Addis Ababa University, College of Health Sciences,

School of Public Health

Ethiopia Field Epidemiology Training Program (EFETP)

Compiled Body of Works in Field Epidemiology

By:

Gebeyehu Dumessa Bekele

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

May 2015

Addis Ababa

Addis Ababa University, College of Health Sciences,

School of Public Health

Ethiopia Field Epidemiology Training Program (EFETP)

Compiled Body of Works in Field Epidemiology

By:

Gebeyehu Dumessa Bekele

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

Advisors:

Dr. Negussie Deyessa

Abigail Greenleaf

June 2015

Addis Ababa

ADDIS ABABA UNIVERSITY

School of Graduate Studies

Compiled Body of Works in Field Epidemiology

By:

Gebeyehu Dumessa Bekele

Ethiopia Field Epidemiology Training Program (EFETP)

College of Health Sciences, School of Public Health

Addis Ababa University

Approval by Examining Board

____________________________ ____________________________

Chairman, School Graduate Committee

____________________________ ____________________________

Advisor

____________________________ ____________________________

Examiner

____________________________ ____________________________

Examiner

Table of Content

List of tables

List of Figures

List of Annexes

Acknowledgement

My heartfelt gratitude goes to my mentor Abigail Greenleaf for her dedication and critical comments on my outputs.

I would like to thank Dr. Negussie Deyessa instructor of Addis Ababa University (AAU), School of Public Health for his valuable comments given on my outputs.

I wish to thank Mr. Tesfaye Deti ORHB/PHEM Core process owner and field base supervisor for his helpful comments and advice on field works during my first year residency.

My deepest gratitude goes to Abiyot Bekele Ethiopian public health Institute, PHEM Early Warning and Response team coordinator for his assistance and advice during my second field base residency.

I would like to acknowledge with thanks Dr. Lucy Boulange EFETP Resident Advisor for her great advice and assistance throughout my residency.

I also extend my sincerely appreciation for FETP Program and Academic Coordinator (Dr. Adamu Adissie, Dr. Zegeye Hailemariam, Mr. Alemayehu Bekele and Dr. Desalegn Dalecha) for their strict mentoring, advice and comments during theoretical session, Field work and field base visit.

I sincerely appreciate Center for Disease Control (CDC) and Ethiopian Public Health Association (EPHA) for their technical and financial support throughout two years of residency period.

I am also grateful to all instructors of AAU-Public Health School for their broad knowledge shared for us during class session and fieldworks.

Finally but not least I will take the opportunity to thank Oromia Regional Health Bureau PHEM staff, Ethiopian public health Institute PHEM staffs and my colleagues of cohort 5 residents for their technical assistance during my field base residency.

List of abbreviations

AAU: Addis Ababa University

AFI: Acute febrile illness

AFP: Acute flaccid paralysis

AIDS- Acquire immunodeficiency syndrome

ANC- Antenatal Care

AR: Attack Rate

ART: Anti-Retroviral Therapy

AWD: Acute watery diarrhea

CD: Cluster of Differentiation

CDC: Center for Disease Control

CFR: Case Fatality Rate

CNS: Central Nerves System

CSA: Central Statistical Agency

DHO: District health office

DHS: Demographic and Health Survey

E.C: Ethiopian Calendar

EDS: Early Detection system

EFETP: Ethiopian Field Epidemiology `Training Program

EFY: Ethiopian fiscal year

EHSDP: Ethiopia health sector development plan

EPHA: Ethiopian Public Health Association

EPHI: Ethiopian Public Health Institute

EPI: Expanded Program on Immunization

FMOH: Federal Ministry of Health

GC: Gregorian calendar

HC: Health Center

HEP: Health Extension Program

HEWs: Health Extension Workers

HH: House Holed

HIV: Human Immunodeficiency Virus

HMIS: Health Management Information and System

HO: Health Office

HP: Health Post

HSDP: Health Sector Development Program

IDS: Integrated Diseases Surveillance

IDSR: Integrated Diseases Surveillance and response

IgM: Immuno Globulin M

IHR: International Health Regulation

IMR: Infant Mortality Rate

IPD: In Patient Department

IRS: Indoor Residual Spraying

ITNs: Insecticide Treated Nets

MCH: Maternal and child Health Care

MM: Meningococcal meningitis

MOH: Ministry of Health

NAPA: National Adaptation Program of Action

NNT: Neonatal tetanus

OPD: Outpatient Department

ORHB: Oromia Regional Health Bureau

PHEM: Public Health Emergency Management

PICT: Provider Initiated Counseling Testing

PMTCT: Preventing Mather to Child Transmission

PSNP: Productive Safety Net Program

RNA: Ribo Nucleic Acid

RTI: Respiratory Tract Infection

SARS: Sever Acute Respiratory Syndrome

SNNPR: Southern Nation Nationality people

SPH: School Of Public Health

TB: Tuberculosis

TSF: Targeted Supplementary Food

TTBA: Traditional Trained Birth Attendance

UNICEF: United Nations Children funds

URI: Upper Respiratory Infection

USAID: United State Agency for International Development

VCT: Voluntary Counseling and Testing

WHO: World Health Organization

ZHO: Zonal health office

Executive summery

The current health service policy of Ethiopia gives emphasis to health promotion and prevention focusing on communicable diseases, nutritional disorders and environmental health problems without neglecting essential curative activities. In order to achieve this government of Ethiopia has outlined major strategies that include human resource development. Ethiopian Field Epidemiology Training Program, adapted from the United States Centers for Disease Control and Prevention (CDC) Epidemic Intelligence Service (EIS) was established in 2009 with the aim of producing skilled public health professionals who provide in-service assistance to advance and prevent public health problems and contribute to evidence-based decision-making. Since its inception the program has played a significant role in investigation of outbreaks of unknown causes, priority disease surveillance activities, strengthening of surveillance system and prevention and control measures of prioritized diseases.

From October, 2013 to May, 2015 I have stayed in Field Epidemiology Training Program, School of Public Health-AAU and at Oromia Regional Health Bureau and Ethiopian public health institute field bases. During my stay I have learnt a lot and carried out many public health activities. I have carried out two outbreak investigations, one surveillance data analysis, one surveillance system evaluation, one district health profile description, one scientific manuscript for peer reviewed journal, two abstracts for scientific conference, one maher health need assessment and one epidemiological research proposals. In addition I have provided training for district and zonal surveillance focal persons and prepared seven weekly epidemiologic bulletins of Oromia regions.

We have investigated two Measles outbreaks during field base residency. The investigations were performed by descriptive and analytical epidemiology methods to describe magnitude of the diseases and identify risk factors associated with diseases.

Over the period of outbreak in Beko Jimma Kebele a total of 291 measles cases and 10 community deaths were detected. The overall attack rate was 2.91% and the case fatality rate was 3.44%. Having contact with a person suspected to have measles, presence of measles case patient in the family and malnutrition were independent risk factors for contracting measles infection. We recommend enhanced routine immunization service, strengthened of surveillance and early reporting system and awareness creation to the community on mode of transmission, prevention and health seeking behavior.

In Tselemty district refugee camps a total of 272 measles cases with no deaths were identified. The overall attack rate of this outbreak was 4.26 per 1,000 inhabitants of the areas with the highest attack rate were observed at Mai-Ayni refugee camp. The majority of cases 214 (78.7%) vaccination status for measles were unknown and 10 (3.7%) of them were aged below the eligible measles vaccination age (<9 month). We recommended measles vaccination campaign to be conducted to all individuals aged 18 years and bellow in the refugee camps and in kebeles nearby to the camp.

We analyzed five years (2009 – 2013) suspected Meningococcal Meningitis surveillance data in Oromia region to know the burden and trends of the disease. In the five years there were 2,498 suspected Meningococcal Meningitis patients in Oromia Region with a mean annual incidence of 1.64 suspected patients per 100,000 and 66 suspected deaths with case fatality rate of 2.6%. The magnitude of suspected meningococcal meningitis in Oromia region showed an increasing trend during the past five years except in 2012. We recommended the system to be supported by laboratory.

Evaluation of surveillance system was conducted from June 8 to June 30/2014 in East Harerge Zone, Oromia Region, Ethiopia. The surveillance system of the zone was simple, flexible and useful. However attributes like; data quality, acceptability, timeliness, representative and stability require attention for improvement of surveillance process. The system needs to be improved through training, supervisions and feedbacks.

We have collected and summarized health and other health related events, demographic, socio-economic, political and cultural aspect of Tullo District of West Harerge Zone from February 26, 2014 to March 8, 2014. The leading cause of adult outpatient (OPD) and inpatient visit was trauma, whereas the leading causes of under-five OPD visit was pneumonia.

We have also prepared scientific manuscript for peer reviewed journals on measles outbreak investigation and response in Beko Jimma Kebele, Sibu Sire District of East Harerge Zone, Oromia.

Two abstracts were prepared for scientific conference on Five year Epidemiology of Suspected Meningococcal meningitis in Oromia Region and Measles Outbreak Investigation and Response in Beko Jimma Kebele of Sibu Sire District, East Wollega Zone, Oromia, Ethiopia.

Meher Season need assessment was conducted in four zones of west and south west Oromia to identify humanitarian needs including Health emergencies like disease outbreaks or wide spread malnutrition, that usually follow after emergency events due to natural or manmade disasters. We identified lack of emergency preparedness, shortage of emergency drugs and therapeutic feedings and medical equipment at both zonal level and many districts of these zones.

Epidemiological research project proposal on Assessment of Knowledge, Utilization and Associated factors affecting insecticide treated bed net (ITN) use in Ziway Dugda District, Oromia, was prepared. A Cross-sectional descriptive study will be used for this study and Multi-stage sampling technique will be used to get study subjects. The total of 845 households will be assessed in this study. The aim of this study is to assess utilization of ITNs by household, the knowledge of the community about malaria and benefits of use of ITNs, the status of ITNs and factors affecting its use. The total estimated budget required for the study is 87,785. ETB.

Training was given to zonal and District surveillance focal persons to create awareness on History of Ebola viral disease (EVD), Ebola reservoir, Ebola transmission cycle, Ebola sign and symptom, Prevention of EVD, Treatment, Laboratory diagnosis of EVD and Ebola Surveillance and Outbreak Investigation.

Additionally seven Weekly surveillance bulletin of Oromia Region PHEM was also prepared. The bulletin serves to provide feedback on surveillance activities, and summarizes weekly surveillance data and performance of ORHB/PHEM on epidemic prone diseases and other public health emergencies.

Chapter – I: Outbreak Investigations

1.1. Measles Outbreak Investigation and Response in Beko Jimma Kebele, East Wollega Zone of Oromia, Ethiopia, 2014

Abstract

Measles (rubeola) is a highly contagious, acute, viral illness of the respiratory tract caused by RNA enveloped virus of the family paramyxovirus, genus Morbillivirus. Measles is the most common of vaccine preventable diseases that occur in Ethiopia; where parents recognize it as a self-limited common childhood illness for which no medical care is often sought. Measles outbreak was detected in Beko Jimma Kebele of Sibu Sire District, East Wollega Zone in March 2014. Investigation was done to verify the existence of an outbreak, to determine the magnitude and identify associated risk factors contributed for the occurrence of the outbreak.

A Cross-sectional descriptive study followed by a one to two unmatched case control study was conducted from May 4 to 18, 2014. Interview by using structured questionnaire was used to collect data from cases and controls. Data was managed and analyzed by using Microsoft Excel 2007 and Epi-Info 7.1.

From five of the cases, blood samples were collected for laboratory confirmation, and all tested positive for Measles IGM. All other cases were epidemiologically linked with the confirmed cases. Over the period of outbreak a total of 291 measles cases with 10 community deaths were detected. 52.2 % of the cases were females and the age of the cases ranged from 1 month to 55 years with median age of 5 years. More than three quarter of the cases were aged below 15 years. 88.3% of the cases including all the deceased were not vaccinated for measles. The overall attack rate was 2.91% and the case fatality rate was 3.44%. Having contact with a person suspected to have measles AOR: 31.16 (95% CI, 8.19 – 118.62) and presence of measles case patient among the family in the house hold AOR: 6.36 (95% CI, 2.23 – 18. 13) were independent risk factors for contracting measles infection. However, nutritionally being normal was found to be protective for measles infection AOR: 0.13 (0.05 – 0.34).

This outbreak occurred in remote pocket kebele of the Sibu Sire District with extremely low immunization coverage. Multiple factors contributed for the occurrence of the outbreak. We recommend enhanced routine immunization service, availing therapeutic feeding service and awareness creation to the community on mode of transmission, prevention and health seeking behavior.

Key word: measles, outbreak, Beko Jimma, Sibu Sire.

1.1.1. Introduction

Measles (rubeola) is a highly contagious, acute, viral illness caused by RNA enveloped virus of the family paramyxovirus, genus Morbillivirus. Measles virus is the only member of the genus *Morbillivirus* that infects humans. The genetic variability of wild-type virus (23 genotypes identified) permits identification of strains endemic within a given area where measles cases have occurred and can help to suggest from where the virus comes. The cellular receptors for measles virus are the CD46 and CD150 molecules expressed on many human cells (1). This highly contagious virus is spread through contact with nose and throat secretions of infected people and through airborne droplets released when an infected person sneezes or coughs (2). Patients are contagious from 1 or 2 days before symptom onset until 4 days after the rash appears. Infectivity peaks during the prodromal phase. The mean intervals from infection to symptom onset and rash appearance are 10 and 14 days, respectively (1). The signs and symptoms of measles include fever, lack of appetite, cough, coryza, red eyes, and maculopapular rash, with complications such as pneumonia, blindness, brain damage, diarrhoea and croup (2).

Measles occurs throughout the world and remains the leading cause of childhood morbidity and mortality in the world predominantly in developing countries. Before a vaccine was available, infection with measles virus was nearly universal during childhood, and more than 90% of persons were immune by age 15 years (2).

Globally, more than 20 million cases are reported yearly and 345 000 deaths were recorded in 2005. Fifty to sixty percent of 1.6 million global deaths attributed to vaccine preventable diseases are attributed to measles. In Africa 450 000 cases were reported and in Sub Saharan Africa 250 000 deaths were reported in 2009 (3).

Measles is the commonest of vaccine preventable diseases that occur in Ethiopia; where parents recognize it as a self-limited common childhood illness for which no medical care is often sought. In Ethiopia measles cases usually come late to health facilities and often after they have developed complications. Measles surveillance in a few selected administrative zones of Ethiopia in 2002 revealed age shift of measles cases from children under five to those above five years of age. A total of 931 measles cases were registered during the surveillance period, of which 52.4% were children 5 to 14 years and the remaining 42.5% being in children under five years (4).

The risk factors for measles virus infection include: infants who lose passive antibody before the age of routine immunization, children with vitamin A deficiency and immunodeficiency due to HIV or AIDS, leukemia, or corticosteroid therapy, regardless of immunization status and children who travel to areas where measles is endemic or contact with travelers to endemic areas. Malnourished and young children are at higher risk of developing complications and mortality from measles infection (5). The complications of measles can be divided into three groups, according to the site involved: the respiratory tract, the central nervous system (CNS), and the gastrointestinal tract. Respiratory tract involvement, manifested as laryngitis, croup, or bronchitis, occurs in the majority of cases of uncomplicated measles. In young children, otitis media is the most common complication. Pneumonia is a frequent reason for hospitalization, especially of adults. The pneumonia is of viral origin in the majority of cases, but secondary bacterial infection (most commonly caused by streptococci, pneumococci, or staphylococci) also develops with some frequency (1).

Measles is one of the vaccine preventable diseases that are targeted for elimination and with half of the world close to eliminating measles, many countries in sub Saharan Africa including Ethiopia are still struggling to control the disease. In 2006, countries in the World Health Organization (WHO) African Region adopted a goal to achieve 90% measles mortality reduction by 2010 compared with the estimate for 2000. By 2008 in the African Region, reported measles cases decreased 93% and estimated measles mortality decreased 92% compared with 2000.Since 2002, Ethiopia adopted these regional goals and strategies and has been taking important steps to control and ultimately to eliminate measles by 2020 (2, 5).

Measles vaccination is one of the most cost-effective interventions available. Since measles vaccine was developed in 1958, it has saved the lives of millions of children throughout the world. The history of immunization services in Ethiopia prior to 1980 has not been documented very well although the smallpox eradication activities have left some legendary memories. The Expanded Programme on Immunization (EPI) was launched in Ethiopia in 1980 based on the international, as well as national, experiences and resources gained during the smallpox eradication activities in the late 1970s. Currently the service is delivered through static and outreach sites nationwide. The current Ethiopian routine immunization schedule recommends measles vaccination at 9 months of age (4).

High coverage of vaccination of children below the age of 15 years has led to reduction of measles cases by up to 99% in developed or industrialized countries. Developing countries are failing to achieve high vaccination coverage's, hence frequent outbreaks of measles with high case fatalities as high as 3-30% occurred (6).

In Oromia region measles outbreak is still a main public health concern. During the period of 2013/14, measles epidemics were reported from nine zones namely; East Wollega, Arsi, Bale, Borena, Guji, Horro Guduru Wollega, Illubabor, Kellam Wollega, West Hararghe and West Shewa Zones of the region. Unpublished outbreak investigation report by Field Epidemiology Training Program Residents showed that the possible factors associated with the disease were low immunization coverage, malnutrition, poor cold chain management and community attitude toward measles control.

1.1.2. Background

Sibu Sire is one of the district (woreda) found in East Wollega Zone Oromia Region of Ethiopia. Part of the East Wollega_Zone, Sibu Sire is bordered on the south by _Bonaya Boshe district, on the west by Wayu Tuka district, on the north west Guto Gid district, on the north by Bila Seyo and on the east by Gobu Say district. The administrative center of this woreda is Sire Town, which is about 300 km away from Addis Ababa to the west. In Sibu Sire district there are 22 kebeles, three urban and 19 rural kebeles. According to the 2007 national population and housing census, total population of the district is estimated to be 124,304 in 2014. The district has four health centers and 22 health post. Health service coverage of the district is 80 % by health center and health post coverage is about 88 %. Bekeo Jimma is one of the kebeles that found in Sibu Sire District and affected by measles outbreak since April 5th to the beginning of June 2014. Total population of this kebele is 10,017 and it has only one health post staffed by two health extension workers which makes the health service coverage to 50 %. Based on the Ethiopian primary health service coverage strategy this kebele supposed to have two health posts, each staffed with two health extension workers. Bekeo Jimma is one of the hard to reach pocket kebele of the district. This kebele shares border with two districts of East Wollega Zone; Billa Seyo district on the north and east, Guto Gida district on the west and on the south bordered by Dengelo Guyo and Hagelo Tulema kebeles of Sibu Sire District (fig.1).

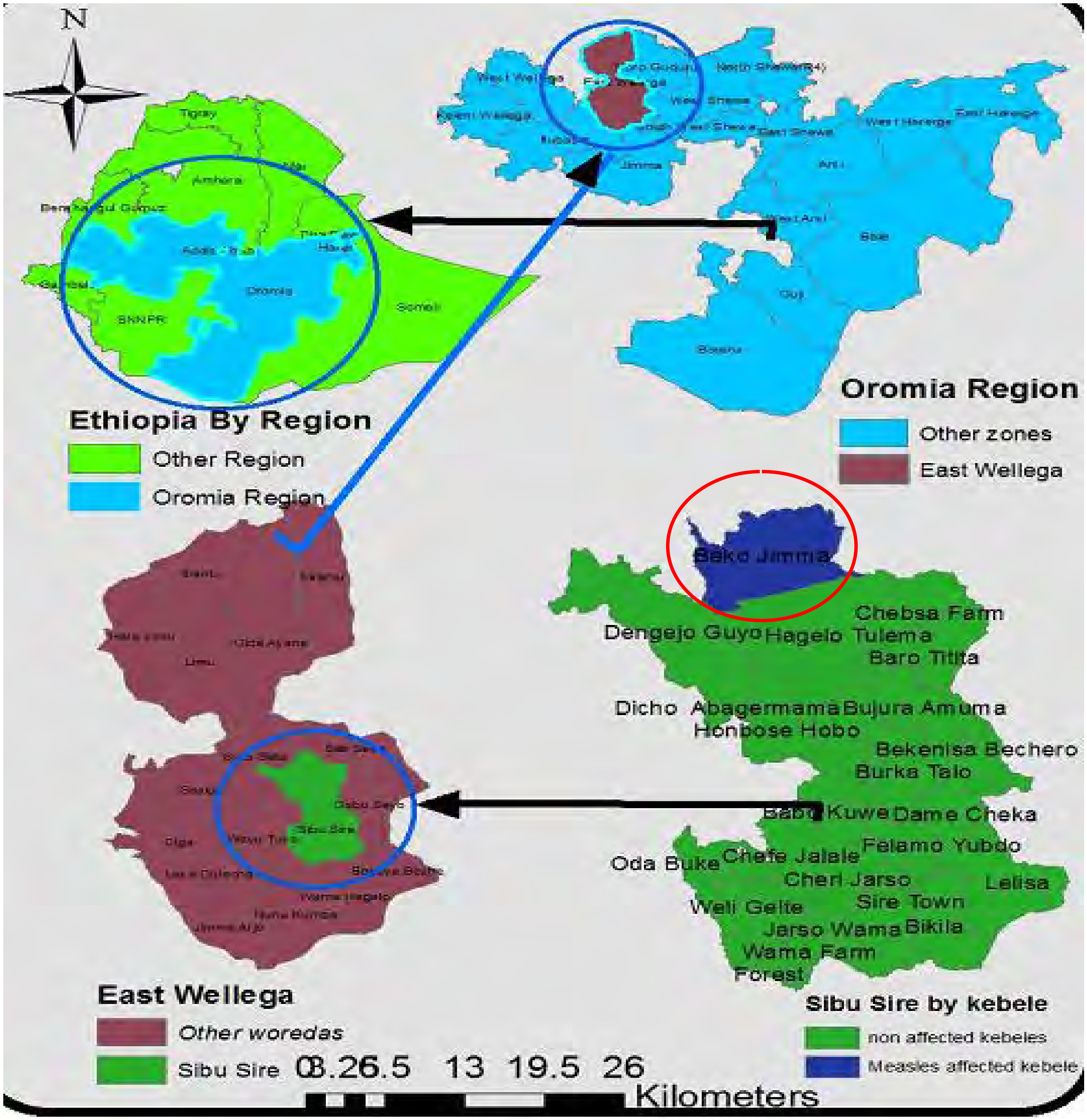


Figure 1: Map of Beko Jimma Kebele, SibuSire District, East Wollega Zone, Oromia Region, Ethiopia, 2014.

1.1.3. Objectives

1.1.3.1. General Objective

The overall objective of the investigation was to verify the existence of an outbreak, to describe the outbreak and identify associated risk factors contributed for the occurrence of the outbreak and ensure that virus transmission is interrupted as soon as possible in Beko Jimma Kebele, 2014.

1.1.3.2. **Specific objectives**

- To verify existence of measles outbreak in the district.
- To identify risk factors contributed for contracting the disease.
- To describe the outbreak by time, place and person
- To raise community and health care professionals’ awareness about the disease and its prevention.

1.1.4. Methods

1.1.4.1. Study area

We conducted the investigation in Beko Jimma Kebele of Sibu Sire District, East Wollega Zone, Oromia, May 2014.

1.1.4.2. Study period

We conducted a case – control study from May 4 to May 18, 2014 G.C in Beko Jimma Kebele of Sibu Sire District, East Wollega Zone, Oromia, Ethiopia.

1.1.4.3. Study design

A one to two unmatched case control study design and descriptive analysis was done on the measles cases identified during the epidemic period. The previous five years data of EPI coverage was reviewed and collected from the district.

The uni-variate analysis included the calculation of means and medians for quantitative (numerical) variables, and frequencies and percentages for qualitative (categorical) variables. Attack rates per 1,000 inhabitants of the community and by age group were also calculated. Moreover Bi-variate and multi- variate analysis was performed to determine associated risk factors for contracting the illness.
A WHO working case definition was used to actively search for the cases in the community and the active case search was done at house to house level.

1.1.4.4. Study Source Population

All population of the Beko Jimma kebele was the source population of measles outbreak investigation.

1.1.4.5. Target population

During this outbreak investigation, all confirmed and suspected measles cases, deaths and selected community controls were target population of this study.

1.1.4.6. Sample size Determination and Sampling

For case control study 54 cases and two controls for each cases were selected conveniently based on geographical accessibility.

Inclusion criteria

Cases: Any resident of Beko Jimma Kebele who tested positive for IgM or those who fulfill measles case definitions from April 4 to June 3, 2014 and who agreed to participate in the study was included.

Controls: A control was any resident of Beko Jimma Kebele during the study who did not develop signs and symptoms of measles and agreed to participate was included.

Exclusion criteria

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

Controls: Those who refused to participate and family members from the same household were excluded.

1.1.4.7. Case definition

1.1.4.7.1. Measles suspected cases at community level:

A community member should report any person with rash and fever to a health worker and also advise the person to go to a health facility (2).

1.1.4.7.2. Suspected measles 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 (2).

1.1.4.7.3. Confirmed measles case:

Cases with a positive laboratory result for measles specific immunoglobulin M (IgM) antibody testing that had not received measles vaccination within the 4 weeks before the specimen collection (2).

Controls were neighbors of cases who did not suffer from measles during the period of the study. Two controls for one case per house hold were selected from the neighbors' of cases (2).

1.1.4.7.4. Measles outbreak:

In Ethiopia, a measles outbreak is defined when three or more laboratory confirmed measles IgM -positive cases occur in a health facility or district in a month (2).

1.1.4.7.5. Epidemiologically linked case:

A suspected measles case that has not had a specimen taken for serologic confirmation and is linked (in place, person and time) to a laboratory confirmed case; i.e., living in the same or in an adjacent district with a laboratory confirmed case where there is a likelihood of transmission; onset of rash of the two cases being within 30 days of each other (2).

1.1.4.7.6. Measles death:

For surveillance purposes, a measles death is defined as any death from an illness that occurs in a confirmed case or epidemiologically linked case of measles within 30 days of the onset of rash (2).

1.1.4.7.8. Oprational definition

Litrate: for this investigation we labled litrate those study subjects that have the skill to read and write.

Illiterate: study subjects who were not capable to read and write were labled illiterate.

Nutritionally normal: For under five aged children mid-uper arm circumfrance (MUAC) measurement over 135 mm indicates that the child is well nourished.

Moderatly Acute Malnutrition: For under five aged children MUAC measurement beween 110 mm and 135 mm indicates Moderatly Acute Malnutrition.

Severly Acute Malnutrition: For under five aged children MUAC measurement less than 110 mm (11 cm) indicates severe acute malnutrition.

1.1.4.8. Data Processing and Analysis

Data was entered, summarized and analyzed by using Epi-info version 7.1 and Microsoft office Excel 2007 softwares. Results were presented using graph, table and figures. Frequencies, Attack rates and case fatality rate were also calculated. Additionally, estimated odds ratio and 95% confidence interval for risk factors were determined through bi-variate and multi-variate analysis.

1.1.4.9. Ethical consideration

Ethical clearance and support letter were obtained from Oromia Regional health bureau and support letter to conduct the study was obtained from Zonal and District health offices. Moreover objective of the study was briefly mentioned and Oral informed consent was obtained from the study participants or their parents to participate in the study. Participants were treated with respect and willingly participated in the study without payment or cohesion. Confidentiality was assured and no personal details was recorded or produced on this documentation.

1.1.4.10. Data Dessimination

Findings of this investigation in both soft and hard copy was communicated with Oromiya Regional Health Bureau, East Woollea Zonal health office, Sibu Sire District health office and Addis Ababa University. Additionally, soft copy of the document was sent to FETP Resident Advisors, Mentors, Co-ordinators and Field Supervisors.

1.1.4.11. Coordination

The East Wollega zonal health office reported ten deaths and suspected measles outbreak to Oromia Regional health bureau public health emergency management (PHEM) department on April 28, 2014. The zonal health office has received the report from Sibu Sire District health office on April 26, 2014. The office then sent a team with necessary drugs and supplies to the affected site on the same day. The team assessed the situation and collected blood specimens from five cases and sent it to EPHI for confirmation. Sibu Sire district health office organized a team consisting of four persons with different profession and sent to the outbreak site on April 30, 2014. The team has line listed the cases, performed house to house active case search and managed the cases properly. ORHB/ PHEM have sent two field epidemiology residents to the site to investigate the outbreak and give technical support in the control and prevention process. The regional team has departed to West Wollega Zone on May 5, 2014 and discussed with zonal and district health office heads, PHEM focal persons, maternal and child health care (MCH) officers and other experts about the status of the outbreak, action taken and activities performed. Consequently the regional team started investigation of the outbreak with experts from the district health office and the kebele's health extension workers. The team performed the following activities:-

- Active case search based on the working measles case definition at house to house level.
- The line list was updated with the newly identified cases during active case search
- Active cases were treated and managed properly with appropriate drugs with vitamin A supplementation
- Health education was given to the community residents about mode of transmission, prevention and control measures. In addition the community residents were informed and mobilized to take individuals sick of measles to health facilities as soon as possible.
- Children and their guardians were interviewed to collect data for case control study

- Immunization and surveillance data were observed at the zone and districts
- Zonal and district health office heads were debriefed at the end of the investigation.

1.1.5. Result

1.1.5.1. Descriptive analysis

Over the period of outbreak (April 4, 2014 – June 3, 2014) we identified 291 suspected measles cases with 10 community deaths that occurred within 30 days after rash onset. From five of the cases, blood samples were collected for laboratory confirmation, and tested at Ethiopian public Health Institute (EPHI). All of the five samples were positive for measles IgM antibody. Among the total cases 152 (52.2%) of them were females. The age of the case patients ranged from 1 month to 55 years with median age of 5 years. Of the total cases, the majority, 136 (46.7%) of them were children aged below five years and 21.0% of them were aged 15 years and above (Table 1).

Table 1 Distribution of measles cases by age group and sex in Beko Jimma Kebele, Sibu, East Wollega Zone, Oromia Region, Ethiopia, 2014

Age group	Female (%)	Male (%)	Total number of cases (%)
<1	8(2.7*)	3(1.0)	11(3.7)
1-4	71(24.4	54(18.6)	125(43.0)
5-9	31(10.7)	29(10.0)	60(20.6)
10-14	18(6.2)	16(5.5)	34(11.7)
15-19	7(2.4)	16(5.5)	23(7.9)
20-24	5(1.7)	15(5.2)	20(6.9)
25-29	4(1.4)	4(1.4)	8(2.8)
30-34	1(0.3)	1(0.3)	2(0.6)
>=35	7(2.4)	1(0.3)	8(2.7)
Total	**152(52.2)**	**139(47.8)**	**291(100.0)**

*****Numbers in the parenthesis indicate percentage

The outbreak started in 14th WHO epidemiologic week of 2014 and ended in 23rd week of 2014. The number of cases started to rise in WHO epidemiologic week 16th and peaked in 17th week and started to decline thereafter. However the outbreak was detected by the health extension workers and reported to district health office almost after a month (Fig. 2). This is mainly due to absence of weekly and immediately reporting system of priority diseases in the kebele.

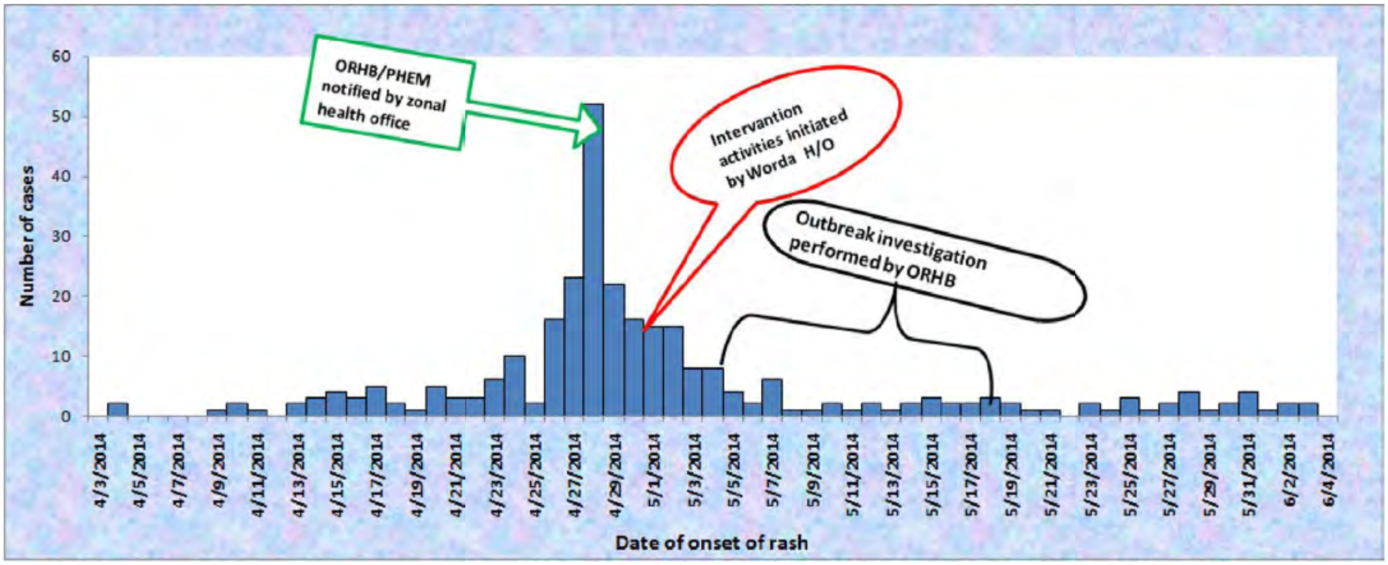


Figure 2: Number of measles cases by date of rash onset in Beko Jimma Kebele, Sibu Sire District, East Wollega Zone, Oromia Region, Ethiopia, from April 4th to June 3rd/2014.

Regarding the vaccination status of the cases, 257 (88.3%) of them were not vaccinated for measles, while only 21 (7.2%) of them reported to have received at least one dose of measles containing vaccine prior to the outbreak period and the rest 13 (4.5%) cases vaccination status was not known (Fig. 3). All data on vaccination status were based on respondent recall; no written document of vaccination history (vaccination card) was available for all cases and controls.

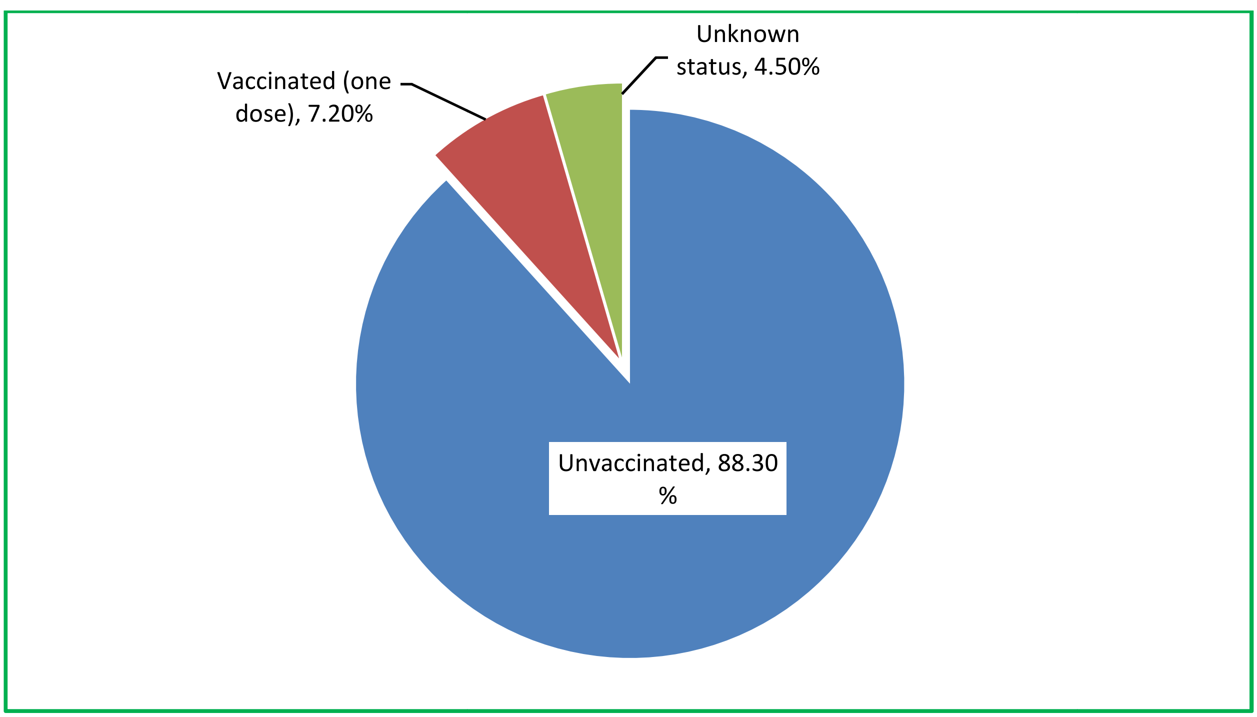


Figure 3: *Measles vaccination status of measles cases* in Beko Jimma Kebele, Sibu Sire District, East Wollega Zone, Oromia Region, Ethiopia, 2014

The overall attack rate of the disease was 29.1 per 1,000 inhabitant of the kebele and the case fatality rate (CFR) was 3.44 per 100 cases.

More than three quarter of the cases were aged below 15 years old. The highest attack rate (93.8 per 1,000) was among children of age group 1 – 4 years. An approximately similar attack rate was observed between male and female cases (Table-2). Individuals in the age group 15 years and above were the least affected with an attack rate of 11.7 per 1,000 inhabitant o f this age group. Highest case fatality rate, 5.65% was also seen in children of age group 1 – 4 year. More than half of the deaths (60 %) were occurred among female, with a case fatality rate of 3.92%.

Table 2: Distribution of measles attack rate and case fatality rate by age group and sex in Beko Jimma Kebele, Sibu Sire District, East Wollega Zone, Oromia Region, Ethiopia, 2014

Variables	Total no of population	No of cases (%)	No of deaths (%)	AR /1,000	CFR %
Age group					
<1 year	311	11 (4)	0	35.4	0
1 – 4 year	1,332	125 (43)	7 (70)	93.8	5.6
5 – 14 year	3,165	94 (32)	2 (20)	29.7	2.13
>= 15 year	5,209	61 (21)	1 (10)	11.7	1.64
Total	**10,017**	**291**	**10**	**29.1**	**3.44**
Sex					
Male	**4,968**	139 (47.8)	4 (40.0)	27.8	2.89
Female	**5,049**	152 (52.2)	6 (60.0)	30.3	3.92
Total	**10,017**	**291**	**10**	**29.1**	**3,44**

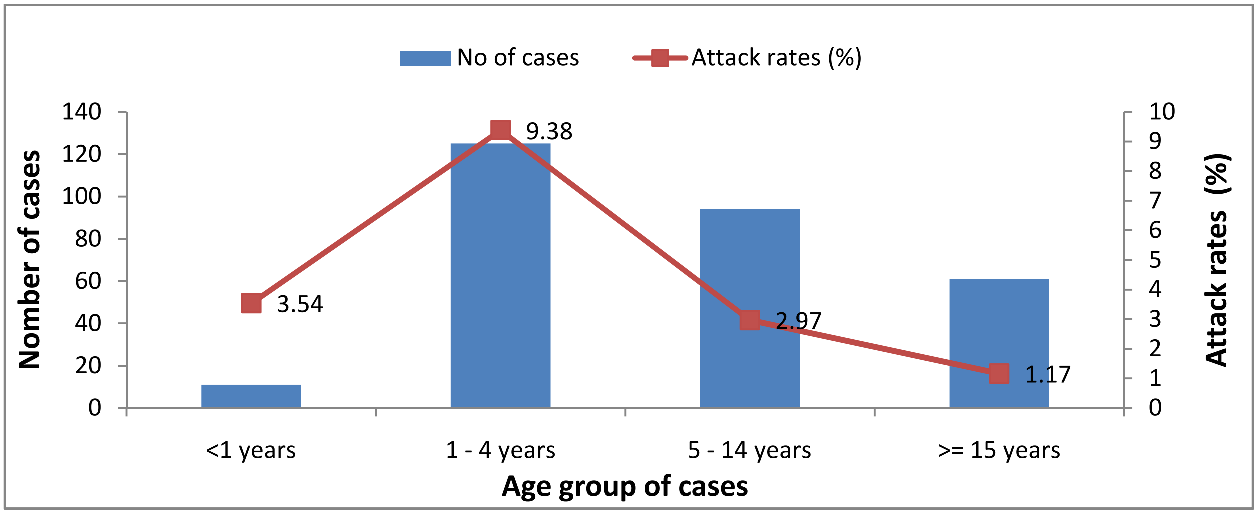
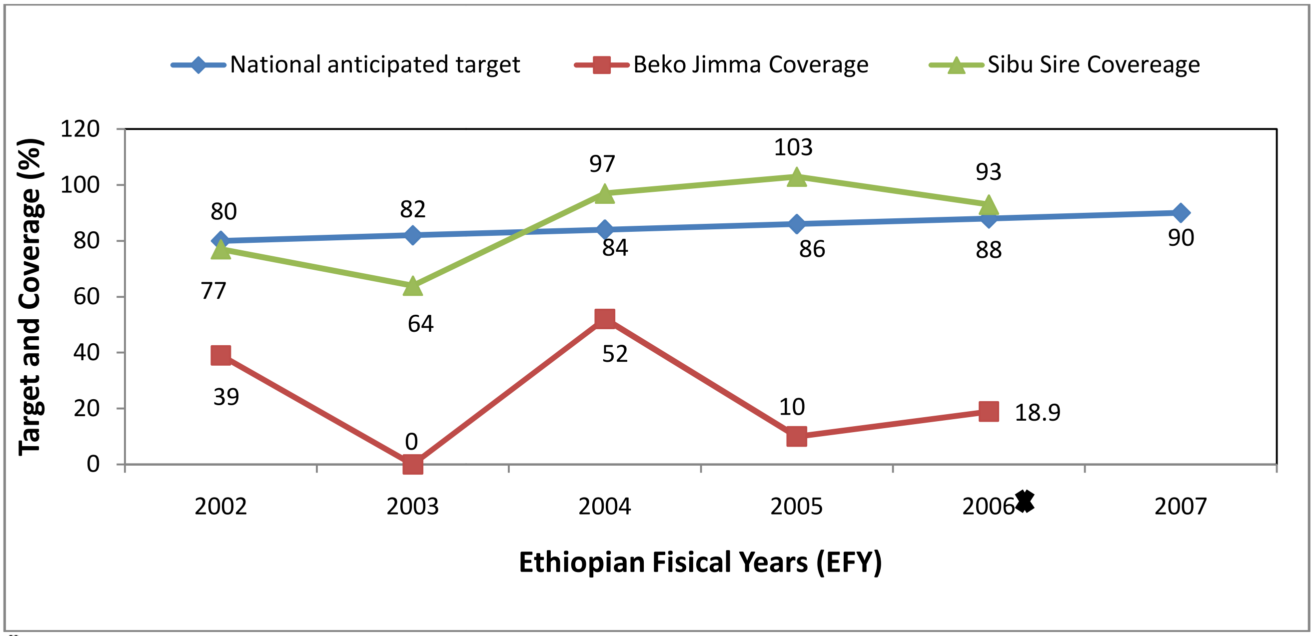


Figure 4: Distribution of number of measles cases and attack rates by age group in Beko Jimma Kebele, Sibu Sire District, East Wollega Zone, Oromia Region, Ethiopia, 2014

1.1.5.2. Vaccination coverage

Beko Jimma Kebele health post didn't have functional refrigerators for the storage of vaccines, as a result in this kebele there is no regular routine immunization service. The immunization service in this kebele is provided on an irregular period by transporting the vaccine from the district health office.

The measles vaccination coverage report of Sibu Sire district shows, in the past three years (2012-2014) the coverage was above 90%, the anticipated measles vaccination target to be achieved in 2015 by ministry of health. There are, however big disparities in kebeles measles vaccination coverage, which ranges from 0% to >100% (Table-3). In contrast to the higher measles vaccination coverage of the district, Beko Jimma Kebele's measles vaccination coverage in the past five years was extremely low, which ranges from 0% in 2003 to 52% in 2004 EFY (Fig. 5 and Table-3).



*As of March, 2006 EFY (Nine month report)

Figure 5: Trends of measles vaccination coverage of Beko Jimma Kebele and Sibu Sire district, East Wollega Zone, Oromia Region, Ethiopia, 2014

Table 3: Five years measles vaccination coverage of kebeles found in Sibu Sire District, East Wollega Zone, Oromia Region, Ethiopia, 2014.

Kebele	Vaccination Coverage (%)				
	2002	2003	2004	2005	2006*
Sire 01				24	62.8
Sire 02	60	54.5	54	>100	28
Bikila	74	45	>100	>100	>100
Felamo Yubdo	63	81	62	69	33.3
Dame Cheka	88	81	>100	54	37
Jarso Wama	26	19	>100	>100	>100
Lalisa	>100	60.4	>100	71	>100
Bujura	84	59	>100	>100	>100
Burka Talo	27	82	85	95	83.3
Bekenisa Becheru	>100	>100	>100	>100	>100
Baro Titita	72	57	>100	>100	56.8
Dicho	>100	85	83	85	67.5
Honbose Hobo	34	28	41	57	42.3
Hagelo Tulam	42	49	49	43	29.6
Dengejo Guyo	>100	10.2	97	40	61.7
Beko Jima	**39**	**0**	**52**	**10**	**18.9**
Waligalte	89	62.5	>100	>100	80

Ada Buke	>100	>100	>100	>100	93.8
Chingi 01	>100	>100	>100	>100	0
Chefe Jalale	83	55.8	>100	95	59.7
Cheri Jarso	>100	65	>100	>100	>100
Babo Kuwe	>100	>100	>100	>100	96.1
Sibu Sire District	**77**	**64**	**97.4**	**>100**	**93**

*** As of March 2006 EFY**

1.1.5.3. Analytical epidemiology

In this investigation a total of 54 cases and 108 healthy controls who resided in the same kebele with the cases were selected for analytical study with a ratio of one case to two controls. Among the total 54 interviewed cases 30 (55.6%) of them were males and among the total 108 controls 62 (57.4%) of them were females. The age of the case patients ranged from 0.25 year (3month) to 25 years with mean age of 9.1 years and median age of 9 years, whereas the age of the controls ranged from 0.5 year (6 month) to 30 years with mean age of 7.8 years and median age of 5.5 years.

In bi-variate analysis; having contact with a person suspected to have measles during the last 2 -3 weeks OR: 39.42 (95% CI, 15.2 – 102.2) and having travel history to a place with active measles OR: 8.69 (95% CI, 3.73 – 20.21) and presence of measles case patient in the family OR: 7.18 (95% CI, 3.38 – 15. 29) were significantly associated with contracting measles. Moreover malnutrition OR: 3.96 (95% CI, 1.53 – 10.28) and not knowing the mode of transmission of measles OR: 2.44 (95% CI, 1.18 – 5.05) have significantly associated with the presence of measles illness (table – 4).

Table 4 : List of risk factors for contracting measles in Beko Jimma Kebele of Sibu Sire District,East Wollega Zone, Oromia Ethiopia, 2014

Exposure variables		Cases	Controls	OR	95%CI
Sex	Male	30	46	1.68	(0.87 – 3.25)
	Female	24	62		
Age group	< 5 years	21	39	1.13	(0.57- 2.21)
	≥ 5 years	33	69		
Educational status of the Family	Illiterate	54	107		
	Literate	0	1		
Did you ever vaccinated for measles?	Yes	7	21	0.62	(0.24 – 1.560)
	No	47	87		
Presence of sick person in the family	Yes	30	16	**7.18**	(3.38 – 15. 29)
	No	24	92		
Travel history to the area with active measles	Yes	46	43	**8.69**	(3.73 – 20. 21)
	No	8	65		
Contact history with measles case-patients	Yes	41	8	**39.42**	(15.2 – 102.2)
	No	13	100		
Do you know measles modes of transmission?	Yes	34	87	**0.41**	(0.19 – 0.85)
	No	20	21		
Housing Condition	Ventilated	6	18	0.63	(0.23 – 1. 68)
	Not Ventilated	48	90		
Nutritional Status	Normal	41	100	**0.25**	(0.09 – 0.65)
	Moderate and Severe	13	8		
Family size	1 child	4	10	0.78	(0.23 – 2.63)
	>1 children	50	98		
Is measles vaccine preventable?	Yes	38	88	0.54	(0.25 – 1.15)
	No	16	20		

In-multivariate analysis we have identified two factors that remained independently associated with contracting measles infection in Beko Jimma Kebele outbreak; Presence of sick individuals among the family members and having contact with measles infected cases in the past two to three weeks. In addition being nutritionally normal was found to be protective against measles infection (table 5).

Table 5: Independent risk factors associated with contracting measles illness in Beko Jimma Kebele Sibu Sire District, Oromia Region, Ethiopia, 2015.

Independent risk factors	OR (95%CI)	AOR (95%CI)	P-value
Presence of sick person among family members	7.18 (3.38 – 15.29)	6.36 (2.23 – 18.13)	< 0.0001
Having Contact history with measles case patient in the past 2 to 3 weeks	39.42 (15.2 – 102.20)	31.16 (8.19 – 118.62)	< 0.0001
Nutritional status	0.25 (0.09 – 0.65)	0.13 (0.05 – 0. 34)	< 0.0001
Travel history to the area with active measles	8.69 (3.73 – 20.21)	0.64 (0.18 – 2.22)	0.4777
Do you know measles modes of transmission?	0.41 (0.19 – 0.83)	0.51 (0.21 – 1.26)	0.1446

1.1.5.4. Public Health Interventions

Active case search based on the case definition at house to house level were our primary duty during the outbreak investigation and active cases were treated properly with appropriate drugs and vitamin A was given as a supplementary treatment. The line list was updated with the newly identified cases during active case search. Health education was given to the community residents about mode of transmission, prevention and control measures. In addition the community residents were informed and mobilized to take individuals sick of measles to health facilities for medical care as soon as possible.

1.1.5.5. Discussion

Literatures supports that a number of factors contribute for the occurrence of measles outbreak in an area, where mainly occurs when the accumulated number of susceptible individuals is greater than the critical number of susceptible individuals, or epidemic threshold, for a given population to sustain transmission (7). Similarly our investigation has identified several factors that were associated with contracting measles in Beko Jimma Kebele of Sibu Sire District East Wollega Zone. Over the period of the outbreak a total of 291 cases were identified with the highest overall attack rate of 291 per 10,000 inhabitants compared to the attack rate of measles outbreak in Simada District of south Gonder Zone which was 4.1/10,000 people and other studies (8). There was no significant attack rate difference observed in this outbreak between male and female cases which is comparable with the finding of outbreak investigation in Simada District of south Gonder Zone (8).

The most affected age group in this outbreak was children aged 1 to 4 years with attack rate of 938/10,000 which was similar as indicated by WHO and other literatures (6); however finding in other unpublished studies in Arsi Zone showed the most affected age group in children aged 5 to 9 years with Attack rate of 10.4/10,000 (9). The case fatality rate (CFR) of this outbreak was 3.44% with high proportion of deaths (70%) with a case fatality rate (5.6%) occurred in children aged 1 to 4 years, which is supported by WHO's estimate that 90% of measles related deaths are in children under age of five years (3,6). The likely contributing factor for the mortality of the cases might be measles related complication, malnutrition and poor health service seeking behavior of the people which all of the deceased cases were not sought treatment at health facility. According to WHO estimate the expected case fatality rate in developing countries ranges from 3% to 6% (3, 5) which the CFR in our finding also falls within this range. The CFR of this outbreak was lower than other measles outbreak CFR observed; like a retrospective community-based study conducted in West Hararghe zone (CFR= 6.7%), outbreak investigation in Simada District of South Gonder (13.4%) and outbreak investigation in Harena & Dawe Sere districts of Bale Zone (15.7%) (8, 10, 11). It was higher than the finding from Sudan and India; CFR of 0.9% and 0.45% respectively (12, 13). High proportions (88.3%) of cases in this outbreak were not vaccinated against measles infection. This is comparable with the finding of study on measles outbreak in West Harerge and in Zone Granada Spain; where 80.3% and 89% of the cases had not received any dose of measles vaccines respectively (11, 14). Studies have demonstrated that measles vaccines induce sero- converion of 85% vaccinate children at 9 months and above 95% after 12 months of age

(3, 5, 7). In order to develop herd immunity among non-immune people, reduce transmission and risk of exposure to measles virus 90% of the population needs to be immunized; whereas to prevent outbreak occurrence very high vaccination coverage (95%) is needed (7). Moreover a number of studies have reflected that being unvaccinated is one of the main risk factor for contracting measles infection (2, 4, 13, 15). However according to the Sibu Sire District's health office report, the five year (2002 -2006 as of March EFY) vaccination coverage of Beko Jimma Kebele was 39%, 0%, 52%, 10% and 18.9% respectively, which is much more lower than the National and WHO minimum expected district vaccination coverage (90%) (16). Therefore this low immunization coverage resulted in the accumulation of susceptible individuals in the Kebele might be one of the factors played a significant role in the occurrence of this outbreak.

Having contact with measles cases was found to be an independent risk factor for contracting measles infection which is supported by a similar study done in Zimbabwe and by the fact that the secondary attack rate of measles is 90% in the presence of susceptible individuals (2,4, 7,18).

In addition presence of measles infected family member in the house hold was also found to be an independent risk factor for contracting measles infection in this outbreak which is supported by the fact that secondary attack rate of measles is 90% if there is a susceptible individual (2,17,18). Moreover as indicated in many studies malnutrition was also significantly associated with contracting measles infection in this outbreak (3, 7, 19).

1.1.5.6. Limitations

Absence of vaccination card that was difficult to determine the vaccination status, exact date of vaccination and other relevant information which could cause information bias

Recall bias on the date of rash onset by the cases and their guardians since the investigation was conducted lately.

1.1.5.7. Conclusion

This outbreak occurred in a remote pocket kebele of the Sibu Sire District with extremely low immunization coverage, a weak surveillance system and delayed reporting. The outbreak was reported after four weeks and after the occurrence of deaths. In this outbreak overall high attack rate with a wider age range has been observed. More than three quarters of the cases of this outbreak were children below 15 years age. Factors contributed for the occurrence of this outbreak include; having contact with measles cases, presence of measles cases in the family and being malnourished. High proportion of unvaccinated below 15 years old measles cases of the outbreak most likely resulted due to the accumulation of susceptible individuals in the kebele as a result of low routine immunization coverage and weak supplementary immunization activities that aim to provide a second opportunity for measles immunization. The low immunization coverage could have been attributed because of the low health service coverage (one health post for more than 10,000 populations) of the kebele. Malnutrition has been also one of aggravating factors of the outbreak. The majority of cases and all deaths of the outbreak occurred before the zonal health office and regional health bureau being notified and initiated the response activities. The number of measles cases and deaths of the outbreak could have been reduced if there were a well functioning surveillance and timely reporting system in the district particularly in Beko Jimma Kebele.

1.1.5.8. Recommendations

The Sibu Sire District health office should have to establish and implement routine EPI service in Beko Jimma Kebele and other similar kebeles as soon as possible. Additionally the district have to work hard to attain primary measles vaccination coverage of >90 % in under one year children and to achieve >95 % supplementary immunization activities in all Kebeles that found in districts. Moreover inhabitants of the community need to be mobilized to increase their awareness on importance of immunization and health service seeking behavior.

The district health office should have to enforce all health facilities found in the district to participate on surveillance system and follow them to report and notify all reportable diseases according to the national PHEM guideline recommendations. Moreover the office need to train all health workers found in the district on disease notification and surveillance to enable them early detect an outbreaks and to prevent reoccurrence of another outbreak in Beko Jimma and other kebeles.

Additionally the health office should have to establish and implement screening and treatment service for malnourished cases in Beko Jimma kebele.

The health extension workers in Beko Jimma kebele health post should enhance the awareness of the community on mode of transmission of measles, its prevention and importance of taking appropriate treatments if being infected to prevent measles related complications and death.

The East Wollega Zone health office should have to enforce and follow district health offices to strengthen their routine EPI service, in order to attain primary measles vaccination coverage of >90 % in under one year children and make sure that penta-valent to measles dropout rate is less than 10%. Also the office should have to work hard to achieve >95 % supplementary immunization activities in all districts that found in the zone by making the service available and accessible.

1.1.5.9. Acknowledgment

We would like to Acknowledge and thanks Mr Nestanet Kude and Mr Mulugeta experts of Sibu Sire District Health office for their commitment and active participation on the investigation process.

Our deepest gratitude goes to Mrs Aster and MrS Askale, health extension workers of Beko Jimma for their help during the investigation period

We also extend our sincerely appreciation to Beko Jimma Kebele community inhabitants for their willingness and cooperation during the outbreak investigation period at large. At last but not the list, we would like to thanks Addis Ababa University, Oromia Regional Health Bureau PHEM core process and EPHA for their technical and financial support.

Refernces

1. Harrison's Principles of Internal Medicine. 17th ed. United States of America: The McGraw-Hill Companies, Inc.; 2008.

2. EHNRI. Guideline on measles surveillance and outbreak management 3rd ed. Addis Ababa, Ethiopia: Ethiopian Public Health Institute; 2012.

3. Corinne Danet, Fermon F. Management of a measles epidemic: Practical guide for Doctors, Nurses, Laboratory technicians and Medical auxiliaries. : Medecine Sans Frontieres; 2013.

4. Kufakwanguzvarova PW, Robert MF, Notion GT. Measles outbreak investigation in Zaka, Masvingo province, Zimbabwe. BioMed Central Ltd. 2012.

5. Berhane Yemane , Haile Mariam Damen, Helmut K. Epidemiology and Ecology Of Health and Disease In Ethiopia

Addis Ababa, Ethiopia: Ethiopian Public Health Association; 2005.

6. WHO. Measles mortality reduction and regional elimination; atrategic plan 2001 - 2005. World health Organization, Geneva. 2001.

7. Heymann D. Control of Communicable Diseases Manual: An Official report of the American public Health Association,. 2004.

8. Mer'Awi Aragaw, Tilay T. Measles outbreak in Simada District, South Gonder Zone, Amhara Region: Immediate need for sttrengthened routine and supplementary immunization actiivities. Ethiopian Journal of health Development. 2012;26(2):115-8.

9. Muleta D. Measles outbreak investigation and responce in Arsi Zone, Ormia Region. 2012.

10. Abiyot Bekele Weyessa, al e. Investigation of measles outbreak- Herena and Dawe-Serer Districts of Bale Zone, Oromia Region, Ethiopia, February 2011. Retrovirology. 2012;9(suppl 1):39.

11. Kassahun Miitiku, Kegne W. Measles outbreak investigation in West Hararghie Zone of Oromia Region, Ethiopia. Ethiopian Journal of Pediatrics and Child health July 2011;7(7). Epub 44.

12. Fatima Coronado, et al. Retrospective measles outbreak investigation, Sudan. J Trop Pediatr. 2006;52(5).

13. Ministry of Health and Family Welfare, India. Measles Catch-up Immunization Campaign: Guideline for Planning and Immplimentation. 2011.

14. Navarro E, et al. Study of a measles outbreak in Granada with preventive measures applied by the courts, Spain, 2010 to 2011. Euro Surveill. 2013;18(43).

15. Adeoye et al. Investigation of a measles outbreak in a Rural Nigerian community – The Aladura experience. African Journal of Microbiology Research. 2010;4(5):pp. 360-6,.

16. Kristen R. Ehresmann, Norman Croucch, et al. An outbreak of measles among unvaccinated youg adults and measles seroprevalence study: Implication for measles outbreak control in adult populations. J Infect Dis. 2004;189(Suppl. 1):S104-s7.

17. Balcha G. Masresha, Reinhard Kaiser, et al. Progress Toward Measles Preelimination — African Region, 2011–2012. CDC Morbidity and Mortality Weekly Report April 2014;63(13):285-91.

18. World Health Organization. Guidelines for measles and rubella outbreak investigation and response in the WHO European Region. 2013.

19. Jonathan A Polonsky, et al. High levels of mortality, malnutrition, and measles, among recently-displaced Somali refugees in Dagahaley camp, Dadaab refugee camp complex, Kenya, 2011. Conflict and Health 2013;7(1).

