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

Ethiopia Field pidemiology Training Program (EFETP)

Compiled Body of Works in Field Epidemiology

By

Addisalem Mesfin

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, 2016

Addis Ababa, Ethiopia

Cell phone: 0911243303

E-mail: addisaleme@yahoo.com

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Advisors

1. **Dr. Daddi Jimma**
2. **Dr. Alemayehu Bekele**

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Approved by Examining

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Chairman, School Graduate Committee

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Advisor

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Examiner

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Examiner

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Preface

The Ethiopia Field Epidemiology Training Program (EFETP) is an in-service training program in field epidemiology adapted from the United States Centers for Disease Control and Prevention (CDC) and Epidemic Intelligence Service (EIS) program. The Program is designed to assist the Ethiopian Ministry of Health in building or strengthening health systems by recruiting promising health workers and building their competencies through on-the-job mentorship and training. Field epidemiology training resembles a traditional medical residency program, because trainees spend an extended period of time practicing and developing their skills in a ―hands on" manner.

Ethiopia adopted the Field Epidemiology Training Program to help improve leadership within Public Health Emergency Management. The EFETP provides residents a Master of Public Health Degree in Field Epidemiology after they complete two years of supervised work in applied or field epidemiology.

The goal of the EFETP is to strengthen the Ethiopian Public Health Emergency Management system by: Improving public health event detection and response; creating a robust disease surveillance system; building capacity in field epidemiology and public Health; Enhancing evidence-based decision making for public health practice; and Reducing morbidity and mortality associated with priority diseases.

Residents are expected to prepare and submit this body of work which will be assessed and evaluated by examiners to make sure that resident has acquired the expected level of competencies during his/her residency. Therefore, this body of work summarizes the required field residency‘s outputs accomplished at field base during residency. It has eight chapters,namly Outbreak Investigation, Surveillance Data Analysis Report, Evaluation of the Surveillance System, Health Profile Summary Report, Scientific Manuscript for peer review journals, Abstract and Writing Protocol/Proposal of Epidemiologic Research Project and a Summary of Disaster Situation Visited/Risk Assessment.

This document contains a two years Field Epidemiology Training Program outputs which is to be submitted to graduate school of public health for fulfillment of masters degree in Field Epidemiology. It includes reports of diseases outbreak investigations, public health surveillance data analysis, surveillance system evaluation, narrative summary of disaster situation report, manuscripts and abstracts. Accordingly the document is organized to eight chapters.

The first chapter includes two outbreak investigations both of the investigations were conducted using case control study design, one on Diarrheal Outbreak in Addis Raey Training Center, Amibara Woreda Afar Regional State and the other on influenza like illness Outbreak in South Gondare Zone, Amhara Regional State. The second chapter contains five years Surveillance Data Analysis of Meningococcal meningitis in Ethiopia. Chapter three, four, and seven contain Surveillance System Evaluation conducted in Enderta Woreda, Health Profile Description of Hintalo-Wajrate Woreda, and Disaster Risk Assessment on Prioritized Districts in Tigray region respectively. In addition to those, scientific manuscripts for peer reviewed journals are found in chapter five and out of four, threeabstracts which resulted from Diarrheal, Influenza like ilness outbreak investigation and surveillance data analysis are included in chapter six.The ILI abstract is submitted to the option IX for the control of influenza international conference, organized by the International Society for Influenza and other Respiratory Virus Diseases(ISIRV) and it is accepted for presentation. An Epidemiologic research project entitled, Under-Five Childhood Diarrheal morbidity and its, correlates in Kirkos Sub city, Addis Ababa, Ethiopia, 2016, is included in chapter eight. There were multiple activities such as follow up for passengers who came from ebola affected countries and following drought mull nutritioned patient screening activity was widely engaged, but eventhough those activities were holding most of our time, I felt it is not useful to present here for academic purpose.

List of Abbreviations/ Acronyms

AAU-SPH	Addis Ababa University School of Public Health
ACT	Artemisinin-Based Combination Therapy
AFENET	African Field Epidemiology Network
AFI	Acute Febrile Illness
AFP	Acute Flaccid Paralysis
AIDS	Acquired Immune Deficiency Syndrome
ANC	Antenatal Care
ART	Antiretroviral Therapy
aVDPVs	Ambiguous Vaccine Drive Polio Virus
AWD	Acute Watery Diarrhea
BCG	Bacillus Calmette Guerin
CFR	Case Fatality Rate
CHD	Child Health Development
CHW	Community Health Worker
CNS	Central Nerve System
CPR	Contraceptive Prevalence Rate
CSA	Central Statistics Agency
CTC	Cholera Treatment Center
CVDPVs	Circulating Vaccine Drive Polio Virus
CVS	Cardio Vascular System
DPT	Diphtheria, Pertussis, and Tetanus
E.C	Ethiopian Calendar
EFETP	Ethiopia Field Epidemiology Training Programme
EFY	Ethiopian Fiscal Year
EOS	Enhanced Outreach Strategy
EPHA	Ethiopian Public Health Association
EPHI	Ethiopian Public Health Institute
EPI	Expanded Program on Immunization

ETB	Ethiopian Birr
FGD	Focal Group Discussion
FMoH	Federal Ministry of Health
GIS	Geographic Information System
GPI	Gender Parity Index
GUS	Genito Urinary System
HC	Health Center
HEENT	Head, Eye, Ear, Nose and Throat
HEWs	Health Extension Workers
HF	Health Facility
HH	House Hold
HIT	Health Information Technology
HIV	Human Immune deficiency Virus
HP	Health Post
IDSR	Integrated Disease Surveillance and Response
IEC	Information, Education, Communication
IHR	International Health Regulations
IRS	Indoor Residual Spray
ITN	Insecticide Treated Net
IVDPVs	Immunodeficiency Vaccine Drive Polio Virus
K.G	Kinder Garten
K.M	Kilo Meter
LLINs	Long Lasting Insectide Nets
LLITN	Long Lasting Insecticide Treated Nets
MCH	Mother and Child Health
MCP	Malaria Control Program
MSS	Musculo Skeletal System
MUAC	Mid-Upper Arm Circumference
NGO	Non Government Organization
NID	National Immunization Day

OPD	Outpatient Department
OPV	Oral Polio Vaccine
OR	Odds Ratio
ORS	Oral Redehydration Solution
OTP	Outpatient Therapeutic Programme
PHEM	Public Health Emergency Management
PLW	Pregnant and Lactating Women
PLWHA	People Living With HIV/AIDS
PMTCT	Preventing Mother to Child Transmission
PNC	Postnatal Care
PPE	Personal Protective Equipment
PPV	Predictive Positive Value
RDT	Rapid Diagnostic Test
REC	Reach Each Child
RHB	Regional Health Bureau
RI	Routine Immunization
SC	Stabilizing Centers
SIA	Supplementary Immunization Activity
SNNPR	South Nation Nationality of People Region
STI	Sexually Transmitted Infection
TB	Tuberculosis
TBA	Traditional Birth Attendant
TEPENET	Training Programs in Epidemiology and Public Health Network
TFP	Therapeutic Feeding Program
TT	Tetanus Toxoid
TTBA	Traditional Trained Birth Attendant
TTC	Tetracycline
UNICEF	United Nation International Children‘s Fund
VAPP	Vaccine-Associated Paralytic Poliomyelitis
VCT	Voluntary Counseling and Tsting

VDPV	Vaccine Drive Polio Virus
WHO	World Health Organization
WPV	Wild Polio Virus

Chapter I: Outbreak/Epidemic Investigations

1.1 Outbreak Investigation of Diarrheal Disease in Addis Raey Training Centre, Amibara Woreda, Afar Region, Ethiopia, April 2016.

Abstract

Background: Diarrheal diseases can be caused by numerous pathogens and transmitted through multiple vehicles. Worldwide, 780 million individuals lack access to improved drinking-water and 2.5 billion lack improved sanitation. Globally, there are nearly 1.7 billion cases of diarrheal disease every year. On June 3, 2015, a team from the EPHI was deployed to investigate for AWD outbreak in Amibara woreda of Afar region, Ethiopia.

Method: We conducted a descriptive study followed by unmatched case control study, useing a structured questionnaire to collect data from cases (51) and controls (102) to find out the risk association. We took water samples for Microbial analysis and 1102 Stool samples were collected for bacterial culture and parasitological investigations. Epi Info was used to calculate frequencies, odds ratios and SPSS to perform logistic regression to identify risk factors for diarrhea from 03 June-02 Jul 2015.

Result: Fifty-one cases and 102 controls were enrolled. On multivariate logistic regression analysis Cases attending patient (AOR=7.5; 95%CI: 2.43, 23.35), Lack of using soap after toilet or latrine (AOR = 5.2; 95% CI: 1.66, 16.34) were more likely to be affected by diarrhea. Copared to those who wash thir hands after toilet; those who washed their hands some times were more likely to develop diarrhea (AOR = 7.2; 95% CI: 1.95, 26.64). Also those who used latrine were more likely to be affected by diarrhea (AOR= 19.6; 95% CI: 6.47, 59.45).

Conclusion: The causative agent of the outbreak was confirmed by lab.Factors independently associated with the occurrence of diarrhea outbreak were attending patient, not using soap after toilets, washing hands some times after toilet and using toilet were found risk factor for the occurrence of this outbreak.Therefore,these findings underscore the importance of adequate access to safe water, sanitation, hygiene and environmental sanitation as well as continuous treatment of drinking water is highly recommended.

