and district health offices. There was shortage of weekly reporting format in the in all visited sites. Data analysis is limited to Zonal health office. Zonal and District health office were not conducted regular supportive supervision according to PHEM guideline. Of 19 visited sites 73.1% were disseminated feedback to the health facilities on quarter bases that didn't contain surveillance activities. All of the respondents (100%) agreed that the case definitions are easy to understand. All visited sites respondent agreed that implementation of PHEM will not be difficult with changes in existing procedure of case detection. All visited health facilities were well engage in the system and active participant in the case detection and reporting. The health service converges of the visited woredas ranges from 85% to 100%. The human health system has no communication with animal health surveillance system in data sharing.

Conclusion: Supportive supervision and feedback is not conducted on regular basis. Data utilization is very low at the lower level. The system was not supplemented with other surveillance systems. Specific supportive supervision and continuous feedback system should be strengthened. Supplemented system with the animal health surveillance system in data sharing should be considered.

Key word: Surveillance system, East Shewa, Anthrax

Background

Surveillance is the ongoing systematic collection, analysis, and interpretation of outcome specific data for use in planning, implementing and evaluating public health policies and practices. A communicable disease surveillance system serves two key functions; early warning of potential threats to public health and program monitoring functions which may be disease specific or multi-disease in nature (1). Public health surveillance systems have been developed to address a range of public health needs. In addition, public health information systems have been defined to include a variety of data sources essential to public health action and are often used for surveillance (2).

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. Ethiopia as a member state adopted this strategy, which is district centered and outcome oriented (3).

Anthrax surveillance system objective are to prevent or reduce livestock losses and to prevent human disease. Hence, the system should emphasize education of the producers and front-line veterinarians in the detection, confirmation and reporting of cases. This detection, confirmation and reporting should be followed by a strong response from the veterinary health system to control the disease. Prevention of cases among livestock depends on knowledge of enzootic regions and on vaccination of livestock in those affected areas. Gaining knowledge of risk areas is a secondary objective of surveillance for the disease (4).

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. With the continuing advancement of technology and the importance of information architecture and related concerns, inherent in these attributes are certain public health informatics concerns for public health surveillance systems. These concerns include comparable hardware and software, standard user interface, standard data format and coding, appropriate quality checks, and adherence to confidentiality and security standards (5).

IDSR promotes rational use of resources by integrating and streamlining common surveillance activities. Surveillance activities for different diseases involve similar function

(Detection, reporting, analysis and interpretation, feedback, action) and often use the same structures, processes and personnel. Additionally, IDSR takes into account the One World-One Health perspective which is a strategy that addresses events at the intersection of human, domestic animal, wildlife, and ecosystem health. For example, 75% of recently emerging and re-emerging diseases affecting human health are of animal origin (hemorrhagic fever and avian influenza) (6).

Ministry of Health and its Agencies identified 7 core processes. Public Health Emergency Management (PHEM) is one of the core processes identified. The PHEM was started in 2009; the processes considered and incorporate international obligations that Ethiopia ratified. Hence, most of the components of the International Health Regulations (IHR 2005) are also included into the new process. The IHR 2005 is a legally binding document that entered into force on 15 June 2007. The purpose of the IHR 2005 is to prevent, protect against, control and provide public health response to the international spread of disease in ways that are relevant and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade (7).

To promote the best use of public health resources, all public health surveillance systems should be evaluated periodically. No perfect system exists; however, and tradeoffs must always be made. Each system is unique and must balance benefit versus personnel, resources, and cost allocated to each of its components if the system is to achieve its intended purpose and objectives (8).

Many countries' surveillance systems have developed in an uneven way, with various surveillance activities funded and managed by different control programs sometimes based in different institutions like MoH, academic or research institutes and NGOs. Detection and reporting of cases and epidemics are rarely carried out on time, and analysis, interpretation and use of available data at all levels for decision making and action is poor.

Each country needs to periodically assess its overall surveillance system so that this continues to reflect national disease control priorities, remains efficient and takes advantages of opportunities for the integration of activities The World Health Organization (WHO) is promoting a more coordinated and synergistic approach to the surveillance and control of communicable diseases (9).

The design of a surveillance system for Anthrax depends in part on its objectives. The primary objectives of any Anthrax surveillance system are to prevent or reduce livestock losses and to prevent human disease. To achieve these objectives, the surveillance system should emphasize education of the producers and front-line veterinarians in the detection, confirmation and reporting of cases. This

detection, confirmation and reporting should be followed by a strong response from the veterinary health system to control the disease (4).

Target diseases under surveillance in PHEM

Federal ministry of health Ethiopia currently identified 23 diseases and health conditions under surveillance are classified in to two reporting periods (15 immediately reportable and 8 weekly reportable) depending on their epidemic potential, diseases targeted for elimination and eradication.

Table 8: List of PHEM Disease under surveillance in Ethiopia

Immediately reportable disease		Weekly reportable disease	
1.	Acute Flaccid Paralysis(AFP)	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	Severe Acute Malnutrition(SAM)
8.	Pandemic Influenza	8	Scabies
9.	Rabies		
10.	Severe Acute Respiratory Syndrome (SARS)		
11.	Small Pox		
12.	Viral Hemorrhagic Fever		
13.	Yellow Fever		
14.	Maternal death		
15	Perinatal death		

Purpose of anthrax surveillance

The primary objectives of any anthrax surveillance system are to prevent or reduce livestock losses and to prevent human disease. To achieve these objectives, the surveillance system should emphasize education of the producers and front-line veterinarians in the detection, confirmation and reporting of cases. This detection, confirmation and reporting should be followed by a strong response from the veterinary health system to control the disease. Identification of the characteristics of the disease in the affected populations, and evaluation of prevention and control activities by monitoring the incidence of the disease in both animal and human populations, should be among other objectives chosen by the national surveillance program.

Rationale of the study

Even though Anthrax is one of public health important disease in East Shewa zone of Oromia region, the report is considered under reported despite existence the disease in the Zone. Therefore, this study is intended to evaluate surveillance system in East Shewa zone mainly focusing on Anthrax prevention and control activities. Additionally, findings of this evaluation may lead decisions and use as an input for strengthening public health surveillance activities.

Public health surveillance systems should be evaluated periodically in order to assess their performance and determine how well the system operates to meet its stated purpose and objectives ensure data collected are adequately and effectively guiding their intended public health actions develop recommendations for improving quality, efficiency, and usefulness, including the optimization of resources and ensure that problems of public health importance are being monitored efficiently and effectively (11).

Use of the collected data at the local level as evidence for public health decision making is not well known and also evaluation of Anthrax surveillance system is not done in the zone and little is known about the effectiveness and efficiency of the system.

Literature review

Ethiopia has tried a multiple strategies to have functioning and effective surveillance system. Following the resolution of 48th in 1998 WHO/AFRO assembly, stated promoting integrated disease surveillance and response (IDSR) for all member state to adopt as main strategy to strengthen national surveillance system. Currently Ethiopia is categorized among the countries, which have tremendous achievement in the process of integrated disease surveillance and response. However, surveillance data for communicable diseases are neither reported nor analyzed promptly (12).

Most zoonotic diseases, where animals serve as the primary sources of human infection and epidemics (as opposed to zoonosis, where both humans and animals may be infected from common environmental sources), control of anthrax among humans depends on the integration of veterinary and human health surveillance and control programs. Routine cross-notification between the veterinary and human health surveillance systems should be part of any zoonotic disease prevention and control program, and close collaboration between the two sectors is particularly important during epidemiological and outbreak investigations (4).

Reporting Periodicity

The identified 23 disease and conditions are classified in to two reporting periods depending on their epidemic potential, diseases targeted for elimination and eradication as indicated In Table 1 below; immediately reportable and weekly reportable.

Immediate reporting: Currently 21 diseases are identified to be reported immediately to next reporting level. For the immediately reportable diseases, a single suspected case is considered as a suspected outbreak.

Therefore, suspected outbreak of these diseases should be notified from level to level within 30 minutes of identification as follows: From community or health post or health center to woredas health office within 30 minutes, From woreda health office to zone/region within another 30 minutes, From zone to regional office within another 30 minutes, From region health bureau to federal level within another 30 minutes, MOH to WHO within 24 hours of detection. You can report the information verbally or by telephone, radiophone or use an electronic methods such as email, fax, mobile short message service.

Weekly reporting: Currently 7 diseases and conditions are identified to be reported weekly to the next reporting level. Reporting of the total number of cases and deaths seen within a week (Monday to Sunday) and should be reported to the next level as follows:

Health facilities report data from Monday to Sunday to woreda every Monday till midday; Woredas report to zone/region every Tuesday till midday; Zone (if applicable) report to region every Wednesday till midday; Region report to EHNRI /PHEM every Thursday; EHNRI /PHEM report to stakeholders every Friday (7).

Operation and reporting of surveillance system

Surveillance data flow of is usually from reporting site to the next level up to the national level. The community and health facilities at the lowest level particularly health posts are the main source of information about the occurrence of health related events.

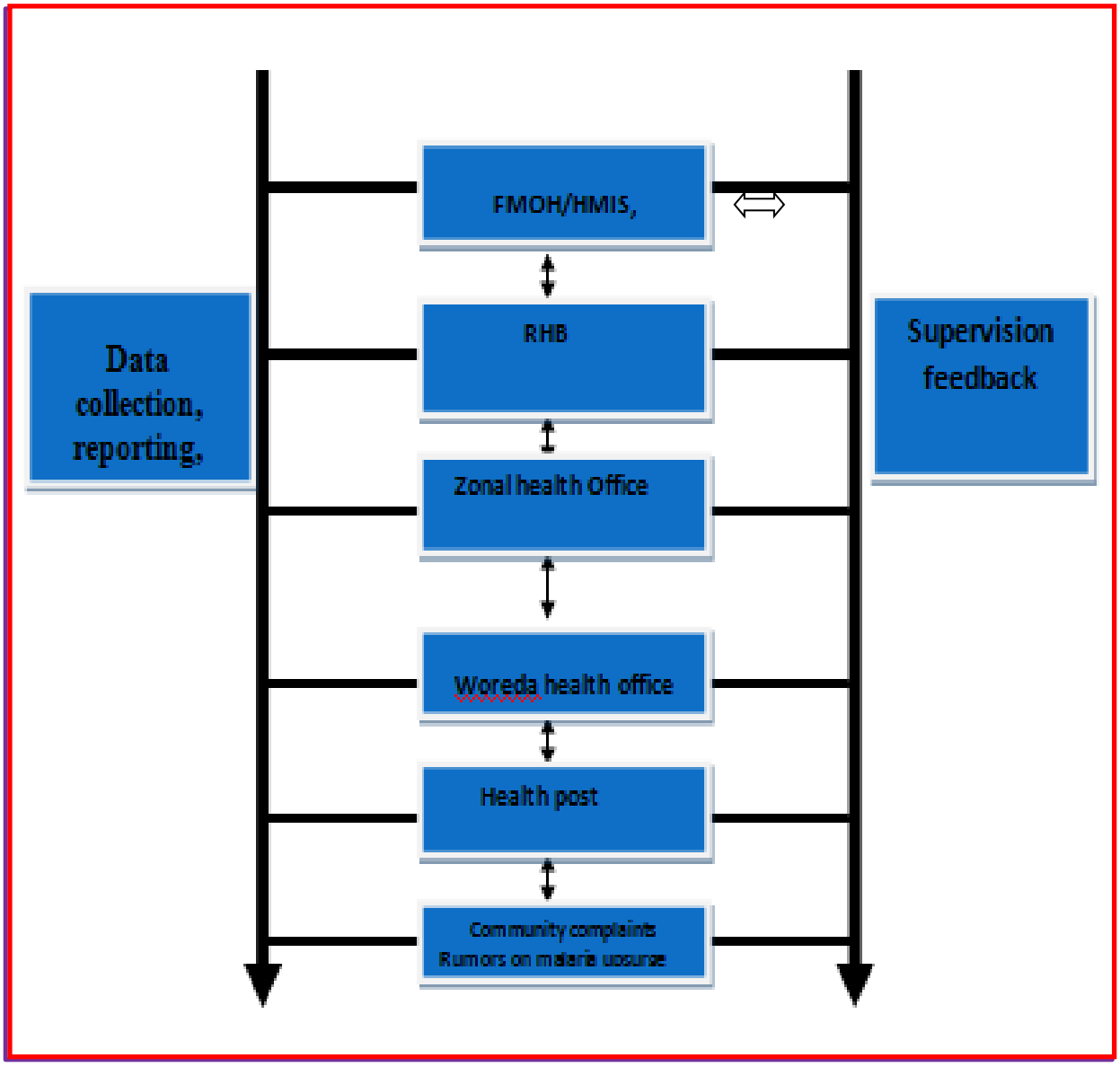

Figure 27: Surveillance data and information flow chart

Objective

General objective

- To describe core, supportive functions and evaluate key attributes of the Anthrax surveillance system in East Shewa zone, Ethiopia 2018.

Specific objective

- To describe the core process of the surveillance system.
- To assess supportive activities of surveillance system.
- To evaluate surveillance system key attributes

Methods

Study area

East Shewa is one of the Zones of the Ethiopian Region of Oromia.is located in the middle of Oromia, connecting the western regions to the eastern ones. This zone is bordered on the south by the West Arsi Zone, on the southwest by the Southern Nations, Nationalities and Peoples Region, on the west by South west Shewa and Oromia Special Zone Surrounding Finfinnee, on the northwest by North Shewa, on the north by the Amhara Region, on the northeast by the Afar Region, and on the southeast by Arsi.

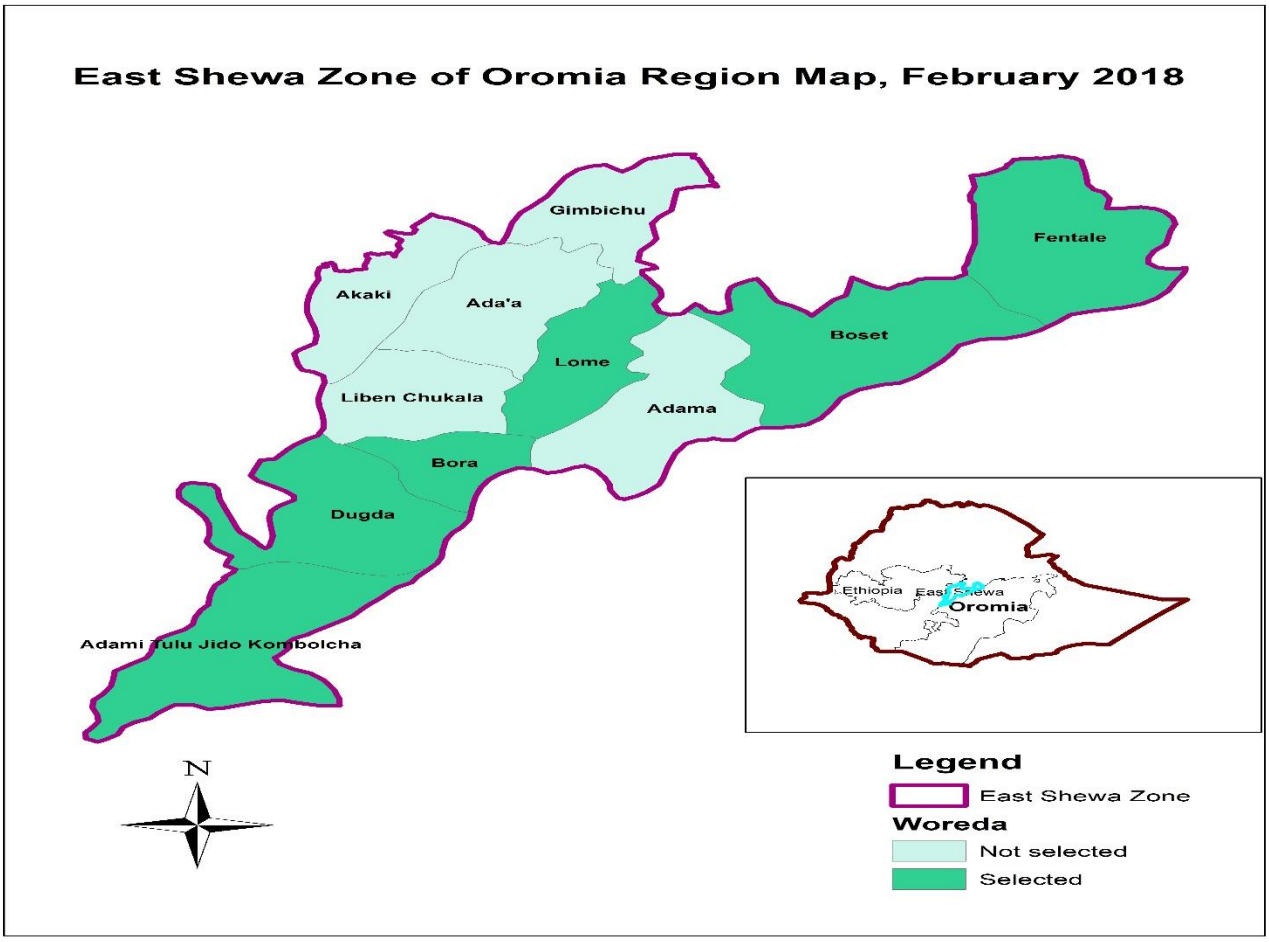

Figure 28: Map of East Shewa Zone Oromia region as of 2018.

Study period

We conducted the study from February 5 to 25/2018 in East Shewa zone, Oromia Region, Ethiopia.

Study Design

We used descriptive cross-sectional study design to evaluate the surveillance system.

Study Population: Zonal and Woreda Health Offices and Health Facilities providing health services in zone were our study population.

Study subject

The study subjects were selected health facilities (one Hospital, six Health Centers, and six Health Posts) and one zonal and six woreda health offices.

Sample Size and Sampling technique

East shewa zone was purposively selected based on the performance on the basis for its burden on Anthrax cases compared with other zones of the region. Simple random sampling method (lottery) was used to select six woreda, then six health centers from each woreda and six health posts from each health centers and one hospital with a total of 19 health facilities were included in this system evaluation. All surveillance focal persons in the selected health office and facilities were interviewed.

Data collection procedure

The data was collected by using structured questionnaires customized from CDC guidelines for evaluation of public health surveillance. Data were collected using both face to face interviews and reviewing Secondary data source such as surveillance report completeness and timeliness as well as Anthrax surveillance data, supervision report, written feedbacks, preparedness plans were also reviewed. Data were collected from Focal persons of PHEM at zonal, district and at health facility levels, health professionals, and stakeholders of districts at various levels were interviewed to get the important data of the existing surveillance system of the study area.

Data processing and analysis

We have used Microsoft Office Excel 2007 to enter, organize and analyze the data. Frequency and percentage were calculated, result was presented by graph, table and narration.

Dissemination

The findings will be forwarded to all concerned bodies like PHEM, Region, Zone, woredas

Ethical issues

The consent letter was written Oromia regional health bureau to cooperate the principal investigator for the matter of realizing that the evaluation is beneficial to the zone and gap pointer to the zonal and regional health officers.

Case definition Anthrax

Suspected case

A clinically-compatible case of illness without isolation of B. anthracis and no alternative diagnosis, but with laboratory evidence of B. anthracis by one supportive laboratory test; or Clinically-compatible case of anthrax epidemiologically linked to a confirmed environmental exposure (infected animal product, contaminated

Confirmed case

A clinically compatible case of cutaneous, inhalational or gastrointestinal illness that is laboratory-confirmed by: Isolation of B. anthracis from an affected tissue or site; or other laboratory evidence of B. anthracis infection based on at least two supportive laboratory tests.

Note: it may not be possible to demonstrate B. anthracis in clinical specimens if the patient has been treated with antimicrobial agents.

Operational definition

Data Quality: Data quality reflects the completeness and validity of the data recorded in the public health surveillance system.

Flexibility: is the ability of the system to adapt to changing needs with little additional time, persons or allocated funds. A flexible public health surveillance system can adapt to changing information needs or operating conditions with little additional time, personnel, or allocated funds. Flexible systems can be easily integrated with other systems.

Timeliness: is the ability of the system to trigger appropriate action in time. The surveillance system must provide information in time to control communicable diseases.

Completeness: proportion of all expected data reports that were actually submitted to the public health surveillance system.

Representativeness: is the ability of the system to describe health events accurately in terms of time, place and person. A public health surveillance system that is representative accurately describes the occurrence of a health-related event over time and its distribution in the population by place and person.

Sensitivity: is of a surveillance system can be considered on two levels. First, at the level of case reporting, sensitivity refers to the proportion of cases of a disease (or other health-related event) detected by the surveillance system. Second, sensitivity can refer to the ability to detect outbreaks, including the ability to monitor changes in the number of cases over time.

Simplicity: The simplicity of a public health surveillance system refers to both its structure and ease of operation. Surveillance systems should be as simple as possible while still meeting their objectives.

Acceptability: reflects the willingness of persons and organizations to participate in the surveillance system.

Stability: refers to the reliability (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.

Results

Meeting with Stakeholders

Before we conducted this evaluation, discussions were done with head of the health bureau PHEM core process on the objective of evaluation and to ensure that the evaluation of the system addresses appropriate questions and attributes to produce useful and acceptable findings. The meeting was also an important first step for assessment and recommendations; which will help for the implementation of recommendations and betterment of the surveillance and response of the major priority diseases of the evaluated zone.

Overview of surveillance system

Federal Ministry of Health and its Agencies identified 7 core processes that will enable the fulfillment of sectoral visions and missions. Public Health Emergency Management (PHEM) is one of the core processes identified. PHEM is the process of anticipating, preventing, preparing for, detecting, responding to, controlling, and recovering from the consequences of public health threats in order that health and economic impacts are minimized.

Objectives surveillance system

- To establish strong and sustainable early warning system.
- To detect public health emergencies on a timely basis.
- To strengthen communication/information exchange capacity at all levels.
- To enhance community participation/involvement in Emergency Preparedness and Response (EPR) activities.
- To establish and maintain coordination and collaboration framework
- To strengthen monitoring and evaluation capacity at all levels

Population under surveillance

The national public health emergency management targets all the population in the country to be under surveillance for all the twenty one priority diseases.

Table 9: Population under surveillance of East Shewa zone and administrative areas by place of residence (Projected population for 2018.

Woreda	Total	Male	Female	Urban	Rural
Fentale-Wereda	109435	57201.6	52233.7	21530.3	87905.1

Boset-Wereda	187921	96470.4	91450.9	28188.4	159733
Lome-Wereda	155054	80651.3	74402.8	34359.4	120695
Dugda-Wereda	192783	100132	92651.7	37083.5	156174
Adami Tulu J/K-Wereda	190137	99043.8	91093.5	24657.6	165480
Bora-Wereda	78177.2	39336.2	38841	16796	61381.2
Total	913509	592794	553471	162615	751368

Core functions of the surveillance system

National surveillance guidelines

National manual for surveillance was available at Zonal health office and all district health office, 83% health center and 50% health post, availability of surveillance manual decrease as we go down from zone to health post level.

Case detection and registration formats

The case definition of Anthrax was available in 5/6 (83%) visited health facility and 4/6 (66%) posted on the wall. The understanding of the available case definition by health care providers was good, as confirmed by some of healthcare providers could define the cases at the time of health facility visited. Most of visited health center had posted the case definition at medical office than outpatient department OPD. The clinical register was found.in all of the visited health facilities together with OPD registration at OPD level, has no separate clinical registration book. All health centers had the cold chain but don't have guideline to collect and ship samples for Anthrax.

Reporting:

There was shortage of weekly reporting format in all visited health office and health facilities, they use their own print out paper to send reports. All visited health facilities do not have customized line list at a time of data collection. Among visited health facility, one health facility recorded 24 suspected anthrax cases on clinical register but not sent to the upper next level, there is difference in register and reporting form for the same weeks. The weekly reporting rates of the visited health facilities over the past 6 weeks (week29-52/2017) prior to assessment were 94% (for health posts 92%, for health centers 96%). The overall reporting rate of the visited district to the Zonal Health Department is 96%.

Zonal health office sends the report to the region through email, 83.3% of district health offices are using mobile SMS and additionally use hard copy to send the report to the zonal health office. whereas one health office use only hard copy to send the report, two health centers send the report by SMS and hard copy to the district health office by the same means and all Health posts are using mobile SMS and hard copy to send report to the health centers.

Data analysis

Zonal health office data was analyzed at regular bases. None of the visited district health offices and health facilities analyzed and used the data collected for surveillance activities at their capacity.. Instead they used raw numbers to compare the incidences of diseases with the previous experiences at the woredas and health facilities level. All assessed districts health facilities and all health posts, including the zone, have established action threshold for reportable diseases (only malaria) according to the national PHEM guideline recommendation. All of the assessed district and health offices have appropriate denominators needed for surveillance data analysis.

Epidemic Preparedness and Management

The zonal and district health office has written emergency preparedness and response plan for epidemic prone diseases but which is not active enough. Among visited health facilities 66.6% has written emergency preparedness and response plan. Regarding existence of epidemic management committee four 67% of the districts and the zonal health office have established the epidemic management committee and 83% assessed districts including the zone had rapid response team, which is not functionally active. However there were no meeting minutes found at the time of the evaluation that shows the existence and activities of the team at all districts and zone health office. All the district health office has no budget line for emergency, according to the respondent the epidemic management committee and the rapid response teams are activated only when there is an event. Among the assessed district health offices all of them have no drugs and supplies necessary for emergency management during the assessment.

Table 10: Availability of materials for preparedness plan in selected districts of east shewa zone.

Variables	District	zone
Availability of Written emergency preparedness plan	4	1
Availability of emergency stocks of drugs and supplies	3	1
Experienced shortage of drugs during in the past year	6	1
Presence of budget line for epidemic response	0	0

Observed epidemic management (RRT) meetings minutes	0	0
Presence of epidemic management committee	4	1
established Rapid response team (RRT)	6	1

Availability of Resources for Surveillance Activities

Resources for data management, communication, and logistics were all available at zonal level. However, they all became scarce at the peripheral heath facility. There were no PHEM/ surveillance units in all visited woreda. The PHEM/ surveillance units at the woreda and health facility level did not have communication ways- like, fax machines, internet and so on. At zonal level, the PHEM unit has its own computer for data management and telephone for communication. The logistic and budget constraints were observed at all the visited sites except at zonal level. None of the assessed health post has any means of communication for reporting rather than their own phone and even there is lack of access to network in some of them Availability of essential material and resources to undertake surveillance activities at all levels in the hierarchy of the system were indicated in the table below.

Table 11: Number of districts and their emergency preparedness status East Shewa Zone of Oromia 2018.

Materials	Six Health post	Six Health center	Six District	One Zone
Electricity	0	6	6	1
Computer	0	6	6	1
Printer	0	4	6	1
Stationary	0	6	6	6
Bicycle	0	0	0	0
Motorcycle	0	4	6	1
Vehicle	0	0	6	1
Fax	0	0	0	1
Telephone	0	6	6	1
Internet	0	0	1	1
Calculator	0	6	6	1

Outbreak investigation

The zonal health office and assessed district responded that as there was no outbreak Anthrax in 2009 EFY and no written report or document about outbreak investigation seen during the assessment.

Among visited district, Dugda district of East Shewa zone recorded 24 Anthrax cases on clinical register log book one year prior to the assessment of but not considered as an outbreak and not sent report to the next higher level.

Supportive functions

Supervision

Zonal health department planned to conduct joint supportive supervision than specific PHEM supervision to health facility on quarterly basis. But zonal health department supervised only health centers (without including health posts) once in the previous six months for health centers. All health centers and health posts supervised at least once in previous three months by woreda health office; but supervision is joint rather than specific. Of visited Districts; 83.3% have conducted integrated supportive supervision for health facilities with limited number of surveillance indicators. To evaluate the surveillance system during the supervisory visits checklist was used by expertise but was not applicable during health centers supervise health posts, for the reason that there is one permanently assigned health personnel for health post from health center to provide technical support for health post staffs.

Feedback

Zone health department distributed written monthly feedback to the woreda health offices. All the visited health facility disclosed that they did receive one feedback at month from zonal health department. Only one written feedback to both health centers and health posts were given in the past six months from woreda health office. Frequency of feedback from health center was better than that of district to health facility. But feedback to communities related to epidemic prone disease that had occurred in the community is almost none practiced.

Training

At zone level all technical staffs working in PHEM unit were trained on IDSR surveillance system. All PHEM focal persons (representatives) of the assessed woredas health office had took short term training on surveillance for 3-5 days on the guideline by the regional health bureau and partners. At some health facilities level, only focal person assigned for surveillance was trained. There is no appropriate formal training given to HEWs on surveillance, rather simple onsite orientation were given to them only on the reporting formats. There was no training given on focusing anthrax surveillance starting from health post upward to regional health bureau.

Laboratory capacity

In all visited health facilities there were no capacity to collect and transport of Anthrax sample in the surveillance of Anthrax. The region has two regional health research laboratories which are used in the outbreak investigation and confirmation at their capacities. The regional public health research laboratories were responsible for quality assurance of facility level laboratories in their respective zones. The regional health research laboratories and national laboratory do not have the capacity to test suspected anthrax case. Hospital and health centers laboratories were not able to test anthrax.

Description of system attribute

Simplicity

Simplicity of the surveillance system is undertaken to observe how much the standard case definition for anthrax is simple, easy, and understandable. All of the respondents (100%) agreed that the case definitions of these priority diseases for identification of suspected cases are easy to understand and can be applied by all levels of health professionals, but it was difficult to confirm cases due to not availability of laboratory for confirmation.

Regarding the route of data flow all respondents agree that it is simple and clear as it was indicated in the PHEM guideline and were familiar with when and to whom the report will send. In addition all participants of the evaluation responded that surveillance reporting formats are also clear and simple. From all assessed district health offices 85% of them said, it takes 10 -15 minutes to fill the weekly reporting format.

The human health system has no communication with animal health (agriculture and livestock) surveillance system in data sharing, which would add the value of the system case detection.

Flexibility

All respondents (100%) reported that the current reporting format (weekly and immediately) is not difficult to use for new diseases or events and it can accommodate new variables and information, can be operated with other system. All Zonal and district level respondents agreed that implementation of National PHEM guideline will not be difficult with changes in existing procedure of case detection, case definition and report forms.

Usefulness

In all visited sites respondents responded that surveillance system is useful to detect outbreaks of selected priority disease and have an ability to estimate anthrax cases and death in the facility/community, factors related to those diseases and to permit assessment of the effect of the

prevention and control program. The data collected through surveillance system were useful for health policy decision making.

Data Quality

Data collection formats for anthrax clear and easy to fill for all the data collectors/ reporting sites. Some of the missed variables in the weekly reporting formats are date of report was sent and the expected number of health facilities to report, starting and ending dates of the week. Documenting copies of report in in order is poor at district and health facility levels. There were no unknown or blank responses variables in each of the reported forms in the visited health facility and health office.

Acceptability

Reporting agent's willingness and active participation in the case detection and reporting indicate the acceptability of the surveillance system assessed. Of visited district health offices were 100% active participant and the reporting agents engaged in the case detection and reporting. However there were factors influencing sites to participate in the surveillance system like; poor means of communication, lack of feedback and/or no availability of laboratory for confirmation.

Representativeness

The routine surveillance covers all governmental health facilities zonal, woredas health office, health center and health posts, private health facility, and all population under surveillance in the catchment area. The representativeness of the surveillance system is related to the health service coverage, the reporting rate of the health facilities, the health seeking behavior of the community, and the technical capacity of the health care providers. The health service converges of the visited woredas ranges from 85% to 100%. Most of responders agree that the case and death of reported in Anthrax surveillance system represents the real situation in the facility or community.

Timeliness and completeness

The 2017 gc, weekly Report completeness of the zone was all above 80%. However we couldn't able to determine the timeliness of visited health facilities due to incompleteness of data on reporting period. The average weekly reporting rate/timeliness of the zone was 85.9% in the past six month prior to the assessment.

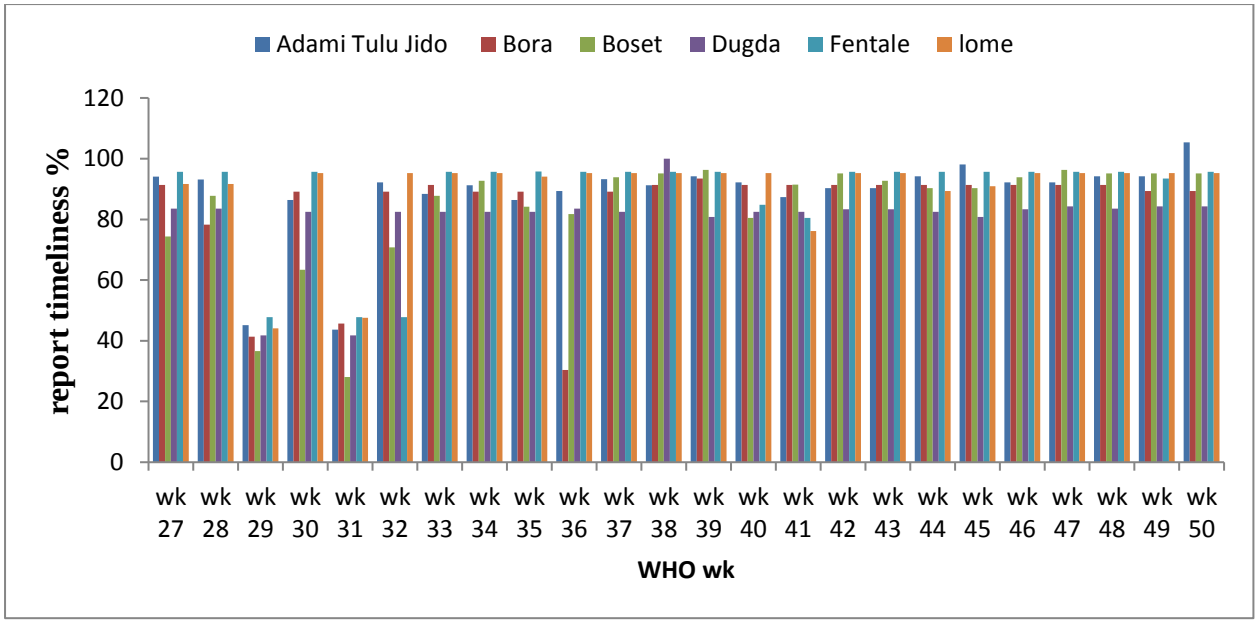

Figure 29: Six month Timeliness of woreda by week East Shewa Zone Oromia, Ethiopia 2017

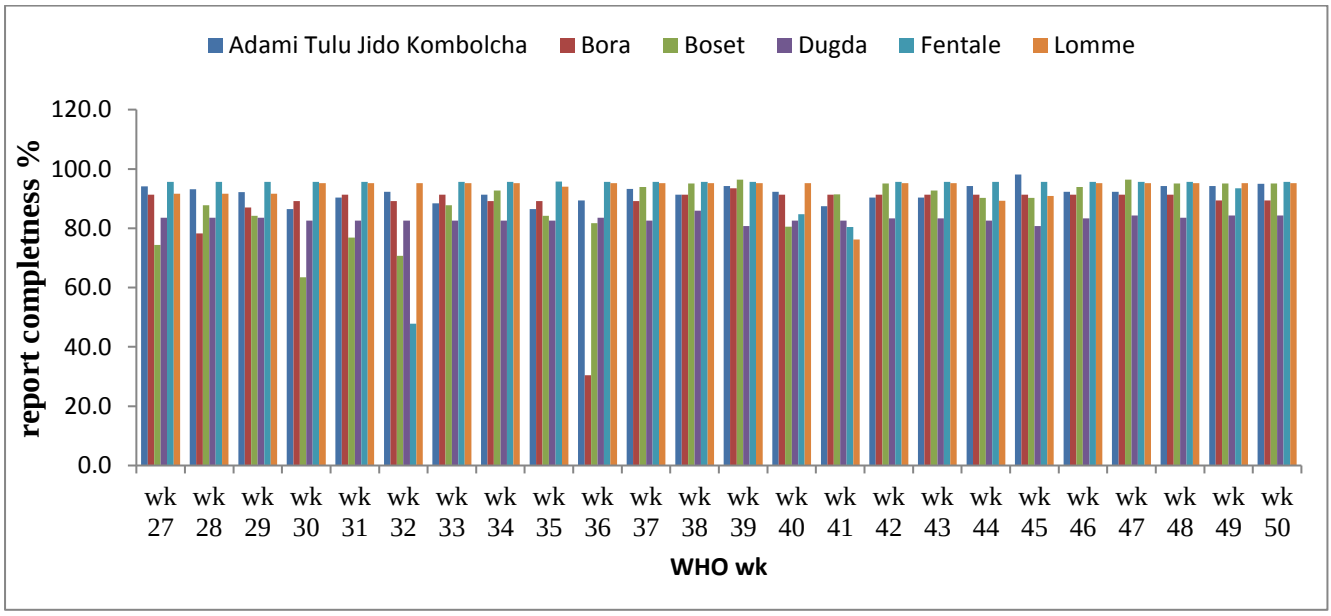

Figure 30: Six month completeness of woreda by week East Shewa Zone Oromia, Ethiopia 2017

Stability

The surveillance system ensured to function in proper way and according to the standard guideline. As all participants responded that as there were no new restructuring affects the procedure and activities of the Anthrax surveillance, there was no lack of resources that interrupt the system and there were no any time and condition that Anthrax surveillance was not fully functioning. Shortage of budget and logistics specific to the system is tackling to undertake supervision and capacity building activity at zonal and district level as per the standard.