Annex I. **Questionnaire for case – control study on measles outbreak.**

Questionnaire for Case - control study on Measles outbreak in Beko Jimma Kebele, Oromia Region, 2014

"Case status"

1. Case_________

2. Control_______

Patient Name______________________________ date of Data collection___________

Region________ Zone_______ Woreda______ Kebele _______ Got _______ Phone________

Location: Longitude:_________________ Latitude:______________________

I. Socio-demographic Characteristics

S. No	Questions	Alternatives
1.1	Sex	1. Male 2. Female
1.2	Age	years________ Months________
1.3	Occupation of the patient/control	1. Farmer 2. House wife 3. Student 4. Unemployed 5. Daily laborer 6. Merchant 7. Gov't 8. Other (specify)_________
1.4	Family Occupation	1. Farmer 2. House wife 3. Student 4. Unemployed 5. Daily laborer 6. Merchant 7. Gov't 8. Other (specify)_________
1.5	Religion	1. Orthodox 2. Protestant 3. Muslim 4. Catholic 5. Other (specify)_________
1.6	Ethnic group	1. Oromo 2. Tigre 3. Amhara 4. Other (specify)

1.7	Educational level of the patient/control	1. Illiterate 2. Read and write 3. Elementary 4. Secondary 5. Above secondary 6. Under school age
1.8	Educational level of the family	1. Illiterate 2. Read and write 3. Elementary 4. Secondary 5. Above secondary
1.9	Marital status of the patient/control	1. Single 2. Married 3. Divorced 4. Widowed 5. Separated, 6 N/A
1.10	Family size	______________
1.11	Is there any sick person with rash, fever, running nose/conductivities (illness)? In the family?	1. Yes 2. No
1.12	If yes, number of sick person	____________________

II. **Clinical History of Diseases:**

2.1	What was the symptom?	1.fever *2.*Rash 3.cough, 4.coryza (runny nose), 5. conjunctivitis (red eyes) 7. Ear discharge 8. pneumonia 10. Vomiting

		11. Others__________
2.2	**ONLY if complication**	a) Pneumonia:☐ yes no ☐ b) Cornea: ☐ yes no ☐ c) Blindness : ☐ yes no ☐ d) Convolution ☐ yes no ☐ e) Otitis media (ear discharge): ☐ yes no ☐ f) diarrhea : ☐ yes no ☐ g) Feeding problem☐ yes no ☐
2.3	Date of rash on set	___/___/____
2.4	Duration of rash________	
2.5	Date seen at health facility	___/___/_______
2.6	Illness duration before visiting the health facility	_____________ in days/hours
2.7	Did you (he/she) take treatment?	1.Yes 2.No
2.8	Location when rash started?	District________________Kebele__________________
2.9	Did you recovered after the treatment?	1.cure 2. partially 3. deteriorated/disabled 4.death

III. Risk factor

3.1	Did you ever vaccinated for measles?	1.Yes 2.No 3. Unknow 4.Not applicable
3.2	If yes last vaccination date	1. Patient recall________ dd/mm/yy 2. Vaccination card_______ dd/mm/yy 3. Don't remember
3.3	Number of vaccine doses received	1. One dose 4. Don't remember 2. Two dose 3. Three and above
3.4	Age of vaccination at first vaccinated.	_____________
3.5	If not vaccinated why?	☐ lack of knowledge about vaccination campaign, ☐ absence during vaccination campaign, ☐ other, specify
3.6	Did you have any travel history 7-18 days to areas with active measles cases before onset of symptoms?	1.Yes 2.No If Yes where ____________
3.7	Did you contact with a person with measles symptoms within the last 2-3	☐ yes ☐ no

	weeks?	
3.8	Do you have any travel history four days before and after rash onset	1.Yes 2. No If yes where _______________
3.9	Do you have any contact history with someone else four days before and after rash onset	1.yes 2.No If yes with whom_________________
3.10	If Yes to question 3.5 place of travel	1.School 2.Neighbor 3.Market 4.Other_________
3.11	Do you know modes of transmission for measles?	1.Yes 2.No 3. If yes specify__________________________
3.12	Nutritional status of the cases	1.Normal 2.Moderate 3.Severely malnourished
3.13	What is the estimated area of the house?	______________
3.14	House condition?	☐ ventilated ☐ not-ventilated
3.15	Distance from house to HC?	☐ greater than 5 km ☐ equal or less than 5 km

3.16	Where did you go first when you get ill?	1. Health Facility 2. Traditional Healers 3. Holy Water 4. Stayed at home 5. Other :(Specify)_______________
3.17	How do you think people get measles?	1. Contact with a virus from ill person 2. From God 3. Bad attitude of other people 4. Other(Specify)
3.18	Do you Know measles is vaccine preventable?	1. Yes 2. No 3. Don't Know
3.19	Who do you think can be affected by measles?	1. Children of aged less than 5 years 2. Children of aged less than 18 years 3. Women of any ages 4. Any age groups of both male and women 5. Other (specify):_____________________
3.20	How do you think measles can be cured?	1. Using modern medicine 2. Using traditional Medicine 3. Holly water 4. By feeding nutritious foods 5. Keeping the sick person indoor 6. Other(Specify)_______________

1.2. Measles Outbreak Investigation and Response in Refugee camps at Tselemty District, North West Tigray, Ethiopia, 2015

Abstract

Measles is a highly contagious, acute, viral illness caused by RNA enveloped virus of the family paramyxovirus, genus Morbillivirus. Measles occurs throughout the world and remains the leading cause of childhood morbidity and mortality in the world predominantly in developing countries including Ethiopia. In Tigray Region measles outbreak is still a main public health concern and in 2014/15 many districts including refugee camps reported measles outbreaks. A refugee camp in Tselemti District of Tigray reported an outbreak of measles in Adi-Harush and May-Aini refugee camps and we investigated to verify the existence of an outbreak, to determine the magnitude and identify associated risk factors contributed for the occurrence of the outbreak.

A one-to-one unmatched case control study was conducted from February 1 to 16, 2015 in Adi-Harush and May-Ayni refugee camps. We used structured questionnaire to interview cases and controls. Data was managed and analyzed by using Microsoft Excel 2007 and Epi Info 7.1.

Seven blood samples were collected from the cases for laboratory confirmation and three of them tested positive for measles IGM. We identified 272 suspected measles cases with no deaths. The overall attack rate of this outbreak was 4.26 per 1,000 inhabitants of the areas with the highest attack rate were observed at Mai-Ayni refugee camp. The age of the case patients ranged from 2 month to 44 years with mean age of 15.83 years. The majority, 170 (62.5%) of them were aged 15 years and above. For the majority of cases, 214 (78.7%), vaccination status for measles were unknown and 10 (3.7%) of them were aged below the eligible measles vaccination age (<9 month). Having contact with a person suspected to have measles AOR: 7.21 (95% CI, 2.33 – 22.32) and presence of measles case patient in the family AOR: 15.34 (95% CI, 5.22 – 45.09) were independent risk factors for contracting measles infection, whereas being vaccinated against measles AOR: 0.36 (95% CI, 0.15 – 0.85) were found to be protective against measles infection.

This outbreak occurred in refugee camps where there is crowded setting which increases the contact rates and the likelihood of spread of the virus is elevated in the presence of susceptible populations. We recommended measles vaccination campaign to be conducted for all individuals aged 18 years and bellow in the refugee camps and in kebeles nearby to the camp.

1.2.1. Introduction

Measles is an extremely contagious, acute, viral illness caused by RNA enveloped virus of the family paramyxovirus, genus Morbillivirus. Measles virus is the only member of the genus *Morbillivirus* that infects humans. It is highly contagious; the secondary attack rate in a susceptible individual exposed to measles is between 75 to 90 percent. Anyone who is not immune to measles can get the infection (1, 2). This highly contagious virus is transmitted through contact with nose and throat secretions of infected people and through airborne droplets released when an infected person sneezes or coughs (1, 3). Patients are contagious from 1 or 2 days before symptom onset (4 days before rash) until 4 days after the rash appears. Infectivity peaks during the prodromal phase. The mean intervals from infection to symptom onset and rash appearance are 10 and 14 days, respectively (4, 5). The signs and symptoms of measles include fever, lack of appetite, cough, coryza, red eyes, and maculopapular rash, with complications such as pneumonia, blindness, brain damage, diarrhea and croup (5). In tropical area, most of measles cases occur during the dry season, whereas in temperate zones, incidence of measles peaks during late winter and early spring (4).

The risk factors for measles virus infection include: infants who lose passive antibody before the age of routine immunization, children with vitamin A deficiency and immunodeficiency due to HIV or AIDS, leukemia, or corticosteroid therapy, regardless of immunization status and children who travel to areas where measles is endemic or contact with travelers to endemic areas. Malnourished and young children are at higher risk of developing complications and mortality from measles infection (1, 5).

The complications of measles can be divided into three groups, according to the site involved: the respiratory tract, the central nervous system (CNS), and the gastrointestinal tract. Respiratory tract involvement, manifested as laryngitis, croup, or bronchitis, occurs in the majority of cases of uncomplicated measles. In young children, otitis media is the most common complication. Pneumonia is a frequent reason for hospitalization, especially of adults. The pneumonia is of viral origin in the majority of cases, but secondary bacterial infection (most commonly caused by streptococci, pneumococci, or staphylococci) also develops with some frequency (1, 5).

Measles occurs throughout the world and remains the leading cause of childhood morbidity and mortality in the world predominantly in developing countries. Before a vaccine was available, infection with measles virus was nearly universal during childhood, and more than 90% of persons were immune by age 15 years (4, 6).

Globally, more than 20 million cases are reported yearly and 345 000 deaths were recorded in 2005. Fifty to sixty percent of 1.6 million global deaths attributed to vaccine preventable diseases are attributed to measles. In Africa 450 000 cases were reported and 250 000 deaths were reported in Sub Saharan Africa in 2009 (3).

Measles vaccination is one of the most cost-effective interventions available to prevent measles infection. Since measles vaccine was developed in 1958, it has saved the lives of millions of children throughout the world. However, measles remains an important cause of death and disability in countries with limited health infrastructure. In countries where vaccination has substantially reduced the incidence of measles, failure to maintain high coverage of childhood immunization in all districts has resulted in a resurgence of the disease (4, 7).

Measles is probably the commonest of vaccine preventable diseases that occur in Ethiopia; where parents recognize it as a self-limited common childhood illness for which no medical care is often sought. In Ethiopia measles cases usually come late to health facilities and often after they have developed complications. Measles surveillance in a few selected administrative zones of Ethiopia in 2002 revealed age shift of measles cases from children under five to those above five years of age. A total of 931 measles cases were registered during the surveillance period, of which 52.4% were children 5 to 14 years and the remaining 42.5% being in children under five years (8).

It is also one of the vaccine preventable diseases that are targeted for elimination and with half of the world close to eliminating measles, many countries in sub Saharan Africa including Ethiopia are still struggling to control the disease. In 2006, countries in the World Health Organization (WHO) African Region adopted a goal to achieve 90% measles mortality reduction by 2010 compared with the estimate for 2000. By 2008 in the African Region, reported measles cases decreased 93% and estimated measles mortality decreased 92% compared with 2000. Since 2002, Ethiopia adopted these regional goals and strategies and has been taking important steps to control and ultimately to eliminate measles by 2020 (3, 8).

The history of immunization services in Ethiopia prior to 1980 has not been documented very well although the smallpox eradication activities have left some legendary memories. The Expanded

Program on Immunization (EPI) was launched in Ethiopia in 1980 based on the international, as well as national, experiences and resources gained during the smallpox eradication activities in the late 1970s. Currently the service is delivered through static and outreach sites nationwide. The current Ethiopian routine immunization schedule recommends measles vaccination at 9 months of age (8).

High coverage of vaccination of children below the age of 15 years has led to reduction of measles cases by up to 99% in developed or industrialized countries. Developing countries are failing to achieve high vaccination coverage's, hence frequent outbreaks of measles with high case fatalities as high as 3-30% occurred (9).

In Tigray region measles outbreak is still a main public health probem. During the period of 2014/15, measles epidemics were reported from many districts of the region including refugee camps. Measles outbreak at two refugee camps of Tselemti District in Tigray region were reported by health department of Administration for Refugee and Returnee Affairs (ARRA) based at Shire to the national public health emergency management (PHEM), early warning and response team on January 13th of 2015. A team comprising two EFETP and one PHEM expert were sent to the area in order to verify the existence of an outbreak, identify associated risk factors contributed for the occurrence of the outbreak to prevent its spread.

1.2.2: Back ground

Ertrean refugees entered Ethiopia following the Ethio-Eritrean border conflict in 1998 - 200. They were initially just about 4,000 refugees settled in Wala'nhibi and were later moved to Shimelba refugee camp in May 2004. There are currently four Eritrean refugees camp in Tigray region; Namely Shimelba, Mai-Ayni, Adi-Harush and Hitsats refugee camps. Among these camps the current outbreak has occurred in two of them; Mai-Ayni and Adi-Harush refugee camps. Mai-Ayni refugee camp was established in May 2008 in Mai-Ayni Kebele,Tselemti District of Tigray region and currently hosts about 19,458 refuugees, 59% of whom are males. The camp is mainly populated with high number of unaccompanid minors. Adi-Harush refugee camp was established in Aprily 2010 in Medhanialem Kebel near to Mai-tsemri town the addministrative seat of Tselemti District and currently hosts about 35,489 refugees, 61% of whom are males. However due to the transient nature of the the refugees it was not possiible to determine exact statistics on the poopulation of the camps. Both camps has one health centers that provide comprhensive health service activities for the refuugees.

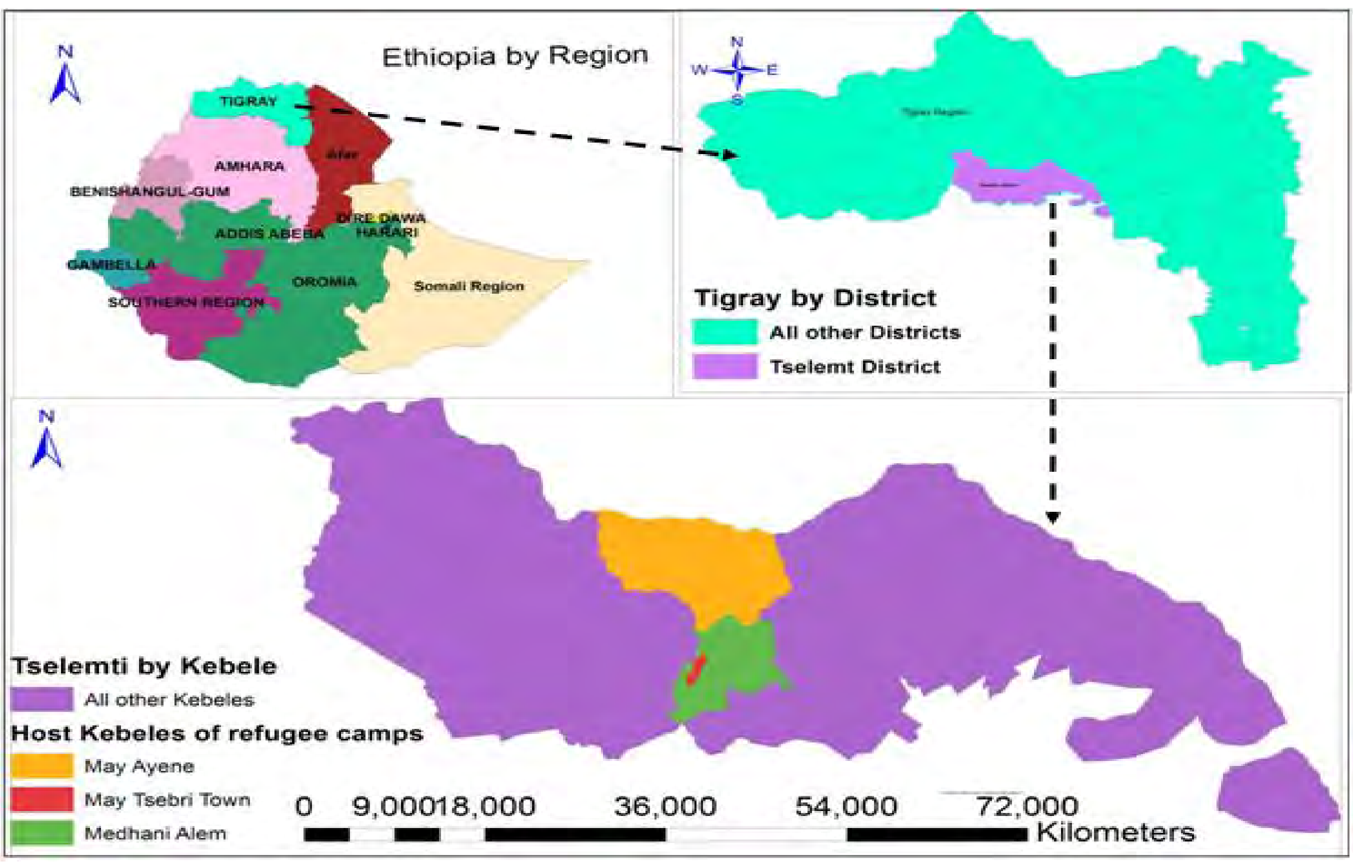


Figure 6: Map of Tselemti District by Kebele, North West Tigray Region, Ethiopia 2015.

1.2.2. Objectives

1.2.2.1. General Objective

The overall objective of the investigation was to verify the existence of an outbreak, identify associated risk factors contributed for the occurrence of the outbreak and ensure that virus transmission is interrupted as soon as possible in refugee camps of Stelemti District, Tigray, Ethiopia, Feb. 2015.

1.2.2.2. **Specific objectives**

- To identify risk factors contributed for contracting the disease.
- To describe outbreak in terms of person, place and time.
- To strengthen the surveillance system and prevent further spread of outbreak

1.2.3. Methods

1.2.3.1. Study area

We conducted the outbreak investigation at Adi-Harush and Mai-Ayni refugee camp of Tselemti district, Tigray region, Ethiopia, February 2015.

1.2.3.2. Study period

We have conducted a case-control study from February 1 to 16, 2015 at Adi-Harush and Mai-Ayni refugee camp of Tselemti district, Tigray region.

1.2.3.3. Study design

A cross- sectional descriptive study and A one-to-one unmatched case control study design was done on the measles cases identified during the epidemic period, on the basis of the variables of patient, location and time.

The uni-variate analysis included the calculation of means and medians for quantitative (numerical) variables, and frequencies and percentages for qualitative (categorical) variables. Attack rates per 1,000 inhabitants of the community by sex and age group were also calculated. In addition bi-variate and multi-variate analysis was performed to determine associated risk factors for contracting the illness.

A working case definition was used to actively search for the cases in the community and active case search was done at house-to-house.

1.2.3.4. Study source population

The source populations of the study were all individuals living in the Adi-Harush and Mai-Ayni refugee camp.

1.2.3.5. Target population

During this outbreak investigation, all confirmed and suspected measles cases and selected community controls were the target population of this study.

Controls were neighbors of cases who did not suffer from measles during the period of the study. One control for every case per house hold was selected from the same refugee camp.

1.2.3.6. Sample size Determination and Sampling

For case control study 100 cases and one controls for each cases were selected conveniently based on accessibility and availablity of cases in the household.

Inclusion criteria

Cases: Any resident of Adi-Harush and Mai-Ayni refugee camps who tested positive for measles IgM or those who fulfill measles case definitions from December 1, 2015 to February 20, 2015 and who agreed to participate in the study was included.

Controls: A control was any resident of Adi-Harush and Mai-Ayni refugee camps during the study who did not develop signs and symptoms of measles and agreed to participate was included.

Exclusion criteria:

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

Controls: Those who refused to participate and family members from the same household were excluded.

1.2.3.7. Case definition

Suspected measles 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.

Confirmed measles case:

Cases with a positive laboratory result for measles specific immunoglobulin M (IgM) antibody testing that had not received measles vaccination within the 4 weeks before the specimen collection.

Measles suspected cases for community:

A community member should report any person with rash and fever to a health worker and also advise the person to go to a health facility for further diagnosis and intervention.

Measles outbreak:

Is laboratory confirmed when 3 or more laboratory confirmed measles IgM -positive cases occur in a health facility or district in a month.

Epidemiologically linked case:

A suspected measles case that has not had a specimen taken for serologic confirmation and is linked (in place, person and time) to a laboratory confirmed case; i.e., living in the same or in an adjacent district with a laboratory confirmed case where there is a likelihood of transmission; onset of rash of the two cases being within 30 days of each other.

Measles death:

For surveillance purposes, a measles death is defined as any death from an illness that occurs in a confirmed case or epidemiologically linked case of measles within one month of the onset of rash.

1.2.3.8. Data processing and analysis

Data was entered, summarized and analyzed by using Epi-Info version 7.1 software and Microsoft Office Excel 2007. Results were presented using graph, table and figures. We calculated frequencies, attack rates and case fatality rate. Additionally, estimated odds ratio and 95% confidence interval for risk factors were determined through bi-variate and multi - variate analysis.

1.2.3.8 Ethical consideration

Ethical clearance and support letter were obtained from Ethiopian public health institute and support letter to conduct the study was also obtained from Tigray Regional health Bureau, District health office and from health department of the Ethiopian government administration for refugees and returnees affair. Moreover objective of the study was briefly mentioned and Oral informed consent was obtained from the study participants or their parents to participate in the study. Participants were treated with respect and willingly participated in the study without payment or cohesion. Confidentiality was assured and no personal details was recorded or produced on this documentation.

1.2.3.9. Data dissemination

Findings of this investigation in both soft and hard copy was communicated with Tigray Regional Health Bureau, Tselemti District health office, Shire Administration for Refugee and Returnee Affairs (ARRA) health department and Addis Ababa University. Additionally, soft copy of the document was sent to FETP Resident Advisors, Mentors, Co-ordinators and Field Supervisors.

1.2.3.10. Coordination

After receiving a report of measles outbreak at Adi-Harush and Mai-Ayni refugee camp from Administration for Refugee and Returnee Affairs (ARRA) the national public health emergency management (PHEM) has sent a team comprised of three experts (one PHEM expert & two Field epidemiology residents) to the site for investigation of the outbreak and give technical support in the control and prevention process. The national team departed to the outbreak site on February 1st, 2015 and discussed with Tigray regional health bureau PHEM focal person, Tselemti district health office experts, Shire ARRA health coordinator, Mai-Ayni refugee camp health center head and Adi-Harush refugee camp health center head about the status of the outbreak, activities performed and action taken. Then after, the national team started investigating of the outbreak with experts from Shire ARRA and Mai-Ayni and Adi-Harush refugee camp health centers. The team performed the following activities:-

- Active case search based on the standard measles case definition at house to house level.
- The line list was updated with the newly identified cases during active case search
- Active cases were treated and managed properly with appropriate drugs and vitamin A supplementation
- Health education was given to the refuge community about mode of transmission, prevention and control measures.
- Cases and their guardians were interviewed to collect data for case control study
- Regional PHEM head and experts and district health office heads were debriefed at the end of the investigation.

1.2.4 Result

1.2.4.1. Descriptive analysis

During the outbreak period (12/1/2014 to 2/20/2015) a total of 272 suspected measles cases with no deaths were identified. From seven of the cases (2 from Adi-Harush and 5 from Mai-Ayni camp) blood samples were collected for laboratory confirmation and sent to the national laboratory. Three 42.9 % of them (one from Adi-Harush and Two from May-Ayni) tested positive for measles IGM and all the others cases were epidemiologically linked to these positive cases. Among the total cases 195 (71.7%) of them were males and. The age of the case patients ranged from 2 month to 44 years with mean age of 15.83 years (15 years & 10 months) and median age of 15 years. Of the total cases, the majority, 170 (62.5%) of them were aged 15 years and above and 19 (6.9%) of them were children aged below five years (Table 6).

Table 6: Distribution of measles cases by age group and sex in refugee camps found at Tselemty District, North West Tigray, Ethiopia 2015.

Age group	Female (%)	Male (%)	Total number of cases (%)
<1	6 (2.2)*	5(1.8)	11 (4.0)
1-4	6 (2.2)	2 (0.7)	8 (2.9)
5-9	3 (1.1)	5(1.8)	8 (2.9)
10-14	14 (5.1)	61 (22.4)	75 (27.6)
15-19	35 (12.9)	91 (33.5)	126 (46.3)
20-24	8 (2.9)	14 (5.1)	22 (8.1)
25-29	2 (0.7)	7 (2.6)	9 (3.3)
30-34	2 (0.7)	7 (2.6)	9 (3.3)
>=35	1 (0.4)	3 (1.1)	4 (1.5)
Total Cases	**77 (28.3)**	**195 (71.7)**	**272 (100.0)**

*Numbers in parenthesis indicate percentage

The outbreak started in 49th WHO epidemiologic week of 2014 and ended in 8th WHO week of 2015. The number of cases started to rise in WHO epidemiologic week 2nd and peaked in 3rd week and started to decline thereafter (Fig. 2).

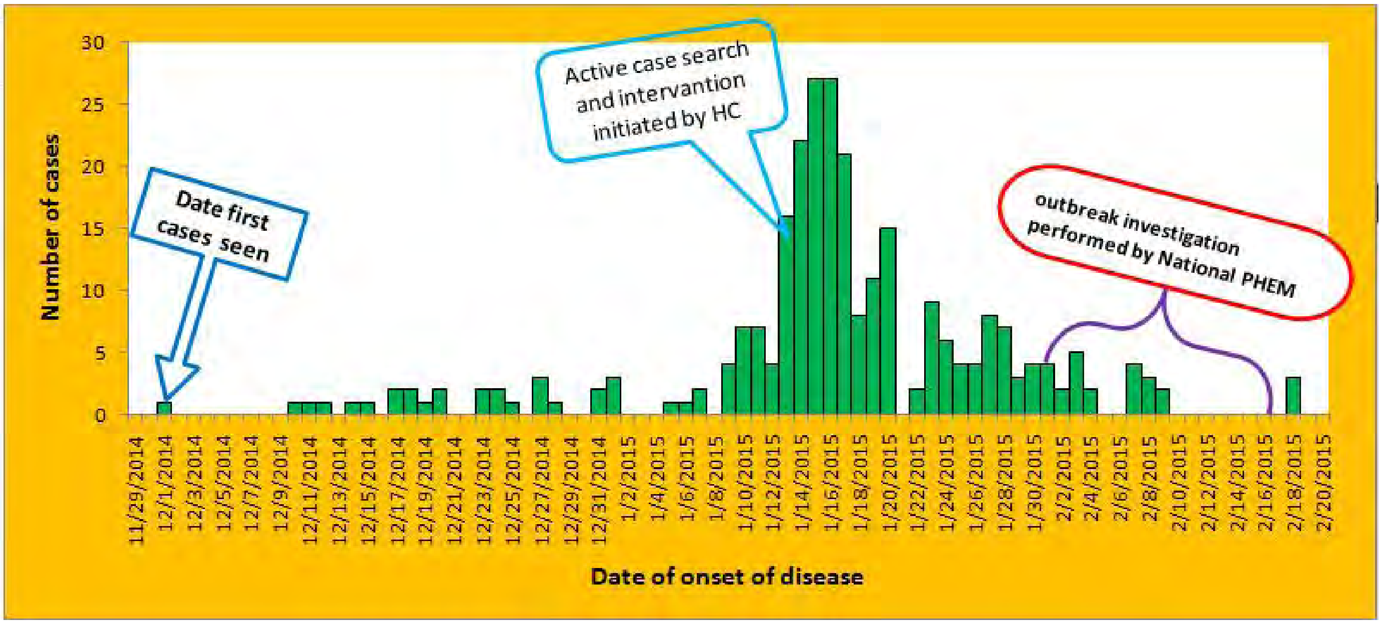


Figure 7: Distribution of measles cases by date of onset of the disease at Adi-Harush and May-Ayni Camp, Tselemti District, North West Tigray, Ethiopia December to February 2015.

The outbreak started at Adi-Harush refugee camp on December 1st, 2015, whereas the first measles case from Mai-Ayni camp was reported on January 9th, 2015. The first case of this outbreak was a 30 years old man, but during the time of the investigation we couldn't locate the index cases at both camps, because they left the camp and illegally traveled to Sudan and other camps.

Among the total cases line listed during the outbreak period 262 (96%) of them were from refugee camps (Adi-Harush & Mai-Ayni camps) and the rest 10 (4%) were from the host community (Adi-Gebru). Among the cases of refugee camp the majority of them, 207 (75.7%) were from Mai-Ayni refugee camp and the rest 55 (20.2%) were from Adi-Harush refugee camp. The majority of the cases from Mai-Ayni camps were from "zone- A" 79 (38.3%) followed by "zone-B" 52 (25.2%) and "zone-D" 46 (22.3%) cases (Fig. 8).

All of the cases were admitted separately from other cases and treated appropriately at the health center of the refugee camps. The medications provided for the cases include; Anti-pyretic, Anti-biotics, Vit-A, TTC eye ointment, IV- fluid, and ORS. Vitamin-A has been given for 266 (97.8%) measles patient, while Anti-biotic and TTC eye ointment have been given for 209 (76.8%) and 37 (13.6%) of the cases respectively. About 86% of the cases visited health center to get treatment within three days after the onset of the disease (42% after 1 day, 20% after 2 days and 22 after 3 days). The median duration for seeking treatment after onset of illness was two days (Q1=1; Q3=3). Of the total cases 98% of them responded to have had rash that has lasted for two to seven days. The median duration of rash was three days (Q1=3; Q3=4).

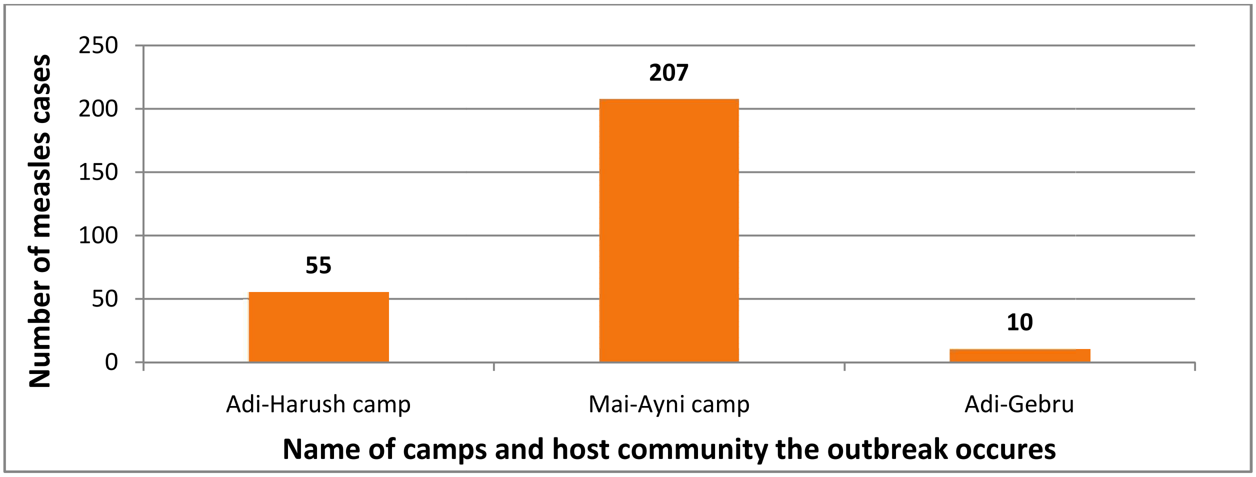


Figure 8: Distribution of measles cases by place at Tselemty District refugee camps, North West Tigray, Ethiopia, December to February 2015.

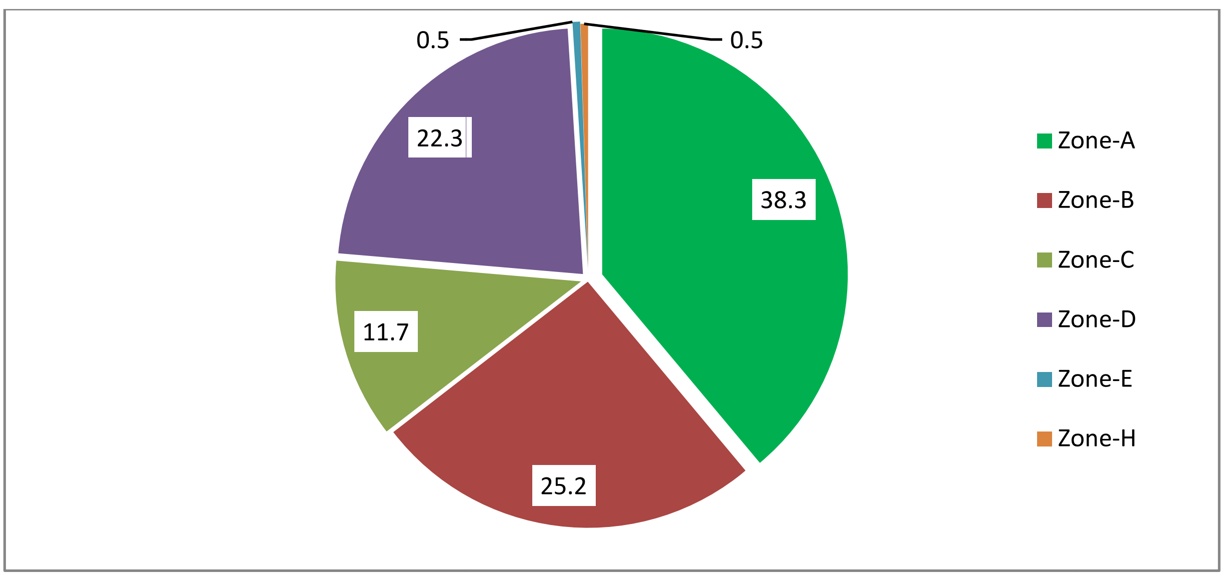


Figure 9: Proportion of Mai-Ayni refugee camp measles cases by zones of the camp at Tselemty District refugee camp, North West Tigray, Ethiopia, December to February 2015.

Among the total line listed cases 10 (3.7%) of them were aged below the eligible measles vaccination age (<9 month) and the majority of the cases 214 (78.7%) vaccination status for measles were unknown (Fig.9). Only 24 (8.8%) of cases have responded to have taken one dose of measles containing vaccine.

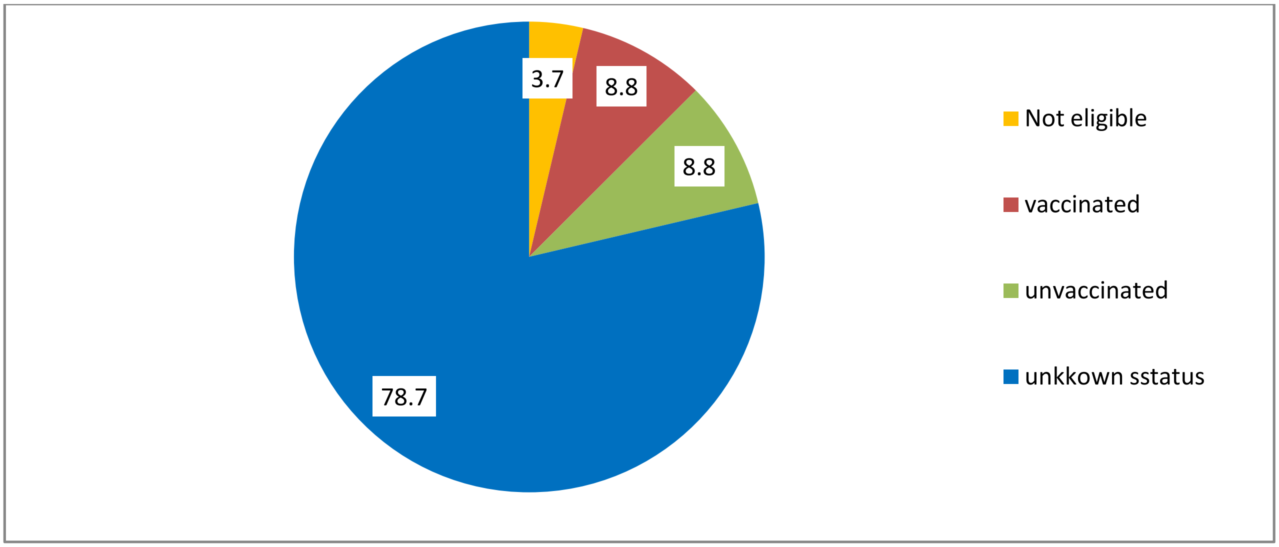


Figure 10 Measles vaccination status of measles cases at *Tselemty District refugee camp, North West Tigray, Ethiopia, December to February 2015.*

The complications diagnosed as a consequence of measles infection during the outbreak period included; conjunctivitis, Diarrhea, Pneumonia + Diarrhea, Pneumonia and Pneumonia + tonsillitis where 90 (33.1%) of the cases have developed one or combination of them. Pneumonia was the leading complication diagnosed on 75 (27.6%) cases followed by conjunctivitis and diarrhea with a magnitude of 6 (2.1%) and 5 (1.8%) cases respectively.

The overall attack rate of this outbreak was 4.26 per 1,000 inhabitants of the areas with the highest attack rate 10.64 per 1,000 inhabitants of the camp were observed at Mai-Ayni refugee camp. The attack rate for Adi-Harush refugee camp and Adi-Gebru town were 1.55 and 1.12 per 1,000 residents of the areas respectively. Overall males were the most affected group compared to females with attack rate of 5.19 and 2.92 per 1,000 people respectively. At Mai-Ayni camp males were more affected than females with attack rate of 13.59, whereas at Adi-Harush camp both males and females were affected almost similarly. The highest attack rate 14.76 per 1,000 was among residents of Mai-Ayni refugee camp aged below 18 years. However at Adi-Harush camp individuals aged 18 years and above were the most affected with attack rate of 2.21 per 1,000 individuals. In general in this outbreak largest proportion (76.2%) of cases with the highest attack rate was observed in Mai-Ayni refugee camp compared to Adi-Harush camp and Adi-Gebru town (Table-6).

Table 7: Measles attack rate by age group, sex and places at *Tselemty District refugee camps, North West Tigray, Ethiopia, December to February 2015.*

Camps/kebele Name	Variables	Population	Number of cases (%)	Attack rate per 1,000 population
Adi-Harush camp	**Age group**			
	<18	20,584	22 (8.1)	1.07
	>=18	14,905	33 (12.1)	2.21
	Total	35,489	55 (20.1)	1.55
	Sex			
	Male	21,648	33 (12.1)	1.52
	Female	13,841	22 (8.1)	1.59
	Total	35,489	55 (20.2)	1.55
Mai-Ayni camp	**Age group**			
	<18	10,702	158 (58.2)	14.76
	>=18	8,756	49 (18.0)	5.60
	Total	19,458	207 (76.2)	10.64
	Sex			
	Male	11,480	156 (57.4)	13.59
	Female	7,978	51 (18.8)	6.39
	Total	19,458	207 (76.2)	10.64
Adi-Gebru Town	**Age group**			
	<1	278	1 (0.4)	3.60
	1 – 14	4,660	2 (0.7)	0.43
	>=15	4,024	7 (2,6)	1.74
	Total	8,962	10 (3.7)	1.12
	Sex			
	Male	4,418	6 (2.2)	1.36
	Female	4,544	4 (1.5)	0.88
	Total	8,962	10 (3.7)	1.12

1.2.4.2. Analytical analysis

For the analytical study a total of 100 cases and 100 healthy controls were selected from Adi-Harush (22 cases and 24 controls) and Mai-Ayni refugee (78 cases and 76 controls) camps with a ratio of one case to one control. Among the total 100 interviewed cases 69 (69.0%) of them were males whereas among the total 100 controls 56 (56.0%) of them were males. The age of the case patients ranged from 0.92 year (11month) to 40 years with mean age of 14. 68 years and median age of 15 years (Q1=13, Q3=17), whereas the age of the controls ranged from 0.83 year (10 month) to 34 years with mean age of 17.08 years and median age of 17 years(Q1=14, Q3=21). Among the cases only 9 (9%) of them have responded to have being vaccinated for measles whereas 33 (33%) of the controls responded they have received at least one dose of measles vaccine.

Among the 100 interviewed cases 90 (90%) of them have responded that measles can be cured by modern medicine and 97 (97%) of cases have provided the same response. In the houses of 39 (39%) cases at least one member of the roommate had measles infection, whereas only in 4 (4%) of the control's house there were other measles infected roommate. In this study we have found no significant difference on knowledge of measles between cases and controls.

In bi-variate analysis; having contact history with a person suspected to have measles during the last 2 -3 weeks OR: 6.69 (95% CI, 3.56 – 12.57) and presence of measles case patient in the house hold OR: 15.34 (95% CI, 5.22 – 45.09) were significant risk factors for contracting measles. In addition not being vaccinated against measles OR: 20.53 (95% CI, 9.21 – 45.77) have significantly associated with the presence of measles illness (table -7).

Table 8: Bi- variate analysis of rrisk factors for contracting measles in Adi-Harush and Mai-Ayni refugee camps at Tselemty District, North West Tigray, Ethiopia, December to February 2015.

Exposure variables		Cases	Controls	OR	95%CI	P - value
Sex	Male	**31**	44	0.57	0.32 – 1.02	0.79
	Female	69	56			
Age group	< 5 years	9	8	1.14	0.42 – 3.01	0.06
	≥ 5 years	91	92			
Religion	Christian	96	96	1.00	0.24 – 4.10	1.00
	Muslim	4	4			
Educational status of the Father	Illiterate	54	59	0.81	0.47 – 1.42	0.42
	Literate	46	41			
Educational status of the Father	Illiterate	67	68	0.96	0.53 – 1.71	0.88
	Literate	33	32			
Presence of person with measles in the house hold	Yes	39	4	**15.34**	5.22 – 45.09	0.000
	No	61	96			
Contact history with measles patients in the past 2 – 3 week	Yes	64	21	**6.69**	3.56 – 12.57	0.000
	No	36	79			
vaccinated for measles	Yes	9	33	**0.20**	0.09 – 0.44	0.000
	No	91	67			
Know prevention of measles infection	Yes	74	76	0.89	0.47 – 1.70	0.74
	No	26	24			
Housing Condition	Ventilated	58	58	1.00	0.57 – 1.75	1.00
	Not Ventilated	42	42			
Nutritional Status	Normal	99	100			
	Moderate and Severe	1	0			
Number of sleeping room	=< 1 room	65	77	0.55	0.29 – 1.03	0.06
	> 1 room	35	23			
Number of individual in the house	<= 3 people	14	22	0.58	0.28 – 1.20	0.14
	> 3 people	86	78			

Is measles vaccine preventable?	Yes	74	84	0.54	0.27 – 1.09	0.08
		26	16			

Moreover in-multivariate analysis, all factors significantly associated with measles infection in bi-variate analysis have remained independently associated with contracting measles illness at Adi-Harush and Mai-Ayni refugee camps measles outbreak.

Table 9: Independent factors associated with contracting measles illness in Adi-Harush and Mai-Ayni refugee camps at Tselemty District, North West Tigray, Ethiopia, December to February 2015.

Independent risk factors	AOR	95% Confidence Interval	P- value
Presence of person with measles in the house hold	3.74	(1.87 – 7.46)	0.0002
Contact history with measles patients in the past 2 – 3 week	7.21	(2.33 - 22.34)	0.0006
Vaccinated for measles	0.36	(0.15 – 0.85)	0.0205

1.2.5. Discussion

Over the period of the outbreak (December 1st 2014 to February 18th 2015) a total of 272 cases were line listed from two refugee camp and one nearby town. The overall attack rate of the outbreak was 42.6 per 10,000 inhabitants which was about ten times higher than similar study in Simada District of South Gonder Zone with attack rate of 4.1/10,000 people(8). Overall males were almost twice more affected than females (AR male 51.9 and female 29.2/10,000). A wide age range (from 2 month to 44 years) has been seen among cases affected by this outbreak. The most affected age groups were those who aged below 18 year with attack rate of 51.9 per 10,000 peoples where the attack rate of individuals aged 18 years and above was 32.1 per 10,000 people. Unlike other measles outbreaks in this outbreak no deaths were occurred as a result of complications whereas similar other investigations found high case fatality rates (CFR) like; a retrospective community-based study conducted in West Hararghe zone (CFR= 6.7%), outbreak investigation in Simada District of South Gonder (CFR=13.4%) and outbreak investigation in Harena & Dawe Sere districts of Bale Zone (CFR=15.7%) (9-11). One of the most important factors that played a pivotal role in the absence of death was the health seeking behavior of the refugees and early treatment. All of the 272 case were admitted and treated appropriately at the refugee camps health centers. According to WHO estimate the CFR of measles would be 3% to 6% in developing countries in the absence appropriate treatment. Moreover studies have found that even the case fatality of measles outbreak would be higher up to 20% in areas like refugee camps (12). In this investigation we have identified that large proportion (78.7%) of the case's vaccination status for measles were not known because most of them are unaccompanied minor and they are living in the refugee camp without their parents and didn't have idea whether they have been vaccinated or not. However 24 (8.8%) of cases have responded to have taken one dose of measles containing vaccine. Moreover the investigation has found that 10 (3.7 %) case patients were aged below the eligible vaccination age (9 month) for measles. Their infection might be due to being born from unprotected mother. Infants born from immunized mothers either by vaccination or prior infection can be protected against measles for six to nine months (14).

Moreover in this study we identified several factors that were associated with contracting measles infection in Mai-Ayni and Adi-Harush refugee camps. Among them being unvaccinated against measles was a risk factor for contracting measles infection in this outbreak, where other similar studies in Korea and Zimbabwe reveals the same finding that cases were high in unvaccinated children than those who were vaccinated (6, 15). Having contact with measles cases was also found to be a risk factor for contracting measles infection which is supported by a similar outbreak investigation done in Zimbabwe and by the fact that the secondary attack rate of measles is 90% in the presence of susceptible individuals (3, 6). In addition presence of measles case patient in the house hold was also found to be a risk factor for contracting measles infection which is supported by the fact that secondary attack rate of measles is 90% if there is a susceptible individuals (2, 3, 16).

1.2.6. Limitations

Index cases were not identified to determine the source of the outbreak because of illegal mobility of the refugees to different camps both within and out of Ethiopia.

Absence of vaccination card that made difficult to determine the vaccination status and exact date of vaccination of cases and controls which might cause information bias.

Absence of data about the refugee camps population by different age category (<1 year, <5 years <15 years) that helps to determine age specific rates. In addition it was not possible to determine the exact population statistics due to the transient nature of the refugees.

Incompleteness and absence of EPI and vaccination coverage date of the district and refugee camps.

Between district health office and refugee camp health centers line list data discrepancy because of poor communication and reporting between the two organizations.

1.2.7. Conclusion

This outbreak of measles has occurred in refugee camps where refugees live in a crowded setting that increase the contact rates and the likelihood of spread of virus is elevated in the presence of susceptible populations. The outbreak has affected a wide age range but those individuals aged less than 18 years have been attacked highly. Males were highly affected by this outbreak than females. Even if the outbreak affected large number of refugees no death has been occurred unlike other similar outbreaks mainly due to the treatment provided for all cases by health center of the camp. The house to house active case search and awareness creation done by incentive community health workers of the refugee camp has played a pivotal role in increasing health service seeking behavior for measles among the refugees and to take ill cases to heath center for treatment. The independent associated risk factors for contracting measles infection for this outbreak were having contact history with measles case patient, not being vaccinated against measles and presence of measles infected individual among the roommates.

1.2.8. Recommendations

A system should be in place to strengthen the communication between the district health office and the ARRA heath facilities and on top of that the surveillance system needs to be strengthened.

Measles vaccination campaign needs to be conducted as soon as possible to all individuals aged 18 years and below who live in Adi-Harush & Mai-Ayni refugee camps and kebeles neighboring to these camps. Moreover the vaccination campaign also should have to be conducted in other refugee camps found in the region, due to refugees illegally moves from one camp to other frequently.

The community health workers of the refugee camp should have to strength active case search and the Line list needs to be updated and send to national PHEM regularly.

To interrupt and stop the outbreak early all non-immune individuals contacted the case should have to be restricted from school and other public gathering areas and limit their movement for 18 days. Isolate them soon when they develop fever or other measles symptoms.

The district health office should have to document properly EPI coverage data by place and time (Monthly by Kebele).

EPHI/PHEM should have to provide measles vaccines as soon as possible as per the request for the targeted individuals (18years and below).

EPHI/PHEM should have to provide feedback of laboratory results within the time period indicated on the national PHEM guideline for all facilities and has to perform identification of sero-types of the virus to know the origin of the outbreak.

Refernces

1. Harrison's Principles of Internal Medicine. 17th ed. United States of America: The McGraw-Hill Companies, Inc.; 2008.

2. World Health Organization. Guidelines for measles and rubella outbreak investigation and response in the WHO European Region. 2013.

3. Corinne Danet, Fermon F. Management of a measles epidemic: Practical guide for Doctors, Nurses, Laboratory technicians and Medical auxiliaries. : Medecine Sans Frontieres; 2013.

4. WHO. Measles mortality reduction and regional elimination; atrategic plan 2001 - 2005. World health Organization, Geneva. 2001.

5. EHNRI. Guideline on measles surveillance and outbreak management 3rd ed. Addis Ababa, Ethiopia: Ethiopian Public Health Institute; 2012.

6. Kufakwanguzvarova PW, Robert MF, Notion GT. Measles outbreak investigation in Zaka, Masvingo province, Zimbabwe. BioMed Central Ltd. 2012.

7. WHO. Measles vaccines: WHO position paper. Wkly Epidemiol Rec. 2009;35(84):349-60.

8. Berhane Yemane , Haile Mariam Damen, Helmut K. Epidemiology and Ecology Of Health and Disease In Ethiopia Addis Ababa, Ethiopia: Ethiopian Public Health Association; 2005.

9. Heymann D. Control of Communicable Diseases Manual: An Official report of the American public Health Association,. 2004.

10. Mer'Awi Aragaw, Tilay T. Measles outbreak in Simada District, South Gonder Zone, Amhara Region: Immediate need for sttrengthened routine and supplementary immunization actiivities. Ethiopian Journal of health Development. 2012;26(2):115-8.

11. Abiyot Bekele Weyessa, al e. Investigation of measles outbreak- Herena and Dawe-Serer Districts of Bale Zone, Oromia Region, Ethiopia, February 2011. Retrovirology. 2012;9(suppl 1):39.

12. Kassahun Miitiku, Kegne W. Measles outbreak investigation in West Hararghie Zone of Oromia Region, Ethiopia. Ethiopian Journal of Pediatrics and Child health July 2011;7(7). Epub 44.

13. Wolfson LJ, Grais RF, Luquero FJ ea. Estimates of measles cases fataliy rate: a comprhensive review of community-based studies. Int J Epidemiology.2009(38):192-205.

14. Pinquer D. ea. Distribution of serum measles-nuetralizing antibodies according to age in women of child bearing age in France 2005-2006: impact of ruotine immunization. pedit infect dis J. 2007;26(8):749-50.

15. So JS, Go UY, DH L, al. e. Epidemiological Investigation of a measles Outbreak in a pre-school in Korea. Pub Med. 2006.

16. Balcha G. Masresha, Reinhard Kaiser, et al. Progress Toward Measles Preelimination — African Region, 2011–2012. CDC Morbidity and Mortality Weekly Report April 2014;63(13):285-91.

Annex II: Questionnaire for case – control study on Measles outbreak investigation in Shire, Tigray Region, February 2015.

Questionnaire for Measles outbreak investigation

1. *Data collector information:* Name:___________________ Phone number*:* _____________
2. *Date of Data collection:*______________

   *Region*________ *Zone*_____________ *District*___________ *Kebele* _________ *Got* _______

   House: Longitude:________________ *Latitude:*_____________________

3. *Who is answering the questionnaire?:*

   ☐ Parent/ guardian of sick person ☐ Sick person ☐ Other (please specify) ___________

4. *Respondent category*: ☐ case ☐ control Active case: Yes☐ No ☐

I. **Socio-demographic information**

4. Patient Name_________________________
5. Patient phone number: ___________ __(whose phone#?) ______________________

3. Age**:** years_____ months ____

4. Sex**:** ☐ Male ☐ Female

6. What is your occupation?**:**

☐ Farmer ☐ Merchant ☐ Housewife ☐ Unemployed ☐ Government

☐ Pastoralist ☐ Student ☐ Not applicable ☐ Other _____

7. What is your ethnicity?

☐ Oromo ☐ Tigre ☐ Amhara ☐ Gurage ☐ Other (specify) ________________________

8. What is your religion?**:** ☐ Orthodox ☐ Protestant ☐ Muslim ☐ Catholic ☐ other______________
9. What is your marital status ?: ☐ Single ☐ Married ☐Widowed ☐ Divorced ☐ Not applicable
10. Have you ever attended school?: ☐ yes (go to question 10) ☐ No (go to question 11)
11. What is the highest level of education you have completed? (read answers): ☐ KG ☐ Primary ☐ Secondary ☐ Tertiary ☐ Not applicable
12. Father's occupation : ☐ Farmer ☐ Merchant ☐ Unemployed ☐ Government ☐ Student ☐ Pastoralist ☐ Other __________________
13. Parent's of case/control's education : Mother: ☐ Illiterate ☐ Primary ☐ Secondary ☐ Tertiary

    Father: ☐ Illiterate ☐ Primary ☐ Secondary ☐ Tertiary
14. Family size :____________________

15. What is the main material of the roof? RECORD OBSERVATION

(Natural roofing): ☐ no roof ☐ thatch/leaf/mud

(Rudimentary roofing): ☐ Rustic mat/plastic sheets ☐ reed/bamboo ☐ wood planks ☐ cardboard

(FINISHED ROOFING): ☐ Corrugated Iron /Metal ☐ Wood ☐ Roofing Shingles

☐ Asbestos/Cement Fiber ☐ Cement/Concrete ☐ Other (Specify) ________________

II. Knowledge Questions

1. What is measles, or are you not sure? ____________
2. How do you think measles is transmitted? You can pick more than one response:
   ☐ Through the air ☐ Fecal/oral ☐ Food ☐ Close contact with an ill person ☐ Other _____________
3. How do you think measles can be prevented? :
   ☐ Vaccination, ☐ There is no prevention ☐ local healing ☐ Other _____________________
4. Who do you think can be affected by measles, or are you not sure?
   ☐ Children less than 5 years old ☐ Children between 5-18 years ☐ People over 18 years old
   ☐ Any age groups of both male and women ☐ Don't know ☐ Other (specify):_________________
5. Why do some people vaccinate their children with measles vaccine?
   ☐ To prevent measles ☐ Other ____________________________
6. What is the routine age for a child to be vaccinated with measles vaccine, or do you not know?
   ☐3 months ☐ 6 months ☐ 9 months ☐ Don't know ☐Other_________
7. Do you think vaccination can prevent measles? ☐ Yes ☐No ☐ Don't know
8. Where did you go first when you get measles? ☐ Health Facility ☐ Traditional Healers
   ☐ Holy Water ☐ Stayed at home ☐ Other :(Specify)_______________
9. How do you think measles can be cured? ☐ Using modern medicine ☐ Using traditional Medicine
   ☐ Holly water ☐ By feeding nutritious foods ☐ Keeping the sick person indoor
   ☐ Other(Specify)_______________

III. Clinical presentations ***(for case ONLY)***

10. What were the symptoms?

h) rash: ☐ Yes ☐ No

i) fever: ☐ yes ☐ No

j) runny nose: ☐ yes ☐ No

k) red eyes: ☐ yes ☐ No

l) cough : ☐ yes ☐ No

m) Tiny white spots or sores inside the mouth

☐ yes ☐ No

11. What is the date when you first saw a rash on your body? : ____/_____/_________

12. Were you in your home village when you first noticed you were ill?

☐ Yes (skip to question 15) ☐ No (go to next question)

13. Where were you when the illness started?

District;_________________Kebele; _________________________

14. How long have you had a rash? (Duration of rash) ________days

15. Do you still have the rash? ☐ yes ☐ No

16. Did you visit health facility for this illness?

☐ Yes (date went to facility____/____/____) ☐ No (go to question # 20)

17. How long were you sick before visiting the health facility? ____________ in days/hours

18. Admitted: ☐ Yes ☐ No, If yes**,** date admitted:___/___ /______

    a. Treatment given? ☐ yes ☐ No, if yes

☐ ORS ☐ Antibiotics ☐ Vitamin A ☐ Supplementary food

☐ TTC ointment ☐ Anti pyretics ☐ Other _________________

    b. Outcome: ☐Alive ☐ death

19. Did you have any of the following complications when you were sick with measles?

I. Pneumonia: ☐ yes ☐ No

II. Diarrhea: ☐ yes ☐ No

III. Ear infection: ☐ yes ☐ No

IV. Convulsions: ☐ yes ☐ No

V. Change in vision: ☐ yes ☐ No

VI. Blindness : ☐ yes ☐ No

20. Did you travel four days prior to or four days after rash onset?

☐ Yes (go to question #22) ☐ No (go to question #23)

21. Where did you travel to? ☐ School ☐ Neighbor ☐ Market ☐ Other______________________

22. Do you have any contact history with someone else four days before and after rash onset?

☐ yes ☐ No ☐ If yes with whom________________

IV. Risk factors

VACCINATION STATUS

23. Did you ever vaccinated for measles? ☐ Yes ☐ No ☐ Unknow ☐ Not applicabl

24. If yes last vaccination date? (**If no go to question # 28)**.

☐ Patient recall________ dd/mm/yy ☐ Vaccination card_______ dd/mm/yy ☐ Don't remember

25. Were you vaccinated again for measles?:

☐ Yes (go to question 26) ☐ No (go to question 25) ☐ Don't know (go to question 25)

26. What is the number of measles vaccine doses received? ☐One ☐Two ☐ More than two

Age of first dose _________ Age of second dose ________ Age of third dose _________

27. Were these vaccinations given during routine programming (at the health center during vaccination days) or during a campaign, or both? :

☐ Routine program ☐ Campaign ☐ Both ☐ Don't know

28. What is the main reason were you not vaccinated against measles?

☐ Clinic was too far ☐ You were absent during vaccination campaign

☐ You didn't know it was time for vaccination ☐ You think the vaccine will hurt the child

☐ Someone told you not to go ☐ You are scared of vaccines

☐ Other, (specify) ____

EXPOSURE

29. Did you have any travel history outside of your village 7-18 days to areas with active measles cases before onset of symptoms?

    ☐ Yes, ☐ No. If yes, District _____________________ Kebele __________

30. Did you have contacted with a person with measles symptoms within the last 2-3 weeks?

☐ yes ☐ No ☐ Don't know

31. Is there other person with measles symptoms in your household?: ☐ Yes, if yes how many______ ☐ No

32. *Does the case have any symptoms of malnutrition? (Malnutrition being…)*: ☐yes, ☐ No.

    If yes, on OTP: ☐ Yes, ☐ No

33. How long does it take you to walk to the health facility from your house?

☐ Less than 10 minutes ☐ 10-30 minutes ☐31 minutes – 1 hour

☐ More than 1 hour ☐ More than 2 hours

34. *How many windows does the house have?* ☐ One Window ☐ two/ more windows ☐ no windows

35. How many sleeping rooms are there in your house? ______________

36. How many people slept in your house last night? ________________

Chapter II- Surveillance data analysis

2.1. Epidemiology of Suspected Meningococcal meningitis in Oromia Region, Ethiopia, 2009 – 2013.

Abstract

Background: Meningitis is a disease caused due to inflammation of the protective membranes covering the brain and spinal cord. Among the bacteria's that causes meningitis, the Gram-negative diplococcic bacteria, *Neisseria meningitidis* is the predominant causes of bacterial meningitis and it is the only bacterial meningitis which has the potential to cause epidemics. Each year, approximately 500,000 cases of meningococcal disease and 50,000 deaths occur in the world. Ethiopia is one of the countries lying in the "African Meningitis Belt" and the first meningitis was recorded in 1902.The information generated from the analysis of surveillance data of meningitis is important to know the burden and trends of the disease.

Method: We conducted a retrospective secondary data analysis to collect and analyze five years (2009 -2013) meningitis surveillance data of Oromia Region. We used Epi-Info 7.1 and Microsoft Excel 2007 to compile and analyze the data.

Result: During the years 2009 - 2013 there were 2,498 suspected Meningococcal Meningitis patients in Oromia Region with a mean annual incidence of 1.64 patients per 100,000 and 66 suspected deaths with case fatality rate of 2.6%.The highest number of suspected cases 726 (29.1%) was reported in 2013 with annual incidence of 2.5 cases per 100,000. The highest number of patients was reported from Horo Guduru Wollega 394 (15.8%), West Arsi 377 (15.1%) and Guji 260 (10.4%) Zones with a mean annual incidence of 12.04%, 3.25% and 3.37% per 100,000 populations respectively

Conclusion: Generally magnitude of suspected meningococcal meningitis in Oromia region showed an increasing trend during the past five years except in 2012. The majority of the cases occurred during the dry season and high number of cases were reported in the year 2013 as a results of the epidemic occurred in three zones.

Key words: Meningitis, suspected, Surveillance, Oromia

2.1.1. Introduction

Meningitis causes inflammation of the protective membranes covering the brain and spinal cord that is known as the meninges (1). Meningitis could develop in response to many causes, usually due to bacteria or viruses, but it can also be caused by fungi, parasites and physical injury, cancer or certain drugs. However its severity and treatment differ depending on the cause. Thus, it is important to know the specific cause of meningitis (1).

Bacterial meningitis is a life-threatening condition that requires early diagnosis and treatment. Beyond the newborn period, the most common causes of bacterial meningitis are *Neisseria meningitidis*, *Streptococcus pneumoniae*, and *Haemophilus influenza (2)*.

Among the bacteria that cause meningitis, *Neisseria meningitidis* is one of the leading causes of bacterial meningitis globally and can also cause sepsis, pneumonia, and other localized infections. Meningococcal meningitis, commonly known as cerebrospinal meningitis, is the only form of bacterial meningitis which has the potential to cause epidemics (1). Apart from epidemics, meningococcal meningitis occurs sporadically throughout the world, with seasonal variations, and accounts for a variable proportion of endemic bacterial meningitis (*1)*.

The majority of all meningococcal disease cases around the world (90%) can be attributed to five main groups of the *Neisseria meningitides* (meningococcus) that cause meningococcal disease. These groups, called serogroups, are A, B, C, W-135 and Y (3). The incidence of each sero-group can vary by country and region, and can shift over time, making it impossible to determine the groups that will result in the majority of cases each year (3, 4).

The burden of meningococcal disease is high in an area of sub-Saharan Africa known as the meningitis belt which stretches from Ethiopia to Senegal (4).

Each year, approximately 500,000 cases of meningococcal disease occur around the world, causing about 50,000 deaths. According to the World Health Organization (WHO), approximately 5-10 percent of people who contract meningococcal disease will die – often within 24-48 hours of the first symptoms – even if they are diagnosed and receive early and appropriate treatment. Without treatment, the mortality rate from meningococcal disease is 70 percent to 90 percent (5).

Every year, bacterial meningitis epidemics affects more than 400 million at risk people living in the 21 countries of the "African meningitis belt" and over 800,000 cases were reported in the last 15 years (1996–2010). Among these cases, 10% resulted in death and another 10–20% developed permanent neurological damage. During the 2010 epidemic season (weeks 1–26) 22,831 cases were recorded in 14 countries under enhanced surveillance. Among the 22,831 cases there were 2,415 deaths, (case-fatality ratio (CFR) of 10.6%). The highest number of cases were reported by Burkina Faso (6,145 including 863 deaths) followed by Nigeria (4,699 cases including 322 deaths) and Chad (3,058 cases including 231 deaths).The countries in the belt area experience epidemics in 8-12 year cycles. Epidemics usually begin to occur during the dry season and decrease with the start of the rainy season(2).