Key Words: Poor Snitation, diarrhea, outbreak, risk factors, pathogens, Afar, Ethiopia

1. Introduction

Diarrhea is the passage of three or more loose or liquid stools per day, or more frequently than is normal for the individual. It is usually a symptom of gastrointestinal infection, which can be caused by a variety of bacterial, viral and parasitic organisms. Diarrial Infection spread through contaminated food or drinking-water, or from person to person as a result of poor hygiene (1).

Dysentery is a general term for a group of gastrointestinal disorder characterized by inflammation of the intestines, particularly the colon. Characteristic features include abdominal pain and cramps, straining at stool and frequent passage of watery diarrhea or stools containing blood and mucus both are common but potentially serious disorder of the digestive tract occurs throughout the world(1).

It can be caused by number of infectious agents ranging from viruses and bacteria to protozoa and parasitic worms; it may also result from chemical irritation of the intestine. Dysentery is one of the oldest known gastrointestinal disorders, have been described as early as the Peloponnesian War in the fifth century B.C. Epidemics of dysentery were frequent occurrences among sailing vessels as well as in army camps, walled cities, and other places in the ancient world where large groups of human beings lived together in close quarters with poor sanitation. As late as the eighteenth and nineteenth centuries, sailors and soldiers were more likely to die from the "bloody flux" than from injuries received in battle. It was not until1897 that a bacillus (rod-shaped bacterium) was identified as the cause of one major type of dysentery (2).

Dysentery in the modern world is most likely to affect people in the less developed countries and travelers who visit these areas. According to the Centers for Disease Control and Prevention (CDC), most cases of dysentery in the United States occur in immigrants from the developing countries and in persons who live in inner-city housing with poor sanitation. Other groups of people at increased risk of dysentery are military personnel stationed in developing countries, frequent travelers, and children in day care centers, people in nursing homes, and men who have sex with other men (2, 3).

Infectious diarrhea remains a major risk to deployed military units worldwide in addition to their impact on travelers and populations living in the developing world (4, 5). Diarrheal disease is a leading cause of child mortality and morbidity in the world, and mostly results from contaminated food and water sources. Worldwide, 780 million individuals lack access to improved drinking-water and 2.5 billion lack improved sanitation. Diarrhea due to infection is widespread throughout developing countries. Globally, there are nearly 1.7 billion cases of diarrheal disease every year (6). Diarrheal diseases can be caused by numerous pathogens and transmitted through multiple vehicles. Persons living in developing countries with poor access to safe water, sanitation, or hygiene infrastructure have increased risk of exposure to viral, bacterial, and parasitic pathogens that can cause diarrheal diseases (5).

This report describes an outbreak of diarrheal illness in Addis Raey training center, Amibara woreda Afar region, which came from a big city and towns throughout the country for the purpose of enabling jobless youngster to equip with skill to have a job on the mega projects of the country. On June 2, 2015, at the request of the Ministry of Health, a team from the EPHI was deployed to assist with the investigation. At that time, due to limitations in surveillance and diagnostic capacity and poor clinical setup, the scope and nature of the outbreak were unclear. An initial aim of the investigation was to improve our understanding of the temporal distribution of the diarrhea cases, and to implement a mechanism for rapidly and reliably assessing the progression of the outbreak. We also aimed to identify diarrhea etiologies and risk factors for acquiring diarrhea, and to recommend appropriate strategies to prevent similar events from recurring.

Litrature Riview

A study conducted in Kersa district, located in Eastern Ethiopia. A community-based cross-sectional study was conducted by a group of researcher from college of health science, Haramaya University, Addis continental institute of public health, and School of public health Addis Ababa University; among 1456 randomly selected households with at least one child less than 5 years of age. The two-week prevalence of diarrhea among children under 5 years of age was 22.5%. Improper refuse disposal practices, lack of hand washing facilities, living in rural area, the presence of two or more siblings in a household, and age of the child were the major risk factors for diarrhea. This study demonstrated that diarrhea morbidity was relatively high among children less than five years of age residing in Eastern Ethiopia (8).

Diarrheal illness is one of the most common infectious risks among short-term travelers to the developing world, with some studies indicating over 50% of travelers being affected during a two week visit to an endemic country (9 and10). In a series of 784 American tourists traveling in the developing world for a median 19 days, 46% reported at least one episode of diarrhea (Hill, 2000), while Scottish tourists in Central and South America reported comparable rates of diarrhea (39.5%) (11). On the other hand, a cohort of 36 Peace Corps volunteers in Guatemala developed 4.7 episodes of diarrhea over a mean 1.8 years of follow-up; 6.1 episodes/person-year occurred in the first 6 months, declining to 3.6 episodes/person-year after 12 months (12).

Among military populations, there was diarrheal disease studies conducted in the Middle East during Operation Bright Star. In 1989, up to 44% of personnel reported diarrheal disease with ETEC (49%) as the predominant pathogen identified (13). During surveillance activities in 2001, 9.3% of troops reported a diarrheal episode in 2005; diarrheal disease was prevalent with 35 cases of diarrhea/100 person-months (14). In personnel deploying to Iraq or Afghanistan in 2003 to 2004, 78.6% of troops in Iraq and 54.4% of those in Afghanistan experienced diarrhea, with 80% seeking care from their unit medic; eating local food from non-U.S. sources was associated with an increased risk of illness (15). U.S. forces during missions conducted in Latin America showed an overall attack rate of 26%, with off-base travel and ice consumption being associated with higher reported disease rates (16). These studies have demonstrated the risk that diarrheal illness presents to military operations and the risks associated with local food sources.

Other study conducted in Tanzania, Lack of access to safe drinking water, together with inadequate sanitation and hygiene, has been identified to be the main contributor to diarrhea infection and deaths globally (17). In rural areas of developing countries, drinking contaminated water is an important cause of diarrhea (18). Lack of access to basic water supply and sanitation is a major problem in both rural and urban Tanzania. Less than half of the rural population in Tanzania has access to safe drinking water (19). Access to clean and safe water in rural areas has declined since 2001 – from 46% to 40% in rural areas (20).

Diarrhea was the fourth contributor of outpatient visit and the fifth cause of Mortality among children under the age of five years in the child gets about 5 episodes of diarrhea per year and the most frequently affected regions in the country are Shinyanga, Mara, Rukwa, Dodoma, Mbeya, Coast and Kigoma (22). The most recently study on prevalence of diarrhea among underyear 2009 in Tanzania (21).-five children was conducted in semi-urban wards of Mkuranga district and reported the prevalence of 32.7% (23). However, there is scarce information on the prevalence of diarrhea among children under-five years, and information on knowledge on causes of diarrhea among community members in rural areas of Mkuranga district.

2. Objective

2.1 General objective

To investigate determine diarrheal outbreak in Addis Raey, Amibara wereda, Afar region Ethiopia, June 2015

2.2 Specific Objectives

- To confirm the existence of the outbreak
- To identify the causative agent and mode of transmit ion of the outbreak
- To describe the outbreak in respect of time, place and person
- To take possible intervention measures as to contain the outbreak and prevent occurrence of further cases

3. Methods and Materials

3.1 Study area and Period

Addis Raey Camp is located in Afar regional State, Amibara woreda 43 K.M from Awash Sebat City and around 293 K.M from the capital city. Addis Raey Training center is a nongovernmental and non profitable organization which trains jobless citizen in different profession and technical fields in collaboration with different governmental stakeholders to build a capacity for the non employed young citizens who come most of them from low economic status including homeless from the street of big cities to have job on the megaprojects own by government and investors. According to the authority, the center so far graduated 7.560 and all of them have job opportunity on the ongoing governmental and other projects. In the implementation of this project government stakeholders such as Ministry of Defiance, Ministry of Agriculture, Revenue and Customs Authority and Ministry of Health have been playing their respective role. The camp has a total population of 10.000 people of which 9780(98%) males and 220(2%) are females (figure: 1), the study was conducted from 03 June-02 Jul 2015.