Discussion

A public health surveillance system is dependent on a clear case definition for the health-related event under surveillance. Public health emergency management manual was available in most visited health facility and Standard case definitions for Anthrax were seen in most of the health facilities. In some of the health facilities cases definitions of Anthrax were posted in medical director office that suppose to the OPD and public, not utilized appropriately.

East Shewa Zone assessed woreda office and health facility had shortage of reporting formats during the assessment period and six month prior to assessment; they use their own print out paper to send reports. This is due to interrupted supply from national PHEM and its partners.

Case/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 (10). Visited health facilities in the Zone, region and Ethiopia as a Country have no the capacity to collect specimens for anthrax confirmation. In all assessed health facility in the zone there is no available materials required to collect blood for anthrax and don't have guideline to collect and ship samples for Anthrax. This will underestimate the exact number of Anthrax cases and health professionals face difficulties to diagnose the case.

Epidemic preparedness refers to the existing level of preparedness for potential epidemics and includes availability of preparedness plans, designation of isolation facilities, setting aside of resources for outbreak response (10). Written epidemic preparedness and response plan was seen only at the zonal level and 66% assessed woredas, all assessed woredas has no budget line for emergency and 50% of districts were out of stock for emergency drugs. This all makes responses late and provide opportunity for emergencies to stay longer by adversely affecting the public.

Surveillance data flow of is usually from reporting site to the next level up to the national level with unidirectional fluctuation of data, in simple and defined role and responsibility of each reporting entities. But flow has so many obstacles with reporting means and infrastructure like transport, telephone, radio, fax and computers for data management and analysis.

Supportive supervision and Feedback are important function of all surveillance systems. Appropriate feedback can be maintained through supervisory visits, newsletter and bulletins. In all visited level there is no encouraged written feedback. Zonal health office and District health office were not conducted regular supportive supervision according to guide line. Shortage of vehicle, budget and logistics were attributed for not conducting regular supportive supervision at zonal level.

Data analysis is important for detecting outbreaks and unexpected increases or decreases in diseases occurrence, monitoring disease trends. In the visited woreda health offices and health facilities. Practice of analyzing, interpretation and usage of surveillance data at facility and district level is poor, instead they used raw numbers to compare the incidences of diseases with the previous experiences at the woredas and health facilities level. This could be due to the work load and lack of capacity to do data analysis and lack of commitment in all the visited sites.

Simplicity of the system was found good, but the system is not supplemented with other Surveillance systems (with the animal health surveillance system in data sharing), this can underestimate case detection and reporting of the disease.

Acceptability of surveillance by health facilities found in the zone was good and Reporting agents are willing and active participant in case detection and reporting, However there were factors influencing sites to participate in the surveillance system like; poor means of communication, lack of feedback and/or delay in laboratory results. Respondents agreed on the usefulness of the surveillance system for detecting outbreaks and responding accordingly to control it properly.

Stability is the ability to collect, manages, and provides data properly without failure and the ability t o be operational when it is needed. The system is operating well without interference. Representativeness of the surveillance system is related to the health service coverage, the reporting rate of the health facilities, the health seeking behavior of the community. The health service converges of the visited woredas ranges from 85% to 100%.

Limitation

Due to no availability of laboratory service for Anthrax we did not evaluate positive predictive value, sensitivity and specificity of the system. That would add the value of the report.

Conclusion

National manual for surveillance was available at zonal and woreda health office level. Shortage of reporting format at all visited sites. Poor surveillance (PHEM) specific supportive supervision at all level. Data analysis is limited to zonal health office but nonexistent both at woreda and health facility level. Emergency preparedness and response plans were not prepared at all level. There is no appropriate formal training given to HEWs on surveillance, rather simple onsite orientation. The system was not supplemented with animal health surveillance. Supplemented system with the animal health surveillance system in data sharing should be considered. Regarding attributes the surveillance system of the zone was representative, acceptable, stable, flexible and useful. Attributes that require attention for improvement of surveillance process were data quality, timeliness and completeness.

Recommendation

- ✓ Surveillance manual and Reporting formats should be checked and provided on regular basis for lower level by zonal and woreda health office.
- ✓ Specific supportive supervision and continuous feedback system should be strengthened at all level.
- ✓ Refreshment and on job training should be given to the surveillance focal persons, health extension worker by regional, zonal and woreda health office.
- ✓ Woreda health office and respective health facility should analyze surveillance data and interpreted and used for decision making at all levels.
- ✓ Written emergency preparedness and response plans should have to be prepared at all levels of the surveillance system (supervised by zonal health office)
- ✓ Particularly the training needs to be given for health extension workers on surveillance by woreda health office.
- ✓ Establishing supplemented system with other sectors (with the animal health surveillance system in data sharing) should be considered by the Federal/ regional to facilitate surveillance activities.

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CHAPTER – IV

DISTRICT HEALTH PROFILE ASSESSMENT

4.1 Health profile description of Lome District, East Shewa zone, Oromia Region 2016

Abstract

Background: Health profile provides summary health information to support local authority members, officers and community partners to lead for health improvement. Lume district health profile description was not done before unable to find baseline data. The study aimed to assess health profiles of Lume district, East Shewa zone, Oromia, 2016.

Methods: Descriptive cross sectional study design was applied to develop the health profile description. Standard questionnaires were used and secondary data was reviewed. Data were obtained from Health, Education, Water, finance and economy, Agriculture, Culture and tourism and other sector offices. Descriptive statistics calculated and result was presented by graph table and narration.

Result. In 2016 total population of district were 112670, of total 51% were female. The potential health service coverage of the Lume district is 100%. Acute upper respiratory infection (AURI) followed by acute febrile illness accounted for adult morbidity 18.4% and 18% respectively. Whereas diarrhea none bloody and AURI with 28% 21% respectively were the leading cause morbidity for under five children. Antenatal care (ANC) at least one visit and four visits for this district was 72% and 61% respectively. Five TB deaths and eight TB relapse were reported. Seventy percent of kebelles are malarious and (67 %) of population are at risk of being infected by malaria. Skilled health personnel delivery, full immunization coverage and Safe drinking water coverage was 77%, 81.8%, 60.2%, respectively. There is no service for solid and liquid waste disposal in the woreda.

Conclusion and recommendation:

Majority of population are at risk of malaria. Acute upper respiratory infection and diarrhea none bloody are top morbidity cases for adult and children respectively. Presence of treatment failure may facilitate Multi-Drug Resistant and lead to death. Problem of Low latrine coverage, No solid and liquid waste disposal service, Low Safe drinking water coverage Lower TB detection Lower measles vaccination community were identified. Woreda health office and other sectors have to work to prevent communicable disease by promoting hygiene and sanitation for the community.

Key word: Ethiopia, Lume, health profile assessment.

Back ground

Health profile provides summary health information to support local authority members, officers and community partners to lead for health improvement. Health Profiles is a program to improve availability and accessibility for health and health-related information. Health Profiles are produced annually, designed to help local government and health services to make decisions and plans to improve local people's health and reduce health inequalities, the profiles present a set of health indicators that show how the area compares to the national average. The indicators are carefully selected each year to reflect important public health topics (1).

The Health Profiles provide a snapshot overview of health for each local authority. They are conversation starters, highlighting issues that can affect health in each locality. Health Profiles aim is to provide a consistent, concise, comparable and balanced overview of the population's health, and inform local needs assessment, policy, planning, performance management, surveillance and practice, primarily of use to joint efforts between local government and the health service to improve health and reduce health inequalities and empower the wider community. Traditionally the Health Profiles have been a 4 page pdf report. These reports have been produced annually since 2006 - all previous versions are available to download from the website. The most recent pdf report was published in September 2016 and contained 31 indicators. Indicators are reviewed regularly to ensure that they reflect important public health topics. (1).

The Ethiopia country health profiles provide an overview of the situation and trends of priority health problems and the health systems profile, including a description of institutional frameworks, trends in the national response, key issues and challenges. They promote evidence-based health policymaking through a comprehensive and rigorous analysis of the dynamics of the health situation and health system in the country (2).

Health profile of a district is a comprehensive document that contains information about the history and location of the district, its accessibility, its cultural value, political and administrative setup, demographic characteristics of its population, general health status, health indicator, education and socioeconomic status of the district (8).

The purpose of the assessment is to describe health and health related issues in the given district (woreda) and communication of the local burden of morbidity, mortality, any disaster and other public health related information of the district and it is very important document to be utilized by any stake holders in general and public health professionals in specific.

Literature

According to the report of Federal Ministry of Health (FMOH) in 2007 EFY indicates that Tuberculosis (TB) is still among the major public health problem. Detecting and curing TB are among the key health interventions for disease burden. The TB case detection rate was 67.3% in 2007 EFY, TB treatment success and cure rates nationally 92.1% and 77.9% .Oromia TB treatment success and cure rates 39% and 85.1% respectively in in 2007 EFY (5). The 2015 incidence of clinical and confirmed Malaria cases Oromia and national were 885/100,000 and 2109/100,000**.**

Nationally Overall, 36 percent of currently married women are using a method of family planning, 35 percent are using a modern method. Among sexually active unmarried women, 58 percent are currently using a contraceptive method, 55 percent are using a modern method and 3 percent are using a traditional method, among currently married women, the most popular methods are injectable 23%. In Oromia region 28.6% of currently married women and sexually active unmarried women age 15- 49use any method of contraceptive.

The 2016 mini EDHS results showed that 62% of women who gave birth in the five years preceding the survey received antenatal care from a skilled provider at least once for their last birth. Three in 10 women (32 percent) had four or more ANC visits for their most recent live birth. The use of ANC services by a skilled provider and proper number of ANC visits also increases steadily with household wealth. In Oromia region 50.7% received first visit anti natal care from skilled provider. 22.1% had four anti natal care visits (3).

The percentage of live births delivered by a skilled provider remained unchanged for a period of 5 years after 2000, but increased substantially after 2005; from 6 percent in the 2000 and 2005 EDHS, to 10 percent in 2011 EDHS, and reached 28 percent in 2016 EDHS. A similar trend is observed for the percentage of live births that occurred in a health facility; it increased from 5 percent in the 2000 and 2005 EDHS surveys, to 10 percent in the 2011 EDHS, and to 26 percent in the 2016 EDHS(3).

To protect their last birth against neonatal tetanus 49 percent of women received sufficient doses of tetanus toxoid. The infant mortality rate was 48 deaths per 1,000 live births. The child mortality rate was 20 deaths per 1,000 children surviving to age 12 months, while the overall under 5 mortality rates was 67 deaths per 1,000 live births. The neonatal mortality rate was 29 deaths per 1,000 live births, and the post neonatal mortality rate was 19 deaths per 1,000 Live births (3).

The 2014 Ethiopian federal ministry of health report most causes of inpatient deaths are due to communicable diseases, including pneumonia (12.4%), tuberculosis (7%), HIV/AIDS (5.1%) and malaria (3.1%).

According to WHO/UNICEF Joint Monitoring Program 2014 report, the country has improved water supply by 57% (97% in urban areas and 42% in rural areas), thus achieving the Millennium Development Goal (MDG) 7 target 7C. Despite the progress seen in Ethiopia, 43% of the population does not have access to an improved water source. Although the sanitation target has not yet been achieved, there has been tremendous progress during the past decade in improving sanitation and ending open defecation. The progress has been largely due to the establishment of a Government-led WASH coordination mechanism (ONE WASH program) involving Ministry of Water, Health, Education and Finance and Economic Development, as well as development partners(7).

According to FMOH 2015 report proportion of open defecation free kebelles out of the total kebelles for National and Oromia was 26% and 16% respectively (5).

Rational of the woreda health profile description

Lume woreda health profile assessment was not done before. Therefore the purpose of this health profile assessment is to understand the status of health and health related indicators in the given woreda/ district and to identify strategies that improve the access of the community to effective health care and health promotion. Describing health profile is helpful to understand the current health of population and factors that influence community's life. This Health profile generates information that is useful at community level. The data generated from the health profile description will also help the woreda and other stakeholders for public health decision making, resource allocation and priority setting.

Objectives

General objective

- To assess health profiles of Lume Woreda, East Shewa zone, Oromia, Ethiopia 2016.

Specific objectives.

- To describe the demographic characteristics of the population in Lume woreda.
- To identify the availability of existing health infrastructures of Lume woreda.
- To assess the status of health delivery system in woreda
- To describe the health service status and health indicators of Lume woreda
- To identify priority health problems

Method and Materials

Study area

Health profile assessment was conducted at Lume woreda found in the East Shewa Zone, part of Oromia region, about 90 km away from Addis Ababa.

Lume (also spelled Lume) is one of the woredas in the Oromia Region of Ethiopia. Part of the East Shewa Zone located in the Great Rift Valley, Lume is bordered on the south by the Koka Reservoir, on the west by Ada'a Chukala, on the northwest by Gimbichu, on the north by the Amhara Region, and on the east by Adama. Most of this woreda ranges in altitude from 1500 to 2300 meters above sea level. The 2007 national census projected a total population for 2016 of this woreda was 112670, of whom 55356 were men and 57215 were women. The three largest ethnic groups reported in Lume were the Oromo (66.1%), the Amhara (29.66%), and the Silt'e (1.15%); all other ethnic groups made up 3.09% of the population. Oromiffa was spoken as a first language by 57.53%, and 40.53% spoke Amharic; the remaining 1.94% spoke all other primary languages reported (3).

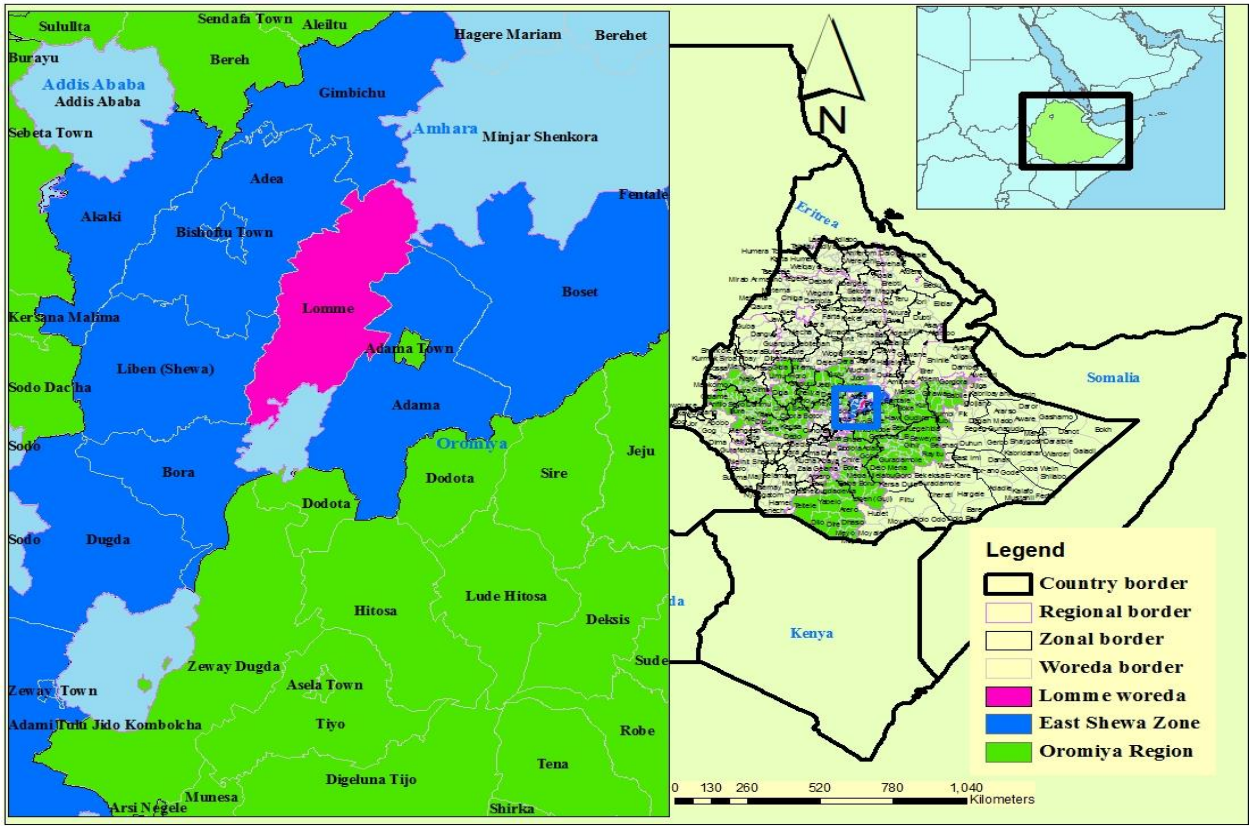

Figure 31: Administration Map of Lume woreda

Study period

From February 13/02/2017 up to 30/02/2017.

Study design

Descriptive cross sectional study design was applied

Sampling techniques: Purposive sampling technique was used. The study area was selected by discussing with zonal health office and among 12 woredas found in the zone.

Source of data: Secondary data (administrative data) was used to prepare/compile this profile. The sources of data include:

- Health office,
- Culture and tourism office
- Plan and Program Core Process sector bureau
- Agriculture and rural development office,
- Education office, District finance and economy office
- Water office and other sectors of the woreda
- Review of related Literatures conducted in Addis Ababa & Addis Ketema Sub City

Data collection tool and procedure

Standard semi structured questionnaires were used as tools and reviewing available data was used for collecting district health profile. The assessment survey marks the involvement of multiple department offices at various levels to ensure credibility of the findings. Before starting data collection brief discussion with woreda Health office and other offices on the purpose and benefit of this work were takes place.

Data analysis

Micro-Soft Excel was used to compile and analyze the collected data. Descriptive statistics like frequencies, percentages and ratio was calculated to describe the collected health profile data. The result is presented in the form of narration; table and figure will be used.

Ethical Consideration

A formal letter will be submitted to the data manager at each source organizations in order to get access to the data. Confidentiality was assured and maintained. (Ensuring that information is accessible only to those authorized to have access).

Dissemination of findings: The result of the study was disseminated to Addis Ababa university school of public health, East shewa zone Health office, and Lome Woreda Health Office.

Operational Definition

Maternal mortality rate: - Number of deaths assigned to pregnancy-related causes during a given time interval

Infant mortality Rate: - Number of deaths of children < 1 year of age reported during a given time period among Number of live births reported during the same time period.

Skilled Birth Attendant Delivery: - delivery which is attended by health professionals in Facility

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

Ante natal care 1 (ANC1): - Number of pregnant Women received ante natal care at least one time.

Antenatal care 4 (ANC 4): - Number of pregnant Women received ante natal care at least four time.

Post Natal Care Coverage: - Proportion of women who seek care, at least once during postpartum (within 42 days after delivery), from a skilled health attendant.

Still Birth rate: - proportion of stillbirths from total births attended by skilled health attendants.

TB treatment 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 detection Rate: - TB case detection rate is number of new pulmonary and extra pulmonary (all forms) TB cases detected, among the TB cases estimated to occur countrywide.

TB treatment success rate: - a percentage of a cohort of new TB cases registered in a specified period that successfully completed treatment.

Result

Historical background and culture

Lume is one of the 309 woredas found in Oromia region and one of woredas found in East Shewa Zone. According to the tourism office, Lume was named after a famous and key person whose name was Lume, who was known as called Lume Miecha who was the land lord of the woreda before the reign Hailesilase government,. There is no written document to confirm this.

Location, Geography and Climate

Lume woreda is 73Km away from Addis Ababa and 19Km away from Adama town the administrative seat of East Shewa Zone. The woreda is found in the eastern part of East Shewa Zone, is surrounded by four woreda's of East Shewa and one woreda of Amhara region. The woreda shares border on the North- bounded by Gimbichu district and Amhara region, on the South – bounded by Bora and Adama district, on the East- bounded by Adama district, on the West- bounded by Liban Chukala and Adea district. Towns in woreda include Ejere, Daka bora and Koka Ejersa, Biyo, kemise. Mojo is the administrative seat of the woreda. The total area of the Lume woreda is about 75,200 hec Area. As a result in east Shewa zone woreda' gets the 2nd rank in terms of area next to Adea woreda.

According Lume woreda land use and environmental protection office report, total land area of the woreda is 75200 hec. from the total land area of the district potentially cultivable land constitute 51830.4ha, (cultivated) land 47582ha, , manmade forest (reforested) 2462ha, uncultivable land (hills) 7523ha, grazing land 361.08ha and others 17272ha. It is found 1500-2500 meter above sea level and contains some mountain and plateaus at southern part. 50% of district above 2000m and the rest 50% is < 2000m. Climatically, the district is classified into highland (dega) 5%, midland (woinadega) 95%. Rain fall is ranges from 750 to 1500mm, with an average annual rain fall of 750 mm. According to woreda agriculture office, four major seasons occur per year; only one seasons (mehir) concessive for production of agricultural activities.

Administrative and political structure

Administratively, Lume woreda is divided into 41 kebelles (35rural and six urban kebelles) of the smallest administrative units. It has a well-organized political structure and its own counsel that works harmoniously with all governmental sectors of the district and the zone.

Socio-demographic characteristic

The 2007 national census projected 2016 total population for this woreda was 112670 of whom 55424.71 were men and 57245.33 were women. From these total population 85% of woreda's population residing in rural areas. The majority of the inhabitants follow Ethiopian Orthodox Christianity, with 90.11% of the population reporting they observed this belief, while 3.4% of the population practiced traditional beliefs, 3.27% of the population were Protestant, and 2.72% of the population were Muslim.

Table 12: Estimated Population per kebelles of Lome district, East Shewa zone, Oromia, 2016.

S No	Name of kebeles	Male	Female	Total
1	Bali Abboo	2096.73	2090.37	4187.1
2	Jirmi Insilalee	1444.32	1511.23	2955.55
3	Arifeta Joggoola	956.4	1007.86	1964.26
4	Momo Shokkii	1338.35	1401.12	2739.47
5	Tafi Abboo	1452.98	1513.66	2966.64
6	Biyo Bisiqqee	803.62	845.64	1649.26
7	Kurma Fantoolee	1692.71	1761.65	3454.36
8	MalMalee	632.835	658.56	1291.395
9	Tade dildimaa	1048.87	1067.82	2116.69
10	Golje Dildimaa	1370.44	1430.12	2800.56
11	Bola Butaa	1497.2	1557.91	3055.11
12	Jogo godedoo	1672.13	1741.07	3413.2
13	Kolba Godee	1914.36	1994.62	3908.98
14	Tulu rahee birmaji	1083.54	1127.78	2211.32
15	Kora Fincawaa	860.693	894.65	1755.343
16	Adeda Danbalaa	1249.21	1300.66	2549.87
17	Ejere	1017.68	1058.84	2076.52
18	Danse Shanburee	1288.31	1340.79	2629.1
19	Tilti Garbii	1050.61	1092.8	2143.41
20	Ejere Walqixxee	1601.12	1666.98	3268.1
21	Dani Jahatanii	1271.84	1324.32	2596.16
22	Finchawa Mariyam	660.502	683.256	1343.758
23	Ardaga Kordidaa	1328.44	1382.98	2711.42
24	Naanawaa	1209.73	1267.35	2477.08
25	Dildila Gomboree	1696.82	1765.76	3462.58
26	Daka boraa	2236.02	2327.6	4563.62
27	Haroo Yohannisa	1203.93	1252.29	2456.22
28	Kiltu Baajaa	1645.84	1725.07	3370.91

29	Kunche Daalotaa	1288.31	1340.79	2629.1
30	Biqqaa	839.664	874.65	1714.314
31	Muda Sanqallee	1238.92	1290.37	2529.29
32	Ejersa Jorroo	1348.41	1406.4	2754.81
33	Darar Danbalaa	1323.29	1377.83	2701.12
34	Dungugi Baqalee	1294.11	1354.82	2648.93
35	Koka Nagawoo	1141.45	1188.78	2330.23
36	koka ejersa 01	1920	1994.2	3914.2
37	koka ejersa 02	2857.53	2973.81	5831.34
38	Sheera Dibandiba	1217.4	1387.32	2604.72
39	kemise	1012	1008	2020
40	Dakabora	1168.4	1205.6	2374
41	Biyo	1450	1050	2500
	Total	55424.71	57245.33	112670

Population pyramid shows the count of a population by age and sex. The pyramidal shape of the population distribution of Lume district indicated short life expectancy.

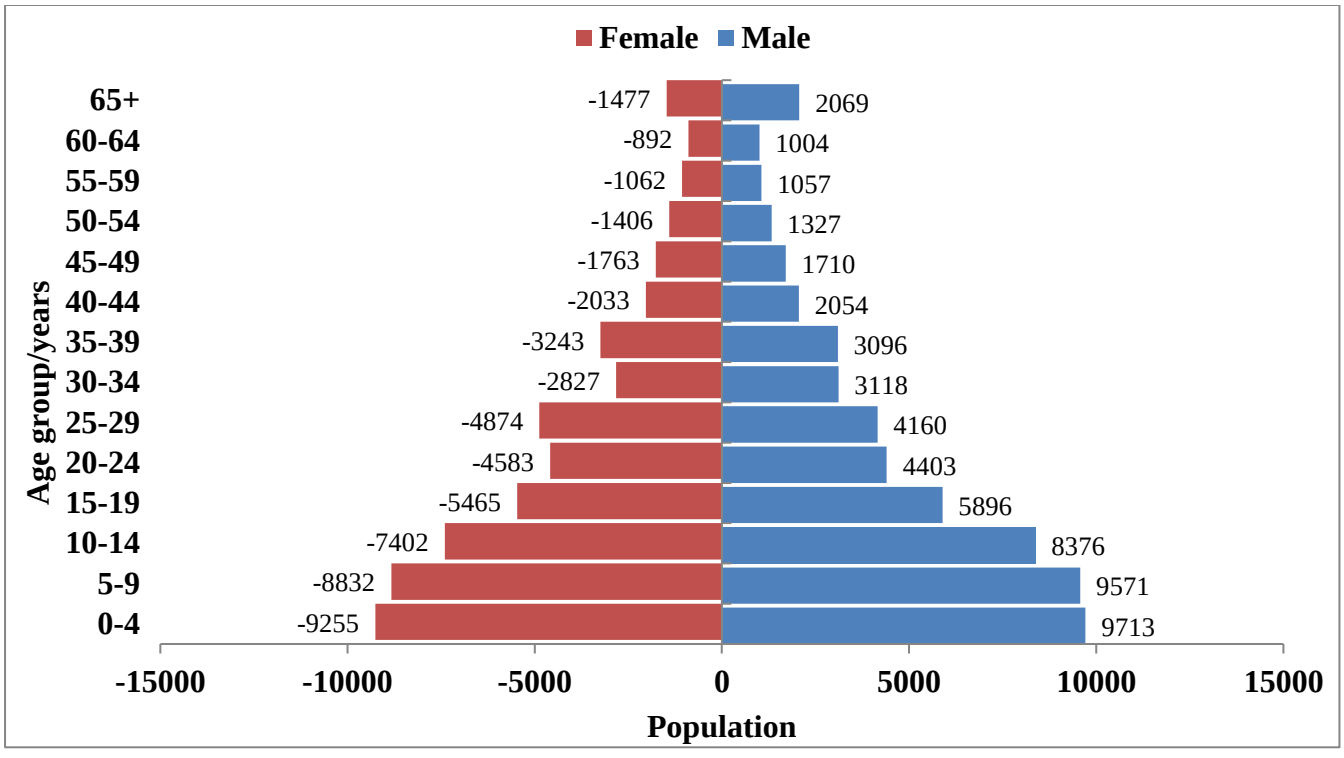

Figure 32: Population pyramid of Lume District East Shewa zone, Oromia Region, Ethiopia 2016.

Education

In Lume woreda there are 62 primary cycle schools with a total of 18014 students (9586 males and 8428 females), three (9-10) secondary school with a total of 1210 (693 males and 517 females) and one preparatory school with a total of 41 students (22 males and 19 females). Overall, student was 19265 with a total educational coverage of 56.6%. There is no TVET and college in the woreda. Crude school dropout rate for 2008EC was 4.6% and sex specific dropout rate for males were 5.7% and females were 3.4%. The possible reasons for the dropout rate were: to help family during farming, disease, transfer out, getting married and others but no data were found on percentage of dropout due to marriage and other. One preparatory, 03 high school, and 27 Elementary Schools had water supply. Schools with latrine for both sexes were 18Elementary, 03 high schools and 01 preparatory. Almost all schools have different clubs like: HIV, Environmental, Females and Ethics. The woreda Education officers have no data on level of education for 2008EC.

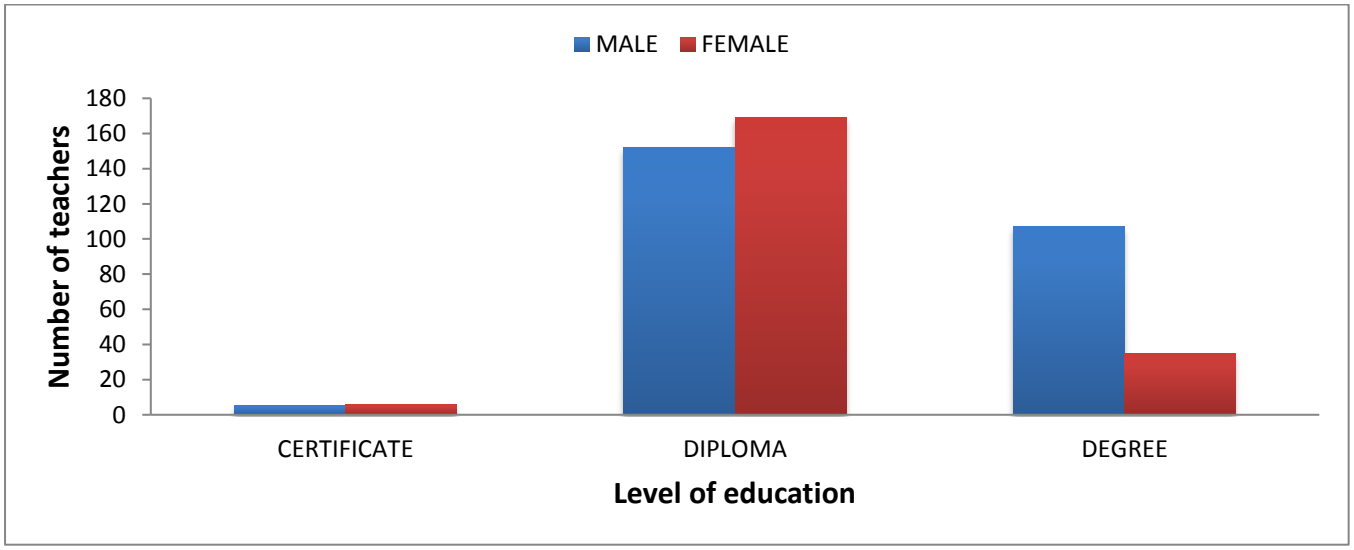

Figure 33: Number of Teachers and their educational level in Lume woreda, East Shewa zone, Oromia, Ethiopia 2008.

Productivity and income

As the life of most of the societies in Ethiopia depends on agricultural activities, the same is true for the society of Lume woreda. The main source of income for the inhabitants of the woreda is mixed agriculture. Out of total population, about 85% of households are dependent on crop and animal productions. In 2008 EFY The cultivated area covers about 47582 hectares and gives annual 1816774 quintals from both rainy season and irrigation activities. The mainly produced crops were wheat, Teff and others. The average monthly or yearly income of individual in the woreda is not known.

Table 13: Types and number of crops in the Lume woreda, East Shewa zone, Oromia Region, Ethiopia, 2008 EFY.

Product item	Product per quintal	percentage
Wheat	752723	41.4
Teff	501758	27.6
Barley	35488	2.0
Maize	35770	2.0
Beans	33375	1.8
Pea	12619.5	0.7
Lentil	105201	5.8
Navy Beans	32316	1.8
Chickpea	302523.6	16.7
Vetch	5000	0.3
Total	1816774.1	100.0

4.7. Health service institutions and infrastructures

There are 35 health posts, eleven clinics, five health centers and no Hospital in the woreda. Health facility to population ratio of the woreda was (1:25000 and 1:5000 for H.C, HP). In Lume woreda health facility to population ration H.C 1:22534, H.P 1:3220 population and 11 private clinics for 1:10248 provide the services. In terms of electric power, telephone service and water supply: five health centers have sustainable 24 hours electricity service and three health centers have telephone (mobile and fixed telephone) while two health centers were without telephone service, five of health centers have piped water source, Out of five health centers, all have year round transportation access. From a total of 35 health posts 29 of them has lack of electricity; all health post has lack telephone service and piped water supply. Out of thirty five health post five of them have no round transportation access. This is difficult situations for health professionals to transport necessary drugs and other medical supplies to that area. Due to proximity of the woreda to Addis Ababa and Adama health center found in the Lume woreda health centers are giving only outpatient services. The potential health service coverage of the Lume woreda is 100%.

Table 14: Number of health facilities by type in Lume Woreda, East Shewa Zone, Oromia Region, 2008 EFY.

Types of health institution	Number of health institution	Remarks
Hospital	0	planed
Health center	5	Government
Clinics	11	Private
health post	35	Government
Drug store	03	Private

Human resource and man power in health institutions

Government health employees distribution in the woreda was as follows: thirty seven Nurse, Ten Midwife, eight Health officers, six Medical laboratories, six Pharmacy and druggist, three Environmental health, three health information technologist, sixty seven HEWs and thirty five non-health professionals. The health professional to Population ratio for HO 1:14084, for nurses and Midwife of the woreda are 1:3045 and 1:11267 respectively). In addition, there is 3,254 Health Development Army (HDA) in the woreda which is selected from the society to work with the health extension workers to accelerate community health service program.

Table 15: Human resources in Health facility of Lume woreda East Shewa Zone, Oromia, Region, Ethiopia, 2008 EFY.

professional type	level of education	Number of professional		Total
Health officer (HO)	Degree	06 male	02 female	08
Nurses	Degree	03 male	07 female	10
	Diploma	10 male	17 female	27
midwifes	Degree	0	0	0
	Diploma	02 male	08 female	10
Laboratory	Degree	03 male	0 female	03
	Diploma	01male	02 female	03

pharmacy	Degree	01 male	0 female	01
	Diploma	04 male	01 female	05
Env. Health	Degree	03 male	0 female	03
	Diploma	0	0	0
HIT	Degree	0 male	03female	03
	Diploma	0	0	0
HEWs	Diploma	0	67 female	67
Others supportive staff				35

Priority diseases

The top ten leading causes of adult outpatient visits 2008 EC, in Lume woreda were: Acute upper respiratory infection (AURI) followed by acute febrile illness (AFI). There is no inpatient (admission) service in Lume woreda, due to proximity of the woreda to Adama town.

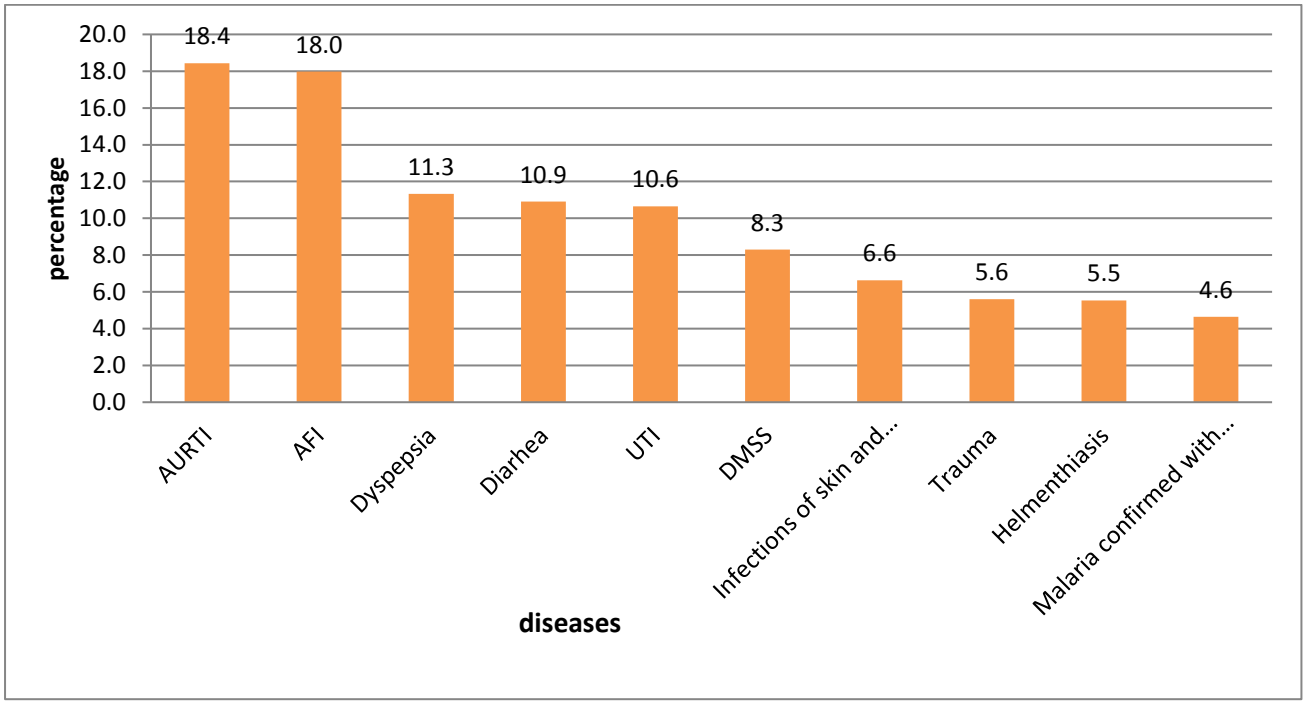

Figure 34: Top ten causes of adult OPD visit in Lume woreda, East Shewa Zone, Oromia, Ethiopia 2008.