Meningitis was first recorded in Ethiopia in 1902, but no systematic investigation of meningococcal meningitis epidemics was done until 1979. Outbreaks were reported in 1935, in the 1940s, 1950s, 1964, 1977, 1981and 1989 (6).

The 1981 and1988/1989 outbreaks were the most significant epidemics ever reported and documented(6). Nearly 50,000 cases and 990 deaths were reported during the 1981 epidemic and 45,806 cases and 1,686 deaths in 1989. In 1989, the overall attack was 133 per10,000 population and a case-fatality rate of 3.7%. Males were more affected than females and approximately 70% of cases were between the ages of 5-44 years.(6). Unlike previous epidemics, the one in 1989 included areas outside of the traditional meningitis belt areas; areas as far as South Wollega in Oromia Region were affected(6).

The next epidemic was in 1996 G.C. There was a local outbreak of meningococcal meningitis in Konso Wereda in the Southern Nation's Nationality and People's Region (SNNPR) on February 4, involving 771 cases and 11 deaths (6).

In 1997, three isolated outbreaks occurred (319 cases and eight deaths) in SNNPR between January and March. In 1999, an outbreak of meningitis occurred in Amhara and Tigray Regions involving 268 cases and nine deaths between February and March (4, 6). The most common sero-group in Ethiopia is type "A" followed by type "C"(6).

In 2000/2001, a meningitis outbreak started in October 2000 in Quarit Woreda, West Gojam Zone, Amhara Region and spread to neighboring districts in Amhara Region and to SNNPR in the south, Gambella Region in the west, Tigray in the north, Dire Dawa and Somali Region in the east (4, 6).The number of regions affected increased from one in October to 10 in March with a total of 33 Zones and 93 woredas affected by the end March (4, 6).During this epidemic period a total of 6,964 meningitis cases and 332 deaths were reported from ten regions (4, 6).

In 2013 three regions (SNNPR, Oromia and Tigray) reported cases of meningitis. SNNPR and Oromia Regions were the most affected regions by this recent meningococcal meningitis epidemic. Confirmed cases were reported from 19 zonal health offices of these two regions (Oromia and SNNPR). During this epidemic period a total of 1,466 cases were reported from three regions; SNNP Region 929 cases (63.4 %), Oromia Region 528 (36 %) and Tigray Region 9 cases (0.6 %). The first case (index case) was reported from Shebedino district, Sidama zone of SNNP Region on January 02, 2013. During subsequent weeks more similar cases were reported from Sidama zone (Shebedino, Dale, Wondo Genet,Gorche,Wonsho and Yirgalem Districts), Hawasa Town and Arba Minch Town of SNNPR. In addition 11 districts of West Arsi zone,two districts of Guji Zone and one district of HoroGudru Zone of Oromia region have reported more cases. Later, the outbreak spread to other districts of both regions affecting about 600 kebeles(2).

The highest number of cases was reported by Horoguduru Wollega Zone of Oromia region, which represented 255(17.4%) of reported outbreak cases of 2013. Wolayita zone reported the second highest number of cases 236(16%) followed by Sidama zone 220(15%) of SNNPR region and West Arsi zone of Oromia region 210(14.3%)(2).

2.1.2. Background

Oromia Regional State is one of the Regional States in the Federal Democratic Republic of Ethiopia. Oromia shares borders with all the regional states in Ethiopia, except Tigray region. It also shares international borders with the Republic of the Sudan (with 66 km borderline) in the west and Kenya Republic (with 521km) in the south. With a total area of 363,136 km^2, Oromia is the largest regional state in Ethiopia and accounts for about 34.3 percent of the total area of the country. Administratively, the region is divided into 18 administrative zones, 304 woredas (39 are towns structured with the level of woredas and 265 are rural woredas), with more than 6,342 urban and 482 urban kebeles. It has a total border length of about 5700km (about 600km international borderlines with Kenya and the Sudan, and 5100km with National Regional States).

According to projections from the population and housing census report of CSA (2007), the total population of Oromia Regional State is 32,976,276 million, which accounts for 36.7% of the total country's population. In Oromia, the rural population constitutes about 87.8% of the total population of the region, while the urban population constitutes about 12.2%. Of the total population in the region, women constitute 49.6% of the total population, while men constitute 50.4%. According to CSA National population and housing census (2007), the annual population growth rate of the Oromia Regional state is 2.9 and the region has an estimated average crude population density of 77 persons per square kilometer. The total family size of the region is 4.8, with 5.0 for rural areas and 3.8 persons for urban areas. In Oromia there are about 6,165 health posts, 1,318 heath centers and 40 hospitals.

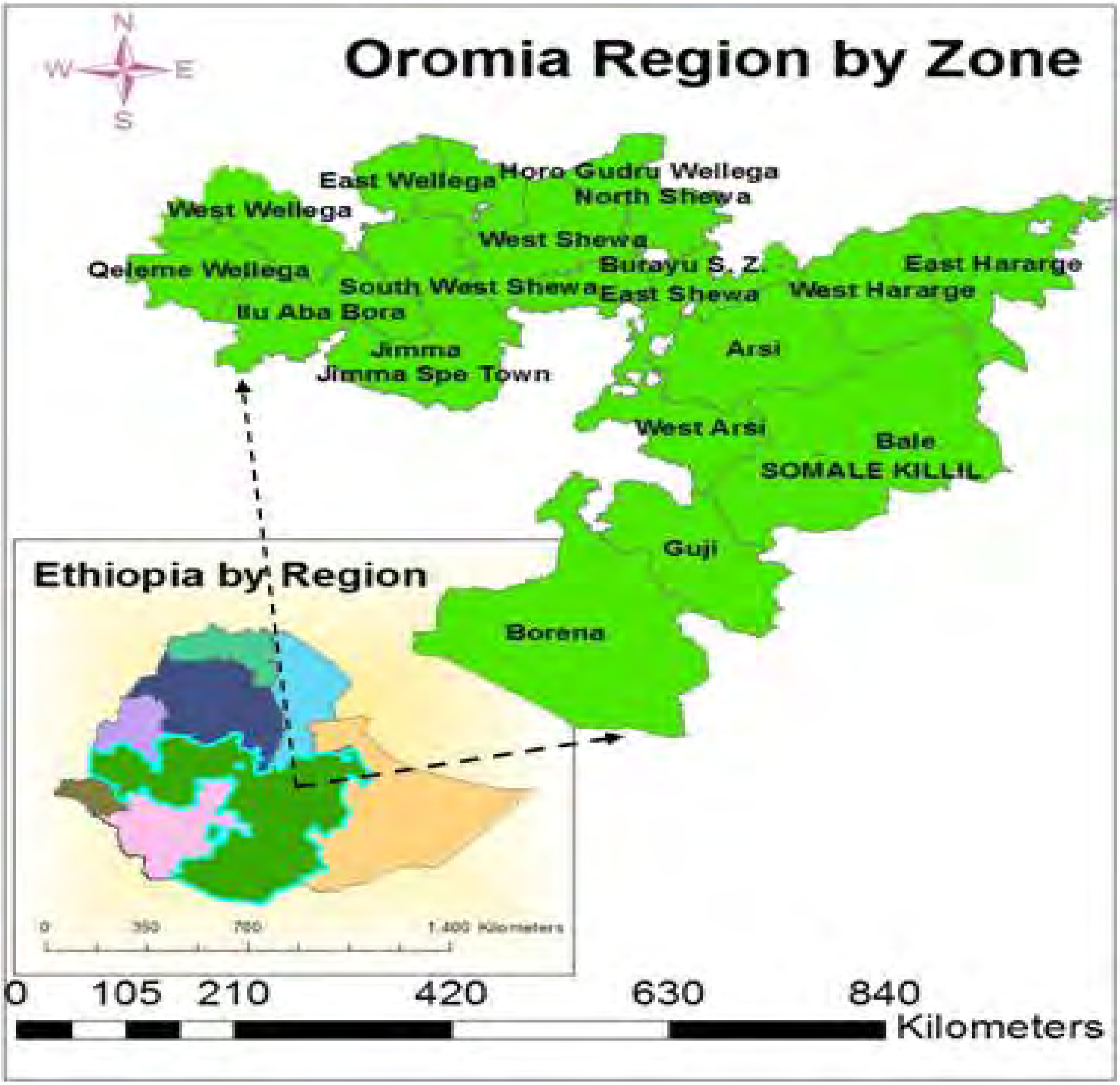


Figure 11: Map of Oromia Regional state, Ethiopia, 2015

2.1.3. Rationale of the study

Meningococcal meningitis is one of the public health priority diseases with the potential to occur both as an epidemic and endemic disease in Ethiopia. Continuous monitoring of the disease and prediction of the occurrence of the disease through surveillance systems has tremendous use for the early warning, preparedness, and response units of PHEM. Therefore the occurrence and impact of outbreaks of the disease will be prevented, averted and mitigated. The information generated from the analysis of five years (2009 – 2013) surveillance data of meningitis is important to know the burden and trends of the disease. In addition it helps to identify the available gaps in the surveillance system and provide recommendations base on the findings.

2.1.4. Objectives

2.1.4.1. General objective

To assess the trends and distribution of suspected Meningococcal meningitis in Oromia Region over the past five years (2009-2013)

2.1.4.2. Specific objectives

- To describe the morbidity and mortality of suspected Meningococcal meningitis in terms of time and place in Oromia
- To see the effectiveness of Meningococcal meningitis control program
- To identify gaps and set recommendations on the surveillance program

2.1.5. Methods and materials

2.1.5.1 Case definitions

Suspected cases:

An illness with sudden onset of fever (>38.5°C rectal or >38.0°C axillary) and one or more of the following:

- neck stiffness
- altered consciousness
- other meningeal sign or petechial or puerperal rash

In patients <1 year, suspect meningitis when fever accompanied by bulging fontanel

Probable:

A suspected case as defined above and**:**

- Turbid CSF (with or without positive Gram stain) **or** ongoing epidemic and epidemiological link to a confirmed case

Confirmed: A suspected or probable case with laboratory confirmation.

2.1.5.2. Study design

We used a retrospective study design to collect and analyze five year secon (2009 – 2013) meningitis surveillance data of Oromia Region. All five year weekly surveillance reports sent to Oromia PHEM from all health facilities found in Oromia were analyzed to describe the burden and distribution of meningitis in the region. Meningitis is one of the eight diseases and health conditions under surveillance, identified to be reported on weekly bases.

2.1.5.3. Study area

The study was conducted in Oromia regional state, which is one of the nine regional states in the Federal Democratic Republic of Ethiopia.

2.1.5.4. Target Population

The target population was the population of the Oromia regional state, which is estimated to be 32,976,276 in 2013 based on 2007 CSA population and housing census.

2.1.5.5. Study population

All individuals suspected of meningitis in Oromia Region, in a five years time from 2009 to 2013.

2.1.5.6. Study period

Meningitis surveillance data from 2009 – 2013 was compiled, analyzed and interpreted from January 14 to February 20, 2014.

2.1.5.7. Data collection procedure

Secondary data on meningitis for the last five years (2009 – 2013) from Oromia Regional health bureau PHEM department was reviewed and collected by using structured checklists. All five year weekly surveillance reports sent to Oromia PHEM from all health facilities found in Oromia were analyzed to describe the burden and distribution of meningitis in the region.

2.1.5.8. Data processing and Analysis

We used Epi Info 7.1 and Microsoft Excel 2007 to compile, organize and analyze the collected data. In the analysis we have determined the trends, burden and distribution of meningitis in Oromia region Ethiopia by time and place.

2.1.5.9. Dissemination of Results

We submitted this report to AAU/School of public health/Department of EFETP, EPHA, and ORHB by both hard copy and electronic soft copy.

2.1.6. Result

2.1.6.1. Trends and magnitude of Meningitis morbidity and mortality

From 2009 – 2013 there were 2,498 suspected Meningococcal Meningitis cases in Oromia region with a mean annual incidence of 1.64 cases per 100,000 people. During the same time period, there were 66 suspected deaths with a case fatality rate of 2.6%. The highest number of suspected cases 726 (29.1%) was reported in 2013 G.C and 638 (25.5%) was reported in 2011 G.C with annual incidence of 2.5 cases per 100,000 people and 2.2 cases per 100,000 people respectively. The lowest number of cases 48 (1.9%) were reported in 2012 G.C with annual incidence of 0.2 cases per 100,000 people. The highest suspected Meningococcal Meningitis deaths 35 (0.11per100, 000) were reported in 2013 at Oromia Region. The case fatality rate was high (8.3%) in 2012 G.C and it was low (0.0%) in 2009. Detail of morbidity and mortality of suspected Meningococcal Meningitis is indicated in the Table 10 below. Among the total cases 520 (20.82%) occurred during an epidemic (WHO week 4 –22, 2013).

Table 10: Meningococcal Meningitis suspected cases and deaths in Oromia Region Ethiopia 2009 -2013G.C.

Year	Population at risk	No. of cases	No. of deaths	Percent		Incidence		Case Fatality Rate (%)
				Cases%	Deaths%	Cases/100,000	Deaths/100,000	
2009	28,584,114	524	0	21.1%	0.0%	1.8	0.00	0
2010	29,413,053	563	11	22.6%	16.7%	1.9	0.04	2.0
2011	30,266,032	638	16	25.7%	24.2%	2.1	0.05	2.5
2012	31,143,747	48	4	1.9%	6.1%	0.2	0.01	8.3
2013	32,046,915	726	35	28.7%	53.0%	2.2	0.11	4.8
Total	**30,290,772**	**2498**	**66**			**8.7**	**0.22**	**2.6**

Among the total cases reported in these five years 1,313 (52.6%) of them were seen as outpatients (Figure: 13). The highest number of outpatient cases (497, or 37.9% of the outpatient cases over the five years) was reported in 2009 G.C followed by 2010 G.C which was 428 (32.6%); whereas the highest number of inpatient cases 643 (54.3%) were reported in 2013 G.C and 358 (30.2) cases were reported in 2011 G.C. The lowest number of both inpatient and outpatient cases were reported in 2012 G.C which was 23 (1.9%) and 25 (1.9%) respectively (Figure- 12).

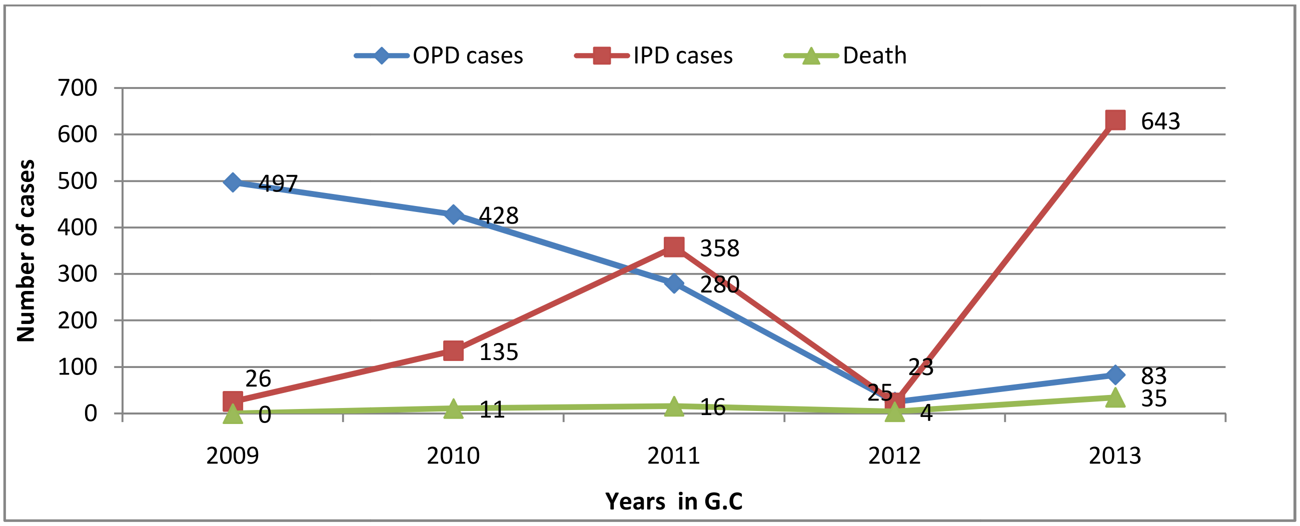


Figure 12: Trends of inpatient and outpatient suspected meningococcal meningitis cases in Oromia Region 2009 - 2013

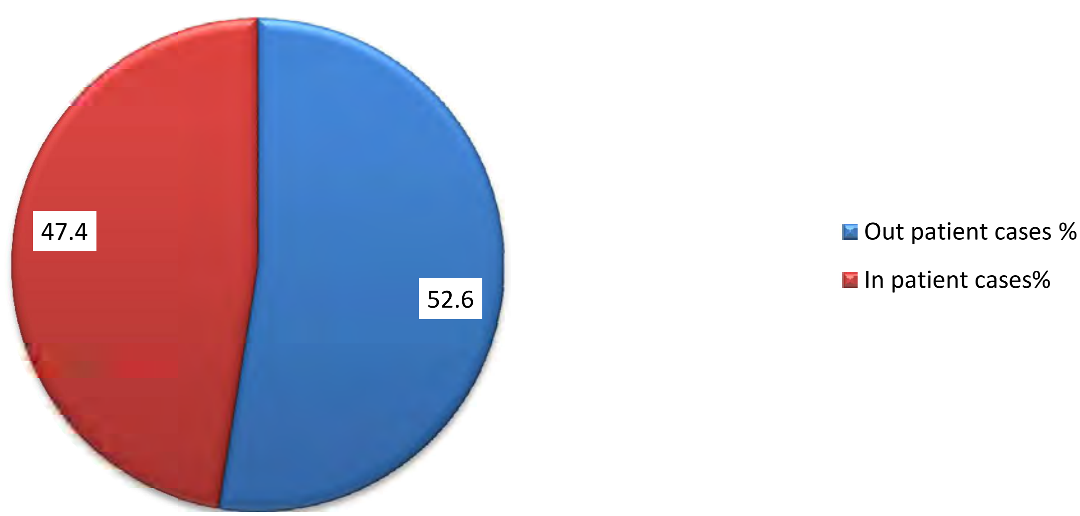


Figure 13: Proportion of outpatient and inpatient suspected meningococcal meningitis cases in Oromia Region, 2009 - 2013 G.C.

During the five years the incidence had shown an incremental trends from 1.8 per 100,000 in 2009 to 2.0 per 100,000 in 2010 and to 2.1 per 100,000 in 2011 then sharply decreased to 0.2 per 100,000 in 2012. During 2013, the incidence and the death rate sharply increased to 2.2 per 100,000 and 0.11 per 100,000, respectively. Trend of incidence and death rate is indicated in Figure 14 below.

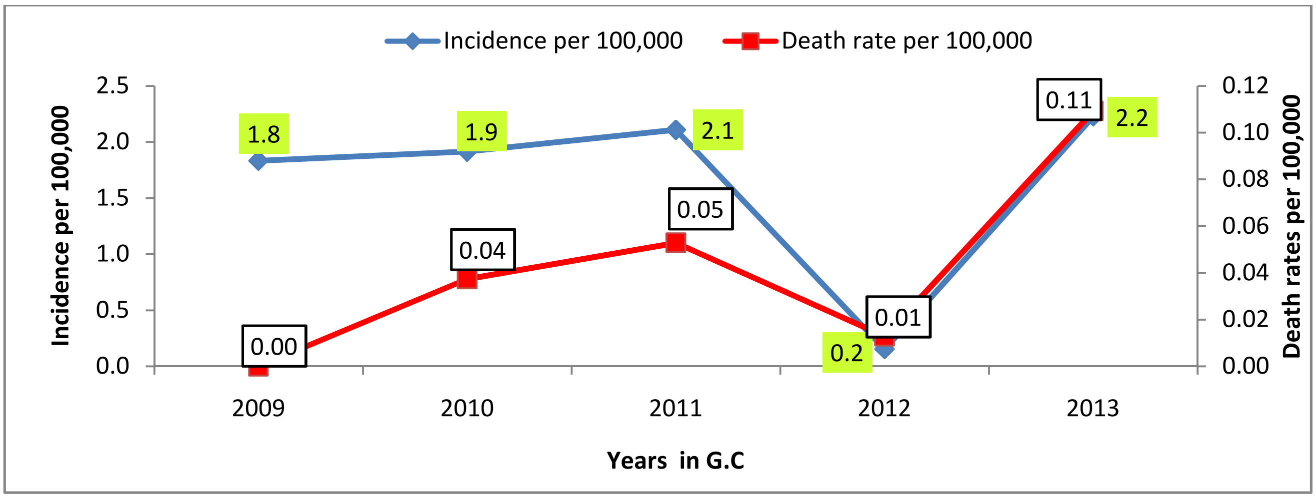


Figure 14: Meningococcal meningitis incidence and death rates trends per 100,000suspected cases in Oromia Region Ethiopia 2009 - 2013 G.C.

The data showed the expected seasonal variation of suspected Meningococcal meningitis cases throughout the five years. There was a peak in cases in December 2009 and 2010, whereas the peak in 2011 was in August and in 2013 the highest cases were reported in February, March and May. Overall, during the five years, the highest number of suspected Meningococcal meningitis cases was reported in December, February and May with a magnitude of 574, 371 and 295 respectively during the dry season. Further information regarding seasonality of the disease is in Figures 15 and 16 below.

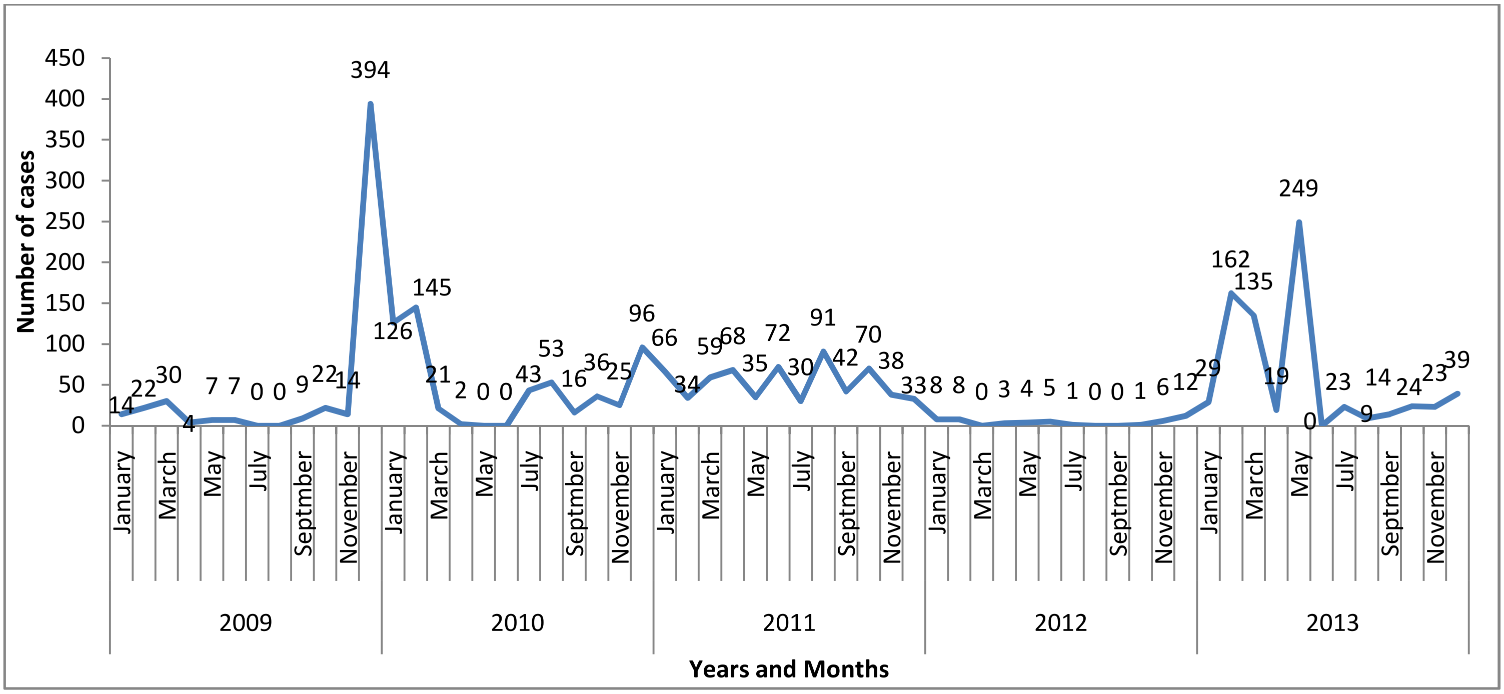


Figure 15: Seasonal variation of suspected meningococcal meningitis cases in Oromia Region Ethiopia, 2009 - 2013 G.C.

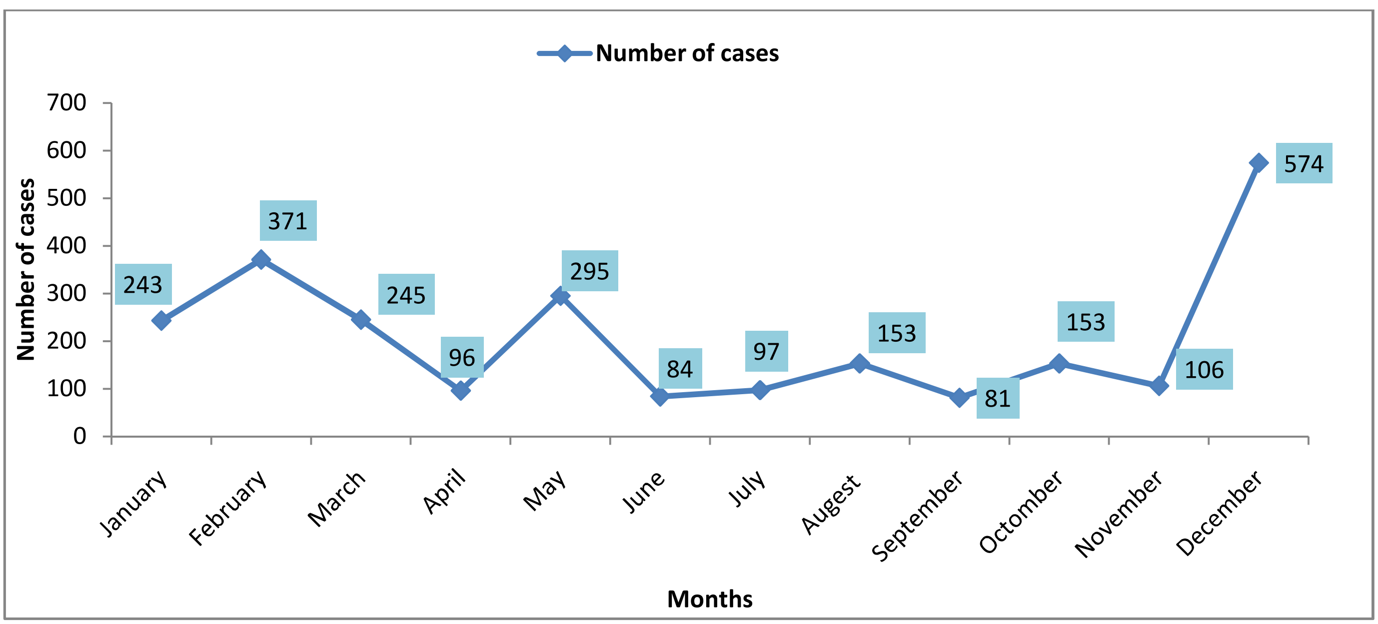


Figure 16: Distribution of total number of suspected meningococcal meningitis cases by months in Oromia Region Ethiopia, 2009 - 2013 G.C.

2.1.6.2. Distribution of morbidity and mortality by zones

When seeing the distribution of suspected Meningococcal Meningitis cases in five year (2009 – 2013) by zones the highest number of cases was reported from Horo Guduru Zone 394 (15.8%), West Arsi Zone 377 (15.1%) and Guji Zone 260 (10.4%) with a mean annual incidence of 12.04 per 100,000, 3.25 per 100,000 and 3.37 per 100,000 respectively. The lowest number of cases was reported from Kelem Wollega Zone 5(0.2%) and West Wollega Zone 18 (0.7%) with a mean annual incidence of 0.11 per 100, 000 and 1.07 per 100,000 people, respectively. Distribution of cases by zones is indicated on Figure: 17 below.

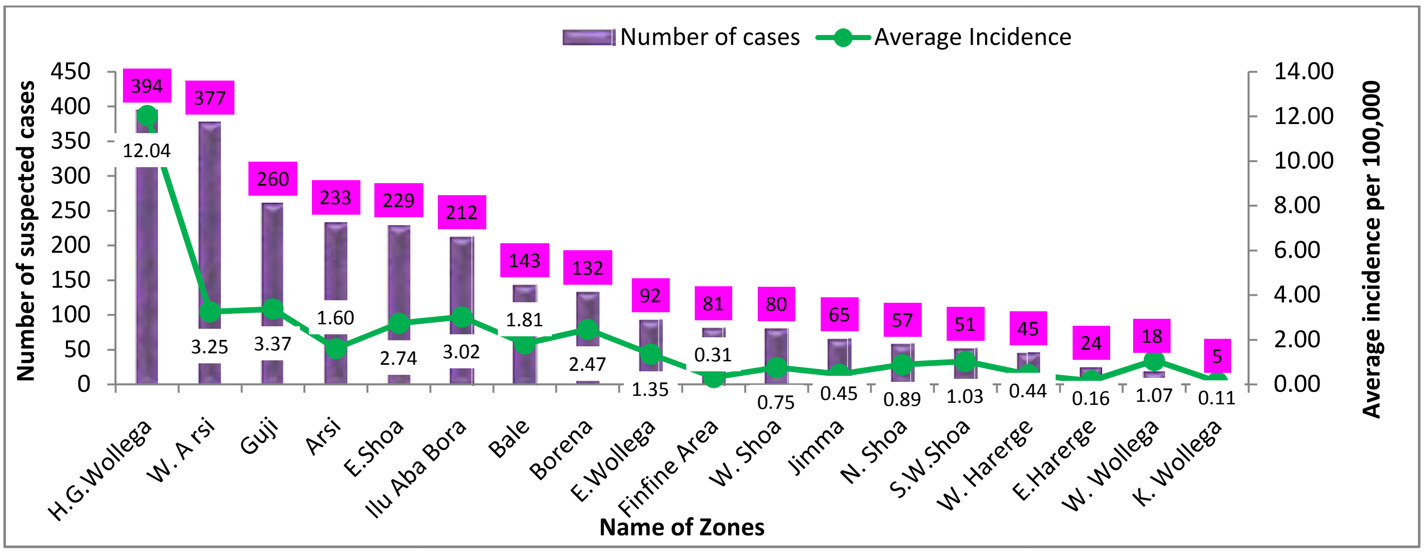


Figure 17: Distribution of five years number of cases and mean annual incidence of suspected meningococcal meningitis by zones in Oromia Region Ethiopia, 2009 - 2013 G.C.

During the five year period, the highest number of outpatient cases was reported from East Shewa, Guji and Illu Aba Bora Zones whereas the highest number of inpatient cases were reported from West Arsi, East Wollega and Arsi Zones (Figure 18).

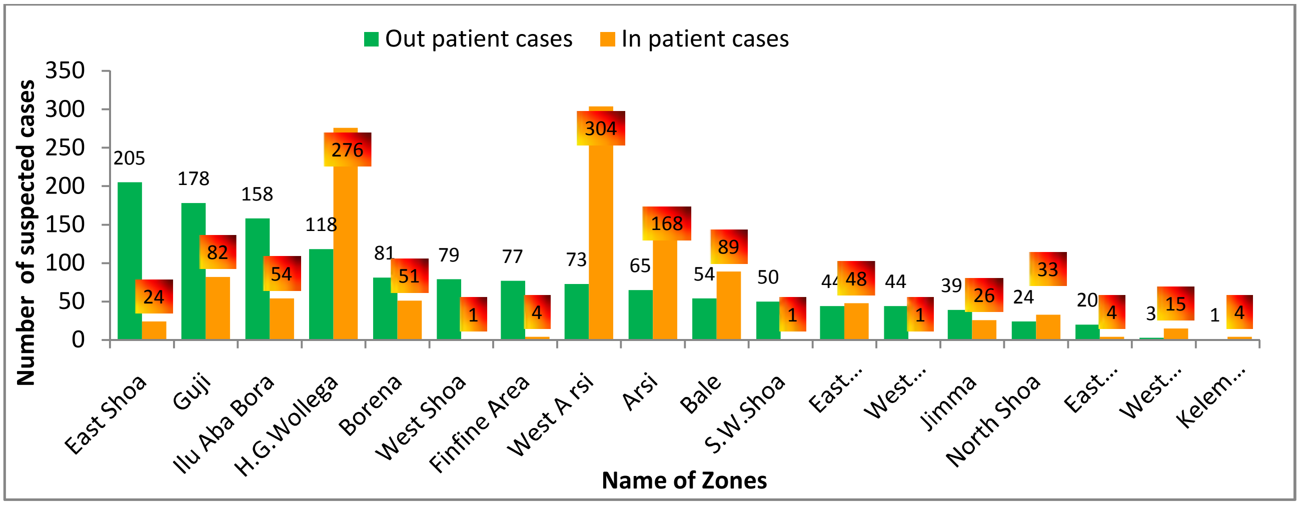


Figure 18: Distribution of inpatient and outpatient suspected meningococcal meningitis by zones in Oromia Region Ethiopia, 2009 - 2013 G.C.

During the five years the highest number of suspected Meningococcal Meningitis deaths was reported from West Arsi Zone 15 (22.7%), Bale Zone 10 (15.1%) and Ilu Aba Bora Zone 7 (10.6%) with a mean annual death rate of 0.13, 0.13 and 0.09 per 100,000 people respectively. In East Wollega, West Wollega and West Shewa Zones there were no reported deaths throughout the five years. When seeing the death rates the highest were in Finfine Area (0.14 per 100,000 people) which is followed by West Arsi and Bale Zones with a magnitude of 0.13 per 100,000 people each. Details on the number of deaths are in Figure 19 and Table 11 below.

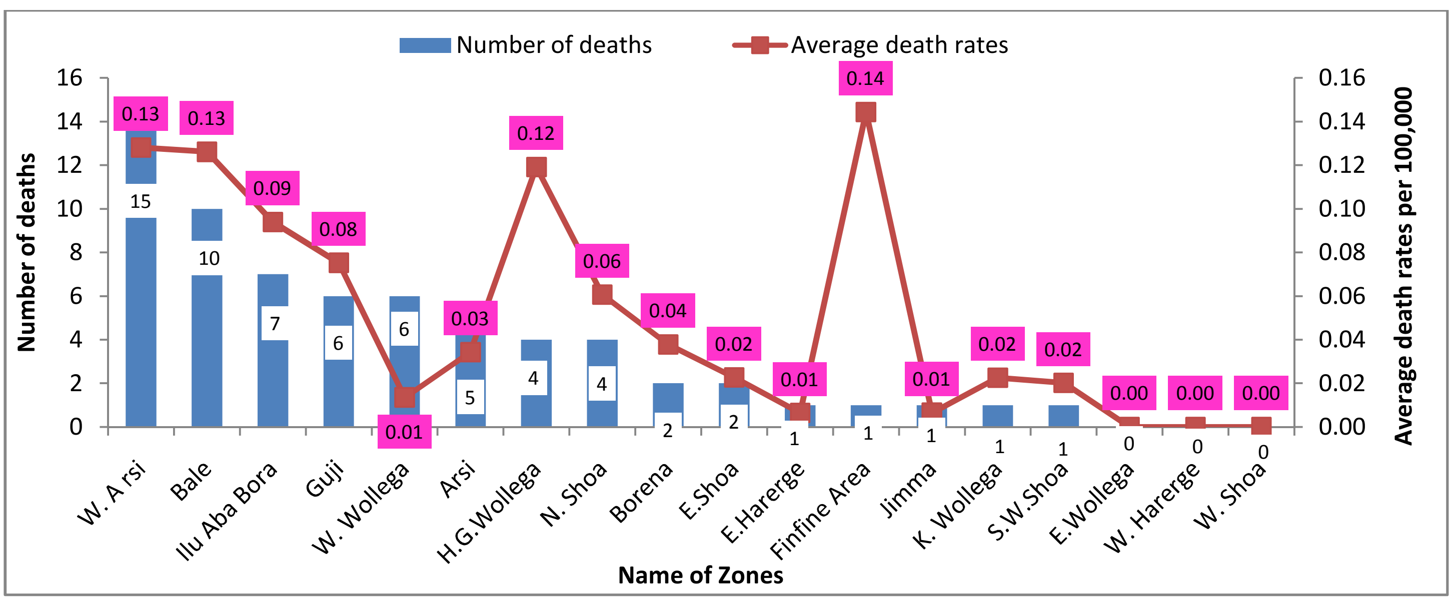


Figure 19: Distribution of five years number of and mean annual death rates of suspected meningococcal meningitis by zones in Oromia Region Ethiopia, 2009 - 2013 G.C.

2.1.6.3. Annual incidence, death rate and case fatality rate by zones

In 2009, among eighteen zones of Oromia Region, the highest incidence of suspected Meningococcal Meningitis was seen in Ilu Aba Bora Zone (10.52 per 100,000 people), followed by East Shewa (9.07 per 100,000) and Horo Guduru Wollega (8.13 per 100,000) Zones. There were no deaths from meningitis in 2009 in all zones.

In 2010 the highest incidence was seen in Horo Guduru Wollega Zone (10.48 per 100,000 people) followed by Southwest Shewa (4.85 per 100,000 people) and Guji Zone (3.98 per 100,000 people); whereas the lowest incidence was from Kelem Wollega (0.00 per 100,000 people) and East Harerge (0.17 per 100,000 people). In this year high death rate (0.26 per 100,000 people) was noted in Bale Zone with case fatality rate of 10.81%. Nine (50%) of the eighteen zones in Oromia didn't report death in this year.

During 2011 the highest annual incidence of suspected Meningococcal Meningitis was seen in Arsi Zone (5.49 per 100,000 people) which is followed by Guji Zone (4.77 per 100,000 people) and East Wollega Zone (3.97 per 100,000 people) while the lowest was seen in West Harerge Zone (00.24 per 100,000 people) and Finfine Area Zone (0.25 per 100,000 people). When seeing the death rate the highest was noted in Guji Zone (0.19 per 100,000 people) with a case fatality rate of 4.05% and in ten zones of the region no death was reported (Table:2). The highest case fatality rate during this year was seen in Kelem Wollega Zone (25.00%).

During 2012 low number of case 48(1.9%) were reported by all zone than the other four years. In this year the highest annual incidence was 0.82 per 100,000 people. The number of deaths reported in this year was only four, where two of them were from North Shewa and the rest two were from East Harerge and Horo Guduru Wollega Zones.

In 2013, a higher number of suspected Meningococcal Meningitis cases was reported than the other four years (726 cases, or 29.1% of the five years report). Among the total cases 506 (69.3%) of them were reported from Horo Guduru Wollega Zone 264 (36%) and West Arsi Zone

242 (33.3%) with annual incidence of 38.61 per 100,000 people and10.15 per 100,000 people respectively. Among the eighteen zones in four of them; East Harerge, Kelem Wollega, south West Shewa and West Shewa no cases were reported. In this year the highest suspected Meningococcal Meningitis death rate was seen in West Arsi Zone (0.46 per 100,000 people) and Horo Guduru Wollega Zone (0.44 per 100,000 people). When seeing the case fatality rate, the highest was in West Wollega, Ilu Aba Bora and Jimma Zones with a magnitude of 85.71%, 554.55% and 16.67% respectively.

Table 11: Incidence per 100,000 death rates per 100,000 and case fatality rates of suspected meningococcal meningitis by years and zones in Oromia region, Ethiopia, 200 - 2013

Zones	2009			2010			2011			2012			2013		
	Incidence per 100,000	Death rate per 100,000	CFR (%)	Incidence per 100,000	Death rate per 100,000	CFR (%)	Incidence per 100,000	Death rate per 100,000	CFR (%)	Incidence per 100,000	Death rate per 100,000	CFR (%)	Incidence per 100,000	Death rate per 100,000	CFR (%)*
Arsi	0.72	0.00	0.00	1.40	0.04	2.50	**5.49**	0.14	2.48	0.00	0.00		0.39	0.00	0.00
Bale	0.68	0.00	0.00	2.43	**0.26**	**10.81**	3.12	0.13	4.08	0.25	0.00	0.00	2.59	0.24	9.30
Borena	2.27	0.00	0.00	3.07	0.10	3.13	3.45	0.09	2.70	0.54	0.00	0.00	2.99	0.00	0.00
EastHarerge	0.03	0.00	0.00	0.17	0.00	0.00	0.49	0.00	0.00	0.10	0.03	33.33	0.00	0.00	
East Shoa	9.07	0.00	0.00	2.60	0.06	2.27	0.92	0.00	0.00	0.06	0.00	0.00	1.03	0.05	5.26
E.Wollega	0.78	0.00	0.00	0.98	0.00	0.00	3.97	0.00	0.00	0.29	0.00	0.00	0.76	0.00	0.00
FinfineArea	0.00	0.00	0.00	1.05	0.00	0.00	0.25	0.00	0.00	0.12	0.00	0.00	0.12	0.00	0.00
Guji	3.89	0.00	0.00	3.98	0.00	0.00	4.77	**0.19**	4.05	0.19	0.00	0.00	4.02	0.18	4.55
H.G.Wollega	8.13	0.00	0.00	**10.48**	0.00	0.00	2.82	0.00	0.00	0.15	0.15	**100.00**	**38.61**	0.44	1.15
Ilu Aba Bora	**10.52**	0.00	0.00	1.60	0.00	0.00	1.83	0.07	3.85	**0.82**	0.00	0.00	0.33	0.40	54.55
Jimma	0.47	0.00	0.00	0.81	0.00	0.00	0.69	0.00	0.00	0.10	0.00	0.00	0.19	0.03	16.67
K. Wollega	0.00	0.00	0.00	0.00	0.00		0.45	0.11	**25.00**	0.11	0.00	0.00	0.00	0.00	
NorthShoa	0.97	0.00	0.00	2.04	0.08	3.85	0.84	0.08	9.09	0.30	0.15	50.00	0.29	0.00	0.00
S.W.Shoa	0.00	0.00	0.00	4.85	0.10	2.08	0.29	0.00	0.00	0.00	0.00		0.00	0.00	
West Arsi	1.51	0.00	0.00	1.05	0.05	4.35	3.42	0.13	3.90	0.13	0.00	0.00	**10.15**	0.46	4.55
W. Harerge	0.05	0.00	0.00	1.73	0.00	0.00	0.24	0.00	0.00	0.05	0.00	0.00	0.14	0.00	0.00
WestShoa	0.24	0.00	0.00	3.11	0.00	0.00	0.37	0.00	0.00	0.04	0.00	0.00	0.00	0.00	
W. Wollega	0.00	0.00	0.00	1.08	0.07	6.25	3.82	0.00	0.00	0.00	0.00		0.43	0.37	85.71
Oromia	**1.83**	**0.00**	**0.00**	**1.91**	**0.04**	**1.95**	**2.11**	**0.05**	**2.51**	**0.15**	**0.01**	**8.33**	**2.27**	**0.11**	**4.82**

*CFR = Case Fatality Rate

2.1.7. Discussion

The incidence of suspected Meningococcal Meningitis cases has shown a slight upward trend for the first three years (2009 – 2011) and dramatic drop down trend in 2012, which the rate decreased by 90.5% from 2.1 per 100,000 inhabitant in 2011 to 0.2 per 100,000 inhabitant in 2012. The incidence again increased to 2.2 per 100,000 inhabitants in 2013.This was due to an epidemic that occurred in three zone of the region during this period. A similar trend has been observed in the mortality rate of suspected Meningococcal Meningitis as that of the incidence during the five years. The mean annual incidence of suspected Meningococcal Meningitis (1.64 per 100,000 inhabitant) of Oromia Region is higher than most of Europe Countries; Germany (0.93), France (0.95), Spain (0.80) and Russia (0.88) per 100,000 inhabitants(7)and it is smaller than the incidence of Palestine in2005 (2.62/100,000), Yemen (4.78/100,000 in 2005), Morocco (5.41/100,000 in 2005) and Sudan (13.26/100,000 in 2006)(8).

According to National Health and Health Related Indicator 2011 Report, the Meningococcal meningitis incidence rate for Ethiopia was 4.35 per 100,000 inhabitants and for SNNPR, Addis Ababa, and Tigray; 1.29, 0.23 and 0.32 per 100,000 inhabitants respectively. All the five years Oromia incidence rates were lower than the national but they were higher than SNNPR, Addis Ababa, and Tigray rates(9).

According to National health and health related indicator 2011 report, the suspected Meningococcal meningitis death rate for Ethiopia was 0.13 per 100,000 inhabitants and for SNNPR, Addis Ababa, and Tigray; 0.03, 0.01 and 0.02 per 100,000 inhabitants. All the five years Oromia suspected Meningococcal meningitis death rates were lower than the national and approximately similar to SNNPR, Addis Ababa, and Tigray rates. Moreover, the case fatality rate nationally was 6.95% and 1.78%, 0.89 and 0.53 for SNNPR, Tigray and Addis Ababa respectively. All the five years Oromia case fatality rates were smaller than the national and higher than other regions(9).

The five years death rates were smaller than that of Addis Ababa's 2001/2 death rate which was 2.5/100,000. The case fatality rates showed an upward trend and they were smaller than Addis Ababa's 2001/2 epidemic case fatality rate (4.7%)(10).

During the five years period the incidence showed seasonal patterns as reported in many publication. In 2009 and 2010 the peak incidence of suspected Meningococcal Meningitis cases were on December, while in2011 it was peak on August and in 20013 it started to rise on December and peaked on February, March and May, which is the peak cases were mostly occurred during the dry season except in 2011. This is similar to reports on most of the publications and literatures. As reported in many publications the incidence dropped during the rainy season except in 2011(1, 10).

Generally in the five years time suspected Meningococcal Meningitis cases were reported from all zones of Oromia regional state with different magnitude. The distributions of cases in the region were not evenly distributed. Generally Higher mean annual incidence was observed in Horo Guduru zone, West Arsi and Guji zones. This might be due to the epidemic occurred in 2013 G.C in these zones. The 2011 incidences rate of Arsi and Guji zones were higher than the national, whereas Oromia Region and all other zones incidence rate were lower than that of national in 2011 (4).

2.1.8. Limitations

It was not possible to analyze the data by age and sex because the PHEM reporting format lacks these variables information.

Shortage of references that indicates current burden and distribution of meningitis in Ethiopia

Lack of confirmation and identification of meningitis cases by laboratory method

Lack of completeness of data which could result in under estimate of the magnitude

2.1.8. Conclusion

Magnitude of suspected meningococcal meningitis in Oromia region showed an increasing trend during the past five years except in 2012 and Oromia was one of the regions that reported more suspected cases in Ethiopia. The majority of the suspected cases occurred during the dry season (December to June). The cases were distributed throughout Oromia in all zones with different magnitudes where the majority of the cases were from Horo Guduru Wollega, West Arsi, and Guji zones. More over the magnitude was high in 2013 than the previous four years due to an epidemic occurred in these three zones.

2.1.9. Recommendations

- The weekly IDSR reporting forms should include important person variables like sex and age in order to better understand the distribution of cases in the population
- There should be a system to identify suspected meningitis cases then confirm by laboratory diagnosis. This would help in the prevention, control and management of cases by knowing causative agent and its geographical distribution.
- Capacity building of hospital laboratories both in material and technical capacity on diagnosing and identifying meningitis needs to be given emphasis. Moreover clinicians also have to be capacitated on CSF specimen collection.
- Regular follow-up and feedback to reporting health facilities to strengthen completeness of weekly surveillance report.

2.1.10. Acknowledgment

I would like to thank Mr. Tesfaye Deti ORHB/PHEM core process owner for his advice and help during data collection.

My deepest appreciation goes to my Mentors Dr. Negussie Deyessa and Abigail Greenleaf for their unreserved comments and correction in preparing this report.

I sincerely appreciate staffs of Oromia regional health bureau PHEM department for their help during data collection. My appreciation also goes to EPHA and CDC for their logistic support.

Refernces

1. **WHO. Control of epidemic Meningococcal disease. WHOpractical guideline. second ed. Geneva2001.**
2. **EHNRI. Post meningococcal meningitis epidemic evaluation 2013.**
3. **MOH. Health Sector Development Programme - IV. 2010/11 - 2014/15.**
4. **FMOH. Health and Health Related Indicators in Ethiopia. 2003.**
5. **CSA. Ethiopian Demograpphic Health Survey. 2011.**
6. **CSA. Ethiopian National Houcing and Population censuse 2007.**
7. **Society EMD. Epidemiology of Meningococcal Meningitis in Europian Countries 2013.**
8. **Mehmet Ceyhan SA, Robert Pawinski, Andrew Vyse. Meningococcal disease in the Middle East and North Africa: an important public health consideration that requires further attention. Int J Infect Dis. August, 2012;16(8):574 - 82.**
9. **FMOH. Health and Health Related Indicators 2003 E.C/2011 G.C**
10. **Yemane Berhane DHM, Helmut Kloos. Epidemiology and Ecology Of Health and Disease In Ethiopia**

Ethiopian Public Health Association; 2005.

Chapter –III: Evaluation of Surveillance system

3.1. Surveillance System Evaluation in East Harerge zone, Oromiya, Ethiopia, 2014.

Executive summary

Public health surveillance is the ongoing systematic collection, analysis, interpretation and timely dissemination of health-related data for action and program evaluation. Conducting a surveillance system evaluation is crucial for monitoring efficacy and effectiveness of intervention programs in health care systems. This study is intended to evaluate surveillance system in East Harerge zone mainly focusing on malaria and measles prevention and control activities.

We used a descriptive cros-sectional study design to evaluate the surveillance system of the East Harerge zone of Oromia Region. We included 25 facilities in the study. We collected data by interviewing PHEM focal persons at all levels of the system using structured questionnaire for evaluation of surveillance system adapted from WHO and CDC. Additionally, we also used observation of secondary documents and tools used for surveillance at all level to collect data.

We identified a lack of a written emergency preparedness and response plan that helps to strengthen capacity in recognizing and responding to public health emergencies. In addition half of assessed districts failed to have emergency drugs stock and most facilities in the system have experienced emergency drugs shortage in the past two years. Moreover, at all levels surveillance data was not analyzed to generate information for action.

Overall the surveillance system of East Harerge Zone was not operates well to meet its objectives. Even if the surveillance system of the zone was simple, flexible and useful there were attributes that require attention for improvement of surveillance process such as; data quality, acceptability, timeliness, representative and stability.

In order to increase case detection of diseases, improve the system performance, reporting and data analysis on regular basis; capacity of health care providers of both governmental and non-governmental health facilities need to be improved through training and supervision. Particularly the training needs to be given for health extension workers.

3.1.1. Introduction

Public health surveillance is an ongoing systematic collection analysis, interpretation and dissemination of data regarding a health related event for the purpose of public health action to reduce morbidity and mortality and to improve health. In short it also defined as "information for action" (1). Proper understanding and use of public health surveillance data helps health workers at the health units and health official at different level of the health system to set priorities, plan interventions, mobilize and allocate resources, detect epidemics early, initiate prompt response to epidemics, and evaluate and monitor health interventions. It also helps to portray the ongoing pattern of health and health-related states and events, to assess public health status, trigger public health action, define public health priorities and assess long term disease trends. Hence a functional public health surveillance system is essential for defining health problems and taking actions. It is carried out through a system in the health sector which has legal support and extending from the central health authorities down to the peripheral health facilities up to the community level through sets of communication channels, which include upward reporting and down ward feedback mechanism(1-3).

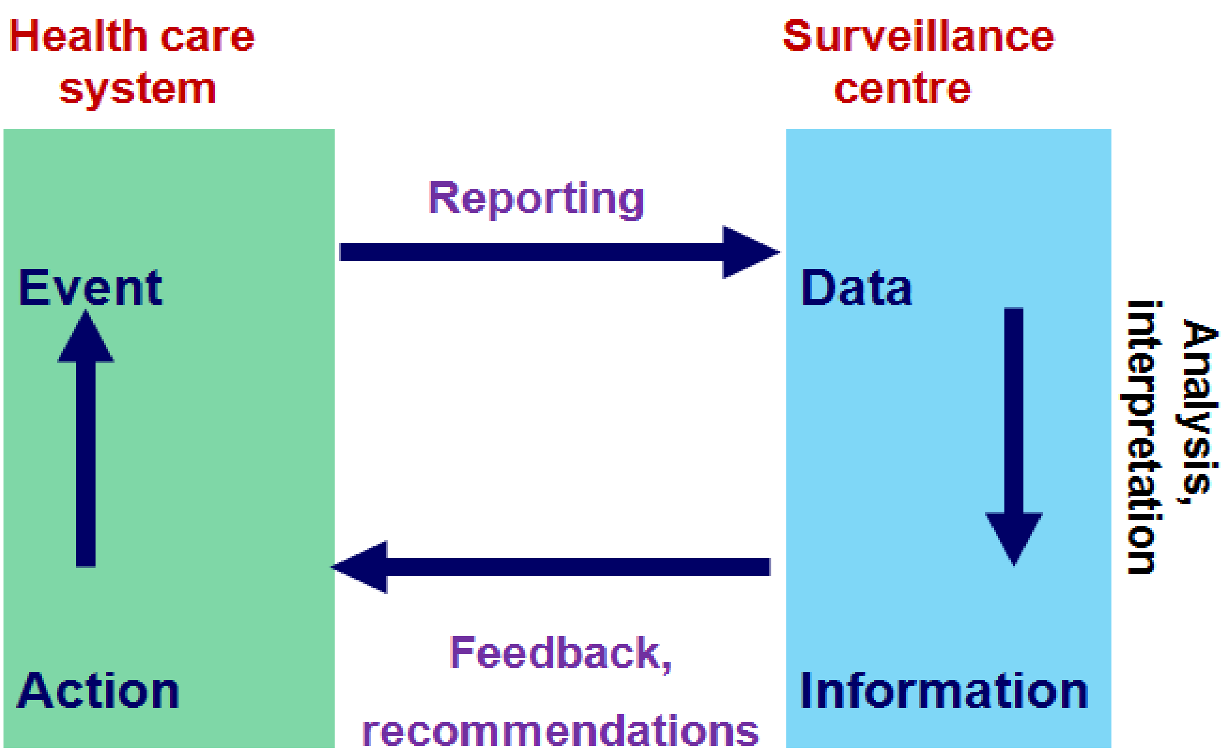
Ethiopia underwent different strategies to have a functioning and effective surveillance system. Ethiopia introduced integrated disease surveillance and reporting (IDSR) strategy in 1996 as part of the response to growing public health problems with communicable disease focusing on 17 priority diseases. Ethiopia adopted the WHO IDSR strategy in 1998 and frequently revise the list of priority diseases (1, 2, 4). Since 2008 the Federal Ministry of Health (FMoH) launched a reform and restructuring of the health sector aimed at bringing effectiveness and efficiency in execution of various work by using business re-engineering process (BPR) as a tool. Based on this the Federal Ministry of Health (FMoH) identified 8 core processes that will enable to fulfill its visions and missions. Public Health Emergency Management (PHEM) was one of the core processes identified to ensure rapid detection of any public health threats, preparedness related to logistic and fund administration, and prompt response to and recovery from various public health emergencies, which range from recurrent epidemics, emerging infections, nutritional emergencies, chemical spills, and bioterrorism(5). This core process comprised of four sub-processes which are: Public Health Emergency Preparedness, Early Warning, Response, and Recovery. The activities under this core process are to be implemented by appropriately trained and capable professionals (PHEM focal persons and experts). The modern principles of emergency management and the implications of the International Health Regulation (IHR) 2005 are also clearly reflected in the system. This new structure was extended down to the district level in their capacities and designed as basic tool for better tracking and monitoring of diseases of public health concerns(3-5).

The Ministry currently identified 21 top priority diseases and conditions (13 are immediately reportable and 8 weekly reportable) for surveillance activities that are epidemic prone, internationally required under IHR 2005, and diseases targeted for eradication and elimination. These diseases are set to be reported as mandatory notification by designated bodies through available means of communication (telephone, email and paper based reporting etc) to the next level according to the reporting period (immediately or weekly)(5).

To determine how well a public surveillance system operates it needs to be evaluated periodically. The purpose of evaluating public health surveillance system is to ensure that problems of public health importance are being monitored efficiently and effectively. Hence evaluation finding would yield specific recommendations for improving surveillance quality, efficiency, and usefulness. In addition to periodic evaluation, public health surveillance system should be monitored routinely to ensure they continue to meet their objectives (6).

We evaluated the surveillance system of selected diseases of East Harerge Zone Health office. The evaluation of the surveillance system assesses diseases targeted for elimination and epidemic potential in our country (malaria and measles). The overall purpose of surveillance of these diseases is to monitor the trend against the seated tolerance limits, detect occurrence and pick any deviation from the limit at the earliest point in time and have a prompt response. Furthermore, as an early warning system, it guides prevention and risk aversion actions like immunization, vector control and so on. In this study, purposes and attributes of surveillance systems in East Harerge Zone were described in detail. The purpose of evaluating surveillance of this disease is to monitor their trends and trigger public health action as they are shown increased. Enhancing surveillance system of these diseases is also crucial for reducing their magnitude.

For these purposes, each of these diseases has case definition(s) and integrated diseases reporting formats defined by the ministry of health and the WHO; and reporting is institutionalized into the health facilities and health offices. The general flow chart of surveillance system and data flow is shown in the figure 19.



Source: CDC Surveillance system evaluation ppt.

Figure 20: Simplified flow chart of surveillance loop

Assessing the effectiveness and efficiency of a surveillance system in achieving the stated goals/ objectives is part of the development or improvement of the existing resources, infrastructure and design (1). This improves the information provided and thereby helps improve service provision and delivery (7). Especially, with the implementation of the new structure for surveillance system (PHEM) in the sector, the change in the quality of information need to be assessed particularly for diseases which exert high public health stress.

3.1.2. Rational of the study

Surveillance system evaluation is an important tool to assess the capacity of the system to meet its purpose and objectives; to improve its operation and to optimize the available resources (2). Hence evaluation of East Harerge Zone surveillance system provides information if the surveillance system is useful, describes the specific attributes, identifies areas that needs improvement and make recommendations to improve the quality, efficiency and usefulness of the system. In addition it can be used as a base line for future evaluation of the system. Malaria and measles are public health important diseases and health conditions selected for evaluation of the system in East Harerge. Therefore the findings of this evaluation can be used as an input to strengthen the overall surveillance system activities of the zone to achieve its intended objectives and purpose.

3.1.3. Objectives

3.1.3.1. General objectives

To evaluate the capacity of the surveillance system in detecting and predicting epidemics and in monitoring trends of priority diseases to prevent and control their occurrence in East Harerge Zone, Ethiopia 2014.

3.1.3.2. Specific Objectives

- To describe the performance of surveillance system in line with its objectives
- To assess and describe key attributes of the surveillance system
- Assess major gaps, challenges and the strength of the surveillance system
- To assess the resources available for surveillance system

3.1.4. Methods and Materials

3.1.4.1. Study area

We conducted the study in East Harerge Zone of Oromia regional state. East Harerge zone is one of the 18 Zones of the Oromia Region that located in the eastern part of Ethiopia. The population of the zone was estimated to be about 3.3 million in 2014 based on the projection from the 2007 Ethiopian Cunses. Administratively, Eeast Harerge Zone is divided into 19 districtes and three special townes. *East* Harerge is bordered on the southwest by the Shebelle River which separates it from Bale Zone, on the west by West Harerge, on the north by Dire Dawa and on the north and east by the Somali Region. The Harari region is an enclave inside this zone.

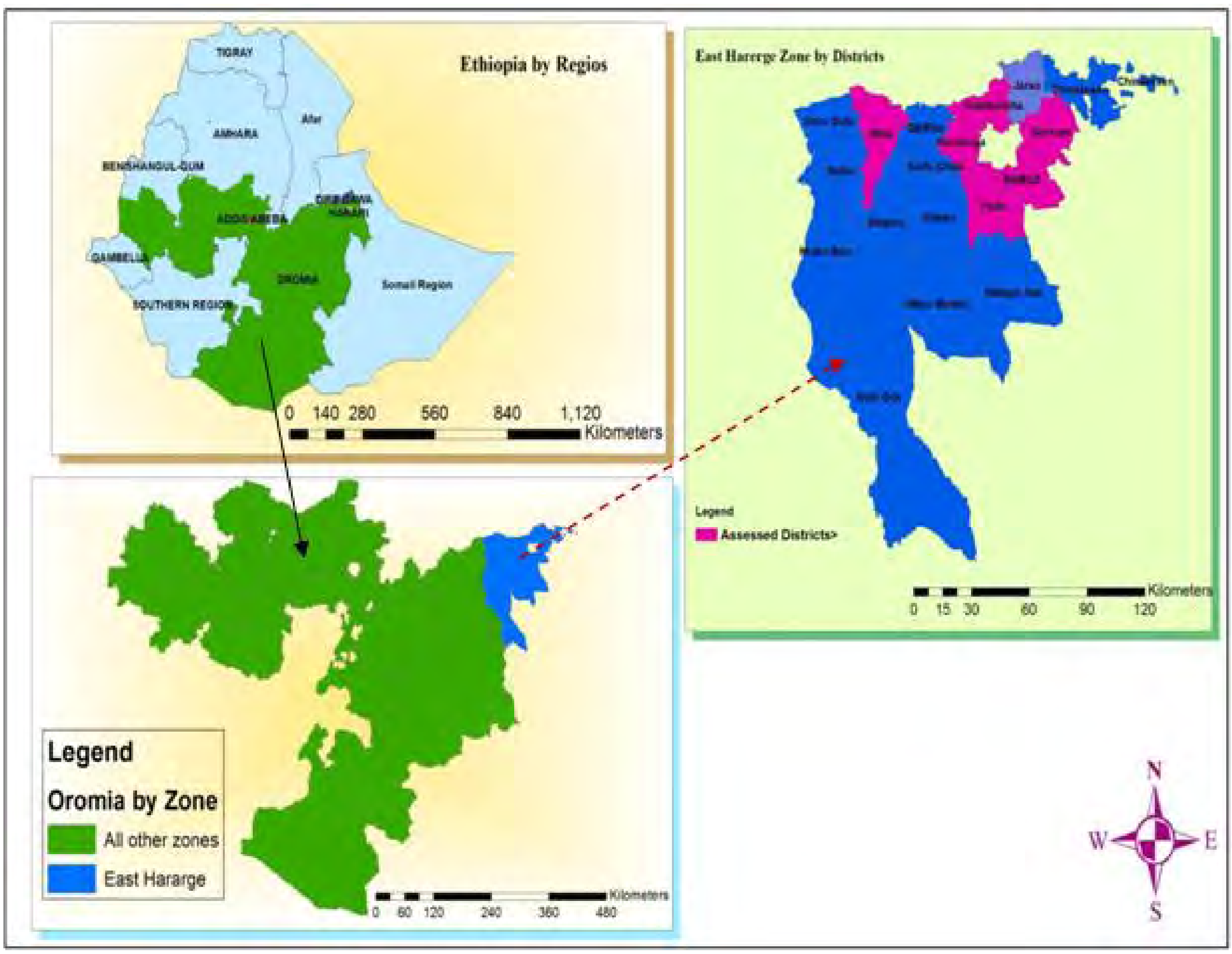


Figure 21: Map of East Harege Zone by Distrctt, Oromia Region, Ethiopia,, 2014.