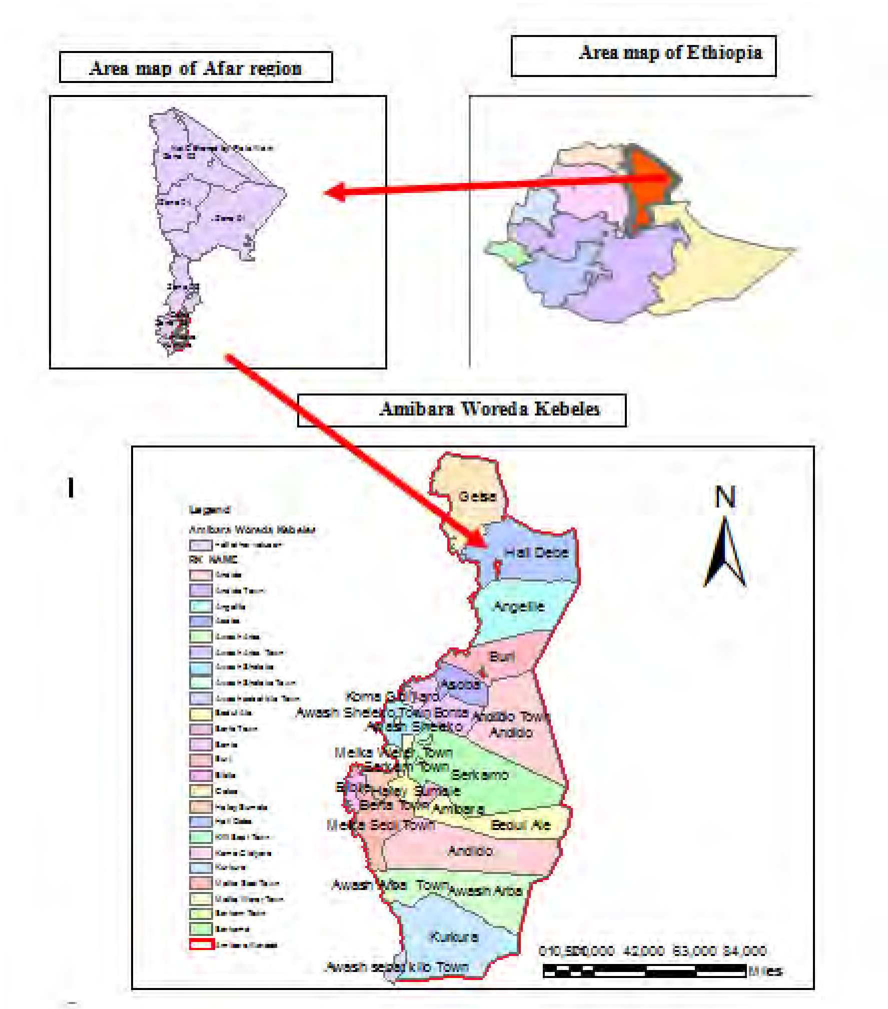

Figure 1: Map of Amibara Woreda, Afar region, addis Raey Training center, Ethiopia, 2015

3.2 Study design

We conducted unmatched case-control study to investigate the outbreak

3.3 Study population

- **Cases:** any person residing in the camp who had three or more loose or watery stool in a 24-hour‘s period, abdominal cramps, vomiting and nausea in the Addis Raey training center within the two weeks period of time prior to the outbreak (51 cases).

- **Controls:** were all people without diarrhea symptoms during the study (102 controls)

3.4. Inclusion and Exclusion criteria

Inclusion Criteria

- **Cases:** All 51 diarrheal cases sent by line list that had symptoms of diarrhea (watery, mucoid or bloody diarrhea, vomiting, abdominal cramps) from 03-18 June 2015 who agreed to participate in the study were included.
- **Controls:** Any resident of Addis Raey training center during the study period who was a neighbor to a case and who did not develop signs and symptoms of diarrhea and agreed to participate were included.

Exclusion criteria

- **Cases:** No refusal to participate in the study was encountered.
- **Controls:** Those who refused to participate were excluded as well as when more than one eligible in the family the elder were excluded.
- **Case Definition**
- Diarrhea: is defined as having three or more loose or watery stool in a 24-hour‘s period in the Addis Raey training center within the two weeks period of time prior to the outbreak.

- **Key terms**
- **Ameobiasis**, also known as **amebiasis** or **entamoebiasis**, is an infection caused by any of the amoebas of the *Entamoeba* group. It is a parasitic infection caused by the protozoal organism *E histolytica,* which can give rise both to intestinal disease (e.g., colitis) and to various extra intestinal manifestations, including liver abscess (most common) and pleuropulmonary, cardiac, and cerebral dissemination.
- **Giardiasis**, also known as beaver fever or giardial infection is an infection of the digestive system, caused by giardia lamblia, a single-celled organism (parasite).

3.5. Sampling

The sample size was calculated using Stat calc function of Epi-info version 7.1.4.0. Using the confidence level of 95%, power of 80%, and assuming a 32.6% prevalence of a previous contact with someone with diarrhea like disease in under five(24) and an OR 2.7, with 1:2 cases to controls a total of 51 cases and 102 controls were enrolled.We used a structured questionnaire that addresses possible exposures for the suspected diarrheal dysentery. We identified study subjects at health facilities both cases and controls were recruited at health center outpatient department, when they came to the clinic for medical support. Simple random sampling method was conducted without replacement and if more than one eligible in the camp one was taken by lottery method as control with nearst care taker to the case was given priority until the sample size was reached.

3.6. Data collection method

A structured interviewer-administered questionnaire was used to collect data on factors associated with contracting diarrhea, attending patient, not using soap after toilets, and washing hands some times after toilet and using toilet, sharing utilities and latrine utilization.

Descriptive: Dismantled Medical records were assessed and reviewed. Physicians working at nearby Mohamed Ali Hospital and Nurses of the training center were interviewed.We evaluated information concerning any recent change in the case definitions, reporting situations and laboratory diagnosis tools and population size. We defined suspected cases of unidentified diarrheal dysentery illness as any person with abnormal stool (watery, mucous and bloody), Abdominal cramp, loss of appetite, general weakness, dehydration, sometimes vomiting and Abdominal upset in Addis Raey Camp**.** Direct patient interview was conducted with some of the patients. Active case search was performed block to block. Discussion with the block residence committee was conducted. Treated cases with diarrheal dysentery were identified from ill handling and dismantled records to use line list from 14/05/2015- 3/07/2015. Data were entered in Excel and descriptive analysis was done. We described the outbreak over time by date of onset. We calculated the attack rate by sex, age and place. Finally, bases on their clinical manifestation, severity of illness and residence setup we ruled out some of different parasites (such as Ameba Gardia) and Bacterial infection like bacilli and others and drug s were requested accordingly.

Analytical Study: We conducted analytical observational unmatched case control study (1:2). We designed a structured questionnaire that addresses possible exposures for the suspected diarrheal dysentery. We identified study subjects at health facilities Both cases and controls were recruited at health center outpatient department (OPD) when they come to the clinic for medical support and the control for help of their friends by using random sampling methods. We gave oral consent for study subjects. We interviewed 51 suspected cases and compared with 102 control subjects. Cases were defined as any person with any of the following sign and symptoms such as, an active watery diarrhea, dysentery, abdominal crump, dehydration, vomiting and fever with measured temperature of $\geq 38^{0}$ C. within the last 14 days history of on set. Controls were defined as any person having the same characteristics with case patients except history of the above clinical pictures. We calculated odds ratio and 95% confidence intervals using Epi Info. We entered data and analyzed by excel and Epi-info version 7.1.4.0

Physical Examination: We also assessed patients physically for farther information in order to critically list all possible differential diagnosis. Complete demographic and personal information of the patients were not obtained. Clinical manifestations and fever were also documented

Laboratory:

Water samples were taken for Microbial analysis; two water samples were collected aseptically from the main tanker and from the point of use. The samples were collected using sterile 500ml container obtained from EPHI public health laboratory. Aerobic Plate count (APC), coli form count, fecal coli form and *E.coli* type1 was done using World Health Organization (WHO) and reference methods.

Stool Culture

A total of 1102 Stool samples were collected forparasitological and 27 sample for bacterial culture investigations. Stool specimens were collected from eligible patients and shipped to National Bacteriology and Mycology reference laboratory using Cary Blaire transport media at 2-8C^{0}, and tested for common aerobic bacterial pathogens at clinical bacteriology Laboratory using Clinical Laboratory Standard Institute Guideline 2014 .

Environment Investigation

General Assessment of the Camp on residential area, Food Service, Water Supply, Latrines and Health facility Services were assessed.

3.7. Data analysis and clearance

The data was collected, entered and edited using Epi-Info version7 software and checked for completeness and consistency. Descriptive statistics were used to determine the frequency of different variables. Bivariate and multivariate logistic regression analysis was applied. Results were displayed using tables and graphs and it was interpreted using Odd ratio, P value <0.05 and 95% confidence interval.

3.8. Ethical issues

The Addis Raey managing committee request help to FMOH to investigate and to contain the outbreak .FMOH give order to EPHI to assigned a team of investigators with different team compositions in coordination with one expert from FMOH, organized from Ethiopian public health institute (EPHI) and deployed on Jun 3-2015 to the training center under close supervision of the health officials (FMOH and EPHI) having the objective to investigate and identify the causative agent, source and root of transmission and finally to come up with prevention and control measures.The purpose of the investigation was clearly explained for all respondents before clinical specimens and epidemiological data were collected. We told all respondents as the result of the study will be used only to prevent and control the outbreak. The specimen collected will not used for other purpose rather than investigating the causative agent for the outbreak.

4. **Results**

Descriptive Analysis

We identified 1814 reported cases of diarrheal report from May 14 to Jul 2, 2015. Of the cases 1763(97.2%) cases were males while the rest 51(2.8%) females. Crude attack rate (CAR) was 18.1% while Sex specific attack rate was (SSAR 23% and 18%) in females and in males' respectively. There was no any death reported.