For under -five children the leading causes OPD visit in 2008 EC for the woreda was diarrhea non-bloody (28.5%) followed by acute upper respiratory infections (21.7%).

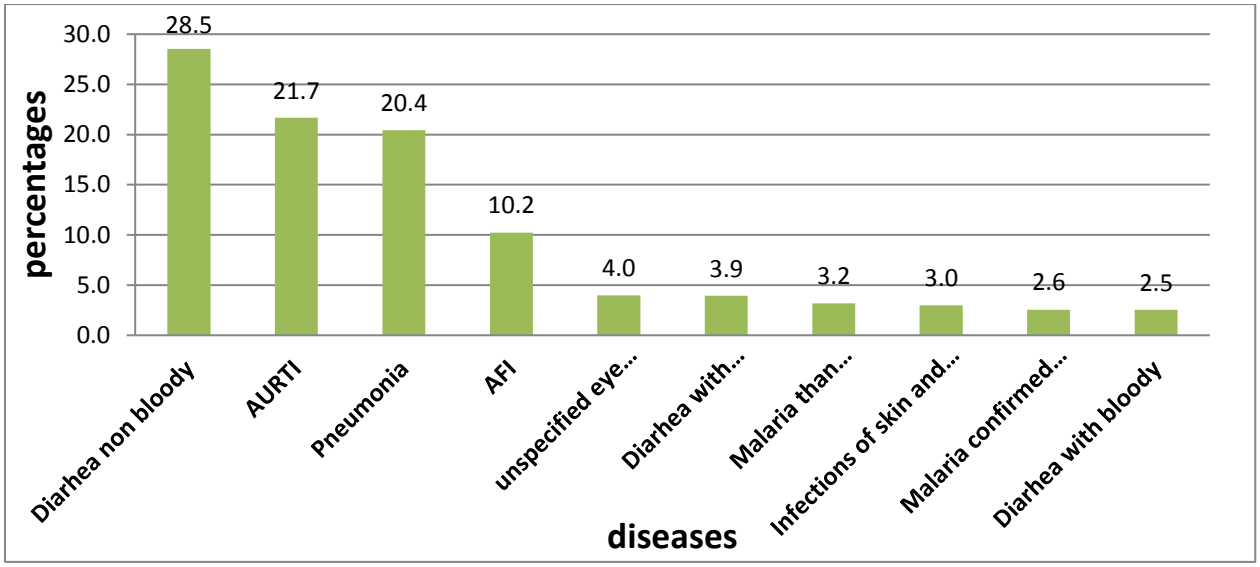

Figure 35: Top ten causes of under 5 years OPD visits of Lume woreda, East Shewa, Oromia Ethiopia 2008.

Vital statistics and health indicators

In Lume woreda has total population of 112670 of which 55206 (48.9%) are males and 57461 (50.9%) are females with a total of 23473 households. The average household size is 4.8 people per household. Vital statistics and Health indicators are important to estimate and evaluate performances of health activities and to set strategies as needed.

There is no data of some vital statistics such as Maternal Mortality Rate, Infant Mortality Rate, Under Five Mortality Rate, and Crude Death Rate in the woreda.

Table 16 : Population and Vital statistics in Lume woreda, Oromia, 2008 E.C.

S/No	Parameter	Number (%)
1	Total population	112670
2	Male	55425
3	Female	57245
4	Under 1 years old	3605
5	Under 5 years old	18478
6	Under 15 years old	54081
7	Female 15-49 years old	24900
8	Pregnancy	3910
9	Live birth	3910
10	Non-pregnant women	20990
11	Average house hold size	4.8
12	Infant mortality rate	No data
13	Under 5 mortality rate	No data
14	Crude birth rate	No data
15	Crude death rate	No data

Maternal health service coverage

The woreda maternal health service coverage in 2008EFY was as the following: 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). Antenatal care (ANC) coverage at least one visit for this woreda was 72%, ANC coverage at least four visits was 61%.

Number of births attended by skilled health personnel in 2008 EFY of this woreda was 3010 (77%). During 2008 EFY 40 woman received comprehensive abortion care service, out of this 39 of them were age greater than 18 years old. A large proportion of maternal and neonatal deaths occur during the first 48 hours after delivery. Thus, prompt postnatal care (PNC) for both the mother and the child is important to treat any complications arising from the delivery, as well as to provide the mother with important information on how to care for herself and her child, post natal care service in the same years was 97%. Family planning refers to a conscious effort by a couple to limit or space the number of children they have through the use of contraceptive methods. Contraceptive prevalence rate (CPR) of the woreda was 17286 (82%) in 2008 EFY.

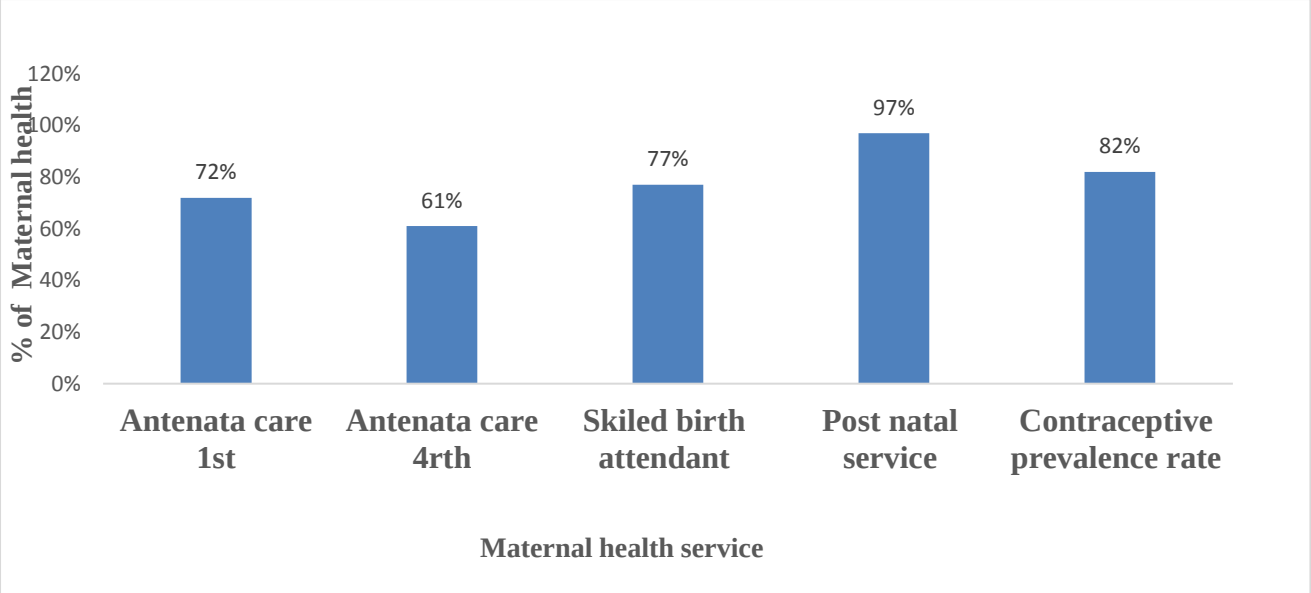

Figure 36: Status of maternal health service of lume woreda 2008EFY

Contraceptive acceptance rate (CAR)

CAR is proportion of women of reproductive age (15-49 years) who are not pregnant who are accepting a modern contraceptive method (new and repeat acceptors) (10). Contraceptive acceptance rate of Lome Woreda was 73%. Of total new and repeat acceptors disaggregated by method, 84% of them were repeat acceptors. Among new contraceptive acceptors during the study period, 63.3% of clients accepted injectable contraceptive method, see graph below.

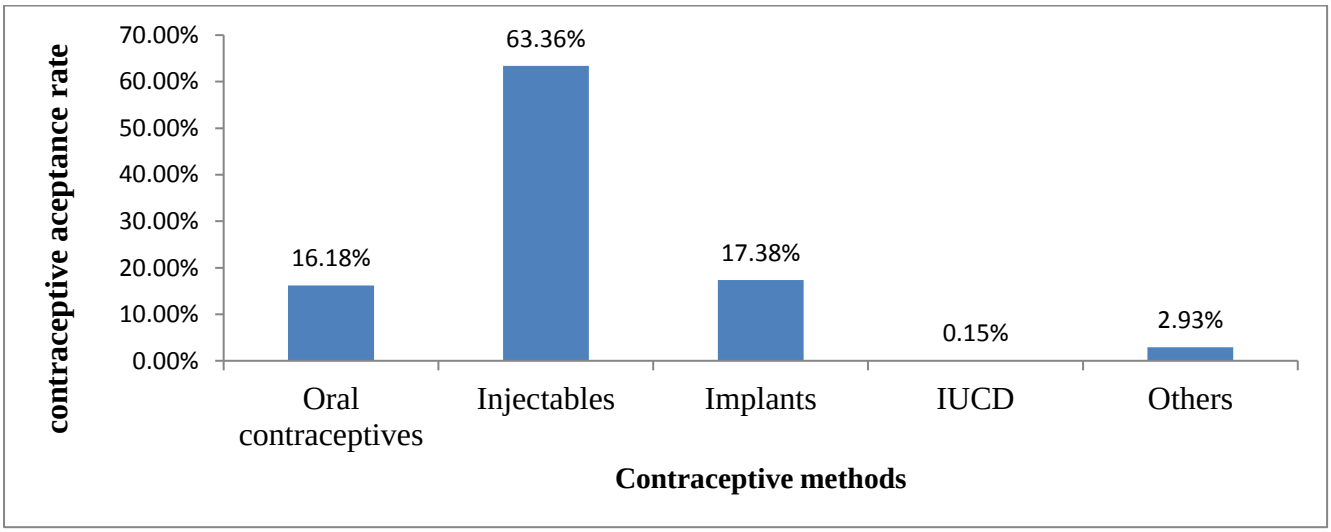

Figure 37: New contraceptive acceptors disaggregated by method of Lume woreda east showa zone 2008 EFY.

Immunization coverage

Expanded Program on Immunization (EPI) is focused on vaccine preventable diseases and one of the health sector programs involved in disease prevention and control. Full immunization coverage of Lume woreda in 2008EFY was 81.8%. Neonatal tetanus preventable cause of neonatal mortality globally, TT coverage for a 15 – 49 years old woman the woreda was 43%.

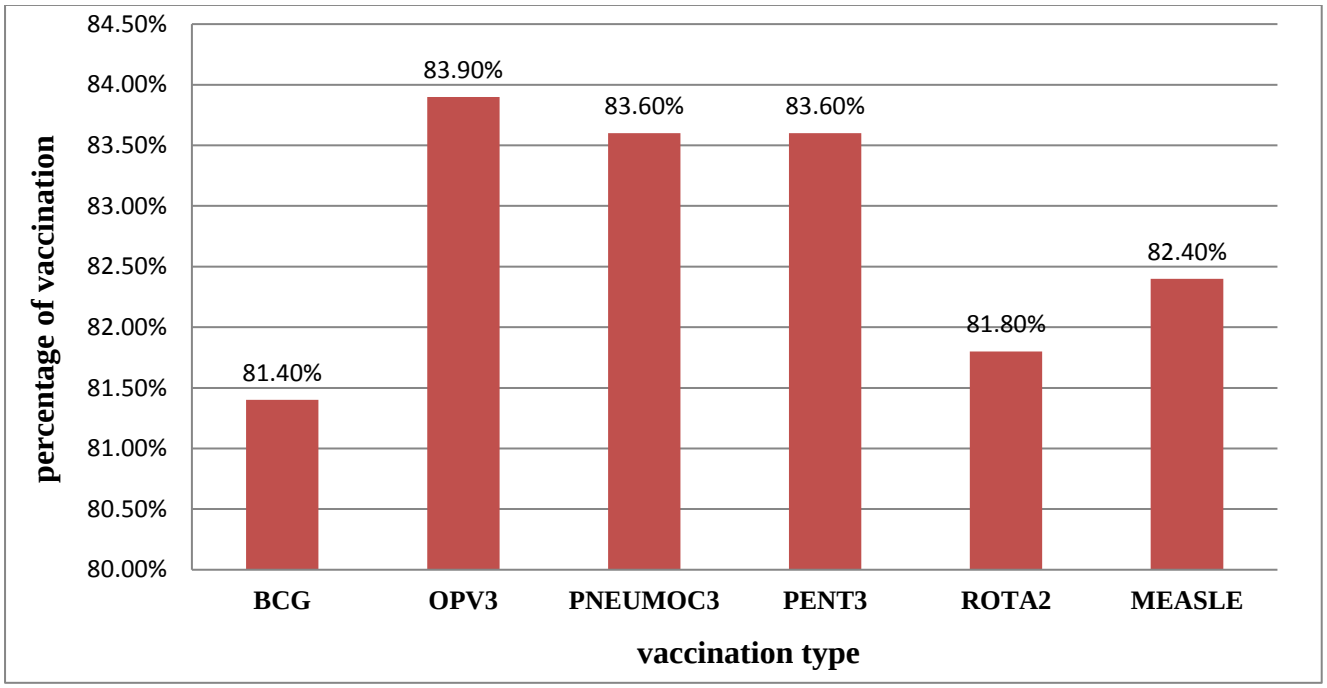

Figure 38: Immunization status of Measles case, Lume woreda, Oromia 2008 EFY

Water, Sanitation and Hygiene (WASH)

Hygiene and environmental Health has a great impact on Human health. Our environment may be contaminated in different ways. If these contaminants are not managed timely, it can affect human health. Lume woreda Safe drinking water coverage was 55% for rural population and 45% for urban population. Source of water was hand dug wells and deep wells. Pit latrines were the dominant type, the latrine coverage of the woreda was 71.6%. There was no data on utilization rate of the latrine made. No solid and liquid waste disposal servise in the woreda including in the towns and no employed staff for this purpose. Health education was given at the health centers and health posts by different health professionals and at home by HEWs. The topics covered by the health education were on communicable disease like HIV, TB, Malaria, FP, Immunizations and environmental sanitation.

Endemic disease

Malaria

In Lume woreda 70% of kebeles (29/41) are malarious and 75756 (67 %) of population and 15783(62.7%) house hold of are at risk of being infected by malaria. From a total of malaria cases during 2008 EFY there was 2369(3.12%) confirmed malaria cases detected, out of this 280(12%) were under five children and no deaths were reported during this year. Among total of 2369 confirmed malaria cases 1186(5.1%) of were p. vivax specious and 1183 (49.9%) were p. falciparum species. Insecticide treated nets (ITNs) were distributed to Malarious kebeles in 2008EFY which covered all house hold 15783 100% of the hose hold population. The woreda health office has applied indoor residual spray (IRS) for 11 (37%) of the woreda malarious kebeles, which is for a total of 29739 (40%) of at risk population. During 2008 EFY there were no major shortages of anti-malarial drugs and other supplies.

Tuberculosis

According to Lume woreda health office during 2008EFY A total case of tuberculosis (all forms) 170 were detected in woreda; of which 49(29%) were smear positive PTB, 62(36%) were extra PTB, 59(35%) smear negative PTB and 8 relapse TB patient reported. There were five deaths caused by TB and two lost follow up. There were no TB treatment failure and defaulter In 2008 EFY. TB detection rate for the woreda was 60.2%. From a total of TB cases 159(93.5%) of patients were tested for HIV, of this 20 of them were positive and all of them were linked to ART service.

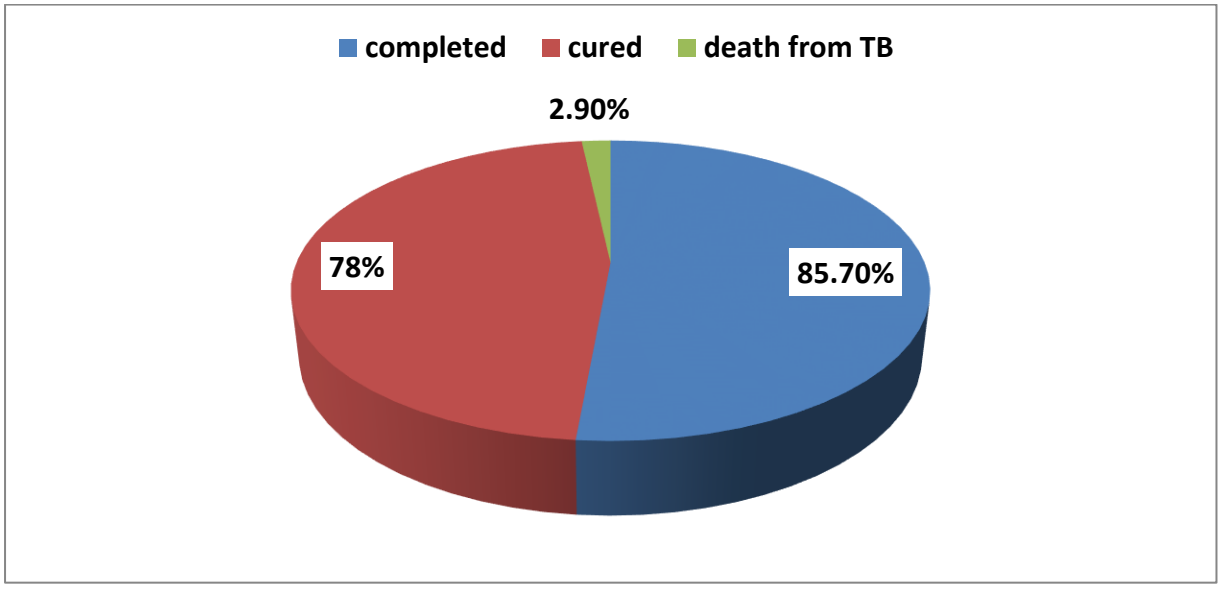

Figure 39: Distribution of Pulmonary TB Treatment Outcome Lume woreda enrolled in and Complete Treatment Cohort in 2008 E.C.

HIV/AIDS

During 2008 EFY, A total of 5278 people screened for HIV/AIDS among those 40(0.75%) were positive of which 9(22%) were male and 31(78%) were female. From the total 40 positive cases 27(67.5%) were enrolled for pre ART chronic care in initiated and put on anti-retroviral therapy (ART). Total number of people living with HIV/AIDS (PLWHA) in the Woreda in the same year was 836. The total Number of HIV positive persons receiving CTX prophylaxis was 738 and Number of adults and children with advanced HIV infection ever started on ART was 98. Out of five health centers in the woreda only one health center Koka gives ART service. No data found on other sexually transmitted disease.

With regards PMTCT a total of 2835 pregnant women were attended for ANC service in Lume woreda, out of these pregnant women 2027 (72%) were tested for HIV during ANC follow up and labor. Out of tested women 13(1.3%) were positive for HIV virus, 13 of them were received full course of ARV prophylaxis's and no refer to other health facility. In the same year 7 HIV positive women delivered in facility and all 7 neonates were received full course of HIV prophylaxis. No data found on other sexually transmitted disease.

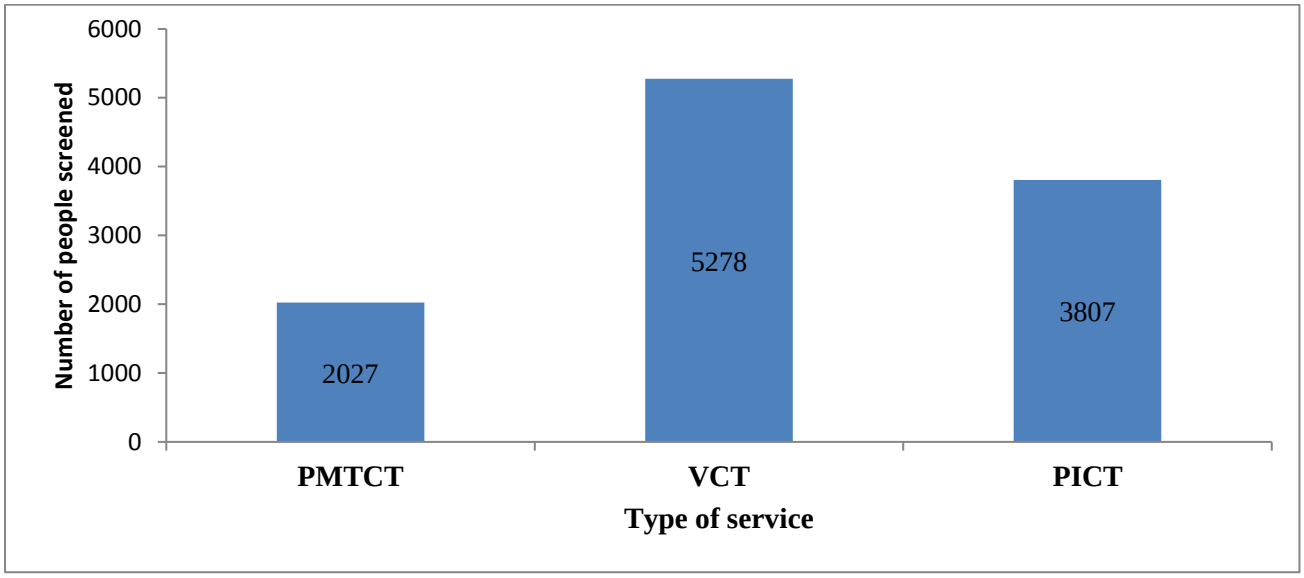

Figure 40: Performance of VCT, PIHCT and PMTCT Lome district East Shewa zone Oromia Region 2016.

Disasters and Nutritional status

There was an epidemic of AWD during 2016 EFY July month, there were 16 cases, and two cases were confirmed, with no death. There was no significant malnutrition problem in the woreda. In Lume woreda a total of 64 children were treated at OTP sites and all were cured. There are 36 OTP and five SC sites were available and also there is targeted supplementary program and community based nutritional program.

Budget allocation for woreda health office

2008 EFY 79,292,325 ETB was allocated for the woreda, out of this 9,247,298 was allocated for woreda health office. Of total budget allocated for woreda health office 73% for salary and 27% for running different programmatic activities.

Discussion

Acute respiratory tract infection was the leading cause of morbidity in the woreda, accounting 18.4% in adult this was higher than the national prevalence of OPD visit reported in 2015/2016 as 7.77 %. In under five children OPD visits diarrhea non-bloody was the leading cause OPD visits followed by acute respiratory tract infection 28.5% and 21.7%, this was higher than the national prevalence of OPD visit reported in 2015/2016 as 24.88% and 13.70% respectively (5). This might be due to the poor environmental sanitation which exposed them to easily prevented communicable disease.

The safe drinking water coverage 2008 EFY of the woreda was 45% for urban community, which was lower than the national coverage which was 97%, whereas the rural safe drinking water coverage in was 55% which was comparable with the national coverage 56 % (3). The latrine coverage of this woreda lower than regional latrine coverage (9).

TB detection is a tool that plays a great role to decrease TB prevalence by increasing early initiation of TB treatment and that enables us to decrease TB transmission. Among the new all forms TB cases estimated in the woreda, TB detection rate was 60.2% and lower than the national TB detection rate which is 67.3% (3). This is an area which needs improvement. Among new TB smear positive cases in the woreda TB treatment completeness and TB cure rate were 85.7% and 78% respectively. There were no TB treatment failure and defaulter In 2008 EFY. All those died patients were on anti-TB treatment in the same year. From a total of TB cases 159 (93.5%) of patients were tested for HIV, of this 20 of them were positive and all of them were linked to ART service.

Tetanus is a major cause of early infant deaths in many developing countries, Tetanus toxoid immunization coverage for a 15 – 49 years old woman the woreda was 43%, this is by far lower than the national and Oromia which is 55% and 47% respectively (3).

Drinking water from unprotected sources; rivers, springs and holy water sites; Open defecation due to lack of latrines, poor solid waste collection and disposal, Poor food hygiene, eating raw/ uncooked foods and overcrowding were identified as the common risk factors for the AWD outbreak. In 2016 July month there was AWD outbreak. In 2008 EC there was 16 AWD case were treated and all were recovered (no death). Absence of solid and liquid waste disposal system and low safe drinking water coverage in the woreda could be the reason for the occurrence of epidemic and other endemic diseases.

The proportion of pregnant women who had at least one ANC visit was 72% and 61% for woman who had four visits. This was greater than national 62% and 31.8% and in oromia region 50.7% woman who had first visits, 22.1% woman who had four visits. It was encouraging and the facility should

work for more success in increasing to give care for pregnant woman. The percentage of deliveries assisted by skilled health personnel was 77% which was greater than national and Oromia region figure 27% and 19.7% respectively (3).

Immunization coverage of the children was encouraging, full immunization coverage of Lume woreda in 2008EFY was 81.8 percent; this is above national and oromia region coverage 38.5% and 24.7% respectively (3). All vaccination performances were more than 81 percent. This showed that community awareness and outreach activities were performed well done by strengthen activity of health extension workers and health development army. Other reason for maximization of vaccination coverage is routine supplementary immunization activities were done integrated with national campaign. But Measle vaccination coverage of the woreda 82% is lower than the national 95% and regional 98% coverage (11).

Health facility to population ratio of the woreda is above the standard of the ministry of health (1:25000 and 1:5000 for H.C, HP). In Lume woreda health facility to population ration H.C 1:22534, H.P 1:3220 population and 11 private clinics for 1:10248 provide the services.

Strength of the health profile description

This document is help to simplify and communicate information on health indicator and the local burden of disease in a practical, accessible format for district health planning. It is intended for use by district health management team, federal/provincial/regional governments and development partners.

Limitations

Vital statistics like Infant mortality rate, neonatal mortality rate, under five mortality and maternal mortality rate were not available either at woreda health office or health institutions level. Some of the experts from different offices in town have less knowledge of their office information and also sectors use different population as denominator instead of using the same population size. Getting the right on time in their office was very difficult situation.

Conclusion

- More than half of the morbidity outpatient visits were accounted by the top ten causes of morbidity.
- Acute upper respiratory infections were the leading cause of morbidity for adult in the woreda and diarrhea non-bloody were the leading cause of OPD visits for less than five children.
- Majority of kebelles population are at risk being infected by malaria.
- Low coverage of measles vaccination in the woreda
- There was no data on utilization rate of the latrine made and there is no service for solid and liquid waste disposal system.
- There was Low performance of safe drinking water coverage, TB detection rate and TT immunization in the woreda in comparing with the national one.
- Vital statistics and Health indicators like, maternal mortality rates were not recorded.
- No electric power and telecommunication in majority of health post
- Better performance were seen in ANC follow up, Number of births attended by skilled health personnel, and post natal coverage in comparing national and regional figure.

PROBLEM IDENTIFIED

Table 17: Problem Identified and prioritized

	Identified Problems	Relevance	Availability of	Urgency of the	Feasibility	Political	Applicability	Ethical	Total	Rank
1	Low latrine coverage	3	2	2	3	3	2	3	18	2
2	Low Safe drinking water coverage	3	3	3	2	3	3	3	20	1
3	No solid and liquid waste disposal service	3	2	3	3	3	2	2	18	2
4	Lower TB detection	2	2	3	3	3	2	2	17	3
5	Lower measles vaccination	3	3	2	2	3	2	2	17	3

Key: - Each indicator was scored out of three

Action plan

Table 18: Major health problem identified and action plan with responsible body

SN	Theme Intermediate goal	Objectives	Tasks	Responsibility	Timeline	Evaluation
1	Improving latrine coverage	To construct new latrine with standardized sewage disposal system	Communication of concerned (bodies) Writing Proposal for finance Requesting for Budget Constructing the Latrine	Oromia, zonal & Woreda Health offices with development partners and WASH team	**March - August ,2017**	Communication with OHB,ZHO &Woreda health office &WASH project about the accomplishment of the proposed project
2	Improving /Establishing standard solid and liquid waste disposal system	Providing appropriate Septic tank waste disposals & solid waste disposal containers	Communication of concerned (bodies) Writing Proposal for finance Requesting for Budget Construction of sewage system & provision of septic tank &containers.	Oromia, Zonal & Woreda Health office, Any organization with WASH project partners	**March – December ,2017**	Sufficient size of septic tanks after Deceber in the woreda sites Sufficient number of solid waste disposal Containers after December
3	Improving Safe drinking water coverage	Providing safe drinking and adequate water supply	Communication of concerned (bodies) Writing Proposal for finance Requesting for Budget Providing of safe drinking water for the community	Oromia, Zonal & Woreda water and sewerage office, Any organization with WASH project development partners	**March,2017- February 2018**	Communication with OHB,ZHO &Woreda health &water office about the accomplishment of the proposed project
4	Improve TB detection Improve measles vaccination coverage	To improve TB case detection and measles vaccination coverage	Oromia, Zonal & Woreda Health office including professional will discuss on the gap identified Training for professionals on case dection & plan to maximize measles immunization coverage	Oromia, Zonal & Woreda health office, STOP TB project and other partners	**March, - december 2017-**	Communication with ,ZHO &Woreda health office about the accomplishment of the proposed project

Recommendations

- ✓ Appropriate strategies should be designed to improve the lower performance achieved in detection rate of TB, safe drinking water coverage, solid and liquid waste disposal system and latrine coverage
- ✓ Better achievements attained in antenatal care and skilled birth attendant, immunization coverage needs to be maintained and initiated further.
- ✓ Efforts should be made to improve measles immunization coverage to improve child health.
- ✓ Policies and strategies should be developed for prevention, control and management of the top ten causes of morbidity
- ✓ Better attainment in the health service coverage should be encouraged.
- ✓ Vital statistics health an indicator occurring in the woreda has to be documented and the surveillance system and its documentation should have to be strengthened and improved.
- ✓ The woreda administration, health office and other stake holders has to work to improve Health posts without electric supply, telecommunication services
- ✓ However the ITN coverage was 100% and indoor residual spraying was conducted. Malaria is still one of the cause for morbidity among top ten disease, so attention should be given to societies practices residing in that woreda.

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CHAPTER - V

SCIENTIFIC MANUSCRIPTS FOR PEER REVIEWED JOURNALS

5.1 Dengue fever Outbreak investigation in Kabridahar, Somali Region, Ethiopia: 2017.

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Background: Dengue fever (DF) is mosquito born viral disease. About half of world's population is now at risk of DF. The 2014 DF outbreak in Godey Town Ethiopia is the first in Somali Region and similar outbreak was reported in DireDawa Ethiopia in 2013. We investigated suspected DF outbreak to verify the diagnosis, to identify the source and associated risk factors.

Method: Descriptive study followed by (1:2) unmatched case-control study design was conducted. We collected data using structured questionnaires. We isolated DF virus using Polymerase Chain Reaction. We inspected mosquito larva in water container placed in indoors and outdoors of 150 households. We run a Bi variate and Multivariate test to identify risk factors.

Result: we identified 101 cases with attack rate of 17/10,000 population, one death with case fatality rate of 1%. Of cases, (61%) was in males. Highest attack rate (29/10000) was in 15-44 years-old. Among 50 cases and 100 controls, No formal education (AOR= 4.23,95% CI (1.60-11.17), open containers (AOR=3.02, 95%,CI (1.22-7.48),Presence of Larvae in containers (AOR= 4.17, 95%, CI (1.66-10.51), wearing half sleeves shirts (AOR=3.29, 95%, CI (1.29-8.39) were associated risk factors whereas and LLINs usage (AOR= 0.21, 95%, CI (0.05-0.79)*were protective factor. Of calculated larva indices; Household, Container and Brateau indexes were with 66/136(49%), 210/411(51%) and 210/136(154%) respectively.

Conclusion: Epidemiological, entomological and serological investigations revealed outbreaks were due to dengue fever. Male sex, 15-45 age groups and Kebelle 07 was most affected. No formal education, presence of larva in the water container, open container and wearing shirts with short sleeves were independent risk factors for the occurrence dengue fever and using LLINs were protective factor. High Aedes house indices indicated high risk of dengue transmission. We educated the community on best practice of preserving water and disposal of water containers to reduce Ae Aegypti densities.

Key words: Dengue, outbreak, risk factor, entomology,

Introduction

Dengue fever, also known as break bone fever, is a mosquito-borne infectious tropical disease caused by the dengue virus. Symptoms include fever, headache, muscle and joint pains, and a characteristic skin rash. In a small proportion of cases, the disease develops into life-threatening dengue hemorrhagic fever called severe dengue, which results in bleeding, thrombocytopenia, and leakage of blood plasma, or into dengue shock syndrome, in which dangerously low blood pressure occurs, (1). There are4 distinct, but closely related, serotypes of the virus that cause dengue (DEN-1, DEN-2, DEN-3 and DEN-4. The disease varies in presentation from asymptomatic infections to dengue hemorrhagic fever (DHF) or dengue shock syndrome (DSS), which are the most serious forms of the disease (2) .

The global incidence of dengue has grown dramatically in recent decades. About half of the world's population is now at risk. Dengue is found in tropical and sub-tropical climates worldwide, mostly in urban and semi-urban areas. Severe dengue is a leading cause of serious illness and death among children in some Asian and Latin American countries. There is no specific treatment for dengue/ severe dengue, but early detection and access to proper medical care lowers fatality rates below 1 %. Recovery from infection one serotypes provides lifelong immunity against that particular serotype (3) .

Dengue is the most rapidly spreading mosquito-borne viral disease in the world. The magnitude of the dengue problem has increased dramatically and has extended geographically to many previously unaffected areas. It remains the most important arthropod-borne viral disease of humans in the last 50 years; incidence has increased 30-fold with increasing geographic expansion to new countries and, in the present decade, from urban to rural settings. An estimated 50 million dengue infections occur annually and approximately 2.5 billion people live in dengue endemic countries (4).

More than 70% of the population at risk for dengue worldwide lives in member states of the WHO South-East Asia Region and Western Pacific Region, which bear nearly 75% of the current global disease burden due to dengue. Since 2000, epidemic dengue has spread to new areas and has increased in the already affected areas of the region. In 2003, eight countries Bangladesh, India, Indonesia, Maldives, Myanmar, Sri Lanka, Thailand and Timor-Leste reported dengue cases. (4).

According to the Center for Disease Control (CDC), more than one-third of the world's population lives in areas at-risk of dengue fever infection, with up to 400 million people becoming infected with dengue annually (5).

According to WHO Some 50–100 million new infections are estimated to occur annually in more than

100 endemic countries, with a documented further spread to previously unaffected areas; every year hundreds of thousands of severe cases arise, including 20 000 deaths; 264 disability-adjusted life years per million population per year are lost, at an estimated cost for ambulatory and hospitalized cases of US$ 514–1394, often affecting very poor populations. The true numbers are probably far worse, since severe underreporting and misclassification of dengue cases have been documented (6).

Reported incidence of dengue has increased worldwide in recent decades, but little is known about its incidence in Africa. During 1960–2010, a total of 22 countries in Africa reported sporadic cases or outbreaks of dengue; 12 other countries in Africa reported dengue only in travelers. The presence of disease and high prevalence of antibody to dengue virus in limited serologic surveys suggest endemic dengue virus infection in all or many parts of Africa. Dengue is likely under recognized and underreported in Africa because of low awareness by health care providers, other prevalent febrile illnesses, and lack of diagnostic testing and systematic surveillance. Aedes aegypti mosquitoes, the principal DENV vector, originated in Africa and spread to other countries in Africa and other tropical countries in the 17th and 18th centuries. Several other Aedes species mosquitoes, including, Ae. Albopictus, Ae. Africans, and Ae. Luteocephalus are found in Africa and are potential DENV vectors (7).

In Ethiopia for strengthening dengue prevention and control: expand the scope of the existing Malaria Control Program to include Dengue Fever and other Vector-Borne Diseases; initiate dengue surveillance by establishing sentinel sites at health centers and hospitals in the most affected areas of Dire Dawa, Afar and Somali Regions; strengthen capacity for laboratory diagnosis and case management; develop an integrated vector management strategy and plan of action; establish a coordination mechanism with relevant sectors, including establishment of a multi-Sectoral task force; work with partners such as WHO, CDC and AFENET for capacity building in case management, integrated vector management and surveillance; actively engage in Advocacy, communication and social mobilization. Dengue is found in tropical and sub-tropical climates worldwide, mostly in urban and semi-urban areas, putting more than 40% of the world's population at risk. Since 2013, Ethiopia has reported more than 12000 dengue fever cases (8).The investigation was conducted to describe the magnitude of the outbreak by person, place, and time and to assess risk factors associated with Dengue Fever outbreak.

Method and Materials

Study area and period

This study was conducted in kabridahar Town, Somali Region. It is 1000 km from Addis Ababa and 450 km from Jigjiga town capital of Somali region. The total population of the town is 59638 as projected for 2017 and study was conducted from 5/21/2017 to 6//28/2017. Ethical permission was not required for this study, since it was an outbreak investigation.