3.1.4.2. Study Design

We used descriptive cross-sectional study design to evaluate the surveillance system of the East Harerge Zone of Oromia Region, Ethiopia 2014.

3.1.4.3. Study Period

We conducted the study from June 8 to June 30/2014 in East Harerge Zone, Oromia Region, Ethiopia.

3.1.4.4. Study Subjects

The study subjects are selected health facilities (one Hospital, 9 Health Centers, and 9 Health Posts), health offices of East Harerge Zone (six District Health Offices, one Zonal Health department) and the Regional Health Bureau.

3.1.4.5. **Sample Size and Sampling technique**

The regional health bureau, zonal health office, six district health offices, ten health centers, ten health posts and one zonal hospital, totally 25 facilities have been included in the study. Selection of these facilities was done as follow:

- We have selected six districts (31.6%) out of 19 districts found in the zone conveniently by considering geographical accessibility
- From three of selected district we selected one health center by simple random sampling (SRS) technique and from the rest three districts we have selected two health centers by simple random sampling technique.
- Among the four hospitals found in the zone we have selected one by SRS technique.
- Finally we selected one health post among the five health posts under each selected health centers by SRS technique.

3.1.4.6. Data collection procedure

We collected data by interviewing PHEM focal persons at all level of the system by using structured questionnaire for evaluation of surveillance system adapted from WHO and CDC.

Additionally we have also used observation of secondary documents and tools used for surveillance at all level to collect data.

3.1.4.7. Data processing and analysis

We have used Microsoft Office Excel 2007 and Epi-Info 7 soft ware to enter, organize and analyze the data appropriately.

3.1.4.8. Dissemination of the Study

The finding of the study was submitted in both hard and soft copy to the AAU- SPH and at the assessed Districts health offices and East Harerge zonal health office and Oromia Regional health bureau and other stakeholders. In addition the report will also be submitted to EFETP resident coordinators, Mentors and advisors in soft copy.

3.1.5. Results

3.1.5.1. Involvment of stakeholders

Before the start of the evaluation activities, dissccussions were done with head of the Oromia Regional health bureau PHEM core process on selection of a zone to be included in the study and to ensure that the evaluation of the system addresses appropriate questions and attributes to produce useful and acceptabte findings. Moreover we disscused the objectives and purpose of the evaluation with East Harerge zone health office deputy head and PHEM focal persons; selected district health offices heads and surveillance focal persons and selected health facilities heads and surveillance focal persons. All individuals assinegned and engaged on surveilance system of the selected organization participated in the evaluation process.

3.1.5.2. Description of the surveillance system

3.1.5.2.1. Overview of surveillance system

In Ethiopia Public Health Emergency Management (PHEM) is one of the core processes identified by Ethiopian Federal Ministry of Health's (FMOH) following the 2008 health sector reform and restructuring based on business reenginering process (BPR) to ensure rapid detection of any public health threats, preparedness related to logistic and fund administration, and prompt response to and recovery from various public health emergencies, which range from recurrent epidemics, emerging infections, nutritional emergencies, chemical spills, and bioterrorism (3). Public Health Emergency Management (PHEM) is defined as the process of anticipating, preventing, preparing for, responding to and recovering from the impact of epidemics and health consequences of natural and manmade disasters (3). This core process is comprised of four sub-processes namely; Public Health Emergency Preparedness, Early Warning, Response, and Recovery. The early warning sub-process mainly involved in the integrated disease surveillance and reporting activities. The purpose of warning is to enable the provision of timely and effective information to the public and to responders through identified institutions that allow preparing for effective response or taking action to avoid or reduce risk (3). The FMOH currently identified 21 top priority diseases and health conditions (13 are immediately reportable and 8 weekly reportable) for surveillance activities that are epidemic prone, internationally required under IHR 2005, and diseases targeted for eradication and elimination (2, 3). The overall purpose of surveillance of these priority diseases is to monitor their trends against the pre seated tolerance limits, and pick any deviation from the limit at the earliest point in time and have prompt response (3, 6). In addition as early warning system, it guides prevention, control and risk aversion actions like immunization, vector control and so on (3).

3.1.5.2.2. Objectives of the surveillane system

- To detect epidemics/outbreaks so that they can be controlled in a timely manner
- To predict epidemics so that health services can plan to respond, prevent where possible, treat and control priority diseases,
- To monitor trends of priority diseases in order that changing trends inform policy decision.
- To evaluate an intervantion so that effective and efficient actions/policies are identified and supported (3).

3.1.5.2.2. Public health importance of health events targeted for surveillance in Ethiopia

The 21 top priority diseases and health conditions identified by the FMOH to be reported by the surveillance system are important public health events that fulfill one or more of the following conditions; have high epidemic potential (measles, cholera, meningitis, smallpox, SARS, yellow fever, avian human influenza, malaria), required internationally under IHR 2005 (smallpox, SARS, wild type poliomyelitis, human influenza), disease targeted for eradication or elimination (wild type poliomyelitis, dracunculiasis, neonatal tetanus), diseases that have a significant public health importance (rabies, dysentery, relapsing fever, malnutrition, typhoid fever) and diseases that have effective control and prevention measures (3).

This surveillance system evaluation assessed one immediately reportable disease (measles) and one weekly reportable disease (malaria). They are important public health problems of the zone that caused significant amount of morbidity and mortality. They have also the potential to cause outbreaks/epidemics in the zone if the surveillance system not operates properrly. To detect and report these important public health problems the surveillance system uses two types of case definitions (standard and community case definitions) for each events.

Description of Selected Diseases (Malaria and Measles) in Surveillance System Evaluation

Malaria: Around 75% of Oromia region land mass is malarious which makes more than 20 million populations of the region at risk for malaria infection. There are 75 hotspot districts for malaria has been identified in the region. Among this hot spot districts nine of them are found in East Harerge Zone. In 2006 E.F.Y a total of 480,501 malaria cases (clinical and confirmed) were reported in Oromia Region. Among these cases 361,046 (75.1%) of them were laboratory confirmed cases. Of the confirmed cases 213, 726 (59.2%) 0f them were P. falciparum and the rest 147,320 (40.8%) were P. vivax. East Harerge Zone has contributed 23,464 (6.5%) of the Oromia laboratory confirmed malaria cases. Of the total confirmed cases reported by East Harerge Zone 15,252 (65%) of them were P. falciparum.

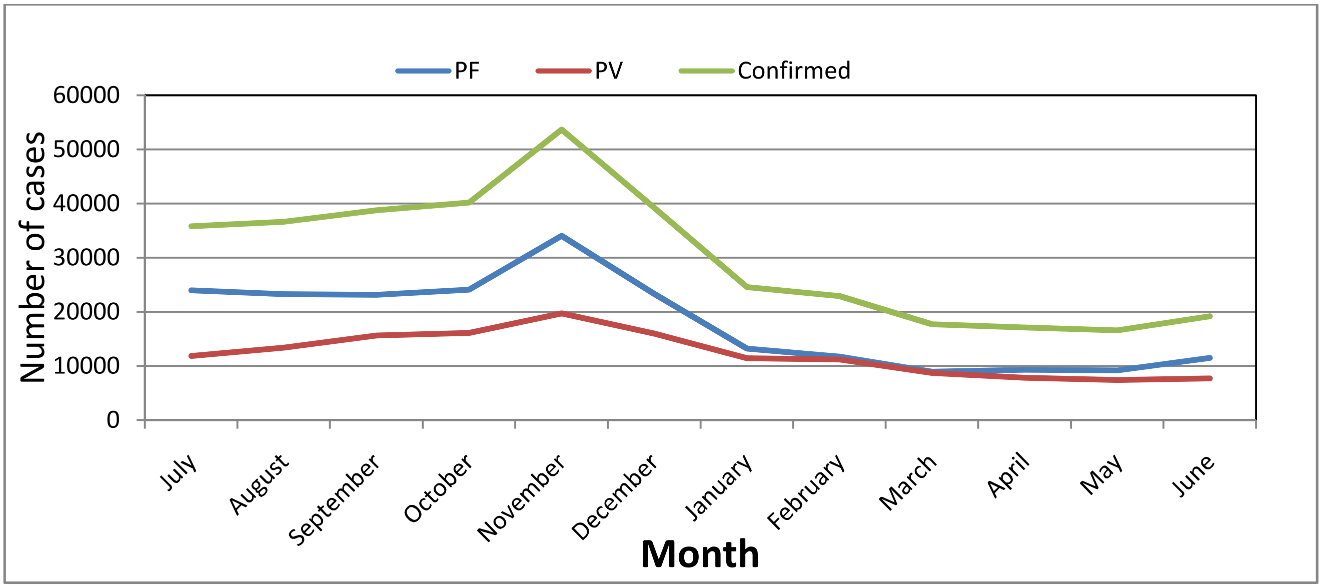


Figure 22: Trends of confirmed malaria cases by months for Oromia Region m Ethiopia, 2006 E.F.Y

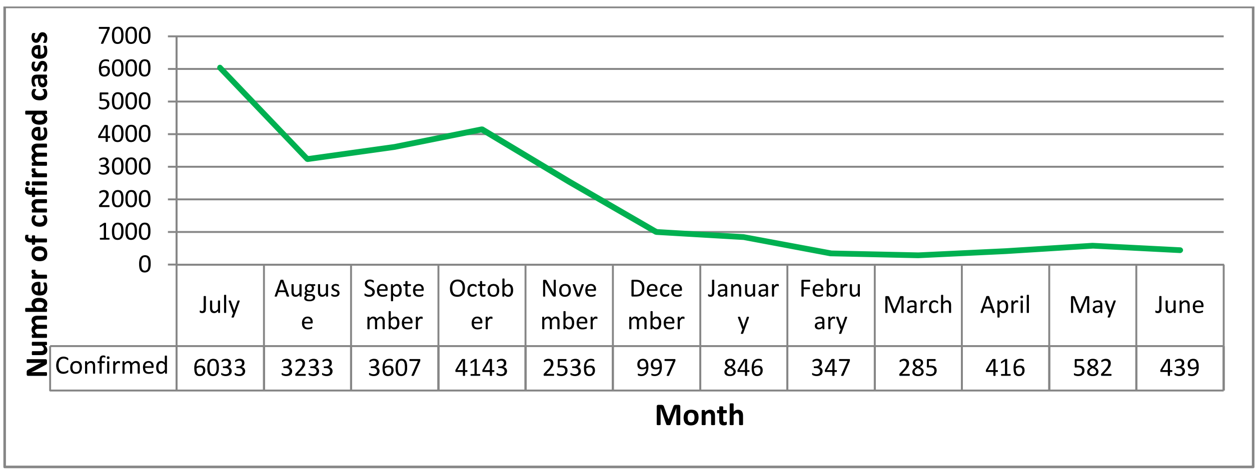


Figure 23: Trends of Total confirmed malaria cases by months East Harerge Zone, Oromia Region Ethiopia, 2006 E.F.Y

Among the total confirmed cases reported by East Harerge Zone 13,317 (57.84% of East Harerge zone confirmed cases) of them were reported by the assessed six districts, where the majority of them were from Haromaya and Kombolcha districts with a magnitude of 5,557 (24.1%) and 4,225 (18.3%) respectively (Fig. 24).

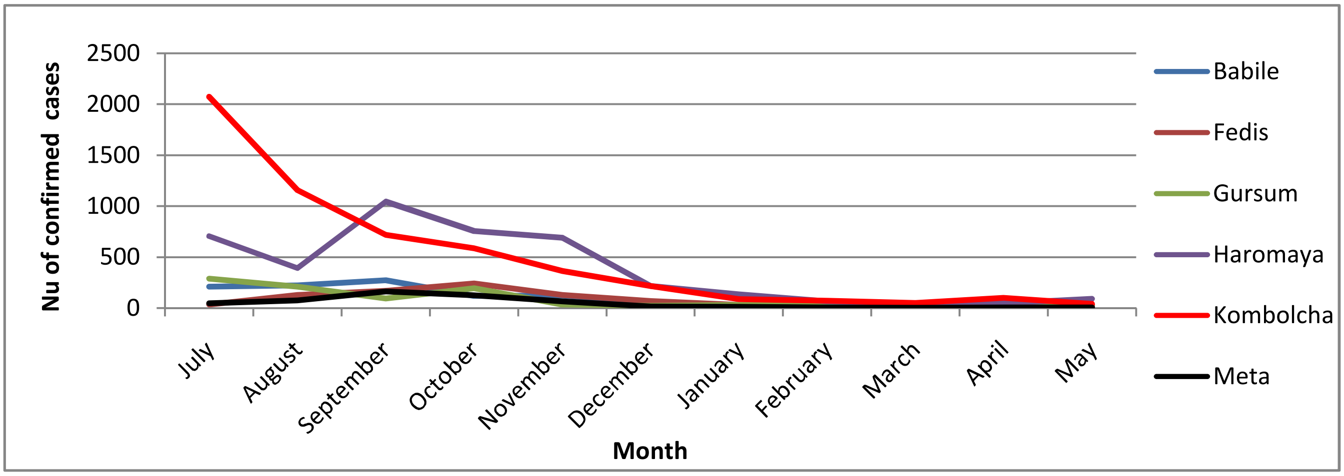


Figure 24: One year trends of total confirmed malaria cases of assessed districts of East Harerge Zone, Oromia Region Ethiopia, 2006 E.F.Y

Measles: In Oromia region measles outbreak is still a main public health concern. In 2006 EFY a total of 3,898 suspected measles cases with 43 deaths were reported from oromia region. In the same fiscal year east Harerge Zone has reported 66 suspected measles cases from four different districts.

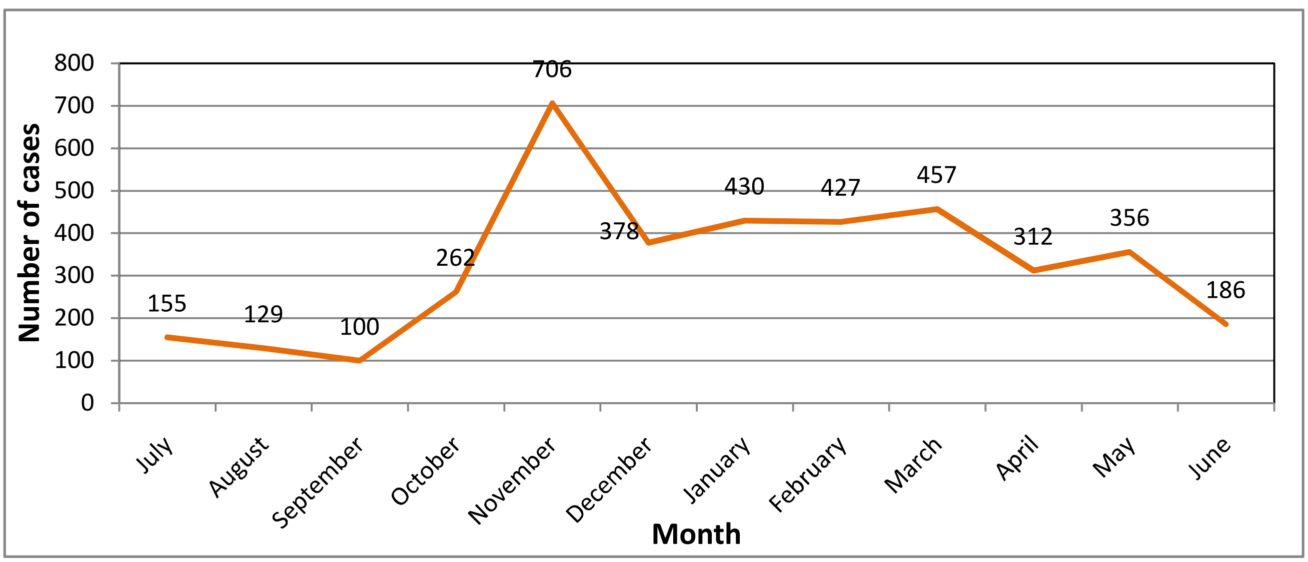


Figure 25: Trends of suspected measles cases in Oromia Region in 2006 EFY.

3.1.5.2.3. Case definitions of selected diseases

The use of a standard case definition increases the specificity of reporting and improves the comparability of the health-related events reported from different sources of data, including geographic areas (3). Case definitions of the selected diseases for evaluation of the system are:

3.1.5.2.3. **Standard case definition of selected diseases**

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

Measles: - 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.

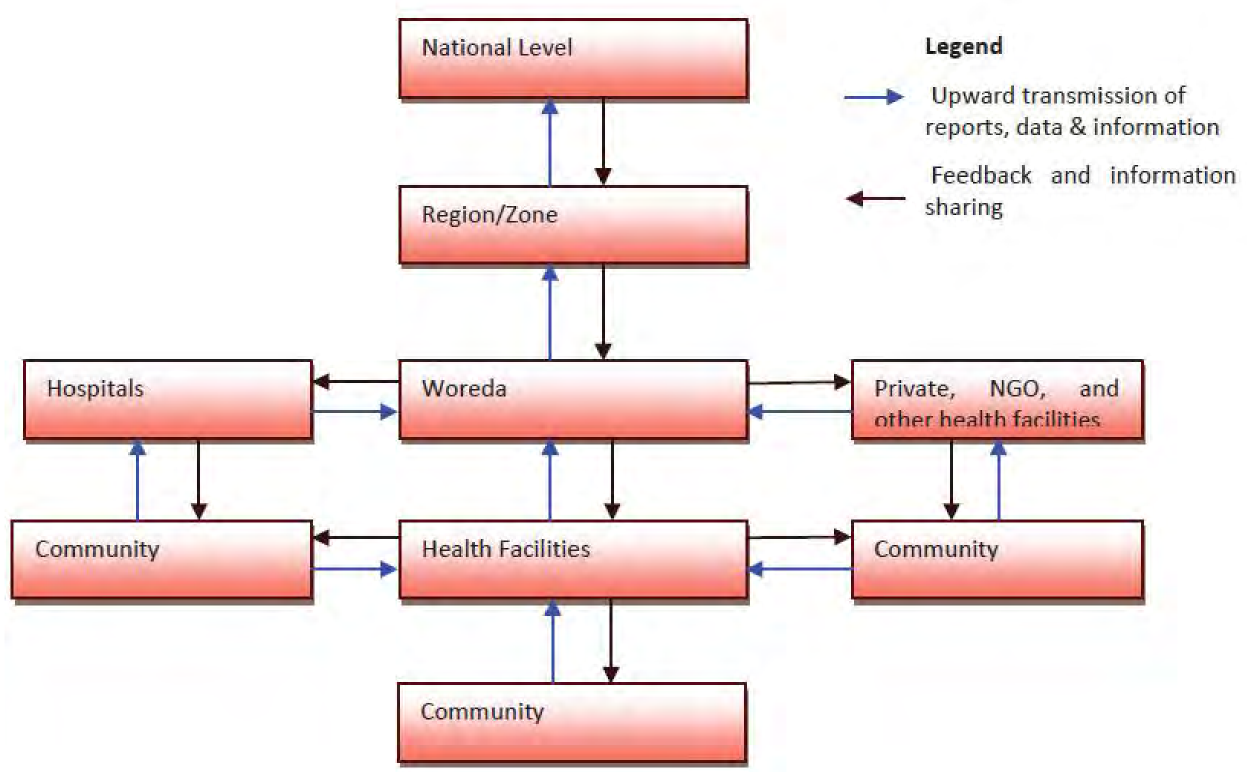
Community case definitions;

Malaria:-Any person with fever or fever with headache, back pain, chills, rigor, sweating, muscle pain, nausea and vomiting.

Measles: - Any person with fever and rash starts from face.

3.1.5.2.4. Operation and reporting of surveillance system

The formal flow of surveillance data is usually from reporting site to the next level up to the national level and to WHO. The community and health facilities at the lowest level particularly health posts are the main source of information about the ooccurrence of health related events(Fig. 26). The information collected from this site is compiled in standardized forms, analysed and then forwarded to the district health office by health centers. The district level compiles, analyzes and sends the data to the zonal level by using a standared form. Similarly the zonal level compiles and analyzes the report and sends the compiled data to the region by using a standared form and internet, from which the national level recieves the compiled data. The zonal and regional levels usualy send the report to the next level by email. Feedback and information sharing follow the same route,but in the reverse direction (Fig. 26).



Source: Ethiopian National PHEM Guideline

Figure 26: Data and information flow chart of surveillance system indicating varying cycles at various levels

3.1.5.2.5. Reportig periodicity

The identified 21 diseases and health conditions under surveillance of Ethiopia are classified in to two reporting periods (14 immediately reportable and 7 weekly reportable) depending on their epidemic potential, diseases targeted for elimination and eradication (Table 12)

Table 12: List of reportable diseases/ conditions in Ethiopia

Immediately Reportable Diseases	Weekly Reportable Diseases & conditions
1. Acute Flaccid Paralysis (AFP)	15. Dysentery
2. Anthrax	16. Malaria
3. Avian Human Influenza	17. Meningococcal Meninigitis
4. Cholera	18. Relapsing fever
5. Dracunculiasis/Guinea worm	19.Severe Malnutrition

6. Measles	20. Typhoid fever
7. NNT	21. Typhus
8. Pandemic Influenza A	
9. Rabies	
10. Smallpox	
11. SARS	
12. Viral Hemoragic Fever (VHF)	
13. Yellow Fever	
14. Maternal death	

Source: Ethiopian National PHEM Guideline

Immediately reporting

Currently 14 diseases are identified to be reported immediately to the next reporting level. For the immediately reportable diseases, a single suspected case is considered as a suspected outbreak. A single occurance of these diseases needs to be reported from the community, health post or health center to district health office within 30 minutes, from the district health office to zone/region level within 30 minutes, similarly from zonal health office to region within another 30 minutes, then from the regional health bureau to the national within another 30 minutes and finally from the FMOH to the WHO within 24 hour. The information can be reported by means of available convinient methods; like telephone, radiophone, email, fax or mobile short massage service (3).

Weekly reporting

Currently seven diseases and health conditions are identified to be reported weekly to the next reporting level. The total number of cases and deaths occurred within the week (Monday to Sunday) needs to be reported; from the health facilities to district health office every Monday till mid-day, from the district health office to zone/region leve every Tuesday till mid-day, from zonal health office to region every Wednesday till midday, then from the regional health bureau to national PHEM every Thursday and finally from the FMOH to stakeholders every Friday (3).

3.1.5.2.6. Population under surveillance

The Ethiopian Ministry of Health PHEM targeted all the population of the country to be under surveillance for all 21 public health important health events. Hence, Oromia Regional Health Bureau followed the same strategy and targeted all population of the region which is estimated to be about 33 million in 2014 based the projection from 2007 Ethiopian census, to be under surveillance. Similarly all populations of East Harerge zone were under surveillance for the all reportable health events. The population of East Harerge zone is estimated to be about 3.3 million in 2014 based on the projection from the 2007 Ethiopian Censes. Administratively East Harerge Zone is divided into 19 districts and three special towns. In this zone there are four public hospitals, 115 health centers and 547 health posts that have been participating in the surveillance system. According to the zonal health office report the primary health service coverage of the zone was 83% in 2014. During the evaluation of the zone's surveillance system we have assessed; zonal health office, six district health offices, one hospitals, nine health centers and nine health posts (Table 13). According to the reponse of surveillance focal persons, the health seeking behaviour of the populations of all assessed districts for all priority health events under the surveillance have immproved after the implimentation of health extenssion program.

Table 13: Number of health facilities found in East Harerge Zone and Selected districts and health service coverage, Oromia, Ethiopia 2014.

Sr no	Assessed facilitie	Population 2014	Number of Hospitals	Number of health centers	Number of health posts	Health servic coverage (%)
1	Oromia Region	32,976,276	43	1260	6563	
2	East Harerge Zone	3,304,532	4	115	547	83
3	Haromaya District	281,259	1	7	34	94
4	Kombolcha District	170,140	0	5	19	76
5	Babile District	115,068	1	4	21	89
6	Fedis District	136,622	0	5	19	89
7	Gursum District	184,313	0	7	39	98

8	Meta District	305,388	0	11	55	92

3.1.5.3. Case detection and registration

To detect and report reportable public health problems appropriately, the surveillance system uses two types of case definitions (standard and community case definitions) for each event.

During the assesment period we observed standard case definations only for four reportable diseases (Malaria, measles, Acute Flaccid Paralysis (AFP) and NNT) in the assessed health facilities (Hospital & Health centers). The standard case definations for measles and Acute Flaccid Paralysis (AFP) were observed in all assessed health facilities. However the case definitions for malaria and Neonatal Tetanus (NNT) were observed in only 30% and 60% of the the health facilities respectively. All assessed health facilities didn't have the case defination for severe acute malnutrition. Among the assessed health posts only one (12.5%) of them have case defination for three of the reportable diseases (Malaria, measles and AFP). The case definations were well understood by all health personnels and the seven (87.5%) of health extension workers. All assessed health facilities (health centers & hospitals) used clinical register and correctly recorded reportable diseases whereas only four (50%) of health postes have clinical register.

Among the assessed health centers and hospital 8 (80%) of them have no capacity to collected CSF specimen and 2 (20%) of them have no capacity to collect blood specimens due to abscence of experties (clinician for CSF and Laboratory technician for blood) capable of collecting the specimens. However all of the facilities are capable to collect stool and sputum specimens. Specimen collection, handling and transportation guidelines were found in six (60 %) of the health facilities. All health facilities were capable to transport specimen to reference laboratory and have the necessary materials (cold box, packaging materials and cold chain) to handle and transportthe specimens. However all of them didn't have the necessary materials needed to collect CSF specimen, three (30%) for stool and two (20%) for blood specimen.

3.1.5.4. Data Reporting

The national public health emergency management and its partners are responsible for preparing and distributing different reporting form to regional health bureaus to be used for reporting by all levels of the system. At the time of the assessment two (20%) of the health centers and seven (87.5%) of the health posts have lacked the reporting form. They used hand prepared and photo copied forms to report the data. Health posts are using mobile SMS and hard copy to send report to the health centers and health centers also send the report to the district health office by the same means. All district health offices are using mobile SMS and four (66.7%) of them additionally use hard copy to send the report to the zonal health office. East Harerge zonal health office sends the report to the region through email. Regarding the periodicity of the report we have observed that all health facilities and heath posts and 83.3 % of district health offices didn’t follow the data collected dates of the week (data collected Monday to Sunday) to be included on weekly reportable health conditions as described in the national PHEM guideline.

3.1.5.5. Data analysis

Surveillance data collection either by immediately or weekly reporting system is not an end by itself. The collected data needs to be analyzed (by time place person), interpreted and used for action and decision making starting from local to the central level in order for the values of the data to be realized. At all level of the zone, surveillance data were not analyzed weekly by time, place, and person except some performed analysis for malaria weekly to monitor its trends. Weekly malaria trend analysis was done by all district health offices, five (50%) of health facilities (health centers & hospital) and three (37.5%) health posts. According to the respondents the responsible person for surveillance data analysis is PHEM focal person at all level of the health system. All assessed districts including the zone, six (60%) of health facilities and one (12.5%) of health posts have established action threshold for reportable diseases according to the national PHEM guideline recommendation. All of the assessed health facilities and health offices have appropriate denominators needed for surveillance data analysis.

3.1.5.6. Outbreak investigation

Investigating and managing an outbreak appropriately is essential to minimize morbidity and mortality by aborting the outbreak early before it spreads in the area. The zonal health office responded that they had investigated four measles outbreaks at different districts and used the findings for intervention; however there was no written report or document about outbreak investigation seen during the assessment. The outbreaks occurred in four different districts in the past one year prior to this assessment with a total number of 65 cases (Aweday 18 cases, Haromaya 10 cases, Kombolcha 13 cases and Babile 24 cases). All assessed district health offices haven't ever performed outbreak investigation except Fedis district that performed acute watery diarrhea (AWD) outbreak investigation in 2012 but there was no written report or document found at the time of the investigation.

3.1.5.7. Epidemic Preparedness and Management

The zonal health office has soft copy of draft emergency preparedness and response plan for epidemic prone diseases but it was not completed. All assessed district health offices have no written emergency preparedness and response plan. Among the assessed district health offices three (50%) of them have no drugs and supplies necessary for emergency management during the assessment. Moreover all districts including the zonal health office have experienced shortage of drugs and supplies necessary for emergency management. All districts and the zone have no specific budget line for emergency management and response. Regarding existence of epidemic management committee four of the districts and the zonal health office have established the committee and all assessed districts including the zone responded that they have rapid response team. However there were no documents or meeting minutes found at the time of the evaluation that shows the existence and activities of the committee at all districts and zone health office.

Table 14: Number of districts and their emergency preparedness status, East Harerge Zone, Oromia, Ethiopia 2014.

Variables	# of districts (N=6)	Zone (N=1)
Availability of Written emergency preparedness plan	none	1 (draft)
Availability of emergency stocks of drugs and supplies	3 (50%)	1
Experienced shortage of drugs during in the past year	6 (100%)	1
Presence of budget line for epidemic response	0	0
Observed epidemic management (RRT) meetings minutes	0	0
Presence of epidemic management committee	4 (63%)	1
Established Rapid Response Team (RRT)	6 (100%)	1

3.1.5.8. Availability of Budget and Resources for Surveillance Activities

Availability of critical resources and budget is important for executing surveillance activities and epidemic preparedness effectively. There is no specific budget line or allocated budget from government source for public health emergency activities at zonal and district level. Resources needed for data management, communication, and logistics were all available at the regional level. However, they all became very scarce or absence down in the hierarchy. 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 15: Availability of resource needed for surveillance activities, East Harerge Zone, Oromia, Ethiopia 2014..

Sr.#	Materials	Zone (N=1)	Districts (N=6)	Health facilities (N=10)	Health posts (N=8)
1	Electricity	1 (100)*	6 (100)	9 (90)	1 (12.5)
2	Computers	1 (100)	6 (100)	7 (70)	0(0)
3	Printers	1 (100)	6 (100)	3 (30)	0 (0)
4	Stationary	1 (100)	6 (100)	10 (100)	7 (87.5)

5	Vehicles (Ambulance)	1 (100)	6 (100)	3 (30)	NA
6	Motorcycle	1 (100)	5 (83.3)	9 (90)	NA
7	Bicycle	1 (100)	0 (0)	5 (50)	1 (12.5)
8	Fax	1 (100)	0 (0)	1 (10)	0 (0)
9	Telephone	1 (100)	6 (100)	4 (40)	0 (0)
10	Calculator	1 (100)	6 (100)	8 (80)	5 (62.5)

*Numbers in the parenthesis indicates percentage (%)

3.1.5.9. Feedbacks

The regional health bureau has provided weekly PHEM bulletin that contains a summarized report of the weekly surveillance data by zone and week for all zones including East Harerge Zone. However the zonal health office has not provided written specific feedback on surveillance activities to the districts and health facilities, but it has given feedback on integrated activities every quarter of a year that didn't contains comments on surveillance activities. Similarly none of the assessed district health offices and heath facilities has provided surveillance specific feedback to their respective reporting facilities.

3.1.5.9. Supportive Supervision

During the past six months prior to this assessment the zonal health office in collaboration with WHO have conducted two supervisions on surveillance activities for the districts and health facilities. Among the assessed health sectors all district health offices (three of the 2x and the rest three 1x), nine heath facilities (six of them 2x and three of them 1x) and three health posts (2x) have been supervised for their surveillance activities. Due to lack of logistics (financial, vehicles) only three of the assessed districts have conducted two supportive supervision to their respective health facilities on integrated activities including surveillance in the past six months prior to this evaluation. None of the health centers has conducted supportive supervision for their respective health posts.

3.1.5.10. Training

Availability of trained staff on surveillance activities is an important key for improvement of weekly reporting system, early detection and reporting of outbreaks and for meeting the objectives and purpose of the surveillance system in general. According to zonal health office response there are 22 trained focal persons engaged on surveillance activities in the zone during the assessment. Among the assessed health sectors one (16.7%) district health office, five (50%) health centers and six (75%) health posts have no trained surveillance focal person. The rest health sectors have at least one trained surveillance focal person that has been engaged on surveillance activities (Table 16 below).

Table 16: List of selected facilities and their number of staff trained on basic surveillance system at East Harerge Zone, Oromia, Ethiopia 2014.

Sr.#	Name of health sector with no trained staff	Name of health sector with one trained staff	Name of health sector with two trained staff
1	Gursum District HO	Fedis District HO	Zonal Health Office
2	Gursum H/C	Babile District HO	Kombolcha District HO
3	Wayu H/C – Babile	Haromaya District HO	Meta District HO
4	Babile H/C	Kombolcha H/C	Bisidimo Hospital
5	Kero Deda H/C- Haromaya	Boko H/C- Fedis	
6	Hawbery H/C - Gursum	Chinaksen H/C- Meta	
7	Bishan Babile H/P	Duse H/C- Meta	
8	Muyedin H/P- Gursum	Tulla H/P- Babile	
9	Kedo Deda H/P- Haromaya	Gemechu Buse H/P- Meta	
10	Tulla H/P- Kombolcha		
11	Umer kule H/P- Fedis		
12	Hawbery H/P- Gursum		

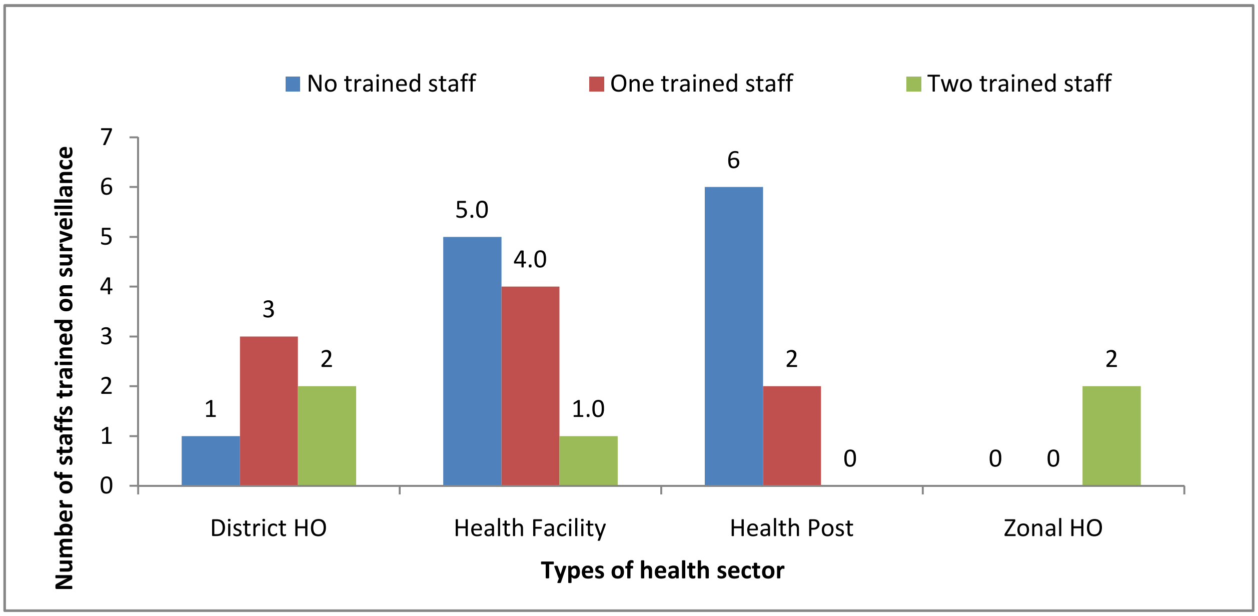


Figure 27: Number of staff trained on basic surveillance system at different level of the surveillance system at East Harerge Zone, Oromia, Ethiopia 2014.

3.1.5.11. Case Confirmation and Laboratory Capacity

The laboratory capacity to test, collect, transport and role in the surveillance of AWD, meningitis, AFP/Polio, malaria and measles were assessed both at the health centers and one hospital. In Oromia Region there are two public health research and reference laboratories that have the capacity to diagnose and confirm cholera (AWD), meningitis, malaria, typhoid fever and bacterial dysentery. Among the assessed health facilities 8 (88.9%) of the health centers and the hospital have the capacity to diagnose and confirm malaria by microscope. Moreover all health facility laboratories have the capacity to collect specimen for AFP and AWD (cholera) and 80% of them capable to collect blood specimen for measles. However all assessed health facilities except the hospital have no capable to collect CSF and also they don't have specimen transporting media for AWD (cholera) and meningitis. Moreover late or no feedback (result) from National reference laboratory on sent specimen for confirmatory test has being a challenge in early detection and management of outbreaks.

3.1.6. Description of attributes of the surveillance system

3.1.6.2. Usefulness

All assessed health sectors responded that the surveillance is useful for early detection of outbreaks of diseases and health events under surveillance. In addition they responded that it helps to determine the burden of morbidity and mortality of the reportable health events and to determine the risk factors related to those diseases and to permit assessment of the effect of the prevention and control program. Government and non-government organizations have used surveillance data to make decisions and take actions.

3.1.6.3. 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 (6). Respondents from all visited district health offices including zonal health office, from all health facilities and 75% of health extension health workers understand the case definitions for selected priority diseases (measles, AFP, malaria and malnutrition). In addition, they believe that community case definitions are easy to understand at community level. 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 except two (25%) health extension workers responded that the formats are not easy to use due to language barrier. Among the assessed district health offices 66.7% of them said, it takes 10 -15 minutes to fill the weekly reporting format.

3.1.6.4. Flexibility

As the current reporting format contains additional spaces named others at the end for both weekly and immediately reportable diseases, it can make it flexible to accommodate newly occurring health events/disease to fill on without any difficulty. Existing reporting format was updated in 2009 during the time IDSR was changed to the current PHEM to include newly emerged diseases such as Avian Influenza, Pandemic Influenza and SARS. 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.

3.1.6.5. Data Quality

Even though the reporting formats for weekly and immediately reportable diseases are well understood at all levels of the surveillance system, during the evaluation we have observed common data quality problems in all levels; mostly of blank spaces on the reported formats.

Common surveillance data quality problems identified on filled reporting formats during the assessment were; address of reporting sites not recorded, the starting and ending dates of the week not recorded, date report sent, report prepared by and zero reports were not recorded. In addition at most health centers and district health offices didn't recorded number of sites expected to report and number of sites reported on time on the form that are important variables to determine completeness and timeliness of the reporting. The main reasons for poor data quality were lack of training for health extension workers and health facility focal persons, work overload, lack of commitment, lack of supervision and feedbacks specific to surveillance.

3.1.6.6. Acceptability

Acceptability of surveillance reflects the willingness of persons and organizations to participate in the surveillance system. Acceptability is a largely subjective attribute that encompasses the willingness of persons on whom the public health surveillance system depends to provide accurate, consistent, complete, and timely data (6). Among the health sectors available in East Harerge Zone all district health offices were 100% active participant whereas health posts, health centers, Hospitals and other private and NGO health facilities participation on average were 95.7%, 95.9%, 93.8% and 98.0% respectively in the past 12 weeks prior to the evaluation. Overall participation rate of all health sectors found in the zone were 94.6%. However there were factors influencing sites to participate in the surveillance system like; lack of understanding on relevance of data by these facilities, competing priorities, lack of supervision and feedbacks and poor monitoring system of governmental organizations.

Table 17: Last three month Weekly report completeness of health facility at East Harerge Zone, Oromia, Ethiopia 2014.

	Health posts		Health Centers		Hospitals		Private & NGO		All type H/F	
WHO WK	E	R	E	R	E	R	E	R	E	R
WK11	547	517	114	108	4	3	98	88	763	716
WK12	547	523	114	107	4	3	98	88	763	721
WK13	547	522	114	105	4	3	98	90	763	720
WK14	547	528	114	111	4	4	98	87	763	720
WK15	549	528	115	112	4	4	114	99	782	743
WK16	549	529	115	112	4	4	114	101	782	746
WK17	549	524	115	109	4	4	114	101	782	738
WK18	549	524	115	110	4	4	114	100	782	738
WK19	549	525	115	110	4	4	114	100	782	740
WK20	549	526	115	111	4	4	114	101	782	742
WK21	549	523	115	113	4	4	114	102	782	742
WK22	549	529	115	112	4	4	114	104	782	744
Average H/F	548.3	524.8	114.7	110.0	4.0	3.8	108.7	96.8	775.7	734.2
Reporting rate /WK		95.7		95.9		93.8		89.0		94.6
NB: E= Expected R= Reported H/F= Health Facility WK= week										

3.1.6.7. Representativeness

Following implementation of health extension program, majority of the population are accessed to basic health services as a result of many health posts have been constructed since implementation of this program. In Oromia region, there are more than 6,500 health posts and over 1,200 functional health centers (Table-13). During the assessment in East Harege Zone there were 547 health posts, 115 health centers, four hospitals and about 114 private and NGO health facilities. The primary health service coverage of the zone was 83% and the health service coverage of the visited districts was ranged from 76% to 98% (Table -17). The health seeking behavior of the communities dramatically changed as a result of awareness creation done by Health extension workers in collaboration with women health development in the rural area of the zone.

3.1.6.8. Timeliness and Completeness

Timely report of surveillance data is important for early public health interventions. Timeliness of the public health surveillance is usually considered that time interval between the onset of health-related event and the reporting of the event within the time period specified in national PHEM guideline to the public health agency responsible for immediate control effort, prevention of continued exposure or program planning. The minimum expected reporting timeliness is 80% as per recommendation of the national PHEM guideline. The 2006 EFY weekly report timeliness 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/completeness of the zone was 94.6% in the past three month prior to the assessment (Fig.28).

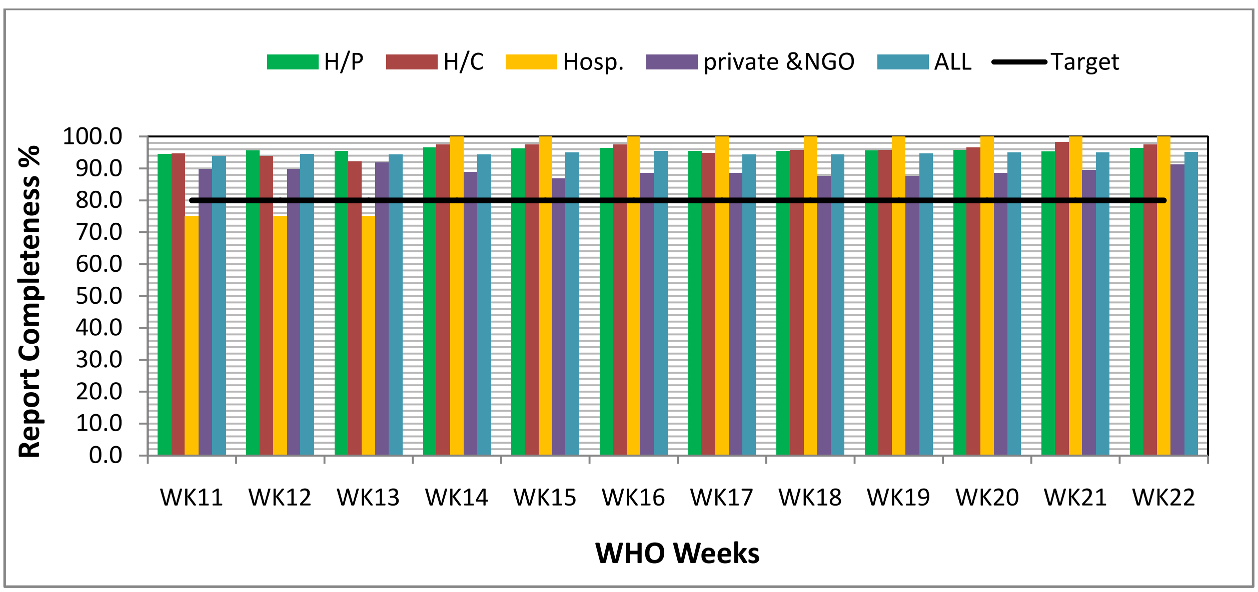


Figure 28: completeness of Past three month Weekly report by types of health facility at East Hareerge Zone, Oromia, Ethiopia 2014

The weekly reporting rate/completeness of all visited district health offices were ranged from 86% to 100% in the past three month prior to the assessment, which was all above the national minimum expected reporting rate (80%). However we couldn't able to determine the report completeness for the district by health facilities due to incompleteness and absence of copy of reported data both at district and facility level.

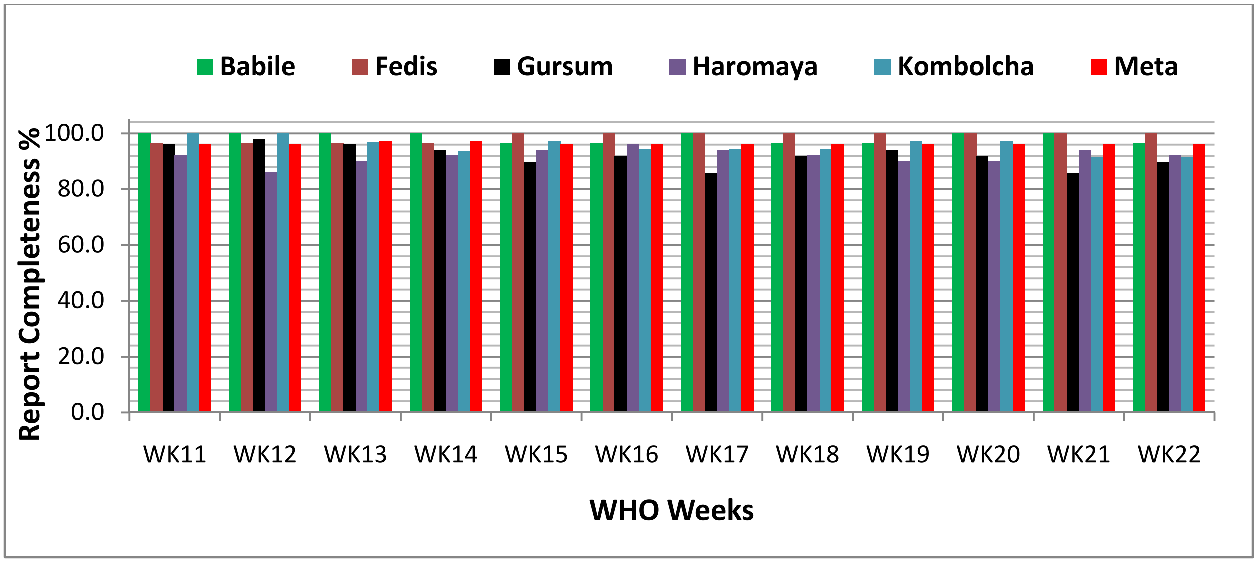


Figure 29: Three month reporting completeness of assessed districts of East Hareerge zone, Oromia,, Ethiopia 2014.

3.1.6.8. Sensitivity

The sensitivity of a surveillance system can be considered at two levels. 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 (6). However in this evaluation it was difficult to evaluate sensitivity of the system quantitatively without knowing false negatives and true positives that identified by the system, which requires collection or access to data external to the system (Eg. population survey) to determine the true frequency of reported health conditions and validation of data collected by the system.

3.1.6.9. Stability

Stability of surveillance system is the reliability and availability (ability to be operational when needed) of the surveillance system without interruption. We assessed the stability of the system based on the cost required to undertake, the desired and actual amount of the time required for the system to collect or receive data, manage the data including transfer, entry, editing, storage and release of the data. Availability of PHEM focal persons at Zonal, district and at all Health facility level is a good opportunity for running surveillance system even with limited resources. However shortage of budget and logistics specific to the system is hindering supervision and capacity building activity at zonal and district level. Moreover being engaged on activities other than surveillance of PHEM focal persons at all levels were also affected the stability and proper functioning of the system to achieve its intended objectives and purpose.

3.1.7. Discussion

A surveillance system evaluation is an important tool to assess the capacity of the system to meet its intended purpose and objectives; to improve its operation and to optimize the available resources utilization (2). Since the establishment of PHEM as a core process at all levels of the health sectors during the restructuring of health system by Business Process Re-engineering significant achievements were recorded on surveillance activities. Moreover the starting of field epidemiology training in Ethiopia has also contributed a significant role in the improvement of the surveillance by producing qualified human resource for the system. In Oromia Region, surveillance system evaluations have been done by EFETP residents during their field base residency in the past four years in different zones. Findings of these assessments have been used as inputs in strengthening surveillance activities of the region. Similarly the finding of this evaluation can be used as an input to strengthen the overall surveillance system activities of East Harerge Zone to achieve its intended objectives and purpose.

Epidemic preparedness and response is existing level of preparedness for potential epidemics (emergencies) and includes availability of preparedness plans, stock keeping, designation of isolation facilities, setting aside of resources for outbreak response (3). The purpose of preparedness is to strengthen capacity in recognizing and responding to public health emergencies through conducting regular risk identification and analysis, establishing partnership and collaboration, enhancing community participation and implementing community-based interventions and strategic communication during the pre-emergency phase and ensuring their monitoring and evaluation (1). However the preparedness level of East

Harerge Zone was poor as all assessed districts and health facilities didn't have written emergency preparedness and response plan and also 50% of districts were out of stock for emergency drugs during the assessment. In addition all assessed facilities have encountered emergency drug shortage in the past. Moreover there were no evidence or document that shows the existence and activities of emergency management team and rapid response team in all assessed facilities of the zone.

Supervision is a process of helping to improve work performance. Supervision is not an inspection. Rather, good supervision aims to sustain good quality services rather than finding things that are wrong (2). Frequent supportive supervision and providing regular feedback are vital for the improvement of surveillance data quality, stability of the system, report timeliness and report completeness. However due to shortage of budget, vehicle and logistics supportive supervision on surveillance activities have not been conducted in 2006 EFY by district health offices to their respective reporting health facilities, but the districts have been supervised by zone health office in collaboration with WHO. Even if availability of trained staff on surveillance activities is important for improvement of, data quality, reporting system, early detection and reporting of outbreaks and for achievement of objectives and purpose of the surveillance system in general, about 50% of the assessed facilities (most of health centers and health posts) surveillance focal persons were not trained on basic surveillance activities.

A public health surveillance system is dependent on a clear case definition to detect and report the health-related event under surveillance. Using standard case definitions ensures that every case is diagnosed in the same way, regardless of where or when it occurred, or who identified it. This allows for comparing the number of cases of the disease or condition that occurred in one time or place with the number occurring in another time or place (2). The case definition of a health-related event can include clinical manifestations (i.e., symptoms), laboratory results, and epidemiologic information (e.g. person, place, and time), and/or specified behaviors, as well as levels of certainty (e.g., confirmed/ definite, probable/presumptive, or possible/suspected). The use of a standard case definition also increases the specificity of reporting and improves the comparability of the health-related event reported from different sources of data (6). During the assessment we have observed standard case definition for measles, AFP, and NNT in all visited sites, but only 30 % of them have malaria case definition and none of the have cholera, Malnutrition, meningitis and others health events.

To report health related events regularly at all levels of the system, there shouldn't be shortage of reporting formats. The national public health emergency management and its partners are responsible for preparing, publishing and distributing different reporting formats to regional health bureaus to be used for reporting by all levels of the system. During the assessment 87% of health posts and 20% of health centers didn't have standard reporting format dedicated for them, there for some of them has interrupted the reporting and most of them didn't kept (documented) a copy of the report in the facility.

Effective public health responses depend on the ability of the surveillance system to provide reliable, timely and complete information to support action (6). The minimum expected reporting timeliness is 80% as per recommendation of the national PHEM guideline. The 2006 EFY weekly report timeliness 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. Regarding the report completeness both at zonal and visited districts level were above the national minimum expected reporting rate (80%), but copy of reported data were not available at health post, health center and district health office to determine the report completeness of heath facilities.

Appropriate use of data and conclusions that can be drawn from surveillance data will depend on the quality of collected data. Data quality also reflects the completeness and validity of the data recorded in the public health surveillance system (6). Examining the percentage of "unknown" or "blank" responses to items on surveillance forms is a straightforward and easy measure of data quality. Even though the reporting formats for weekly and immediately reportable diseases are well understood at all levels of the surveillance system, during the evaluation we have observed common data quality problems in all levels; mostly of blank spaces on the reported formats, like address of reporting sites not recorded, the starting and ending dates of the week not recorded, date report sent, report prepared by and zero reports were not recorded.

Surveillance is information for action. Therefore surveillance data collection either by immediately or weekly reporting system is not an end by itself. The collected data should have to be analyzed, interpreted and used for action and decision making starting from local to the central level in order for the values of the data to be realized. Analyzing and interpreting public health Surveillance data are the link between the operation of a Surveillance system and the use of data from the system to implement public health action and disease control program (6). At all level of the East Harerge Zone PHEM, surveillance data were not analyzed frequently by time, place, and person except few facilities performed minor analysis for annual and biannual report. However, weekly malaria trend analysis was done by all district health offices, five (50%) of health centers and three (37.5%) health posts.

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 (6). All respondents of the assessment agreed on the usefulness of the surveillance system for detecting outbreaks and responding accordingly to control it properly. Additionally they said the system operation and the reporting formats use are simple except two health extension workers that responded as system is difficult. It was also agreed by all respondents that the surveillance system is flexible for newly occurring health and health related events.

Acceptability of surveillance by health facilities found in the zone was good. Among the health sectors available in East Harerge Zone all district health offices were 100% active participant whereas health posts, health centers, Hospitals and other private and NGO health facilities participation on average were 95.7%, 95.9%, 93.8% and 98.0% respectively in the past 12 weeks prior to the evaluation. However there were factors influencing sites to participate actively in surveillance system like; lack of understanding on relevance of data by these facilities, lack of training, competing priorities, lack of supervision and feedbacks and poor monitoring system of governmental organizations.

Stability of surveillance system is the reliability and availability (ability to be operational when needed) of the surveillance system without interruption (6). Shortage of budget and logistics specific to the system is hindering supervision and capacity building activity at zonal and district level. Moreover being engaged on activities other than surveillance of PHEM focal persons at all levels were also affected the stability and proper functioning of the system to achieve its intended objectives and purpose.

3.1.8. Conclusion

Periodic assessment of public health surveillance system is a key activity to identify strengths and gaps of the existing system and to assess its capacity to meet its purpose and objectives. Over all the surveillance system of East Harerge zone needs improvement for the proper functioning of the system to meet its objectives and purpose.

We identified lack of written emergency preparedness and response plan that helps to strengthen capacity in recognizing and responding to public health emergencies. In addition we identified that half of assessed districts failed to have emergency drugs stock and most of facilities in the system have experienced emergency drugs shortage in the past one year.

Although there was an integrated supportive supervision that helps to identify and fill gaps related to overall activities in the zone, we identified lack of supervision specific to surveillance particularly at lower level of the system. Moreover most of the surveillance focal persons at the health facilities (health centers & health posts) were no trained on basic surveillance activities which affected the quality of collected data and effectiveness of the system.

Although case definitions of few diseases under surveillance were seen at some facilities, the standard and community case definitions for malaria and malnutrition were not identified in most of the health facilities. We have also identified lack of recording and reporting format at all health posts which caused interruption of reporting and poor documentation.

Timely and complete report from surveillance is vital to take appropriate action at the right time. Regarding timeliness the zone performance was good but we couldn't able to determine the timeliness at district and health facilities due to lack copy of reported data in some sites and others failed to record reporting time and of reported data. At zonal level the reporting rate was above the set target, but more efforts are needed to enforce all sites to report and include all health facilities in the system. In addition most of districts health offices and health centers failed to record the number of reported and expected sites under their catchment area on weekly report format that helps to determine reporting rate (completeness). Moreover we identified most of the facilities in the system didn't follow the data collection days for weekly report as stated in the national PHEM guideline; Monday to Sunday collected data needs to be included in weekly report and should be sent to the next level on the day and time dedicated for each reporting level.

The data quality also most in need of improvement, because many blank spaces were observed for necessary variables of the report in most of the visited sites. Even if weekly malaria trend analysis were performed by the majority of the sites, surveillance data analysis was not performed for all other diseases under surveillance at all levels of the system. The collected data should have to be analyzed, interpreted and used for action and decision making by all levels of the system.

Regarding attributes the surveillance system of the zone was simple, flexible and useful. Attributes that require attention for improvement of surveillance process were data quality, acceptability, timeliness, representative and stability.

3.1.9. Limitations

- Unable to determine report timeliness of districts and health centers due to poor data quality (absence of variables needed timeliness)
- Unable to determine report completeness of districts by health center and health centers by health post due to absence of data on the number of reported and expected sites under their catchment area on weekly report
- Lack of willingness by health extension workers of some health post to be assessed.
- Unable to determine sensitivity of the system quantitatively without knowing false negatives and true positives that identified by the system, which requires collection or access to data external to the system (Eg. population survey)

3.1.10. Recommendations

- Written emergency preparedness and response plans should have to be prepared at all levels of the surveillance system. In addition all levels should have to establish Emergency response management team with identified role and responsibilities. Activities of the team need to be documented properly including the meeting minutes.
- Sufficient stocks of emergency drugs should have to be constantly available at least at zonal and district levels.
- In order to increase case detection of diseases, improve the system performance, reporting and data analysis on regular basis; it is needed to build the capacity of health care providers of both governmental and non-governmental health facilities through providing training. Particularly the training needs to be given for health extension workers.
- Regular scheduled supportive supervision and provision of regular feedback on surveillance activities is needed at all level of the system for improvement of surveillance data quality, report completeness and stability of the system.
- Health facilities should have to avail standard and community case definitions of public health important diseases for health personnel and the community respectively.
- District health offices and health centers should have to record number of sites reported and number of sites expected to report on the reporting formats and they have to monitor the report timeliness and completeness on weekly bases. In addition, a copy of the report should have to be kept (documented) at all levels of the system.
- The collected data should have to be analyzed by time, person and place and interpreted to be used for action and decision making by all levels of the system.
- Sufficient amount of reporting form for health post needs to be distributed.
- All reporting sites should have to follow the PHEM guideline instructions and WHO weeks for days to be included in weekly report (Monday to Sunday). Moreover the zonal PHEM focal persons should have to create awareness on the reporting system through training and supervision.

- For the system to be stable and acceptable by all levels the national PHEAM and regional health bureau should have to assign a budget specific to the system at zonal and district level.
- Laboratory results of specimens referred to the national laboratory should have to be communicated as early as possible to confirm suspected outbreaks and take action timely.

3.1.11. Acknowledgement

I would like to acknowledge East Harerge zone health department deputy head for her support to undertake this evaluation at zonal and selected districts. Additionally, my heartfelt thanks goes to Mr. Adane East Harerge zone PHEM focal person for his support in assessment of surveillance system.

I would like to thank all visited districts and health centre's heads and PHEM focal persons for their great help and dedication during the assessment.

My deepest thanks also go to Mr. Tesfaye Deti Oromiya Regional Health Bureau-PHEM Core Process Manager for his valuable advice on selection of study sites.

Finally, my gratitude is goes to Addis Ababa University School of Public Health, CDC and EPHA for their financial, technical and logistic support to conduct this assessment.

Refernces

1. CDC. MMWR, Morbidity and Mortality Weekly Report, Update guide lines for evaluating Public Health Surveillance Systems. 2001;50.

2. WHO. Technical Guidelines for : INTEGRATED DISEASE SURVEILLANCE AND RESPONSE IN THE AFRICAN REGION. Second ed2010.

3. EPHI. Public Health Emergency Managment Guideline. 2012.

4. FMOH. Health Sector development programme- IV, annual performance report. 2010/2011;1.

5. FMOH. National Integrated Disease Surveillance and Response Guideline. 2002;1.

6. Lisa M. Lee SMT, Stephon B. Thacker, Michael E. St. Louis. Principle and practice of public health surveillance. Third ed: Oxford University 2010.

7. WHO. Emerging and other communicable Diseases, Surveillance and control. Protocol for Evaluation of Epidemiological Surveillance System. 1997.

Annex

Annex III: Zonal Level Questionnaire for evaluation of surveillance system 2012.

1. Regional /Zonal Level Questionnaire

Background Information of Region/Zone

1. Name of Region/Zone______________________________
2. Number of Zone/Woreda:_________ 1. Total____________ 2. Urban_______ 3. Rural________

I. Availability of a National Surveillance Manual

1. Is there a national manual for surveillance?

   1. Yes 2. No 3. Not applicable 4. Unknown

2. If yes, describe (last update, diseases included, case definitions, surveillance and control, integrated or different for each disease):

   ____

   ____

   ____

3. Is surveillance/IDSR included in the annual health plan (EFY 2005) of the zone/Region?

   1. Yes 2. No

II. Case Detection and Registration

4. Do you have standard case definitions for the Country's priority diseases like MENINGITIS, AFP /polio, malaria, Meningitis Neonatal tetanus and measles? (Observed the standard case definition for each priority disease)

III. 1. Yes 2. No 3. Unknown 4. Not applicable

IV. Data reporting::

5. Is the center/region responsible for providing surveillance forms to the health facilities?

   1. Yes 2. No 3. Unknown 4. Not applicable

6. If yes, is there shortage of appropriate surveillance forms at any time during the last 6 months?
7. 1. Yes 2. No 3. Unknown 4. Not applicable
8. What are the reporting units for the surveillance system?