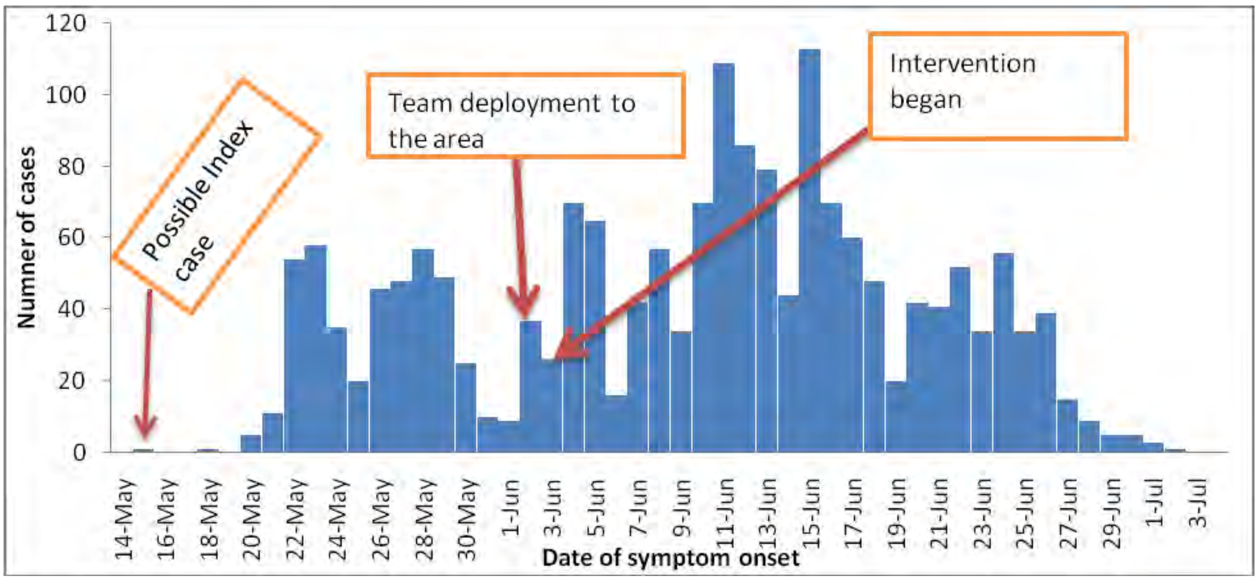

Figure 2: A common source of diarrheal outbreak cases distribution by date of onset, Addis Raey Training Center, Amibara Woreda, Afar, Ethiopia; July- 2015

Among the cases, younger age groups were more affected during the outbreak with attack rate of 59.2% and 33.7% for the age groups 15-24 and 25-34 respectively. Similarly, among the age group of 15-24 most of them were males 1763(ASAR 97.2 %) and 51 (ASAR 2.8 %) were females. Almost all of the Female cases (92.2%) were among this age group; the rest (7.8%) was with the age group 25-34. There is no case below or above the age of 15 and 52 respectively. (Table 1)

Table 1: Case distribution by age and the majority case are under age group of15-24 years.

Age groups	Male Cases	Female Cases	Total Cases	Percent
< 1	0	0	0	0.0%
1_4	0	0	0	0.0%
5_9	0	0	0	0.0%
10_14	0	0	0	0..0%
15_24	1026	47	1073	59.2%
25_34	607	4	611	33.7%
35_44	126	0	126	6.9%
45_54	4	0	4	0.2%
55_64	0	0	0	0.0%
> 65	0	0	0	0.0%
Total	1763	51	1814	100%

The distribution of stool characteristics registers during clinical examination, the higher frequency were watery diarrhea (47%) followed by Dysentery (33%) and Mucoid (20 %). (Figure 3).The distribution of the case between unites (shaleka) were almost the same in all four shalkas namely Abay, Tekeze, Hidase and Gibe.(Figure 4).

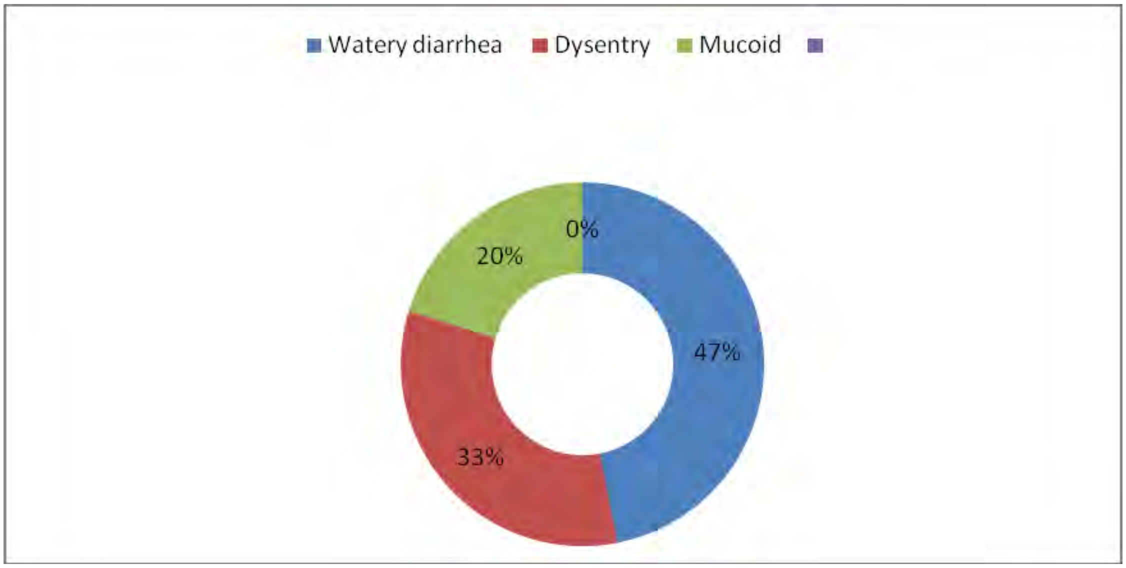

Figure 3: The frequency Distribution of Cases by Type of stool character during Clinical Visit (Only for case that has detailed description of stool character).

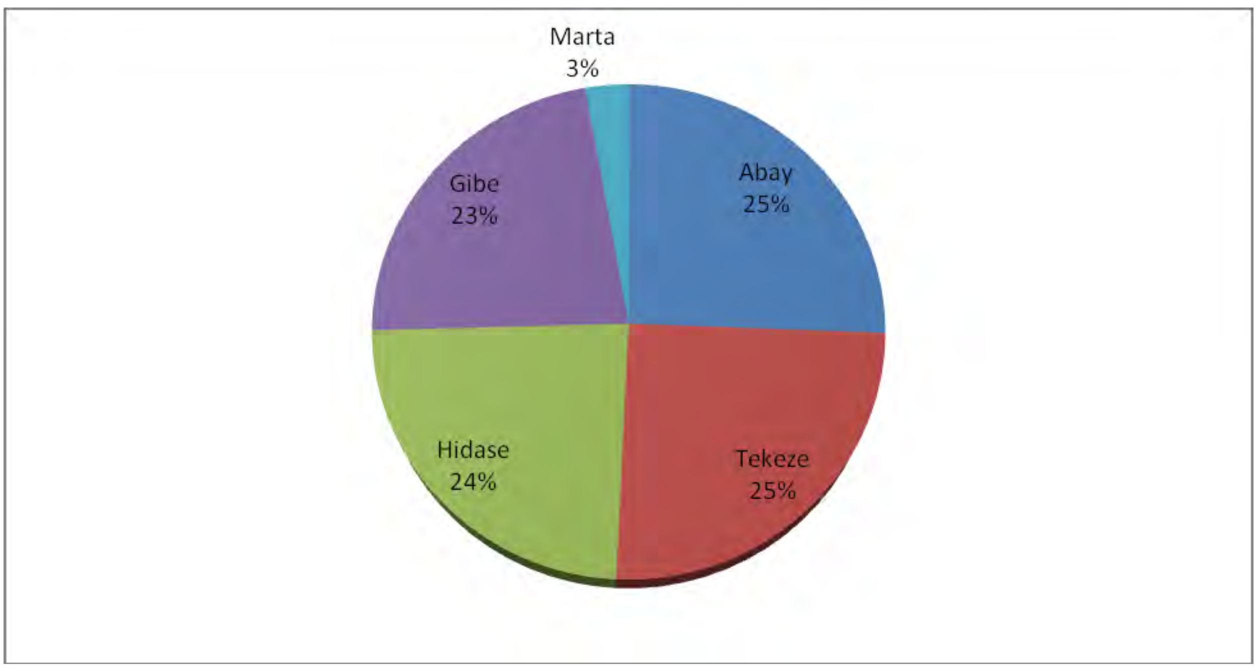

Figure 4: Cases distribution by place (Among the Shaleka*)
* A form of military organization in Amharic equivalent to regiment.

Environmental Investigation

General Assessment of the Camp on Residential Area, Food Service, Water Supply, Latrines and Health facility Services were assessed.The Environmental assessment reviled that most of the camp areas including kitchen, dining areas and latrines have poor sanitation. In addition there is no enough washing facility and latrines so that open defecation is common in the camp. Water storage materials are not regularly cleaned before use and patients identified with diarrheal illness participate in food and water handling and preparation. The camp has one kitchen, three cafeterias and uses the same water source. They have also 26 big blocks used to reside the trainees ,the male trainee are residing in 25 Blocks in which 7080 male trainee live (more than 250 in each Block) while the females (220) living together in one block. There was no proper clinical set up and pharmaceutical supplies. There was no clear referral system. There are extremely over crowded population which does not much with the available resource to maintain proper environmental and personal hygiene. There is one kitchen for the entire trainee with three cafeteria, 42 pipeline water, 120 showers, 221 hand washing facility, 198 close washing gantries (Genda) and 160 bathrooms for the entire trainee.(Figure5).

Figure 5: A sample photo of latrine used by the trainee with full of dirty overflowing sewrage and without slap.