Descriptive epidemiology

We described cases by person, place, time followed by 1:2 unmatched case-control. an epidemic curve was drawn to observe the dynamic of the outbreak. We used the Dengue fever Guide lines case definition to define a suspected Dengue. Individuals are suspected to have dengue when they have acute febrile illness (38 °C) of 2–7 days' duration, with the following non-specific manifestations of DF: headache, retro-orbital pain, myalgia, arthralgia, rash, hemorrhagic manifestations, and leucopenia. Confirmed Dengue was also associated with one or more of the following: supportive serology (reciprocal haemoagglutination–inhibition antibody titre, comparable immunoglobulin G (IgG) enzyme linked immunosorbent assay (ELISA) titre, or positive monoclonal IgM antibody capture (MAC-ELISA) test in a serum specimen.

Data were collected by the investigator, at Hospital and households levels, using pre-developed and tested structured questionnaires. We reviewed records, including reports and line lists from health facility, the district health office, and zonal health department.

House to house surveys were conducted with health extension worker, and health office staff with the involvement of community volunteers to identify fever cases in the affected kebelles. Data were also collected through observation on Aides mosquito breeding sites at water sources, and household levels The basis for laboratory confirmation of Dengue fever infection was the presence of Dengue-specific IgM antibodies by PCR from acute cases in serum taken from cases after 5 days of development of fever and less than 5 days of onset of fever.

Case control: unmatched case control was used to identify the risk factors for the occurrence of dengue infection. Cases and controls were cases were selected from the same population; two controls were selected for each case from the general population of the same community. Descriptive statistics and odds ratios (OR) with 95% confidence intervals (CI) was calculated. Variables showed P-value < 0.2 underwent logistic regression. A multivariable backward stepwise logistic regression model was

applied to identify the risk factors for DF/DHF. Analyses were performed using epi info software (Version 7.2).

Entomological investigation

To understand the density of vectors responsible for viral transmission, Entomological investigation was carried out. Single larval survey (SLS) technique was used by searching mosquito breeding sites inside and outside houses. Larvae were identified by visual inspection of their appearance and movement in water, by the regional public health specialist and EPHI expert/epidemiologist. To estimate the prevalence and infestation level of vectors in the locality, Analysis of the standard Aedes larval indices, such as House Index (HI), Container Index (CI) and Breteau Index (BI), were carried out.

The BI and HI are commonly used for the determination of priority (risk) areas for control measures. HI greater than 5% and/or a BI greater than 20 for any locality are an indication that the locality is dengue-sensitive (9).

Environmental study

The investigation team observed the sanitation practices, water collection habits, water containers for mosquito breeding, mosquito breeding sites, drainage systems and personal protection measures against mosquitoes.

RESULT

Descriptive epidemiology

A total of 101 affected patients were identified in the Town. All 100 cases had fever. The case-fatality ratio (CFR) was 1%. The index case was recognized by physician Kabridahar Hospital on May 12, 2017 and the case was from kebelle 02 site. The sex specific attack rate (AR) was higher among male 18/10,000 population. Age specific Attack rate showed that young children 15 to 45 year of age were the most affected age groups with 30.3/10,000 population. The outbreak started in the 2nd week of May 2017 in kebelle 07. It was further spread to other kebelles of the Town and increased to reach high pick on the same week of May, 2017. The highest incident rate of 34.5/10,000 population is Kebelle 07. Of 21 serum blood collected and tested, 72% (15/21) were positive for Dengue fever by PCR.

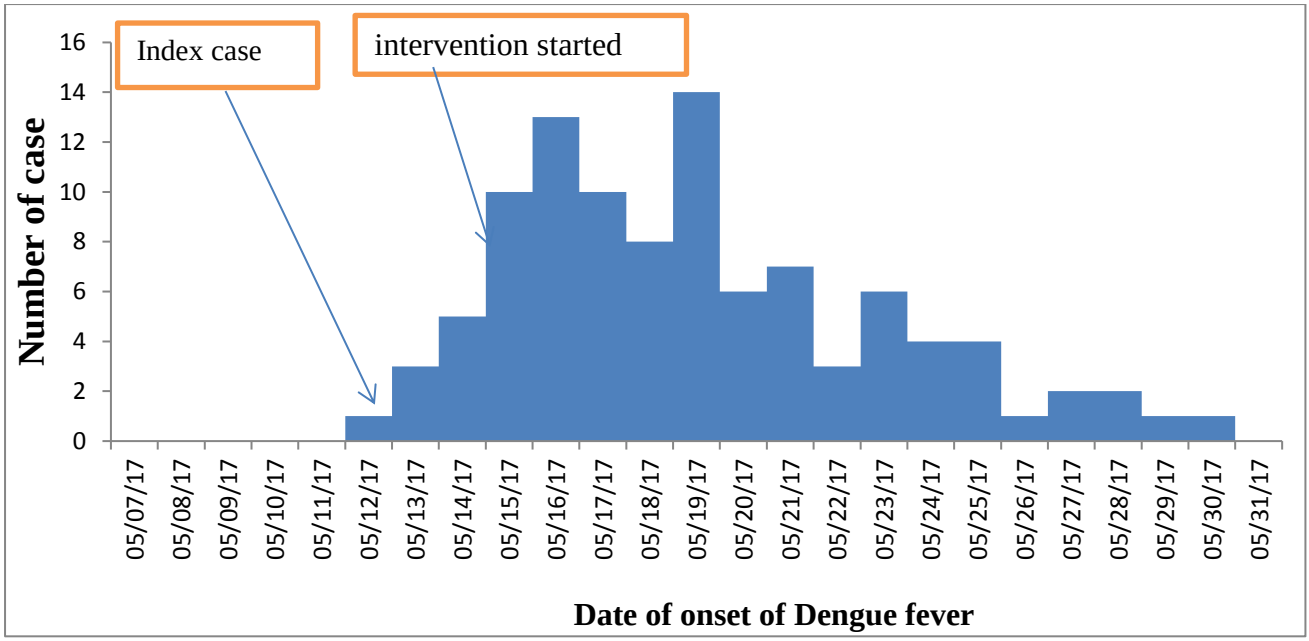

Figure 41: Epicurve of Dengue fever cases by date in kabridahar Town, Somali region, 2017.

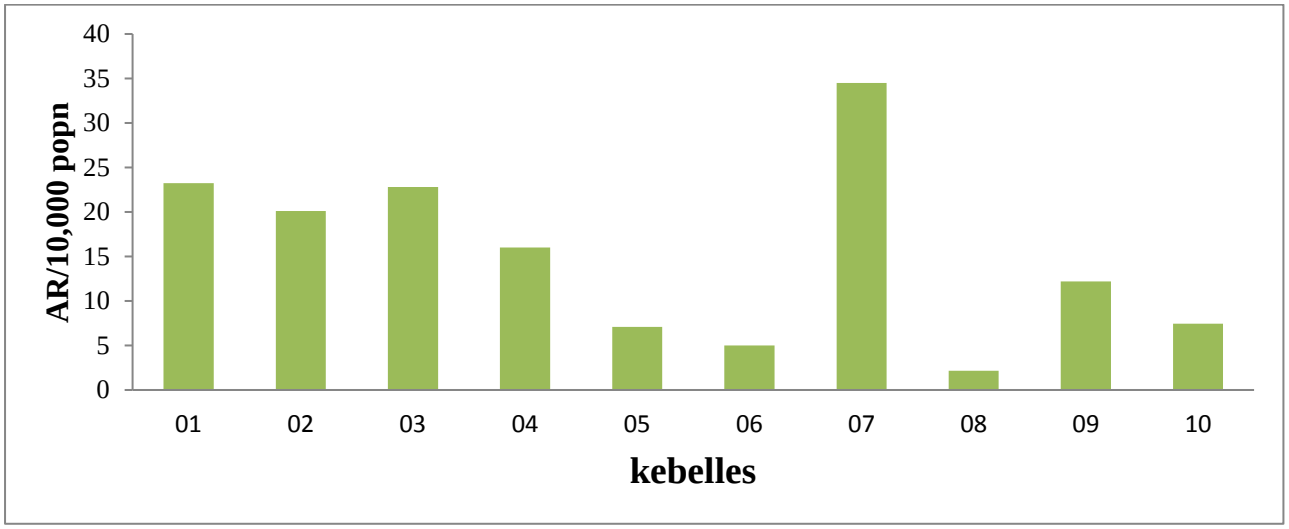

Figure 42: Distribution of dengue fever cases by place in Kabridahar Town, Qorahay Zone, Somalia Region, Ethiopia 2017.

Analytic epidemiology

Table 19: Potential factors for Dengue fever outbreak spread and control kabridahar Town, May 2017. (n=150, case=50, control =100)

Variables	Case	Control	COR (95%CI)
Status of Containers			
Closed	16 (32)	60(60)	3.18(1.55- 6.52)
Open	34(68)	40(40)	
Having LLINs			
Yes	39(78)	91(90)	0.36(0.134 -0.913)
No	11(22)	9(9)	
LLINs usage			
No	10(26)	7(8)	0.241(0.08-0.693)
Yes	29(74)	84(92)	
Educational status			
No formal Education	37(74.0)	54(54.0)	3.34(1.58-7.03)
Had formal Education	13(26.0)	46(46.0)	
Existence stagnant water around their residency			
Yes	5(10)	6(6)	1.74(0.5-6.0)
No	45(90)	94(94)	
Presence of Larvae in the household			
Yes	31(62)	36(36)	3.16(1.55-6.41)
No	19(38)	64(64)	
Respondents household IRS spray in last six months			
No	50(50)	100(100)	1.0
Yes	0( )	0( )	
Kinds of clothes usually wear			
Trousers/body full dress	17(34)	58(58)	2.68(1.32-5.43)
Short and T-shirt	33(66)	42(42)	
Do you use mosquito repellent on your skin			
Yes	8	27	0.51(0.21- 1.23)
No	42	73	
Sleeping inside screened window or door			
Yes	23	53	0.75(0.38 – 1.49)
No	27	47	

The final model was constructed using backward binary logistic regression method. study subjects with no formal education compared to those who had formal education were more likely to be affected (AOR= 4.23(1.60-11.17), open containers (AOR=3.02, 95%,CI (1.22-7.48),Presence of Larvae in containers (AOR= 4.17, 95%, CI (1.66-10.51), kind of cloths usually wear (AOR=3.29, 95%, CI (1.29-

8.39) and LLINs usage (AOR= 0.21, 95%, CI (0.05-0.79)*were found to be protective factor for the occurrence of Dengue Fever (Table).

Table 20: Independent predictors of Dengue Fever, kabridahar Town, Somali Region, may 2017.

Variables	Cases (N=50)%	Controls (N=100)%	AOR(95%CI)
Educational status			
No formal Education	37(74.0)	54(54.0)	4.23(1.60-11.17)*
Had formal Education	13(26.0)	46(46.0)	1:00
Status of Containers			
Open	34(68)	40(40)	3.02(1.22-7.48)*
Closed	16(32)	60(60)	1:00
Presence of Larvae in the household			
Yes	32(64)	36(36)	4.17(1.66-10.51)*
No	18(36)	64(64)	1:00
Kind of cloths usually wear			
Body full dress	17(32)	58(58)	3.29(1.29-8.39)* 1:00
Short T-shirts	33(78)	42(42)	
LLINs usage			
No	41(41)	54(54)	0.21(0.05-0.79)*
Yes	9(9)	45(45)	1:00

*-variables that has significantly associated with p-value less than .05

Entomological survey

An average of 42.4% (66/136) of houses showed the presence of Aedes aegypti larvae. The average HI, CI and BI were calculated in the all kebelles (HI) 42.4, (CI) 49 and (BI) 143 values were observed.

Environmental study

It was observed that water accumulated in cemented tanks (Birka), big plastic water container, jerycans, buckets and other containers of water. This favored mosquito breeding. After careful examination, Birka, earthen pots and plastic containers were found to be positive for Aedes aegypti larvae.

Container type: Overall 411 artificial containers were inspected among which 211 containers were found positive for mosquito larvae, of which 60.4% were from large containers

Discussion

The 2014 dengue outbreak in Godey Town is the first in Somali Region and the second in Ethiopia following Dire Dawa outbreak in 2013 and kabridahar Town is the second in Somali region and the third in Ethiopia in 2017. Overall, awareness and knowledge of the respondents about Dengue Fever was observed to be low.

This outbreak investigation revealed different factors associated. The study showed that Presences of open containers in a household were 3.52 times more at risk of Dengue fever compared to a house in closed container. This finding is higher than the finding of study done in Sundials, Chakaiser, and Shangla, Pakistan-2008 (10). This could be due to low awareness towards the specific disease and unable to afford to cover the widely available large cemented water container.

According to study done in Vietnam, People living near stagnant water, favorable mosquito breeding places had higher rates of morbidity (11), though our study showed no significance association between stagnant water and Dengue fever outbreak. This may be due to presence of stagnant water around pastoralist area at a distance of more than 100 meter from most of assessed households.

Presence of larvae in household water containers is another independent risk factor for dengue fever outbreak. This finding is consistent with study performed on factors associated with spread of dengue fever in urban, Lahore, Punjab, Pakistan, 2013 (12).

In kabridahar, a study found that most families stored their drinking water; only 49% of them covered their water storage containers. This is lower than study done in Sudan, south kordofan state (13). The difference could be due to study design used. Currently residents use water storage containers like mostly stored in cemented tanks (Birka), big plastic bag, jerry cans, and bucket available and this makes difficult to avoid the outbreak.

Female Aedes aegypti mosquitoes have been shown to enter houses at night to find resting sites, and then they may take a blood meal from household members the following morning (14). In our study usage of LLINs were found to have a protective Effect AOR 0.14, 95% CI: 0.03-0.55. This result is supported by studies conducted in Kenya no usage of LLINs significantly associated with having evidence of current or recent DENV infection. Not use of Mosquito bed net use were associated with the DF outbreak in our study, this is due to shortage of mosquito bed net available, from a total respondents only 36% of them had mosquito bed net. the use of mosquito repellents on the skin and use mosquito replant in the house were not associated with the DF outbreak in our study, possibly because the repellents were being applied incorrectly and may be the participants often do not afford to buy the repellents.

Regular use of an indoor insecticide spray is believed to protect against DF if a residual effect insecticide is used according to standard guideline (15). In our study indoor insecticidal spray was not associated with dengue fever outbreak in our study; this is because there was no respondent's house sprayed for the last 6 month.

Among the socio-demographic variables, the education level of the participants was an independent predictor of risk level ($P<0.05$) which is consistent with the study conducted on KAP Regarding Dengue Fever in in rural areas of Yemen 2015 (16). The majority of cases were in the age group of 15–44 years, this is similar with study conducted in Sudan (13).

In this study, most of 52% the cases were men and young, in the age group of 15–45 years; this finding was similar to that of a study in West Bengal India (17), but not similar to another study Kanyakumari of Dharmapuri district (18), where more women and children (6–15 years) were affected.

Our study revealed wearing of short T-shirts cloths (sleeve) were significantly associated with Dengue fever outbreak 2.5 times as compared with those who wear body full dress. This may due the weather condition of the town inhabitants prefer to wear short shirts. The Somali region in Ethiopia is usually characterized by high temperatures, throughout the year, that favor the proliferation of DENV and subsequent transmission by Ae Aegypti (19).

Our study showed Breteau index (BI) of town was greater than 145, Container index was 49% and house index was 42.3%.this is not similar with study conducted at Dare s salaam Tanzania in 2014 Breteau 8.2, Container index 70% and House index was 27.5% (20). This dissimilarity could be due to difference in geographical area that favored for mosquito to breed. The Breteau indices in the all kebelles of Kabridahar Town were above 100. Higher Aedes indices, BI in particular, provides indication of geographical areas at high risk for dengue transmission (21). But this is almost similar with study conducted in Ethiopia DireDawa larval indices (house, container, and Breteau index) are depicted in HI, CI, and BI ranged between 33.33 and 86.15, between 23.18 and 73.91, and between 56.52 and 188.88, respectively. The higher Aedes mosquito HI, CI and BI may not be surprising as the study was carried out during an epidemic (22).

Strength and limitation of the study

This study is the first study to identify factors associated with DF in this Town. The odds ratios for the associated risk factors are a better measure than the odds ratio of the strength of the association. The design of this study is integrated with a simultaneous entomological survey in the study area. Larvae were identified by visual inspection alone and not confirmed by a laboratory.

Conclusion and Recommendation

This finding of study from the epidemiological, entomological and serological investigations revealed that suspected fever outbreaks were due to dengue fever virus infection. The sex specific attack rate was higher among male population, age specific Attack rate was higher in 15 to 45 year of age and highest cases were from 07 kebelle. Variables educational status, presence of larva in the water container, status the container, kind of cloth usually wear were independent risk factors for the occurrence dengue fever and LLINs usage was protective factor.

Dengue outbreak in town resulted from the existence of poor practice preserving water, disposal of containers and low awareness of the disease. We recommend the promotion of awareness in the community by health education, and promotion the best practices of preserving water and disposal of containers in reducing *Ae*. *Aegypti* densities. District water and sewerage office to provide a reliable supply of Piped water in every household would reduce the need for water storage containers that also act as aquatic habitats for dengue vectors in the long term. In the long term we recommend that the Ministry of Health should make it mandatory Organize vector surveillance and control programs against *Ae*. *Aegypti* mosquitoes in Kabridahar, in particular, where currently vector control activities focus on malaria vectors only.

Consent for publication: Not applicable for this article as there is no individual images, or videos or information is included.

Availability of data:

The data sets used to prepare this report are collected to respond to the outbreak and available from the corresponding author anytime on reasonable request.

Competing interest: All Authors declared that they have no any competing interests.

Funding: No, separate budget line was allocated for this activity.

Authors' contribution:

The work presented here was of a collaborative nature. MAG proposed and designed the analysis, carried out data cleaning, categorizing, analysis and write-up of the manuscript. All authors have participated in the interpretation of findings and review of the manuscript. All authors have read and approved the final manuscript.

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5.2. Epidemiology of Measles in Oromia Region, Ethiopia: Surveillance Data Analysis from 2007-2016.

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Background: Measles is the leading vaccine preventable childhood disease designated for elimination by WHO. More than 20 million people are affected by measles each year, particularly in Africa and Asia. Outbreaks of measles are reported in the Oromia region of Ethiopia each year. We analyzed to assess the epidemiology of measles in the Oromia region of ten years (2007-2016) GC.

Method: : We collected and reviewed Oromia Measles Secondary data of ten years (2007-2016) from case based and line lists of EPHI PHEM department. We analyzed using Microsoft Excel and Epi-Info version 7.2, we performed descriptive statistics and the result is presented by figure tables and narration. Odds ratio used to assess associated variables with measles death.

Result: A total 26,908 suspected cases and 288 deaths (CFR=1.07%) measles were reported from 2007–2016. Median age was 6.0 years. Majority 14253 (53%) were male. Majority of cases were from Guji zone 27/10,000 population. The highest mean annual incidence 27 per 100,000 populations with 1- 4 years. The highest cases were reported in 2014 which is 13/1000 population. Highest 45% of cases were reported during first quarter (January – March). Of cases 64% reported by case based and from total tested samples 36% were positive for Measles Igm. Unvaccinated status was 29%. High proportion of deaths was reported among age group < 5year and during 2012 -2016 year (77.2%) as compared to the 2007 -2011 year period.

Conclusion and recommendation: Measles is public health concern in Oromia region. Large proportion of measles cases were among unvaccinated and living in rural areas. Under the age of 5 was the most affected population. Measles surveillance and increasing coverage of supplementary immunization activities is recommended. Early detection of cases and specificity of reporting suspected measles cases should be improved.

Key word: Data, Measles, Surveillance, Oromia.

Background: Measles is one of the most infectious viral diseases caused by measles virus. The virus is a member of the genus Morbillivirus of the Paramyxoviridae family. Humans are the only natural hosts of measles virus. Transmission is primarily by airborne respiratory droplets to mucous membranes in the upper respiratory tract or the conjunctiva (1). Approximately 30 percent of reported measles cases have one or more complications (2).This virus characterized by fever, peaking as high as 103°F –105°F, Followed by cough, coryza and conjunctivitis Within 2 - 4 days of the prodromal symptoms, a rash made up of large, blotchy red spots (maculo-papular rash) typically lasts 3-7 days. Incubation period ranges from 7 to 21 days from exposure onset of fever, rash usually appear about 14 days after exposure (3, 4).

Globally measles is responsible for 454,000 deaths each year. Of these, 410,000 are among children under the age of five years. According to, the World Health Organization (WHO) In the year 2000 estimated that 535 000 children died of measles, the majority in developing countries, and this burden accounted for 5% of all under-five mortality (5). In developing countries, measles case-fatality rates for among young children may reach 5–6% .In developed countries, approximately 10–30% of measles cases require hospitalization, (6).

Measles is one of public health important disease and it is one of the weekly reportable diseases in Ethiopia. In 2013, measles incidence was 7.2 cases per 100,000 populations. Totals of 243 measles outbreaks were confirmed in 2013 compared to 146 in 2012. Occurrence of measles has been observed in Ethiopia with a seasonal pattern over the years, with increased number of measles cases during the late-early part of the year (December to February) (7). Almost half (49%) of the reported measles cases occurred in children that were unvaccinated or whose vaccination status was unknown, (8). Measles has been one of the major causes of death and sickness of children in Ethiopia (2). Measles is one of the public health priority diseases with the potential to occur both as an epidemic and endemic disease in different parts of Ethiopia including Oromia region. It is among the notifiable lists of diseases in the country. Information from the analysis of ten years measles data is important to understand trends of the disease in the region. In addition it helps to identify the available gaps in the surveillance system and provide recommendations based on the findings. We aimed to assess epidemiology of measles and to describe its distribution in Oromia from 2007-2016.

Method

Study area

Oromia is one of ethnically based regional state of Ethiopia. The Region has 18 administrative zones, 304 woredas (out of which 39 are towns structured with the level of woredas and 265 rural woredas),

more than 6,342 farmer and 482 urban dwellers. According to the population and housing census report of central statistics (2016), the projected total population of the Region is 35, 127213; the total area of the Region is 363,136 km2, accounting for about 34.3 percent of the total area of the country (9).

Study design: We conducted cross-sectional retrospective descriptive study design to analyze measles data.

Study population: All individuals reported with measles cases in Oromia Region, in a ten year time from (2007-2016).

Sample size: All measles cases that is 26, 908 cases reported during 2007-2016 years period.

Sampling procedure

First permission was obtained from public health emergency management (PHEM) then after a ten year Oromia region Measles data accessed to carry out this analysis. Variables; like Name, ID number, reporting district and reporting health facility of the cases were excluded and 26908 measles cases found in all zones and towns Oromia were extracted.

Variables

- **Independent Variables:** Age, Sex, Fiscal year
- **Dependent Variables:** Death, Alive

Data collection procedure

First permission was obtained from public health emergency management then after a ten year Oromia region Measles data accessed to carry out this analysis. Variables; Name, ID number, reporting district and reporting health facility of the cases were excluded and 26908 measles cases from zones and towns Oromia were extracted from case based and line lists. We analyzed all reported measles case.

Data processing and analysis

We used Microsoft Excel and Epi-Info version 7.2 to enter, edit, clean and analyze data. We calculated statistics like mean, frequencies, and percentages to analyze ten years collected measles surveillance data during 2007—2016. We presented result by graph, table and figures. Odds ratio and Chi-square was used to assess associated variables with measles death.

Measles Case Definition

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.

Laboratory confirmed: A suspected case with laboratory confirmation (positive IgM antibody) or epidemiologically linked to confirmed cases in an epidemic.

Epidemiologically linked: A suspected measles case that has not had a blood specimen taken for serologic confirmation, but is linked to a laboratory confirmed case (definitive serologic evidence of recent measles virus infection). Linked is interpreted as being in the same geographic area (place) during the infectious period (time) of a laboratory-confirmed case (person), that is, in the same district within 30 days.

Discarded: A suspected measles case that has been completely investigated, including the collection of adequate blood specimen (5 ml), but lacks serologic evidence of recent measles virus infection (that is, IgM negative).

Clinical / Compatible: A suspected measles case that has not had a blood specimen taken for serologic confirmation, and cannot be epidemiologically linked to a laboratory-confirmed case.

5. Result

Measles case distribution by age and sex

A total of 26908 Measles cases were reported in Oromia region from 2007 -2016. The median age of measles cases were 6.0 years. Highest incidence rate was recorded among children under the age of 1 with the mean annual incidence rate of 26 per 100,000 populations; followed by children 1- 4 years old (27/100,000 populations). From a reported measles case 12655 47% were female. A total of 288 deaths were reported, making the overall case fatality rate of 1.07%. Highest deaths were reported in age group 1-4 years with the average annual CFR of 1.35% per 100 population followed by < 1 years with CFR of 1.32%.

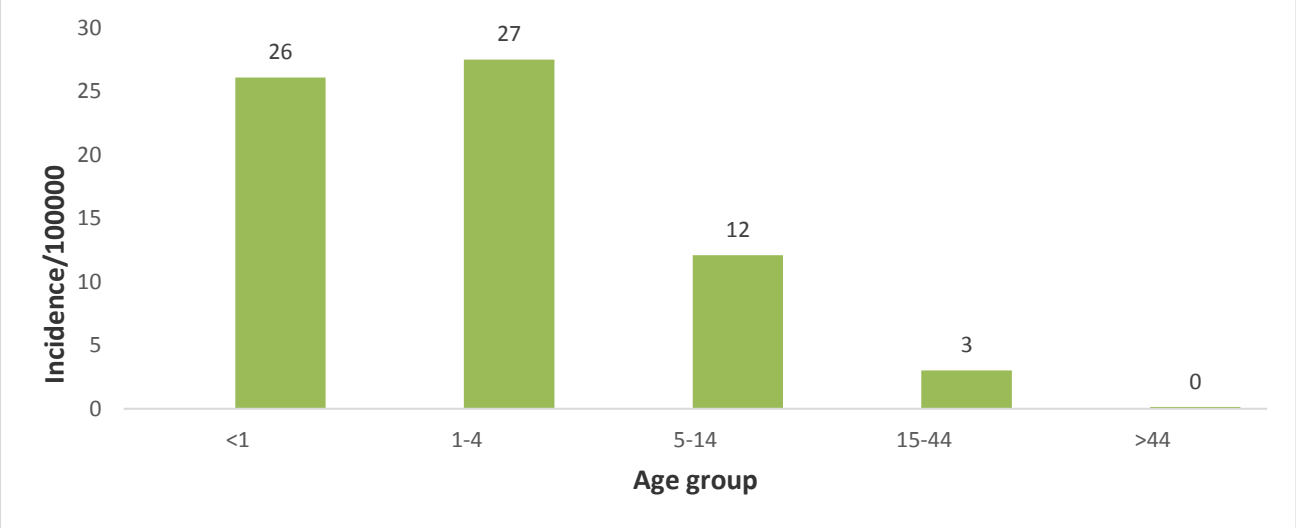

Figure 43: Measles age category, average annual incidence rate of Oromia, 2007-2016.

Distribution of measles cases by time

Figure 16 showed the trend of measles cases. The highest suspected measles cases attack rates were seen in 2014 and 2008 accounted for 13 per 100,000 and 12 per 100,000 populations respectively. While remarkable decrement of suspected measles case were reported in year 2007 which is 4 per 100000 and 6 per 100000 populations in year 2015 and 2016. About 45 %(12116) of measles case were reported during the first quarter (January to March) of the year, followed by 23.4% (6305) during the second Quarter (April-June), 19.8% (5320) during last/fourth quarter (October-December) and 12.7% (n=3167) during the third quarter (august-September) of the year

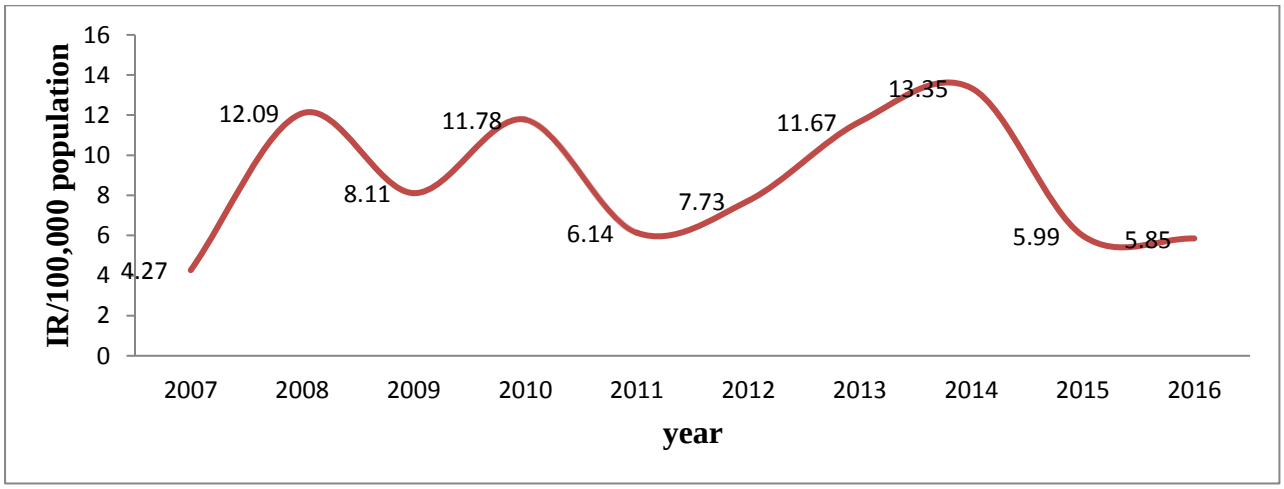

Figure 44: Trend of measles cases per 100,000 populations per year, 2007 to 20016, in Oromia region.

Measles case distribution by place

We observed Variations across the zones and towns region for both the number of cases notified and their respective incident rates. Highest 21240 (79%) reported measles cases were from rural setting. Of reported measles case majority of cases were from, GUJI and WEST ARSI zones accounted 27/10,000 and 7/10,000 population respectively. With regarding geographical distribution from a totally recorded 26908 measles cases, majority of reported measles cases were from rural setting which is 21240 (79%). While 5668 (21%) of reported measles cases were from urban setting.

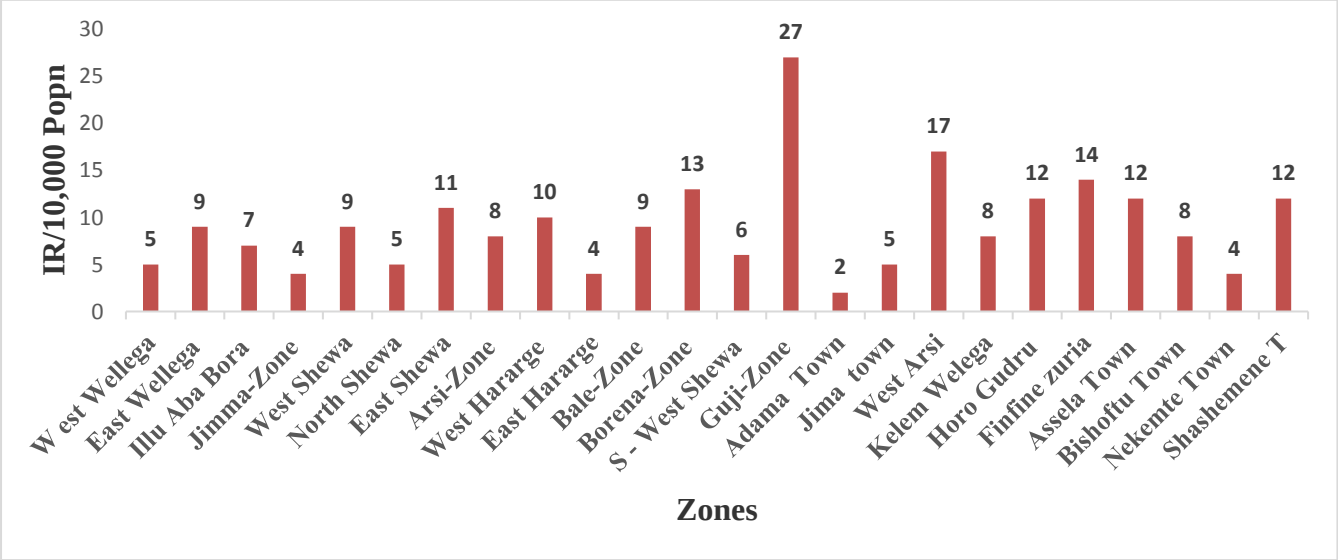

Figure 45: Measles case, incidence rate by zone of Oromia region from 2007-2016.

Vaccination status of measles case

Forty six percent (n=12495) of the case patients have unknown vaccination status, 29% (7814) has no vaccination history and the remaining case patients, 19% (4995) have received single dose vaccine,4% (1088) has received two dose of vaccine, 2% (516) have received ranging from 3three to seven doses.

Measles outcome

A total of 288 deaths were reported with the overall CFR of 1.07%. The highest death was recorded during 2014 (30%) followed by 2013(20%) whereas no measles death were recorded during 2009, 2011, 2015 and 2016.

Vaccination status of measles case

Forty six percent (n=12495) of the case patients have unknown vaccination status, 29% (7814) was not vaccinated. Forty six percent (n=12495) of the case patients have unknown vaccination status, 29% (7814) was not vaccinated and the remaining case patients, 19% (4995) have received single dose vaccine,4% (1088)has received two dose of vaccine, 2% (516) have received ranging from 3three to seven doses. The least vaccination coverage was recorded age greater than 44 years which is (0.2%). Of all 12495 unknown vaccination status of measles cases 19.5% cases were reported from West Arsi zone and from a total of 7814 not vaccinated measles cases 20% cases were from Guji zone.

Measles case final classification: With regards measles classification 30.3% of cases were epidemiologically linked, 23% confirmed by laboratory whereas, 3.6% of cases were suspected cases.

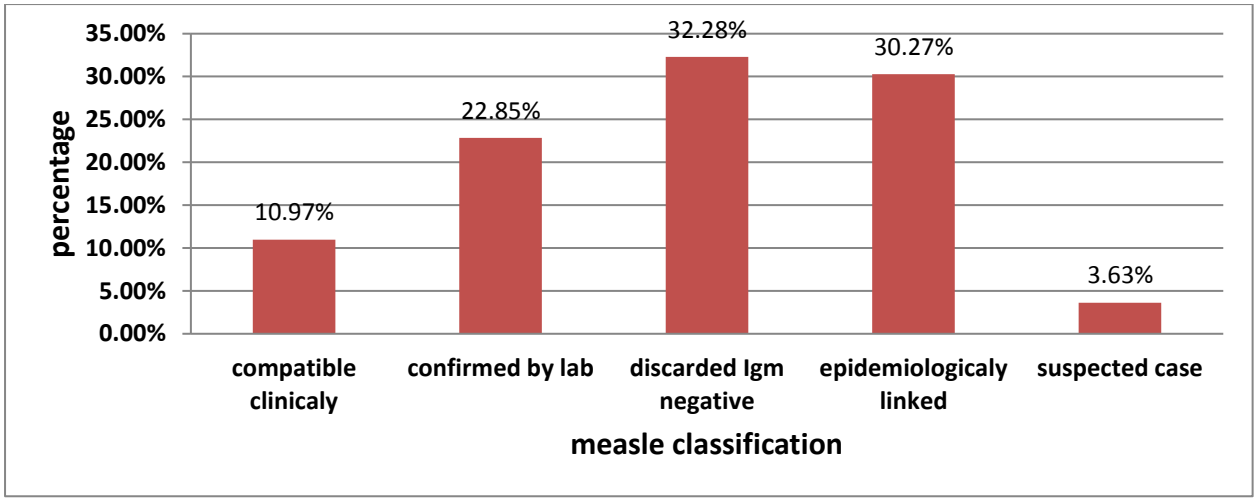

Figure 46: Measles case final classification, Oromia region, 2007- 2016.

Measles cases data type: Of total suspected measles cases, 17236 (64%) were reported by case based. while nine 9672 (36%) were reported by line list. there was no reported measles cases by line list during 2011 and 2015 year.

Laboratory result

During ten years period 36% samples were positive for Measles Igm, the highest positivity rate (27%) were recorded in 2015. From samples of (8484 negative and 366 indeterminate for Measles Igm) 8850 of them were tested for Rubella Igm. Of them 81.1% (7179) were negative for Rubella Igm, while 918(3.4%) cases were positive for rubella Igm.

6. Discussion

This analysis has tried to look at the epidemiology of measles cases, deaths and vaccination coverage. The vaccination coverage is relying on the administrative report. The analysis showed that the disease mainly affected children less than five years age groups. Similar results were reported in Uganda indicating a 64% measles cases in less than five children (10). The incidence of suspected measles cases has shown a slight upward trend for the first two years (2008 – 2009) and remarkable drops down trend in 2011, the rate decreased from 11.7 per 100,000 populations in 2010 to 6.14 per 100,000 populations in 2011. The incidence again progressively increased to 13.3 per 100,000 populations in 2014. This was due to a disease epidemic that occurred in most zone of the region during this period. The same trend has been observed in the mortality rate of suspected measles as that of the incidence during ten years.

The overall case fatality rate in ten years period was (1.07%). WHO estimate the CFR of measles would be 3% to 6% in developing countries. These rates may underestimate the true lethality of

measles because of under reporting of measles death. Similarly this finding is lower than CFR study conducted in districts of Bale Zone CFR of 15.7% (11). The highest average CFR occurred in children aged 1 to 4 years. This is different from the study conducted in Ethiopia which shows the highest case-fatality rate occurs in infants 6 to 11 month of age, with malnourished infants at greatest risk (1).