   1. Public health facilities

2. NGO health facilities
3. Military health facilities
4. Private health facilities
5. Others________________________

9. Percent of Zonal/Woreda reported (either directly or through an intermediate level) received each reporting period at the regional level during the past 3 months:

   Number of reports in the last 3 months compared to expected number

   Weekly: _________ /12 times the number of districts

   Immediately:_____ /------ times the number of districts

10. On time (use national deadlines)

    Number of weekly reports received on time: /12 times the number of districts

11. Was there any report of the immediately reportable diseases in the past 1 month?

    1. Yes 2. No

12. If yes, with in what time is the report received after detection of the case/ diseases?

    1. Less than 1 hour 3. 2-24 hour 4. 1- 2 days
    2. 3- 7 days 5. After 1 week

13. Means of reporting to next level by:

    1. E-mail 2. Telephone 3. Fax 4. Radio

V. <u>Data analysis</u>

Does the regional level/Zonal Level

14. Describe data by person (case based, outbreaks, and sentinel)? Observed description of data by age and sex:

    1. Yes 2. No 3. Unknown 4. Not applicable

15. Describe data by place? Observed description of data by district (tables, maps)

    1. Yes 2. No 3. Unknown 4. Not applicable

16. Describe data by time? Observed description of data by time:

    1. Yes 2. No 3. Unknown 4. Not applicable

17. Perform trend analysis? Observed line graph of cases by time

    1. Yes 2. No 3. Unknown 4. Not applicable

18. List disease(s) for which line graph is observed

____

____

____

____

____

19. Have an action threshold defined for each priority disease? (MENINGITIS, Measles, AFP/polio, malaria)

    1. Yes 2. No 3. Unknown 4. Not applicable

20. Who is responsible for the analysis of the collected data? _________________________

21. How often do you analyze the collected data?

    1. Daily 3. Weekly 5. Every 2 weeks
    2. Monthly 4. Quarterly 6. As needed……..

22. Have appropriate denominators? Observed presence of demographic data (E.g. population by district and hard to reach groups)

    1. Yes 2. No 3. Unknown 4. Not Applicable

VI. Outbreak Investigation

23. Number of outbreaks suspected in the past year:_________________________

24. List the diseases: _______________________________

    ____

    ____

25. Of those, number of investigated outbreak: (Observe reports & take copies) ____________

26. Number of outbreaks in which risk factors were looked for:_____________

27. Number of outbreaks in which findings were used for action: [Observe report] ________

28. Number of districts that looked for risk factors [observe in reports] _________________

29. Number of districts that used the data for action [observe in final report] _____________

VII. Epidemic preparedness(relevant for epidemic prone diseases)

30. Does the Region/Zone have a written emergency preparedness plan for any of the outbreak disease relevant to the area? (Observed a written plan)

    1. Yes 2. No 3. Unknown 4. Not applicable

31. Existence of emergency stocks of drugs, vaccines, and supplies at all times in past 1 year:

    Has the region/Zone had emergency stocks of drugs, vaccines, and supplies at all times in past 1 year?

    1. Yes 2. No 3. Unknown 4. Not applicable

32. Has the Region/zone experienced shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)?

    1. Yes 2. No 3. Unknown 4. Not applicable

33. Do you have a standard case management protocol for MENINGITIS, Malaria, AFP (polio), measles (Observed the existence of a written case management protocol for at least 1 priority disease)

    1. Yes 2. No 3. Unknown 4. Not applicable

34. If yes, list:____

35. Is there a budget line for epidemic response?

    1. Yes 2. No 3. Unknown 4. Not applicable

36. Is there a regional/Zonal epidemic management committee? Observed minutes (or report) of meetings of epidemic management committee

    1. Yes 2. No 3. Unknown 4. Not applicable

37. Does the region/Zone have a rapid response team for epidemic?

    1. Yes 2. No 3. Unknown 4. Not applicable

VIII. Response to epidemics

38. Does the region/Zone respond within 48/24 hours of notification of most recently reported outbreak: Observed that the region/zone responded within 48 hours of notification of most recently reported outbreak (from written reports with trend and intervention)

    1. Yes 2. No 3. Unknown 4. Not applicable

39. Has epidemic management committee evaluated its preparedness and response activities during the past year (Observe written report to confirm)?

1. Yes 2. No 3. Unknown 4. Not applicable

IX. Feedback

40. How many feedback reports has the regional/zonal level produced in the last year? Observed the presence of a report that is regularly produced to disseminate surveillance data

1. Yes 2. No 3. Unknown 4. Not applicable

X. Supervision

41. How many supervisory visits have you made in the last 6 months? ______________

Obtained required number of visits from regional/zonal level _______________

42. The most usual reasons for not making all required supervisory visits. (Text)

____

____

____

XI. Training

43. What percent of your subordinate personnel have been trained in surveillance? ___________

44. Have you been trained in disease surveillance?

1. Yes 2. No 3. Unknown 4. Not applicable

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

____

____

____

XII. Resources

Percent of sites that have:

46. Data management

Computer	1. Yes	2. No	3. Unknown	4. Not applicable
Printer	1. Yes	2. No	3. Unknown	4. Not applicable
Photocopier	1. Yes	2. No	3. Unknown	4. Not applicable

Data manager 1. Yes 2. No 3. Unknown 4. Not applicable

Statistical package 1. Yes 2. No 3. Unknown 4. Not applicable

47. Communications

Telephone service 1. Yes 2. No 3. Unknown 4. Not applicable

Fax 1. Yes 2. No 3. Unknown 4. Not applicable

Radio call 1. Yes 2. No 3. Unknown 4. Not applicable

Satellite phone 1. Yes 2. No 3. Unknown 4. Not applicable

XIII. Surveillance

48. Do you have a computerized surveillance network at this level?

1. Yes 2. No 3. Unknown 4. Not applicable

49. Is there a budget source for surveillance in the Regional/zonal level?

1. Yes 2. No 3. Unknown 4. Not applicable

50. If yes, what is the proportion: % ________________

51. How could surveillance be improved? (Opportunities for strengthening surveillance)

____

____

XIV. Surveillance Co-ordination

52. Is there a focal unit for surveillance at the regional/zonal level? [Observe organo-gram to confirm]

1. Yes 2. No 3. Unknown 4. Not applicable

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

____

____

____

XV. Questionnaire for Attributes and level of Usefulness in 2014

54. What is the incidence / Prevalence of priority disease in your area

S/N	Diseases	2010		2011		2012		2013		2014	
		case	Death	Case	Death	case	Death	case	Death	case	Deat

						h
1	Meningitis					
2	Malaria					
3						
4						

55. Does the surveillance system help for these selected priority diseases?

1. To detect outbreaks of these selected priority diseases early?

   1. Yes 2. No

2. To estimate the magnitude of morbidity and mortality related to these diseases, including identification of factors associated with these diseases?

   1. Yes 2. No

3. Permit assessment of the effect of prevention and control programs?

   1. Yes 2. No

4. Interventions and diseases trends analyzed

   1. Yes 2. No

XVI. Describe Each System Attributes:

I. Simplicity:

1. Is the case definition of meningitis, malaria, AFP (polio), neonatal tetanus, meningitis and measles easy for case detection by all level health professionals?
   1. Yes 2. No
2. What are the organizations which need to receive reports of the surveillance data?
3. Do you feel that additional data collected on a case are time consuming?
   1. Yes 2.No

4. How long it takes to fill the format? 1. <5 minute 2. 10-15minuts 3. >15 minutes
5. How long does it take to have laboratory confirmation of
   A. MENINGITIS ______________
   B. Measles ____________
   C. Malnutrition _________
   D. Malaria ____________

II. Flexibility:

1. Can the current reporting formats be used for other newly occurring health event (disease) without much difficulty?
   1. Yes 2. No
2. Do you think that any change in the existing procedure of case detection, reporting, and formats will be difficult to implement?
   1. Yes 2. No

   Comment:____

   ____

   ____

III. Data Quality: (Completeness of the reporting forms/and validity of the recorded data)

1. Are the data collection formats for these priority diseases clear and easy to fill for all the data collectors/ reporting sites?
   1. Yes 2. No
2. Review the last months report of these diseases
   A. Average number of unknown or blank responses to variables in each of the reported forms

   ____

   ____

   B. Percent of reports which are complete(i.e. with no blank or unknown responses) from the total reports

   ____

   ____

   ____

IV. Acceptability:

1. Do you think all the reporting agents accept and well engaged to the surveillance activities?

   1. Yes 2. No

2. If yes, how many are active participants (from the expected)? _______________

3. If No, what is the reason for their poor participation in the surveillance activity?

   1. Lack of understanding of the relevance of the data to be collected
   2. No feedback / or recognition given by the higher bodies for their contribution; i.e. no dissemination of the analysis data back to reporting facilities
   3. Reporting formats are difficult to understand
   4. Report formats are time consuming
   5. Other

   ____

   ____

V. Representativeness:

1. What is the health service coverage of the zone/ region? __________%

2. Do you think, the populations under surveillance have good health seeking behavior for these diseases?

   1. Yes 2. No

3. Do you think is well represented by the surveillance data?

   1. Yes 2. No

VI. Stability:

1. Was the new BPR restructuring affect the procedures and activities of the surveillance of these diseases? 1. Yes 2. No

2. Was there lack of resources that interrupt the surveillance system? 1. Yes 2. No

Annex IV : District (intermediate) level questionnaire for surveillance system evaluation

Identifiers

Assessment team	District
Date	region/province
Interviewer	country
Respondent	surveillance system

Percent of districts with available national surveillance manual

1. Is there a national manual for surveillance at this site?

   Obs Observe national surveillance manual:

   Yes ☐ No ☐ unknown ☐ Not Applicabl ☐

I. Case confirmation

Percent of districts that have the capacity to transport specimens to a higher level lab

2. Does the district have the capacity to transport specimens to a higher level lab?

   Yes ☐ No ☐ unknown ☐ Not Applicable ☐

Percent of districts with guideline for specimen collection, handling and transportation to next level

3. Does the district have guidelines for specimen collection, handling and transportation to the next level?

   Yes ☐ No ☐ unknown ☐ Not Applicable ☐

II. Data reporting

Percent of sites that have forms recommended for the country for that site at all times over the past 6 months

4. Have you lacked forms recommended for the country at any time during the last 6 months?

   Yes ☐ No☐ unknown☐ Not Applicable ☐

Percent of health facilities that reported each reporting period to the district level during the past 3 months:

5. Number of reports received in the last 3 months compared to expected number

   Weekly: ___________________ /12 times the number of health facilities

   Immediately: _______________________/----- times the number of health facilities

On time (use national deadlines)

6. Number of weekly reports submitted on time: ____/12 times the number of health facility
7. Number of immediately reports submitted on time: ___________/3 times the number of health facilities
8. Percent of districts that have means for reporting to next level by e-mail, telephone, fax or radio

   How do you report:

   a. Mail
   b. Fax
   c. Telephone
   d. Radio
   e. Electronic
   f. Other

Strengthening reporting

9. How can reporting be improved?

   ____

   ____

III. Data analysis____

10. I. Percent of sites that:

Describe data by person (case based, outbreaks, sentinel)

Obs Observed description of data by age and sex

Yes ☐ No☐ unknown☐ Not Applicable ☐

11. Describe data by place

Obs Observed description of data by place (locality, village, work site etc)

Yes ☐ No☐ unknown☐ Not Applicable ☐

12. Describe data by time

Obs Observed description of data by time

Yes ☐ No☐ unknown☐ Not Applicable ☐

13. Perform trend analysis

Obs Observed line graph of cases by time

Yes ☐ No☐ unknown☐ Not Applicable ☐

14. List:

____

____

15. Have an action threshold for each priority disease

Do you have an action threshold for any of the country priority diseases?

Yes ☐ No☐ unknown☐ Not Applicable ☐

16. If yes, what is it? __________cases _________% increase ________rate (Ask for 2 priority diseases)_

____

____

17. Have appropriate denominators

Obs Observed presence of demographic data at site (E.g. population <5 yr, population by village, total population)

Yes ☐ No☐ unknown☐ Not Applicable ☐

18. Who is responsible for data analysis? ______________________

19. How often do you analyze the collected data?

    a. Daily
    b. Weekly
    c. Every 2 weeks
    d. Monthly
    e. Quarterly
    f. As needed……..

IV. Outbreak investigation

20. Percent of suspected outbreaks that were investigated in the past 6moths:

Number of outbreaks suspected in the past year6 months:_______________

Obs Of those, number investigated (Observe reports and take copies if possible): ____________________

21. have you ever conducted an outbreak investigation

Has your district ever investigated an outbreak?

Ye☐ N☐ unkn☐ Not Applic☐

V. Epidemic preparedness

22. have your district a plan for epidemic preparedness and response

(Obs) Observed a written plan of epidemic preparedness and response

Yes ☐ No☐ unknown☐ Not Applicable ☐

23. have your district have emergency stocks of drugs and supplies at all times in past 1 year?

Obs Observed the stocks of drugs and supplies at time of assessment

Yes ☐ No ☐ unknown ☐ Not Applicable ☐

24. Has the district experienced shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)?

Yes ☐ No ☐ unknown ☐ Not Applicable ☐

25. Is there a budget line or access to funds for epidemic response?

Yes ☐ No ☐ unknown ☐ Not Applicable ☐

26. Does your District that have an epidemic management committee

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

Yes ☐ No ☐ unknown ☐ Not Applicable ☐

27. Does the district have a rapid response team for epidemics?

Yes ☐ No ☐ unknown ☐ Not Applicable ☐

VI. Responses

28. Percent of sites that implemented prevention and control measures based on local data for at least one reportable disease or syndrome

Has the district implemented prevention and control measures based on local data for at least one reportable disease or syndrome?

Yes ☐ No ☐ unknown ☐ Not Applicable ☐

29. In how many time do you respond to Epidemic situation?

Obs Observed that the district responded within 48 hours of notification of most recently reported outbreak (from written reports)

Yes ☐ No ☐ unknown ☐ Not Applicable ☐

30. Does your district achieved acceptable case fatality rates (e.g. 10% for Meningococcal CSM 1% for Cholera) during the most recent outbreak?

Obs What was the case fatality rate for most recent outbreak ?(Observe from outbreak report)

Yes ☐ No ☐ unknown ☐ Not Applicable ☐

31. Has epidemic management committee evaluated their preparedness and response activities during the past year? (observe written report to confirm)

Yes ☐ No ☐ unknown ☐ Not Applicable ☐

VII. Feedback

32. How many feedback written reports has the district produced in the last year?

Obs Observed the presence of a written report that is regularly produced to disseminate surveillance data (district and higher)

Yes ☐ No ☐ unknown ☐ Not Applicable ☐

33. How many feedback bulletin or reports has the district received in the last year?

Obs Observed at least 1 report or bulletin at district from a higher level during the past year on the data they have provided

Yes ☐ No ☐ unknown ☐ Not Applicable ☐

VIII. Supervision

34. How many times have you been supervised by the higher level in the last 6 months?

Obs Observed supervision report or any evidence of supervision in last 6 months

Yes ☐ No ☐ unknown ☐ Not Applicable ☐

35. Number of Observed appropriate review of surveillance practices in the district in the past 6 month?______________

36. How many supervisory visits have you made in the last 6 months?

Expected ☐ Achieved: ☐ Not Done: ☐

(Obtain required number of visits from central level)_________________

37. The most usual reasons for not making all required supervisory visits. (Text)

Reason 1____

Reason 2____

Reason 3____

IX. Training

38. Number of health personnel (in position of responsibility) trained in disease surveillance?_____________

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

____

40.Number of Health personnel in the district have been trained in surveillance and epidemic management? ____________________________________

X. Resources

40. I. Do the district have Important Logistics?

a. Electricity c. Bicycles

b. Motor cycles d. Vehicles/ambulance

41. Data management

a. Stationery c. Calculator d. Computer

b. Printer Statistical package

42. Communication

a. Telephone service c. Fax

b. radio d. Computers that have modems

43. Information education and communication materials

a. Posters
b. VCR and TV set
c. Projector (Movie)
d. Megaphone
e. Generator
f. Other:
g. Flipcharts or Image box
h. Screen

44. Hygiene and sanitation materials

a. Spray pump
b. Disinfectant

XI. Surveillance co-ordination:___________________

45. Is there a surveillance co-ordination focal point within the district epidemic management committee?

Yes ☐ No ☐ unknown ☐ Not Applicable ☐

XII. Satisfaction with surveillance system__________________________________

with surveillance system

46. Are you satisfied with the surveillance system?

Yes ☐ No ☐ unknown ☐ Not Applicable ☐

47. If no, how can the surveillance system be improved?

____

____

48. Opportunities for integration

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

____

____

____

Annex V: Health facility [Hospital/Health Canter] *level questionnaire for surveillance system evaluation*

Identifiers

Assessment team__________ Type of health facility_____________

Date_________ District Name___________________

Interviewer________ Region/province__________________

Respondent_________ Country_________________________

Name of health facility________ Surveillance system _______________

---

1. Is there a national manual for surveillance at the Hospital? Health center?

   Obs Observe national surveillance manual:

   Yes ☐ No ☐ unknown ☐ Not Applicable ☐

I. <u>Case detection and registration</u> ____________________________________

2. Does Hospital/Health Center that have a clinical register?

   Obs Observed the existence of a clinical register ?

   Yes ☐ No ☐ unknown ☐ Not Applicable ☐

3. Does the Health Center/Hospital correctly register cases?

   Obs Observed the correct filling of the clinical register during the previous 30 days

   Yes ☐ No ☐ unknown ☐ Not Applicable ☐

4. Does the Health Center/Hospital have standardized case definitions for priority diseases(MENINGITIES, AFP (polio), measles, malaria?

Yes____ No ____ unknown ____ Not Applicable_____

II. Case confirmation

5. Does the Hospital/Health center have the capacity to collect specimens (sputum stool, blood/serum and CSF)?

Are you able to collect sputum Y: ☐ N ☐ U ☐ N/A: ☐

Stool Y ☐ N ☐ U ☐ N/A ☐

Blood Y ☐ N ☐ U ☐ N/A ☐

CSF at this facility? Y ☐ N ☐ U ☐ N/A ☐

6. Does the Hospital/Health Center have necessary materials required to collect specimen?

Stool ? Y N U N/A

blood/serum Y N U N/A

CSF Y N U N/A

7. Does The Hospital/Health Center have the capacity to handle specimens like sputum, stool, blood/serum and CSF until shipment?

Yes No Unknown Not applicable

8. Does the Hospital/health Center have proper cold chain management during shipment?

Yes No Unknown Not applicable

9. Does the Hospital/health Center have the capacity to ship specimens to a higher level lab?

Yes No Unknown Not applicable

10. Does the Hospital/health Center have packing materials for shipment of specimens at health facility?

Yes No Unknown Not applicable

III. Data reporting

11. Does the Hospital/health Center have appropriate surveillance forms for that site at all times over the past 6 months?

Yes No Unknown Not applicable

12. Does the Hospital/health Center have accurately report cases from the registry into the summary report to go to higher level?

Observed that the last monthly report agreed with the register for 4 diseases (1 for each targeted group [eradication; elimination; epidemic prone; major public health importance])

a. Obs Measles Y N U N/A
b. Obs Malaria Y N U N/A
c. Obs Malnutrition (polio) Y N U N/A
d. Obs MENINGITIES Y N U N/A

13. Does the Hospital/health Center have reported each reporting period to the next higher level during the past 3 months?

Number of reports in the last 3 months compared to expected number

Obs Weekly: /12 times the number of sites

Obs immediately: /-- times the number of sites

14. On time (use national deadlines)

Obs Number of weekly reports submitted on time:-_____ /12 times the number of sites

Obs Number of immediately reports submitted on time: ___/-- times the number of sites

15. Does the Hospital/health Center have have means for reporting to next level by e-mail, telephone, fax or radio

How do you report?

a. Mail
b. Fax

c. Telephone
d. Radio
e. Electronic
f. Other

16. Strengthening reporting

How can reporting be improved?

____

____

____

IV. Data analysis

Percent of sites that:

17. Does the Hospital/health Center have describe data by person (outbreaks, sentinel)?

Obs Observed description of data by age and sex

Yes No Unknown Not applicable

18. Does the Hospital/health Center have describe data by place

Obs Observed description of data by place (locality, village, work site etc)

Yes No Unknown Not applicable

19. Does the Hospital/health Center have describe data by time ?

Obs Observed description of data by time

Yes No Unknown Not applicable

20. Does the Hospital/health Center have Perform trend analysis?

Obs Observed line graph of cases by time

Yes No Unknown Not applicable

21. Does the Hospital/health Center have an action threshold for each priority disease ?

Do you have an action threshold for any of the Country priority diseases?

Yes No Unknown Not applicable

22. If yes, what is it (Ask for 2 priority diseases)? ________cases _____ % increase ______rate

23. In the Hospital/health Center Who is responsible for data analysis? ____________________________

24. In the Hospital/health Center have How often do you analyze the collected data?

   a. Dail
   b. Weekly
   c. Every 2 weeks
   d. Monthly
   e. Quarterly
   f. As needed……..

25. Does the Hospital/health Center have appropriate denominators

Obs Observed presence of demographic data at site (E.g. population <5 yr., population by village, total population)

Yes No Unknown Not applicable

V. Epidemic preparedness

26. Does the Hospital/health Center have a standard case management protocol for epidemic prone diseases

Obs Observed the existence of a written case management protocol for 1 epidemic prone disease

Yes No Unknown Not applicable

VI. Epidemic response

27. Percent of sites that implemented prevention and control measures based on local data for at least one epidemic prone disease

Does the Hospital/health Center have implemented prevention and control measures based on local data for at least one epidemic prone disease?

Yes No Unknown Not applicable

28. Does your Hospital/health center achieved acceptable case fatality rates? (e.g. 10% for Meningococcal CSM 1% for Cholera) during the most recent outbreak

Obs Observed that the health facility achieved an acceptable case fatality rate for most recent outbreak

Yes No Unknown Not applicable

VII. Feedback

Does your Hospital/health center have received a report or bulletin from a higher level during the past year on the data they have provided?

Yes No Unknown Not applicable

29. How many feedback bulletin or reports has the health facility received in the last year? ___

30. Does your Hospital/health center conducted at least semi-annual meetings with community members to discuss results of surveillance or investigation data ?

Yes No Unknown Not applicable

How many meetings has this the Hospital/health Center conducted with the community members in the past six months? ________________

VIII. Supervision:

31. How many times have you been supervised in the last 6 months?_________

32. Of those supervised in the previous 6 months, percent of individuals for which the supervisor from the next higher level reviewed surveillance practices appropriate to their level

Obs Observed supervision report or any evidence for appropriate review of surveillance practices

Yes No Unknown Not applicable

IX. Training

33. Does health personnel In Hospital/Health center trained in disease surveillance and epidemic management?

Yes No Unknown Not applicable

34. Number of Helath Personnel trained ________

35. If yes, specify when, where, how long, by whom?_______________________________

____

X. Resources

36. Number of Hospital/Health center that have Logistics

a. Electricity
b. Bicycles
c. Motor cycles
d. Vehicles

37. Data management in Health Center/Hospital

a. Stationery c. Calculator e. Computer

b. Software d. Printer f. Statistical package

38. Communications in Health Center/Hospital

a. Telephone service c. Radio call

b. Fax d. Computers that have modems

39. Information education and communication materials in Health Center/Hospital

a. Posters d. Megaphone f. Flipcharts or Image box

b. VCR and TV set e. Generator Screen

c. Projector (Movie) g. Other:

40. Hygiene and sanitation materials in Health Center/Hospital

a. Spray pump b. Disinfectan

41. Protection materials (list) ________________________________ ______ ________

____

____

XI. Satisfaction with surveillance system_____________________________________

42. Satisfaction with the surveillance system in Health Center/Hospital

Are you satisfied with the surveillance system?

Yes No Unknown Not applicable

43. If no, how can the surveillance system be improved? ____________________________

____

44. Opportunities for integration

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

____

____

____

Annex VI: Health Post level questionnaire for surveillance system evaluation

Identifiers

Assessment team Type of health facility

Date District

Interviewer Region/province

Respondent Country

Name of health facility Surveillance system

---

1. Number of Health Post with national surveillance manual

    Is there a national manual for surveillance at Health Post?

    Obs Observe national surveillance manual:

    Yes No Unknown Not applicable

I. Case detection and registration ____________________

2. Does the Health Post that have a clinical register ?

    Yes No Unknown Not applicable

3. Does the Health Post correctly register cases during the previous 30 days?

    Yes No Unknown Not applicable

4. Does the Health Post have standardized case definitions for the priority diseases (each priority disease) Meningitis, AFP (polio), measles, malaria?

    Yes No Unknown Not applicable

II. Data reporting ____________________

5. Does the Health Post have appropriate surveillance forms for that site at all times over the past 6 months

Yes No Unknown Not applicable

6. Does the Health Post reported accurately cases from the registry into the summary report to go to higher level

Observed that the last monthly report agreed with the register for 4 diseases (1 for each targeted group [eradication; elimination; epidemic prone; major public health importance])

a. Obs Measles Y N U N/A
b. Obs Malaria Y N U N/A
c. Obs AFP (polio) Y N U N/A
d. Obs Meningits Y N U N/A

7. Does the Health Post that reported each reporting period to the next higher level during the past 3 months?

Yes______ No____________ not Known_________ Not applicable________

8. Number of reports in the last 3 months compared to expected number

Obs Weekly: /12 times the number of sites

Obs immediately: /-- times the number of sites

9. On time (use national deadlines)

Obs Number of weekly reports submitted on time:-_____ /12 times the number of sites

Obs Number of immediately reports submitted on time: ___/-- times the number of sites

10. Does the Health Post have means for reporting to next level by e-mail, telephone, fax or radio

How do you report?

a. Mail
b. Fax
c. Telephone

d. Radio
e. Electronic
f. Other

11. Strengthening reporting

How can reporting be improved?

____

____

____

III. Data analysis

Percent of sites that:

12. Does the Health Post describe data by person (outbreaks, sentinel)

Obs Observed description of data by age and sex

Yes No Unknown Not applicable

13. Does the Health Post describe data by place

Obs Observed description of data by place (locality, village, work site etc)

Yes No Unknown Not applicable

14. Does the Health Post describe data by time

Obs Observed description of data by time

Yes No Unknown Not applicable

15. Does the Health Post Perform trend analysis

Obs Observed line graph of cases by time

Yes No Unknown Not applicable

IV. Epidemic response____

16. Does the Health Post implemented prevention and control measures based on local data for at least one epidemic prone disease for at least one epidemic prone disease?

Yes No Unknown Not applicable

V. Feedback____

17. Does the Health Post have received a report or bulletin from a higher level during the past year on the data they have provided

Yes No Unknown Not applicable

18. How many feedback bulletin or reports has the health facility received in the last year? _____________

19. Does the health post receive at least 1 report or bulletin from a higher level during the past year on the data they have provided ?

Yes No Unknown Not applicable

20. Doe the health post conducted at least semi-annual meetings with community members to discuss results of surveillance or investigation data?

Yes No Unknown Not applicable

21. How many meetings has the health post conducted with the community members in the past six months? ________________

Obs Observed the minutes or report of at least 1 meeting between the health facility team and the community members within the six months

Yes No Unknown Not applicable

VI. Supervision:____

22. Is HEWs was supervised in the past 6 months?

Yes No Unknown Not applicable

23. How many times have you been supervised in the last 6 months?_________

24. Of those supervised in the previous 6 months, percent of individuals for which the supervisor from the next higher level reviewed surveillance practices appropriate to their level

Obs Observed supervision report or any evidence for appropriate review of surveillance practices

Yes No Unknown Not applicable

VII. Training

25. Number of HEWs trained in disease surveillance and epidemic management?

Yes No Unknown Not applicable

26. If yes, specify when, where, how long, by whom?________________________________

____

VIII. Resources

27. Does the Health post have

a. Electricity c. Motor cycles

b. Bicycles d. Vehicles

28. Data management

a. Stationery c. Calculator e. Computer

b. Software d. Printer f. Statistical package

29. Communications

a. Telephone service c. Radio call

b. Fax d. Computers that have modems

30. Information education and communication materials

a. Posters d. VCR and TV set g. Generator

b. Megaphone e. Screen h. Projector (Movie)

c. Flipcharts or Image box f. Other:

31. Hygiene and sanitation materials

a. Spray pump

b. Disinfectant

32. Protection materials (list) ________________________________ ______ ________

____

____

IX. Satisfaction with surveillance system

33. Satisfaction with the surveillance system

Are you satisfied with the surveillance system?

Yes No Unknown Not applicable

34. If no, how can the surveillance system be improved? ____________________________

____

35. Opportunities for integration

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

____

____

____

Annex VII: laboratory assessment tool *for surveillance system evaluation*

LABORATORY ASSESSMENT TOOL

General information		
Name of the laboratory		
Address of the laboratory:	Telephone_______ Fax_______ e-mail__________	
Level of the Laboratory :	Community Health Facility District Regional National	
Affiliation of the Laboratory :	**Public**/Private /Academic /Religious Institution / NGO	
Name of head of Laboratory		
Building Facilities and utility services		

Is the laboratory in a free-standing building or part of larger structure?		
How many rooms with bench space are there in the laboratory Do the Laboratory have the following services available? Electricity/Running water		
Is there a back-up power source in case of power failure (e.g. emergency generator)?	Yes / No	
If yes, what systems are protected?		
Refrigerators/freezers	Yes No	
Computers	Yes No	
Other(specify)	Yes No	
What types of communications systems are available?		
Post	Yes No	
Telephone	Yes No	
Fax	Yes No	
Satellite phone	Yes No	

E-mail (no. computers)	Yes No	
Internet (no.computer)	Yes No	
Laboratory staff		
1. Medical Laboratory Professioal Number a. MSc, b. Bsc c. Dipoma		
2. Assistants (not doing tests)		
3. Clerical/Cleaner		
Has training been conducted for the laboratory staff on		
MENINGITIES		
Malaria		
Other epidemic prone diseases (briefly describe)		
If yes when was the last training been conducted for your laboratory staff ?		

Reagents

Where you are getting your reagents?	From a commercial supplier
	From another laboratory
	Supplied by Regional/Zonal/District/health office
Was there shortage of reagents in the last six month which are used for identifying diseases	Yes/No
If Yes What Are the most important reasons?	Lack of funds Lack of information unprioritizing others(specify)
What type of water is used for preparation of media and reagents?	
Deionized Distilled Distilled Tap water	Yes No Yes No Yes No

Tests performed at the laboratory

Disease	**Specimen type**	**Assay Performed**	**Yes**	**No**	**Number/ Month**
Meningitis	CSF	a. Cell count b. Latex agglutination			

		c. Gram stain d. Culture e. Identification tests f. A-M susceptibility			
Watery diarrhea (cholera)	Faeces	Microscopy of wet preparation Culture-TCBS Culture-Alk. Peptone Serotyping			
Malaria	Blood	Thick/Thin film microscopy			
Measles	Serum Throat swab, conjunctival swab	IgM by EIA Other serological test Virus isolation			
Yellow fever	Blood, postmortem liver	IgM Virus isolation			

suspect typhoid or brucellosis	Blood, faeces serum	Culture Identification tests A-M susceptibility Serological tests (Widal, brucella agglutinins)			
Hepatitis	Serum	Anti-HAV IgM Anti-HbsAg Anti-HCV IgM			
Viral haemorrhagic fevers (any)	Serum Serum, other tissue specimens	IgM Virus detection			
Acute flaccid paralysis	Faeces	Virus isolation Virus typing			

Specimen collection, labeling and handling

Do request forms contain **ALL** of the following patient information: specimen source, date and time of collection, type of test requested?	Yes No
Are specimens that are received labeled with the patient's name and	Yes No

unique identifiers?	
Does the laboratory have a logbook/electronic record of all specimens sent for diagnostic testing?	Yes No
Are specimens discarded after testing, or are they stored?	Discarded Stored
Does you laboratory refer bacteriology isolates or serum samples to a reference laboratory?	Yes No
If yes, reason for referral (□□all)	
Confirmation Identification of unknown organism Test not performed on site	Yes No Yes No Yes No
Number of sample referred in the last six month?	
Types of transport media used (□□all that apply)	
Trans-isolate Cary and Blair Viral transport medium	Yes No Yes No Yes No
Other (describe):	

Reporting procedures

Are records kept of the number and type of tests performed and results?	Yes No
Does the laboratory have a list of diseases that are supposed to be reported to the Ministry of Health?	Yes No
Does the lab staff know what diseases should be reported?	Yes No
Does the lab provide regular reports of patients with notifiable diseases to any of the following Ministry of Health offices/institutions?	
District Health Office State Health Office	Yes / No / NA Yes / No/ NA
National / MOH level	Yes / No/ NA Yes / No /NA
If reports are submitted, how frequently?	
Weekly Monthly Quarterly Other	Yes No Yes No Yes No Yes No
Quality control procedures and programs	
Does the laboratory use any system for internal quality control?	Yes No

Does the laboratory participate in any external quality assurance or proficiency schemes?	Yes No
Was there any general laboratory supervision conducted to this laboratory?	Yes No
If yes, how often in for the last one year?	one times/two times/ three and more
Does your laboratory have a system for regularly monitoring of quantities of reagents and materials so that there is warning if stocks become low?	Yes No

Chapter-IV: Health profile description

4.1. Health Profile Description of Tullo District, West Harerge Zone Oromia, Ethiopia, 2013/14

Abstract

Health Profile assessment is a systematic collection, organization and documentation of health and socio-demographic data from a specific area. This summarized and comprehensive health profile data of the district is important for public health officials and stakeholders to use it for policy development, planning and evaluation of public health programs.

We collected retrospective health and demographic data from Tullo District, West Harerge Zone, from February 26, 2014 to March 8, 2014 by using standard checklist and interview. The data was analyzed using Microsoft Excel and Epi-Info software's.

The total area of the district is about 450 km^2 . Administratively, the district is divided in to 33 kebeles (30 rural and three urban kebeles). The population of the district in 2006 EFY is estimated to be 179,078; of whom 91,450 (51.1%) were males. The health service coverage of the district was 100% in terms of health post and 85.7% in terms of health centers. In 2005 the district's full immunization coverage, family planning coverage and TB case detection rate was 90%, 76% and 52 % respectively. The leading cause of adult outpatient (OPD) and inpatient visit was trauma, whereas the leading causes of under-five OPD visit was pneumonia (42%). HIV prevalence was 0 .16%.

The leading cause of adult OPD and IPD visit was trauma; hence health official's in collaboration with the district police should have to work hard on prevention and control of trauma.

Key word: -Health profile, Health indicators, District Health system

4.1.1. Introduction

Historical development of modern medicine in Ethiopia as organized by government began to be practiced at the beginning of 20^{th} century. However it was introduced and practiced in a fragmentary situation starting from 16^{th} century by different groups of people ranging from religious and diplomatic missions to travelers, traders, invaders and warriors. The government was not fully responsible for the operating of modern health service system until the start of 20^{th} century. Prior this time, even though the services existed they were limited to few private individuals, religious missions, diplomats and member of the royal family. The first government sponsored health facilities were established in Harar and Addis Ababa by Ras Mekonen an Emperor Minilik-II in1909 respectively (1). The first health legislation that formally delegates the government with the responsibility of ensuring public health was promulgated in 1947. Following this legislation, a separate Ministry of health was established in 1948. However the health service provided were majorly centered in main cities to the ruling and wealthy class (2).

Following the 1974 revolution, the country's health policies were reformulated to emphasize disease prevention and control, decentralization and rural health services, self reliance and community involvement. Ethiopia signed the Alma Ata charter in 1978 to implement primary health care (PHC) and adapted the 1979 declaration of "Health for all by the year 2020" using PHC strategies (3). The basic principles of PHC were community participation, intersectoral collaboration, utilizing technology in health care activities, focus on prevention and ensuring the equitable distribution of health care resources across rural/urban and wealthy/poor population group (4).

Health Profile assessment is a systematic collection, organization and documentation of health and health related data of specific area. 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. This summarized and comprehensive public health data of the district is important for public health officials and stakeholders to use it for policy development, planning, implementation and evaluation of public health programs. More over Describing health profile of a particular district is vital to describe and communicate health status and determine diseases burden in a simple way and can also be used as an entry point for operational research. Hence collecting, compiling and documenting of health profile of a district is critically important for countries like Ethiopia where data management and information system is poor, especially at district level. Hence this data will be a valuable asset for the health offices that found in this zone.

4.1.2. Objectives

4.1.2.1. General objective

To develop comprehensive district health profile for Tullo woreda of west Harerge Zone, Oromia Region, Ethiopia 2014.

4.1.2.2. Specific objectives

- To assess the health and others health related condition of the district.
- To describe Tullo district health service status, health indicators and to identify problems for priority setting.
- To determine disease burden and communicate health and others health related information in simple way.

4.1.3. Materials and Methods

4.1.3.1. Data collection tool and method

Cross sectional descriptive study design was used to describe the health profile of the district. We interviewed district experts using standard questionnaires and reviewed available data at Tullo District Health Office; Tullo District Education Office; Tullo District Water and Energy Office; agricultural office; Disaster Preparedness, Prevention and Control Office; Tullo District Culture and tourism office and national housing and population census of 2007 report.

4.1.3.2. Study period

We collected Health, demographic and others health related data in Tullo District, West Hareerge Zone, from February 26, 2014 to March 8, 2014.

4.1.3.3. Study area

Health profile assessment was done at Tullo Woreda (district). Tullo District was found in the West Harerge Zone, Eastern part of Oromia region, about 374 km away from the capital.

4.1.3.4. Data analysis procedure

We compiled and analyzed collected data by using Micro-Soft Excel and Epi-Info Software's.

4.1.4. Results

4.1.4.1. Historical Background and culture

Tullo District is one of 309 districts in Oromia Regional State and is one of the 19 districts in West Harerge Zone which is located in the eastern part of Ethiopia. According to legend Tullo got its name from the name of a village called Tullo which was the administrative seat of the district during Emperor Minilik the second's governance. The original Tullo Village was named after a famous and key person whose name was Tullo, who was known as a generous person that let strangers and travelers spend the night in his home. There is no written document to confirm this legend.

4.1.4.2. Location, Geography and Climate

Tullo District is found in the north eastern part of West Harerge Zone, which is found in the eastern part of Ethiopia. It is about 374Km away from Addis Ababa and 48Km away from Chiro town, the administrative seat of West Harerge Zone. Tullo is surrounded by three districts of West Harerge Zone and two districts of East Harerge Zone. It shares boarder on the south with Mesella District, on the north with Doba District, on the west with Chiro District and on the east with East Harerge Zone. Towns in Tullo include Hirna and Doba, where Hirna is the administrative seat of the district. The total area of the district is about 450 Km^2.According to the districts agricultural office report, from the total land area of the district potentially cultivable land constitute 23337ha, arable (cultivated) land 13280ha, natural forest 524ha, manmade forest (reforested) 2426ha, uncultivable land (hills) 2805ha, grazing land 253.3ha and others 4737ha. Attitudinally the district stretches from 1500 – 28000 masl. Topographically the district is divers and includes lowlands, highlands and valleys. Climatically, the district is classified into highland (dega) 43.3%, midland (woinadega) 53.7% and lowland (3%). Rain fall is bi-modal and ranges from 650 to 1200mm, with an average annual rain fall of 750 mm. There are two rainy seasons, Belg and Meher. The *Belg* rain extends from March to April while the *Maher season is* from mid-June to end of September**.** The temperature of the district ranges from 16 to 33^{o}c. Hirna, Burka, Dabaso and Burka Recha rivers flow through the district. They have the potentials to irrigate about 1334 hectare of land.

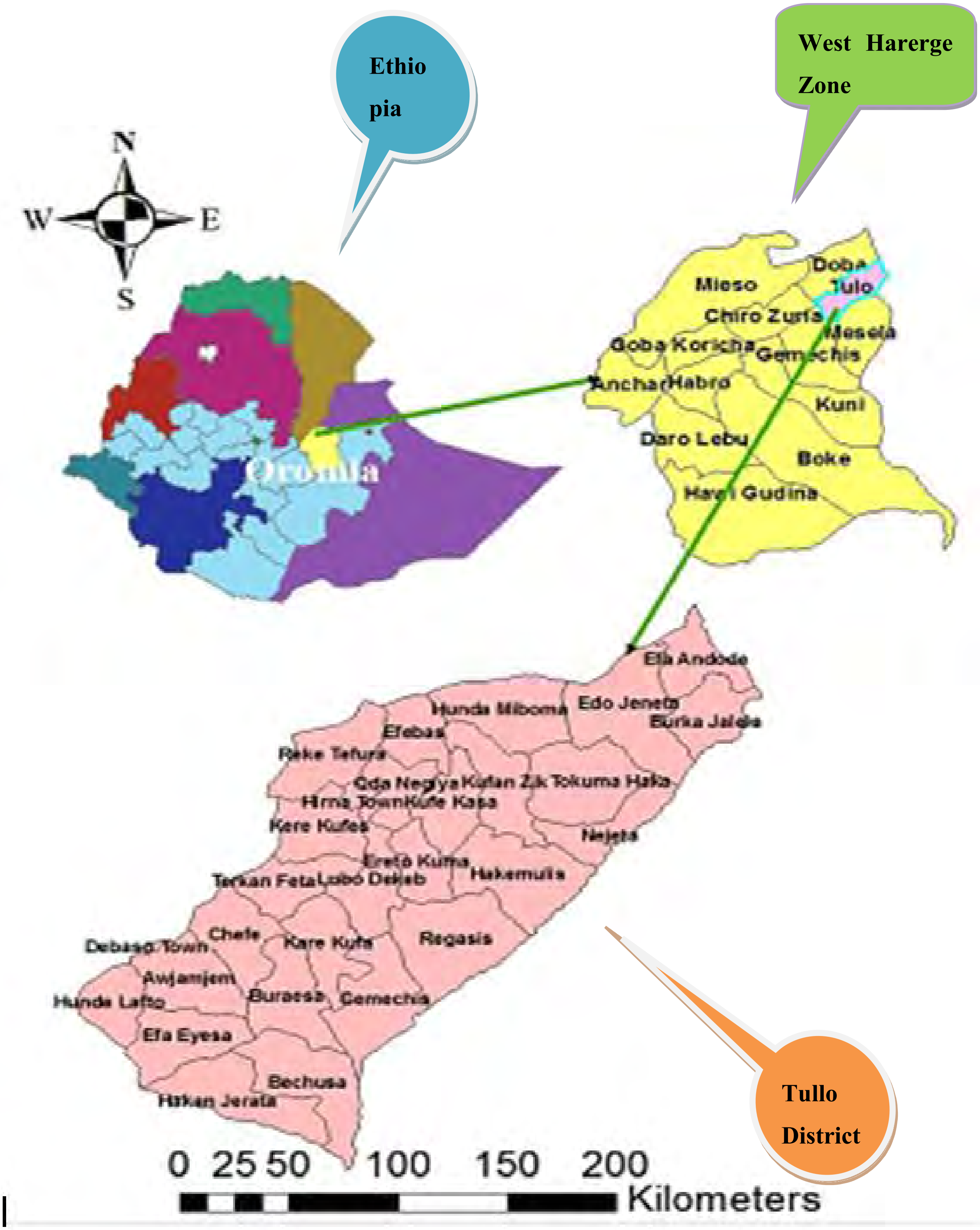


Figure 30: Map of Tullo District, West Harerge Zone, Oromi, Ethiopia, 2005 EFY

4.1.4.3. Administrative and political structure

The district is the basic decentralized administrative unit and has an administrative council composed of elected members. It is further divided into kebeles, the smallest administrative units in Ethiopia. The districts directly report to the zone. Administratively, Tullo District is divided into 33 kebeles (30 rural and three urban kebeles), 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. The ruling political party in the district is the Oromo People Democratic Organization (OPDO).

4.1.4.4. Demographic information

Based on the 2007 Ethiopian population and housing census projection, the population of Tullo District in 2006 EFY is estimated to be 179,078 of whom 87,627(48.9%) are females. Among the total population of the district 18,413(10.3%) are urban dwellers, of which 9,537(51.8%) are males. Of the total population 6084(3.4%) are children of under one year age and 29,391(16.4%) are children aged under five years. Women in the reproductive age group (women with age 15 – 49 years) constitute 39,379(22%) of the total population of the district (Figure 3). The majority of the inhabitants, 78.72% are Muslim, while 20.04%, 1.09%, and 0.06% are Orthodox Christian, Protestant, and Catholic religion followers respectively. Among the different ethnic groups in the district, Orommo constitute the majority (78.67%), while 20.46% are Amhara. Other ethnic groups total less than one percent of the population. Oromiffa is spoken as a first language by 79.61% of the population, and 19.96% speak Amharic and the remaining 0.43% speak all other primary languages reported(5).

Table 18: Distribution of Toollo District population by sex and Kebeles, Oromia, Ethiopia 2005 EFY

Sr. no	Name of Kebeles	Male	Female	Total population
1	Hirna 01	3812	3647	7459
2	Hirna 02	3738	3577	7315
3	ReketaFura	3206	3068	6274
4	KereKufise	2861	2738	5599
5	L/Dekeb	3031	2901	5932
6	Gemechis	3396	3249	6645
7	OdaNega	1848	1768	3616
8	Ifabas	1848	1768	3616
9	Debeso 01	1950	1866	3816
10	Terkefet	2984	2855	5839
11	Chefe	2708	2592	5300
12	Buraysa	3457	3309	6766
13	GaraKufa	3361	3216	6577
14	HundeLafto	2724	2606	5330
15	IfaHiyessa	4099	3923	8022
16	Awjimjim	2398	2294	4692
17	Bachesa	2592	2480	5072
18	HakanJirata	3639	3483	7122
19	Regasise	4038	3864	7902
20	HakaMulis	4755	4551	9306
21	IreeTokuma	2142	2050	4192
22	Kakase	2073	1983	4056
23	Kufanzik	3454	3306	6760
24	HundeMisoma	2071	1981	4052
25	Kenisa	2071	1981	4052
26	Nejata	1961	1876	3837
27	TokumaHaka	2053	1965	4018
28	Weltahi	2054	1966	4020
29	IdoBaso	2709	2593	5302
30	IdoJeneta	2182	2088	4270

31	TokumaBira	1938	1855	3793
32	IfaHandode	1886	1804	3690
33	Burka	2471	2365	4836
	Total	**91509**	**87569**	**179078**

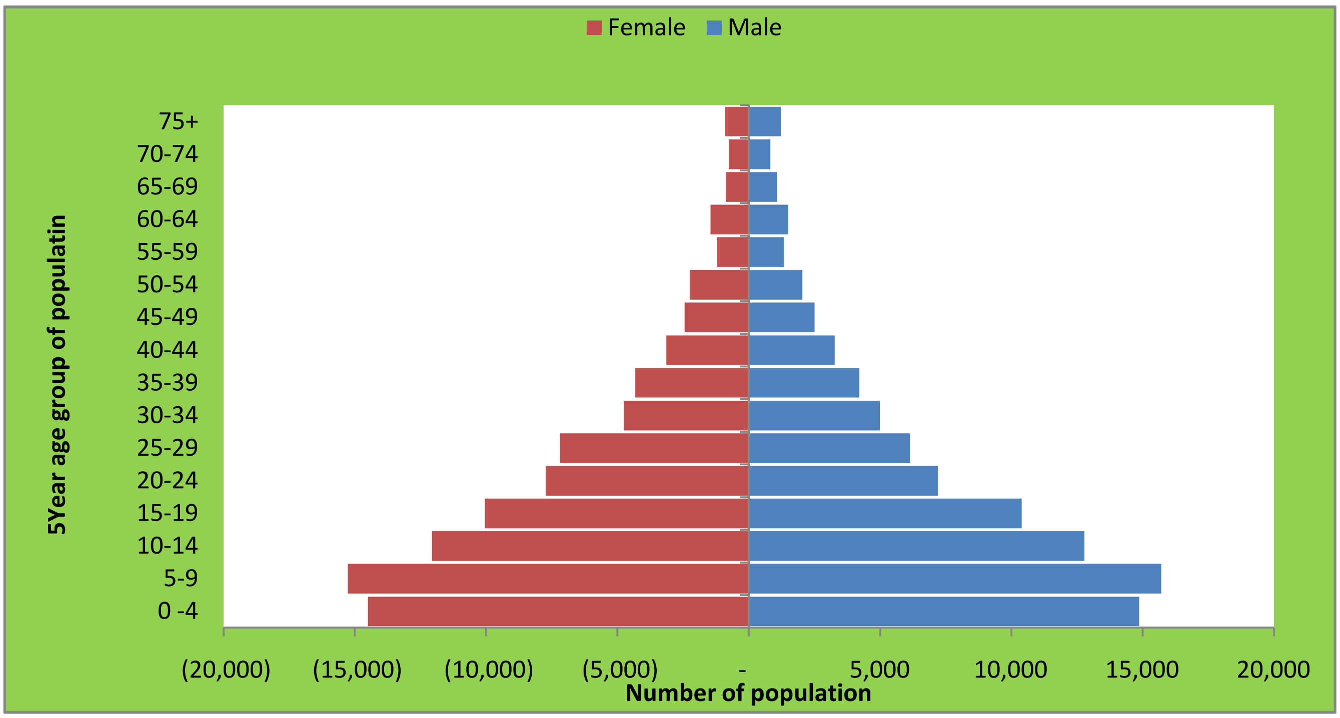


Figure 31: Population pyramid of Tullo District, West Harerge Zone, Oromia Ethioppia, 2005 EFY

4.1.4.5. Productivity and income

The majority of the districts population (89.7%) lives in the rural areas. Therefore the main livelihood of the population is the sedentary mixed farming system, which is heavily dependent on crop and livestock production. According to the district's agricultural office's report the major food crops produced in the area are sorghum and maize. Haricots beans are also the dominant crop grown in all agro-ecological kebeles of the district, while barley and wheat is grown in the highland areas. Khat, coffee, sweet potato, potato and onion are the major cash crops grown in the area. Among the total 30 rural kebeles (Peasant Association) Inhabitants, 15 Peasant Association(PAs) belongs to the sorghum, coffee, khat, haricot bean and Livestock producer, and the rest 15 PAs belongs to maize, barley, wheat, khat, sweet potato, potato, onion, pepper, tomato and Livestock producer. Animal fattening and animal products are good sources of cash income to households of the district. Especially, the oxen fattening, which generate 20,000birr – 47,000 birr per ox is one of the major cash income to the farmers, within two to three months of fattening period. This make Tullo district one of the areas that supply fattened Harars oxen for beef producers in Ethiopia in particular to Addis Ababa. According to the districts agriculture office report in 2005/2006 E.F.Y a total of 20,469 hectare land has been planted with different crops and 221,293.4 quintal crops produced. For detail see the table: 19 below.

Table 19: Total area cultivated and total crop harvested in Tullo District, West Harerge Zone, Oromia, Ethiopia 2005/2006 EFY

Sr. #	Types of crops planted	Area planted in hectare	Product in quintal	Percentage of product
1	Maize	4161	64072	28.95%
2	Sorghum	3329	47654	21.53%
3	Teff	2855.7	23898	10.80%
4	wheat	1323	24530	11.08%
5	Barley	530	4240	1.92%
6	Bean	505.3	6083.4	2.75%
7	Dangulle	232	1856	0.84%
8	Haricot bean	4711	29284	13.23%
9	Lentils	10	40	0.02%
10	Fenugreek	5	15	0.01%
11	Linseed	7	21	0.01%
12	Chickpea	2800	19600	8.86%
	Total	**20469**	**221293.4**	**100.00%**

4.1.4.6. Education

The current system of formal education in Ethiopia is based on a three – tier system; eight years of primary education (1 – 8th grade), followed by four years of secondary education (9 – 12th grade), and four to seven years of tertiary education, depending on the area of study (7).

Tullo district has a total of 45 primary school, of which 11 are first cycle (grade 1-4) and 34 are second cycle (grade 1-8); and three high schools, one preparatory and one TEVT. In addition the district also has six kindergartens. In 2006 EFY a total of 38,083 students were enrolled to school, of which 21,207 (55.69 %) are males. For details on students profile see fig.32 below.

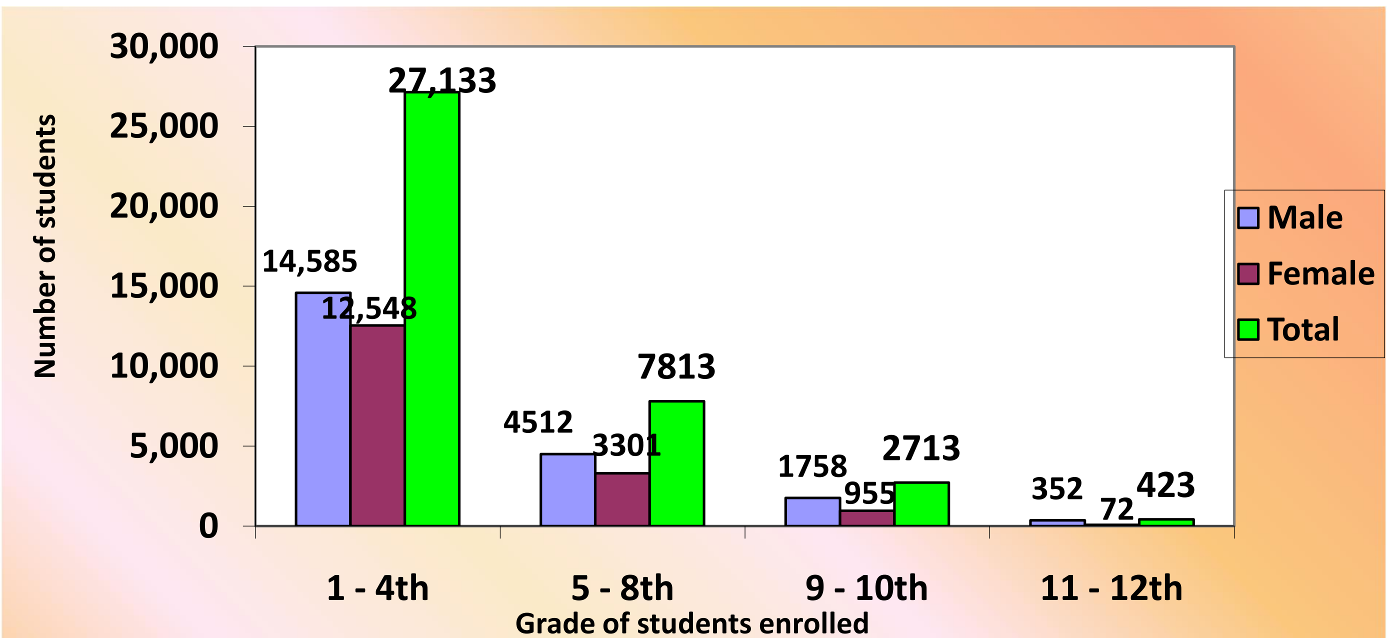


Figure 32: Number of students enrolled at different grade level in Tullo District, West Harerge Zone, Oromia, Ethiopia 2006 EFY

According to the Tullo District's Education office report the district's current gross attendance ratio (GAR) for first cycle (1 – 4th grade) school is 121.1 %, second cycle primary school (5 – 8th grade) is 84% , grade 1 – 8th school 91.5%, grade 9 – 10th61.3% and grade 11 – 12thschool 8.3%, whereas the Net Attendance ratio (NAT) for first cycle (1 – 4th grade) shcool is 93.5% , second cycle primary school (5 – 8th grade) 76.7% , grade 1 – 8th school 89.8 % and grade 9 –

10th36.1% respectively. Tullo district has a total of 581 teachers, of whom 362 (62.3%) are males. For details on teaching staff profiles see fig.33 below.

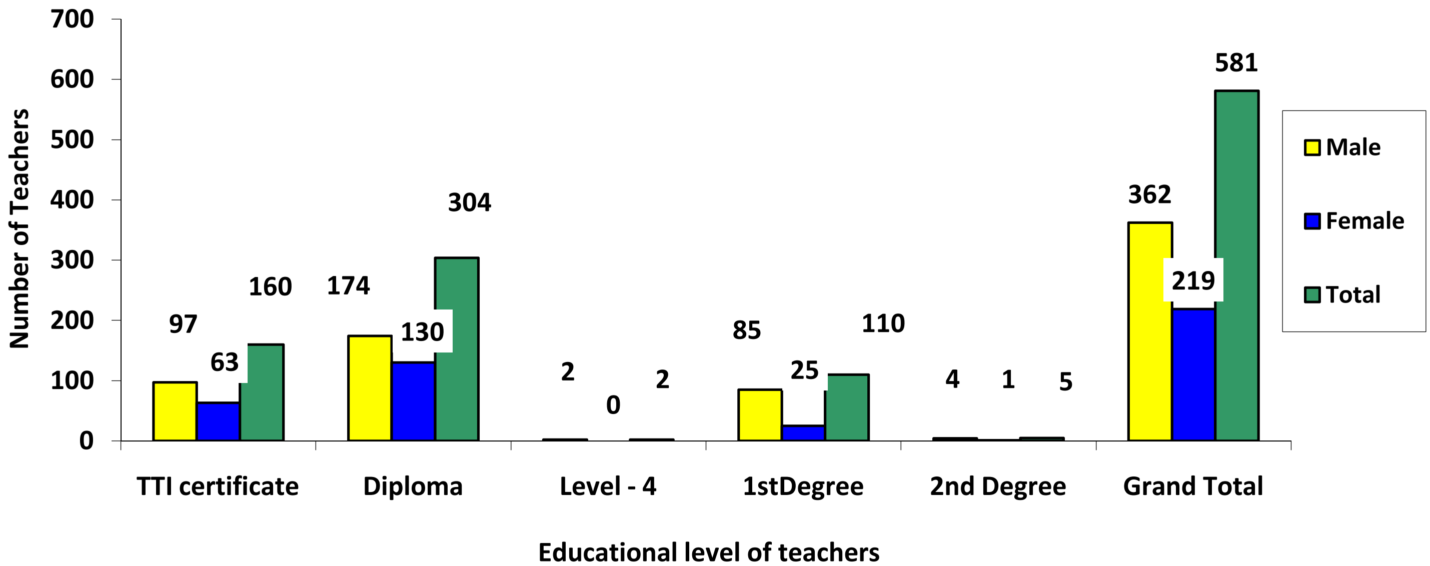


Figure 33: Number of Teachers and their educational llevelfoound in Tullo District, West Harerge Zone, Oromia, Ethiopia 2006 EFY

4.1.4.7. Facilities

One of Ethiopia's major roads, leading to Dire Dawa, Harar and Jijiga, goes through Tullo District. The district can be accessed through this road from Addis Ababa, Chiro; administrative seat of west Harerge zone and from eastern part of Ethiopia. Among the 30 health post of the district 20 of them were accessible in dry season and all six health centers were accessible year-round. Regarding communication only one of the health centers had fixed line call service and all health facilities had mobile phone network coverage. Only one health center and one health post had water supply. Regarding electric power supply among the health facilities of the district only two of the health centers had electric power supply.

4.1.4.8. District health system

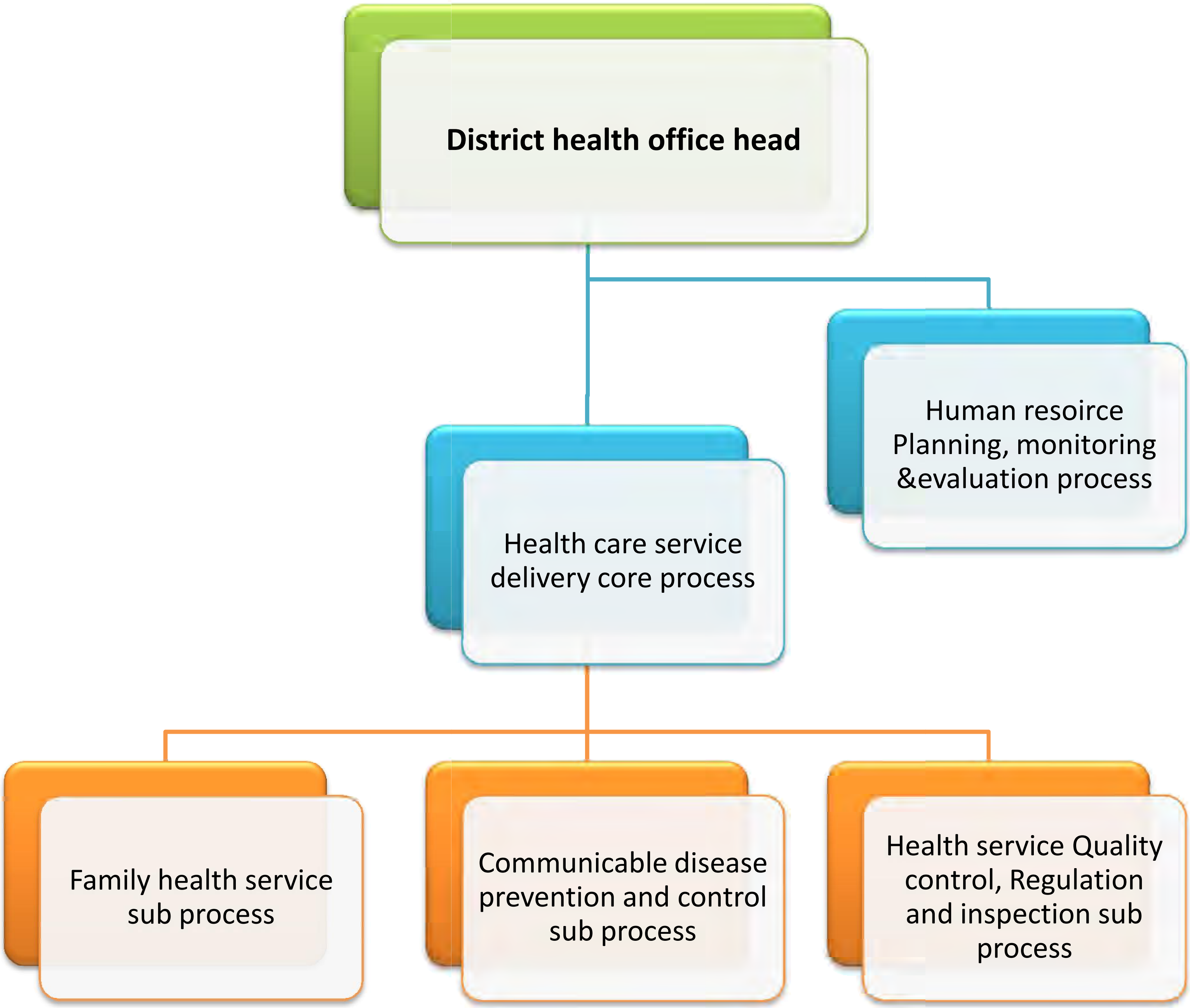


Figure 34: Organizational structure of Tullo District Health Office, West Harerge Zone, Oromia, Ethioopia 2006 EFY

4.1.4.9. Organizational structure

The recently implemented business process reengineering (BPR) of the health sector has introduced a three-tier health care delivery system which is characterized by a first level of a Woreda/District health system comprising a primary hospital (with population coverage of 60,000-100,000 people), health centers (1/15,000-25,000 population) and their satellite Health Posts (1/3,000-5,000 population) that are connected to each other by a referral system. A Primary Hospital, Health center and health posts form a Primary health care unit (PHCU) with each health center having five satellite health posts. The FMOH and the RHBs focus more on policy matters and technical support while district Health Offices have basic roles of managing and coordinating the operation of a district health system under their jurisdiction. Districts have district health offices, responsible for the management of public health services at their levels (8, 9).