Health facility

There was no proper clinical set up for the trainee; only two metal sheet constructed rooms were available with insufficient staffing of man power and with shortage of basic medical supplies (no antiseptic, disinfectant chemicals and drugs).poor hand washing facilities and very crowded waiting areas was evident. There was no clear referral system .After the problem existed, after our arrival and demand the clinic was staffed with three health officers, one Lab technician and one pharmacist from afar and Addis Ababa administrationHealthBureau with agreement of FMOH and the mention health bureaus .The center have no environmental professionals.

Generally the medications and the supplies in the center were below optimal to deliver care for patients.

Laboratory results:

Water analysis result

The Bacterial isolation conducted at EPHI showed that high Bacterial coli forms and E coli were identified from water used at the Camp. Of the two water samples analyzed for bacterial contamination using four parameters both storage tanker and point of use were unacceptable for use based on the required acceptability set by WHO Standards for un chlorinated water.(see tables 1& 2)for Point use and storage tanker.

Table 2: Shows result of drinking water test taken from storage tanker and point of use.
Shows result of drinking water test taken from storage tanker and point of use.

Parameter	Result	Acceptable limit
At storage tanker		
APC at35 ^{0}c**	<1x10^{1}cfu/ml	
Coli form count*	35 MPN/100ml	
Fecal coli form*	35MPN/100ml	<1MPN/100ml
E.coli type 1	present	Absent
At point of use		
APC at35 ^{0}c**	<1x10^{1}cfu/ml	-
Coli form count*	160 MPN/100ml	-
Fecal coli form*	160MPN/100ml	<1MPN/100ml
E.coli type 1	present	Absent

*In the coli form count minimum detection level of <1 is considered as not detected.

** In the other count <1x10^1 is the standard reporting format for plates from all dilution of the sample has no colonies.

Stool culture results

From the total 27 stool specimens check by convectional culture techniques. Only 2 (7.4%) were positive for bacillary dysentery caused by shigella Flexinari serogroup B.

Parasitological examination results

Using direct microscopy at the Camp Clinic, We took a total of 1102 microscopic stool analysis, of which 450(40.8 %) case were positive for protozoa, parasitic and pus cells. Among the positive results, the most circulating agent 166(36.9%) was Ameobia followed by Giardia 115 (26.6%) and pus cells 102(23.1%) (See table 3).

Table 3: Mixed cause diarrheal distribution by Microscopic stool analysis findings, Addis Raey training center, Afar, Ethiopia-July 2015

Type of Parasite	M(Pos*)	F(Pos)	Total	Positive%
Ameobiasis	155	11	166	36.9
Giardiasis	103	22	115	25.6
Puss cells	95	8	103	22.9
Ascariasis	18	0	18	4.0
T.trichuria	11	0	11	2.4
H.nana	10	1	11	2.4
Taniasis	5	0	5	1.1
S.mansoni	4	0	4	0.9
E.vermicularis	3	0	3	0.7
S.stercolaris	3	0	3	0.7
H.worm	1	0	1	0.2
Sub Total	**408**	**42**	**450**	**100.0**

Total Lab exam	Positive	Negative
1102	**450(40.8%)**	**652(59.2%)**

Analytical

More than half 29(56.9%) of cases and 62(60.8%) of controls age groups were less than 25 years old. Among the study subjects 44(86.3%) and 87(85.3%) were cases and controls respectively. Concerning educational status 25(49.0%) of cases and 49(48.5%) of controls were educated to the level of primary school.

Table 4: Socio-demographic characteristics of diarrheal disease in Addis Raye Camp, Afar 2015

Variables	Cases (N=51)%		Controls (N=102)%		COR
	Number	Percent	Number	Percent	
Age in years					
<25 years	29	56.9	62	60.8	1:00
>= 25 years	22	43.1	40	39.2	1.2(0.59-2.32)
Sex					
Female	7	13.7	15	14.7	1.1(0.41-2.85)
Male	44	86.3	87	85.3	1.00
Education					
Primary	25	49.0	49	48.5	1.0(0.52-2.00)
Secondary	26	51.5	52	51.5	1:00

Thirty two (62.7%) of cases and 31(30.4%) of controls were attending patients. Sharing of utilities were reported by 23(45.1%) of cases and 23(22.5%) of controls. Among cases 15(16.0%) were using soap after toilet while most 79(84.0%) of controls were using soap after toilet. Majority 45(88.2%) of cases and 43(42.2%) of controls were hand washing some times after toilet. Most 40(78.4%) of the cases were using toilet while 18(17.6%) of the controls were using toilet (Table 5).

Table 5: Risk Factors among visiting diarrheal disease patients in Addis Raye Camp, Afar 2015

Variables	Cases (N=51)%		Controls (N=102)%		COR
	Number	Percent	Number	Percent	
Attending Patient					
Yes	32	62.7	31	30.4	3.8(1.90-7.82)*
No	19	37.3	71	69.6	1:00
Sharing Utilities					
Yes	23	45.1	23	22.5	2.8(1.37-5.80)*
No	28	54.9	79	77.5	1:00
Using Soap after toilet					
Yes	15	16.0	79	84.0	1:00
No	36	61.0	23	39.0	8.2(3.85-17.63)*

Hand Washing after toilet					
Some times	45	88.2	43	42.2	10.2(4.02-26.29)*
Always	6	11.8	59	57.8	1:00
Latrine utilization					
Yes	40	78.4	18	17.6	16.9(7.33-39.28)*
No	11	21.6	84	82.4	1:00

* Variables which shown significant association during the multivariate analysis

The final model was constructed using backward binary logistic regression method. All variables which had shown statistically significant association during chi-square analysis such as attending patient, sharing utilities, washing hands after toilet,using soap after toilet and latrine utilization were included. However, on multivariate backward binary logistic regression analysis, out of these five independent variables only attending patient, washing hands after toilet, and using soap after toilet and latrine utilization were found to be independent predictors for the occurrence of diarrhea. Compared to those who were not attending patient; those who attend were more likely to develop Diarrhea (AOR= 7.5; 95%CI: 2.43, 23.35). Those who were not used soap after toilets were more likely to develop diarrhea compared to those who were used soap after toilet (AOR= 5.2; 95%CI: 1.66, 16.34). Compared to those who wash their hands always after toilet; those who washed their hands some times were more likely to develop diarrhea (AOR=7.2; 95%CI: 1.95, 26.64) and compared to those who were not using toilet; those who were using toilet were more likely to develop diarrhea (AOR=19.6; 95%CI: 6.47, 59.45) .

Table 6: Independent predictors of diarrhea, in Addis Raye Camp, Afar, 2015

Variables	Cases (N=51)%		Controls (N=102)%		COR	AOR
	No	%	No	%		
Attending Patient						
Yes	32	62.7	31	30.4	3.8(1.90-7.82)*	7.5(2.43-23.35)*
No	19	37.3	71	69.6	1:00	1:00
Using Soap after toilet						
Yes	15	16.0	79	84.0	1:00	1:00
No	36	61.0	23	39.0	8.2(3.85-17.63)	5.2(1.66-16.34)*
Hand Washing after toilet						
Some times	45	88.2	43	42.2	10.2(4.02-26.29)*	7.2(1.95-26.64)*
Always	6	11.8	59	57.8	1:00	1:00
Latrine utilization						
Yes	40	78.4	18	17.6	16.9(7.33-39.28)*	19.6(6.47-59.45)*
No	11	21.6	84	82.4	1:00	1:00

*Variables which shown significant association during the multivariate analysis

Case management, Action taken (intervention):

After reviewing treatment protocol with Camp Clinicians medications were availed for case management and Diarrheal Surveillance was started at the camp clinic. After communicating with the camp management few hand washing facilities were availed at the dining area and health education on hygiene and sanitation was give by Army health professionals.

After observing the current status of the outbreak the following interventions are conducted.

⇒ Established a RRT committee from camp staffs and MOH Outbreak team (the action plan is attached on the annex)

⇒ The camp staffs started to avail washing facilities to trainees but yet not enough

⇒ Wetried to avail very necessary drugs and supplies from Mohamed Akle hospital and Worer health center and other available source to rescu critical patients.

⇒ Started diarrheal surveillance at the clinic

⇒ All food handlers are screened for Diarrhea

⇒ Other Activities on action plans were underway

⇒ Preparing of immediate need and summated to FMOH

⇒ FMOH gave prompt respond and supplied all requested materials

⇒ Health education was done with health professionals who came from MOND Planed for seven days.

⇒ The team conducted a series of meeting with Mohamed Akle hospital and doctors, Alshaiday managing director and management, and with MOND heath team

⇒ Water treatment regularly was highly recomanded

5. Discussion

It was found that a total of 1814 reported cases of diarrheal report from May 14 to Jul 2, 2015.

Of the total cases 97.2% of cases were males while the rest 2.8% were females. The over all crude attack rate was 18.1% while sex specific attack rate was 23% and 18% for males‘ and females respectively. This can be due to high male tranee recruited for training. Among the cases, younger age groups were more affected during the outbreak with attack rate of 66.0% and 31.4% for the age groups 15-25 and 26-36 respectively. The laboratory results identified bacterial and numerous parasitic pathogens present in the stool samples from individuals that had reported diarrheal illness. The laboratory result for parasitological investigations, stool sample for bacterial culture and water sample for microbial analysis confirmed that the presence of parasites (dominantly Ameba (36.9 %) and Giardia (25.6%), bacillary dysentery caused by shigella Flexinari serogroup B (7.4%) and high Bacterial coli forms and E coli were identified respectively.