It was further observed that a high proportion of deaths was reported during 2012 -2016 year period (77.2%) as compared to the 2007 -2011 (22.9 %). this could be due to the time of strengthened performance of surveillance activity and it could be due to improved previously underreported death.

During the ten years period the incidence showed seasonal patterns as reported. the peak incidence of suspected measles cases were during first quarter of the year (January to march) started to rise on December and peaked on January, which is the peak cases were mostly occurred during the dry season and the incidence dropped during the rainy season. This is similar to the study done in Ethiopia, Amhara regional state in 2016 (12).

The age specific attack rate was highest 37 cases per 100,000 populations in those aged <1 year. Cumulative incidence decreased with increasing age to low levels (0.003/100,000) in person's ≥45 years. This finding was similar with a survey done in South Africa and France (13,14). The national surveillance system performed above the recommended WHO target of 2 cases/100,000 populations year for 2013 (15). Simultaneously, this study revealed death was higher among age group less than five as compared to greater than five year, this could be due to the fact there is weak immunity at this age.

Our study revealed that most (0.19%) 19/1000) of the cases were reported from Guji zone region followed by West Arsi (0.17%) 17/1000). The reason for this could be due to the fact that these zones have a high population density and experiences relatively high rates of immigration from other areas. The numbers of reported case-patients differed between zones.

In this study 29% measles cases were not vaccinated and 46.4% of cases were unknown for vaccination status this finding was not Similar to study done at Oromia Zone in 2011 which is 83 % not received the measles vaccine (16). This finding was lower than the finding in the states of southern and western Nigeria, 56.8% of cases had received the measles vaccine and 39.7% of cases were not vaccinated (17).

With regards to measles laboratory result, of total tested samples for measles during ten years period 36% samples were positive for Measles Igm. This is similar to 36.7% of positivity rate studies done in Amhara region (11), in contrary this finding was lower than Analysis of National Measles Surveillance

Data in Ethiopia during 2015 (17). Measles Igm positivity rate showed improvement starting from except for the year 2013 and 2016, this could be due to strengthened surveillance system and increased capacity laboratory confirmation.

The success of prevention and control programmers in reducing morbidity and mortality from vaccine preventable disease can only be measured if there is a reliable disease surveillance system in place. The case based surveillance was put in place to detect cases and outbreak of measles and taking as important steps to control measles. Of reported suspected measles cases, (64%) of measles cases were reported by case based during ten years period. This can be an indicator for strengthened surveillance from time to time.

Strength and Limitations of the study

The data obtained from EPHI/ PHEM office was complete with important variables and it can help us to, determine the distribution of illness, generate hypotheses, stimulate research, assess the disease trend, evaluate control measures, monitor changes, facilitate planning and estimate the magnitude of specific problems. Due to the nature of study design in that we were relying on already collected data and could not come up with definitive reasons as to why there were certain trends and differences in our findings. The rate may underestimate the case fatality of measles due to under reporting of measles death.

Conclusion and Recommendation

Measles is still public health problem in Oromia region of Ethiopia, A large proportion of measles cases occur among unvaccinated individuals and those living in rural areas. The burden of the disease was remarkably high and it persists in most of Oromia zones in each year. Under the age of 5 was the most affected population. Seasonal occurrence of Measles has been observed with increased number of Measles cases during the first quarter of the year. Majority of (CFR) were significantly occurred age less than 5 years and 2012-2016 reporting year. Male were the most affected than female by the disease. Over all from total suspected measles cases majority of cases were epidemiologically linked. Oromia health bureau should work on Maximizing vaccination campaign with wide age group in the region as there is more case in the age group <15 years. Early preparedness and supplementary immunization activities should be started before the late-early part of the year (Dec to Feb) to overcome changes in seasonal patterns of measles cases. We suggested further investigations for understanding the incidences rate disparities across zones and the lower case detection rate. The surveillance activities need improvement in early detection of cases and specificity of reporting suspected measles cases.

Consent for publication:

Not applicable for this article as there is no individual images, or videos or information is included.

Availability of data:

The data sets used to prepare this report are collected to respond to the outbreak and available from the corresponding author anytime on reasonable request.

Competing interest: All Authors declared that they have no any competing interests.

Funding: No, separate budget line was allocated for this activity.

Authors' contribution:

The work presented here was of a collaborative nature. MAG proposed and designed the analysis, carried out data cleaning, categorizing, analysis and write-up of the manuscript. All authors have participated in the interpretation of findings and review of the manuscript. All authors have read and approved the final manuscript.

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CHAPTER – VI

ABSTRACTS FOR SCIENTIFIC PRESENTATION

6.1. Dengue fever Outbreak investigation in Kabridahar, Somali Region, Ethiopia: 2017.

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Background: Dengue fever (DF) is mosquito born viral disease. About half of world's population is now at risk of DF. The 2014 DF outbreak in Godey Town Ethiopia is the first in Somali Region and similar outbreak was reported in DireDawa Ethiopia in 2013. We investigated suspected DF outbreak to verify the diagnosis, to identify the source and associated risk factors.

Method: Descriptive study followed by (1:2) unmatched case-control study design was conducted. We collected data using structured questionnaires. We isolated DF virus using Polymerase Chain Reaction. We inspected mosquito larva in water container placed in indoors and outdoors of 150 households. We run a Bi variate and Multivariate test to identify risk factors.

Result: we identified 101 cases with attack rate of 17/10,000 population, one death with case fatality rate of 1%. Of cases, (61%) was in males. Highest attack rate (29/10000) was in 15-44 years-old. Among 50 cases and 100 controls, No formal education (AOR= 4.23,95% CI (1.60-11.17), open containers (AOR=3.02, 95%,CI (1.22-7.48),Presence of Larvae in containers (AOR= 4.17, 95%, CI (1.66-10.51), wearing half sleeves shirts (AOR=3.29, 95%, CI (1.29-8.39) were associated risk factors whereas and LLINs usage (AOR= 0.21, 95%, CI (0.05-0.79)*were protective factor. Of calculated larva indices; Household, Container and Brateau indexes were with 66/136(49%), 210/411(51%) and 210/136(154%) respectively.

Conclusion: Epidemiological, entomological and serological investigations revealed outbreaks were due to dengue fever. Male sex, 15-45 age groups and Kebelle 07 was most affected. No formal education, presence of larva in the water container, open container and wearing shirts with short sleeves were independent risk factors for the occurrence dengue fever and using LLINs were protective factor. High Aedes house indices indicated high risk of dengue transmission. We educated the community on best practice of preserving water and disposal of water containers to reduce Ae Aegypti densities.

Key words: Dengue, outbreak, risk factor, entomology,

6.2. Epidemiology of Measles in Oromia Region, Ethiopia: Surveillance Data Analysis 2007-2016.

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Background: Measles is the leading vaccine preventable childhood disease designated for elimination by WHO. More than 20 million people are affected by measles each year, particularly in Africa and Asia. Outbreaks of measles are reported in the Oromia region of Ethiopia each year. We analyzed to assess the epidemiology of measles in the Oromia region of ten years (2007-2016) GC.

Method: : We collected and reviewed Oromia Measles Secondary data of ten years (2007-2016) from case based and line lists of EPHI PHEM department. We analyzed using Microsoft Excel and Epi-Info version 7.2, we performed descriptive statistics and the result is presented by figure tables and narration. Odds ratio used to assess associated variables with measles death.

Result: A total 26,908 suspected cases and 288 deaths (CFR=1.07%) measles were reported from 2007–2016. Median age was 6.0 years. Majority 14253 (53%) were male. Majority of cases were from Guji zone 27/10,000 population. The highest mean annual incidence 27 per 100,000 populations with 1- 4 years. The highest cases were reported in 2014 which is 13/1000 population. Highest 45% of cases were reported during first quarter (January – March). Of cases 64% reported by case based and from total tested samples 36% were positive for Measles Igm. Unvaccinated status was 29%. High proportion of deaths was reported among age group < 5year and during 2012 -2016 year (77.2%) as compared to the 2007 -2011 year period.

Conclusion and recommendation: Measles is public health concern in Oromia region. Large proportion of measles cases were among unvaccinated and living in rural areas. Under the age of 5 was the most affected population. Measles surveillance and increasing coverage of supplementary immunization activities is recommended. Early detection of cases and specificity of reporting suspected measles cases should be improved.

Key word: Data, Measles, Surveillance, Oromia.

CHAPTER – VII

NARRATIVE SUMMARY OF DISASTER

7.1. Disaster Need Assessment of IDPs Health, Nutrition and WASH in West and East Hararge zones of Oromia Region, Ethiopia 2018.

Summary of Key Findings

Back ground: An internally displaced person (IDP) is persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence. More than 600,000 Oromo ethnic people displaced from Ethio- Somali region and boarder of Oromia woredas within Ethio Somali region during 2017. Aimed to identify the health and health related need of the IDP in East and West Hararge Zone of Orormia region, 2018.

Methodology: Data was collected on key indicators that have impacts on human health. Structured questionnaire was used for collecting information. Meeting discussions with zonal and woreda officials was Conducted. A review of documents and reports obtained from woreda and zonal health office.

Result: The total population IDPs of West and East Hararge zone is 16019 House hold (HH), 92787 populations, of this 49232 were female and 51434 HH, 221,204 populations, of this 112,877 were female respectively. A total of 8338 cases had visited OPD. Diarrheal Diseases, Pneumonia and Acute Febrile Illness were the top leading cause of mortality. Of this 392 children identified with SAM. Unavailability of the adequate and safe water supply, absence of soap for personal hygiene, overcrowded living condition, shortage of emergency drugs and therapeutic feedings and medical equipment at both zonal level and many districts of these zones. Poor coordination and weak emergency preparedness and response plan for epidemic prone diseases were the prominent gaps identified during the assessment. Technical, financial, emergency drugs and therapeutic food supplies and emergency materials support is needed to strengthen their preparedness and response capacities. No TSFP and SC programs established in the visited IDP sites.

We recommend to Strengthening sector collaboration for IDP response, to request and fill the missing but necessary drugs for treatment of regularly encountered, Preparation of the emergency preparedness and response plan for epidemic prone diseases and Consistent Provision of safe and adequate water supply.

Background:

An internally displaced person (IDP) is persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognized State border (1).

Globally, there were estimated 38.2 million IDPs at the end of 2014, the highest level since 1989, and the first year for which global statistics on IDPs are available. The countries with the largest IDP populations were Syria (7.6million), Colombia (6million), Iraq (3.6million), the Democratic Republic of the Congo (2.8million), Sudan (2.2million), South Sudan (1.6 million), Pakistan (1.4 million), Nigeria (1.2 million) and Somalia (1.1 million) (2).

Internal displacement in Ethiopia is multi-causal and complex. The interaction between high levels of existing vulnerability in rural populations; severe droughts, sometimes followed by heavy rains and floods; ongoing conflict; already high numbers of displaced people; and overstretched government capacity create a high-risk environment in which new displacements are likely to continue. Though just one of the immediate causes of displacement, extreme climate events push Ethiopia's displacement figures up every year. As 85 per cent of the country's workforce depends on agriculture and pastoralism, weather-related hazards such as droughts and floods regularly force many people to leave their homes in search of food, water and work (3).

Three weeks before the eruption of the September mass expulsion,176 HHs(880 people) were displaced from Tullu Guled woreda of Fafan zone of Somali region and came to Jarso woreda and settled in Anano Mixe Kebele. Following the September 2017 conflict, quite large number of IDPs came from Ethio-Somali region (Jijiga, Kebribeyah, Togocale, Tuluguled, Bike and Erer Area), Somale Land (Hargessa and Berbara Area).

More than 600,000 Oromo ethnic population displaced from Ethio-Somali region and boarder of Oromia woredas within Ethio Somali region in 2017. Of displaced Oromo ethnic peoples 221,204 displaced populations currently resided in all East Hararge Zone districts of Oromia region and 92787 internal displaced populations are resided in West Harage Zone districts of Oromia region.

The most pressing needs of Ethiopian IDPs are access to livelihoods, restoration of land and property, and an adequate standard of living. With consecutive droughts driving many pastoralists from their land and killing large numbers of cattle, there is an overwhelming need for income generation opportunities among IDPs and in host communities. In addition, water and food shortages have created widespread malnutrition, and many people are vulnerable to diseases such as acute watery diarrhoea and have no access to healthcare. Other impacts of displacement that need to be addressed include disruption of children's education, mental health issues, and limited access to health and nutrition services (3).

Needs Assessments are simply systematic processes for collect information and making justifiable decisions. Experience has shown that coordinating needs assessments is an important element in saving lives and restoring people's livelihoods. Along with emergency preparedness, the timeliness and quality of assessments help determine an effective humanitarian response. This assessment is aimed to identify the health and health related need of the IDP in East Hararge Zone, West Hararge Zone of Oromia region, 2018.

Objectives

General Objectives

- ✓ To identify the health and health related need of the IDP in East Hararge Zone, West Hararge Zone of Oromia region, 2018.

Specific objective

- ✓ To Characterize the population residing in the affected area
- ✓ To Describe the effects of the disaster on health, Nutrition and WASH
- ✓ To Determine the critical health needs and assess the disaster's effect

Methods

During the assessment health and health related data and information from the two Harage zones and respective woredas IDP sites were collected using different methods.

- Meeting discussion with woreda and zonal health official and review of the existing documents.
- Structured questionnaire was used to collect the required information.
- A review of documents and reports obtained from woreda and zonal health office.
- Field visits in selected IDPs to discuss with community figure heads to triangulate data and information collected from zone and woredas
- Face to face interview was undertaken with at least one person in each visited room of the IDP sites.

Result

East Hararge Zone IDP report

A total of 221,204 Oromo ethnic population displaced are currently resided in all East Hararge Zone districts of Oromia region, of this displace population in East Hararge Zone 100,993 were from Ethio-Somali region. The remaining 120,211 were from boarder district of East Hararge zone within Somali region. Totally from families of IDPs resided in East Hararge zone 55 Oromo people has lost their life. Twenty six (26) females were raped from the families of these IDPs. There are 12 unaccompanied children in these IDP.

Table 21: Oromo Population displaced from boarder district of East Hararge zone within Somali region 2018.

Woreda	**HH**			**Family**			**Grand Total**		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Kumbi	6170	2531	8701	15147	19657	34804	21317	22188	43505
Mayu	6730	1339	8069	13039	19237	32276	19769	20576	40345
Cinaksan	1560	1340	2900	5350	6250	11600	6910	7590	14500
Babile	1280	450	1730	2938	3982	6920	4218	4432	8650
M/Tolaa	1345	566	1911	3337	4307	7644	4682	4873	9555
Gursum	247	256	403	1146	914	2060	1393	1170	2563
G/Gutu	132	137	269	421	403	824	553	540	1093
Total	**17464**	**6619**	**23983**	**41378**	**54750**	**96128**	**58842**	**61369**	**120211**

Table 22: Oromo ethnic population displaced due to conflict from Ethio Somali region as of 2018.

S.No	Woreda	HH			Family			Grand Total		
		Male	Female	Total	Male	Femal	Total	Male	Femal	Total
1	Dadar	2151	2054	4205	3172	3754	6926	5323	5808	11131
2	Haramaya	260	549	809	964	914	1878	1224	1463	2687
3	Qarsaa	410	592	1002	994	1012	2006	1404	1604	3008
4	M/Balloo	476	413	889	423	552	975	899	965	1864
5	Kur/Callee	121	78	199	205	260	465	326	338	664
6	Baabilee	967	785	1752	2983	3112	6095	3950	3897	7847
7	Kombolcha	159	261	420	474	589	1063	633	850	1483
8	Cinaaksan	1375	472	1847	6065	4836	10901	7440	5308	12748
9	Mettaa	738	694	1432	1471	1705	3176	2209	2399	4608
10	G/Gutuu	627	607	1234	1317	1619	2936	1944	2226	4170
11	G/Muxii	309	195	504	723	788	1511	1032	983	2015
12	Grawa	215	169	384	402	435	837	617	604	1221
13	Fadis	2792	738	3530	3879	4475	8354	6671	5213	11884
14	M/ Tolaa	602	526	1128	1376	1693	3069	1978	2219	4197
15	Jarsoo	1743	2406	4149	2241	5172	7413	3984	7578	11562
16	Gursum	1134	787	1921	3538	4533	8071	4672	5320	9992
17	Mayuu	21	10	31	34	49	83	55	59	114
18	Baddannoo	229	170	399	508	629	1137	737	799	1536
19	Gola Odaa	20	16	36	55	52	107	75	68	143
20	H/Hamares	1067	513	1580	3245	3294	6539	4312	3807	8119
	Total	**15416**	**12035**	**27451**	**34069**	**39473**	**73542**	**49485**	**51508**	**100,993**

Current response at IDP sites

Preparedness and Coordination

East Hararge zone has written emergency preparedness plan, emergency coordination forum and rapid response. The IDP response team comprises of all relevant sectors and professionals from the catchment health centers and health posts. The team has been working in four major thematic areas; case management headed by the zonal health service, surveillance team headed by the zonal PHEM focal, water, sanitation and hygiene (WaSH) by disease prevention and malnutrition screening team headed by maternal and child health (MCH). The task force headed by the east Hararge zone administration has the meeting with the sector head of the zone.

4.1.3. Outbreak:

Currently no epidemics of priority diseases or cluster of cases were encountered in the IDP sites but the presence of risk factors like unsafe drinking water, overcrowding (up to (7 HH) families per room), malnutrition.

Situation of some public health epidemic prone diseases

Among human epidemic prone diseases, AWD, Scabies, Malaria, Measles, and severe acute malnutrition are the most common public health emergencies threat to the people in the Zone.

AWD and scabies outbreak were occurred in most woredas of the zone and anticipated risk because of low latrine coverage and utilization and low access to safe and adequate water supply and shortage of household water treatment chemicals in most woredas of the Zone.

As to malaria, all of the districts are malarious and 11 hotspot districts are closely monitored by the Zone and region. Outbreak of malaria was reported from different villages of Haromaya, and Fedis in 2017. Because of this malaria outbreak will be anticipated in other malarious Woredas. Measles epidemic was not reported in the last Two year but it is anticipated risk because of low vaccination coverage in some woredas and interruption of vaccination in 5 woredas bordered by Ethiopian Somali region due to border conflict.

As to severe acute malnutrition (SAM), all woredas of the zone were reporting SAM cases throughout the year and the rate of admission was high especially from May to October every year. SAM is usually associated with household food insecurity, lack of nutritious foods for children and poor feeding habits. Shortages and poor linkage to SFP were among major problems for this program.

Health service

Health service providing the routine and other services to IDP at health center, health post and at temporary clinics established in four IDP sites namely Hamaressa, Kersa, G/Gutuu and Dadar district camp, which is from a total district in the zone with the internal displaced people, The clinic has health professional shifted from health centers to serve conflict affected people. Starting from the establishment mobile clinic until the day before assessment health service was given for 8338 people.

Delivery and Vaccination Services

Antenatal care was given for 133 pregnant women, delivery services were given for 95 women's and there was no data (information) that shows service given for woman after child birth (post natal care services). With regards to vaccination, through Measles vaccination campaign 3634 children were vaccinated and 663 pentavalent vaccinations.

Nutritional screening

The screening majorly focuses on screening the pregnant and lactating women (PLW) and under five years of child for malnutrition on the field/ at the site of the settlement. A total of 12363 childreen (6-59 month) and 5985 pregnant and lactating woman were screened.

Table 23: malnutrition screening and the status of the nutrition of PLW and under five children in IDP sites of East Hararge zone, March, 2018

Screening	**Total**	**MAM**	**SAM**
PLW	5985	2485	0
Under five years	12363	3106	337
Total	18348	5591	337

WASH

The main task of WASH includes Provision/facilitation of provision of water at a site were the IDP has settled in , Prepare the latrine in area where the latrine is not previously available, Cleaning the latrine underutilization and Closing of filled trench latrine and environmental hygiene. Accordingly Zonal/District in collaboration with community support a total of 60 trench type sit hole latrine constructed, Water Supply by water trucking vehicle and distributing water containers (Rotto) are activities done by zone and woreda administration.

Identified Gaps:

Health

- Absence of the emergency and non-emergency drug in different preparation
- Poor documentation of the health data
- Poorly mapped referral linkage between the temporary clinics and health post and health center and hospital during patient transfer from health facility to facility

- In adequate health care service, no availability of health professionals (24 hour) at mobile clinic and Limited laboratory testing capacity: Laboratory testing services.
- No activity of community mobilization through awareness creation taken to prevent communicable diseases despite the existence of favorable condition to water born disease

Delivery and Vaccination Services

- No data that shows how many of pregnant women ante natal care service were given
- There was no specific trained health professional assigned like midwifery in the mobile clinic
- There was no denominator data that shows from how many children vaccination conducted.

WASH:

- No/insufficient latrine and below the minimum standard international humanitarian charter sated for displaced population (1 sit hole/ 50 person).
- Very poor sanitation across all IDP sites, Open defecation very common at all sites due to poor utilization and no adequacy of toilet, Poor design and construction of toilet and shower facilities
- No soap distribution at all IDP sites
- Shortage of water and water storage container (Rotto) at all visited IDP camp
- Overcrowding found to be a serious problem, up to 30 families per single room
- Poor utilization and management of existing toilets, and shower room.

Food and non-food item distribution

- Huge food and supplementary food shortage seen where there is people with severe acute malnutrition.
- No data that shows (denominator data) of how many of PLW and children screening service were given
- There is no TSFP and SC service in all IDP site despite high level of SAM. Complicated SAM cases have been referred to Hospital which is very far for the beneficiaries.
- There is no mechanism where the SAM cases on discharged get supplementary feeding as the program does not exist.
- NO material for cooking ,No blanket and mattress, and scarcity of water container in visited IDP sites

Coordination

- Coordination is not represented by relevant government sectors and NGO
- No functional RRT at all level and has no planed schedule for regular meeting.
- Rapid response team thought to be activated when outbreak occurred
- Preparedness activity to prevent anticipated diseases or outbreak is not encouraging. For example the environment is malarious area but bed net is not distributed and no insecticide residual sprays.

West Hararge zone IDPs report

The total internal displaced population are 16019 household or 92787 beneficieries. Of total 13298 beneficiesries were from displaced from Ethio somali region. Currently IDPs are found in 9 woredas of the zone. According to information from administration office 210 family members of IDPs died, of this 35 of them were females. There are 12 unaccompanied children in these IDP.

Table 24: Oromo population displaced from ethio somali region and boarders of Oromia woredas with ethio somali region 2017.

No	Woreda	Displaced Kebelle	HH			Family		
			M	F	Total	M	F	Total
1	D/Labu	14	2096	698	2794	7806	8124	15930
2	H/Guddina	11	2270	2458	4680	13862	12795	26657
3	Mi'eesso	13	4327	1525	5852	18739	14669	33408
4	Dobbaa	3	448	67	515	1572	1225	2797
5	G/ Bordode	9	1345	392	1737	4622	4152	8769
6	Ciroo town	0				1737	1807	3544
7	Ciroo	9	211	19	230	271	232	503
8	Habro	6	72	24	96	333	328	661
9	G/Qorichaa	4	102	13	115	291	227	518
Total		**69**	**10871**	**5196**	**16019**	**49232**	**43555**	**92787**

Current response at IDP sites

Preparedness and coordination: West Hararge Zonal health office has written emergency preparedness plan for IDP was not available, established rapid response team but there is no minute taken during meeting that shows the activities going on.

Situation of some public health epidemic prone diseases: Human epidemic prone diseases, AWD, Malaria, Measles, and severe acute malnutrition are the most common public health emergencies concern for the people in the Zone.

Health service: in west hararge zone IDPs are getting support after distributed to 11 woredas (16 sites), but there is no mobile clinic established at all this site of IDP. People move to the nearest health center when they become ill.

Delivery and Vaccination Services: From health service given antenatal care follow up was given for 163 pregnant woman, delivery service was given for 28 women at the health center and hospital level. There is no information or data recorded whether those delivered had postnaal care follow up or not. With regards to vaccination Measles vaccination was given 45 children, pentavalent vaccination was 663 children.

Nutritional screening: screening was majorly focuses on screening the pregnant and lactating women (PLW) and childreen (6-59 month) for malnutrition on the field/ at the site of the settlement. Accordingly 3630 children less than five year and 1089 pregnant and lactating women screened.

Table 25: malnutrition screening and the status of the nutrition of PLW and under five children in IDP sites of West Hararge zone, March, 2018

Screening	Total screened	MAM	SAM
PLW	1089	288	0
Under five yearrs	3630	428	55
Total	4719	716	55

4.2.7. Wash: The main task of WASH includes Provision/facilitation of provision of water at a site were the IDP has settled in , Prepare the latrine in area where the latrine is not previously available, Cleaning the latrine underutilization and Closing of filled trench latrine and environmental hygiene. Accordingly Zonal water and sewarage authorithy is supplying water for IDPs, but the water supplied is not enough even for drinking which is 10,000 litres per day per IDP. With regards to toilets 28 sithole trench latrine was constructed for all IDP site, but due to not proportional to the size of population and poor sanitation at each IDP site the existed toilets are not giving service for IDP.

Identified Gaps

Preparedness and Coordination:

- weak emergency preparedness and response plan for epidemic prone diseases and for diseases with identified risk factors
- Coordination is not represented by relevant government sectors and NGO
- No functional RRT at all level and has no planed schedule for regular meeting.
- Rapid response team thought to be activated when outbreak occurred
- Preparedness activity to prevent anticipated diseases or outbreak is not encouraging. For example the environment is malarious area but bed net is not distributed and no insecticide residual sprays.

Health

- In adequate health care service, there is no mobile clinic established at all site of IDP, People move to the nearest health center when they become ill.
- No activity of community mobilization through awareness creation taken to prevent communicable diseases despite the existence of favorable condition to water born disease
- Poorly mapped referral linkage between the temporary clinics and health post and health center and hospital during patient transfer from health facility to facility
- Shortage of emergency and non-emergency drug in different preparation
- Poor documentation of the health data

Delivery and Vaccination Services

- No data that shows how many of pregnant women ante natal care service were given
- There was no denominator data that shows from how many children vaccination conducted.

WASH:

- No/insufficient latrine and below the minimum standard international humanitarian charter sated for displaced population (1 sit hole/ 50 person).
- Very poor sanitation across all IDP sites, Open defecation very common at all sites due to poor utilization and no adequacy of toilet, Poor design and construction of toilet and shower facilities
- No soap distribution at all IDP sites
- Shortage of water and water storage container (Rotto) at all visited IDP camp
- Overcrowding found to be a serious problem, up to 25-30 families per single room

Food and non-food item distribution

- Huge food and supplementary food shortage seen where there are people with severe acute malnutrition.
- No data that shows (denominator data) of how many of PLW and children screening service were given
- There is no TSFP and SC service in all IDP site despite high level of SAM. Complicated SAM cases have been referred to Hospital which is far for the IDPs..
- There is no mechanism where the SAM cases on discharged get supplementary feeding as the program does not exist.
- NO material for cooking ,No blanket and mattress, and scarcity of water container in visited IDP sites

Recommendation

- ❖ Strengthening sector collaboration for IDP response (zonal and woreda administration**)**
- ❖ To request and fill the missing but necessary drugs for treatment of regularly encountered cases (RHB, zonal / woreda health office and catchment health facilities and logistic team)
- ❖ Preparation of the emergency preparedness and response plan for epidemic prone diseases (EPHI team, RHB, zonal and woreda health offices and catchment health facilities).
- ❖ Consistent Provision of safe and adequate water supply (water and sewerage authority)
- ❖ Provision of the soap and health education on hygiene practice (WASH team)
- ❖ To identify gap, inform the respective team and follow for improvement implementation for identified gaps(all teams and woreda/zonal administration)
- ❖ Cleaning the available latrine, building the latrine where not available and closing the filled trench latrine (WASH team) as needed
- ❖ Revision of the distribution of the food and non-food items and to take corrective actions (zonal DRMC)
- ❖ Establish mobile clinic at IDP sites where there is no nearest health facility (Zonal/woreda health office)

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CHAPTER-VIII PROPOSAL FOR EPIDEMIOLOGI C RESEARCH PROJECT

8.1. Challenges associated with malaria parasitological diagnosis, in Hararge zone of Oromia region, 2017.

Summary

Background: Malaria parasite based diagnosis support the exclusion of malaria in differential diagnosis of febrile illness which may contribute to improve the clinical management of non-malaria illnesses. Malaria is one of the main public health problems in Ethiopia, 75% of the land are malarious' areas and more than 54 million people are vulnerable. The study was aimed to assess level and Challenges associated with Malaria parasitological diagnosis, in west Hararge zone Oromia region.

Methods: Facility based cross sectional study with both quantitative and qualitative approach will be employed from 10 2018-to February 28, 2018. Multi stage sampling technique will be employed: primary involved selection of eight Woredas by simple random sampling and secondary stage involved purposively selecting sixteen health centers and health posts respectively. By using single population proportion formula and p-value (P=0.5%) of Malaria diagnosis, 402 health professionals will be involved to the study. Data will be collected by face to face interview using structured questionnaires and document review using checklist for quantitative part. Data will be entered and cleaned and analyzed using Epi info version 7.0. The analysis will be verified using descriptive interpretation. The attitude toward malaria diagnosis will be assessed by using point's ordinal Likert scales. For qualitative Key informant in depth interview will be applied using Interview guide contained open-ended questions. After entering, coding and categorizing the qualitative data open code, it will be analyzed by using content analysis approach. Data analysis will be started along with data collection. After each interview recordings, the field note will be jotted down. The digital recording was transcribed and notes will be searched for missing information and deficiencies to take a correction for subsequent interviews. Informed consent will be obtained from each participant. At the end the result will be communicated to Addis Ababa University School of public health and Zonal health offices. To complete this study 139,671 ETB.birr will be required.

Project outcome: This study will identify the factor that will determine the Malaria diagnosis in the zone. Generation of baseline data on the malaria diagnostic capacity of the region, drawing recommendations from the results of the study for strategic intervention against the problems and Identification of constraints associated with parasitological diagnosis of malaria cases.

Work Plan: This study will take three months duration and be completed in March, 2018.

Introduction

Malaria parasite based diagnosis support the exclusion of malaria in differential diagnosis of febrile illness which may contribute to improve the clinical management of non-malaria illnesses. Parasite diagnosis reduces malaria over diagnosis and unnecessary antimalarial treatments. Confirmation of malaria by parasitological test guides the prescription of more specific treatment with potential less drug reactions (1).

Globally in 2016, 91 countries reported a total of 216 million cases of malaria; an increase of 5 million cases over the previous year. The global tally of malaria deaths reached 445 000 deaths, about the same number reported in 2015. The WHO African Region continues to account for about 90% of malaria cases and deaths worldwide. Fifteen countries – all but one in sub-Saharan Africa – carry 80% of the global malaria burden. Clearly, if we are to get the global malaria response back on track, supporting the most heavily affected countries in this region must be our primary focus (2).

Africa has looked at variations on the question of what proportion of children and adults given an antimalarial has actually had malaria. The answer has been consistent: overtreatment of children and especially adults with antimalarial is substantial. Over diagnosis is defined as giving an antimalarial to a patient who does not have any malaria parasites detected on a malaria test the clinician has requested. This is true for severe disease as well as for non-severe disease, but this review concentrates on non-severe disease because it is most relevant to (AMFm) Affordable Medicines Facility-malaria (3).

Proper and accurate diagnosis of malaria is the key to effective disease management, guiding the management of febrile patients and reducing the unnecessary use of antimalarial drugs. Misdiagnosis of malaria results in significant morbidity and mortality. Rapid, accurate and accessible detection of malaria parasites has an important role in reducing malaria burden and in promoting the more rational use of increasingly expensive medicines. Use of RDTs makes it possible to provide accurate diagnosis for remote populations, reaching those who lack access to good-quality microscopy services (1).

WHO recommend all cases of suspected malaria should have parasitological test (microscopy or Rapid diagnostic test) to confirm the diagnosis (4). High sensitivity of malaria diagnosis is important in all settings, and essential for the most vulnerable population groups in which malaria infection produces an acute illness that can rapidly progress to death. To improve the quality of care (case management), parasitological confirmation of the clinical diagnosis of malaria should be part of good clinical practice wherever possible. Although clinical diagnosis is sensitive and detects almost all malaria cases it is not specific: reliance on clinical diagnosis alone results in a high proportion of misdiagnoses. The

result is prolonged and worsening illness and missed opportunities to treat diseases other than malaria, which may be the main cause of illness (1).

Malaria presents a diagnostic challenge in most endemic countries in sub-Saharan Africa, yet early diagnosis and appropriate treatment is a challenge of current malaria policy. In sub-Saharan Africa, documentation of fever or history of fever has traditionally been considered sufficient evidence for prescribing anti-malarial therapy (5).

Malaria is one of the main public health problems in Ethiopia, 75% of the land are malarious' areas and more than 54 million people are vulnerable. Plasmodium falciparum and P. vivax are commonly known species in Ethiopia are to cause malaria accounting for 60% and 40%, respectively. The burdens of malaria in Ethiopia are lost productive personnel due to illness, school absenteeism; medical costs and other indirect costs including adult laborers are infected by malaria and stop working. Burdens are increased by absolute poverty of the country that cannot protect themselves from the bite of mosquito (6).

Parasitological diagnosis is recommended by the World Health Organization (WHO) for all patients in whom malaria is suspected as part of the 'test, treat, track' strategy (7).

Ethiopia National Malaria Control Program recommended malaria diagnostic both microscopy and malaria rapid diagnostic tests (RDT) methods. Since 2007, there has been a major shift from clinical diagnosis to confirmatory diagnosis following the wide-scale use of RDTs in peripheral health facilities. To improve the quality of malaria diagnosis and treatment at peripheral health facilities (health posts) pan specific RDTs are now being introduced. HEWs will be trained on the use of multi-species RDTs in the integrated refresher training (IRT) The objectives are 100% of suspected malaria cases are diagnosed using RDTs and or microscopy within 24 hours of fever onset; 2) 100% of positive malaria diagnosis is treated according to national guidelines and 3) 100% of severe malaria cases are managed according to national guidelines (8). Since the launch of PMI, a total of 6.24 million RDTs and 12.34 million ACT treatment doses have been procured (9).

The initial scale-up of malaria prevention and control efforts in Ethiopia largely focused on the procurement of and access to key malaria commodities, rather than strengthening the support systems (10).

Oromia Regional State is the largest of the 11 regional states of Ethiopia, with estimated population of 40 million people and covering about one-third of the country's landmass. Because of its malaria burden, Oromia has been the focus state for the US President's Malaria Initiative (PMI; http:// www.pmi.gov). The aim of the survey reported here was to assess the malaria parasitological diagnosis and existing challenge in selected health facilities within West Hararge zone Oromia, Ethiopia.

Statement of the problem

For unknown reason there is high proportion 27.5% of clinical diagnosed Malaria cases in West Hararge zone of Oromia region. WHO guideline recommends all cases of suspected malaria should have parasitological test to confirm the diagnosis. National malaria treatment policies in most high transmission countries call for laboratory confirmation of malaria in older children and adults. In reality, however, diagnosis is frequently made on clinical grounds alone. Shortages of supplies, staff, and training mean that laboratory-confirmed diagnosis is not consistently available, leading clinicians to rely on clinical diagnosis much of the time. Reliance on clinical diagnosis alone results in a high proportion of misdiagnoses. The result is prolonged and worsening illness and missed opportunities to treat diseases other than malaria, which may be the main cause of illness.

Diagnostic algorithms employing fever and other clinical signs may be more specific than those based on fever alone, but decreased sensitivity may lead to more missed malaria diagnoses. This increases the unnecessary administration of these drugs and may also become difficult combat the spread of resistance by ensuring that only malaria patients receive this treatment. It will also mean that patients who present with a fever but do not have malaria are more likely to be given inappropriate treatment more rapidly.

If long standing problems can be successfully addressed, the use of Microscopy and and Rapid Diagnostic Test for malaria diagnosis could improve the management of both malaria and other febrile illness.

Rationale of the study

It is important to identify factors affecting testing compliance in the local setting in order to develop context specific interventions and maximize the benefits of RDT and microscopy. This study, therefore aimed to assess challenges associated with malaria parasitological diagnosis, health workers perceptions about malaria diagnosis using RDT, microscopy of health professional at health facility in west Hararge zone Oromia region, 2017. If long standing problems can be successfully addressed, the use of Microscopy and and Rapid Diagnostic Test for malaria diagnosis could improve the management of both malaria and other febrile illness. This study will identify the factor that will determine the Malaria diagnosis in the zone. Generation of baseline data on the malaria diagnostic capacity of the region, drawing recommendations from the results of the study for strategic intervention against the problems and Identification of constraints associated with parasitological diagnosis of malaria cases. The stakeholders will use the finding from the research to act and improve the Malaria diagnosis achievement in their respective jurisdiction. The study can also be used as an input to design the new approach to improve the practice of the Malaria parasitological diagnosis in the zone.

Literature Review

A study in Tanzania showed that clinicians appeared to make malaria treatment decisions on the basis of conventional clinical logic and diagnostic algorithms on the one hand, and social factors with no obvious basis in clinical logic on the other. They also used tests to confirm their suspicions, rather than make a diagnosis or allocate treatment. Elsewhere, there was evidence of over diagnosis of malaria in the formal health-care sector in many parts of Africa. Mostly, clinicians often failed to request a diagnostic test when it was clinically appropriate. Even when clinicians chose to test, they often ignored the results (11).