The HEWs are expected to spend less than 20% of their time in health posts, and more than 80% of their time is spent on community outreach program visitation to households, especially mothers and children. They provide 96 hours of training to households on the selected packages of HEP and follow the practice before certification and graduation of the households. HEWs provide family planning, EPI, OTP, clean delivery and essential newborn care services, diagnosis and treatment of malaria, diagnose and treatment of pneumonia including dehydration using ORS (8, 9).

A HC is staffed with an average of 20 staffs. It provides both preventive and curative services. It serves as a referral center and practical training institution for HEWs. A HC has an impatient capacity of 5 beds.

A Primary Hospital provides inpatient and ambulatory services to an average population of 100,000. In addition to what a HC can provide, a primary hospital provides an emergency surgery service including Cesarean Section and gives access to blood transfusion service. It also serves as a referral center for HCs under its catchment areas, a practical training center for nurses and other paramedical health professionals. A primary hospital has an inpatient capacity of 25-50 beds (9).

Mandates of District Health Offices

The district heath office is the basic administrative unit of health system and lead Health sectors of the district. They are responsible for planning, financing, monitoring and evaluating of all health programmes and service deliveries in the District. In any health system, there are three important elements that are highly interdependent, namely: the community, the health service delivery system and the environment where the first two elements operate (6).The district health office organizational structure of Tullo District is well organized and works harmoniously with other governmental and non-governmental sectors in the district. The health office's head is also member of the district administrative council. The health service coverage of the district currently is 100% by health post and 86% by health center. Detail health facility profile of the district is shown in the table 20 below.

Table 20: Number of health facilities found in Tullo District, West Harerge Zone, Oromia, Ethiopia 2006 EFY

Types of Health facility	Number of H/F	Remark
Hospital	0	Under construction
Health center	6	Governmental
Health post	30	Governmental
Lower clinics	13	Private
Drug shop	2	Private
Rural Drug venders	6	Private
Total	**57**	

4.1.4.9. Human resource of the health system

The total numbers of government health employees of the districts are 178, of whom 144 (80.9%) are health professionals and the rests are support staff. Table below describes staff profile of the district health system. Apart from 178 employees there are 867 women health development army (HDA) teams where each team comprises 25 – 30 women selected from the community. The women HDA team further divided into 3,985 one into five group and they works under the supervision of HEWs on mobilization of the community for family planning, child health, ANC, EPI and sanitation.

Table 21: Number of health professionals and support staffs and their qualification who work in Tullo district public health facilities, West Harerge Zone, Oromia, Ethiopia 2006 EFY

Sr.No	Qualificationand Level of Educcation	Number
1	Health Officers	13
2	Clinical Nurses (BSC)	5
3	Clinical Nurses (Diploma)	36
4	Laboratory Professionals (BSC)	1
5	Laboratory Professionals (Diploma)	5
6	Pharmacists (BSC)	1
7	Druggists (Diploma)	5
8	Environmental health professionals (BSC)	5
9	Midwife (BSC)	2
10	Midwifes (Diploma)	8
11	Health extension workers (urban)	6
12	Health extension workers (Rural)	57
13	Support staff	34
	Total	**178**

4.1.4.10. Health budget allocation

In 2005 EFY a total of 40, 574,974 Birr was allocated for the district from the government, of which 5,247,054 Birr (12.9%) were the total budget allocated for the district health office. From the total budget of the health office 4,563,893 Birr (87%) of it were for the salary of employees of the health system; 393,161 Birr (7%) for different activities of the health office and the remaining 290,000 Birr (7%) were allocated for drugs procurement. The health office also got additional 667,009 Birr from different Non- Governmental Organizations (NGOs), that is 351,492 Birr, 315,517 Birr and 215,845 Birr from UNISAFE, WHO and Global- Fund respectively.

4.1.5. Health indicators and vital statistics

In the district most vital statistics like total Live birth and under five, maternal and all deaths were not exist. Indicators used in the table 5 below are from national estimates projected from 2007 national census.

Table 22: Distribution of health indicators and vital statistics of Tullo district, West Harege Zone, Oromia, Ethiopia 2005 EFY

S/N	INDICATORS	Number	Percentage (%)
1	Total population	174,031	100
2	Male	88,930	51.1
3	Female	85,101	48.9
4	Under 1 years old	5,917	3.4
5	Under 5 years old	28,541	16.4
6	Women 15- 49 years old	38,286	22
7	Pregnant women	6,961	3.7
8	Urban	17,925	10.3
9	Total live births	5,917	3.4
10	Rural	156,106	89.7
11	IMR/1000	NA*	
12	Under 5 MR/1000	NA*	

*NA= Not available

4.1.5.9. Immunization

Immunizations coverage is one of the indicators used to monitor progress towards the achievement of MDG4 and the reduction of child morbidity and mortality, as it is one of the most cost-effective public health interventions for reaching these goals.

In 2005 EFY the district has conducted both static and outreach immunization services for 5,001 children out of 5917eligible under one year age children, which makes the district's full immunization coverage 84.5%. Detail of immunization coverage of the district is shown in the figure 35 bellow below.

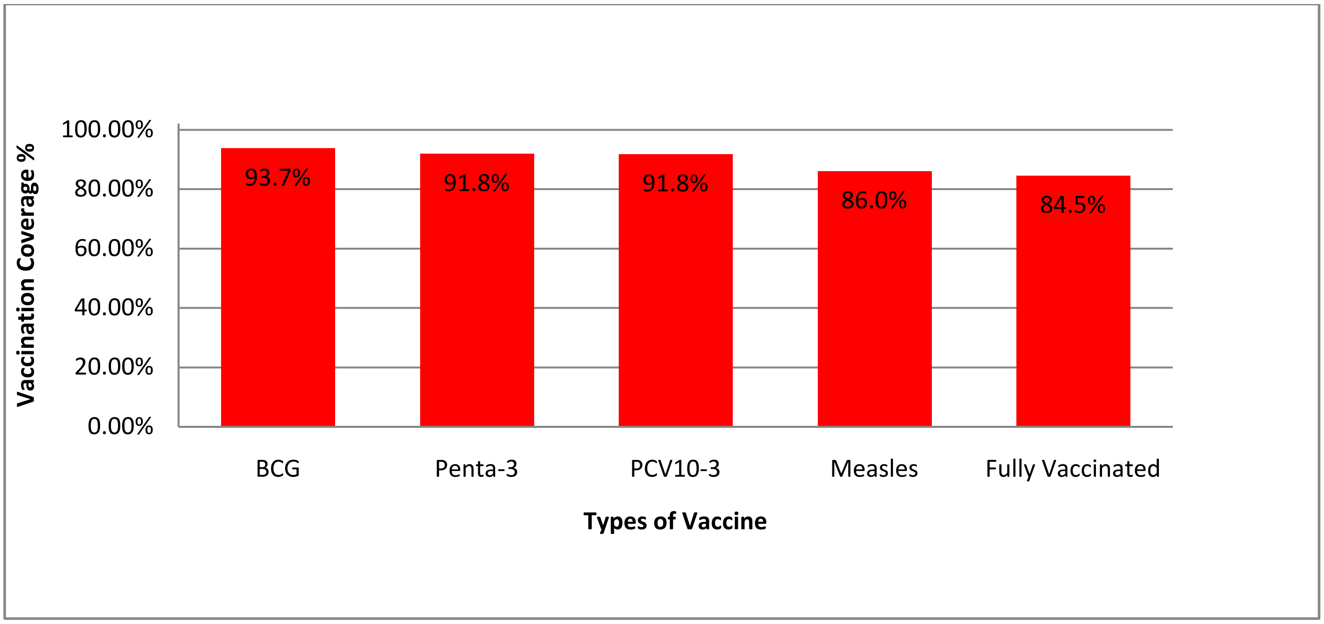


Figure 35: Distribution of immunization coverage by vaccines in Tulo District, West Harerge, Oromia, Ethiopia 2005 EFY

4.1.5.10. Maternal health service coverage

Proper care during pregnancy, delivery and after is important for the health of both the mother and the baby, and is the fifth Millennium Development Goal (MDG). Prenatal care of pregnant women in the first three months of pregnancy is highly correlated with better outcomes and is a reflection of access to care as well as awareness. In Tullo District in 2005 EFY among the total 6,961 eligible pregnant women 3,871 (55.6%) were got ANC service. Among the total 5,871deliveries 381 (6.5%) of them were at health facilities attended by skilled health professionals; while the rests were home deliveries.

4.1.5.11. Water sanitations and Hygiene

In 2005 EFY Tullo District health office environmental health teams in collaboration with HEWs conducted sanitation campaign that reached 180,142 people.

The team also visited and inspected 63 food and drink establishment 15times, 150 shops one time, five butcher houses 12times and one slaughterhouse 15times. More over the team also gave training on hygiene and sanitation topics for 80 health professionals and conducted prison and school heath activities.

According to the report of the district's water and energy office the safe water coverage of the rural area is 41%, where as urban safe water coverage is 80%. The main water sources for the rural community includes; 310 springs, one deep well, one shallow well and nine hand pumps. Among the 310 springs 71 (22.9%) were treated and protected. The main safe water source for urban population were two shallow well and one spring. The standard latrine coverage of TulloDistrict was 45% in 2005EFY.

4.1.5.12. Health Education

In Tullo District in 2005 EFY health education were given at the health facilities by different health professionals and at home by HEWs to a total of 200,685 people. The topics covered by the health education were malaria, TB, HIV/AIDS, FP, Immunizations and others.

4.1.5.13. Top ten leading causes of OPD and IPD visit

In 2005 the leading causes of adult OPD in Tullo District among the leading ten top diseases were trauma 4,140 (39.7%); followed by pneumonia 1,700 (16.8%); and dyspepsia 11,880 (11.0%). Detail of leading causes of OPD visit is shown in the figure 36 and table 23 below.

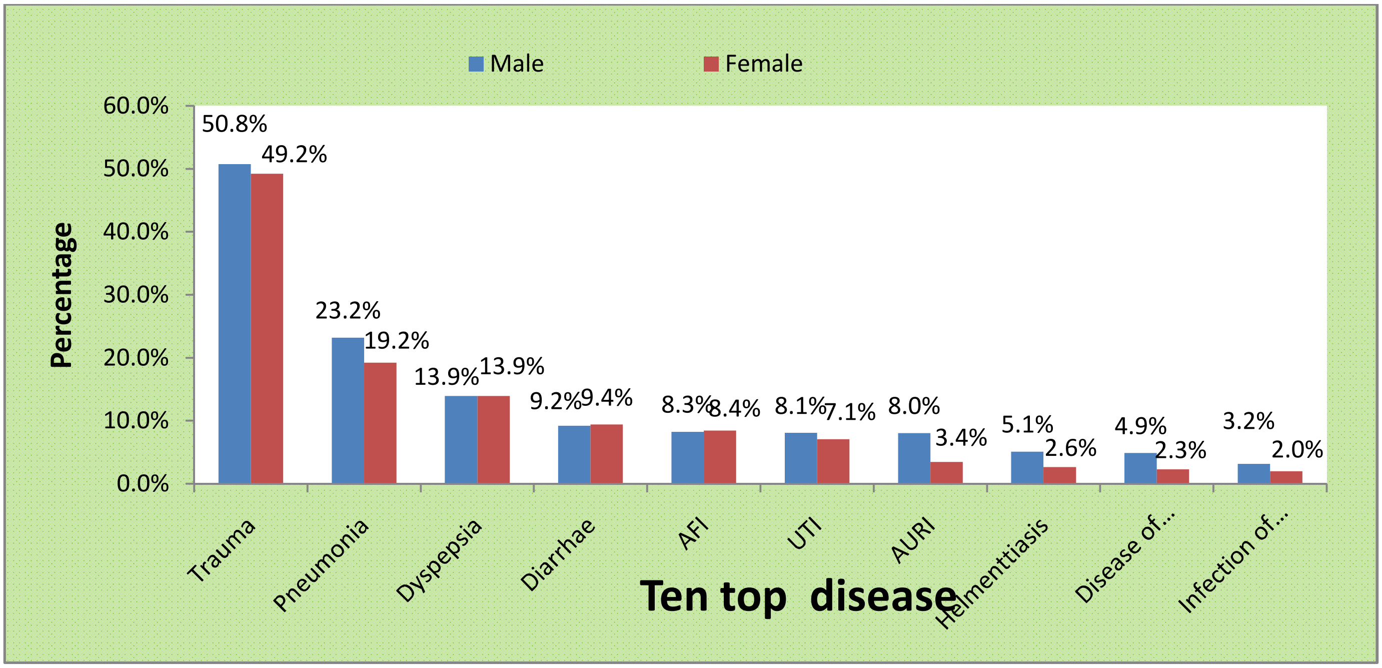


Figure 36: Distribution of ten top causes of adult OPD visit in Tullo District, West Harerge Zone, Oromia, Ethiopia 2005 EFY

Table 23: Distribution of ten top causes of adult OPD visit in Tullo District, West Harerge Zone, Oromia, Ethiopia 2005 EFY

Diseases	Male	Female	Total
Trauma	2152	2088	4240
Pneumonia	984	816	1800
Dyspepsia	590	590	1180
Diarrhea	390	398	788
AFI	350	358	708
UTI	342	300	642
AURI	340	146	486
Helmenttiasis	216	112	328
Disease of musculo- skeletal	206	96	302
Infection of the skin	134	84	218
Total	**5704**	**4988**	**10692**

Among the health centers in Tullo District only Hirna HC gives inpatient admission service with six beds. The leading causes of IPD admission were trauma (20 cases, 46.5%) followed by all forms of TB (14 cases, 32.6%). For detail of IPD admission refer in Figure 37 below.

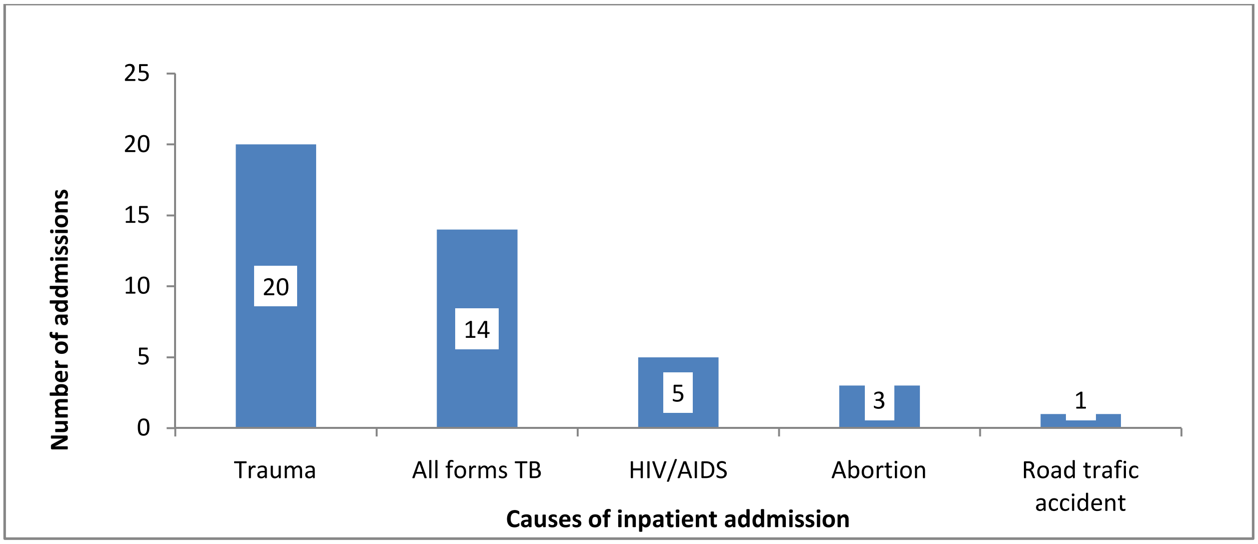


Figure 37: Distribution of top leading causes of adult IPD admission in Tullo District, West Hareerge Zone, Oromia, Ethiopia 2005 EFY

The leading causes of 2005 EFY under -five children OPD visit in Tullo District was Pneumonia (484 cases, 42%) followed by Diarrhea 258 (22%).

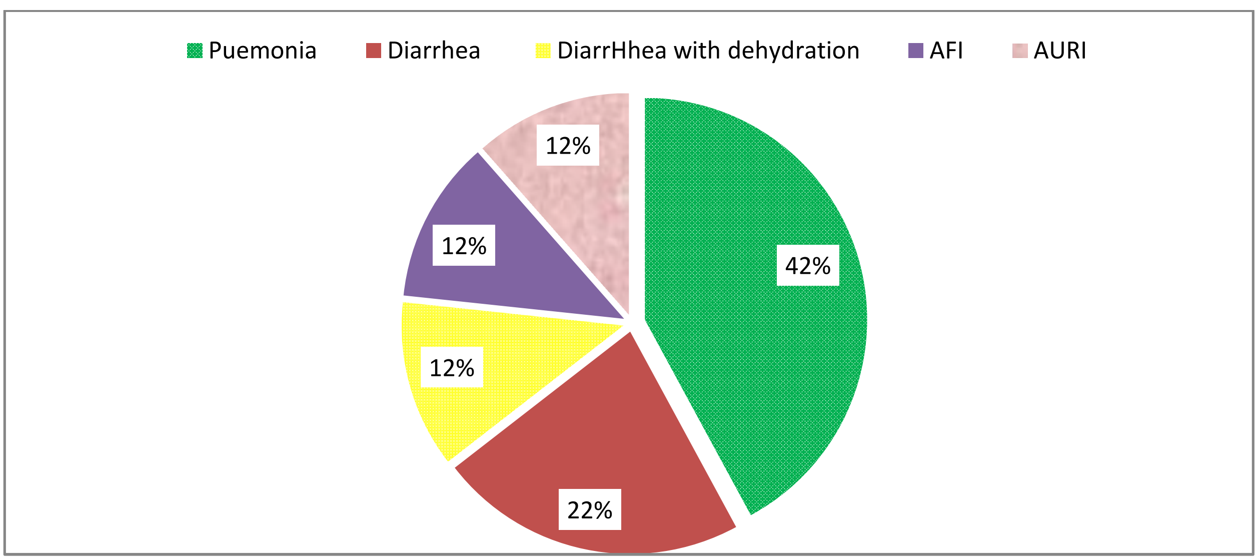


Figure 38: Distribution of top leading causes of Under-fiveOPD visit in Tullo District, West Harerge Zone, Oromia, Ethiopia2005 EFY

4.1.6. Endemic Diseases

4.1.6.1. Malaria

In Tullo District 48.5% of kebeles (16/33) are malarious and 41,364 (23.8%) of the populations are at risk of being infected by malaria. Insecticide treated nets (ITNs) were distributed to these malarious kebeles in 2001 EFY which covered 98% of the population. Since then ITNs have not been distributed for these malarious kebeles. The districts health office has applied indoor residual spray (IRS) for 14 (88 %) of the district's malarious kebeles which covered 37282 (90%) of at risk population in 2005 EFY. Total number of confirmed malaria cases detected in 2005 EFY were 34; 15 females (44.4%), 11 males (32.1%) and eight under five children (23.5 %). In 2005 EFY there were no major shortages of anti-malarial drugs and other supplies; except ITN shortage.

4.1.6.2. Tuberculosis and Leprosy

A total of 309 case of tuberculosis (all forms) were detected in Tullo District In 2005 EFY; of which 108 (35%) were extra PTB, 102(33%) smear negative PTB and 99 (32%) were smear positive PTB. There were five deaths caused by TB. All those who died were on anti-TB treatment in the same year. There were no treatment failure and defaulter. In 2005 EFY, eight cases of leprosy were screened and all begun treatment. TB case detection rate, treatment success rate and treatment completion rate is described in the figure 11 below.

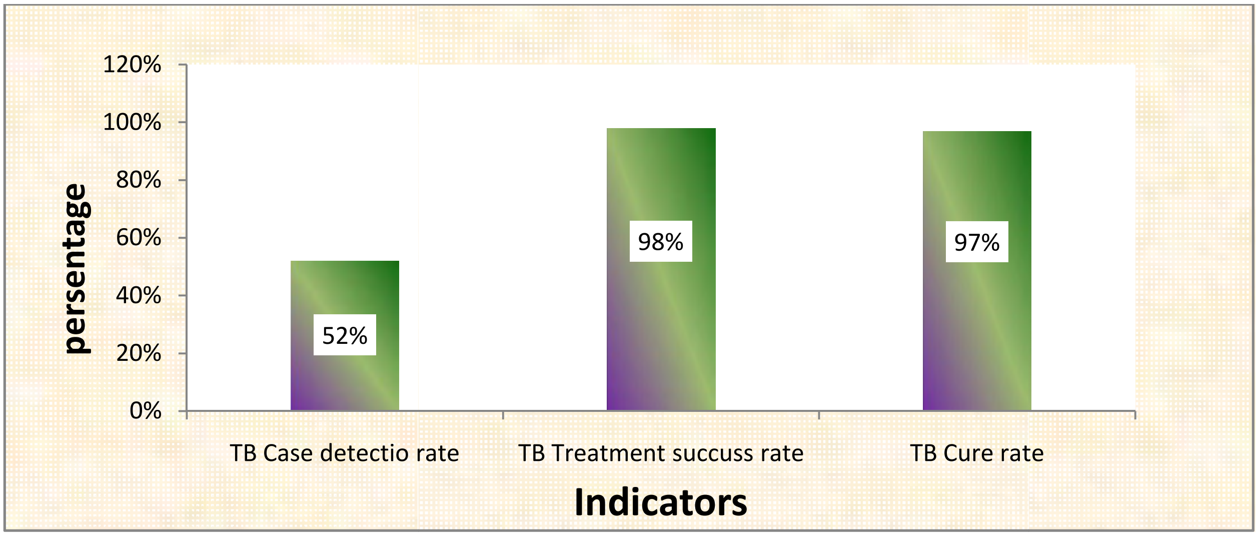


Figure 39: TB indicators coverage of Tullo District, West Harerge Zone, Oromia, Ethiopia, 2005 EFY

4.1.6.3. HIV/AIDS

In the district a total of 17,408 people were screened for the presence of HIV antibody in their blood and 36 (0.2%) of them were positive for HIV in 2005 EFY. Among the positives three of them were pregnant women. Total number of people living with HIV/AIDS (PLWHA) in the district in the same year was 259. The number of PLWHA ever enrolled on ART was 480 and those who ever started ART was 273 up to January 2006 EFY. Currently 233 and 29 PLWHA are enrolled on ART and Pre- ART services, respectively. Among the health facilities in the district only one health center (Hirna HC) gives ART service. Figure 40 below describes number of people screened for HIV at different screening services.

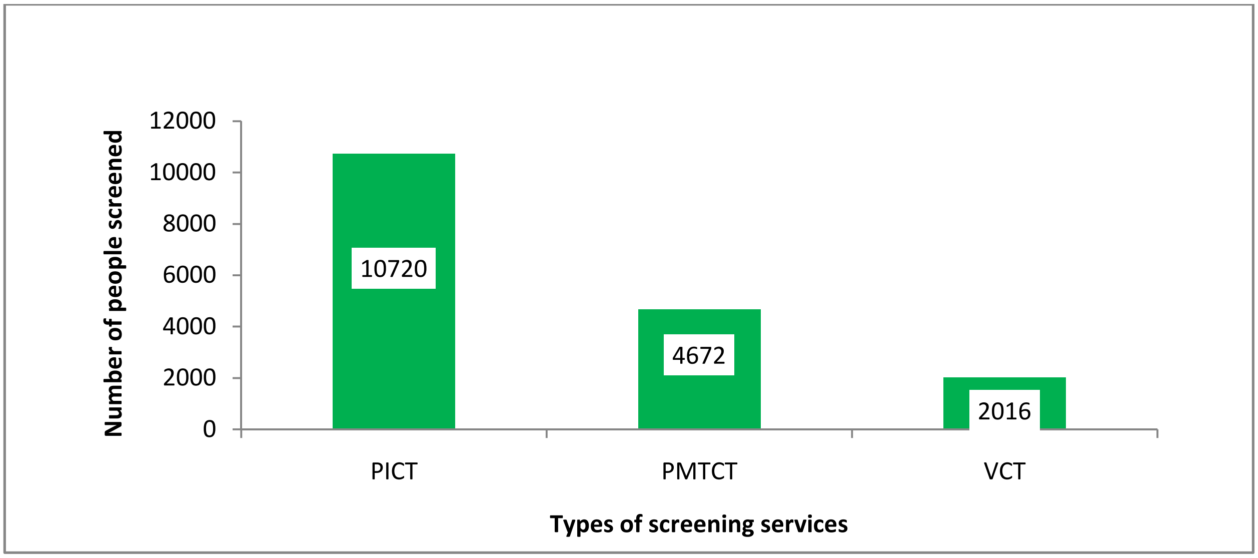


Figure 40: Distribution of individuals screened for HIV by types of screening services in Tullo District, West Harerge Zone, Oromia, Ethiopia, 2005 EFY

4.1.6.4. Nutritional status and disasters

In 2005 there was no significant malnutrition problem in the district. In Tullo District a total of 35 OTP and three SC sites were available. In the same year 785 children were treated at OTP sites and seven children were admitted and treated at SC sites and all cured. There were no disaster or major health problem (epidemics) in 2005 EFY in the district.

4.1.6. Limitation

There was no data available on important vital health indicators like maternal mortality rate, under-five mortality and infant mortality.

There was no important and tangible information about the background, culture and history of the district at culture and tourism office.

There was no profile date at neighboring districts and recent data on important health indicators to be used for comparison.

There was no documented data on weekly reportable diseases under the surveillance system.

4.1.7. Discussion

Based on the data collected from public health facilities, trauma was the leading cause of outpatient visit in the district, which accounts for 39.7% (n=4,140) of the ten top outpatient visit in 2005 EFY. More over it was also the leading causes of inpatient admission with a magnitude of 20 that accounts 46.5% of the top inpatient admissions. This might be due to the aggressive behavior of population resulted due to Chat (Khat) chewing habit of the population, which makes them aggressive and sensitive if they didn't get it particularly in the morning. Vaccination coverage for fully vaccinated children of under one year of age was 84.5%, which was higher than the national and regional full vaccination coverage of 2010, that was 24% and 15.6% respectively(7). This was due to the strengthen activity of health extension workers.

Even if the ANC coverage (55.6%) of the district is higher than the national and Oromia Region 2003 EEFY ANC coverage, which was 34% and 31.5% respectively, the institutional delivery was lower (6.5%) than the national and regional 2003EFY health facility delivery, which was 10% and 8% respectively(8). The safe water coverage of the district was 80% or urban community, which was lower than the 2003 EFY national coverage which was 95%. Whereas the rural safe water coverage was 41% which was comparable with the national 2003 EFY coverage 42%(8). Even if there were 16 malarious kebele in Tullo District, the reported confirmed malaria cases in 2005 EFY was small 34, this was due to high coverage of IRS, which was 90% of households were sprayed.

Regarding TB the case detection rate of the district 52% was higher than the 2003 EFY Oromia region TB case detection rate but lower than the target of Ethiopia health sector development plan-IV (HSDP – IV) and the WHO recommendation, that was 75% and 70% respectively(9).

4.1.9. Conclusion and Recommendation

Among the leading causes of morbidity of the district trauma takes the first place of both inpatient and Outpatient visit. Hence the health official's in collaboration with the district police and security offices should have to work hard on prevention and control of trauma, leading cause of OPD and IPD visit.

The good performance gained on immunization coverage should be strengthened more and kept sustainable.

Maternal health status of the district was poor as seen by under coverage of the indicators. Therefore the district's health office should have to work on improvement of maternal health through increasing the ANC, PNC and institutional delivery coverage by strengthening the activity of HEW and mobilizing women health development army to work on create awareness in the community about maternal health specially on benefits of health facility delivery

The health office also should have to improve the districts safe water coverage and latrine coverage, especially in the rural area by collaborating with respective stake holders.

More needs to be done to achieve the Ethiopian HSDP-IV target and WHOs recommended TB case detection rate through community mobilization and health education by health workers, HEW and women health development army.

Vital statistics occurring in the district needs to be documented and the surveillance system and its documentation should have to be strengthened and improved.

4.1.10. Acknowledgment

I would like to thank Mr. Tesfaye Deti ORHB/PHEM Core process owner for his comments and advice during proposal writing for data collection. I would like to acknowledge with thanks my mentors Dr. Negussie Deyessa and Abigail Greenleaf for their unreserved comments and excellent advice during preparation of this document. I sincerely appreciate experts of Tullo District health office Mr. Ibsa, Mr. Temesgen, Mrs. Nebiat and Mrs Arsiwork for their unreserved help and cooperation during data collection.

My heartfelt thanks go to Tullo District Agriculture office head and experts, Tullo District Education office head and experts, Tullo District water office head, Hirna Town Water office head, Tullo District culture and tourism office head, Tullo District labor and social affair office head and Tullo District revenue office experts.

My appreciation also goes to AAU, ORHB, EPHA and CDC for their logistic support.

Refernces

1. R. P. The beginnings of modern medicine in Ethiopia. . Ethipop Observer.9(2):114-60.

2. R. P. An introduction to the medical history of Ethiopia. Lawrenceville, New Jersey: The red sea press; 1990.

3. MOH. Primary health care review. Addis Ababa1985.

4. Organization WH. Formulating Strategies for Health for All by the year 2000. 3, editor. Geneva: World Health Organization; 1979.

5. CSA. Ethiopian National Houcing and Population censuse 2007.

6. Berhane Yemane , Haile Mariam Damen, Helmut K. Epidemiology and Ecology Of Health and Disease In Ethiopia

Addis Ababa, Ethiopia: Ethiopian Public Health Association; 2005.

7. CSA. Ethiopian Demograpphic Health Survey. 2011.

8. FMOH. Health and Health Related Indicators in Ethiopia. 2003.

9. MOH. Health Sector Development Programme - IV. 2010/11 - 2014/15.

Annex VIII: Data collection tool for District health profile description

Data Collection Tool for District Health Profile Description ***Error! Bookmark not defined.***

1. Data collection tools

1.1. 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____

1.2. Geography and Climate (including map, altitudes, agro ecological zones etc…)

Woreda map____________________________________

Location (distance and direction) ___________________ __________________

Altitude ___________________ surface Area ____________________(________% from the zone)

Geographical coordinate

Latitude _____________________________ longitude _________________________

Annual rain fall(average)_________________, annual temp(average)________

Climatic zones______________(%) ____________(%) _____________(%)

1.3. Facilities

Accessibility (main roads)____

Type of road _________________
How many kebeles have access to transportation ________________
Flow of transportation per day______________
How many people have access to fixed telephone?______________
How many people have access to mobile phone? (coverage)______________
How many people get power supply_____________________

Post office ____________________________

Bank ________________________________

Telecommunication _____________________

1.4. Administrative setup

Total no. of kebeles: rural________Urban____________

Woreda boundaries North_______________south__________________

East________________ weat______________

1.5. Demographic information

Population: Total__________ urban__________.rural_________
Male-------------Female------------ sex ratio----------

Under 1yrs_______. Under five yrs_________.< 15 years______.>64 years_______**(Population pyramid)**

Women 15_49 years of age______________

Total population by kebele(each kebele pop)____________

1.6. Ethnic/language

Oromo____(__%) , Amhara_____(__%), Tigre_____(__%), Gurage____(__%)
Others_____(__%)

1.7. Religion

Orthodox ____(__%), Muslim ____(__%), Protestant____(__%) Other ____(__%)

1.8. Economy(mainstay of the economy, average income levels etc)

Main income sources
Land density _________________
Cultivated ____________________
Farming _______________________
Grazing ____________________
Main crops ____________, ________________, ___________________,
____
Fertilizer utilization _________________________________
<u>House hold income source</u>
Agriculture______ (No.), Different business_____(No.), Employee_______(No.)
Jobless ______(No.) Average income per HH/year_________

1.9. Education and school Health

Number of educational institution
College/ TVET_____, High school______, Medium _____Elementary ___K.G.___
Total School Age Children (target)____________________
Total Enrolment _________________________(_____%)

School dropout in 6 months or year 2004 ______________
If there is school dropout why ___________________

Educational status of the community

Total Educated people________
Male ________
Female ________

School health activities:

water supply: schools with water supply________

Toilets: schools with functional latrines (male & female)_______

Schools with HIV/other Health clubs___________________

1.10. Infrastructure for health Facilities (Transport, Telecommunication, Power supply, water supply…)

How many of the health posts have access to

Transportation____ (__%), Telecommunication____ (__%), Electric power______ (__%)

Water supply ___ (__%)

How many of the health centers have access to

Transportation____ (__%), Telecommunication____ (__%), Electric power______ (__%)

Water supply ___ (__%)

1.11. 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_____(__%)

1.12. Health delivery system

4.2.1. District Health Structure

4.2.2. Health Facilities

Type		**umber**	**Total No. of beds**
Gov. Hospital			
Gov. Health center	Type A		
	Type B		
Private H.Fs (clinics/diag. lab/drug	Clinics (all type)		

stores)	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--------------

4.2.3. Human resource for health sector

Type	No.	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_____

4.2.4. Top causes of morbidity and mortality

Top ten leading causes of OPD visit (morbidity):

Adult		Pediatrics/ < 5 years
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

4.2.5. Top ten causes of admissions

Adult		Pediatrics/ <5 year
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

4.2.6. Top ten causes of deaths (mortality).

Adult		Pediatrics/ <5 year
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

4.2.7. Vital Statistics and Health Indicators

Infant Mortality Rate (IMR) __________(**total <1 yr deaths this 2004 yr_______)**

Child Mortality Rate______________(**this year's total <15 yr deaths______)**

Crude Birth Rate_________

Crude Death Rate__________ (**total deaths 2004 yr____)**

Maternal Mortality Rate___________(**2004 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 ______________________

4.2.8. 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_____(___%)

4.2.9. Health budget allocation:

Government

Total budget allocated for the district _______________

Total budget allocated for health ________(____%)

Funds from NGO

Total ___________ (purpose/programs)____________________

4.2.10. 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__________

4.2.11. Community Health Services;

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____

4.2.12. Status of Primary Health Care Components – with focus on the eight PHC elements and MDG.

MCH (Delivery, ANC, PNC,

____

____

FP(Methods,

____

EPI(outreach service, cold chain, vaccine :

____

____

Environmental Health & sanitation.

Latrine coverage________ & utilization rate________________

water supply coverage______________

others____

Health Education (what, when, where, how and who conducted health education)

____
____

____

4.2.13. Endemic diseases;

Malaria:

Total malariouskebeles_______ & Pop at risk______

ITNs coverage (including current dist)_________ is there IRS this year(No of kebeles)________

Total cases/yr______ deaths/yr________,<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______________________

4.2.14. Nutrition (malnutrition related OTPs,SC,TSF,CBN and PSNP activities)/HO & Early warning

Total OTP sites______, total admissions to OTP/yr_______

Total SC sites,_______, Newly opened/yr______, 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):-
____
____
____
____
____
____

4.2.15. What do you think the major Health problem/s of the woreda?

____
____
____
____
____

4.2.16. Discussion of the highlights and the main findings of the health profile assessment and description

----

4.2.17. Problem Identification and Priority Setting – set priority health problems based on the public health importance, magnitude, seriousness, community concern, feasibility etc

----

Chapter –V: Scientific Manuscripts for Peer reviewed Journals

5.1.1. Measles Outbreak Investigation and Response in Beko Jimma Kebele of Sibu Sire District, East Wollega Zone, Oromia, Ethiopia May 2014.

Abstract

Measles (rubeola) is a highly contagious, acute, viral illness of the respiratory tract caused by RNA enveloped virus of the genus Morbillivirus. Measles is the most common vaccine preventable diseases in Ethiopia; where parents recognize it as a no more than self-limited childhood illness for which no medical care is often sought. A measles outbreak was detected in Beko Jimma Kebele of Sibu Sire District, East Wollega Zone in March 2014. We conducted an investigation to verify the existence of an outbreak, to determine the magnitude and identify associated risk factors that contributed for the occurrence of the outbreak.

A one to two unmatched case control study was conducted from May 4 to 18, 2014. A team of two interviewed participants using structured questionnaire to collect data. Data was managed and analyzed by using Microsoft Excel 2007 and Epi Info 7.1.

From five of the cases, blood samples were collected for laboratory confirmation, and all tested positive for Measles IGM. A total of 291 suspected measles cases with 10 community deaths were detected. 52.2 % of the cases were females. The age of the cases ranged from one month to 55 years. More than three-quartes of the cases were below 15 years old. Almost 90% of the cases, including all the deceased, were not vaccinated for measles. The overall attack rate was 2.91% and the case fatality rate was 3.44%. Statistically significant independent risk factors include: contact with a person suspected to have measles AOR: 31.16 (95% CI, 8.19 – 118.62) and presence of measles case patient in the family AOR: 6.36 (95% CI, 2.22 – 18.13). However nutritional being normal was found to be protective AOR: 0.13 (95% CI, 0.0.05 – 0.34).

This outbreak occurred in remote pocket kebele of the Sibu Sire District with extremely low immunization coverage, weak surveillance system and delayed reporting. Multiple factors contributed for the occurrence of the outbreak. To avoid another outbreak the health office

should focus on enhanced routine immunization service, strengthening of surveillance and early reporting system and awareness creation to the community on mode of transmission, prevention and health seeking behavior.

Key Words: Measles, Outbreak, Case-Control, Beko Jimma, Sibu Sire.

5.1.1. Introduction

Measles (rubeola) is a highly contagious, acute, viral illness caused by RNA enveloped virus of the family paramyxovirus, genus Morbillivirus. Measles virus is the only member of the genus *Morbillivirus* that infects humans (1). This highly contagious virus is spread through contact with nose and throat secretions of infected people and through airborne droplets released when an infected person sneezes or coughs (2). Patients are contagious from 1 or 2 days before symptom onset until 4 days after the rash appears. Infectivity peaks during the prodromal phase. The mean intervals from infection to symptom onset and rash appearance are 10 and 14 days, respectively (1). The signs and symptoms of measles include fever, lack of appetite, cough, coryza, red eyes, and maculopapular rash, with complications such as pneumonia, blindness, brain damage, diarrhoea and croup (2).

Measles remains the leading cause of childhood morbidity and mortality in the world predominantly in developing countries. Before a vaccine was available, infection with measles virus was nearly universal during childhood, and more than 90% of persons were immune by age 15 years (2).

Globally, more than 20 million cases are reported yearly and 345 000 deaths were recorded in 2005. Fifty to sixty percent of 1.6 million global deaths attributed to vaccine preventable diseases are attributed to measles. In Africa 450 000 cases were reported and in Sub Saharan Africa 250 000 deaths were reported in 2009 (3).

Measles is the most common of vaccine preventable diseases that occur in Ethiopia; where parents recognize it as a self-limited common childhood illness for which no medical care is often sought. In Ethiopia measles cases usually come late to health facilities and often after they have developed complications. Measles surveillance in a few selected administrative zones of Ethiopia in 2002 revealed age shift of measles cases from children under five to those above five years of age. (4).

The risk factors for measles virus infection include: infants who lose passive antibody before the age of routine immunization, children with vitamin A deficiency and immunodeficiency due to HIV or AIDS, leukemia, or corticosteroid therapy, regardless of immunization status and children who travel to areas where measles is endemic or contact with travelers to endemic areas. Malnourished and young children are at higher risk of developing complications and mortality from measles infection (5). The complications of measles can be divided into three groups, according to the site involved: the respiratory tract, the central nervous system (CNS), and the gastrointestinal tract. Respiratory tract involvement, manifested as laryngitis, croup, or bronchitis, occurs in the majority of cases of uncomplicated measles. In young children, otitis media is the most common complication. Pneumonia is a frequent reason for hospitalization, especially of adults. (1).

Measles is one of the vaccine preventable diseases that are targeted for elimination. However, even though half of the world is close to eliminating measles, many countries in sub-Saharan Africa, including Ethiopia, are still struggling to control the disease. In 2006, countries in the World Health Organization (WHO) African Region adopted a goal to achieve 90% measles mortality reduction by 2010 compared with the estimate for 2000. Since 2002, Ethiopia adopted these regional goals and strategies and has been taking important steps to control and ultimately to eliminate measles by 2020 (2, 5).

Since the measles vaccine was developed in 1958, it has saved the lives of millions of children throughout the world. The history of immunization services in Ethiopia prior to 1980 has not been documented very well. The Expanded Programme on Immunization (EPI) was launched in Ethiopia in 1980 based on the international, as well as national, experiences and resources gained during the smallpox eradication activities in the late 1970s. Currently the service is delivered through static and outreach sites nationwide(4).

Developing countries are failing to achieve high vaccination coverage’s, hence frequent outbreaks of measles with high case fatalities as high as 3- 30% occurred (6).

In Oromia Region measles outbreak is still a main public health concern. During the period of 2013/14, measles epidemics were reported from nine zones; East Wollega, Arsi, Bale, Borena, Guji, Horro Guduru Wollega, Illubabor, Kellam Wollega, West Hararghe and West Shewa. Unpublished outbreak investigation report by Field

Epidemiology Training Program Residents showed that the possible factors associated with the disease were low immunization coverage, malnutrition, poor cold chain management and community attitude toward measles control.

The Sibu Sire District of East Wollega Zone has reported the occurance of measles out break to zonal health office, then the zonal health office reported it to Oromia regional health Bureau. Bekeo Jimma is one of the kebeles that found in Sibu Sire District and was affected by measles outbreak since April 5th to the beginning of June 2014. Total population of this kebele is 10,017 and it has only one health post staffed by two health extension workers which makes the health service coverage 50 %. Based on the Ethiopian primary health service coverage strategy this kebele supposed to have two health posts, each staffed with two health extension workers. . Bekeo Jimma is one of the hard to reach pocket kebele of the district.

5.1.2. Methods and Materials

5.1.2.1. Laboratory Investigation

Five blood samples were collected from suspected measles cases and sent to National Laboratory for IgM confirmatory test

5.1.2.2 Standard case definitions

Suspected measles 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.

Confirmed measles case: Cases with a positive laboratory result for measles specific immunoglobulin M (IgM) antibody testing that had not received measles vaccination within the four weeks before the specimen collection.

Controls:- were neighbors of cases who did not suffer from measles during the period of the study. Two controls for one case per house hold were selected from the neighbors' of cases.

Measles suspected cases definition for the community:

A community member should report any person with **rash** and **fever** to a health worker and also advise the person to go to a health facility.

5.1.2.2. Study design

A 1:2 unmatched case control study design and descriptive analysis was done on the measles cases identified during the epidemic period, on the basis of the variables of patient, location and time. The previous five years data of EPI coverage was reviewed and collected from the district.

A WHO working case definition was used to actively search for the cases in the community and the active case search was conducted house–to-house.

5.1.2.3. Data Processing and Analysis

Data was entered, summarized and analyzed by using Epi-info version 7.1 and Microsoft Office Excel 2007. Frequencies, attack rates and case fatality rate were also calculated. Additionally, estimated odds ratio and 95% confidence interval for risk factors were determined through bi-variate and multi-variate analysis.

5.1.3. Results

5.1.3.1. Descriptive analysis

Over the period of outbreak (April 4, 2014 – June 3, 2014) we identified a total of 291 suspected measles cases with 10 community deaths that occurred within 30 days after rash onset. From five of the case patients, blood samples were collected for laboratory confirmation, and tested at Ethiopian public Health Institute (EPHI). All of the five samples were positive for measles IgM antibody. Among the total cases 152 (52.2%) of them were female. The age of the case patients ranged from 1 month to 55 years with mean age of 8.6 years and median age of 5 years. Of the total cases, the majority, 136 (46.7%) of them were children aged below five years and 21.0% of them were aged 15 years and above (Table 24).

Table 24: Distribution of measles cases by age group and sex in Beko Jimma Kebele, Sibu Sire District, East Wollega Zone, Oromia Region, Ethiopia, 2014

Age group	Female (%)	Male (%)	Total number of cases (%)
<1	8(2.7*)	3(1.0)	11(3.7)
1-4	71(24.4	54(18.6)	125(43.0)
5-9	31(10.7)	29(10.0)	60(20.6)
10-14	18(6.2)	16(5.5)	34(11.7)
15-19	7(2.4)	16(5.5)	23(7.9)
20-24	5(1.7)	15(5.2)	20(6.9)
25-29	4(1.4)	4(1.4)	8(2.8)
30-34	1(0.3)	1(0.3)	2(0.6)
>=35	7(2.4)	1(0.3)	8(2.7)
Total	**152(52.2)**	**139(47.8)**	**291(100.0)**

*Numbers in the parenthesis indicate percentage

The outbreak started in 14th WHO epidemiologic week of 2014 and ended in 23rd week of 2014. The number of cases started to rise in WHO epidemiologic week 16th and peaked in 17th week and started to decline thereafter (Fig. 41).

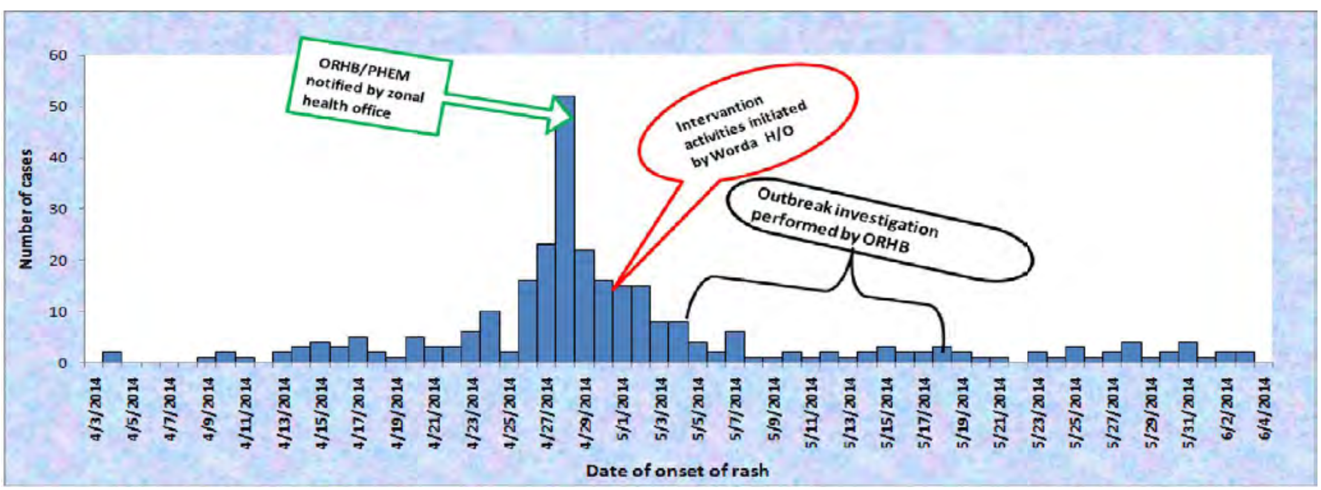


Figure 41: Number of measles cases by date of rash onset in Beko Jimma Kebele, Sibu Sire District, East Wollega Zone, Oromia Region, Ethiopia, from April 4th to June 3rd/2014.

Among the total case patients affected by the outbreak 257 (88.3%) of them were not vaccinated for measles, while only 21 (7.2%) of them reported to have received at least one dose of measles containing vaccine prior to the outbreak period and the rest 13 (4.5%) cases vaccination status was not known (Fig. 42). All data on vaccination status were based on respondent recall; no written document of vaccination history (vaccination card) was available for all cases and controls.

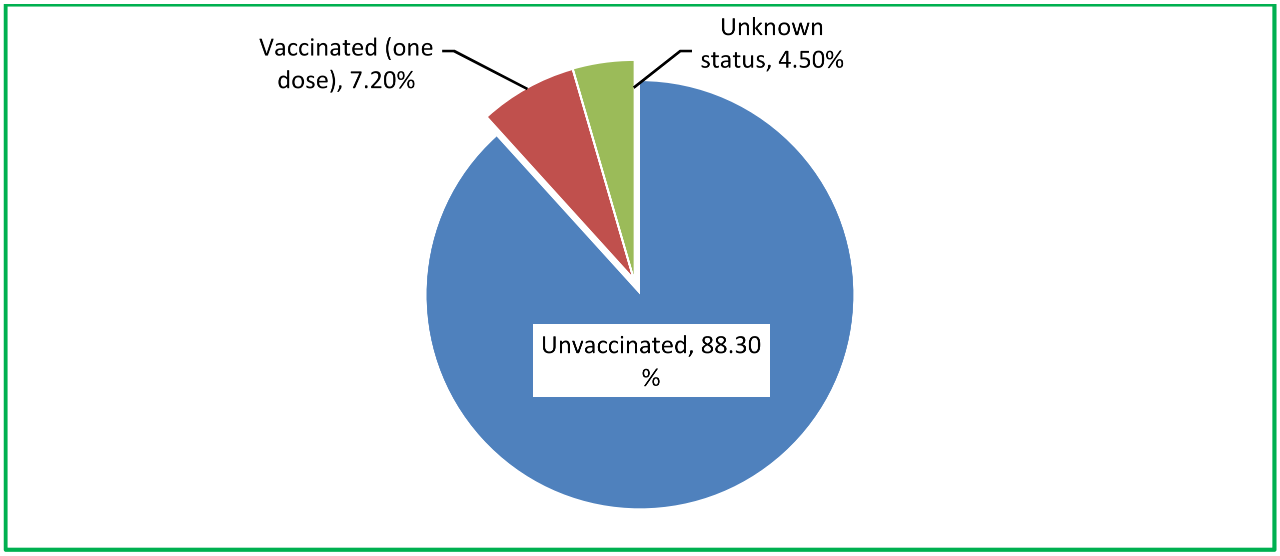


Figure 42: *Measles vaccination status of measles cases* in Beko Jimma Kebele, Sibu Sire District, East Wollega Zone, Oromia Region, Ethiopia, 2014

The overall attack rate of the disease was 2.91 per 100 inhabitant of the kebele and the case fatality rate (CFR) was 3.44 per 100 cases.

More than three quarter of the cases were aged below 15 years old. The highest attack rate (9.38%) was among children of age group 1 – 4 years. Individuals in the age group 15 year and above were the least affected with an attack rate of 1.17 per 100 inhabitant o f this age group. Highest case fatality rate, 5.65% was also seen in children of age group 1 – 4 year. More than half of the deaths (60 %) occurred among female, with a case fatality rate of 3.92%.

5.1.3.2. Vaccination coverage

Beko Jimma Kebele health post didn't have functional refrigerators for the storage of vaccines, as a result in this kebele there is no regular routine immunization service.

The immunization service in this kebele is irregular and when there are immunizations, they are brought from district health office.

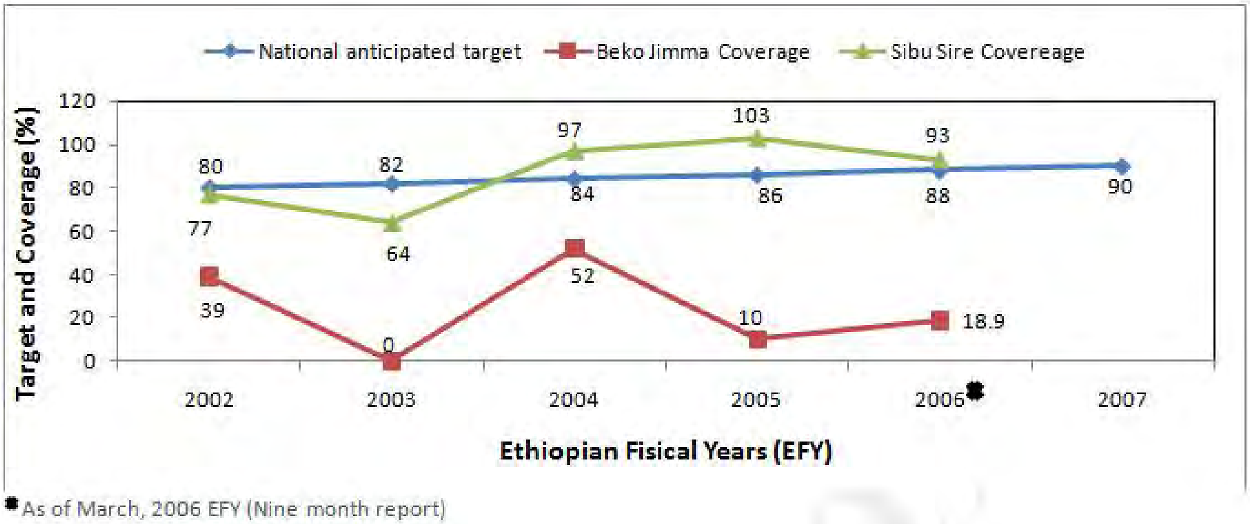


Figure 43: Trends of measles vaccination coverage of Beko Jimma Kebele and Sibu Sire district, East Wollega Zone, Oromia Region, Ethiopia, 2014

5.1.3.3. Analytical epidemiology

In this investigation a total of 54 cases and 108 healthy controls who resided in the same kebele with the cases were selected for analytical study with a ratio of one case to two controls. Among the total 54 interviewed cases 30 (55.6%) of them were males and among the total 108 controls 62 (57.4%) of them were females. The age of the case patients ranged from 0.25 year (3months) to 25 years with mean age of 9.1 years and median age of 9 years, whereas the age of the controls ranged from 0.5 year (6 months) to 30 years with mean age of 7.8 years and median age of 5.5 years.

In bi-variate analysis; having contact with a person suspected to have measles during the last 2 -3 weeks OR: 8.69 (95% CI, 3.73 – 20.21) and having travel history to a place with active measles OR: 39.42 (95% CI, 15.2 – 102.2) and presence of measles case patient in the family OR: 7.18 (95% CI, 3.38 – 15. 29) were significant risk factors for contracting measles. Moreover malnutrition OR: 3.96 (95% CI, 1.53 – 10.28) and not knowing the mode of transmission of measles OR: 2.44 (95% CI, 1.18 – 5.05) have significantly associated with the presence of measles illness.

In-multivariate analysis we have identified two factors that remained independently associated with contracting measles infection in Beko Jimma Kebele outbreak; Presence of sick individuals among the family members and having contact with measles infected cases in the past two to three weeks. In addition being nutritionally normal was found to be protective against measles infection

5.1.4. Discussion

Several literatures supports that a number of factors contribute for the occurrence of measles outbreak in an area, where mainly occurs when the accumulated number of susceptible individuals is greater than the critical number of susceptible individuals, or epidemic threshold, for a given population to sustain transmission (7). Similarly our investigation has identified several factors that were associated with contracting measles in Beko Jimma Kebele of Sibu Sire District East Wollega Zone. Over the period of the outbreak a total of 291 cases were identified with the highest overall attack rate of 291 per 10,000 inhabitants compared to the attack rate of measles outbreak in Simada District of south Gonder Zone which was 4.1/10,000 people and other studies (8).

There was no significant attack rate difference observed in this outbreak between male and female cases which is comparable with the finding of outbreak investigation in Simada District of south Gonder Zone (8). The most affected age group in this outbreak was children aged 1 to 4 years with attack rate of 938/10,000 this is supported by WHO that children under five years are the most affected group (3); however finding in other unpublished studies in Arsi Zone showed the most affected age group in children aged 5 to 9 years with Attack rate of 10.4/10,000 (9).

The case fatality rate (CFR) of this outbreak was 3.44% with high proportion of deaths (70%) and case fatality rate (5.6%) occurred in children aged 1 to 4 years which is supported by WHO estimate that 90% of measles related deaths are in children under age of five years (3). The likely contributing factor for the mortality of the cases might be malnutrition and poor health service seeking behavior of the people which all of the deceased cases were not sought treatment at health facility

According to WHO estimate the expected case fatality rate in developing countries ranges from 3% to 6% (3, 5). The CFR in our finding also falls in this range. The CFR of this outbreak was lower than other measles outbreak CFR observed; like a retrospective community-based study conducted in West Hararghe zone (CFR= 6.7%), outbreak investigation in Simada District of South Gonder (13.4%) and outbreak investigation in Harena & Dawe Sere districts of Bale Zone (15.7%) (8, 10, 11). It was higher than the finding from Sudan and India; CFR of 0.9% and 0.45% respectively (12, 13). High proportions (88.3%) of cases in this outbreak were not vaccinated against measles infection. This is comparable with the finding of study on measles outbreak in West Harerge and in Zone Granada Spain; where 80.3% and 89% of the cases had not received any dose of measles vaccines respectively (11, 14). Studies have demonstrated that measles vaccines induce sero- converion of 85% vaccinate children at 9 months and above 95% after 12 months of age (3, 5, 7). In order to develop herd immunity among non-immune people, reduce transmission and risk of exposure to measles virus 90% of the population needs to be immunized; whereas to prevent outbreak occurrence very high vaccination coverage (95%) is needed (7). Moreover a number of studies have reflected that being unvaccinated is one of the main risk factor for contracting measles infection (2, 13, 15). However according to the Sibu Sire District's report, the five year (2002 -2006 as of March EFY) vaccination coverage of Beko Jimma Kebele was between 0% to 52%, which is much more lower than the National and WHO minimum expected district vaccination coverage (90%) (16). Therefore this low immunization coverage resulted in the accumulation of susceptible individuals in the Kebele was one of the factors played a significant role in the occurrence of this outbreak.

Having contact with measles cases was found to be a risk factor for contracting measles infection which is supported by a similar study done in Zimbabwe and by the fact that the secondary attack rate of measles is 90% in the presence of susceptible individuals (2). Presence of measles case patient in the family member was also a risk factor which might increase the chance of getting in contact with the active cases and being infected. This is supported by the fact that the secondary attack rate of measles is 90% in the presence of susceptible individuals (7, 17, 18).

Moreover as indicated in many studies malnutrition was also significantly associated with contracting measles infection (3, 7, 19).

5.1.4. Limitations

Absence of vaccination card that was difficult to determine the vaccination status, exact date of vaccination and other relevant information.

5.1.5. Conclusion

This outbreak occurred in remote pocket kebele of the Sibu Sire District with extremely low immunization coverage, weak surveillance system and delayed reporting. In this outbreak overall high attack rate with a wider age range has been observed. More than three quarters of the cases of this outbreak were children below 15 years age. Factors contributed for the occurrence of this outbreak include; having contact with measles cases, presence of measles cases in the family, malnutrition and being unvaccinated against measles. High proportion of unvaccinated below 15 years old measles cases of the outbreak most likely resulted due to the accumulation of susceptible individuals in the kebele as a result of low routine immunization coverage and weak supplementary immunization activities that aim to provide a second opportunity for measles immunization. The low immunization coverage could have been attributed because of the low health service coverage (one health post for more than 10,000 populations) of the kebele. Malnutrition has been also one of aggravating factors of the outbreak. The majority of cases and all deaths of the outbreak occurred before the zonal health office and regional health bureau being notified and initiated the response activities. The number of measles cases and deaths of the outbreak could have been reduced if there were a well functioning surveillance and timely report system in the district particularly in Beko Jimma Kebele.

5.1.6. Recommendations

The Sibu Sire District health office should have to establish and implement routine EPI service in Beko Jimma Kebele and other similar kebeles as soon as possible. Additionally the district have to work hard to attain primary measles vaccination coverage of >90 % in under one year children and to achieve >95 % supplementary immunization activities in all Kebeles that found in districts. Moreover inhabitants of the community need to be mobilized to increase their awareness on importance of immunization and health service seeking behavior.

Moreover the office need to train all health workers found in the district on disease notification and surveillance to enable them early detect an outbreaks and to prevent reoccurrence of another outbreak in Beko Jimma and other kebeles.

Additionally the health office should have to establish and implement screening and treatment service for malnourished cases in Beko Jimma kebele.

The health extension workers in Beko Jimma kebele health post should enhance the awareness of the community on mode of transmission of measles, its prevention and importance of taking appropriate treatments if being infected to prevent measles related complications and death.

The East Wollega Zone health office should have to enforce and follow district health offices to strengthen their routine EPI service, in order to attain primary measles vaccination coverage of >90 % in under one year children and make sure that penta-valent to measles dropout rate is less than 10%. Also the office should have to work hard to achieve >95 % supplementary immunization activities in all districts that found in the zone by making the service available and accessible.