Independent Predictors of diarrhea were found to be attending patient, not washing hands after toilet; not using soap after toilet and latrine utilization. Compared to those who were not attending patient; those who attend were 7.5 times more likely to develop Diarrhea. As we described on the descriptive finding the analytical finding also support the source and mode of transmutation which is close contact with patents (attending patient and sharing utilities).This can be due to Shigellosis epidemics usually occur in areas with crowding and poor sanitary conditions, where person-to-person transmission or contamination of food or water by the organism is common (48, 49).

Those who were not used soap after toilets were 5.2 times more likely to develop diarrhea compared to those who were used soap after toilet. This study in line with a study done in Mexico City reported that 9% of the population was infected with *E histolytica* in the 5-year to 10-year period preceding the study. Various factors, such as poor education, poverty, overcrowding, contaminated water supply, and unsanitary conditions, contributed to fecal-oral transmission (33, 34). Compared to those who wash their hands always after toilet; those who washed their hands some times were 7.2 times more likely to develop diarrhea

We also found that patients who were using a bad or unclean latrine were 19.6 times more at risk to have the disease than those do not use the latrines on the center regularly; that means those who used open defecation were protective not to attain the disease. This controversial phenomenon happened due to ill construction, Shortage of water supply and inappropriate handling aggravated by background of the trainee and shortage of cleaning materials. Similar study was conducted among children aged less than five years in Botswana the result reveals, lack of hand washing after using toilet or latrine was more likely to be reported by cases (51).

During this outbreak, we also found that cases who did not report washing their own hands after using the toilet or latrine were 10.2 times more likely to develop diarrhea than control who did report washing their own hands. This can be by the fact that hand washing interventions plus provision of soap can reduce the incidence of diarrhea by up to 53% in developing world settings (52.53.54).

This study describes an outbreak of diarrheal illness among Addis Raey training center trainees in Amibara Woreda, Afar region. We identified an increasing trend of diarrheal illness patients throughout the camp and an association with environmental sanitation and personal hygiene. The camp was extremely over crowded beyond its capacity to trains more than10,000 (which was initially intended to serve for 2500) trainee with only one central kitchen, three cafeterias and one common ground water source with extended storage tankers. There were 26 blocks used to reside the whole trainees with ill constructed toilets which have not enough water supply to flash fecal materials after usage; as a result, most of the trainee flee from use of them. They were dirty with full of flies hovering over them. There were no enough detergents and soaps to wash hands and closes, so that Personal hygiene and environmental sanitation was in poor condition: combine with the background of the trainee which comes from the low socioeconomic status of the society, most of them from the street of big cities. This all fertile condition was epidemiologically hard evidence to raise the outbreak.

6. **Conclusion and Recommendation**

Conclusion

In conclusion, independent predictors of diarrhea were found to be attending patient, not washing hands after toilet; not using soap after toilet and latrine utilization. There was a mixed diarrheal disease outbreak in which Amebasis and Gardiasis accounts for most of the cases, no fatality was identified secondary to the current diarrheal outbreak. The source agent of the outbreak was confirmed by lab as depicts on the above result section. Poor environmental sanitation personal hygiene, overcrowding on food preparation, food and water handling, unhygienic utilization of latrine and un appropriate kitchen sewerage system an appropriate washing facility and having meal without washing hand contribute to the occurrence and spread of the outbreak. Despite the fact that, using latrine was protective for such type of disease, it was inversely play a role of potential source and mode of disease transition. The impactwas exacerbated by lack of adequate medical care.

Recommendations

⇒ Deployment of additional health professionals and strengthen surveillance system

⇒ Urgent construction of sanitary facilities specifically hand washing facilities, latrines should be expanded

⇒ The drainage system of the camp should be constructed

⇒ Environmental cleaning campaign and regular health education services should be provided by the camp

⇒ An environmental health professional should be regularly assigned to control the hygiene and sanitation status of the camp.

⇒ Water treatment with Chlorine

Other long term recommendation

⇒ Construction of a health center should be planed

⇒ Registers and all needed materials and support should be provided to start a surveillance system at Camp Clinic

⇒ Preparedness should be started for other seasonal illness such as Malaria

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1.2 Influenza like Illness outbreak in rural and prison settings of south Gondar, northwest Ethiopia, February 2016.

Abstract

Background: Influenza is a major cause of sickness and death around the world and is one of the most important infectious diseases confronted the world today. It is a highly infectious viral disease which can occur as a pandemic, epidemic, outbreak and in form of sporadic cases. A report was received from the local health authority that there was influenza like illness in rural and a prison setting in South Gonder zone. A team was formed and sent to the two settings to conduct outbreak investigation for the illness reported for consequent public health interventions

Methods: Unmatched case control study design supported by descriptive cross-sectional study was employed. A structured questionnaire that addresses possible exposures for the suspected influenza was used. Epi Info was used to calculate frequencies, odds ratios and SPSS version 21 to perform logistic regression to identify risk factors for Influenza likeIllness. A case was defined as a person residing in South Gondar prisonsetting and in near by rural areas that developed signs and symptoms of flue. Throat swab were collected and tested for viral pathogens. Data were entered and analyzed using Epi-info version 7.1.4.0

Results: Outof 27 throat swabs tested at National virology laboratory for respiratory viruses 41%(11/27) of the suspected cases turned positive for Influenza A (H1N1) pdm09.A total of 48 cases and 96 controls were enlisted of which 15.3% were females and 84.7% were males with attack rate of 5.6%. The median age was 23 year old for cases and 25 years for controls.Having close contact history by shaking hands with similar complaint(s) (AOR=14.6; 95%CI: 5.69, 37.71) and attending mass gathering (AOR=2.8: 95%CI: 1.18, 6.81) were more likely to develop influenza (H1N1) pdm09 than those who did not shaking hands and attend mass gatherings.

Conclusions: Factors independently associated with the occurrence of flu outbreak were shaking hands with similar complaint(s) and attending mass gathering. Regarding the nature of the population, Isolation of cases and using standard preventive measures play crucial role to end up the outbreak in short days.

Key Words: influenza type A (H1N1) pdm09, South Gondar, Ethiopia.

1. Introduction

Influenza is an acute viral infection that spreads easily from person to person. Seasonal influenza epidemics occur yearly during winter months in temperate regions of the world. In some tropical countries, influenza viruses circulate throughout the year, with one or two peaks during rainy seasons. It is a major cause of sickness and death around the world and is one of the most important infectious diseases confronting the world today. It can occur as a pandemic, epidemic, outbreak and in form of sporadic cases (1). Most people who contract seasonal influenza recover without medical attention, but the infection can result in complications and death, particularly among older people, infants and people with underlying chronic medical conditions. Worldwide, seasonal influenza is responsible for an estimated 3.5 million cases of severe illness and 250 000–500 000 deaths each year (2).

Seasonal influenza can cause serious public-health and economic problems. In developed countries, epidemics can cause significant worker absenteeism and loss of productivity. Health facilities can become overburdened at periods of peak illness. Little is known about the effects of influenza epidemics in developing countries owing to a lack of data comparing with developed countries (3).There are three types of influenza virus: A, B and C. Influenza type C usually causes either a mild respiratory illness or no symptoms at all; therefore, public-health efforts to control seasonal influenza each year are focused on types A and B. Type A viruses are divided into types based on differences in two protein–sugar complexes that stud the outer surface of the virus: haemagglutinin (H) and neuraminidase (1, 4). There are 16 known H subtypes and nine known N subtypes. Many different combinations of H and N proteins are possible but only two subtypes (i.e. H1N1 and H3N2) are currently circulating in the human population. Other subtypes are found in other animal species, most commonly in aquatic birds.Influenza B primarily infects human beings and, in contrast with influenza A, does not have subtypes, although it can cause substantial influenza epidemics of season outbreaks and severe disease in individuals, the magnitude of impact is usually less severe than that caused by influenza A (1, 4).

Overview of influenza A (H1N1) 2009

The emergence of a new H1N1 virus in early 2009 was the cause of the first influenza pandemic of the 21st century. Modeling estimates of the global burden of pandemic influenza A (H1N1) 2009 disease range from several tens of millions of cases to 200 million(5). By August 2010, when the transition from pandemic to post-pandemic period was announced, about 18 500 laboratory-confirmed deaths from pandemic influenza A (H1N1) 2009 had been recorded (*6*). The true extent of deaths attributable to the pandemic virus could, however, be significantly higher, since many people died without being tested. Uncomplicated pandemic (H1N1) 2009 is a self-limiting disease with symptoms similar to those of seasonal influenza: fever, cough, headache, body aches, sore throat and runny nose; nausea, vomiting and diarrhea are more commonly reported than with seasonal influenza. Most patients with uncomplicated disease recover within a week without treatment. Spread of the virus seems to be similar to that of seasonal disease: via droplets or aerosol released when speaking, sneezing or coughing (*7*).

Beyond the preponderance of self-limiting illness, pandemic (H1N1) 2009 produced a spectrum of disease that included severe or fatal complications. The main cause of severe illness was viral pneumonia associated with severe lung damage, which resulted in respiratory failure and sometimes circulatory collapse and kidney failure (*7*). A striking difference between pandemic (H1N1) 2009 and seasonal influenza was that most of the burden of disease in the pandemic occurred in younger age groups. One possible reason for this anomalous age distribution is the similarity between the pandemic (H1N1) 2009 virus and 1918–19-like H1N1 influenza viruses. It is possible that older adults had greater protection against the 2009 virus because they had been exposed to 1918–19-like H1N1 influenza viruses in the first 60 years or so of the 20th century (8).