In order for a malaria program to be effective, case management and management of logistics is very important. Before an implementation plan can be drawn up, it is important that clear malaria case management policy documents and guidelines are endorsed that clearly define who will be performing the tests, which tests will be performed, when they will be performed, and at which level of the health service (12).

In two studies, which were conducted in similar epidemiological settings, (One in Tanzania and the other in Zambia), approximately 99 per cent of patients with a positive diagnostic test (either microscopy or RDT) and approximately 50 per cent of those with a negative RDT were prescribed an antimalarial drug. It also stated that the great majority (more than 90 per cent) of all anti-malaria drugs prescribed were given to patients for whom the clinician had chosen to undertake a test and had received a negative result (11).

Study conducted in Tanzania that over prescription with anti-malarial drugs is still practiced in an area of Tanzania where universal testing with RDTs have been introduced as official policy since treatment of RDT-negative patients and treatment based on clinical diagnosis without testing remains. The use of malaria diagnostics was also associated with higher prescription of antibiotics among patients with negative test results. Factors responsible for these practices include system factors such as non-availability of testing facilities, limited capacity to diagnose other causes of fever, staff shortage, and health workers perceptions about the importance of malaria and test results (13).

Malaria Diagnosis:

Basing the diagnosis on clinical features alone is not recommended, as this often has low specificity and increases the chances of the patient being misdiagnosed. Unless there is an ongoing malaria epidemic, careful laboratory testing typically reveals confirmed malaria parasites in fewer than 50% (probably in the range of 20-30%) of the clinically suspected malaria cases in most settings in Ethiopia. Malaria treatment based on clinical diagnosis must be the last option when there is no availability of RDTs or microscopy. **WHO** recommends universal parasitological diagnosis of malaria to ensure targeted use of antimalarial drugs for those individuals who actually have Malaria**.**

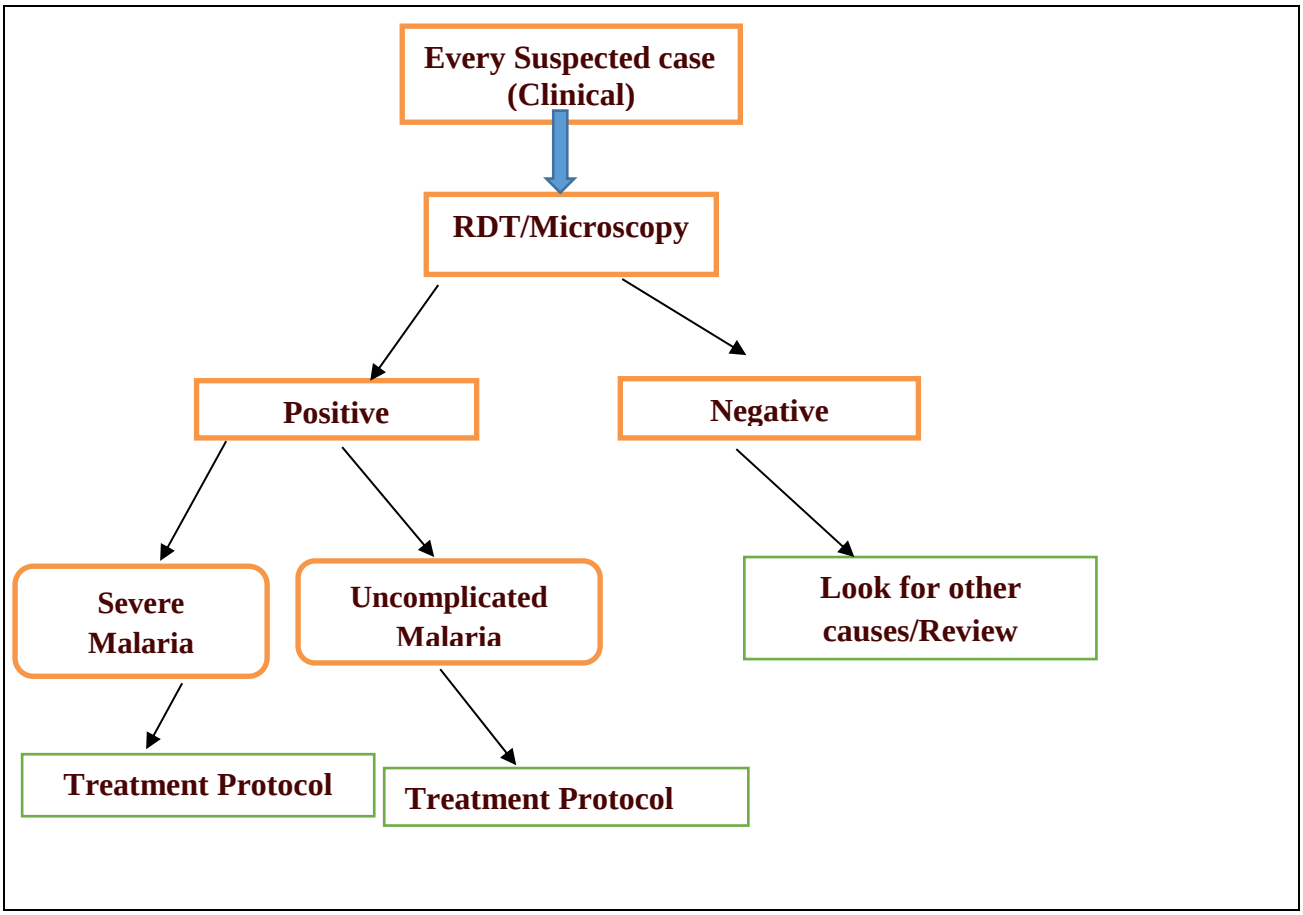

Figure 47: Malaria Management: Algorithm for Diagnosis

Source: World health organization 2005.

Parasitological diagnosis

For confirmation of Malaria etiology Microscopic diagnosis and RDTs are the methods employed. Malaria microscopy is available only in health centers and hospitals, and in higher private health facilities; generally these facilities have electrical power and fresh water. Thick blood films can be very sensitive, detecting as few as 20 parasites/µl of blood using Light microscopy. Thin blood film stained with Giemsa is useful for identifying the malaria parasite species and has a sensitivity of 20 parasites/µl. To determine parasite load, the recommended method is by quantifying the percentage of parasitized red blood cells. Ethiopia introduced, single-species RDTs at health posts in 2005, greatly improving access to accurate P. falciparum malaria diagnosis at peripheral level Currently multi-species RDTs capable of specifically detecting both P. falciparum and P. vivax, are being supplied by

FMOH to health posts, enhancing malaria diagnosis by species at the periphery and reducing the need for empiric treatment and wastage of anti-malarial drugs.

It also provides the opportunity to accurately identify parasite-negative patients in whom another cause of fever (diagnosis) must be sought without delay. RDT or Microscopy test negative Patients for malaria do not need anti-malarial medications (1).

In communities where community health workers (CHWs) can be trained in their use, Malaria RDTs are more practical at the point of care as they do not require electricity or special equipment. RDTs may also detect Plasmodium infection even when the parasites are sequestered in the deep vascular compartments and thus undetectable by microscopic examination of a peripheral blood smear. High-quality RDTs have become available (14).

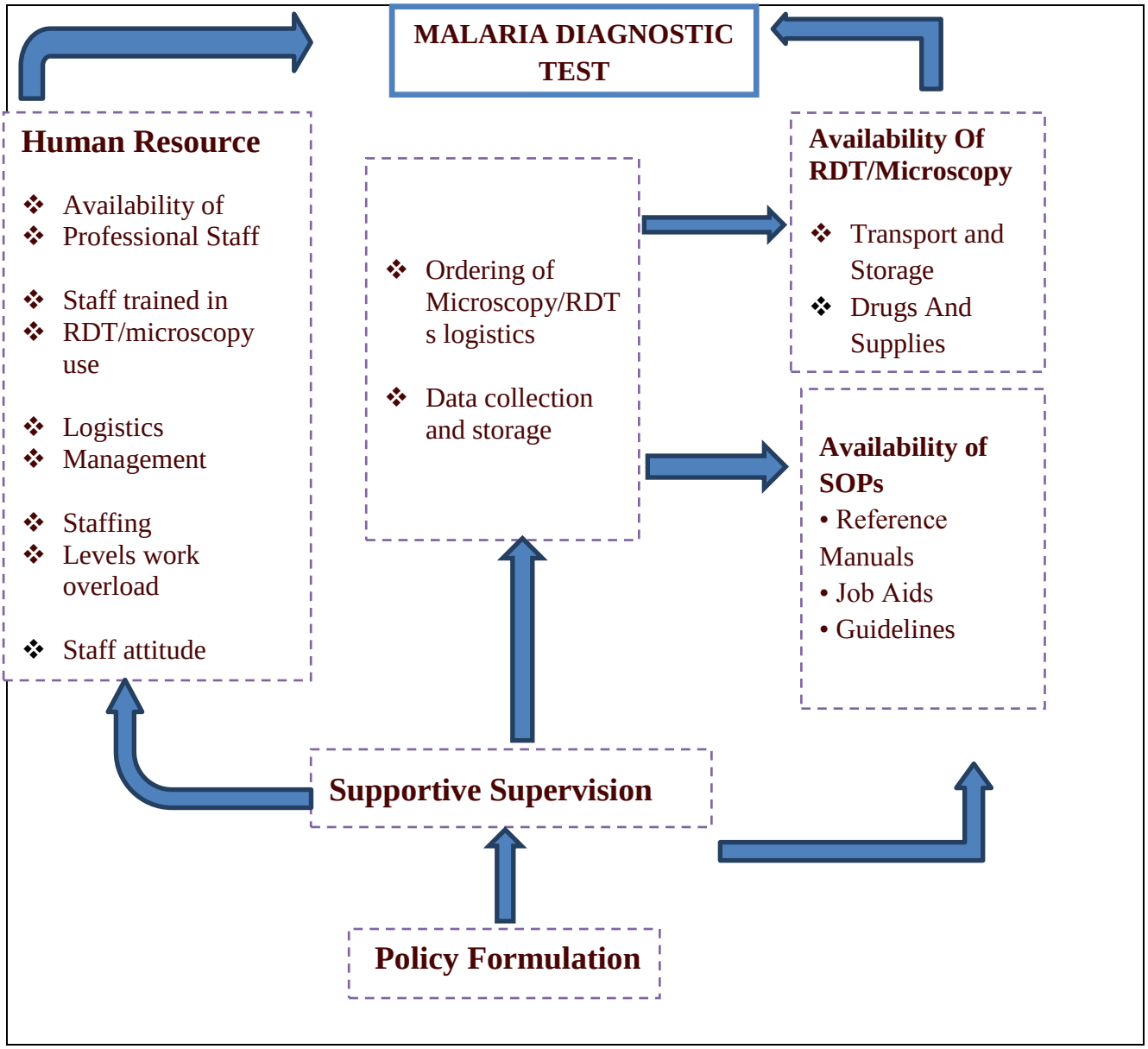

Figure 48: Conceptual framework: challenges for Malaria RDT/microscopy

Source: World Health Organization, 2005.

Objective

General objective:

- To assess level and Challenges associated with Malaria parasitological diagnosis, in west Hararge zone Oromia region

Specific objective:

- To assess the level of malaria parasitological confirmation
- To identify existing challenges of malaria parasitological confirmation

Method

Study area

West Hararge is one of the Zones in the Ethiopian Region of Oromia. West Hararghe takes its name from the former province of Hararghe. West Harerge is bordered on the south by the Shebelle River which separates it from Bale, on the southwest by Arsi, on the northwest by the Afar Region, on the north by the Somali Region and on the east by East Hararghe. Towns in West Hararghe include Chiro, Bedessa, Gelemso, and Mieso. Malaria is one of the main public health problems in west Hararge Zone, 81% of the land are malarias' areas. Based on 2007 central statistics agency CSA, this Zone has a total of population 1,871,706 of whom 958,861 are men and 912,845 women with an area of 15,065.86 square kilometer, west Hararge has population density of 124.23.while 9.36% are urban inhabitant, a further0.56% are pastoralist. A total of 395,127 household were counted in this zone, which results in an average 4. 74 people to a household and 380,019 housing unit……

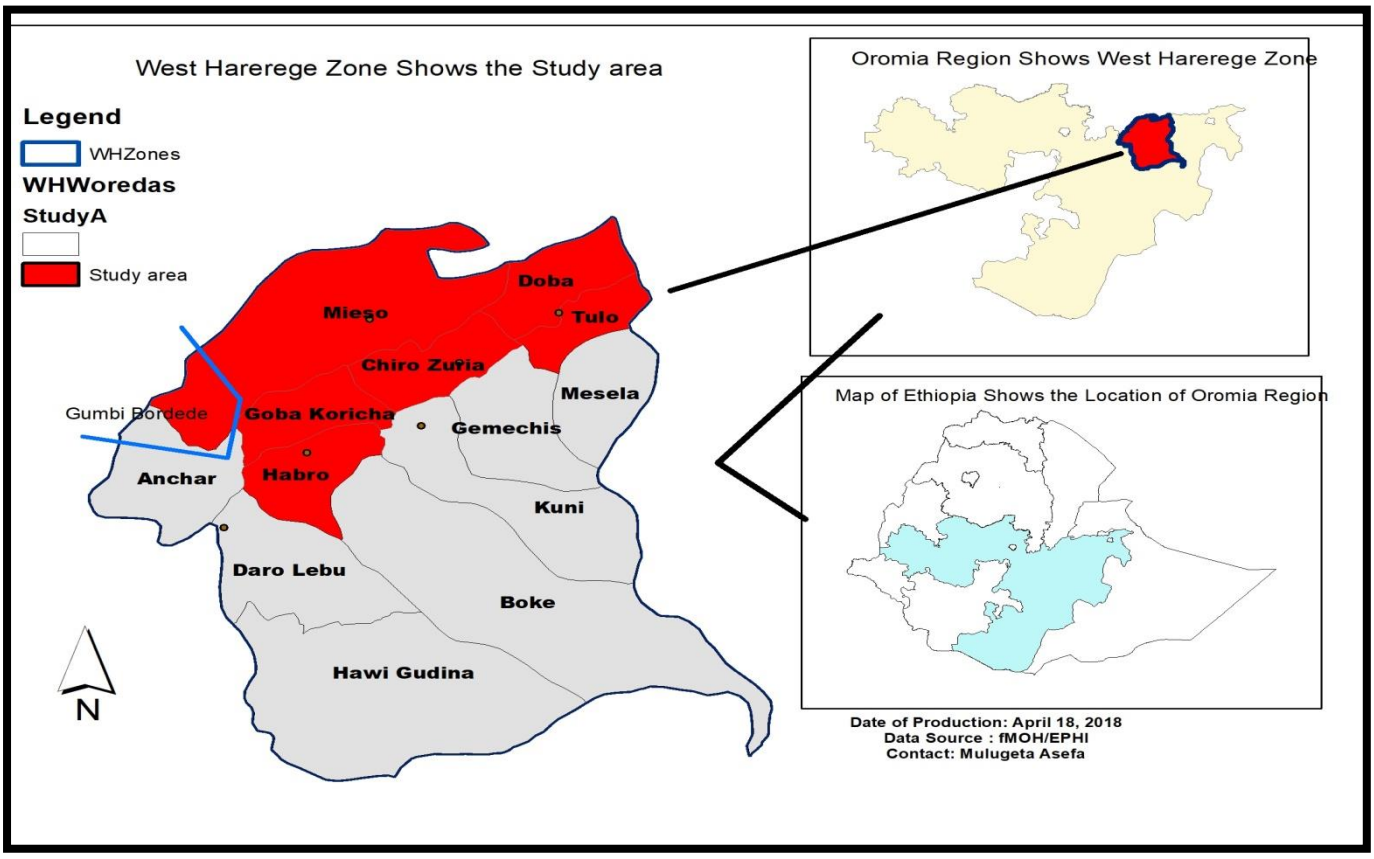

Figure 49: Map of West Hararge zone Oromia region as of 2010.

Study period

The study will be conducted from January 10 2018-to February 28, 2018.

Study Design

Facility based descriptive cross sectional study will be used.

Source Population: All Government health facilities in West Hararge zone Oromia region which has been regularly reporting Malaria during 2017.

Study Population: Constitutes selected government health facilities found in West Hararge zone regularly reporting Malaria to the national PHEM during 2017.

Study Unit

Health professionals either concerned with diagnosis, reporting and reviewing of the Malaria in selected government health facilities (health posts, health centers and hospitals) in west Hararghe zone in 2017 is considered to be the study unit. The health professional is to Laboratory technologist, Doctors, Health officer, Nurse if any, Malaria focal of the health center and hospital, Nurse, General Practioner (GP) and Health Officer on outpatient Department (OPD), surveillance officer and Health extension workers.

Sample Size Calculation

In Ethiopia no clear published study challenge of malaria parasitological diagnosis. So that Single proportion formula will be used to calculate the sample size, 95% CI where Proportion assume P=q=0.5.

By using the single population proportion formula using 95% confidence interval, 5% degree of precision and 0.5% population proportion for Malaria diagnosis, a total of 384 health professionals will be included in the study.

- Estimate of the proportion of malaria diagnosis (p)=50%
- Desired level of absolute precision (d)= 5%
- $n = \frac{1.96^2\, p(1-p)}{d^2}$ =**384**

By expecting total non-response rate of 5% (n=19) of the total sample size, the total sample size enrolled in the study will be **402** health professionals.

Sampling method

Quantitative Study: A Multi stage sampling will be used. The primary stage sampling will be to select 8 woredas from the zones because all of the 16 woredas are on the same level of malaria diagnosis. Sampling frame for all of 16 woredas was prepared and 8 of the woredas will be selected by simple random sampling using lottery method with replacement. Second stage sampling will be purposively selecting needed amount health center health centers and health posts from selected woredas. So each selected woreda contributed one health center and one health post (unproportioned allocation). Like the health centers and health post which were selected from woreda, the district public hospitals will be included in the study.

Qualitative Study: Purposive sampling will be applied to select respondent for in-depth interview.

Exclusion Criteria: All government health facilities reporting the Malaria but not registered in the list of expected health facilities in the west Hararghe zone Oromia region data base. These include newly constructed government health facilities and who began to provide service but not registered in the data base. For key informants, PHEM and Malaria personnel who have acted as a focal person on the position for less than one month was excluded from key informant interview.

Data Collections Tools and Procedures

Quantitative Study: Health care providers will be interviewed using structured questionnaires to collect information on their knowledge and perception in relation to malaria RDTs and microscopy. The data obtained from health professionals will be used for assessment of knowledge and attitude toward Malaria diagnosis practice. Face to face interview with clinician (Doctors or Health officer or Nurse), laboratory professional, and PHEM focal of the health center and hospital, PHEM focal or surveillance officer of the health office will be conducted. Review of documents including copies of PHEM weekly reporting format (WRF) at the health facilities, woreda and zonal and regional level will be conducted to see the number of documented clinically reported malaria cases in that health facilities in the 2017.

Qualitative study: It will be carried out with the total of 41 key informants, comprising of Oromia regional health bureau, one of the selected zone and 8 selected woredas PHEM focal persons and 3 selected hospitals, 16 Health center Key in formant (Nurse or Physician or Health officer, and surveillance officer) and 16 Health post (health extention workers). Those 41 key informants will be included to explore the existing challenges with malaria diagnosis in their respective setting and as malaria are reported from the lowest level, upward. The interview will be conducted using an interview

guide that was developed in English. The interview guide contained open-ended questions to reduce predetermined responses and to allow informants to think and to express their experiences. Questions in the interview guides were arranged in a way that facilitates dialogue. The first part contained general questions followed by more specific. Before conducting the interviews, interviewee was informed about the study and asked for his/her permission. The engagement and probing question was used to extract the detail and needed information from the interviewee. The interview preceded the quantitative data collection at health facility level. As a result of the logistic issues and to obtain the reliable information, the community level key informants were selected from the catchment areas of the selected health posts. Like that of the key informant interview with different level of PHEM case team (woreda, zone/town and region) and hospitals, with this part of data collection it is intended to get insight in to the challenges with malaria diagnosis.

The quantitative data collectors were 3 personals who had worked/have been working in the PHEM/ have exposure to surveillance of at least health centers level. The supervisor was one field epidemiology resident or field epidemiologist. One day training will be given to all of the ten data collectors on malaria diagnosis as introduction and the skill needed to collect quality data. The qualitative data collection (key informant interview) was undertaken by the principal investigator.

Data Analysis

Quantitative Data: The data collected will be entered, categorized and cleaned using Epi-Info 7.0 by principal investigator. It will be exported in to excel spreadsheet to see the knowledge and attitude score for individual study participants. The analysis will be verified using descriptive interpretation. The attitude of the health professional toward malaria diagnosis was assessed by using point's ordinal Likert scales which was made unidirectional i.e. the Likert score for negative questions were reversed. The larger the Likert score the more the participant have positive attitude toward malaria diagnosis practices. Then mean attitudinal Likert score for the woreda was computed by calculating the mean score for the woreda from individual health professionals score in the respective woreda. The data will be summarized in the form of the table. In the same way each enrolled participants from health centers and hospitals were asked a question each weighing five points for knowledge assessment. So the participants were considered knowledgeable about the malaria diagnosis if he/she correctly answers at least eight of eight questions thereby scoring fourty and above.

Qualitative data analysis: Data analysis will be started along with data collection. After each interview recordings, the field note will be jotted down. The digital recording was transcribed and notes will be searched for missing information and deficiencies to take a correction for subsequent interviews. Prior to the actual data analysis, repeated hearing of the recordings was undertaken. After understanding the content of the speech the note was jotted down and it was translated in to English by principal investigator. The initial step of the analysis involved reading and re-reading of the notes and transcriptions and hearing of recordings to understand the issues raised by the interviewee and to get an overall impression of malaria diagnosis challenge factor. The second step will be entering, coding and categorizing the data using open code software. The interview guides will be used to make preliminary labeling of the theme. The third step will be putting relevant texts under the respective themes.

Data quality control

The data collectors and supervisors will be trained one day prior to the data collection about the purpose of study, about the questionnaire, ensuring confidentiality of participants and on how to interview. Data will be collected by interviewing participants using semi structured questionnaire and in depth interview will be conducted for care providers. The English version of the questionnaires will be translated to Oromic which is easy to understand. To check the appropriateness and consistency of the questionnaire, pretest will be done on 10% of subjects before the data collection. During data collection, close supervision was made and the questionnaire was checked for completeness, accuracy and consistency by supervisors to take corrective measures on the right time.

Case definition

Suspected case definition for health center and above: Any person with fever or fever with headache, rigor, back pain, chills, sweats, myalgia, nausea, and vomiting diagnosed clinically as malaria.

Community case definition (case definition for HEWs): Any person with fever OR fever with headache, back pain, chills and vomiting.

Confirmed malaria: Suspected malaria case in which malaria parasites have been demonstrated in a patient's blood by microscopy or a rapid diagnostic test.

Suspected malaria: Patient illnesses suspected by a health worker to be due to malaria and the criteria usually include fever.

Operational Definition

Knowledgeable about Malaria diagnosis practice: If he/she correctly answers at 8 eight of 16 sixteen asked questions thereby scoring fourty and above (one question have five scores, totally sixteen question have eighty scores).

Positive/favorable attitude toward malaria practice: if the participants have scored greater than or equal to four of the total Likert score.

Dissemination of the finding

The result of this study will be presented and submitted to school of public health and college of Health Sciences, Addis Ababa University. The result will be submitted to West Hararge zone health office and Oromia regional health bureau. The summary of the thesis will be submitted to the international or national peer reviewed journal for publication

Ethical approval

Ethical clearance will be obtained from the Ethical Review committee of School of public health of Addis Ababa University. Before the start of data collection, permission will be obtained from Oromia region health bureau and Informed consent will be obtained from the participants using the consent form designed for this study. Respondents will be told that their participation is voluntarily and they can withdraw from the study at any time. To ensure confidentiality, name and other identifiers of health care professionals will not be recorded on questionnaires.

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CHAPTER-IX

ADDITIONAL OUTPUT

9.1. Challenges associated with malaria parasitological diagnosis, in Hararge zone of Oromia region, 2018

Malaria research Project proposal entitled "Challenges associated with malaria parasitological diagnosis, in Hararge zone of Oromia region, 2018" was sent to President Malaria Initiative program for mini grant. It was accepted and funded to be conducted. It was conducted among health facilities in West Hararge Zone, Oromia region, Ethiopia 2018.

Annex 1: questionnaire for Dengue Fever Outbreak-kebridehar, Somali Region, may2017.

No.	Question	Coding Classification	Go To
1. Demographic Information Zone_____ Kebele _____ House No_____			
1.1	Respondent ID	_____	
1.2	Sex	1.Male 2.Female	
1.3	Age	_____Years	
1.4	Marital Status	1. Single 2. Married 3. Divorced 4. Widowed 5.NA	
1.5	Educational status	1. Cannot read & Write 2.Primary school 3. Secondary 4. College And University	
1.6	Ethnicity	1. Somali 2. Amhara 3. Oromo 4. Tigre 5. Other(specify)	
1.7	Occupation	1. Student 2. Daily laborer 3. House wife 4. Merchant 5.Farmer/pastoralist 6.Other(specify) 7. Government employee	
2. Clinical Information			
2.1	Respondent Classification	1. Cases 2. Controls	If Control skip to 3.1
2.2	Date of Onset	dd/mm/yyyy _____	
2.3	Personal Risk Factors	1. Diabetes mellitus 2. Pregnancy 3. Previous same case 4. Any blood disorders 5. Congenital heart disease 6. Asthma 7. Dyspepsia 8. Hypertension	
2.4	Clinical symptoms	1.Fever 2.Headache 3.Chill 5. tarry stool 6. severe muscle and joint pain 7.shortness of breath	

No.	Question	Coding Classification	Go To
		8. easy fatigability 9. Abdominal pain, 10. Vomiting 11. vertigo 12. decrease urine out put	
2.5	Clinical Signs	1. Nasal bleeding 2. Gum bleeding 3. Dry mouth 4. BP<90/60 5. Pale 6. Shifting dullness and fluid trill 7. Decreased air entry over the chest 8. Petechial rash 9. Jaundice	
2.6	Date seen at health Facility	dd/mm/yyyy _____	
2.7	Treatment	1. Antibiotics 2. Antiviral 3. Antipyretics 4. Ant malaria 5. Fresh RBC 6. Fresh frozen plasma 7. Oxygen support 8. Shock treatment 9. Other supportive treatment	
3. Laboratory Specimens			
3.1	Blood Serum	1.Yes 2.No	
3.2	Blood PCR	1.Yes 2.No	
3.3	BF	1.Yes 2.No	
4. Knowledge towards Dengue fever			
4.1	Do you hear about Dengue fever?	1.Yes 2.No	
4.2	If yes, what do you think the cause of Dengue fever?	1.Virus 2.Bacteria 3.protozoa 4.other____ 5. Don't know	
4.3	Is Dengue fever Contagious?	1.yes 2.No 3. I Don't know	
4.4	If yes, how it transmit?	1.By mosquito 2. Air droplets 3.House fly 4.Other___	

No.	Question	Coding Classification	Go To
		5. Don't know	
4.5	At which time mosquito bites people?	1. Night 2. Day 3.Sunrise/sunset 4. I Don't know	
4.6	Does water required for mosquito to breed?	1.Yes 2.No 3.I Don't know	
4.7	Do you know symptoms of dengue fever?	1.Yes 2.No	
4.8	If yes what are the symptoms?	1.Fever 2.Headache 3.Bleeding 4.Rash 5.Other(specify)____	
4.9	Do you know prevention measures of dengue fever	1. Yes 2.No	
5. Exposure			
5.1	Do you have LLINs?	1.Yes 2.No	
5.2	If Yes, do you use LLINs while sleeping?	1.Yes 2.No	
5.3	At which time do you use while sleeping	1.Day 2.Night	
5.4	When did you get the last LLINs?	1. In less than 6 month 2. In greater than 1 year	
5.5	Who use LLINs always?	1.Children 2.preganat women 3. All use equally	
5.6	Is there any water holding container in/around the house?	1. Yes 2. No	
5.7	Do you store water in the container	1.Yes 2.No	
5.8	Status of Container (observe)	1.Open 2.Closed	
5.9	Presence of larvae in the container(observe)	1.Yes 2. No	
5.10	If yes, What is the use of the container?	1. For home use 2.Other use 3. Unusable	
5.11	Is there any stagnant water around your village?	1.Yes 2.No	
5.12	If Yes, approximately distance of stagnant water from your house?	1.less than 100m 2.more than 100m	
5.13	Is your house sprayed for the past 6 month?	1.Yes 2.No	
5.14	When was the last time that your house sprayed?	1.One month ago 2.Two months ago 3, Three months ago 4. More than three months	

No.	Question	Coding Classification	Go To
		5.more than 6 month	
5.15	Is there any river around your village?	1.Yes 2.No	
5.16	If Yes what is the name of the river?	_____	
5.17	Approximately distance of the river from your house?	1.less than 100m 2.more than 100m	
5.18	Is there any person diseased in your family?	1.Yes 2.No	
5.19	If Yes, how many family members become ill?	_____	
5.20	Did you have close contact with person with same complaint within the last 1 to 2 weeks?	1.Yes 2.No	
5.21	Did you have travel history within the last two weeks?	1. Yes 2. No	
5.22	If, yes to where?	_____	
5.23	Do you use air conditioning or window and door screens?	1.Yes 2.No	
5.24	Do you use mosquito repellents on your skin?	1.Yes 2.No	
5.25	Do you use mosquito repellant in your house?	1. Yes 2. No	
5.26	What kind of clothes you usually wear	1. Short and T-shirts 2. Trousers/ body full dress	

Annex 2: Questionnaire for human Rabies exposure in Dehana Woreda

No.	Question	Coding Classification	Go To
6. Demographic Information Zone_____ Kebele _____ House No_____			
6.1	Respondent ID	_____	
6.2	Sex	1.Male 2.Female	
6.3	Age	_____Years	
6.4	Marital Status	1. Single 2. Married 3. Divorced 4. Widowed 5.NA	
6.5	Educational status	1. Cannot read & Write 2.Primary school 3. Secondary 4. College And University	
6.6	Ethnicity	1. Somali 2. Amhara	

No.	Question	Coding Classification	Go To
		3. Oromo 4. Tigre 5. Other(specify)	
6.7	Occupation	1. Student 2. Daily laborer 3. House wife 4. Merchant 5.Farmer/pastoralist 6.Other(specify) 7. Government employee	
7. Clinical Information			
7.1	Respondent Classification	1. Cases 2. Controls	If Control skip to 3.1
7.2	Date of Onset	dd/mm/yyyy _____	
7.3	Personal Risk Factors	9. Diabetes mellitus 10. Pregnancy 11. Previous same case 12. Any blood disorders 13. Congenital heart disease 14. Asthma 15. Dyspepsia 16. Hypertension	
7.4	Clinical symptoms	1.Fever 2.Headache 3.Chill 5. tarry stool 6. severe muscle and joint pain 7.shortness of breath 8. easy fatigability 9. Abdominal pain, 10. Vomiting 11. vertigo 12. decrease urine out put	
7.5	Clinical Signs	10. Nasal bleeding 11. Gum bleeding 12. Dry mouth 13. BP<90/60 14. Pale	

No.	Question	Coding Classification	Go To
		15. Shifting dullness and fluid trill 16. Decreased air entry over the chest 17. Petechial rash 18. Jaundice	
7.6	Date seen at health Facility	dd/mm/yyyy _____	
7.7	Treatment	10. Antibiotics 11. Antiviral 12. Antipyretics 13. Ant malaria 14. Fresh RBC 15. Fresh frozen plasma 16. Oxygen support 17. Shock treatment 18. Other supportive treatment	
8. Laboratory Specimens			
8.1	Blood Serum	1.Yes 2.No	
8.2	Blood PCR	1.Yes 2.No	
8.3	BF	1.Yes 2.No	
9. Knowledge towards Dengue fever			
9.1	Do you hear about Dengue fever?	1.Yes 2.No	
9.2	If yes, what do you think the cause of Dengue fever?	1.Virus 2.Bacteria 3.protozoa 4.other____ 5. Don't know	
9.3	Is Dengue fever Contagious?	1.yes 2.No 3. I Don't know	
9.4	If yes, how it transmit?	1.By mosquito 2. Air droplets 3.House fly 4.Other___ 5. Don't know	
9.5	At which time mosquito bites people?	1. Night 2. Day 3.Sunrise/sunset	

No.	Question	Coding Classification	Go To
		4. I Don't know	
9.6	Does water required for mosquito to breed?	1.Yes 2.No 3.I Don't know	
9.7	Do you know symptoms of dengue fever?	1.Yes 2.No	
9.8	If yes what are the symptoms?	1.Fever 2.Headache 3.Bleeding 4.Rash 5.Other(specify)____	
9.9	Do you know prevention measures of dengue fever	2. Yes 2.No	
10.	Exposure		
10.1	Do you have LLINs?	1.Yes 2.No	
10.2	If Yes, do you use LLINs while sleeping?	1.Yes 2.No	
10.3	At which time do you use while sleeping	1.Day 2.Night	
10.4	When did you get the last LLINs?	3. In less than 6 month 4. In greater than 1 year	
10.5	Who use LLINs always?	1.Children 2.preganat women 3. All use equally	
10.6	Is there any water holding container in/around the house?	1. Yes 2. No	
10.7	Do you store water in the container	1.Yes 2.No	
10.8	Type of container and number observe	_____	
10.9	Status of Container (observe)	1.Open 2.Closed	
10.10	Presence of larvae in the container(observe)	1.Yes 2. No	
10.11	If yes, What is the use of the container?	1. For home use 2.Other use 3. Unusable	
10.12	Is there any stagnant water around your village?	1.Yes 2.No	
10.13	If Yes, approximately distance of stagnant water from your house?	1.less than 100m 2.more than 100m	
10.14	Is your house sprayed for the past 6 month?	1.Yes 2.No	
10.15	When was the last time that your house sprayed?	1.One month ago 2.Two months ago 3, Three months ago 4. More than three	

No.	Question	Coding Classification	Go To
		months 5.more than 6 month	
10.16	Is there any river around your village?	1.Yes 2.No	
10.17	If Yes what is the name of the river?	_____	
10.18	Approximately distance of the river from your house?	1.less than 100m 2.more than 100m	
10.19	Is there any person diseased in your family?	1.Yes 2.No	
10.20	If Yes, how many family members become ill?	_____	
10.21	Did you have close contact with person with same complaint within the last 1 to 2 weeks?	1.Yes 2.No	
10.22	Did you have travel history within the last two weeks?	3. Yes 4. No	
10.23	If, yes to where?	_____	
10.24	Do you use air conditioning or window and door screens?	1.Yes 2.No	
10.25	Do you use mosquito repellents on your skin?	1.Yes 2.No	
10.26	Do you use mosquito repellant in your house?	3. Yes 4. No	
10.27	What kind of clothes you usually wear	1. Short and T-shirts 2. Trousers/ body full dress	

Annex 3: PHEM Case-based Reporting Format (CRF)

House to House Rapid Monitoring of Measles Vaccine Coverage						
Reporting Health Facility:						
Woreda	Zone			Region		
Disease type (put tick mark)						
Anthrax	Cholera		Measles	Meningitis		
Neonatal Tetanus	Hemorrhagic Fever		Yellow Fever	Others/Specify		
Name of Cases:						
Date of Birth (DOB): / / __Day__ Month__ Year (EC)		Age (If DOB unknown): Years: __Months: __ (if under 12 mos.)		Sex: M = Male, F = Female		
Cases's Address:	Kebele:			House number:		
Woreda:	Zone:			Region:		
Locating Information						
Location when symptom started:				Current location:		
If applicable or If the cases is neonate or child, please write full name of mother and father of the cases:						
Date Seen at Health FacMeaslesty: / / / / __Day__ Month__ Year (EC)	Date Health FacMeaslesty notified Woreda/zone: / / / / __Day__ Month__ Year (EC)			Date of Onset: / / / / __Day__ Month__ Year (EC)		
Number of vaccine/TT doses received:	For cases of NNT* , Measles, Yellow Fever, and Meningitis (For NNT, Measles, Yellow Fever – refer immunization card & for Meningitis - ask history) *For NNT cases please complete the additional case investigation form (NNT, Measles, Yellow Fever and Meningitis only)					
Date of last vaccination:/ / / / __Day__ Month__ Year (EC)						
Associated with epidemics?	1=YES 2= NO					
In/Out Cases	1=Incases			2=outcases		
Treatment given	1=YES (specify)			2= NO		
Outcome of the cases at the time of report:	1=Alive	2=Dead		3=Unknown		
Fill only if specimen is collected and sent to Lab						
Date of specimen collection: / / __Day__ Month__ Year (EC)	Date of specimen sent to lab/ / __Day__ Month__ Year (EC)					
Type of specimen(put tick mark)	Stool	Blood	Serum	CSF	Throat swab	Other/ specify
Date form sent to Woreda / / __Day__ Month__ Year (EC)						
Name and signature of the person completing the form Name _____Sig. _____Telephone_____						
For Official Use Only						
ID Number:	Date form received at National/Regional level:/ / __Day__ Month__ Year (EC)					
Final classification of cases	1=Confirmed	2=Probable	3=Discarded	4=Suspected		
Final classification for Measles	1=Laboratory confirmed	2=Confirmed by Epidemiological linkage	3= Clinical compatible	4=Discarded	5= Suspected	
Name and signature of the official :Name _____Sig. _____Telephone_____						

Annex 4: Health Office Level Questionnaire for system evaluation

Date_____ Region_____ Zone_____ District/town_____

Interviewer_____ Respondent_____

General

Location_____

Bordering areas: North_____ South_____ West_____

East_____Latitude_____ Longitude_____

Altitude_____

Total population_____ male_____ female_____ <5

Health institution number:

Hospitals_____ health center_____ health posts_____ private hospitals____

private clinics_____ drug stores_____

Human power

General Practitioners_____ health officers_____ nurses_____ midwifes

_____ supportive staff_____ surveillance officers_____

Health coverage_____

1. Availability of National Surveillance Guidelines

Observed presence of a national guideline for surveillance? 1. Yes 2. No

1. Case Detection and Registration

2.1.Observed presence of the standard case definition for anthrax:

1. Yes 2. No

2.2.Observed the weekly reporting forms:

1. Yes 2. No 3. NA

2.3.Observed line list (general/customized for anthrax outbreak):

1. Yes 2. No 3. NA

3. ***Data reporting***

3.1. Is the central level responsible for providing anthrax surveillance forms to the health facilities? 1. Yes 2. No

3.2.*If yes,* have you lacked appropriate surveillance forms at any time during the last 6 months?