Moreover the office must work hard to make sure at least 80 % of health facilities (health centers and health posts) that found in all districts are sending weekly IDSR report regularly.

Refernces

1. Harrison's Principles of Internal Medicine. 17th ed. United States of America: The McGraw-Hill Companies, Inc.; 2008.
2. Kufakwanguzvarova PW, Robert MF, Notion GT. Measles outbreak investigation in Zaka, Masvingo province, Zimbabwe. BioMed Central Ltd. 2012.
3. WHO. Measles mortality reduction and regional elimination; atrategic plan 2001 - 2005. World health Organization, Geneva. 2001.
4. Berhane Yemane , Haile Mariam Damen, Helmut K. Epidemiology and Ecology Of Health and Disease In Ethiopia

Addis Ababa, Ethiopia: Ethiopian Public Health Association; 2005.

5. EPHI. Guideline on measles surveillance and outbreak management 3rd ed. Addis Ababa, Ethiopia: Ethiopian Public Health Institute; 2012.

6. Heymann D. Control of Communicable Diseases Manual: An Official report of the American public Health Association,. 2004.

7. Corinne Danet, Fermon F. Management of a measles epidemic: Practical guide for Doctors, Nurses, Laboratory technicians and Medical auxiliaries. : Medecine Sans Frontieres; 2013.

8. Mer'Awi Aragaw, Tilay T. Measles outbreak in Simada District, South Gonder Zone, Amhara Region: Immediate need for sttrengthened routine and supplementary immunization actiivities. Ethiopian Journal of health Development. 2012;26(2):115-8.

9. Muleta D. Measles outbreak investigation and responce in Arsi Zone, Ormia Region. 2012.

10. Abiyot Bekele Weyessa, al e. Investigation of measles outbreak- Herena and Dawe-Serer Districts of Bale Zone, Oromia Region, Ethiopia, February 2011. Retrovirology. 2012;9(suppl 1):39.

11. Kassahun Miitiku, Kegne W. Measles outbreak investigation in West Hararghie Zone of Oromia Region, Ethiopia. Ethiopian Journal of Pediatrics and Child health July 2011;7(7). Epub 44.

12. Fatima Coronado, et al. Retrospective measles outbreak investigation, Sudan. J Trop Pediatr. 2006;52(5).

13. Ministry of Health and Family Welfare, India. Measles Catch-up Immunization Campaign: Guideline for Planning and Immplimentation. 2011.

14. Navarro E, et al. Study of a measles outbreak in Granada with preventive measures applied by the courts, Spain, 2010 to 2011. Euro Surveill. 2013;18(43).

15. Adeoye et al. Investigation of a measles outbreak in a Rural Nigerian community – The Aladura experience. African Journal of Microbiology Research. 2010;4(5):pp. 360-6,.

16. Kristen R. Ehresmann, Norman Croucch, et al. An outbreak of measles among unvaccinated youg adults and measles seroprevalence study: Implication for measles outbreak control in adult populations. J Infect Dis. 2004;189(Suppl. 1):S104-s7.

17. Balcha G. Masresha, Reinhard Kaiser, et al. Progress Toward Measles Preelimination — African Region, 2011–2012. CDC Morbidity and Mortality Weekly Report April 2014;63(13):285-91.

18. World Health Organization. Guidelines for measles and rubella outbreak investigation and response in the WHO European Region. 2013.

19. Jonathan A Polonsky, et al. High levels of mortality, malnutrition, and measles, among recently- displaced Somali refugees in Dagahaley camp, Dadaab refugee camp complex, Kenya, 2011. Conflict and Health 2013;7(1).

Chapter –VI: Abstracts for Scientific Presentation

Authors: Gebeyehu D. Bekele, Dr. Negussie Deyessa, Abigail Greenleaf, Tesfaye Deti ; Addis Ababa University School of public health. Ethiopian FETP 5th Cohort resident.

E mail: gebeyehudum@yahoo.com; Phone: +251 920 36 38 81

6.1. Epidemiology of Suspected Meningococcal meningitis in Oromia Region, Ethiopia, 2009 – 2013.

Background: Meningitis is a disease caused due to inflammation of the protective membranes covering the brain and spinal cord. Among the bacteria's that causes meningitis, the Gram-negative diplococcic bacteria, *Neisseria meningitidis* is the predominant causes of bacterial meningitis and it is the only bacterial meningitis which has the potential to cause epidemics. Each year, approximately 500,000 cases of meningococcal disease and 50,000 deaths occur in the world. Ethiopia is one of the countries lying in the "African Meningitis Belt" and the first meningitis was recorded in 1902.The information generated from the analysis of surveillance data of meningitis is important to know the burden, trends and distribution of the disease.

Method: We conducted a Cross-sectional study design to collect and analyze five years (2009 - 2013) meningitis surveillance data of Oromia Region. We used Epi-Info 7.1 and Microsoft Excel 2007 to compile and analyze the data.

Result: During the years 2009 - 2013 there were 2,498 suspected Meningococcal Meningitis patients in Oromia Region with a mean annual incidence of 1.64 patients per 100,000 and 66 suspected deaths with case fatality rate of 2.6%.The highest number of suspected cases 726 (29.1%) was reported in 2013 with annual incidence of 2.5 cases per 100,000. The highest number of patients was reported from Horo Guduru Wollega 394 (15.8%), West Arsi 377 (15.1%) and Guji 260 (10.4%) Zones with a mean annual incidence of 12.04%, 3.25% and 3.37% per 100,000 populations respectively

Conclusion: Generally magnitude of suspected meningococcal meningitis in Oromia region showed an increasing trend during the past five years except in 2012. Moreover Oromia was one of the regions that reported the highest number of suspected patients in Ethiopia.

Key words: Meningitis, suspected, Surveillance, Oromia

6.2. Measles Outbreak Investigation and Response in Beko Jimma Kebele of Sibu Sire District, East Wollega Zone, Oromia, Ethiopia May 2014

Background: Measles (rubeola) is a highly contagious, acute, viral illness of the respiratory tract caused by RNA enveloped virus of the family paramyxovirus, genus Morbillivirus. Fifty to sixty percent of 1.6 million global deaths attributed to vaccine preventable diseases are attributed to measles. Measles is the most common vaccine preventable diseases that occur in Ethiopia; where parents recognize it as a self-limited common childhood illness for which no medical care is often sought. Measles outbreak was detected in Beko Jimma Kebele of Sibu Sire District, East Wollega Zone in March 2014. Investigation was done to verify the existence of an outbreak, to determine the magnitude and identify associated risk factors contributed for the occurrence of the outbreak.

Method: A 1:2 unmatched case control study design was conducted from May 4 to 18, 2014. Interview by using structured questionnaire was used to collect data from cases and controls. Data was managed and analyzed by using Microsoft Excel 2007 and Epi Info 7.1.

Results: From five of the cases, blood samples were collected for laboratory confirmation, and all tested positive for Measles IGM. Over the period of outbreak a total of 291 suspected measles cases with 10 community deaths were detected. 52.2 % of the cases were females. The age of the cases ranged from 1 month to 55 years with mean age of 8.6 years. More than three quarter of the cases were aged below 15 years. 88.3% of the cases including all the deceased were not vaccinated for measles. The overall attack rate was 2.91% and the case fatality rate was 3.44%. Statistically significant independent risk factors include: contact with a person suspected to have measles AOR: 31.16 (95% CI, 8.19 – 118.62) and presence of measles case patient in the family AOR: 6.36 (95% CI, 2.22 – 18.13). However nutritional being normal was found to be protective AOR: 0.13 (95% CI, 0.0.05 – 0.34).

Conclusion and Recommendation: This outbreak occurred in remote pocket kebele of the Sibu Sire District with extremely low immunization coverage, weak surveillance system and delayed reporting. Multiple factors contributed for the occur ace of the outbreak. We recommend enhanced routine immunization service, strengthened of surveillance and early reporting system and awareness creation to the community on mode of transmission, prevention and health seeking behavior.

Key words: Measles, Outbreak, Case-Control, Beko Jimma

Chapter – VII: Narrative Summary of Disaster Situation

7.1. Narrative Summary Report on Meher Health need Assessment in Kelem Wollega, East Wollega, Horo Guduru and Jimma zones, Oromiya, Ethiopia, 2014

Executive Summary

Humanitarian need assessment is a participatory process for assessing hazards, vulnerabilities, risks, ability to cope, preparing coping strategies and finally preparing a risk reduction options implementation plan by the local community. This health need assessment is part of the overall meher season need assessment conducted by a multi-agency team between November 29 to December 18, 2014 in four zones found in Oromia Region; namely East Wollega, Kelem Wollega, Horo Guduru Wollega and Jimma Zones. The multi-agency team assessed two woredas from East Wollega Zone and one woreda from Kelem Wollega, Horo Guduru Wollega and Jimma Zones.

This assessment was intended to investigate the extent, types, magnitude, severity and likelihood of different risks including health emergencies in the most "vulnerable" Woredas and develop response plan based on identified findings.

We identified weak emergency preparedness, shortage of emergency drugs and therapeutic feedings and medical equipment at both zonal level and many districts of these zones. Even if there weren't major risk of epidemic prone diseases in some districts malaria has shown increasing trends. Technical, financial, emergency drugs and therapeutic food supplies and emergency materials support is needed to strengthen their preparedness and response capacities.

7.1.1. Introduction

Humanitarian need assessment is a participatory process for assessing hazards, vulnerabilities, risks, ability to cope, preparing coping strategies and finally preparing a risk reduction options implementation plan by the local community (1).

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.

Health emergency, whether disease outbreaks or other health emergencies including wide spread malnutrition, usually follow after emergency events due to natural or manmade disasters. During emergency conditions, access to food, safe water and sanitary facilities are major challenges. If proper measures are not undertaken, the lack of food, safe water and sanitary facilities could lead to adverse effects in fulfilling daily needs; and could lead to increased morbidity and mortality due to food and water borne diseases (2).

A coordinated assessment is an assessment planned and carried out in partnership by humanitarian actors, in order to document the impact of a particular crisis and to identify the needs of affected populations.

There for meher emergency need assessment is crucial to determine the scale and nature of the problems people actually face and to accurately forecast and assess the magnitude of the emergency threats and accordingly to make the necessary plans and preparations to prevent unnecessary human damage and deaths.

Hence this health need assessment is part of the overall meher season need assessment conducted by a multi-agency team between November 29 to December 18, 20114 in four zones found in Oromia Region; namely East Wollega, Kelem Wollega, Horo Guduru Wollega and Jimma Zones. The multi-agency team assessed two woredas from East Wollega Zone and one woreda from Kelem Wollega, Horo Guduru Wollega and Jimma Zones. Based on 2007G.C Ethiopian population and housing census projection, population of East Wollega, Kelem Wollega, Horo Guduru Wollega and Jimma Zones is estimated to be 1,502,985 (50% male), 981,753 (50.4% male), 715,222 (50.1% male) and 3,090,112 (50.3% male)in 2007 E.F.Y respectively. In East Wollega Zone there are 319 health post, 57 health centers and one government hospital, whereas in Kelem Wollega Zone there are 256 health post, 46 health centers and one government hospital, in Horo Guduru Wollega there are 183 health post, 49 health centers and one government hospital and Jimma Zone has 489 health post, 112 health centers and two government hospitals.

Administratively East Wollega Zone was divided in to 17 woredas. Among these 17 woredas the multi sectoral meher assessment team has visited two of them; Diga and Guto Gida Woredas that has been selected by central Meher assessment team. Whereas Kelem Wollega and Horo Guduru Wollega Zones were administratively divided in to ten woredas each and Jimma Zone was divided in to 20 woredas. The multi sectorial Meher assessment team has assessed one woreda from each of these three zones; namely Anfilo Woreda from Kelem Wollega Zone, Jerdega Jarte Woreda fromGuduru Wollega Zone and Kersa Woreda from Jimma Zone which has been selected by central Meher assessment team

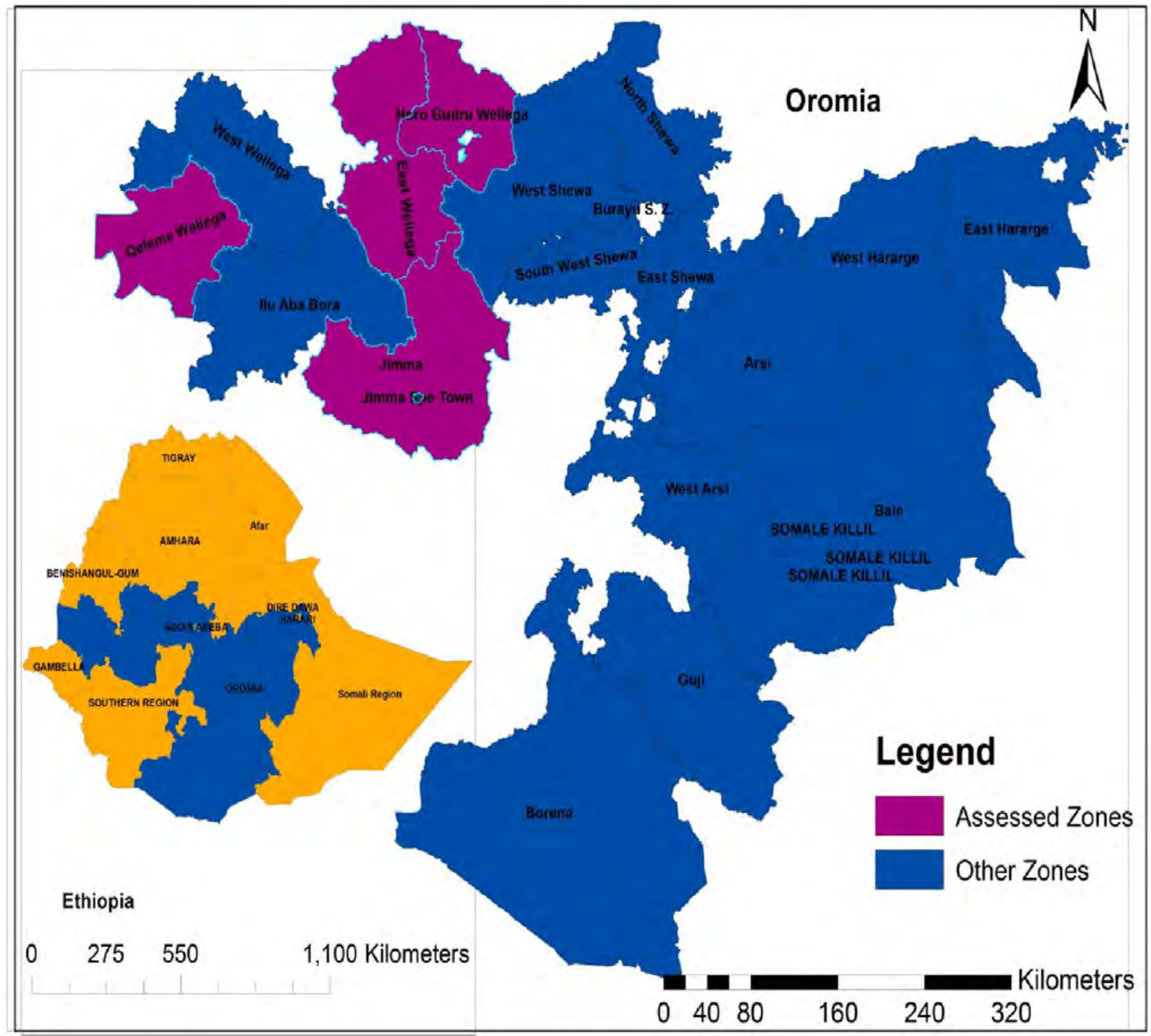


Figure 44: Map of Oromia Region by zones, Ethiopia, 2014.

7.1.2. Objectives

- To identify existing or potential health, nutrition, and WASH emergencies and assess the magnitude and likelihood of the emergency situations.
- To assess the level and severity of health and health related crises and the need for emergency aid.
- To assess the existing capacity of the health system to address those Risks
- To determine gaps in the capacity of the health system to address anticipated risks and existing threats

7.1.3. Methods

During the assessment pertinent health and health related data and information from the selected four zones and respective woredas were collected using different methods:

- Semi structured questionnaire was used to collect the required information.
- A review of documents and reports obtained from woreda and zonal health office.
- Meetings and discussions with woreda and zonal preparedness and response task force, officials and program managers.
- Field visits in selected woredas and kebeles to discuss with community figure heads and lower level governmental administrative bodies to triangulate data and information collected from zone and woredas

7.1.4. Result

7.1.4. 1. Preparedness and Coordination

Among the assessed zones two of them; East Wollega and Horo Guduru Wollega zones have a multi-agency emergency coordination forum with relevant government sectors and NGO agencies represented but it was not functional and has no planed schedule for regular meeting. Whereas Jimma Zone has the emergency coordination forum that has not been represented by relevant government sectors and NGO and Kelem wollega has no multi-agency emergency coordination forum.

The zonal health offices of East Wollega, Jimma and Horo Guduru Wollega Zones have public health emergency preparedness and response plan (PHEPRP) but the plan has no proper budget to respond and control any emergency situations. Moreover they also have rapid response team (RRT) ready to respond any public health emergency situation. However kelem Wollega zone lacks either of them.

All the assessed zonal health offices have two public health emergency management focal persons who have been trained on basic public health emergency management. Moreover each zones have staffs, who have been trained on basic public health emergency management that works woreda health offices and health facilities found in the zones. The numbers of trained staffs were 59 staffs in Kelem wollega, 35 in East Wollega, 52 staffs in Horo Guduru Wollega and 77 staffs in Jimma zones.

7.1.4. 2. Top five causes of morbidity

Pneumonia was the leading causes of under five morbidity in three of the districts of three zones. Moreover Non- bloody Diarrhea, acute febrile illness (AFI), acute upper respiratory illness (AURI) and intestinal parasiitosis were among the top five causes of under five children morbidity for all assessed districts. Similarly these diseases also were among the leading five causes of morbidity of individuals aged five years and above in all visited districts (Tables).

Table 25: Top five causes of morbidity of under five children of selected districts of assessed zones, Oromia, Ethiopia 2014.

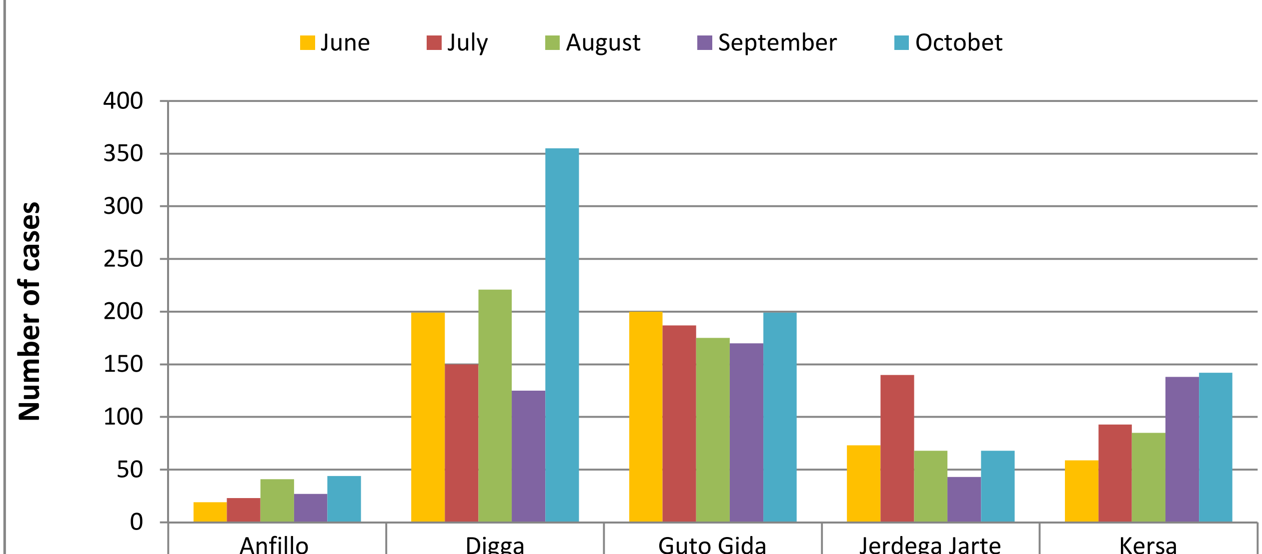
Zones	**Districts/ Woredas**	**Top five causes of morbidity for < 5 children**				
		1	**2**	**3**	**4**	**5**
Kellem Wollega	Anfillo	Pneumonia	Acute febrile illness (AFI)	Acute upper respiratory illness (AURI)	Helmenthiasis	Non-bloody Diarrhea
East Wollega	Digga woreda	Pneumonia	Acute respiratory tract infection (ARTI)	Non- bloody Diarrhea)	Intestinal parasiitosis	Malaria
	Guto Gida woreda	No data were available				
Horo Guduru Wollega	Jardega Jarte	No data were available				
Jimma	Kersa	Pneumonia	Acute febrile illness (AFI)	Acute upper respiratory illness (AURI)	Helmenthiasis	Non-bloody Diarrhea

Table 26: Top five causes of morbidity of Above five years individuals of selected districts of assessed zones, Oromia, Ethiopia 2014.

Zones	Districts/ Woredas	Top five causes of morbidity for >=5 years individuals				
		1	**2**	**3**	**4**	**5**
Kellem Wollega	Anfillo	Acute febrile illness (AFI)	Disease of musculo splender	Typhoid fever	Acute upper respiratory illness (AURI)	Urinary Tract Infection (UTI)
East Wollega	Digga woreda	Acute respiratory tract infection (ARTI	Intestinal parasiitosis	Typhoid fever	Malaria	Urinary tract infection (UTI)
	Guto Gida woreda	Typhoid Fever	Dyspepsia	Intestinal Parasitosis	Pneumonia	Malaria
Horo Guduru Wollega	Jardega Jarte	Urinary Tract Infection (UTI)	Dyspepsia	Acute upper respiratory illness (AURI)	Intestinal parasitosis	Acute febrile illness (AFI)
Jimma	Kersa	Acute febrile illness (AFI)	Urinary Tract Infection (UTI)	Typhoid fever	Acute upper respiratory illness (AURI)	Malaria

7.1.4.3. Situation of some public health epidemic prone diseases

In the past five month (June to October 2014) there were no reported deaths and cases of major epidemic prone diseases like; measles, meningitis, and cholera (AWD) in all assessed districts except Kersa district of Jimma zone that reported 48 measles. However as all assessed districts have malarious kebeles they have reported a total of 3,044 cases with in the past five months (June to October 2014). The majority of cases 1,050 (34.5%) and 931 (30.6) were reported from Digga and Guto Gida districts of East Wollega Zone respectively. Anfillo District of Kelem wollega Zone has reported the least cases 154 (5%). In all districts there were no death reported within the past five months.



	Anfillo	Digga	Guto Gida	Jerdega Jarte	Kersa
June	19	199	200	73	59
July	23	150	187	140	93
August	41	221	175	68	85
September	27	125	170	43	138
Octobet	44	355	199	68	142

Figure 45: Five month number of malaria cases of selected districts of assessed zones, Oromia, Ethiopia 2014.

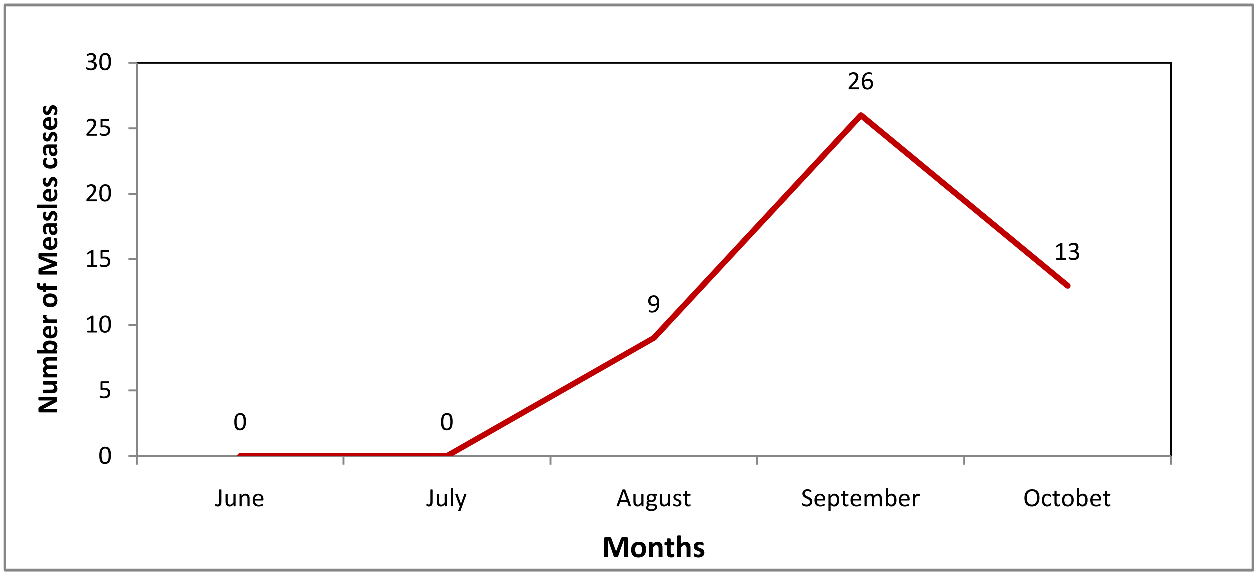


Figure 46: Five trends of measles cases in Kersa District of Jimma Zone, Oromia, Ethiopia 2014.

7.1.4. 4. Outbreak Conditions

According to the report of visited zonal health offices during the last five month period of time there were no outbreaks of epidemic prone diseases except Jimma Zone. Jimma zone reported measles outbreaks in September that affected 75 people with no death. The cases were occurred between August, 2014 and October, 2014 in Jimma town and Kersa woreda with a magnitude of 27 and 48 cases respectively. In addition according to the East Wollega zonal health office report, malaria has showed increasing trends in some malarious woredas compared to last year same period trends; like Jimma Arjo, Nunu Kumba, Diga, Ebantu and Haro Limmu Woredas.

7.1.4. 5. Risk factors of epidemic prone diseases

7.1.4. 5.1. Malaria

As Anfilo Woreda of Kelem Wollega Zone has 13 malarious kebeles and the presence of mosquito breeding site could be risk factors for the occurrence of malaria outbreak. However >80% LLINs coverage, 80% IRS and prevention and control activities performed by the woreda health office will minimize the risk of outbreak occurrence.

Malaria is endemic in both Digga and Guto Gida woredas of East Wollega Zone and in both woredas there is mosquito breeding site and interrupted rivers. Hence the presence of these risk factors makes both woredas a risk area for malaria epidemic. Even if the three years ago LLITNs coverage for both woredas was greater than 80% it is not replaced till now. Indoor Residual Spray is conducted in both woredas and the coverage is above minimum World Health Organization recommendation (90%).

Among the total 24 kebeles of the Jedrega Jarte woreda of Horo Guduru Wollega Zone malaria is endemic in 12 of them and about 28,300 people are at risk population. The two years ago LLITNs coverage of the woreda was 100 % and the 2014 IRS coverage is 41.8% which is below the WHO recommendation. The risk of malaria outbreak in this woreda is high due to poor prevention and control activities.

Among the kebeles found in Kersa woreda of Jimma zone malaria is endemic in 20 of them and about 130,873 people are at risk for malaria. The 2012 LLITNs coverage of the woreda was 100 % and the 2014 IRS coverage is 100% which is above the WHO minimum recommendation. However the presence of malaria breeding sites, interrupted rivers and delayed replacement of LLINTs could fever the occurrence of malaria epidemic in the woreda.

7.1.4. 5.2. Meningitis

There was no reported meningitis epidemic in the last three years in all assessed woredas. A total of 136,465 people of Kersa woreda, 39,465 people of Jedrega Jarte Woreda, 65,829 people of Anfillo Woreda, 69,131 people oof Guto Gida woreda and 15,000 people of Digga Woreda have been vaccinated for meningitis between 7/2/2006 to 17/2/2006 E.C, hence the risk of meningitis outbreak occurrence in these woredas would be very low. Moreover Anfillo woreda of Kelem Wollega Zone has long rainy season which could also minimize the risk of meningitis epidemic in the woreda.

7.1.4. 5.3. AWD (Cholera)

No epidemic of AWD has been reported in all assessed woredas of all zones for the past three years. However the newly settled populations in Anfillo woreda have no safe water sources and they were repeatedly suffered from waterborne diarrheal diseases, where children were the mainly affected groups. In this woreda there were also no supplies of chemicals to treat unsafe waters. There for unless the problems have not been solved immediate in this area the risk for outbreak of waterborne illness including AWD occurrence will be higher. The latrine and safe water coverage of assessed districts are shown in the figure below based on the reports of the district health offices. No data was available on safe water utilization at Digga woreda and latrine coverage at kersa woreda.

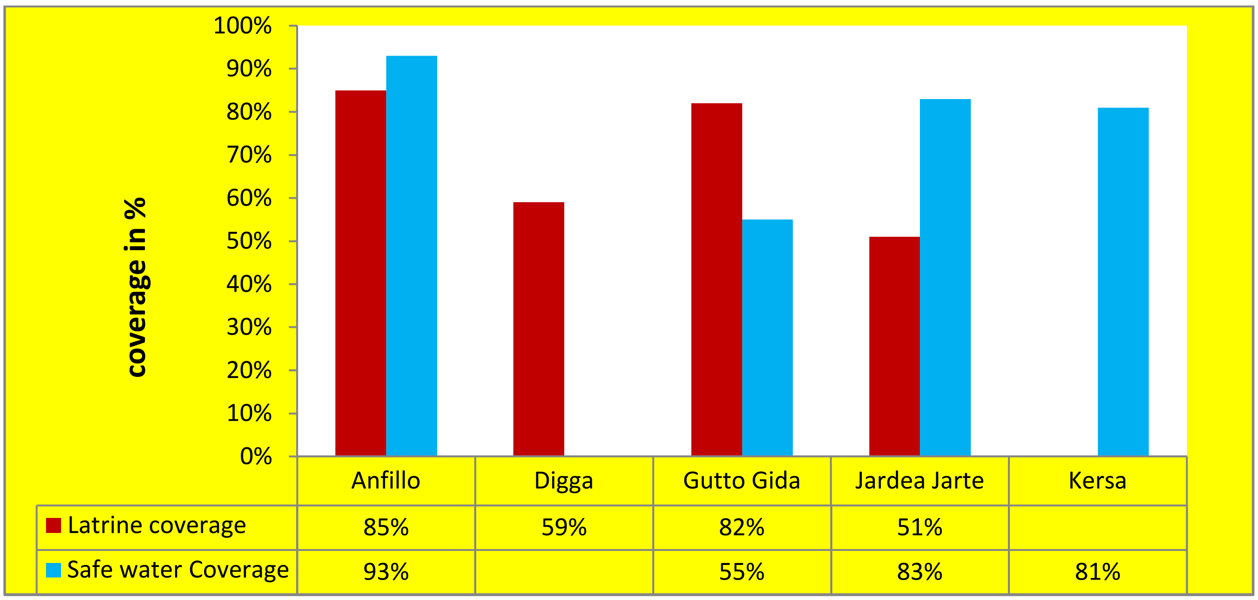


Figure 47: 2006 EFY Safe water and latrine coverage of selected Districts of assessed zones, Oromia, Ethiopia 2014.

7.1.4. 5.4. Measles

Currently there is no an ongoing measles outbreak in all assessed woreda. The 2006 E.F.Y measles vaccination coverage of all visited woredas are shown in the figure below. The coverage of all districts was above the world health organization (WHO) minimum recommendation (80%) except Jardega Jarte woreda. No supplementary immunization activity (SIA) has been conducted in 2006 in all of the districts.

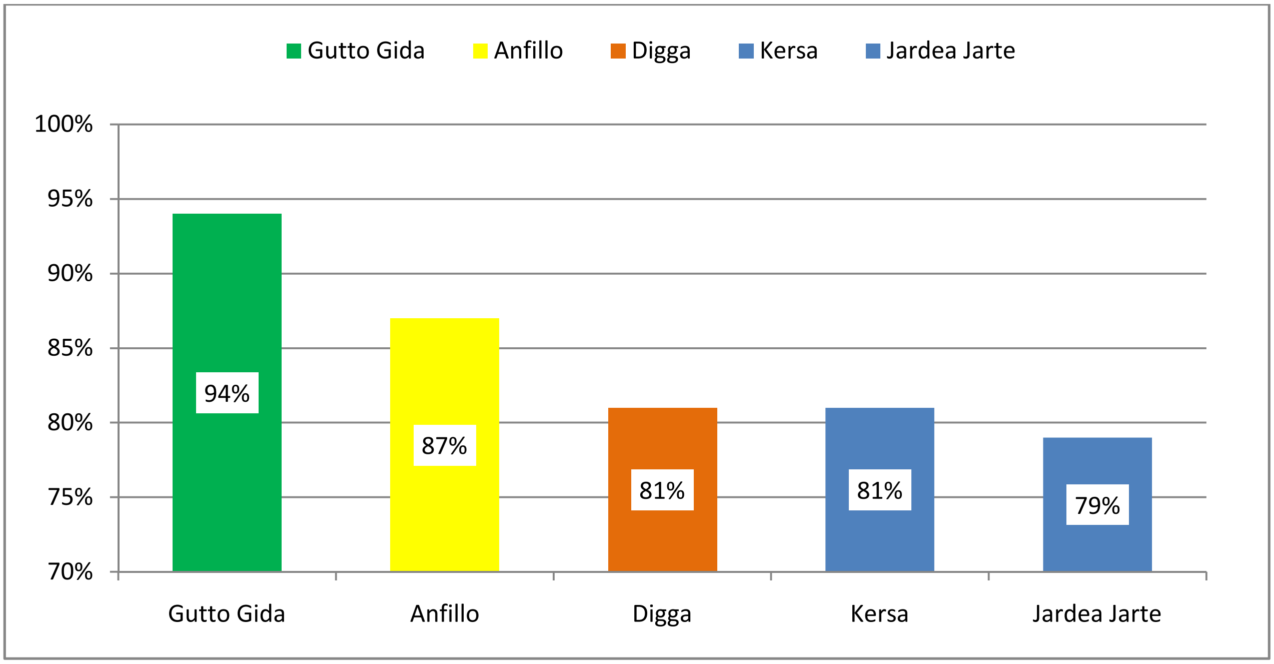


Figure 48: 2006 E.F.Y measles vaccination coverage of selected Districts of assessed zones, Oromia, Ethiopia 2014.

7.1.4. 6. Emergency drugs and supplies stocks

Shortage of emergency drugs and supplies was a major problem at both zonal and district levels. At zonal level there is no a hold on planned emergency drug stock and budget to buy emergency drugs. There is also no planned donation of drugs for emergency by NGOs. List of emergency drug stock needed for six month for the assessed zones are indicated in the tables below.

Table 27: List of emergency drugs stock required for six month, Kelem Wollega Zone, December 2014.

Sr. no	Name of drugs and medical supplies	Unit	Total requirement	Available	gap
1	Meningitis vaccine	Dose	0	0	0-
2	Coartem	box of 6x4	420	0	420
3	Oil CAF	ampul	0	0	0
4	Doxcycline	box	300	0	300

5	Ringer Lactate	bag	100	0	100
6	ORS	Box	50	0	50
7	Amoxil suspension	bottle	700	0	700
8	Co- trimoxazol suspension	bottle	700	0	700
9	Tetracycline ointment	tube	500	0	500
10	Vitamin A	Tin	100	0	100
11	RDT (malaria Dx kit)	box	200	3	197
12	Pastorex	kit	5	0	5
13	LP set	box	5	0	5
14	TI bottle	bottle	10	0	10
15	CTC kit (AWD)	kit	2	0	2
16	Glove	box	100	10	90
17	Syring	Box	100	20	80
18	PPE		50	0	50
19					

Table 28: List of emergency drugs stock required for six month, East Wollega Zone, December 2014.

Sr. no	Name of drugs and medical supplies	Unit	Total requirement	Available	gap
1	Meningitis vaccine	Dose	0	0	0
2	Coartem	box of 6x4	800	150	650
3	Oil CAF	ampul	500	0	500
4	Doxcycline	box	800	200	600
5	Ringer Lactate	bag	200	75	125

6	ORS	Box	200	100	100
7	Amoxil suspension	bottle	2000	1500	500
8	Co- trimoxazol suspension	bottle	700	0	700
9	Tetracycline ointment	tube	1000	700	300
10	Vitamin A	Tin	150	100	50
11	RDT (malaria Dx kit)	Pcs	205,781	8000	197,781
12	Pastorex	kit	10	0	10
13	LP set	box	5	0	5
14	TI bottle	bottle	17	0	17
15	CTC kit (AWD)	kit	4	4	4
16	Glove	box	-	-	-
17	Syring	Box	1000	1000	0

Table 29: List of emergency drugs stock required for six month, Horo Guduru Wollega Zone, December 2014.

Sr. no	Name of drugs and medical supplies	Unit	Total requirement	Available	gap
1	Meningitis vaccine	Dose	39,418	0	39,418
2	Coartem	box of 30 strip	1145	6	1139
3	Oil CAF	ampul	236,508	0	236,508
4	Doxcycline	Caps	77,550	0	77,550
5	Ringer Lactate	bag	1,563	0	1,563
6	ORS	Box	2,349	500	1,849
7	Amoxicillin suspension	bottle	7,200	100	7,100

8	Co- trimoxazol suspension	bottle	700	0	700
9	Tetracycline ointment	tube	7,200	0	7,200
10	Vitamin A	Tin	29	5	24
11	RDT (malaria Dx kit)	Kit	34,350	1,000	33,350
12	Pastorex (meningitis)	kit	30	0	30
13	LP set	box	30	0	30
14	TI bottle	bottle	10	0	10
15	CTC kit (AWD)	kit	2	0	2
16	Glove	box	500	0	500
17	Syring	Box	258	12	246
18	PPE	psc	50	0	50
19					

Table 30: List of emergency drugs stock required for six month, Jimma Zone, December 2014.

Sr. no	Name of drugs and medical supplies	Unit	Total requirement	Available	gap
1	Meningitis vaccine		-	-	Not forecasted
2	Coartem	-	-	-	Not forecasted
3	Oil CAF	-	-	-	Not forecasted
4	Doxcycline	-	-	-	Not forecasted
5	Ringer Lactate	-	-	-	-
6	ORS	Box of 100s	67	0	67
7	Amoxil suspension	Box	278	3	275

8	Co- trimoxazol suspension	Box	248	4	244
9	Tetracycline ointment	Vial	3350	0	3350
10	Vitamin A	Tin	309	15	293
11	RDT (malaria Dx kit)	Not forecasted			
12	Pastorex	-	-	-	Not forecasted
13	LP set	-	-	-	Not forecasted
14	TI bottle	-	-	-	Not forecasted
15	CTC kit (AWD)	-	-	-	Not forecasted
16	Glove	-	-	-	Not forecasted
17	Syring				Not forecasted
18	PPE				Not forecasted

Public health emergency preparedness majorly includes availing of sufficient drugs and supplies, accessibility of emergency fund and availability of trained human power to avert emergency situation. Based on the woredas health office report all woredas have no enough stock of essential drugs necessary to manage main public health emergencies for one month.

Table 31: List of emergency drugs stock required for one month, selected districts off assessed zones, December 2014.

Sr. no	Drugs and supplies	Adequacy for one month (Yes/No)				
		Digga Woreda	Guto Gida Wooreda	Jerdega Jarte Woredas	Kersa Woreda	Anfillo Woreda
1	Ringer Lactate to treat AWD cases	Yes	Yes	No	Yes	Yes

2	ORS to treat AWD cases	Yes	Yes	Yes	Yes	Yes
3	Doxycycline to treat AWD cases	Yes	Yes	Yes	No	No
4	Syringes and gloves for AWD mgt	Yes	Yes	Yes	No	No
5	Amoxicillin suspension (measles)	Yes	Yes	Yes	No	No
6	Tetracycline ointment (measles)	Yes	Yes	Yes	No	No
7	Vitamin A(measles)	Yes	Yes	No	Yes	No
8	Coartem for malaria	Yes	Yes	Yes	Yes	No
9	RDT for malaria	Yes	Yes	Yes	No	No
10	Ceftraxione(Meningitis)	Yes	Yes	Yes	No	No
11	RDT (Pastorex) for Meningitis	No	No	No	No	No
12	LP set	No	No	No	No	No
13	Number of CTC kit available	No	No	No	No	No

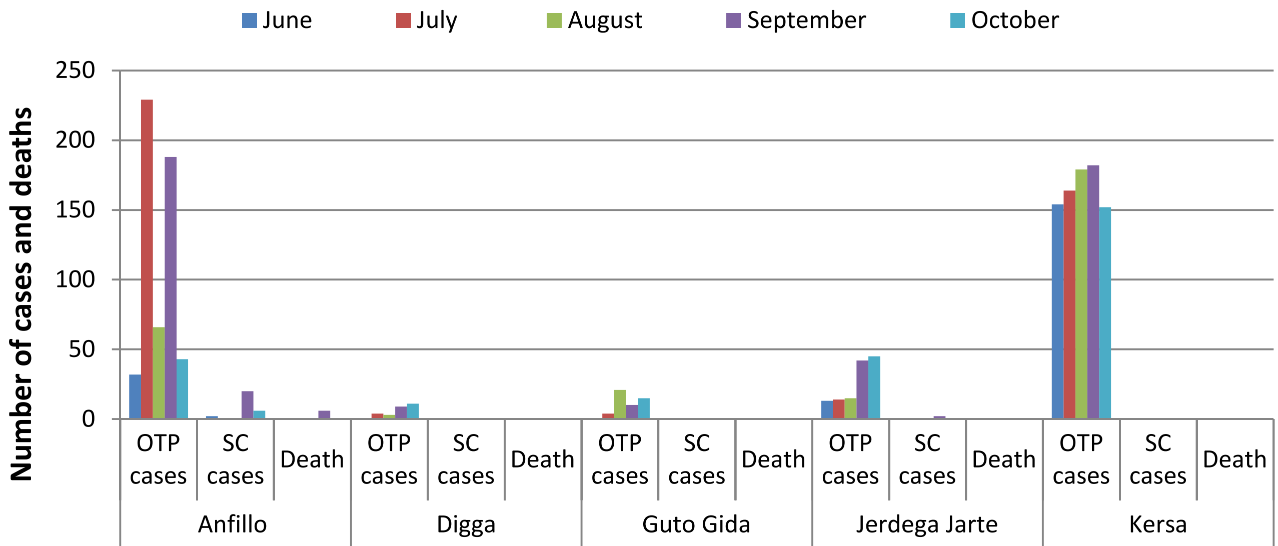
7.1.4. 7. Challenges in Responding Epidemics

During epidemic management, shortage of transportation and emergency drugs are main challenges that faced many districts of both zones. Lack of budget, logistics and trained manpower were others challenges of district in epidemic control activities.

7.1.4. 8. Nutrition situation

Lack of adequate nutrition is underlying cause for major communicable diseases. Hence the availability of therapeutic feeding service is important for prevention and control of the consequence of malnutrition. In all assessed district there are Health facilities that gives therapeutic feeding services for those who have malnutrition problem. The number of Out Patient therapeutic sites (OTP) that found in each districts were 26 OTP sites in Digga, 8 OTP sites in Kersa, 6 OTP sites in Jardega Jarte and in Guto Gida and Anfillo woredas have 3 OTP sites. Among the five assessed woredas only three of them have Stabilization Center (SC) that treats sever acute malnutrition cases; namely Digga, Jardega Jarte and Anfillo woredas have one SC site each. In the last five months (June to October 2014) Kersa woreda of Jimma Zone reported the highest number of Moderate Acute Malnutrition (MAM) cases (831 cases) but no deaths and Sever Acute Malnutrition (SAM) cases were reported from this woreda. Anfillo woreda has reported the second highest number of MAM cases (586) and 28 SAM cases in the past five months. Only two of the assessed cases have reported deaths related to malnutrition; namely Anfillo woreda reported six deaths (3 community death and 3 health facility cases) and Jardega Jarte reported two cases. The majority of the cases and all deaths reported from Anfillo woreda were children from the newly settled population.

Even though therapeutic feeding programs (TFP) were available in all woredas, there were no therapeutic supplies like F100 and F75 used to treat SAM cases in all woredas during the assessment which hinder proper management of the cases.



	Anfillo OTP cases	Anfillo SC cases	Anfillo Death	Digga OTP cases	Digga SC cases	Digga Death	Guto Gida OTP cases	Guto Gida SC cases	Guto Gida Death	Jerdega Jarte OTP cases	Jerdega Jarte SC cases	Jerdega Jarte Death	Kersa OTP cases	Kersa SC cases	Kersa Death
June	32	2	0	0	0	0	0	0	0	13	0	0	154	0	0
July	229	0	0	4	0	0	4	0	0	14	0	0	164	0	0
August	66	0	0	3	0	0	21	0	0	15	0	0	179	0	0
September	188	20	6	9	0	0	10	0	0	42	2	0	182	0	0
October	43	6	0	11	0	0	15	0	0	45	0	0	152	0	0

Figure 49: Five month number of new malnourished cases and deaths of selected Districts of assessed zones, Oromia, Ethiopia 2014.

7.1.4. 9. Recommendations

Financial support for early warning activities to detect and control outbreaks and public health emergencies should be provided by National PHEM and Oromia Health Bureau for the zone

Multi-sectorial PHEM coordination forum and Rapid Response Team needs to be established at all level and should have to be meet regularly. In addition, this team should have to have emergency preparedness and response plan and supported by fund.

There Coordination of zonal health office PHEM with regional health bureau should be Strengthen

Essential materials and necessary drugs to manage and control epidemic for the zones and woredas needs to be provided by National PHEM and Oromia Health Bureau

Capacity building on EPRP preparation and forecasting of emergency drugs should have to be provided to zones and woredas.

Community based malnutrition screening should be strengthened, particularly in the settlement areas found in Anfillo woreda of Kelem wollega zone.

Appropriate budget for public health emergency preparedness and response activities should have to be assigned for the woredas.

Adequate Safe water sources should have to be developed and adequate amount of water treatment chemicals should have to be supplied for the settlers found in Anfillo woreda of Kelem wollega zone.

Drugs should have to be provided for the woreda, especially for health post found at the settlers.

Long lasting insecticide treated bed net should have to be supplied for woredas that has malarious kebeles by regional heath bureau and Malaria prevention and control activities should have to be strengthened at the woreda level.

Adequate amount of therapeutic food supplies (F100 and F75) needs to be supplied for all sites Stabilization Centers (SC) by the regional heath bureau.

1.1.1. Acknowledgement

I would like to thank East Wollega, Kelem Wollega, Horo Guduru Wollega and Jimma zones task force members for their great cooperation and facilitation of this assessment. Also my gratitude goes to all visited districts PHEM focal persons for their support and cooperation in providing relevant data to the assessment.

Finally but not least, I would like to thank Addis Ababa University, Ethiopian Public Health Institute and Ethiopian Public Health Association for their technical and financial support during this assessment.

References

1. Office for coordination of humanitarian affairs, weekly humanitarian highlights in Ethiopia, May 21, 2012
2. UNDP, Emergency Unit for Ethiopia, Field assessment report, August, 2000.
3. Brebbia CA, Kassabb AJ, Divo E.A; Disaster management and human health Risk: WIT press, 2011.

Annex IX: **Regional/Zonal level Questionnaire for Meher assessment**

<table>
<tr><td colspan="2">Interviewer name___________________________________</td><td colspan="2">Institution:</td></tr>
<tr><td colspan="2">Interview Date: (dd) ____/(mm)___/___</td><td colspan="2">Region:_______ Zone:__________</td></tr>
<tr><td>Main contact at this location:</td><td>Name:-</td><td>Position:</td><td>Tel:____________</td></tr>
<tr><td colspan="4">1. COORDINATION</td></tr>
<tr><td colspan="4">A. Is there a functional multisectoral coordination forum for the health sector? Yes□ No □</td></tr>
<tr><td colspan="4">B. Are all relevant government, NGOs and UN agencies represented? Yes□ No □</td></tr>
<tr><td colspan="4">C. Frequency of regular meeting? (Weekly, Every 2 weeks, monthly…..)________________________</td></tr>
<tr><td colspan="4">2. Outbreak?</td></tr>
<tr><td colspan="4">Was there any outbreak in the last 3 months? Yes□ No□
If yes, specify the name of disease outbreak</td></tr>
<tr><td colspan="4">Disease outbreak :-_________ # of cases : __________ Deaths :-______________ (time period) ________</td></tr>
<tr><td colspan="4">Disease outbreak __________# of cases : ____________Deaths __________________ (time period)_________</td></tr>
<tr><td colspan="4">Disease outbreak __________# of cases : ____________Deaths _____________________(time period)_________</td></tr>
<tr><td colspan="4">3. Mention anticipated epidemics ____
If yes please indicate Zone/Woreda at risk and risk population per anticipated risk: (Use the back side)</td></tr>
<tr><td colspan="4">4. Public Health emergency Management</td></tr>
<tr><td colspan="4">A. Is there a Public Health Emergency Preparedness and Response plan? Yes□ No□</td></tr>
<tr><td colspan="4">If yes, is the plan budgeted/ funded? Yes□ No□</td></tr>
<tr><td colspan="4">B. Is there a trained staff on PHEM (Regional/Zonal/Woreda/HFs) Yes□ No□</td></tr>
<tr><td colspan="4">If yes specify number of trained personnel per level:
Region: Female ______Male _Zone: Female____Male______Woreda: Female_____Male_______</td></tr>
<tr><td colspan="4">C. Is there a Regional trained Rapid Response team (RRT)? Yes□ No□</td></tr>
</table>

D. Are there trained staff on Minimum Initial Service Package for RH	Yes□ No□

If yes specify number of trained personnel per level:

Region: Female ______Male______**Zone:** Female_______Male______**Woreda**: Female_____Male_______

			Total requirement	Available	Gap
	Drugs and medical supplies		Total requirement	Available	Gap
	i. Meningitis vaccine				
	ii. Drugs:	Coartem			
		Artesunate (rectal)			
		Artesunate (Inj)			
		Artemether IM			
		Quinine (PO)			
		Quinine (IV)			
		Chloroquine			
		Ceftriaxione			
		Oily CAF			
		Doxcycline			
		Ringer lactate			
		ORS			
		Vit A.			
	iii. Lab supplies	RDT (Malaria)			
		Pastorex (Meningitis)			
		LP set			
		TI bottle			
	CTC Kit (AWD)				
	Medical Supplies	Gloves,			
		Syringe			
		PPE			
	Clinical Delivery Assistance kit PART A: Reusable Equipment				
	Clinical Delivery Assistance kit PART B: Drugs & Disposable Equip.				
	Mgt. of Complications of Abortion kit (Manual Vacuum Asp. Set)				

Summary: Requirements/Needs/ 2013

Region	Zone	Woreda at Risk	Type of Risk	At risk Population

Region/Zone	Type of Health emergency	Total estimated Beneficiaries	Required finance
	Emergency Reproductive Health needs	Please refer the footnote	Please refer the attached matrix

Comments:____

____

____

N.B. Total estimated beneficiaries for Emergency Reproductive Health are Women of Reproductive Age and their number is calculated at 23% of the total of at risk population.

Annex X: **Districtlevel Questionnaire for Meher assessment**

Interviewer name ________________________ Interview Date: (dd) ____/(mm)_____/____

Region:________________________________ Zone:_______________Woreda________________

Main contact at this location: Name:____________ Position:_________ Tel:____________ _

SECTION I: SOCIO- DEMOGRAPHIC PROFILE				
1.1. Woreda total population:	M:___________F:___________		Under 5_______	Total:____
	No. of women of reproductive age (age 15-49 yrs.):__________			
	No. of pregnant women :_______________			
	No. of lactating women:________________			
	Total no. of PLW :______			
1.2. Special Population *(if any):*	Pastorals____	Refugees____	IDPs____	Migrant Workers___

SECTION II: HEALTH PROFILE	
2.1. Coordination	
Is there a functional multi sectoral PHEM coordination forum?	Yes□ No□
Is there a PHE preparedness and response plan?	Yes□ No□
Is there accessible emergency response fund	Yes□ No□
Is there fund allocated for Preparedness activities	Yes□ No□

2.2. Morbidity (List top 5 causes of Morbidity) in the year 2005 EC (Meskerem to Megabit) (2012-2013 GC)

a. Morbidity below 5 years	Morbidity above 5 years
1.	1.
2.	2.

3.	3.
4.	4.
5.	5.

2.3. List number of cases/deaths from Tir 2005 to Ginbot 2005 (Jan–May 2013)

Month	AWD		Malaria		Measles		Meningitis		Other(specify)	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Jan 2013										
Feb 2013										
Mar 2013										
April 2013										
May 2013										

NB: Number of cases and deaths of the specific disease could be total case reported by the routine surveillance system during the period and not necessarily outbreak report

2.4. Outbreak?

Was there any outbreak in the last 3 months? (August- October)	Yes□ No□

If yes, specify the disease:

Disease outbreak __________________# of cases : _____ ___Deaths ________(time period DD/MM/YY))____________

Disease outbreak _________________# of cases : _________Deaths _________(time period DD/MM/YY)____________

Is there any ongoing outbreak of any disease?	**Yes□ No□**

Disease outbreak _________________# of cases : ____________Deaths _____________________(Start date)_________

Disease outbreak _________________# of cases : ____________Deaths _____________________(Start date)_________

Disease outbreak _________________# of cases : ____________Deaths _____________________(Start date)_________

2.5. Preparedness: Is there emergency drugs and supplies enough for 1 month? Or easily

accessible on need? *(NB: Use the stock matrix to calculate this)*	
Ringer Lactate (to treat AWD cases)	Yes□ No□
ORS (to treat AWD cases):	Yes□ No□
Doxycycline *(to treat AWD cases)*:	Yes□ No□
Consumables : Syringes, Gloves *(for AWD management):*	Yes□ No□
Amoxil susp (measles)	Yes□ No□
Tetracycline ointment (measles)	Yes□ No□
Vit A (measles)	Yes□ No□
Coartem for Malaria	Yes□ No□
Artesunate (rectal) for Malaria	Yes□ No□
Artesunate (Injection) for Malaria	Yes□ No□
Artemether IM for Malaria	Yes□ No□
Quinine (PO) for Malaria	Yes□ No□
Quinine (IV) for Malaria	Yes□ No□
Chloroquine for Malaria	Yes□ No□
Ceftriaxione (Meningitis)	Yes□ No□
Lab supply: RDT for Malaria	Yes□ No□
Lab supply: RDT (pastorex) for M eningitis LP set	Yes□ No□ Yes□ No□
Number of CTC kit available: (for AWD)	Yes□ No□
Clinical Delivery Assistance kit PART A: Reusable Equipment	Yes□ No□
Clinical Delivery Assistance kit PART B: Drugs & Disposable Equip.	Yes□ No□
Mgt. of Complications of Abortion kit (Manual Vaccum Asp. Set)	Yes□ No□
Main shortage (if any): Specify	
Is budget allocated for emergency Rapid response by the woreda Health office?	Yes□ No□
Is PHEM guideline distributed to all Health institutions	Yes□ No□
Is there a trained woreda Rapid Response Team?	Yes□ No□

Are there staffs trained on Minimum Initial Service Package for Reproductive Health?	Yes□ No□
If “ Yes” please state the number of trained personnel : Male : ______ Female : ________ Total : ______	
Weekly Timeliness and Completeness (%) of Surveillance report for August – October	

Month	T/C (%)	T/C (%)	T/C (%)	T/C (%)
August 2012				
September 2012				
October -2012				

SECTION III: RISK FACTORS		
Diseases	**Risk factors for epidemics to occur**	
Malaria	Malaria endemic area	Yes□ No□
	Presence of malaria breeding site	Yes□ No□
	Interrupted or potentially interrupting rivers	Yes□ No□
	Unprotected irrigation in the area	Yes□ No□
	LLINs coverage <80%	Yes□ No□
	Indicate the coverage of IRS 2005____	
	Depleted prevention and control activities	Yes□ No□
	Malaria Guideline (new)distributed to all Health facilities	Yes□ No□
	Health workers trained on the new Malaria guideline	Yes□ No□
	Number of malarious kebeles and total population in these Kebeles	Keb _____________ Pop(F)______(M)______
Meningitis	Was there Meningitis epidemic in the last 3 years (If yes specify year)___________	
	Has vaccination been conducted in the past 3 years	Yes□ No□
	If yes : Indicate the date and number of people vaccinated	Date____ No_____

	Is there Meningitis outbreak control Guideline	Yes□ No□
	Are health workers trained on Meningitis outbreak management	Yes□ No□
AWD	Was there AWD epidemic in the last three years (If yes specify date)_________________________	Yes□ No□
	Latrine coverage	
	Latrine utilization	
	Safe water coverage	
	Is Cholera outbreak control Guideline distributed to all HFs	Yes□ No□
Measles	Is there ongoing measles outbreak	Yes□ No□
	What is the measles vaccination coverage of 2004, less than one year (Hamle 2003-Sene 2004)	
	Is Measles Guideline distributed to all Health facilities?	Yes□ No□
	Are health workers trained on Measles	Yes□ No□
	Has SIA been conducted in 2004 EFY	Yes□ No□
	If yes, Indicate the month and number of children vaccinated including the age group	Month________________
		No. Vaccinated__________
		Age group______________

Any other observations you made or any risks of epidemics?

____

____

____

____

____

____

What were the major challenges in your Epidemic response experience?

____
____
____
____
____

Section IV: Nutrition - TFP admissions at woreda level January to May 2013

Month	Total new SAM Cases	Total Number of TFP (OTP/SC) in the woreda	Number of SC.	Number of OTP.	Total Number of OTP/SC reported.	Therapeutic Supplies Y/N			Children Discharged from TFP referred to SFP
						RUTF	F100	F75	Y/N
Jan									
Feb									
Mar									
April									
May									

Therapeutic Supplies enough for the next 1 month: YES___________; NO______________

Any comment

____
____
____
____
____

Chapter – VIII: Protocol/Proposal for Epidemiologic Research Project

8.1. Assessment of Knowledge and Utilization of ITN and factors affecting ITN use in Ziway Dugda District, Oromia, Ethiopia 2015

Executive summary

Malaria is an infectious disease caused by the protozoan parasite of the Genus plasmodium and it is transmitted by Anopheles mosquito species. Ethiopia is also one of the most malaria epidemic-prone countries in Africa. Three quarters of the land mass (altitude < 2000 m) is regarded as malariaous and about two-thirds (68%) of the population is at risk of malaria infection. Insecticide treated net (ITN) is an effective tool for preventing the transmission of malaria. The recent national strategic plan targets that at least 80% of people at risk of malaria shall use ITNs properly.

Ziway Dugda district is one of the malarious district of Arsi Zone. Although ITNs ownership and proper utilization is one of the proven interventions adopted by RBM partners in the country, however information on utilization and associated factors in the district are limited. Hence the study will provide valuable information on the ITNs utilization pattern, Knowledge and associated factors that affect ITNs use in the district.

A community based cross- sectional descriptive study will be conducted to assess the awareness, ITNs utilization and related factors among population of Ziway Dugda district of Oromia Region, from August 1, 2015 to September 30, 2015.

Multi-stage sampling technique will be used to get study subjects and sample size required for this study is 845 households. The study unit will be the households and the sampling frame will be the household found in the kabeles. Data will be collected by using interviewer administered structured questionnaire. Collected data will be summarized and analyzed by using Epi Info 7 and Microsoft Excel 2007 soft wares.

At the end of this study factors that affect ITNs use will be identified, documented and recommendations will be proposed to improve the rate of ITNs utilization. The total cost estimated for the study is 87,785 ETB.

8.1.1. Background

Malaria is an infectious disease caused by the protozoan parasite of the Genus plasmodium and it is transmitted by mosquito species Anopheles *arabiensis,* An*. pharoensis*, An. *funestus* and An. *nili*. It is characterized by recurrent symptoms of chills, fever and generalized body pain. The five species of plasmodium that commonly infect human are: *Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale, Plasmodium malaria and Plasmodium kwolesi (1).*

There are at least 300 million acute cases of malaria each year globally, resulting in more than a million deaths. About 90% of these deaths occur in Africa and mostly in young children (2-4).

Malaria has proven to be the most harmful and intractable amongst the health problems confronting countries in the sub-Saharan Africa, thereby affecting their development with a high proportion of its wealth being drained by it. It is responsible for school absenteeism and low productivity at workplaces and on farms (4).

Pregnant women are vulnerable because their natural immunity is reduced; thus, they are four times more likely to suffer from complications of malaria than non pregnant women. Malaria is a cause of pregnancy loss, stillbirth, low birth weight, and neonatal mortality. Individuals with sickle cell and other low immune groups are also at higher risk (5).

Ethiopia is also one of the most malaria epidemic-prone countries in Africa. Three quarters of the land mass (altitude < 2000 m) is regarded as malariaous or affected, and about two-thirds (68%) of the population is at risk of malaria infection. Rates of morbidity and mortality increase dramatically (i.e. 3-5 fold) during epidemics (6, 7).

Insecticide treated bed nets (ITNs) ownership and use is one of the proven interventions adopted by RBM partners in the country. The use of ITNs has been found to reduce clinical malaria by more than 50% and reduces all-cause mortality in children aged 1 - 59 months by 15 - 30% when overall population usage is greater than 70% (8, 9).

The global commitment of RBM is to halve malaria disease and associated death by 2010; and this target was re-affirmed by leaders of 44 African nations who met in Abuja, Nigeria in April 2000. The specific targets of malaria control under the RBM initiative are: at least 60% of people at risk of malaria, (especially young children and pregnant women) benefit from ITN and minimum of 60% of pregnant women would have access to effective preventive treatment (2, 3).