The H1N1 virus, commonly known as the swine flu virus has begun to cause concern in Ethiopia this year. Since Feb, 2016, swine flu infections have been reported, along with deaths. Recently, Ethiopia fears an outbreak of the deadly H1N1 virus after detecting 4 suspected deaths and 32 confirmed cases of the flu in the Capital Addis Ababa. The Ethiopian health ministry on Feb4, 2016 confirmed that it has detected a new case of H1N1 (or swine Flu) virus in the capital Addis Ababa and its surrounding areas with a confirmed death of four so far. Ethiopia‘s Public Health Institute Deputy Director also confirmed cases of the deadly virus in Ethiopia during a press conference he conducted on Feb, 4-2016 morning in Addis Ababa. He also said (added) the deceased were TB and diabetes patients whose resistance has been weakened.

After nine days of the press conference given by the health authority, there was another outbreak with a total of 114 case and 2 deaths in Amhara regional state, south Gondar Zone, Farta woreda, Megendi Kebele and Debretabor prison center, which is the subject for this outbreak investigation. The Amhara regional health bureau request technical assistance for farther investigation. Based on the regional request, team was deployed from Ethiopian Public Health institute (EPHI) on Feb 15-2016 to the affected district having the objective to investigate and identify the causative agent, source and root of transmission and finally to come up with prevention and control measures.

Modes of transmission

Influenza virus is transmitted among humans in three main ways: by direct contact with infected individuals, through contaminated objects (such as hairbrushes or towels) and by inhaling virus-laden aerosols. The contribution of each mode of transmission to overall spread of influenza is not known (9). The production of aerosols that contain virus particles is necessary for the respiratory transmission. Speaking, singing and even normal breathing can produce an adequate amount of aerosols, while sneezing and coughing lead to more forceful expulsion.

Aerosolized particles produced by the aforementioned activities have different sizes. The largest droplets fall to the ground within a few meters and will infect only those in the immediate vicinity. Distance that other droplets cross is often determined by their size. The droplets that are between 1 and 4 microns in diameter are known as ―droplet nuclei". These remain suspended in the air for long periods of time and not only they have the ability to travel long distances, but they can also reach the lower parts of the respiratory tract. Inhalation of droplets and droplet nuclei situates influenza virus in the upper respiratory tract, where it has the opportunity to initiate infection.

Nasal secretions that contain virus particles are responsible for transmission by direct contact or via contaminated objects. An infected individual most often touches the nose or conjunctiva, thus placing virus on the hand. Any ensuing contact (for example, shaking hands) can transfer the virus to another person, who will then infect themselves by simply touching their eyes or nose. In addition, the virus transmission also happens upon touching other objects with contaminated hands. Researchers have shown that up to 60% of objects from homes and day care facilities were shown to harbor influenza viral RNA. Infectious influenza virus may also persist on paper bills for several weeks, which is another possible way of spread (10).

Symptoms

Common signs and symptoms of the flu include (11): Fever over 100 F (38 C)

- Aching muscles, especially in your back, arms and legs
- Chills and sweats
- Headache
- Dry, persistent cough
- Fatigue and weakness
- Nasal congestion
- Sore throat

Risk factors

Factors that may increase your risk of developing influenza or its complications include (11):

- Age. Seasonal influenza tends to target young children and older adults.
- Living conditions. People who live in facilities along with many other residents, such as nursing homes or military barracks, are more likely to develop influenza.
- Weakened immune system**.** Cancer treatments, anti-rejection drugs, corticosteroids and HIV/AIDS can weaken your immune system. This can make it easier for you to catch influenza and may also increase your risk of developing complications.
- Chronic illnesses. Chronic conditions, such as asthma, diabetes or heart problems, may increase your risk of influenza complications.
- Pregnancy**.** Pregnant women are more likely to develop influenza complications, particularly in the second and third trimesters.

- Obesity**.** People with a BMI of 40 or more have an increased risk of complications from flu.

2. Objective

2.1, General objective

- To investigate Influenza like Illness outbreak in rural and prison settings of south Gondar, northwest Ethiopia, February, 2016

2.2 Specific Objectives

- To confirm the existence of the outbreak
- To identify the causative agent and mode of transmit ion of the outbreak
- To describe the outbreak in respect of time, place and person
- To control and prevent further spread of the diseases after investigating the etiological factor

3. Methods and Materials

3.1 Study area and Period

Four Villages about 1.5kms distance from Megendi primary school namely, Ketemalay ,Gonderber ,Asayewguaro and Quata villages to the east,west,north and south respectively which encircle Megendi primary School are located in Amhara regional State, South Gondar Zone,Ferta Woreda (District) Megendi Kebele 46 KM from Debretabor Town and around 709Km from the capital city. The affected villages have a total population of 892 of which464 (52%) males and 428(48%) females. The other area of the outbreak is Debretabor prison center which is located on North of the town at 02 kebele, weybale residence area with a total of 1288 prisoners of which 1270 (99%) males and 18 (1%) females. (See map).

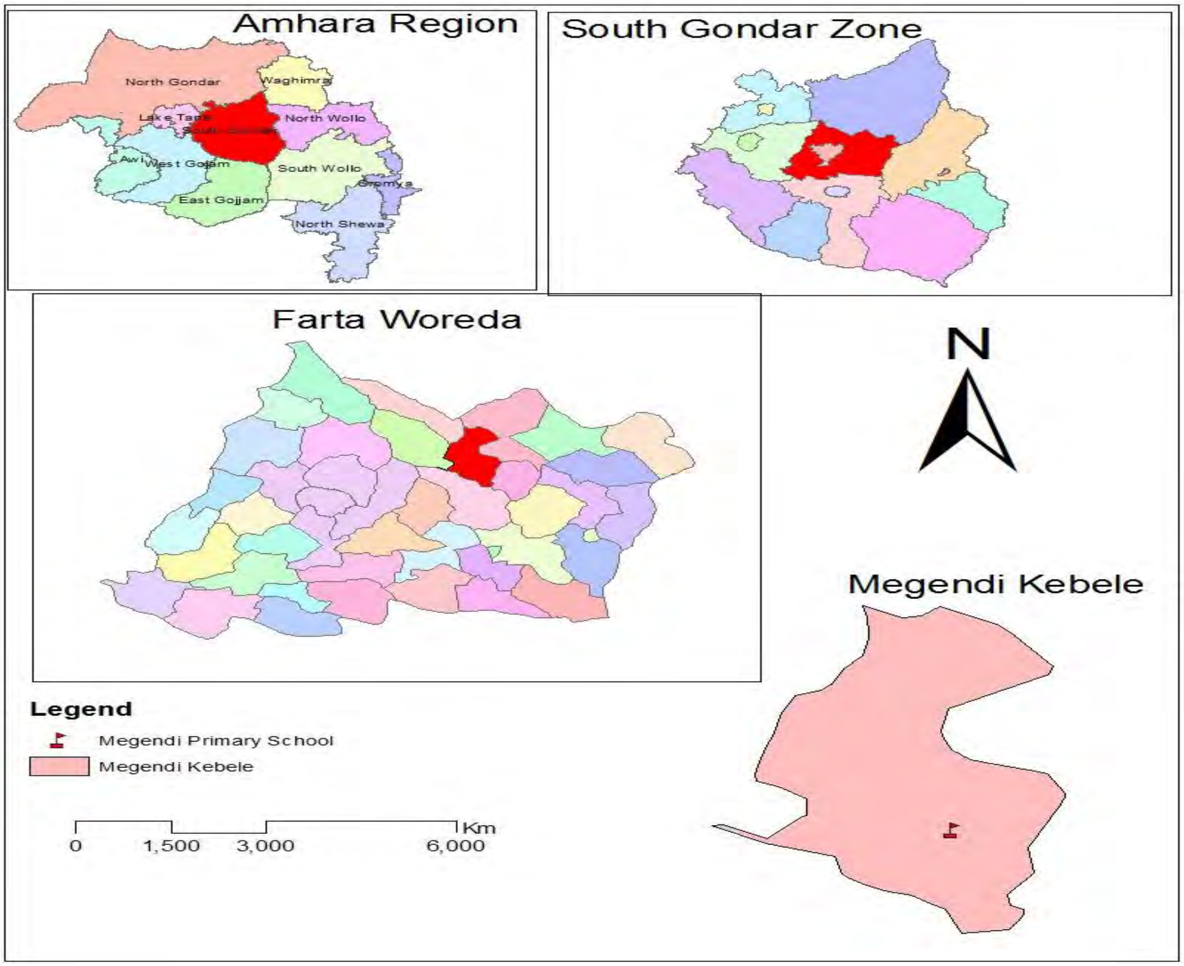

Figure 6: Area map of South Gondar, Northwest Ethiopia, February, 2016

3.2 Study design

We conducted unmatched case-control study to investigate the outbreak

3.3 Study population

- **Cases:** any person residing in the prison who had Fever over 100 F (38 C), Aching muscles, especially in your back, arms and legs, Chills and sweats, Headache, Dry, persistent cough, Fatigue and weakness, Nasal congestion, Sore throat (48 cases)

- **Controls:** were all people without diarrhea symptoms during the study (96 controls)

3.4 Inclusion and Exclusion criteria

Inclusion Criteria

- **Cases:** Of 114cases sent by line list only 48 influenza cases selected randomly that had symptoms of influenza (Fever over 100 F (38 C), Aching muscles, especially in your back, arms and legs, Chills and sweats, Headache, Dry, persistent cough, Fatigue and weakness, Nasal congestion, Sore throat) from 13-24 February 2016 who agreed to participate in the study were included.