1. Yes 2. No

3.3. If yes, list the form lacked_____

3.4. What are the reporting entities for the anthrax surveillance system?

a. Public health facilities 1. Yes 2. No
b. NGO health facilities 1. Yes 2. No
c. Military health facilities 1. Yes 2. No
d. Private health facilities 1. Yes 2. No
e. Others_____(specify)

3.5. Number of weeks of anthrax report sent to the upper next level in the last 3 months:_____

3.6. Number of anthrax weekly reports received on time in the last three months:_____

3.7. How do you report anthrax report to next upper level?

1. Mail 2. Fax 3. Telephone 4. Radio 5. Electronic 6. Other_____(specify)

4. *Data analysis*

4.1. Does the health office:

a. Describe anthrax data by person?

Observed description of data by age and sex:

1. Yes 2. No

b. Describe anthrax data by place?

Observed description of data by tables, maps

1. Yes 2. No

c. Describe anthrax data by time?

Observed description of data by time:

1. Yes 2. No

d. Perform anthrax trend analysis?

Obs Observed line graph of cases by time:

1. Yes 2. No

e. Do you use threshold for anthrax

1. Yes 2. No

f. Which threshold setting method are you using?

1. Doubling method 2. Second largest 3. Others (specify)_____

f. Who is responsible for the analysis of the collected anthrax data?

_____

g. How often do you analyze the collected anthrax data?

1. Daily
2. Weekly
3. Every two weeks

4. Monthly
5. Quarterly
6. As needed

h. Do you have appropriate denominators for anthrax?

Observed presence of demographic data (E.g. population by kebeles and age groups)

1. Yes 2. No

5. *Outbreak Investigation*

5.1. Have you ever encountered anthrax outbreak in the last six months

1. Yes 2. No

5.2. If yes, how many of the anthrax outbreaks were investigated in the last six months_____

5.3. Of the investigated malaria outbreaks in the last six months, percent in which findings were used for action_____ [Observe report]

6. Epidemic preparedness

6.1. Existence of plan for anthrax epidemic preparedness and response

Observed a written plan of anthrax epidemic preparedness and response:

1. Yes 2. No

6.2. Does the anthrax EPRP have budget set-aside?

1. Yes 2. No

6.3. Existence of emergency stocks of drugs and supplies at all times in last six months

6.4. Have you experienced a shortage of drugs and supplies during the most recent epidemic (or outbreak) 1. Yes 2. No

6.5. Existence of a standard case management protocol for anthrax

Observed the existence of a written case management protocol for anthrax

1. Yes 2. No

6.6. Is there a budget line for epidemic response?

1. Yes 2. No

6.7. Existence of epidemic management committee

Observed minutes (or report) of meetings of epidemic management committee:

1. Yes 2. No

6.8. Is there rapid response team (RRT) for epidemics 1. Yes 2. No

6.9. Observed minutes (or report) of meetings of rapid response team (RRT)

7. Response to epidemics

7.1.Ability of the health office to respond within 48 hours of notification of most recently reported anthrax outbreak:

Observed that the woreda/town/zone/region responded within 48 hours of notification of most recently reported anthrax outbreak (from written reports with trend and intervention)

1. Yes 2. No 3. NA

7.2. Ability of the woreda epidemic management committee to evaluate its preparedness and response activities:

7.3. Has epidemic management committee evaluated its preparedness and response activities during the recent anthrax outbreak (Observe written report to confirm)?

1. Yes 2. No 3. NA

8. ***Feedback***

8.1. Existence of a report or bulletin that is regularly produced to disseminate surveillance data:

8.1.1. How many weekly bulletin or reports has the health office produced in the last six months?

_____

8.1.2. Observed the presence of a report or bulletin that is regularly produced to disseminate surveillance data:

1. Yes 2. No 3. NA

8.2. Existence of feedback system

How many feedbacks were received from the higher level in the last six months? _____

Observed the presence of weekly feedback received from the higher level:

1. Yes 2. No 3. NA

How many feedbacks were provided to the lower level in the last six months?

Observed the presence of weekly feedback received from the higher level

1. Yes 2. No 3. NA

9. Supervision

9.1.Number of supervisory visit that was made in the last six months

How many supervisory visits have you made in the last six months? _____

Observed the supervisory report

1. Yes 2. No 3. NA

9.2. If No, the most usual reasons for not making all required supervisory visits

_____

9.3. How many times have you been supervised by the higher level in the last six months?

_____

Observed the supervisory report

1. Yes 2. No 3. NA

10. ***Training***

10.1. What numbers of your subordinate personnel have been trained in? _____

10.2. Have you been trained in anthrax surveillance?

1. Yes 2. No 3. NA

If yes, specify when, where, how long, by whom?

_____

_____

11. Resources

11.1. Does the woreda/town/zone/region health office has

A. Data management materials

1 Computer 1. Yes 2. No

2 Printer 1. Yes 2. No

3 Photocopier 1. Yes 2. No

4 Data manager 1. Yes 2. No

5 Statistical package 1. Yes 2. No

B. Communications

1 Telephone service 1. Yes 2. No

2 Fax 1. Yes 2. No

3 Radio call 1. Yes 2. No

4 Satellite phone 1. Yes 2. No

5 Computers that have modems 1. Yes 2. No

6 Internet 1.Yes 2.No

C. Budget line for emergency 1. Yes 2. No

D. Human power

1 Surveillance officer in number: _____

2 Anthrax focal person: _____

E. Logistics

1 Bicycles Yes 2. No

2 Motor cycles Yes 2. No

3 Vehicles Yes 2. No

12. ***Surveillance Co-ordination***

12.1. Existence of focal unit for surveillance

Is there a focal unit for surveillance? [Observe organogram to confirm]

1. Yes 2. No 3. NA

13. ***Opportunities for integration***

13.1. What opportunities are there for integration of surveillance activities and functions (core activities, training, supervision, guidelines, resources etc.)?

_____

14. ***Satisfaction with the surveillance system***

14.1. Are you satisfied with the anthrax surveillance system? 1. Yes 2. No

If no, how can the surveillance system be improved?

_____

II. Questionnaire for attributes and level of usefulness

a. Total population under surveillance_____

b. What is the incidence of anthrax in your area (2016)?

i. Cases_____ in 2016

ii. Deaths_____ in 2016

15. Level of usefulness

15.1. Does the anthrax surveillance system help to detect outbreaks early?

1. Yes 2. No

15.2. Does anthrax surveillance system help to estimate the magnitude of morbidity and mortality related to the disease, including identification of factors associated with the diseases? 1. Yes 2. No

15.3. Does the anthrax diseases surveillance system permit assessment of the effect of prevention and control programs? 1. Yes 2. No

Observe anthrax interventions and diseases trends analyzed

1. Available 2. Not available 3. NA

III. Describe Each System Attributes

16. Simplicity

16.1. Is the case definition of anthrax easy for case detection by all level health professionals? 1. Yes 2. No

If no mention difficult with malaria case definition_____

_____

16.2. Do you feel that additional data collected on a case are time consuming? 1. Yes 2. No

16.3. How long it takes to fill the format? a. <5 minute b. 10-15minuts c. >15 minutes

16.4. Does the system is supplemented with other surveillance systems (with the animal health surveillance system in data sharing) 1. Yes 2. No

17. Flexibility

17.1. Can the current reporting formats be used for other context without much difficulty? 1. Yes 2. No

17.2. Do you think that any change in the existing procedure of anthrax case detection, reporting, and formats will be difficult to implement? 1. Yes 2. No

Comment: _____

18. Data Quality (Completeness of the reporting forms/and validity of the recorded data)

18.1. Are the data collection formats for anthrax clear and easy to fill for all the data collectors/ reporting sites? 1. Yes 2. No

18.2. Are the reporting site / data collectors trained/ supervised regularly? 1. Yes 2. No

Observe: Review the last months report

Average number of *unknown or blank responses* to variables in each of the reported forms for anthrax_____

Percent of reports which are complete (that is with no blank or unknown responses) from the total reports_____

19. Acceptability

19.1. Health professionals are comfortable to participate in the anthrax system activities 1.Yes 2.No

19.2. Do you think all the reporting agents accept and well engaged to the surveillance activities?

1. Yes 2. No

If yes, how many are active participants (of the expected too)? _____

If No, what is the reason for their poor participation in the surveillance activity?

A. Lack of understanding of the relevance of the data to be collected
B. No feedback / or recognition given by the higher bodies for their contribution; i.e. no dissemination of the analysis data back to reporting facilities
C. Reporting formats are difficult to understand
D. Report formats are time consuming
E. Other_____

20. Representativeness

20.1. What is the health service coverage of the area? _____%

20.2. Do you believe the monthly anthrax case and death report represents the situation in the facility/community 1.Yes 2.No

20.3. Do you think, the populations under surveillance have good health seeking behavior for Anthrax? 1. Yes 2. No

20.4. Who do you think is well represented by the surveillance data? 1. Urban 2. Rural

20.5. Are the private health facilities included in the surveillance? 1. Yes 2. No 3. NA

If No why? : _____

20.6. Are the NGO health facilities included in the surveillance? 1. Yes 2. No 3. NA

20.7. Are the military health facilities included in the surveillance? 1. Yes 2. No 3. NA

21. Timeliness

21.1. When do you report anthrax report to the next level: _____

21.2. Anthrax data is always ready when we need it for planning purposes 1.Yes 2. No

22. Stability

22.1. Was any new restructuring affected the procedures and activities of the anthrax surveillance? 1. Yes 2. No

22.2. Was there lack of resources that interrupt anthrax surveillance system?

1. Yes 2. No

22.3. Was there any time/condition in which the surveillance is not fully operating?

1. Yes 2. No

Annex 5: Health Facility level Questionnaire for system evaluation

Type of the health facility: 1. Health Center 2. Hospital

Name of health facility_____

Date_____ (MM/DD/YYYY)

Region_____ Zone _____Woreda_____

Interviewer's Name_____ Respondent's Name_____

1. National surveillance guidelines

1.1. Is there a national manual for surveillance at this health facility? 1. Yes 2. No

Observed national surveillance guidelines: 1. Available 2. Not available 3. NA

2. Case detection and registration

2.1. Does the health facility has a clinical register

Observed the existence of a clinical register 1. Yes 2. No

2.2. Does health facility correctly register cases?

Observed the correct filling of the clinical register during the previous 30 days

1. Yes 2. No 3. Not applicable

2.3. Does health facility has standardized case definitions for anthrax

1. Yes 2. No 3. Unknown

2.4. Is malaria cased definition posted on the wall/visible site? 1. Yes 2. No

2.5. Observed the respondent correctly diagnosing anthrax using a standard case definition 1. Yes 2. No

3. Case confirmation

3.1. Does the health facility have the capacity to collect specimens for anthrax confirmation (blood?)

1. Yes 2. No 3. NA

3.2. Observed the presence of materials required to collect blood and process for anthrax

3.3. Does the health facility have functional cold chain 1. Yes 2. No 3. NA

3.4. Does the health facility have transport media 1. Yes 2. No 3. NA

4. Data reporting

4.1. Has health facility lacked appropriate surveillance forms at any time during the last 6 months? 1. Yes 2. No 3. unknown

4.2. Does the health facility have WRF at the time of the data collection? 1. Yes 2. No

4.3. Does the health facility have line list at the time of the data collection? 1. Yes 2. No

4.4. Does the line list have relevant variables? (observe) 1. Yes 2. No

4.5. Comparison of the number of anthrax cases with the one reported on WRF:

4.5.1. Observed that the last monthly report agreed with the register for anthrax?

1. Yes 2. No 3. NA

4.5.2. Number on Register for the last 30 days/one month_____

4.5.3. Number of anthrax cases reported to the next level in the last 30 days/one month_____

4.5.4. If there is difference in register and reporting form for the same weeks, put the percent difference in number of cases_____?

4.6. How many times the health facility does reported weekly report in the last six months?

_____

4.7. How many of the weekly reports in the last six months were reported by WRF to higher next level? _____

4.8. What is reporting means used by health facility to report the anthrax data to next upper level? 1. E-mail, 2. Telephone, 3.Fax or radio 4. Other (specify)_____

5. Data analysis

5.1. Does the health facility analyze anthrax data? 1. Yes 2. No

5.2. If yes, who is responsible for anthrax data analysis? _____

5.3. At what time interval anthrax data is analyzed? 1. Daily 2. Weekly 3. Bi weekly. 4 Others (specify)_____

Analysis by personal variables

5.4. Observed description of data by age and sex and other personal variables 1. Yes 2. No 3. NA

Analysis by place variables

5.5. Observed malaria data described by place (locality, village, work site etc)?

1. Yes 2. No 3. NA

Analysis by time variables

5.6. Trend analysis: observed line graph of anthrax cases by time? 1. Yes 2. No

1. Yes 2. No 3. NA

5.6. Have an action threshold set for anthrax? 1. Yes 2. No

5.7. Which threshold are you using for anthrax outbreak detection? 1. Doubling method 2. Second largest/third quartile 4. Others (Specify)_____

5.8. Do you have appropriate denominators for anthrax data analysis? 1. Yes 2. No

Observed presence of demographic data at health facility

A. Total population 1. Yes 2. No
B. Population by age category 1. Yes 2. No
C. Population by sex, 1. Yes 2. No
D. Population by village, 1. Yes 2. No

6. Epidemic preparedness

6.1. Observed the existence of a written case management protocol for anthrax? 1. Yes 2. No

6.2. Does the health facility has:

6.3. …….

2.1. Does the health facility implemented malaria prevention and control measures based on surveillance data? 1. Yes 2. No 3. Unknown

2.2. Observed that the health facility achieved an acceptable case fatality rate for most recent outbreak 1. Yes 2. No 3. Unknown 4. Not applicable

2.3. Does the health facility have emergency preparedness and response plan (EPRP)? 1. Yes 2. No

2.4. What is the anticipated anthrax Attack rate (AR) for the EPRP? _____

2.5. Observe that the EPRP addresses both the plan for preparedness and response? 1. Yes 2. No

2.6. Does the health facility have rapid response team (RRT) 1. Yes 2. No

3. Feedback

3.1. Have health facility received a report or bulletin from a higher level during the last six months on the data they have provided? 1. Yes 2. No

3.2. If yes, how many feedback bulletin or reports has the health facility received in the last six months? _____

3.3. Observed at least one report or bulletin at the health facility from a higher level during the last six months on the anthrax data they have reported

1. Yes 2. No 3. Not applicable

3.4. How many feedback bulletin or reports has the health facility provided to health posts in the past 6 months? _____

3.5. Observed at least one report or bulletin at the health facility provided to health post in the last six months on the anthrax data they have provided

1. Yes 2. No 3. Not applicable

3.6. Has health facility conducted meetings with community members to discuss results of surveillance or investigation data in the last years? 1. Yes 2. No

3.7. How many meetings has the health facility conducted with the community members in the last six months? _____

3.8. Observed the minutes or report of at least one meeting between the health facility team and the community members within the last six months

1. Yes 2. No 3. Not applicable

4. Supervision

4.1. Has health facility supervised by upper level in the last six months? 1. Yes 2. No

4.2. If yes, how many times have you been supervised in the last six months? _____

4.3. Observed supervision report or any evidence of supervision in last 6 months

1. Yes 2. No 3. Not applicable

4.4. Has the supervisor from the next higher level reviewed anthrax surveillance practices appropriate to this level? 1. Yes 2. No

4.5. Observed supervision report or any evidence for appropriate review of surveillance practices 1. Yes 2. No 3. Not applicable

5. Training

5.1. Has the staff in the health facility trained on anthrax surveillance and epidemic management? 1. Yes 2. No

5.2. If yes, how many of the health facility staffs were trained? _____

5.3. Specify?

When: _____

Where: _____

For how long: _____ the last training was given

***6.* Availability Resources**

6.1. Has the health facility have functional:-

a. Electricity 1. Yes 2. No

b. Bicycles 1. Yes 2. No

c. Motorcycle 1. Yes 2. No

d. Vehicles 1. Yes 2. No

6.2. Data management: Has the health facility have:-

a. Stationery 1. Yes 2. No

b. Calculator 1. Yes 2. No

c. Computer 1. Yes 2. No

d. Software 1. Yes 2. No

e. Printer 1. Yes 2. No

6.3. Communication: Has health facility have:-

a. Telephone service 1. Yes 2. No

b. Fax 1. Yes 2. No

c. Radio call 1. Yes 2. No

d. Computers that have modems 1. Yes 2. No

e. Internet 1.Yes 2.No

6.4. Information education and communication materials: Has health facility have:-

f. Posters 1. Yes 2. No

g. Megaphone 1. Yes 2. No

h. Flipcharts or Image box 1. Yes 2. No

i. TV set 1. Yes 2. No

j. Generator 1. Yes 2. No

k. Screen Projector 1. Yes 2. No

l. Other (specify) 1. Yes 2. No

7. Satisfaction with surveillance system

7.1. Are you satisfied with the anthrax surveillance system? 1. Yes 2. No

7.2. *If no*, how can malaria surveillance systems be improved to bring satisfaction?

_____

_____

_____

II. Questionnaire for attributes and level of usefulness

1. Total population under surveillance_____

2. What is the incidence of anthrax in your area?

A. Cases _____of last six months

B. Deaths _____ of last six months

III. Describe Each System Attributes

2. Usefulness

1.1. Does anthrax surveillance system help to detect outbreaks early? 1. Yes 2. No

1.2. Does anthrax surveillance system help to estimate the magnitude of morbidity and mortality related anthrax, including identification of factors associated with the anthrax?

1. Yes 2. No

1.3. Does the anthrax surveillance system permit assessment of the effect of anthrax prevention and control programs? 1. Yes 2. No

2. Simplicity

2.1. Is the case definition for anthrax easy for case detection by all level health professionals? 1. Yes 2. No

2.2. If no, mention difficulty with anthrax case definition_____

2.3. Do you feel that data collected on anthrax case are time consuming? Yes/No

2.4. How long it takes to fill the format? 1. <5 minute 2. 10-15minuts 3. >15 minutes

2.5. How long does it take to have laboratory confirmation anthrax?_____\

2.6. Does the system is supplemented with other surveillance systems (with the animal health surveillance system in data sharing) 1. Yes 2. No

3. **Flexibility**

3.1. Can the current anthrax reporting formats can accommodate addition of new variables/indicators without much difficulty? 1. Yes 2. No

3.2. Anthrax data is always ready when we need it for planning purposes 1. Yes 2.No

3.3. Do you think that any change in the existing procedure of anthrax case detection, registration and reporting will be difficult to implement? 1. Yes 2. No

Comment:_____

4. **Data Quality** (Completeness of the reporting forms/and validity of the recorded data)

4.1. Are the data collection formats for anthrax clear and easy to fill for all the data collectors/ reporting sites? 1. Yes 2. No

4.2. Has the reporting site / data collectors trained/ supervised regularly? 1. Yes 2. No

Observe: Review the last months report

Average number of *unknown or blank responses* to anthrax variables in each of the reported forms_____

Percent of reports which are complete (that is with no blank or unknown responses) from the total reports_____

5. **Acceptability**

5.1. Health professionals are comfortable to participate in the anthrax system activities 1. Yes 2.No

5.2. Do you think all the reporting agents accept and well engaged to the surveillance activities?

1. Yes 2. No

5.3. If yes, how many are active participants (of the expected to)? _____

5.4. If No, what is the reason for their poor participation in the surveillance activity?

a. Lack of understanding of the relevance of the data to be collected

b. No feedback / or recognition given by the higher bodies for their contribution; i.e. no dissemination of the analysis data back to reporting facilities

c. Reporting formats are difficult to understand

d. Report formats are time consuming

*e. Other*_____

6. **Representativeness**

6.1. What is the health service coverage of the area? _____%

6.2. Do you believe the monthly anthrax case and death report represents the situation in the facility/community 1.Yes 2.No

6.3. Do you think, the populations under surveillance have good health seeking behavior for fever? 1. Yes 2. No

6.4. Who do you think is well represented by the surveillance data? 1. Urban 2. Rural

7. **Timeliness**

7.1. When do you report weekly anthrax report to the next level? _____

7.2.Anthrax data is always ready when we need it for planning purposes 1.Yes 2.No

8. **Stability**

8.1. Was any new restructuring affected the procedures and activities of anthrax surveillance? 1. Yes 2. No

8.2. Was there lack of resources that interrupt the anthrax surveillance system? 1. Yes 2. No

8.3. Was there any time/condition in which the anthrax surveillance is not fully operating? 1. Yes 2. No

9. Sensitivity

9.1. The system picks most of the anthrax cases and deaths in the facility /Community 1.Yes 2.No

9.2. If no, Reasons for not picking most of the cases and deaths

_____

9.3. Proportion of anthrax cases and deaths in human in 2017 _____

9.4. Proportion of anthrax cases in animal_____

Annex 6: Health Post Level Questionnaire for system evaluation

Background Questions

Region_____Zone_____Woreda_____

Date_____ (MM/DD/YYYY)

Name of health post_____

Interviewer's Name_____ Respondent's Name_____

National surveillance guidelines

1.1 Is there Integrated Refresher Training (IRT) manual? 1. Yes 2. No

1.2 If yes, observe: 1. Available 2. Not available

1.3 Mention the reason for which the IRT manual is not available

1. Not given
2. Taken by staffs
3. Become out of service
4. Others_____ (Specify)

2. Case detection and registration

2.1.Does the Health Post have clinical register? 1. Yes 2. No

2.2. If yes, Observe: 1. Available 2. Not available 3. NA

2.3.Observe filling of the clinical register during the previous 30 days to make sure it is correct

1. Yes 2. No 3. Not applicable

2.4.Does the Health post have community case definition for Anthrax? 1. Yes 2. No

2.5. If yes, Does the health post have posted the community case definition for Anthrax on the wall?

1. Yes 2. No

2.6. Does the HEWs correctly using the community case definition for diagnosis of Anthrax (observe that the cases listed on the register for the last one month fulfill the community case definition for Anthrax) 1. Yes 2. No

3. Data reporting

3.1. Does the health post have weekly reporting format pad (WRF-HEWs) at all times over the last six months? 1. Yes 2. No 3. Unknown

3.2. Observe for the current presence of WRF-HEWs 1. Yes 2. No

3.3. Do the HEWs utilizing the WRF-HEWs for reporting 1. Yes 2. No

3.4. Number of Anthrax reports sent by health post to health center in the last six months_____(Ask from HEWs)

3.5. Number of weeks in the last six months for which weekly report is sent by WRF-HEWs_____(Observe copies of WRF-HEWs present at health post)

3.6. Number of weekly Anthrax report sent to the health center on Monday in the last six months_____

3.7.Comparison of the number of Anthrax cases registered on register book and reported to the health center in the last six months

A. Number of cases registered on registration book for the last six months_____
B. Number of cases reported to the health center in the last six months_____

3.8. What is the available means of reporting at the time of data collection? 1. Paper 2. Telephone. 3. Other_____ (specify)

3.9.Which of the above mentioned reporting means (Q3.8) are you using? 1. Paper 2. Telephone. 3. Other (specify)

4. Data analysis

4.1. Do you analyze Anthrax data? 1. Yes 2. No

If Yes,

Observe description of data by age and sex 1. Yes 2. No 3. Not applicable
Observe description of data by place 1. Yes 2. No 3. Not applicable
Observe description of data by time 1. Yes 2. No 3. Not applicable

4.2. Observe for the availability of Anthrax epidemic monitoring chart 1. Yes 2. No

4.3. If yes, do the HEWs utilizing Anthrax epidemic monitoring chart? 1. Yes 2. No

4.4. Is there any evidence of Anthrax outbreak on the epidemic monitoring chart? 1. Yes 2. No

*5. **Epidemic preparedness and response***

2.1.Is HEWs implementing Anthrax prevention and control measures by using local surveillance data? 1. Yes 2. No

2.2. Can you give me an example of evidence based decision you made by using Anthrax surveillance data? _____

2.3.

3. *Feedback*

3.1. Are you getting feedback from health center or above level on Anthrax? 1. Yes 2. No

3.2. If yes, how often you got the feedback from health center? _____

3.3. How many feedback has the health post received in the last six months? _____ (Observe)

3.4. Do the HEWs have meetings with community? 1. Yes 2. No

3.5. If yes, is Anthrax prevention and control the agenda during the meeting? 1. Yes 2. No

3.6. How many meetings has the health post conducted with the community members in the past six months? _____

3.7.Is the meeting minute available? (Observe) 1. Yes 2. No

4. *Supervision*

4.1. Has there been supervision on Anthrax from higher level? 1. Yes 2. No

4.2. If yes, how many times have you been supervised in the last six months by health center? _____

*4.3.*How many times have you been supervised in the last 6 months by woreda and above levels? _____

4.4. Observe for any supervision report or any evidence of supervision in last 6 months (regardless of the level providing supervision) 1. Yes 2. No 3. Unknown

5. *Training*

5.1. Have you received IRT? 1. Yes 2. No

5.2. If yes, when was the last time the IRT given? _____

5.3.If yes, how many of existing HEWs has received IRT? _____

6. *Resources*

6.1. Does the Health post have functional electricity 1. Yes 2. No

6.2. Does the health post have any means of transportation 1. Yes 2. No

6.3. If yes, specify the available means of transport_____

6.4. Does health post had regular supply of stationeries in the last six months? 1. Yes 2. No 3. Unknown

7. *Satisfaction with surveillance system*

7.1. Are you satisfied with the Anthrax surveillance system?

1. Yes 2. No

7.2. *If No*, what should be introduced or modified to make better functioning surveillance?

_____

III. Describe Each System Attributes

8. Usefulness

8.1.Total population under surveillance in the catchment areas of the health post_____

8.2. Does the current Anthrax surveillance provide estimation of the magnitude of morbidity and mortality from Anthrax in the community under surveillance? 1. Yes 2. No

8.3.Does the current Anthrax surveillance provide timely estimation of the Anthrax burden to enhance early prevention and control? 1. Yes 2. No

8.4. Does the current Anthrax surveillance permit assessment of effect of malaria prevention and control programs? 1. Yes 2. No

9. Simplicity

9.1.Is the Anthrax community case definition easy for case detection by HEWs? 1. Yes 2. No

9.2.Do you think that extensive training is necessary to use Anthrax community case definition by HEWs? 1. Yes 2. No

9.3.Does the system is supplemented with other surveillance systems (with the animal health surveillance system in data sharing)

9.4.Do you feel that additional data collected on a case are time consuming? 1. Yes 2. No

9.5.How long does it take fill information on register book for single Anthrax patient? A. <5 minute B. 10-15minuts C. >15 minutes

9.6.How long it takes to fill format? A. <5 minute B. 10-15minuts C. >15 minutes

9.7.Do you report Anthrax data to other apart from catchment health center? 1. Yes 2. No

9.8.If yes, to whom you report Anthrax data other than the catchment health center? _____

10. Flexibility

10.1. Do you think that any change in the existing procedure of Anthrax case detection, registration and reporting will be difficult to implement? 1. Yes 2. No If no Comment: _____

10.2. Can the current reporting formats be used for other context without much difficulty 1.Yes 2.No

11. Data Quality: (Completeness of the reporting forms/and validity of the recorded data)

11.1. Are the data collection formats for Anthrax clear and easy to fill 1. Yes 2. No

11.2. Are the reporting site / data collectors trained/ supervised regularly? 1. Yes 2. No

Observe: Review the last months report

11.3. Average number of *unknown or blank responses* to for Anthrax variables in each of the reported forms_____

11.4. Percent of reports which are complete (that is with no blank or unknown responses) from the total report_____

12. Acceptability

12.1. Do you accept and well engaged in the surveillance activities? 1. Yes 2. No

12.2. Health professionals comfortable to participate in the anthrax system activities1. Yes 2. No

12.3. If No, what is the reason for your poor participation in the surveillance activity?

i. Lack of understanding of the relevance of the data to be collected

ii. No feedback / or recognition given by the higher bodies for their contribution; i.e. no dissemination of the analysis data back to reporting facilities

iii. Reporting formats are difficult to understand

iv. Report formats are time consuming

v. Other_____

13. Representativeness

13.1. What is the health service coverage of the area? _____%

13.2. Do you think the populations under surveillance have good health seeking behavior for malaria? 1. Yes 2. No

13.3. I believe anthrax cases and Deaths reported in this system are actually anthrax 1. Yes 2.No

13.4. Who do you think is well represented by Anthrax surveillance data? 1. Urban 2. Rural

14. Timeliness

14.1. When do you report weekly Anthrax report to the health center? _____

14.2. Anthrax data is always ready when we need it for planning purposes 1. Yes 2.No

15. Stability

15.1. Was any new restructuring affected the procedures and activities of the Anthrax surveillance? 1. Yes 2. No

15.2. Was there lack of resources that interrupt the surveillance system? 1. Yes 2. No

15.3. Was there any time /condition in which the malaria surveillance is not fully operating? 1. Yes 2. No

16. Sensitivity

16.1. The system picks most of the anthrax cases and deaths in the facility /Community 1.yes 2. No

16.2. If no, Reasons for not picking most of the cases and deaths

16.3. Proportion of anthrax cases and deaths in human in 2017 _____

16.4. Proportion of anthrax cases in animal_____

Annex 7: Data collection tools for woreda health profile description

1. Historical Aspects of the area (Culture & tourism office).

Woreda Name _____

How & why the name given_____

How and when the woreda was formed_____

Any other historical aspect_____

2. Geography and Climate (including map, altitudes, agro ecological zones etc…)

Location (distance and direction) _____ _____

Altitude _____

Surface Area _____ (_____ from the zone)

Geographical coordinate

Latitude _____ longitude _____

Annual rain fall(average)_____, annual temp(average)_____

Climatic zones_____ _____ _____

3. Facilities

Accessibility (main roads)_____

Type of road _____

How many kebeles have access to transportation _____

How many people get power supply_____

Post office _____

Bank _____

Telecommunication _____

4. Administrative setup

Total no. of kebeles: rural_____ Urban_____

Woreda boundaries North _____south_____

East_____ west_____

5. Demographic information

5.1. Population: Total_____ urban _____.rural_____

Male----------Female---------- sex ratio----------

Under 1years _____. Under five years_____ < 15 years_____.>64 years_____(Population pyramid) Women 15_49 years of age_____

Total population by kebele (each kebele pop)_____

5.2. Ethnic/language

Oromo____ (__%) , Amhara_____(__%), Tigre_____(__%), Gurage____(__%)

Others_____ (__%).

5.3. Religion

Orthodox ____(__%), Muslim ____(__%), Protestant____(__%) Other ____(__%)

6. Economy (mainstay of the economy, average income levels etc)

6.1. Main income sources

Land density _____

Cultivated _____

Farming _____

Grazing _____

Main crops _____, _____, _____,

Fertilizer utilization _____

6.2. House hold income source

Agriculture_____ (No.), Different business_____(No.), Employee_____(No.)

Jobless _____ (No.) Average income per HH/year_____

7. Education and school Health

Number of educational institution

College/ TVET_____, High school_____ Elementary ___ K.G.___

Total School Age Children (target) _____

Total Enrolment _____(_____)

School dropout in 6 months or year 2004 _____

If there is school dropout why _____

7.1. Educational status of the community

Total Educated people_____

Male _____

Female _____

7.2. School health activities:

Water supply: schools with water supply_____

Toilets: schools with functional latrines (male & female)_____

Schools with HIV/other Health clubs_____

8. Infrastructure for health Facilities (Transport, Telecommunication, Power supply, Water supply…)

8.1. How many of the health posts have access to

Transportation____ (__), Telecommunication____ (__), Electric power_____ (__)

Water supply ___ (__)

8.2. How many of the health centers have access to

Transportation____ (__), Telecommunication____ (__), Electric power_____ (__)

Water supply ___ (__)

9. Safe water coverage

Total safe water coverage _____(___)

Safe water supply coverage by kebele _____

Main source of water supply _____

Kebeles getting safe water___ _(__)

Population getting safe water_____(__)

10. Health delivery system

10.1. District health structure

10.2. Health Facilities

Type		number	Total No. Of beds
Gov. Hospital			
Gov. Health center	Type A		
	Type B		
Private H.Fs (clinics/diag. lab/drug	Clinics (all type		
	Diag. lab		
	Drug store		

Gov. Health posts			
NGOs	H.Ps		
	H.Cs		
	Hospitals		
	Clinics		

Health institution to pop ratio:

Hospital: Pop----------. HC: Pop---------- HP: Pop----------Health service coverage----------

10.3. Human resource for health sector

Type	Number	Remark
Specialist		
G.P		
HO		
Nurses (Deg. and Dip.)		
Mid wife (Deg. and Dip.)		
Lab. (Deg. and Dip.)		
Pharmacy (Deg. and Dip.)		
Env. Health (Deg. and Dip.)		
HIT		
Health education		
HEWs		
Others		

Doctor: pop. ratio_____ Nurse: pop. ratio____ Mid. Wife: pop. Ratio ____HEW: pop. ratio_____

10.4. Top causes of morbidity and mortality

10.4.1. Top ten leading causes of OPD visit (morbidity):

No	Adult	Pediatrics/ < 5 years
1		
2		
3		
4		
5		
6		
7		
8		

9		
10		

10.4.2. Top ten causes of admissions (inpatient)

no	Adult	Pediatrics/ <5 year
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

10.4.3. Top ten causes of deaths (mortality).

No	Adult	pediatric/ <5
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

10.7. Vital Statistics and Health Indicators

Infant Mortality Rate (IMR) _____ (total <1 yrs. deaths this 2016 yrs._____)

Child Mortality Rate_____ (this year's total <15 yrs. deaths_____)

Crude Birth Rate_____

Crude Death Rate_____ (total deaths 2016 yrs.____)

Maternal Mortality Rate_____ (2016 total maternal deaths_____)

Contraceptive Prevalence rate_____

Contraceptive acceptance rate _____

ANC rate (how many of the total expected pregnancies attended 1st ANC) _____

ANC rate (how many of the total expected pregnancies attended 4th ANC) _____

Percentage of deliveries attended by skilled birth attendants_____

Percentage of deliveries attended by HEWs_____

Percentage of deliveries attended by TBA _____

10.8. Immunization Coverage (for children and Women);

BCG _____(__%). OPV0____(____%), OPV1_____(___%), OPV3_____(___%)

Measles_____(___%). Penta1_____(___%). penta2 _____(___%) penta 3_____(___%)PCV-10-1_____(__%),PCV-10-3_____(___%),TT2+P.W_____(__%),TT2+

N.P.W_____(___%)

10.9. Health budget allocation

Government

Total budget allocated for the district _____

Total budget allocated for health _____(____%)

Funds from NGO

Total _____ (purpose/programs)_____

10.11. Disaster situation in the woreda

Was there any disaster (natural or manmade) in the woreda in the last one year? _____

Any recent disease outbreak/other public health emergency_____

If yes cases_____ and deaths_____

10.12. Community Health Services;

10.13. Status of services provided by community health workers namely

No. of TBAs/TTBA_____ and their responsibility _____

No. of CHWs/CHPs_____ and their responsibility _____

Responsibility of HEWs_____

Others_____

10.13. Status of Primary Health Care Components – with focus on the eight PHC Elements and MDG.

PNC,_____

FP (Methods,_____

EPI (outreach service, cold chain, vaccine_____

10.14. Environmental Health & sanitation

Latrine coverage_____ & utilization rate_____

Water supply coverage_____

others_____

Health Education (what, when, where, how and who conducted health education)

10.15. Endemic disease

Malarious area

Total Malarious kebeles_____ & Pop at risk_____

ITNs coverage (including current dist) _____ is there IRS this year (No of kebeles)_____

Total cases/yrs_____ deaths/yrs_____, <5yr cases_____ deaths_____

Malaria supplies (Coartem, RDT, etc.) shortage _____

Other issues_____

TB/Leprosy

Total TB cases_____ PTB negative_____ PTB positive____ Extra PTB _____

TB detection rate _____

TB Rx completion rate _____ TB cure rate _____

TB Rx success rate _____

TB defaulter_____

Death on TB Rx_____

Total TB patients screened for HIV_____

Total Leprosy cases_____ on Rx_____

HIV/AIDS;

Total people screened for HIV (last one year)_____

VCT_____ PITC_____PMTCT_____

HIV prevalence_____

HIV Incidence (new cases/yr)_____

Total PLWHA_____

ON ART _____on Pre-ART_____

Other HIV prevention activities_____

10.16. Nutrition (malnutrition related OTPs, SC, TSF, CBN and PSNP activities)/HO & early warning.

Total OTP sites_____, total admissions to OTP/yrs._____

Total SC sites,_____, Newly opened/yrs._____, total admissions to SC/yr_____

Is there TSF (targeted supplementary feeding) program in the woreda_____?