Ziway Dugda District is one of the districts that have kebeles repeatedly affected by malaria in Arsi Zone of Oromia region, Ethiopia. Hence, this study aimed to identify the utilization of ITN and associated factors. The finding would be helpful for policy makers and managers and malaria prevention and control partners to insight their plans.

Literature review

The WHO Global Malaria Program (WHO/GMP) recommends the following three primary interventions for effective malaria control, which must be scaled up if countries are to move towards achieving the United Nations Millennium Development Goals by 2015:

- Diagnosis of malaria cases and treatment with effective medicines;
- Distribution of insecticide-treated nets (ITNs), more specifically long-lasting insecticidal nets (LLINs), to achieve full coverage of populations at risk of malaria; and
- Indoor residual spraying (IRS) to reduce and eliminate malaria transmission (10).

The use of insecticide-treated nets (ITNs) is the main malaria control strategies in most malaria endemic countries to reach the Roll Back Malaria (RBM) targets to reduce the malaria burden by 50% in 2010 compared to 2000 levels and at least 75% by 2015 (11).

All mosquito nets act as a physical barrier, preventing access by vector mosquitoes and thus providing personal protection against malaria to the individual(s) using the nets (4). Pyrethroid insecticides, which are used to treat nets, have an excito-repellent effect that adds a chemical barrier to the physical one, further reducing human–vector contact and increasing the protective efficacy of the mosquito nets. Most commonly, the insecticide kills the malaria vectors that come into contact with the ITN (10).

By reducing the vector population in this way, ITNs, when used by a majority of the target population, provide protection for all people in the community, including those who do not themselves sleep under nets (12, 13).

Recent efforts promoting the use of LLIN have shifted their emphasis from a focus on vulnerable populations to a broader objective of universal coverage, defined at the household level as the use of insecticide-treated nets by all household members regardless of age or gender (10). There is an emerging consensus that a ratio of at least one LLIN for every two household members is typically sufficient to achieve universal coverage in a population (14).

In Ethiopia, the Ministry of Health (MOH) conducted continuously mass distribution of LLINs targeting to distribute two LLINs per household in malaria endemic areas. Despite the large scale distribution of ITNs in many malaria endemic countries, there is a wide variation in the availability and use of ITNs/LLINs at the household level (15, 16).

The recent national strategic plan targets that at least 80% of people at risk of malaria shall use ITNs properly and consistently and 100% of households in malaria-endemic areas should own one ITN per sleeping space by the year 2015. The country aims at malaria elimination in areas with historically low malaria transmission, while achieving near zero malaria transmission in the remaining malarious areas. To achieve such a goal, better understanding of utilization of prevention and control tools, mainly ITNs, is essential (17).

A huge discrepancy was reported between ownership versus use of ITNs (10). Studies quantified this difference as 95% vs 59% (Kenya) (18), 70% vs 53.1% (Nigeria) (19) and 90% vs 77% (Tanzania) (20). Misconceptions about prevention of malaria, discomfort, perceived low mosquito density, inconvenience to hang the nets, place of residence, economic and educational background, age and gender differences, color of nets and inadequate availability were the major reasons to non-use of mosquito nets (19, 21). Malaria Indicator Survey revealed that net ownership differed by wealth status, with 66.4% of the richest households owning at least one net, compared to 44.6% of the poorest households (7). Comparison among regional states revealed that households in Oromia have the lowest percentage of net ownership (44.3%). While all individuals benefit from sleeping under a LLIN, young children and pregnant women are particularly vulnerable to malaria and hence are an important target for LLIN use. Oromia reported the lowest use of nets in children under five (55%) and pregnant women (27.5%) in malaria-endemic areas (<2,000m).

In order to meet the Millennium Development Goals and the Roll Back Malaria targets, it is indispensable to determine the actual levels of use and to take timely corrective actions on barriers that affect its use. Therefore this study aimed to determine the level of LLIN use and identify factors related to their use at the household level is crucial.

8.1.2. Statement of the problem

The distribution and use of ITNs is one of the central interventions for preventing malaria infection (10). National policy aims to provide one ITN for every sleeping space (approximately one net per 1.8 persons in malaria-endemic areas <2,000m) (7). Proper use of ITNs protects the entire local community from malaria for at least three years without need for additional insecticide reapplication (10). To acquire the benefits of ITNs, households need to use, not merely own them (14). In order to meet the Millennium Development Goals (MDG's) and the RBM targets, it is indispensable to determine the actual levels of use and associated factors that affect its use to take timely corrective actions. The aim of this study therefore is to assess utilization of ITNs by household, the knowledge of the community about malaria and benefits of use of ITNs, the status of ITNs and factors affecting its use. Hence the study will provide valuable information on the ITNs utilization pattern, Knowledge and associated factors affecting its use in the district. Therefore recommendations will be proposed for concerned body to improve the ITNs utilization rate in the district.

8.1.4. Rationales and Justification of the study

Ziway Dugda district is one of the malarious district of Arsi Zone. ITNs ownership and proper utilization is one of the proven interventions adopted by RBM partners in the country (3). All persons in the household, particularly under five children and pregnant women are encouraged to sleep under the INTs at all time of the year, however information on utilization and associated factors in the district are limited. This calls for a need to study and characterize the pattern of ITN utilization and determine associated factors in malaria-endemic kebele of the Ziway dugda district. Hence this study will provide valuable information on the ITNs utilization pattern, Knowledge and associated factors in the district. Therefore the finding will lead to understanding some of the factors affecting ITN use among the community members of the area thereby it would be helpful for policy makers and managers to strengthen and plan strategies that will lead to increased ITN use, resulting in reduction of morbidity and mortality rates because of malaria.

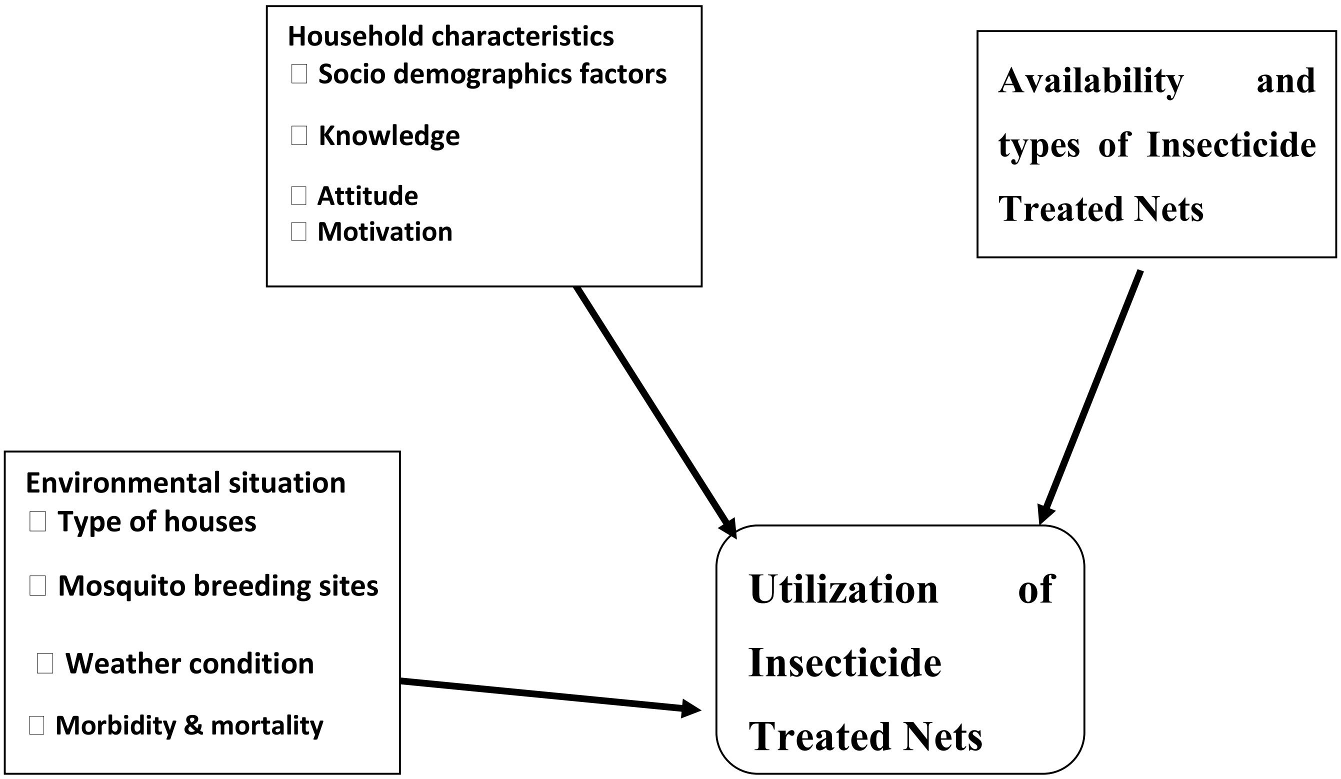


Figure 50: Conceptual framework for factors affecting Insecticide Treated Nets utilization

8.1.5. Objectives

8.1.5.1. General objective

To determine the awareness and utilization of ITNs and its associated factors in Ziway Dugda district, Arsi zone of Oromia Region, Ethiopia 2015.

8.1.5.2. Specific objectives

- To describe the pattern of ITNs utilization in Ziway Dugda district, Arsi zone of Oromia Region, Ethiopia.
- To assess the knowledge on benefits of ITNs usage Ziway Dugda district, Arsi zone of Oromia Region, Ethiopia.
- Determine associated factors on utilization of ITN’s in Ziway Dugda district, Arsi zone of Oromia Region, Ethiopia.

8.1.6. Methods and material

8.1.6.1 Study area

The study will be conducted in Ziway Dugda District. Ziway Dugda District is one of the districts that found in Arsi Zone, Oromia Region of Ethiopia. It is bordered on the south by Munesa District, on the east by Hitosa district, on the southeast by Tiyo District of Arsi Zone and on the west and north by East Showa Zone; also on its western edgeis Lake Ziway is found. The attitude of the district ranges from 1500 to 2300 meters above sea level and the temperature ranges from 18^0c to 28^0c. With an estimated area of 1,269.07 square kilometers, the district has an estimated population density of 94.7 people per square kilometer. The district is administratively divided into two urban kebeles and 34 rural kebeles. Among these kebeles 15 of them are malariuos area. Based on the 2007 Ethiopian housing and population census the population of the district is estimated to be 151,919 in 2015 of whom 75,894 of them are males and the rest 76,025 of them are females. According to the 2007 Ethiopian housing and population census, in the district there are more than 24,360 households.

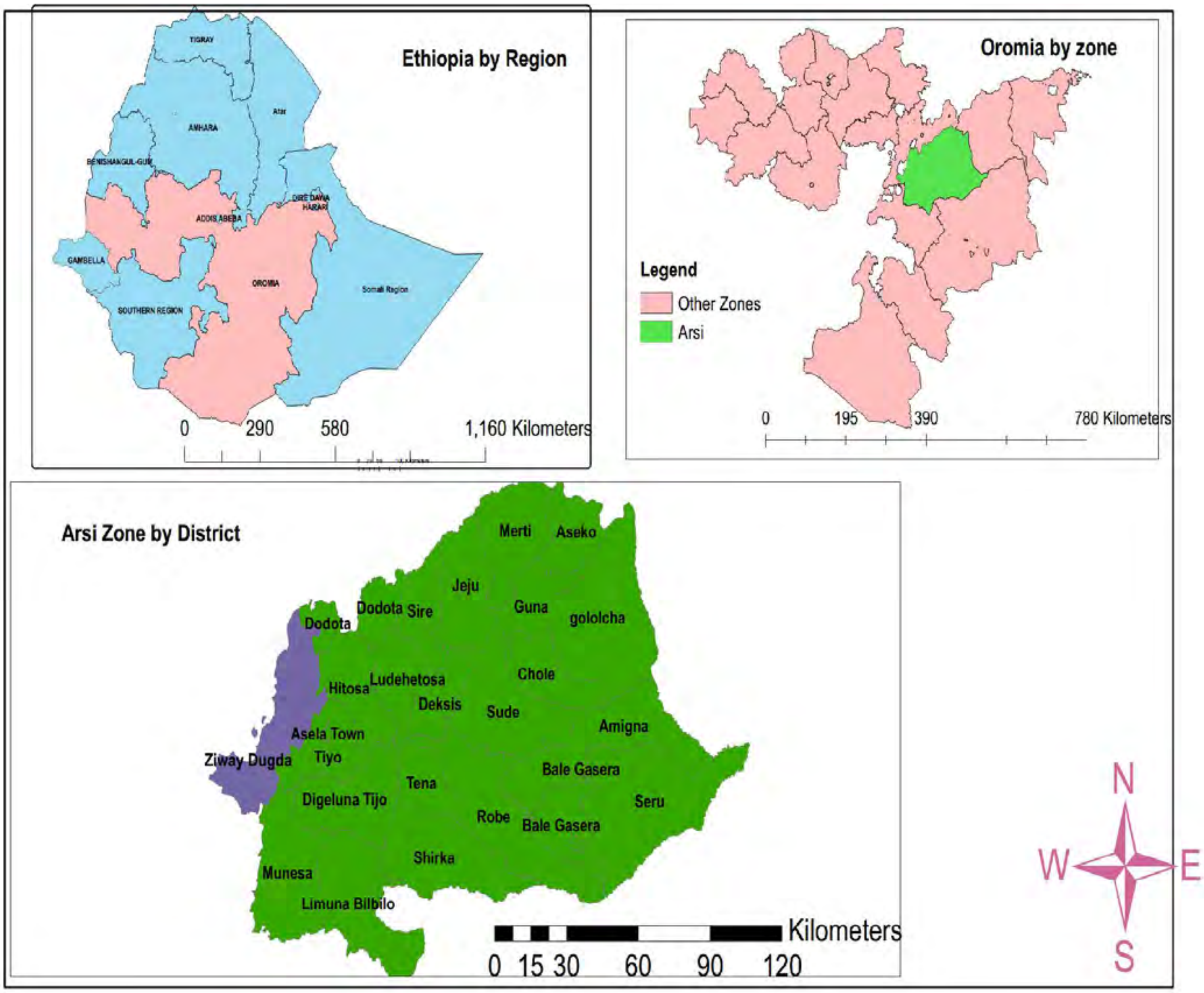


Figure 51: Map of Arsi Zone by Districts, Oromia region, Ethiopia, 2015.

8.1.6.2 Study design

A community based cross- sectional descriptive study will be conducted to assess the awareness, ITNs utilization and related factors among population of Ziway Dugda district of Oromia Region, Ethiopia.

8.1.6.3 Study population

The study unit will be the households found in the selected kabeles of the Ziway Dugda district and information will be collected from the head of the households.

Inclusion criteria: Selected households member consenting to participate in the study and responded to the questions will be included.

Exclusion criteria: Selected households member who will not agree to participate in the study and won't respond to the questions will be excluded from the study.

8.1.6.4 Sampling technique

Multi-stage sampling technique will be used to get study subjects. In the first stage among the 15 malarious kebele (primary sampling unit) of the district eight (50%) of them will be selected by simple random sampling technique followed by Two stage cluster sampling. From each selected kebele five villages (Got) (secondary sampling unit) will be selected by SRS techniques and the total number of villages becomes 40. Finally households (tertiary sampling unit) will be selected by SRS from these villages. The Sample size of the households will be determined by using single population proportion formula (Daniel 1999):

$$n = Z^2 \times P\ (1-P)/d^2 \times DEFF$$

Where: - n = sample size, Z = z statistic for a level confidence,

P = expected prevalence or proportion

d = Absolute precision/ marginal error and

DEFF = Design Effect

The prevalence of malaria is not known in the study area, there for the P (expected prevalence) will be taken as 50% and minimum of 768 sample size will included by using 5% marginal error and a design effect of two. Adding 10% for non-response, the grand total sample size required will be 845. The study unit will be the households and the sampling frame will be the household found in selected villages of in the kabeles. To get the number of household to be selected from each village we divide the calculated sample size with the number of villages (845/40 = 21). There for we will select 21 household from each selected village by systematic random sampling methods.

8.1.6.4: Data collection instrument

Structured household questionnaire will be administered to individuals in households. This tool is taken from Ministry of Health/Ethiopian public Health Institute prepared by Malaria Indicator Survey Technical Working Group team members. The questionnaire will be composed of variables for socio-demographic (sex, age, occupation, educational status), environmental, knowledge, attitude and predictors of LLIN possession and utilization.

8.1.6.4. Operational definitions

Net utilization: is defined as having slept under a net during the night preceding the survey.

Owner ship of ITN: is defined as having one or more ITN in the house including their numbers

Knowledge of malaria: this study will only consider whether the respondent will mention mosquito bite as a cause of malaria.

Knowledge of ITN use: this study only will consider whether the respondent will mention ITN as a protective measure for malaria.

8.1.6.5 Study period

The study will be conducted from August 1, 2015 to September 30, 2015.

8.1.6.6 Data collection and Analysis

The eligible households will be recruited from the houses of the. The information on knowledge of ITN, attitude towards ITN, access, ownership and use of ITN will be collected using structured interviewer administered questionnaire. The information primarily will be collected from head of the household or from an adult in the household member in case the head is not present. Structured household questionnaire will be administered to individuals in households. The data collection team will consists of two field supervisors who have experience in data collection technique and that have BSc in health and five data collectors who have good experience of data collection course probably statistician with minimum of Diploma holder will be recruited.

Data analysis will include both descriptive and statistical inferences from the gathered information. After the data were coded and entered, the statistical analyses will be made using Epi Info 7 and Excel 2007 Soft ware to summarize the raw data. The results will be displayed in tables and graphs. Cross tabulation of variables will also be done. Furthermore inferential statistics will be done to look into factors that influence the major outcome variables of LLIN's usage and other issues related to household knowledge and reasons for not use. For this computation 95% confidence intervals will be used. A p-value of less than 0.05 will be considered as statistically significant.

8.1.6.7 Ethical review

The ethical approval and clearance will be obtained from College of Health Sciences, School of Public Health-Addis Ababa University ethical committee. Permission will be also obtained from the concerned bodies of Oromia Regional Health Bureau, Arsi Zonal Health office and Ziway Dugda District health office. All the study participants will be informed about the objective and importance of the study and will be also informed about their right of not participating in the study at any time. Interview will be carried out only with full consent of the person being interviewed. Privacy and confidentiality of the information will be assured and collected anonymously (Annex - xiv).

8.1.6.8 Variables

8.1.6.8.1 Dependent variable: – Utilization of ITNs

8.1.6.8.2 Independent variables:-

- Socio-demographic variables such as; sex, age, occupation, educational status and wealth quintiles
- Environmental variables such as; distance of vector breeding site from living house, type of housing structure and indoor residual spray
- Knowledge variables such as effectiveness of LLIN against mosquito if washed or

- Attitude variables such as if there are not enough LLIN's for everyone in a household who should be given priority

8.1.6.9 Data quality assurance measures

The questionnaire will be prepared originally in English and then will be translated in to Afan Oromo and back to English to ensure reliable information. Data collection guideline will be prepared and given for data collectors and supervisors. Pre-test of questionnaire and training of data collectors and supervisors will be conducted to ensure the quality of data. Data collectors and supervisors will review every questionnaire for completeness and for logical consistency, and counter checked by the principal investigator at the end of each day in the field. Data cleaning will be conducted at the end of data entry.

Apart from extensive training of data collectors, strict supervision of data collection process using field supervisors by using the following methods will be employed to assure the data quality.

- All questionnaires will be checked by the field supervisors to ensure all questionnaires are completed every week.
- 10% random check and validation of household questionnaires will be done in every cluster every week.

8.1.6.10. Dissemination of findings

Results will be submitted to Ethiopia Field Epidemiology Training Program. To help in future interventions the result will be communicated to governmental and non-governmental bodies. These will include the Dugda Bora Woreda Health Office, East Shoa Zonal Health Department, Oromia Regional Health Bureau, Ethiopia Health and Nutrition Research Institute (EHNRI), United Nation Children's Fund (UNICEF) and others. One day conference will be arranged atdistrict level to present the study results. In addition the finding will be submitted to publish paper and disseminate it via presentation on different national and international conferences.

8.1.6.11. Expected outcomes

The factors that may influence people against use of LLIN's will be clearly identified, documented and recommendations will be proposed to improve the utilization rate of ITNs to concerned bodies and policy makers.

8.1.6.12. Budget and implementation time

A total of 87,785 ETB will be needed to conduct the study. Break down is annexed below (Annex-XII). The project will take about two months including from data collection to preparation of final report. Study will be started within two weeks after grant released.

Refernces

1. WHO. World Health Organization, World malaria report Geneva, Swizerland. 2011.

2. Akande TM Ml. Epidemiology of malaria in Africa, . Africa Journal of Clinical Experment. 2005;9:107-11.

3. WHO. The Abujan declarattion on Rll Back malaria in Africa. World Health Organization Fact sheet. 2000:2-12.

4. Aregawi M. World Health Organization, Global malaria Program. World malaria repor.t Geneva: . 2008.

5. WHO. Roll Back Malaria Partnership . Malaria in pregnancy. World Health Organization. 2007.

6. FMOH. National malaria guideline. Federal Democratic Republic of Ethiopia Ministry of Health. Third ed2012.

7. EHNRI. Ethiopian National malaria indicator survey. Ethiopia Health Nutrition and Research Inistitute. September 2012.

8. Eisele TP LK, Wannemuehler KA, et al. Effect of sustained insecticide-treated bed net use on all-cause child mortality in an area of intense perennial malaria transmission in western Kenya. American Jornal of Tropical Medicine and Hygen. 2006;73.

9. Ter Kuile FO TD, Phillips-Howard PA, Hawley WA, et al. Impact of permethrin-treated bed nets on malaria and all-cause morbidity in young children in an area of intense perennial malaria transmission in western Kenya: cross-sectional survey. . Am J Trop Med Hyg. 2003;68.

10. WHO. Insecticide-Treated Mosquito Nets: a WHO Position Statement. . Geneva: World Health Organization; 2007.

11. Roll Back Malaria: Global strategic plan 2005–2015. . Geneva, Switzerland: Roll Back Malaria Partnership Secretariat; 2005.

12. Binka F, Indome F, Smith T. Impact of spatial distribution of permethrin-impregnated bed nets on child mortality in rural northern Ghana. Am J Trop Med Hyg. 1998;59:80-5.

13. Hawley WA, Phillips-Howard PA, et al. Community- wide effects of permethrin-treated bed nets on child mortality and malaria morbidity in western Kenya. . Am J Trop Med Hyg. 2003;68: 121-7.

14. WHO. Long-lasting insecticidal nets for malaria prevention-a manual for malaria programme managers. . Trial edition ed. Geneva: Global Malaria Programme, World Health Organization; 2007.

15. Larsen DA, Keating J, et al. Barriers to insecticide-treated mosquito Net possession 2 years after a mass free distribution campaign in Luangwa district, Zambia.

. PLoS One. 2010;5.

16. Monasch R, Reinisch A, Steketee RW, Korenromp EL, Alnwick D, Y: B. Child coverage with mosquito nets and malaria treatment from population based surveys in African countries: a baseline for monitoring progress in RBM. . Trop Med Hyg 2004;71:232-8.

17. FMOH. National strategic plan for malaria prevention, control and elimination in Ethiopia 2010 -2015.

18. Githinji S, Herbst S, Kistemann T, Noor AM. Mosquito nets in a rural area of western kenya: ownership, use and quality. Malar Journal. 2010;9(250).

19. Arogundade ED, Adebayo SB, Anyanti J, et al. Relationship between care-givers' misconceptions and non-use of ITNs by under-five Nigerian children. Malar Journal. 2011;10(170).

20. Ruhago GM, Mujinja PGM, Norheim OF. Equity implications of coverage and use of insecticide treated nets distributed for free or with copayment in two districts in Tanzania: a cross-sectional comparative household survey. Int J Equity Health. 2011;10(29).

21. Pulford J, Hetzel MW, Bryant M, Siba PM, Mueller I. Reported reasons for not using a mosquito net when one is available: a review of the published literature

Malar Journal. 2011, ; 10(83).

Annex XI: Project Budget Break Down

Description	Item	Unit	Quantity	Unit cost in Birr	Multiplying factor	Total cost in Birr
Per-diem for Personnel	Principal investigator	DSA	one	300	300 * 10 days	**3000**
	Project supervisor	DSA	one	300	300 * 10 days	**3000**
	Data collectors	DSA	eight	150	150*8*10days	24,000
	Local assistants	DSA	eight	100	100*8*10days	8000
Sub total						**38,000**
Training	For data collectors (2 days)	DSA	18	300	18*300* 1dys	5,400
Sub total						**5,400**
Transportation	Fuel	litter	500	20	10,000	10,000
	Car rent	number	1	1,500	1,500* 22 days	33,000
Sub-total cost						**43,000**
Materials	Pencils	Each	25	**1.00**	25 * 1.00	25
	Note books	Each	25	**5**	25 * 5	125
	CD-RW	Each	25	**5**	25 * 5	125
	Marker	Each	10	**10**	10 * 10	100
	Photo copy	Each	1,000	**1.00**	1,000* 1,00	1,000
	Printing & Binding	Each	4	**2.5**	4 * 2.5	100
Sub-total cost						**1,385**
5% contingency						
Grand Total						**87,785**

Annex XII: Research project implementation Work Plan Ziway Dugda Oromia, Ethiopia.

S.No	Planned Activities	Responsibility	April 2015	May 2015	June 2015	July 2015	August 2015	Sept. 2015
1.	Prepare proposal and submit to donors	Principal Investigator						
2.	Approval of Research proposal	Advisors Principal Investigator						
3.	Select data collectors and research assistants	Principal Investigator						
4.	Conducting training for data collectors and supervisors	Principal Investigator						
5.	Pre-testing of the survey instrument	All Members						
6.	Prepare for field Work	Principal Inv						
7.	Data collocation	All Members						
8.	Data entry and cleaning	All Members						
9.	Data analysis and write up	Principal Investigator						
10.	Data Dissemination/ Prepare Work shop	(PI)						
13	Hold workshop	PI+RA						

Annex XIII: Informed consent form

Title:

Objective: To determine the awareness and utilization of ITNs and its associated factors in Ziway Dugda district, Arsi zone of Oromia Region, Ethiopia.

Procedure: This project will take about 30 minutes of your time. There are two parts. First, we will clearly explain you the purpose, benefits and risks of the study. We will give you a chance to ask questions and gate answers about the study. Second, we will ask you about Utilization of Insecticide Treated Nets among households and describe factors affecting its use in pastoralist area of Fentale Woreda. All information collected during this study will be kept private and will only be known by the investigators.

Benefits: This project will help the government and the community scale up the effort of malaria prevention and control.

Risks: There is no risk to you from answering the questions or being participated in this study. I will give you a copy of this consent.

Privacy: We will keep information about you private. We will not collect your name. Only the investigators will have access to the data and only for study purpose. We will not use any information that might identify you when we present or publish the study's results.

Payment: There is no cost to you for being part of the project. The approximate time that this study will take is 30 minutes. There will be no involvement past today.

Participant Agreement: The project has been explained for me. I have been given a chance to ask questions. I feel that all my questions have been answered. Being in this study is my choice. I may change my mind and leave the study any time during the interview.

The purpose of the study and confidentiality procedures has been explained to me and me on my own consent: a) Agree _____ b) Disagree_____

Participant Signature____________ Date________________________

Name of persons obtaining consent____________________

Signature of persons obtaining consent ____________ Date _________________

Annex XIV: Questionnaires Assessment of Knowledge, Utilization and Associated factors affecting ITN use among households in Ziway Dugda District Arsi Zone , Oromia-_Ethiopia, 2015

I. Socio-demographic Characteristics

1. Place of the resident a) urban b) Rural
2. Woreda________________
3. Gote/village__________________
4. House number Code ___________
5. Sex of the respondent a) Male b) Female
6. Age of the respondent________________
7. Ethnicity: 1=Oromo 2=Amharic 3=Tigre 4=Other
8. Educational level: 1=Illiterate 2=Read andwrite

   3=Elementary 4=Secondary 5= Above secondary

   9. Occupation: 1=Farmer 2=House wife 3=Student 4= Unemployed

   5=Daily laborer 6=Government 7=Merchant

   8= Other(specify)_________
9. Religion: a) Orthodox b)Protestant c) Muslim d) Catholic e) Others ,specify
10. Marital status of the respondent: a) Single b) Married c) Divorce d) Widowed
11. Responsibility of the respondent in the house: a) Husband b) Wife c) Child d) Other________________________________
12. How many people live in the house?______________
13. Estimated Monthly income____________ annual income of the household_____________
14. Are there pregnant women and children less than 5 years of age? 1=Yes 2=No
15. If the response is yes for Q.14 how many pregnant women are there? ________
16. How many children below 5 years are there?____________________
17. Does your household have?

    A radio? 1=yes 2=No

A television? 1=yes 2=No

A telephone? 1=yes 2=No

II. Risk Factors

18. Does your household have any mosquito nets that can be used while sleeping that is distributed in the last three years? 1= Yes 2= No

19. If Q201 is Yes How many mosquito nets does your household get?

1=one 2=two 3=three 4=greater than three

20. Observe How Many of the LLITNs were there in the household?

1=one 2=two 3=three 4=greater than three

21. If the Observed is less than expected(Q202<Q203) Reasons for unavailability of ITNs?

1=sold 2=used for other purpose 3=give for others 4=stolen

22. Did you purchase the net? 1=Yes 2 =No 98=I don't know

23. If Q 206 is Yes, how much did you pay for the net when it was purchased?

1. = < 50 Birr 2= 50 – 100 Birr 3=. > 100 Birr 98=I don't know

24. Please observe or ask the general Conditions of the net.

1= Good (no holes) 2= Fair (no holes that fit a torch battery) 3= Poor (1-4 holes)

4=Unsafe (>5 holes that fit a 5= Unused (still in package 98= unknown

25. How long ago did your household obtain the mosquito net?

1= less than 3 years ago 2= more than 3 years ago

26. Did anyone sleep under this mosquito net last night (at least one of the available ITNs)?

1=Yes 2= No

27. If Yes in Q210 Who was slept under ITNS?

1= elderly people 2=head of household 5= who obtained / bought the net

3= young children 4=pregnant women 6= people who contribute the most money to the household person other 98= I don't know

28. Frequency of using their ITNs**?**

1=Always 2=sometimes 3=If Mosquitoes is seen In the house 4=if somebody was sick 5=during transimission season 99=other (specify)

29. If Q210 is No, Why did no-one sleep under this mosquito net last night?

1= no malaria 2=no nuisance/insects 3= no space for net

4=irritation due to chemical of ITN 5=suffocation / too hot 6=difficult hanging net 7=shape 8= absence from home 9= Absence of bed

99= other (specify) 98=don't know

30. How many separate rooms are in this household? Include all rooms, including kitchen, toilet, sleeping rooms, salon, etc? ______________________

31. How many rooms in this household are used for sleeping? Include only rooms which are usually used for sleeping.__________________

32. How many sleeping rooms were ITNS hanged?_____________________

III. Knowledge and Practice question

33. Main transmission mechanism of malaria?

1= eating immature sugarcane 2= Mosquito bite 3=cold or changing weather

4= Drinking dirty water hunger 5= (empty stomach) 99=Other (Specify)

34. Have you ever caught malaria in the past two year? 1=Yes 2=No

35. Did anyone in your family travel away from home in the last one month? 1=Yes 2=No

36. If Yes, Did she/he use ITN while on travel? 1= Yes 2=No

37. How can we prevent malaria infection?

1= DDT spray 3= Drugs (prophylaxis) 5= Not known 6= drink alcohol

2= Source reduction 4= ITN s utilization 99= If other, specify

38. Ever heard/seen education messages about ITNs? 1=Yes 2=No

39. Think that sleeping under ITN have benefit. 1=Yes 2=No

40. sleeping under ITN have benefits. 1=yes 2=No, If yes what is the benefit?

1=don't get bitten by mosquito 3=don't get malaria 99=other

2=don't get bothered by other insects 4=To get warmth

41. Believe that sleeping under ITN has problem 1= Yes 2=No

42. If Q306 is yes Problems associated with sleeping under ITN

1= Difficult to get up at night 2= It is too hot 3= It takes time to tuck a net each night

4=No enough air when sleeping under 5=it Mosquito can still bite through ITN 6=No comfort 99= other

43. How does ITNs prevent malaria transmission?

1= Physical barriers 3= irritate mosquito 5= If other, specify

2=Kills mosquito 4= Not known

44. Dose the household own ITNs? 1= Yes 2=No

45. If **YES,** to 312 above, how many? 1 =One 2= Two 3= Three and above

46. Ever heard/seen education messages about ITNs? 1= Yes 2=No

47. Source of information for ITN

1= Mass media 2= Health Extension Workers 3=Kebele leader 4=Neighborhood 5=other

48. Did They Wash Their ITNS? In the last One year? 1= Yes 2=No

49. If Yes, frequency of Washing per year? _________

50. What color of ITNs do you prefer for use? 1=White 2= Blue

51. What shape of ITNs do you prefer for use? 1=conical 2= rectangular

IV. CHEKLIST FOR DIRECT OBSERVATION

S.No.	Category	Response
401	Number of beds or places of sleep	1= One 2=Two 3= Three and above
402	Number of bed nets observed in the Household	1=One 2=Two 3= Three and above
403	Number of beds /places of sleep observed with bed nets	1 = One 2= Two 3=Three and above
404	The type of bed net that household owned	1=Re treatable 2=Permanently treated
405	Is the bed net hanged(placed) properly over the bed or sleeping area	1=Yes 99= Other 2=No
406	Is there any hole(throne) in the bed net	1=yes 2=No
407	Did the child found sleeping under the net?	1=yes 2=No
308	Did the pregnant woman slept under the net?	1=yes 2=No

Chapter- IX: Additional Output Reports

9.1. Weekly PHEM Bulletin of Reports for WHO Epidemiologic Week 11/2014, Oromia Regional Health Bureau.

Oromia Regional Health Bureau, PHEM core process

WEEKLY PHEM BULLETIN

HIGH LIGHTS OF THE WEEK

- ***Suspected measles cases report were slightly decreased***
- ***Confirmed malaria cases have been decreasing.***

EPid. Week 11, 2014 (01_07/07/2006 *E.C*)

I. Introduction

In our Region malaria and measles have been still the main public health concern as compared to others. This bulletin was prepared for WHO Epid. Week 11, 2014. The bulletin consists of completeness of weekly report, trend of malaria and measles cases, surveillance and responses.

II. Weekly surveillance Report

In this week report completeness of government health facility for Oromia Region was 89%. It was above the target and increased by 2% as compared to the previous week. All Zones and towns sent the weekly report. All zones and towns report completeness was 80% and above for this week except Bale (78%) and West Shoa (69%) zone. The report completeness of zones and towns is indicated below (fig.1).

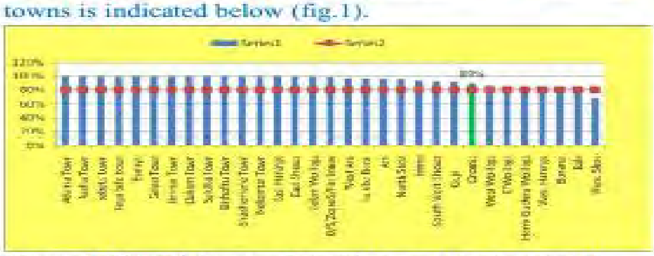


Figure 1: Completeness of weekly report by zones and towns, week 11, 2014,Oromia.

From the past eleven consecutive weeks (Week 01/2014_11/2014), the lowest 78% report completeness was in WHO week 01/2014 and the highest (89%) in WHO week 11/2014 (fig. 2).

Figure 2: Regional surveillnace report completeness by WHO week , from week 1-11, 2014, Oromia.

III. Diseases condition

1. Malaria

In week 11/2014, totally 4,084 confirmed malaria cases were reported. Among confirmed and clinical cases, 105 (1.7%) cases were admitted. From total confirmed cases, 2106(51.6%) were P.falciparum. In this week confirmed malaria cases were decreased by 284(6.5%) as compared to week 10/2014. The weekly magnitude of confirmed malaria cases is indicated in figure 3, which consists the last eleven consecutive WHO weeks report.

Figure 3: Regional confirmed malaria trends including P.f and P.v species from week 01-11/2014,Oromia.

Among the total confirmed cases, the highest number of cases were reported from East Shewa zone, 708(17.3%) which is followed by Jimma zone, 490(12.0%). The other zones with high number of confirmed malaria cases were West Shewa, South West Shewa, and East

** = PUBLIC HEALTH EMERGENCY* *Weekly PHEM Bulletin, Oromiya_ 2014*

Oromia Regional Health Bureau, PHEM core process

WEEKLY PHEM BULLETIN

Wollega with the magnitude of 439(10.7%), 414(10.1%) and, 332(8.1%) cases respectively.

Three consacutive WHO weeks (6_8/2014) confirmed malaria cases of some zones were shown below (figure4).

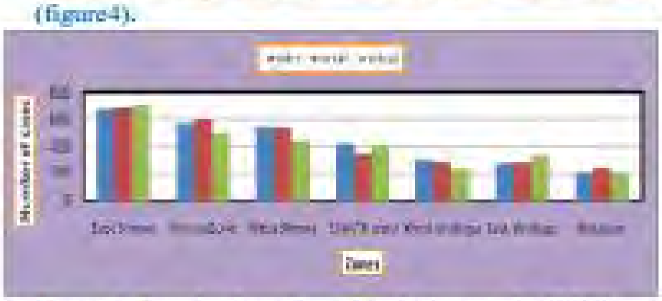


Figure 4: Trends of confirmed malaria cases by WHO weeks, 9-11/2014, of seven Oromia zones.

2. Dysentery (Diarrhea with Blood)

In this WHO week a total of 1,743 dysentery cases were reported. Among the report of last eleven consecutive WHO weeks (1 - 11/2014), the highest number of cases (1872) were reported in week 10/2014 and the lowest cases (1060) were reported in week 1/2014 (Fig.5). This week reported cases were decreased by 129(6.9%) as compared to week 10/2014.

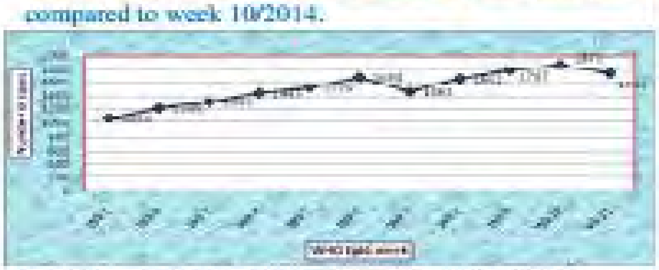


Figure5: Dysentery cases by WHO week from 01-11/2014, Oromia.

3. Measles

This week a total of 106 suspected measles cases were reported. The majority of cases were reported, from Arsi, Bale and Illu Ababora with magnitude of 27(25.5%), 17(16%) and 16 (15.1%) zone respectively. Last eleven consecutive WHO weeks (01-11/2014) suspected measles cases trend is indicated below.

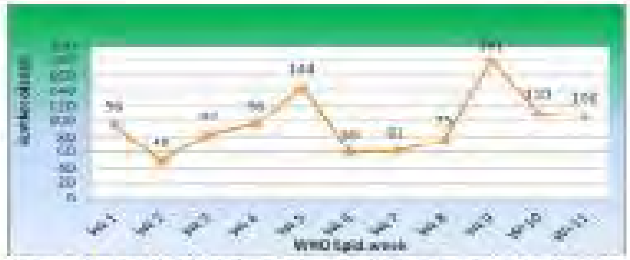


Figure 6: Trends of Regional suspected measles cases by WHO week(01-11/2014), 2014,Oromia.

4. Polio

In this week a total of 8 suspected AFP cases were reported regionally. Bale, Guji and Illu Ababora zones reported 2(25%) cases each, while West Shoa and West Harerge reported 1(12.5%) case each.

5. Malnutrition

A total of 1,334 severe acute malnutrition (SAM) cases and 1 death were reported. The cases were decreased by 240(15.2%) as compared to week 10/2014. Among the total cases, 97 (7.3%) were treated in Stabilizing Center. The highest number of cases were reported from East Harrerghe zone, 263(19.7%) followed by west Arsi, West Hararge and Bale Zones with the magnitude of 248 (18.6%), 158 (11.8%) and 101 (7.6%) respectively. The death was reported from Jimma zone

6. Meningitis

In this week one suspected Meningococcal Meningitis casas and one death were reported from Metu town.

IV. Response activities

- Strengthened active surveillance
- Strengthened completeness of report through routine feedback.
- Strengthened active case management and routine EPI.

9.2. Ebola virus disease (EVD) preparedness and surveillance activity report

Background

Ebola haemorrhagic fever (Ebola HF) is one of numerous Viral Hemorrhagic Fevers. It is a severe, often fatal disease in humans and nonhuman primates (such as monkeys, gorillas, and chimpanzees) (1).

Ebola is caused by infection with a virus of the family Filoviridae, genus Ebolavirus. When infection occurs, symptoms usually begin abruptly. The first Ebolavirus species was discovered in 1976 in what is now the Democratic Republic of the Congo near the Ebola River. Since then, outbreaks have appeared sporadically (1, 2).

There are five identified subspecies of Ebola virus. Four of the five have caused disease in humans: Ebola virus (Zaire ebola virus); Sudan virus (Sudan ebola virus); Taï Forest virus (Taï Forest ebola virus, formerly Côte d'Ivoire ebola virus); and Bundibugyo virus (Bundibugyo ebola virus). The fifth, Reston virus (Reston ebola virus), has caused disease in nonhuman primates, but not in humans (1- 4).

The natural reservoir host of ebola viruses remains unknown. However, on the basis of available evidence and the nature of similar viruses, researchers believe that the virus is zoonotic (animal-borne) with bats being the most likely reservoir. Four of the five subtypes occur in an animal host native to Africa (1).

Ebola virus disease was first described in 1976 in two simultaneous outbreaks in sub-Saharan Africa namely (1- 4).

The most widespread epidemic of Ebola virus disease (EVD) in history is currently ongoing in two West African countries; Sierra Leon and Guinea. This is the first outbreak of EVD in West Africa and the 26th outbreak globally since the disease was discovered in 1976 in Zaire (4). This is the first Ebola outbreak to reach epidemic proportions; past outbreaks were brought under control within a few weeks. It is unprecedented in size, in geographical distribution, and in affecting densely populated urban areas. WHO declared this outbreak a Public Health Event of International Concern (PHEIC) on 8 August 2014. As of May 24/2015 the number of cases reported from ten countries was more than 27,000 and the deaths 11,149 however WHO believes that this substantially understates the magnitude of the outbreak. It has caused significant mortality, with reported case fatality rates of up to 70% and specifically 57–59% among hospitalized patients (4, 5).

This current EVD epidemic was began in Guinea in December 2013 and declared on 21 March 2014, by the Government of the Republic of Guinea. Later the epidemic has spread to two neighboring countries, Liberia and Sierra Leone, thus giving the crisis a regional dimension. At the end of July 2014, a symptomatic case travelled by air to Lagos, Nigeria where he infected a number of healthcare workers and airport contacts before his condition was recognized to be EVD. Other West African Countries affected by this epidemic include Senegal and Mali, which reported one and eight cases respectively. Countries reported imported cases out of Africa were United States, Spain, United Kingdom and Italy. Liberia was officially declared Ebola-free on 9 May after 42 days without any further cases being recorded, but remains on high alert for new outbreaks (3-5).

Since this epidemic declared by WHO the Ministry of health of the Federal Republic of Ethiopia has been working with its partners actively and established and implemented the EVD outbreak response measures and prepared to prevent the deadly Ebola disease from entering the country.

The major activities that have been done by the Ethiopian government are; implementing screening passengers coming from Ebola affected West Africa countries at Addis Ababa International Airport and at major land ports crossing the country borders and also established isolation centers for Ebola suspect cases. In addition, Federal Republic of Ministry of Health has been established a free call hotline at EPHI to create awareness on EVD by responding the questions from the community and receive rumors about Ebola from the community. In addition training and awareness creation were conducted for different health workers and support staffs on Ebola case identification, management and on infection prevention activities. More over the ministry also implemented tracing and following health status of guests who came from Ebola affected countries by measuring their body temperature daily throughout their say in Ethiopia for 21 days. Cohort five Ethiopian field epidemiology training program residents were among the teams assigned by the ministry to perform these activities and have played a pivotal role. As a member of the 5th cohort EFETP resident I have been assigned at land port and EPHI to perform EVD related activities since September 2014. Major EVD activities I performed during my stay were:

1. Responding to EVD hotline
2. Contact tracing and follow-up

3. Providing training and awareness creation for health workers
4. Establishing isolation center and strengthening screening activity at Gambella Pugnudo land port entry.

Objective of Ebola virus disease (EVD) preparedness and surveillance

1. General Objective

To prevent the spread of Ebola virus disease (EVD) in Ethiopia by early detection and isolation of persons entering Ethiopia who are at risk of having EVD at major land ports of entry (2).

2. Specific Objectives

- Screening of all persons entering into Ethiopia at the land ports of entry to be initiated in August 2014, in all land ports in collaboration with RHBs, and health control authorities and other stakeholders.
- Capacitating health workers on EVD prevention and Control measures and taking protective measures
- Raising awareness of the Community on the risk factors for Ebola infection

Activities performed

1. Responding to EVD hotline

The purpose of the hotline was to create awareness on EVD by responding to questions asked from anywhere in the country and to receive any rumors related to EVD. During my stay at EPHI I have responded to a number of calls came from different part of the country. Detailed summarized analysis of the hotline by frequency of call per day; type of questions raised and place of call from August 28 to September 11, 2014 is shown below.

1.1. Analysis by Frequency of Call

A total of 1,099 calls was received by the hotline at EPHI from 8/29/2014 to 9/11/2014, as the graph below shows (Fig1) the number of calls have been dramatically increased. The highest number of calls (153 calls) was on 20 September 2014 followed by September 19 and September 16 2014 with frequency of 153 (14%), 133 (12%) and 114 (10.3%) of calls respectively. This might be due to the notification of the hotline number by radio and television. The least number of calls were on 9/1/2014 and 8/29/2014 with two frequencies of calls on each day.

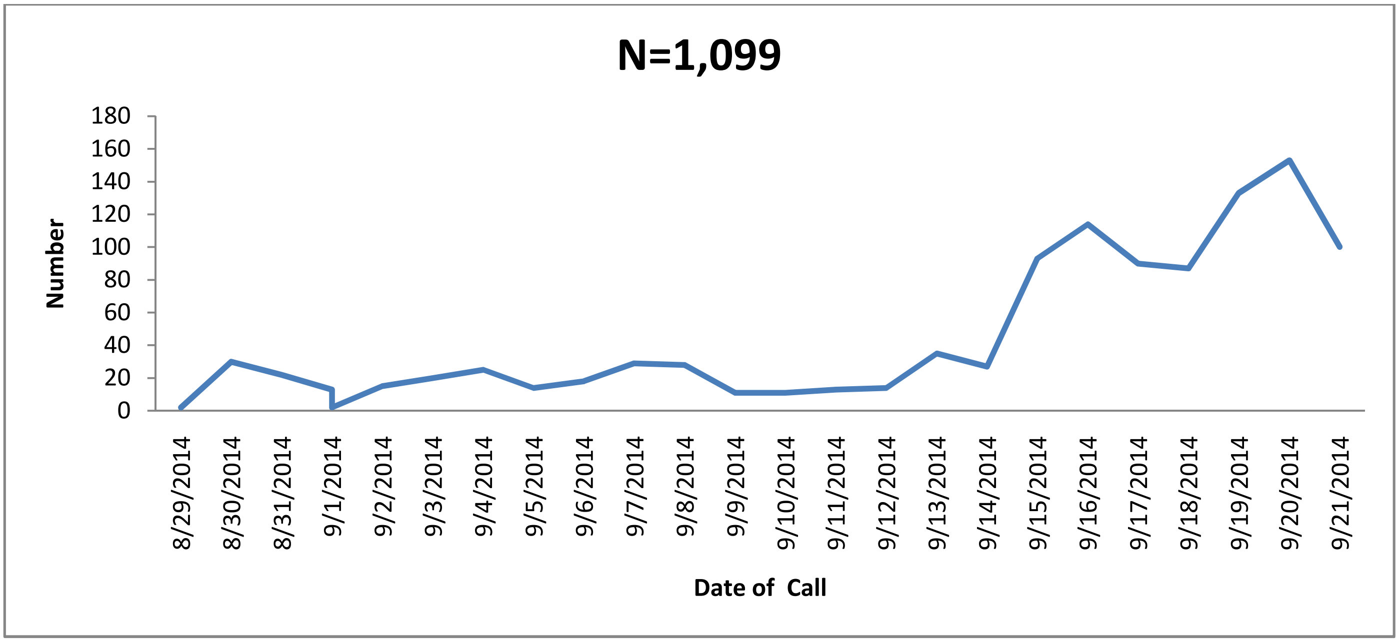


Figure 52: Frequency of Call per day, from 29 August to 21 September 2014, Ethiopia

1.2. Analysis by Place of Call

Among a total of 1,099 calls received in the past 3 weeks, the highest number of calls were from Amhara Region 371(34%) followed by Oromia Region 287(26%) and Addis Ababa City 180 (16.3%), whereas the lowest calls were from Harari Region, Somale Region and Dire Dawa City with frequency of 3, 7 and 9 calls respectively.

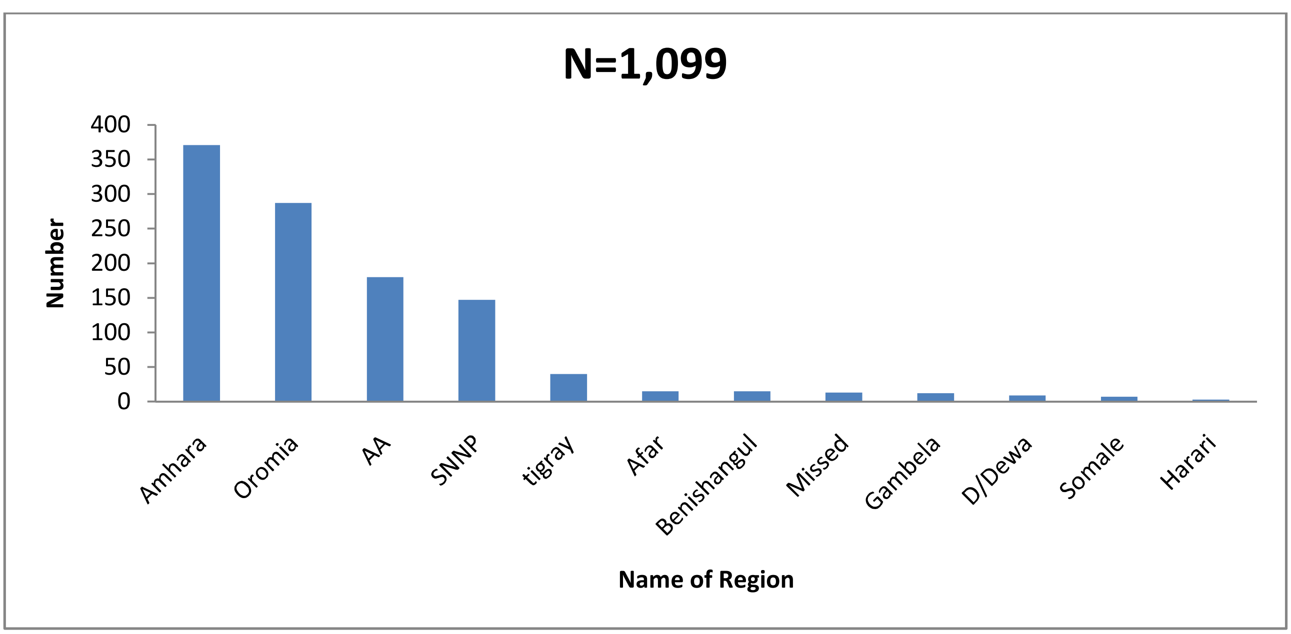


Figure 53: Place of Call by Region from 29 August to 21 September 2014, Ethiopia

1.3. Analysis by Type of Questions Raised

A total of 1580 questions raised about ebola in the past 3 weeks. The most frequently asked questions were; sign and symptoms of the disease 530(33.5%), which is followed by mode of transmission 384 (24.3%) and status of ebola in our country 124 (8%). Asking about flight to West Africa, diagnosis of Ebola virus and the objective of hotline call were the list asked questions with frequency of 3, 5 and 9 questions respectively.

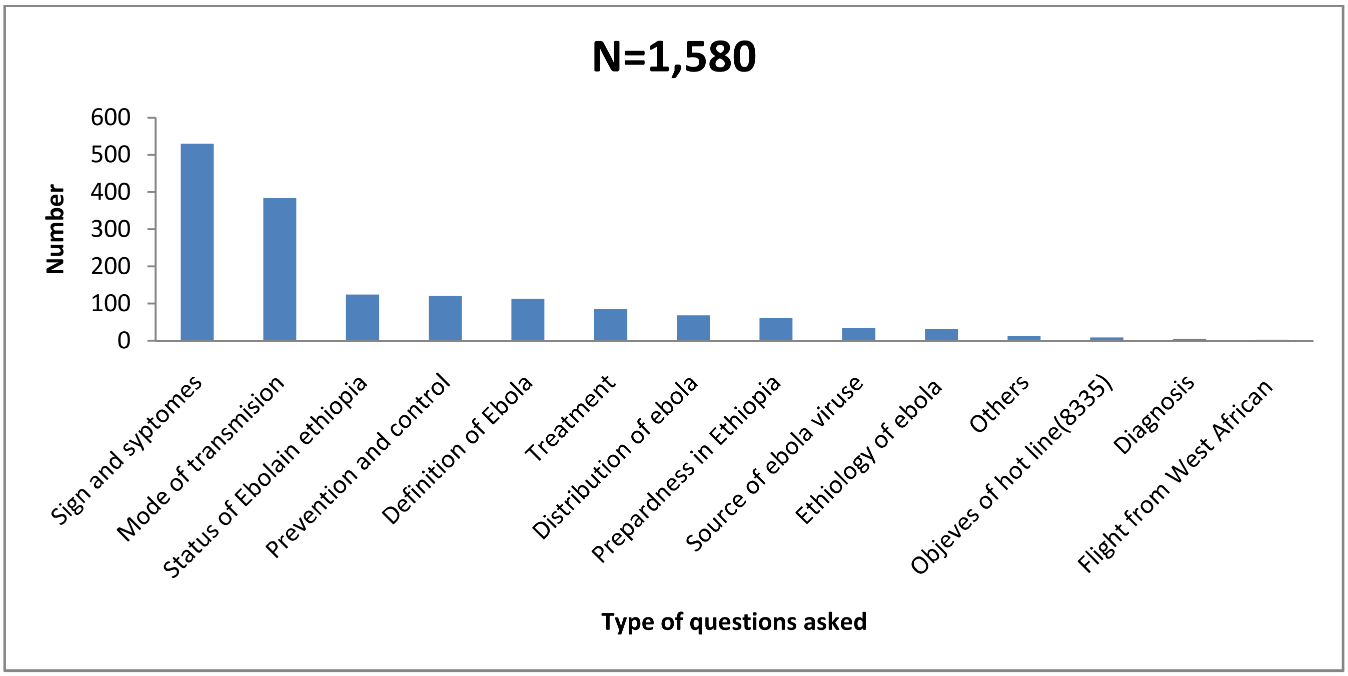


Figure 54: Type of Questions raised from 29 August to 21 September 2014, Ethiopia

2. Contact tracing and follow-up

Contact tracing is defined as the identification and follow up of persons who may have come into contact with an infected person. Contact identification, listing and follow-up start as soon as a suspected case or probable case has been detected. Cases are classified as suspected, probable or confirmed. If a contact develops with a fever or other Ebola Symptoms, they are immediately isolated, tested, provided care, and the cycle starts again–all the new patient contacts are found and watched for 21 days. Even one missed contact can make the outbreak going. It requires listing all contacts of probable and confirmed cases using a contact listing form.

With the current evidence of EVD in West Africa, and the declaration of Public Health Emergency of International Concern, traveller screening – of passengers coming from EVD affected countries is an important activity and contribute to early detection of cases and prevent the importation of a the disease or to delay such importation. WHO advised countries with active EVD to do exit screening of passengers and prohibit passengers from boarding the flight if sick. Doing the entry screening complements the work of exist screening of passengers. Accordingly Ethiopian ministry of health has established and implemented screening activities at Bole international airport and major land port entry sites. Those passengers who came from EVD affected countries have been followed for 21 days by measuring their body temperature up to two times per day.

First the self filled reporting form by passengers regarding suspected ebola virus disease has been reviewed and compiled at airport screening site and sent to the EPHI. The contact tracing team at EPHI (5^{th} cohort EFETP residents) identifies the contacts, list them and following for fever and any sign and by taking their body temperature daily throughout their stay in Ethiopia. As of may 24, 2015 more than 3,000 passengers who came from EVD affected countries have been followed by 5^{th} cohort EFETP residents assigned at EPHI.

3. Establishing isolation center and strengthening screening activity at Gambella Pugnudo land port entry.

Gambella Region is one of the major land port entry sites of the country, therefore the Ministry of Health of Ethiopia have deployed the first supportive technical staffs for EVD screening since august 26/2014 for one month at two land port entry site called Pagag and Gog Woreda.

After one month the second team comprising four EFETP resident have take over the activities from the first team for one month also to strengthen the activates which were started by the first team and fill the gap which were not covered by the previous team. I was one of the residents assigned in the second team to work at Gog District Pugnudo land port.

Figure 4: Picture taken when the first team introduce the second team with Gog Woreda screening site staffs and Gambella Region PHEM focal person.

3.1. Objective

To establish EVD isolation center and scale up and strengthen EVD preparedness, screening and prevention activities at Gambella Gog district, Pugnudo land port screening site.

3.1.1. Strategies

1. By awareness creation on EVD to Gog district health extension workers

2. By capacitating the Screening site with necessary logistics and technical skill.
3. By awareness creation on EVD to Gog district Kebele leaders, Hotel owners and for the community.

4. By strengthening and capacitating the activities of Gog District Ebola task force.

5. Establishing EVD temporary isolation center

Activities we have performed at the land port during our 40 days stay at the area include:

- Oriented all screening staffs of screening site how to operate, use and adjust non-contact IR thermometer for measuring body temperature of in- migrants and strengthened screening service.
- Conducted awareness creation and discussion on EVD with eight Pugnido Town hotel owners in collaboration with Gog Woreda health office. Topics of discussion were:-
    - Sign and symptoms of EVD
    - Mode of transmission of EVD
    - How to communicate carefully to guests who came from ebola affected countries (Ex. not to shake hands)
    - To avoid exposure and direct contact to any body fluids of suspected guest.
    - To follow health status of those guests and immigrants who come from ebola affected countries
    - Infection prevention (to use gloves and disinfectants during housekeeping and cleaning & proper and frequent hand washing in case of contact with any body fluid).

- Provided training for health workers, health extension workers and kebele leaders of Jor district on EVD Sign and symptoms, Mode of transmission, Infection prevention, screening and related topics.
- Established EVD temporary isolation center
- Prepared and distributed pictorial poster showing EVD sign and symptoms, mode of transmission and prevention measures

We printed many copies of the poster and posted at places where many people can gather; i.e hotels, schools, shops, government offices, health centers, military camps, refugee camps and others. We have also given many copies of the poster for the woreda health office to distribute them to other kebeles.

Figure 5: Picture taken while posting EVD awareness creation poster at public gathering areas.

Figure 6: awareness creation training on EVD for Jor district health workers and community leaders

Figure 7. EVD suspected cases temporary isolation center Pugnudo land port, Gambella.

At the end of our stay at the land port we have attended our last weekly technical working group (TWG) meeting and debriefed what we have performed during our stay for the technical working group and handover the EVD prevention, preparedness and response activities to the Gog woreda health office.

Agendas of the TWG meeting were:-

- ✓ Reporting of activities performed and challenges faced by each members
- ✓ Proposing of possible solutions for each challenges
- ✓ Proposing action points to be performed by next week
- ✓ Sharing activities and resource mobilization for all stalk holders
- ✓ Strengthening of the TWG by including all partners working in the woreda

Finally we have attended the first regional Ebola task force meeting chaired by H.E president of Gambella Regional state. The task force discussed and endorsed the regions Ebola viral disease preparedness and response plan, prepared by Gambella Region Health Office. The task force also discussed activities performed on EVD prevention, preparedness and response.

Members of Gambella Region EVD task force:-

- President of Gambella Regional State (chairman)
- Head of Gambella Region health bureau (secretary)
- All members of the regional cabinets
- The regions information and security service center
- All religion leaders
- Defense force leaders in the region
- Gambella air port

Figure 8: Gambella region EVD task force meeting to endorse the regional EVD preparedness and response plan.

Limitations

Security problem due to ethnic conflict happened in the region

Shortage of budget for construction of toilet at the isolation center and scarcity of materials needed in the isolation center (bed, PPE, mattress, vacuum pumper etc)

Shortage of trained staff for the isolation center (Doctors, Health Officers, Nurses, spray mans and cleaners)

Lack of security personnel's at the screening site due to per dime payment problem

Recommendations

EPHI should have to give training on EVD case management, infection prevention and sample collection for a team of health workers needed for the isolation center of the woreda.

EPHI should have to give all necessary materials needed for the isolation center (Full PPE, bleach spraying bottle, hand washing material, disinfectant, stretchers, etc)

Budget should be assigned for the woreda for EVD prevention, preparedness and response activities and for isolation center toilette construction.

References

1. WHO recommended Guidelines for Epidemic Preparedness and Response: Ebola Hemorrhagic Fever (EHF), WHO/EMC/ DIS/97.7
2. EPHII: Ebola Viral Disease interim guideline, September 2014
3. WHO: Ebola Response Roadmap Update Situation Report, May 2015.
4. CDC: Chronology of Ebola Hemorrhagic Fever Outbreaks. Centers for Disease Control and Prevention. 24 June 2014.
5. WHO: "Ebola response roadmap - Situation report - 31 December 2014" (PDF). World Health organization. 31 December 2014.