CBN program_____ PSNP _____other _____

General food security condition_____

Essential drugs (shortage):-

_____11. What do you think the major Health problem/s of the woreda?

_____

12. Discussion of the highlights and the main findings of the health profile

Assessment and description

---

13. Problem Identification and Priority Setting – set priority health problems based on the public health importance, magnitude, seriousness, community concern, feasibility etc.

Annex 8: Questionnaire for IDP Rapid health need assessment

1. Areas affected

1.1. When did conflict occur? 03/01/20010 time 11:30Am

1.2. What was the Cause of conflict (brief description of the causes of the crisis?)

_____

1.3. Location of conflict affected areas (kebele[s], _____, woreda, _____Zone, _____ Region_____

1.4. Accessibility of Affected kebeles, etc _____

1.5. Some background information on past conflict occurrences in the area, if any.

2. Number and profile of the affected population

2.1. Total number of households in affected woreda/s _____ total household displaced_____

2.2. Total population in affected woreda/s _____ Total population displaced _____ female _____male _____ U 5 _____, 5-14_____, 15-44_____, 45-64_____, >=65_____

2.3. Name of affected Kebeles and number of displaced household in each kebeles

2.4. Number of people or household departed from their localities _____

2.4.1. Place where they went to (kebele and woreda) _____, _____, _____, _____, _____

2.5. Number of displaced households arrived to IDP sites and traveled to place of origin (kebele and woreda) _____

2.6. Number of people died, _____ injured_____missed/not there _____

Unaccompanied minors (<18 yrs.) _____ Female _____ male_____

2.8. Number of elderly people and people with physical/mental disabilities_____

2.9. Number of pregnant and lactating women_____& _____

2.10. Number and type of shelter (mass shelter and/ or separate temporary shelter)

_____

2.11. Number of reported GBV cases if any_____

3. Number of people in need of medical care,_____ targeted supplementary feeding,_____ psychosocial/counseling support _____
4. Prospect or risk of additional displacement_____
5. Number of separated/unaccompanied people who need reunification_____

6. Health

6.1. Overall health status of the conflict affected people?

6.2. Mention if there are any diseases of public health concern like communicable diseases, _____ psychological/mental problems, health risks/hazard.

6.2. Was there any outbreak in the last 3 months at IDP/nearby community? Yes_____No_

If yes, specify the type of disease_____Type of outbreak

6.3. Availability of active coordination body and response team to control communicable diseases and epidemics (e.g. measles, acute watery diarrhea, dysentery diseases, acute respiratory infections, malaria and other vector born diseases)

6.4. Availability of health facilities and services which can deliver primary health care for the conflict affected people

6.4.1. Distance from shelter _____, Hours open _____, overnight stay: Yes/ No

6.4.2 Availabilities health professionals of # Doctors ___, Nurses____#, counselors, ___, HEW____ to serve conflict affected people

6.4.3. Is there referral linkage Yes/No Availability of Ambulance Yes /No

6.4.3. Medication and supply Yes/No

6.7. Major gaps, if any (essential drugs and related supplies, health professionals, BCC materials, etc) _____

7. Nutrition:

7.1Nutrition Screening

7.2. Was any conducted in the IDP site? Yes ____ No ____ _____ If yes when _____

Screening children: Number _____ % _____

SAM: Number _____ %_____

MAM: Number _____ %_____

Screening PLW: Number _____ % _____

Vitamin A children: Number _____ %_____

De-worming children: Number _____ %_____

8. TSFP Program at IDP

8.1. Was there a TSFP distribution at IDP Yes ____ No ____ If yes when ____

Are children discharged from OTP referred to TSFP? Yes ____ No ____

8.2. What were the major challenges health and nutrition emergency response at the IDP? _____

8.3. Are there protection incidents (e.g. GBV) reported by IDPs who receive health services?

When protection issues such as GBV are reported, do health facilities make referral to protection service providers?

Any signs of early malnutrition (good if clearly indicate early sign of malnutrition)

- Availability of ready-to-use nutrition supplies
- Availability of emergency nutrition coordination forums
- Nutrition screening results for U5 and PLW
- Number of health facilities with CMAM services running (staff, supplies prepositioned to manage 2 weeks-1 month services)
- TFSP- available monthly? If not- last TSFP distribution
- Any nutrition partners in place- Availability of RUTF, therapeutic milk and medicines to treat SAM children.Govt capacity to manage CMAM services (full health facilities running daily services).

8. **Water, sanitation and hygiene**

- Potable water for Conflict affected people (availability, quality of water, distance of water source)
- WASH intervention to date, if any
- Availability and adequacy of water purification chemicals including WASH facilities equipment, emergency water trucking operation, water containers, water storage units (bladders/tanks, etc)
- Availability and types of latrines in the newly established shelters
- Number of people without water and sanitation facilities

Major gaps, if any

Annex 9: Key informant interview planning for regional, zonal and woreda level PHEM focal and community level, West Hararge zone Oromia Region, 2018.

	S. No	**List of Stake holders**	**Participants**	**No of participants**	**Material Needed**	**Time schedule**	**Moderators**
KII with participants from PHEM structure and hospital/ health center	1	Region PHEM	PHEM focal person	One	Note book Pen Audio tape	The interview were held before data collection for quantitative study and it took 30 minute	X
	2	Zone PHEM	PHEM focal person	One		Time for each Interviewee take 30 minutes	X
	3	Woreda PHEM	PHEM focal person	Ten		Time for each Interviewee took 20 minutes & a total of 2;40 hours were needed	X
	4	Hospitals	Medical directors/ laboarator y and Malaria focal	Three	Note book Pen Audio tape	Time for each Interviewee take 20 minutes & a total of 1;00 hours	X
	5	Health center	Medical directors/ laboarator y and Malaria focal	Ten			
KII with participants with HEWs	3	HEWs	One HEW from each of selected health post in ten woredas	Eight		Single interview needed 20 minute and needed a total of 2:20 hours	X

Annex 10: Consent Form and Information Sheet

Title: Determinant Challenges associated with Malaria parasitological diagnosis, in Hararge zone of Oromia region, 2017

Introduction: Hello, my name is.....I am a research team. Thank you for taking the time to speak with me/us today. We are studying the Challenges associated with Malaria parasitological diagnosis, in Hararge zone of Oromia region, your health facility is one of the selected area for the research.

Procedure: If you agree to take part, this interview will take about 30 minutes of your time. There are four parts: First, I/we will ask you about background information of your health facility in which you are working and your family, secondly the variables thought to be the determinant for malaria diagnosing will be addressed. Individual health professional's knowledge and attitude toward malaria diagnosis process will be assessed as the third and fourth section of the checklist.

Privacy: There will be no labeling of the name of the respondent and we will not use any information that might identify you when I/we present or publish the study's results. The information extract from the interview or checklist will not be used for other purpose except for partial fulfillment of the master's degree at Addis Ababa University and as an input to improve challenge in malaria diagnosis and in turn to enhance malaria diagnosis implementation in in the zone.

Benefits: finding from this research will help the zone Generation of baseline data on the malaria diagnostic capacity of the region, drawing recommendations for strategic intervention against the problems and Identification of constraints associated with parasitological diagnosis of malaria cases. The stakeholders will use the finding from the research to act and improve the Malaria diagnosis achievement in their respective jurisdiction.

Risks: there is no risk to you from answering the questions or for being part of the study

Payment: there is no cost to you for being part of the research. The approximate time that this study will take is 30 minutes.

Informed Consent Form

I have been given information about challenge associated with malaria parasitological diagnosis: I understand that if I consent to participate in this research I will be asked to respond to the question from the investigator. I also consent to participate in an interview to be conducted by a researcher. I understand that my contribution will be confidential and that there will be no personal identification in the data that I agree to allow to be used in the study. I understand that there are no potential risks or burdens associated with this study. I have agreed to respond for the asked question. I have had an opportunity any questions to investigator I may have about the research and my participation. I understand that my participation in this research is voluntary and I am free to refuse to participate and I am free to withdraw from the research at any time. By signing below I am indicating my consent to participate in the research. I understand that the data collected from my participation will be used primarily for a MPH thesis, and will also be used.

Participant Signature_____

Date_____

Name of persons obtaining consent_____

Signature of persons obtaining consent_____

Annex 2: Questionnaire

Checklist for Health professionals

No.	Question	Coding Classification	Go To
1.	Zone_____ woreda _____health facility _____		
	Back ground characteristics of the health professionals		
	Qualification		Remark
	Site of current work/position		
	Basic knowledge on Malaria parasitological diagnosis among respondents		
1.1	Do you Know the case definition for malaria	Yes No	
1.2	If yes, Write the standard case definition of malaria	_____ _____ _____ _____	
1.3	What is the primary objective of malaria parasitological diagnosis?	A/To know the parasite and treat B/For knowledge purpose C/For the report purpose D/ for evidence based decision making and for prevention and control activities	
1.4	Parasite-based examination of the blood is the certain method of confirming malaria infection	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.5	Prescribing antimalarial before performing diagnostic test is beneficial in the management of malaria	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.6	Parasite-based test can be done through microscopy or rapid diagnostic	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.7	There is a need for more educational programs to increase knowledge and awareness on the available malaria case management guidelines	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.8	Use of National malaria case management guideline is important	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	

No.	Question	Coding Classification	Go To
1.9	Microscopic/BF is gold standard malaria diagnosis	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.10	Malaria Rapid Diagnostic Test is the quick parasite-based test for malaria diagnosis	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.11	Malaria Rapid Diagnostic Test is usually specific for one or more species of malaria parasite	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.12	Malaria Rapid Diagnostic Test detects Circulating malaria parasite antigen in the blood	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.13	Malaria Rapid Diagnostic Test result should be read 15 to 20 minutes after the test	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.14	Malaria Rapid Diagnostic Test is superior to microscopy	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.15	Malaria Rapid Diagnostic Test is 100% specific	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.16	Malaria Rapid Diagnostic Test ought to be done always by Laboratory technician	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.17	There is only one type of Malaria Rapid Diagnostic Test Kit	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
	Perception of Malaria parasitological diagnosis among respondents.		
1.18	It is important to make a parasite-based confirmation of malaria diagnosis before commencing treatment	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.19	Prescribing antimalarial drugs for malaria according to the guidelines are cost-effective	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.20	In my opinion Malaria parasitological diagnosis is very useful	A/ strongly agree B/ Agree C/ Disagree	

No.	Question	Coding Classification	Go To
		D/ strongly disagree	
1.21	Malaria parasite Diagnosis harm the patient by delaying initiation of treatment	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.22	Presumptive diagnosis of malaria through presenting symptoms is still better	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.23	Malaria diagnosis is always clear on listening to the patient	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.24	Malaria parasitological diagnosis can reduce the quantity of anti-malaria drugs consumed in a community	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.25	Malaria parasitological diagnosis should be encouraged and promoted	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.26	Confident on RDT result	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	
1.27	Confident on Bf report for malaria	A/ strongly agree B/ Agree C/ Disagree D/ strongly disagree	

1. Questionnaire for Health Post

Name of health post _____ Date_____ Address of the Health Post _____ Woreda_____		
1.	Can you please tell me about your HP's profile?	Total population addressed by HP _____
		Current malaria situation (low, moderate or high) _____
		Total number of Health Extension Workers (HEWs)_____
		Total number of households addressed by HP_____
2.	Do you have any information on malaria elimination in this community?	Yes No

3.	What is your role related to malaria elimination?	Train the community(on transmission and prevention of malaria) Provide technical support(Diagnosis and treatment) Distribute LLINs to households Participate in IRS application of houses Others_____
4.	Case definition for malaria or posted on the wall of Health post	Yes No
Diagnosis		
5.	Are you providing malaria RDT diagnostic service?	☐ Yes ☐ No (Skip to Q 4)
5.1	What is the name of RDT kit are you using?	Write the name of the kit:_____
6	Which type of RDT kit are you using?	☐ Mono species ☐ Multi species
7	Do you have a referral system for malaria suspected cases?	☐ Yes ☐ No
8	Do you have two months stock out of RDTs currently?	☐ Yes ☐ No
9	Do you have malaria diagnosis and treatment guideline?	☐ Yes ☐ No
10	Do you have confidence in RDT results?	☐ Yes ☐ No
11	If no what are your reasons?	
12	Has the health post provided uninterrupted RDTs, with no disruptions due to stock outs in the last 6 months?	☐ Yes ☐ No
13	If no, what was the reason for interruption of services?	☐ No blood lancet ☐ No alcohol/cotton ☐ No RDT ☐ Expired RDT ☐ Other _____
14	Have you received malaria RDT specific trainings?	☐ Yes ☐ No If yes, when:_____
15	Are you or your staff trained as refresher training malaria case management	☐ Yes ☐ No

16	What additional malaria surveillance trainings would you like to receive?	**Check all that apply** ☐ No additional trainings will be useful ☐ Malaria surveillance ☐ M&E of malaria ☐ Malaria training ☐ Integrated Refresher Training (IRT) ☐ Integrated Community Case Management (iCCM) ☐ Other(s)_____
17	How do you assess and assure the quality of Rapid Diagnostic Tests (RDT)?	☐ No quality assurance is performed ☐ Using positive and negative quality control samples ☐ Other(s): _____
18	Does the health post have any SOP or Job aid on how to perform RDT?	☐ Yes ☐ No
19	How do you store RDTs and anti-malarial drugs?	☐ In the room open to direct sun light ☐ In the room protected from sun light
20	Do you check the expiry date of RDTs and anti-malarial drugs?	☐ Yes ☐ No
21	How do you use the RDTs for diagnosis?	☐ Once opened box used first ☐ Boxes are used arbitrarily ☐ Reuse RDTs ☐ Other _____
Case management		
22	Do you sometimes prescribe antimalarial drug without RDT result?	☐ Yes ☐ No
23	If yes what are your reasons?	☐ Patient demand ☐ Relying on clinical feature ☐ To save patients waiting time ☐ No RDT ☐ No reagent
25	Do patients sometimes demand antimalarial drugs when results are negative?	☐ Yes ☐ No
26	Is orientation given from health center to health extension workers on malaria diagnosis?	☐ Yes ☐ No

28	If Yes to Q1.6, How many of health extension workers has received orientation on Malaria diagnosing so far?	
29	What are the challenges your HP has experienced with diagnosing malaria cases?	**Check all that apply** ☐ There are no challenges with diagnosing malaria cases ☐ Commodity stock out ☐ Lack of staff training ☐ Other(s):_____
30	Do feedback given from health center / other upper levels on malaria case management in the last 3 month	☐ Yes ☐ No
31	Is there supportive supervision from health center in the last six months	☐ Yes ☐ No
32	Does your HP have malaria commodities available?	**Check all that apply** ☐ Always ☐ Most of the time ☐ Sometimes ☐ Never
33	Which of the following are available at this HP?	☐ RDT ☐ lancet ☐ cotton ☐ alcohol ☐ antimalarial drug
Malaria Surveillance/lab part		
34	Does your HP track Annual Parasite Incidence (API)?	☐ Yes, how often is this information calculated:_____ ☐ No
35.	What is the formula used to calculate API (numerator/denominator)?	
36.	Does your HP track TPR (test positivity rates)?	☐ Yes, how often is this information calculated:_____ ☐ No
37.	What is the formula used to calculate TPR (numerator/denominator)?	
38.	Does your HP currently have the PHEM guideline?	☐ Yes No (skip to question 6.20.2.)
1.3	Does your HP currently use the PHEM guideline	☐ Yes No (skip to question 6.20.2.)

39.	Why doesn't your HP use the PHEM guideline?	**Check all that apply** ☐ There is no guideline available at the HP ☐ Training was not given on how to use the guideline ☐ There was no need to use the guideline ☐ Other(s): _____
40.	Why does your HP not have a PHEM guideline?	**Check all that apply** ☐ Don't know the reason why it is not available ☐ The guideline was not given to us ☐ Staff member(s) take it home ☐ PHEM guideline is lost ☐ PHEM guideline is damaged Other(s): _____
41.	Has your HP experienced any challenges with malaria surveillance?	**Check all that apply** ☐ This HP has experienced no challenges with malaria surveillance ☐ Households are hard to reach ☐ People with fever do not come to the HF ☐ People seek malaria treatment with traditional healers Other(s):_____

A.	**SUPPORTIVE SUPERVISION**						
42.	Does this HP receive any supportive supervision, feedback or technical assistance for malaria prevention activities from higher level?		Verbal	Written	Phone call	Other:	
		☐ Yes					
		☐ No (skip to question 1.2)					
43.	When last did you have a visit from your supervisor and from which institute?		MOH	RHB	ZHD	W/HO	HC
		☐ 3 months					
		☐ 3 – 6 months					
		☐ > 6 months					
44.	What things related to malaria activities did your supervisor focus on during the visit?	**Check all that apply** ☐ Malaria commodities (ITN…etc.) ☐ Vector control (IRS, larva citing…etc.) ☐ Malaria reports/data ☐ Lab supplies (RDT, etc.) ☐ Malaria case management (malaria diagnosis and treatment)					

		☐ Social and behavior change communication (SBCC) ☐ Other: _____
45.	During the last visit from your supervisor, did you receive any feedback on your work?	☐ Yes ☐ No
46.	Are the staffs at this HP able to meet the needs of this community for malaria activities?	**Check <u>ONE</u> of the following responses** ☐ They meet them very well, (skip to question 1.3) ☐ They meet them to some extent ☐ They don't meet them at all
47.	What are some of the reasons why health workers are not able to meet the needs of this community for malaria activities?	**Check all that apply** ☐ Work overload ☐ High turnover of health workers ☐ Could not fill vacancy ☐ Not having enough malaria commodities ☐ Lack of well-trained health workers ☐ Difficult landscape/topography of the area ☐ Long distance to community members ☐ Budget shortage ☐ Other(s): _____

Annex 2: Questionnaire

1. Questionnaire for Health Facility

Name of health facility _____ Date_____ Address of the Health Facility _____ Woreda_____		
*** Specifically …….?**		
1.	Can you please tell me about your HC's profile?	Total population of your catchment?
		Total number of HPs under this HC
		Total number of kebeles served by this HC
		Total number of malarious kebele' s served by this HC
2.	Do you have any information on malaria elimination in your community?	☐ Yes ☐ No

3.	How many of the following who work on malaria activities are under your HC?	☐ Clinical staff _____ ☐ Lab staff _____ ☐ Pharmacy staff _____ ☐ PHEM focal person _____ ☐ Malaria focal person _____
4.	Is there assigned surveillance malaria focal person in your health center?	☐ Yes ☐ No
5.	Do you have functional laboratory diagnosis?	☐ Yes ☐ No
6.	If no why?	☐ No power supply or generator ☐ No laboratory professional ☐ No laboratory unit ☐ Other _____
7.	Does the laboratory have functional binocular microscope(s)?	☐ Yes ☐ No
8.	If no what are your reason?	☐ No power ☐ No laboratory expert ☐ No microscope Other _____
9.	If yes, which methods do you use to count parasites?	☐ +, ++, +++, ++++ ☐ Parasite/µl/WBC ☐ Parasite/µl/RBC ☐ Percent of RBCs infected
10.	Which diagnostic methods do you use at your HL/HC?	☐ Microscopy ☐ RDT ☐ Both Microscope and RDT ☐ Other_____
11.	Has the laboratory provided uninterrupted malaria testing services for the last 12 months?	Yes No
12.	If no Q1.5 why?	
13.	Do you think the number of staff is adequate	Yes No
14.	If no, please list the required additional number and the professional qualification needed	_____
15.	If you use RDT, what is the reason of using RDT, rather than microscopy?	☐ Lack of microscopic ☐ Non-functional microscope ☐ Shortage of reagent _____ ☐ Supply shortage _____ ☐ Power supply interruption

		□ Other_____
16.	What is an average number of malaria slides examined per week in your HC/hospital?	_____ _____
17.	In what season do you diagnose high malaria cases in your HL/HC?	☐ Major season (Sep-Dec) ☐ Minor season (March-May) ☐ Throughout the year ☐ Other, specify_____
18.	Does the work load of your HC/hospital have any impact on malaria diagnosis?	□Yes If yes, reason: _____ □No
19.	Do you report both parasite species and density?	□ Yes □ No If no, why: _____
20.	Which malaria species have you reported in your HC/hospital so far?	□ P. vivax □ P. ovale □ P. malariae □ P. falciparum
21.	How long do you spend to report malaria slide is negative?	□ 5 minutes □ 10 minutes □ 15 minutes
22.	How do you assess and assure the quality of malaria diagnosis materials (microscopes and RDT)?	□No quality assurance is performed □Cleaning microscopes and other materials □Internal quality control microscopy/rechecking slides □Using positive and negative quality control samples □Other(s): _____
Staff training		
23.	Has your HL/HC received malaria specific trainings in the last 1 year?	☐ Yes ☐ No
24.	If yes, Please provide details on the malaria specific trainings received	☐ Topics of training _____ ☐ No of training _____
25.	What additional malaria trainings do you need currently?	☐ No additional trainings will be useful ☐ Malaria diagnosis & Malaria treatment ☐ Other(s)_____
26.	Have you received malaria Surveillance specific trainings in the last 2 years?	☐ Yes No of training_____ ☐ No
27.	Please provide details on the last malaria Surveillance specific trainings you received?	☐ Subject of training _____ ☐ When_____ ☐ Who provided _____ ☐ useful Yes No

29	Does your laboratory conduct professional competency assessment on malaria diagnosis regularly (at least annually)?	☐ Yes ☐ No
30	What malaria Manual, Guideline and Standard Operating Procedures (SOPs) does your HC refer to when performing malaria activities?	☐ Managing malaria cases ☐ Malaria commodities ☐ SOP for Reagent Preparation(staining solution) ☐ SOP for Smear Preparation ☐ Malaria laboratory diagnosis EQA guideline ☐ Manual for the laboratory diagnosis of malaria ☐ Job aid for malaria microscopy diagnosis
ONLY the HC Health Office Head should be specifically asked ALL of these questions		
31	Do you receive any direction or support from your Woreda Health Office, including from political and community leaders on malaria activities?	☐ Yes ☐ No
32	What types of collaborations on malaria activities occur between your HC and other HCs and/ or partners?	☐ No collaboration ☐ Meetings ☐ Official letters ☐ Joint Supervision ☐ Trainings
33	Who provides your HC with financial resources (anti-malarial drugs, microscopes, lab supplies… etc.) for malaria efforts?	☐ Government ☐ PMI ☐ Global Fund ☐ UNICEF ☐ Other: _____
34	Does your HC allocate funds specifically to malaria activities?	☐ Yes ☐ No
35	Regarding malaria activities, have there been any financial challenges your HC has experienced?	☐ Yes ☐ No
36	How have these challenges been overcome?	☐ Challenges have not been solved ☐ Budget reallocation ☐ Request additional budget ☐ Cover from internal income ☐ Other(s):_____
37	Does your lab participate in national and/or regional EQA programs?	☐ Yes If yes, how many times per year? _____ ☐ No
38	Does this laboratory receive a feedback for each EQA?	☐ Yes ☐ No

39	Did your receive any feedback from the woreda health office on **malaria diagnosis** indicators	☐ Yes ☐ No
40	Does this HC receive any supportive supervision, feedback or technical assistance for malaria prevention activities from higher level?	☐ Yes ☐ No
41	When last did you have a visit from your supervisor and from which institute?	3 Month and less 3 Month before 6 Month before 1 Year before
42	What are the challenges your HL/HC has experienced with diagnosing malaria cases?	☐ There are no challenges with diagnosing malaria cases ☐ Commodity stock out ☐ Lack of staff training ☐ Other(s):_____
Specifically ask clinicians facility head		
	Do you have malaria diagnosis and treatment guideline?	Yes No
	Have you received malaria diagnosis and treatment training?	Yes No
	Do you have confidence in RDT and microscopy results?	Yes No
	If no what are your reasons?	
	Do you sometimes prescribe antimalarial drug without laboratory diagnosis?	Yes No
	If yes what are your reasons?	Patient demand Relying on clinical feature To save patients waiting time and cost No laboratory professional No reagent Other _____
	Do you sometimes prescribe anti-malarial drugs to patients with negative results?	Yes No
	Do patients sometimes demand antimalarial drugs when results are negative?	Yes No

	Do you regularly revise data of malaria in your health center from different document	Yes No

Annex 3: Questionnaire

1. Questionnaire for Health Office

Name of health post _____ Date_____ Address of the Health Post _____ Woreda_____				
1.	Can you please tell me about your woreda's profile?	Total population of woreda (approximately)		
		Total number of HCs under this woreda (approximately)		
		Total number of HPs under this woreda (approx.)		
		Current malaria situation (low, moderate or high)		
		Total number of kebeles within woreda		
		Total number of malarious kebele' s within woreda		
2.	How long have you been working in this woreda?	Years_____ Months_____		
3.	How long have you been in your current role?	Years_____ Months_____		
4.	Which areas do you focus on in your work?	☐ Coordination of malaria activities ☐ Supervision of case management ☐ Supervision of supply chain ☐ Planning of malaria activities ☐ Other(s):_____		
5.	How many of the following who work on malaria activities are under your woreda?	Position Title	# of staff	Profession/training
		Malaria Focal		
		Pharmacy Staff		
		PHEM Focal		
		HMIS Focal		

Laboratory Activities

6.	What are the ways laboratory professionals are building their capacity regarding malaria microscopy?	**Check all that apply** ☐ There is no capacity building ☐ Attending trainings ☐ Receiving mentorship ☐ Receiving feedback on External Quality Assurance (EQA) ☐ Experience sharing ☐ Other(s):_____
7.	How do you assess and assure the quality of malaria diagnosis materials (microscopes and RDT)?	**Check all that apply** ☐ No quality assurance is performed ☐ Cleaning microscopes and other materials ☐ Internal quality control microscopy/rechecking slides ☐ Using positive and negative quality control samples/slides ☐ Other(s): _____
8.	Is this woreda involved in any External Quality Assurance Scheme for malaria microscopy?	A. Yes ☐ No
9.	Please explain how External Quality Assurance (EQA) is done	**Check all that apply** ☐ EQA is not performed ☐ Slide rechecking by regional or other laboratory profes ☐ EQA sample analysis ☐ Blind rechecking ☐ Other(s):_____
10.	How does the woreda provide supportive supervision regarding case management?	
11.	Has your woreda experienced any challenges with malaria diagnosing and treatment?	☐ Yes ☐ No (skip to question 5.6.)
12.	Which of the following challenges have you experienced?	**Check all that apply** ☐ Commodity stock out ☐ Lack of trained staff ☐ Lack of treatment adherence (people do not take full treatment of ACTs) ☐ Patient's sharing personally prescribed antimalarial medication (with family member and others) ☐ People seek treatment with traditional healers ☐ Power shortage ☐ Clean water shortage ☐ Other:_____

13.	Have **you** received trainings on **fever diagnosing** the last 2 years?		Number of trainings on **fever diagnosing you** received within the last 2 years?	
		☐ Yes		
		☐ No (skip to question 1.8.)		
14.	Please answer the following questions based on the **last** training received on fever diagnosing:	Month and year	Who provided the training?	Was it useful to your work? (Yes or No)
16	What are the challenges in diagnosing febrile cases? [Probe on how febrile cases are diagnosed as malaria]	**Check all that apply** ☐ There have been no challenges in diagnosing causes of fever cases ☐ People seek malaria treatment with traditional healers ☐ People with fever do not come to the HF ☐ People seek malaria treatment without lab result ☐ Other(s):_____		
17.	Have you received malaria case management specific trainings in the last 2 years?		Number of trainings on **case management you** received within the last 2 years?	
		☐ Yes		
		☐ No (skip question to 5.10)		

18. `	Please provide details on the last case management training you received?	Topic of training	Month and year	Who provided the	Was it useful? (Yes or No)
		Malaria diagnosis			
		Malaria treatment			
		Other			

19.	What are some of the challenges **you** have experienced using the knowledge/information you gained from the malaria case management trainings you received?	**Check all that apply** ☐ There have been no challenges experienced ☐ Not having enough trainings ☐ The topics covered during the training do not help with my work ☐ Logistical problems (financial, distance) attending the training ☐ Other(s):_____

20.	What additional malaria case management trainings would you like to receive?	**Check all that apply** ☐ No additional trainings will be useful ☐ Vector control ☐ Malaria diagnosis ☐ Malaria treatment ☐ Management of severe and complicated malaria ☐ Malaria training ☐ Integrated Refresher Training (IRT) ☐ Integrated Community Case Management (iCCM) ☐ Other(s): _____

	***Specifically ask the HMIS focal person, PHEM focal person, or anyone that deals with overseeing malaria data management & use**				
21.	Have **you** received malaria **surveillance specific** trainings in the last 2 years?	☐ Yes ☐ No (skip question to 6.2.)			
22.	Number of trainings on **surveillance you** received within the last 2 years?	_____			
23.	Please provide details on the last malaria surveillance specific trainings **you** received**?**	Subject of training	Month and year	Who provided the training?	Was it useful (Yes or No)
24.	What are some of the challenges you've experienced using the knowledge you gained from the malaria surveillance training you received?	**Check all that apply** ☐ There were no challenges experienced ☐ Not having enough trainings ☐ The topics covered during the training do not help with my work ☐ Logistical problems (financial, distance) attending the training ☐ Other(s)_____			
A. MALARIA SURVEILLANCE					
25.	Does your woreda track Annual Parasite Incidence (API)?	Yes, how often is this information calculated:_____ ☐ No			
26.	What is the formula used to calculate API (numerator/denominator)?				
27.	Does your woreda track TPR (test positivity rates)?	Yes, how often is this information calculated:_____ ☐ No			

28.	What is the formula used to calculate TPR (numerator/denominator)?				
29.	Has your woreda experienced any challenges with malaria surveillance?	**Check all that apply** ☐ This woreda has experienced no challenges with malaria surveillance ☐ Households are hard to reach ☐ People with fever do not come to the HF ☐ People seek malaria treatment with traditional healers ☐ Other(s):_____			
B. DATA MANAGEMENT AND DATA USE					
30.	Have **you** received training in recording, processing, or reporting of health information (**data management**) in the last 2 years?	☐ Yes ☐ No (skip to question 6.7.)			
31.	If yes	Subject of training	Month and year	Who provided the training)	Was it useful? (Yes or No)
32.	Which of the following **malaria case reporting** channels does your woreda use and which level is it submitted to?	☐ HMIS ☐ PHEM ☐ Program (report) ☐ Other:_____			
33.	Did your woreda receive any feedback from the zonal health office on **malaria case management** indicators		Verbal	Written	Phone call	Other:
		☐ Yes ☐ No (go to question 6.9)				
35.	What are some improvements, if any, you would like to see with the current malaria case reporting systems (PHEM, HMIS, etc.)	**Check all that apply** ☐ No improvement is needed ☐ Add more malaria related indicators to HMIS ☐ Translate reporting forms into local language(s) ☐ Fix HMIS software problems ☐ Other: _____			
C. DATA ANALYSIS					
36.	Does this woreda compare changes in malaria indicators routinely (data analysis)?	☐ Yes ☐ No (skip to question 6.11)			

37.	What Standard Operating Procedures (SOPs), [such as booklets, posters…etc.] does your woreda refer to when analyzing malaria data?	☐ There are no SOPs for analyzing malaria data ☐ Monitoring malaria data ☐ Determining improvements in malaria data ☐ Other(s):____
38.	Does your woreda check the timeliness, completeness, and accuracy of the malaria data collected and reported?	☐ Yes ☐ No (skip to question 6.12.)
39.	Can you please explain how you do this?	☐ Checking the report submission time ☐ Checking completeness of reports ☐ Checking completeness of record books ☐ Cross checking reported and recorded numbers ☐ Conducting LQAs ☐ Other(s): _____
40.	What are the reasons why you don't check the quality of malaria data?	☐ Not giving attention to data quality checking ☐ Don't know how to do it ☐ Not getting training ☐ Other:_____
41.	What Standard Operating Procedures (SOPs), [such as booklets, posters…etc.] does your woreda have to refer to for data quality activities?	☐ There are no SOPs for data quality malaria data ☐ Malaria data quality assurance ☐ Other(s):_____
42.	Does your woreda have routine meetings where malaria-based information is discussed?	☐ Yes ☐ No (skip to question 6.14)
43.	In the past three months, what malaria information was discussed at the meetings?	**Check all that apply** ☐ There was no malaria information discussed in the past 3 months ☐ Managing malaria-related data regarding quality, reporting or timeliness of reports ☐ Malaria commodity stock out and coverage of malaria interventions ☐ Following up on malaria specific decisions and actions from previous meeting ☐ Any malaria-specific (cases or commodity) issues or problems referred to higher levels
44.	Has your woreda experienced any challenges with managing and using malaria data?	☐ Yes ☐ No (skip to question 6.15)

45.	Does your woreda currently have the PHEM guideline?	☐ Yes ☐ No (skip to question.)
46.	Does your woreda currently use the PHEM guideline?	☐ Yes ☐ No (skip to question.)
47.	Why doesn't your woreda use the PHEM guideline?	**Check all that apply** ☐ There is no guideline available at the woreda ☐ Training was not given on how to use the guideline ☐ There was no need to use the guideline ☐ Other(s): _____
48.	Why does your woreda not have a PHEM guideline?	**Check all that apply** ☐ Don't know the reason why it is not available ☐ The guideline was not given to us ☐ Staff member(s) take it home ☐ PHEM guideline is lost ☐ PHEM guideline is damaged ☐ Other(s): _____
49.	What do you think is needed to improve the current malaria surveillance system(s)?	☐

Qualitative: Challenges associated with malaria parasitological diagnosis: KII interview guides for HEWs

1. How was the procedure of malaria treatment in this health post?
2. What is the basis of your diagnosis for malaria?

Probe:

   a. RDT
   b. Clinical(Merely the sign and symptoms)

3. How you see the clinical treatment of malaria in this health post?
4. What was the magnitude of the problem?
5. Any idea regarding the factors promoting the clinical treatment of malaria?
   Probe:
   a. Lack of technical capacity
   b. Scarcity of supplies
   c. Perceived error with the results of RDT
   d. Others
6. Any intervention done to alleviate the problems predisposing to the clinical treatment
7. Any suggestion on action that should be taken to alleviate the problems

KII Interview guide for the clinician working at Adult/Under five OPD of Health center and hospital.

1. What do you think is the top priority public health problems of the area (woreda/catchment)?

   Probe:

   - Status of malaria (morbidity and mortality) in the area look like
   - Top ten cause of morbidity and mortality

2. What do you feel that treatment procedures for malaria should look like?

   Probe: What diagnosis of malaria should look like?

3. How you compare the practice of the malaria treatment procedures you are practicing against national malaria management guideline

   Probe: regarding the parasitologic confirmation (RDT/BF) vs. clinical treatment

4. How was the problem with the clinical treatment in the area?
5. What do you think of the severity of the problem of clinical treatment of malaria?
6. Any idea regarding the factors leading to the clinical treatment

   Probe:

   - Human resource
   - Technical incapability
   - Supplies
   - Perceived error with test

7. Any intervention done previously on the identified problems for clinical treatment

B. KII Interview guide for the for laboratory technician of health center and hospital

1. How you see the practice of diagnosis of malaria in your facility?

   Probe: Parasitologic confirmation vs. Clinical Diagnosis

2. How you see the magnitude of the laboratory request coming to the lab for suspected malaria patient visiting OPD?
3. What do the communication between the laboratory and the profession working on the OPD looks like regarding the malaria lab result?
4. Any complain/feedback coming from OPD's professionals on the lab result?
5. Any challenges with laboratory test-BF

   Probe:

   - Human resource
   - Technical incapability
   - Supplies

- Perceived error with test

6. Any suggestion for the challenges- BF
7. Any challenges with laboratory test-RDT

   Probe:

   - Human resource
   - Technical incapability
   - Supplies
   - Perceived error with test
8. Any suggestion for the challenges- RDT

The KII guide for woreda health office

1. What is the top public health problem in the area?

Probe: malaria as public health problem

2. How is the malaria treatment taking place!

3. How you see the clinical treatment of malaria on the data coming from health facilities?

4. What is the magnitude of the clinical treatment of malaria?

5. Any factor leading to clinical treatment of malaria

Probe: Human resource

Technical capability

Scarcities of supplies

Perceived error with the lab result

6. Any intervention done previously on the identified problems

7. Any suggestion for the problems

Declaration

I, the undersigned, declare that this is my original work and has never been presented by another person in this or any other University and that all the source materials and references used for this theisis have been duly acknowledge

Name: Mulugeta Asefa Gutu

Signature: _____

Residency place: Ethiopian Public Health Institute (PHEM)

Date of submission: May 13/2018

The theisis has been submitted for examination with my approval as a university

Mentors

Name of mentors: 1. Alemayehu Bekele

2. Yimer Seid

Signature 1._____ 2._____

Date _____, _____