- **Controls:** Any resident of prisonand the mention villages during the study period who was a neighbor to a case and who did not develop signs and symptoms of diarrhea and agreed to participate were included.

Exclusion criteria

- **Cases:** No refusal to participate in the study was encountered.
- **Controls:** Those who refused to participate were excluded as well as when more than one eligible in the family the elder were excluded.

3.5 Sampling

Unmatched Case control study design was employed. Structured questionnaire was developed. Case patients and controls were identified and interviewed. Cases were defined as any person with an acute respiratory illness, with measured temperature of $\geq 38^0$ C and Cough with onset within the last ten days. Controls were defined as any person having the same characteristics with case patients except history of the above clinical pictures. Simple randomsampling method was employed to recruit cases and controls. Both cases and controls were identified at health center in the prison health center and in the community (villages). We recruited all active cases at isolated treatment center and trace back previously treated cases at community level. Sample size was calculated using Stat calc function entered and analyzed by Epi-info version 7.1.4.0 using the confidence level of 95%, power of 80%, and assuming a 14 % prevalence of a previous contact with someone with influenza like illness(12) and an OR 3.2, with 1:2 cases to controls a total of 48 cases and 96 controls were required. Among 114 sent through line list only 48 cases were included in the study using simple random sampling method was conducted without replacement and if more than one eligible in the camp one was taken by lottery method as control with nearest dormitory to the case was given priority until the sample size was reached.

3.6 Data collection method

A structured interviewer-administered questionnaire was used to collect data on factors associated with contracting diarrhea, attending patient, not using soap after toilets, and washing hands some times after toilet and using toilet, sharing utilities and latrine utilization.

Descriptive: Medical records were assessed and reviewed. Physicians and Nurses working at Debretabor Hospital and Debretabor health center were interviewed. Direct patient interview was conducted with some of the patients and the index case (Alex Getasew) in the prison. Active case search was performed house to house and discussion with the village residence and the family of died siblings was conducted. Suspected ILI cases were identified using line list from 13/02/2016-24/02/2016. As part of investigation the population of the village was collected from the village administrators. Data were entered in Excel and descriptive analysis was done by time, person and place. Age and specific Attack Rate (AR), Case fatality rate (CFR), percentage and ratios were calculated. Data was clearly presented by graphs and tables.

Analytical: Unmatched Case control study design was employed. Structured questionnaire was developed. Case patients and controls were identified and interviewed. Cases were defined as any person with an acute respiratory illness, with measured temperature of $\geq 38^0$ C and Cough with onset within the last ten days. Controls were defined as any person having the same characteristics with case patients except history of the above clinical pictures. Purposivesampling method was employed to recruit cases and controls. Both cases and controls were identified at health center in the prison center and in the community (villages). We recruited all active cases at isolated treatment center and trace back previously treated cases community level. Data were entered and analyzed by Epi-info version 7.1.4.0

Physical Examination: We also conducted physical examination for farther information in order to critically list all possible differential diagnosis. Complete demographic and personal information of the patients were obtained. Clinical manifestations and fever were also documented.

Laboratory: Throat swab specimens were collected from eligible patients. Specimens were stored and shipped to national influenza laboratory in viral transport media (VTM) at 2-8C^0, and tested by RT-PCR for influenza viruses.

Ethical Consideration: The Amhara regional health bureau request technical assistance for farther investigation. Based on the regional request, team was organized from Ethiopian public health institute (EPHI) and deployed on Feb 15-2016 to the affected district having the objective to investigate and identify the causative agent, source and root of transmission and finally to come up with prevention and control measures.

The purpose of the investigation was clearly explained for all respondents before clinical specimens and epidemiological data were collected. We told all respondents as the result of the study will be used only to prevent and control the outbreak. The specimen collected will not used for other purpose rather than investigating the causative agent for the outbreak. We also conduct briefings to the community how to prevent the spread of the disease and to reduce the panic which was a critical concern for the community at that time.

3.7 Data analysis and clearance

The data was collected, entered and edited using Epi-Info version7.1.4.0 software and checked for completeness and consistency. Descriptive statistics were used to determine the frequency of different variables. Bivariate and multivariate logistic regression analysis was applied. Results were displayed using tables and graphs and it was interpreted using Odd ratio, P value <0.05 and 95% confidence interval.

3.8 Ethical issues

To investigate and to contain the outbreak .FMOH give order to EPHI to assigned a team of investigators with different team compositions in coordination with one expert from FMOH, organized from Ethiopian public health institute (EPHI) and deployed on February 13, 2016 to the prison under close supervision of the health officials (FMOH and EPHI). The purpose of the investigation was clearly explained for all respondents before clinical specimens and epidemiological data were collected. We told all respondents as the result of the study will be used only to prevent and control the outbreak. The specimen collected will not used for other purpose rather than investigating the causative agent for the outbreak.

4. Results

Descriptive:

From Feb13-Feb 24, 2016 we identified a total of 114 ILI cases and 2 deaths in the affected areas described above in the study area. Of the cases 72(100%) were male from Debretabor Prison Center with attack rate 5.6% while the 42 cases were in Megendi Kebele Villages (namely Ketemalay, Asayewguro, Gonderber and Kata) with attack rate 5%,. Of the 42 cases 22(52.4 %) females and 20(47.6%) were males. Case fatality rate in Megeandi villages was 4.8% and both were female siblings. When we observed the age groups affected during the outbreak (Table 1) age groups 15-24 and 25-34 were the most affected 43(37.72%) and 22(19.30%) respectively .

The manifestation of the sign and symptom during the outbreak also characterized by Cough, high grade fever and headache 89(78.07%), 59(51.75%) and 29(25.43%) respectively (Table 2).

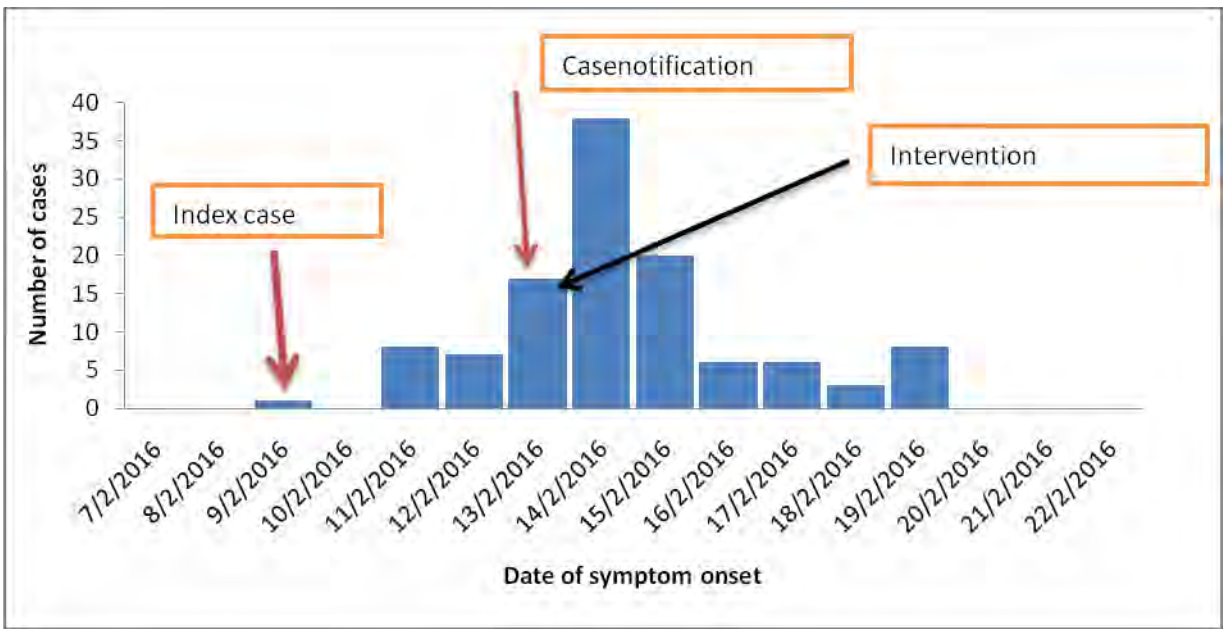

Figure 7: Epidemic curve of common source Influenza like Illness outbreak with continuous exposure, South Gonder Zone, Amhara regional state, Ethiopia, Feb. 2016.

Table 7: Influenza like Illness cases distribution by age group and sex, Debretabor Town Prison Center and Some Megendi Kebele Villages of Farta Woreda, South Gonder Zone, Amhara regional state, Ethiopia, Feb.2016

Age groups	Male Cases	Female Cases	Total Cases	Percent
< 1	0	0	0	0%
1_4	1	2	3	2.6%
5_9	2	1	3	2.6%
10_14	5	3	8	7.0%
15_24	37	6	43	37.7%
25_34	10	3	13	11.4%
35_44	19	3	22	19.3%
45_54	10	2	12	10.5%
55_64	6	2	8	7.0%
> 65	2	0	2	1.8%
Total	92	22	114	100%

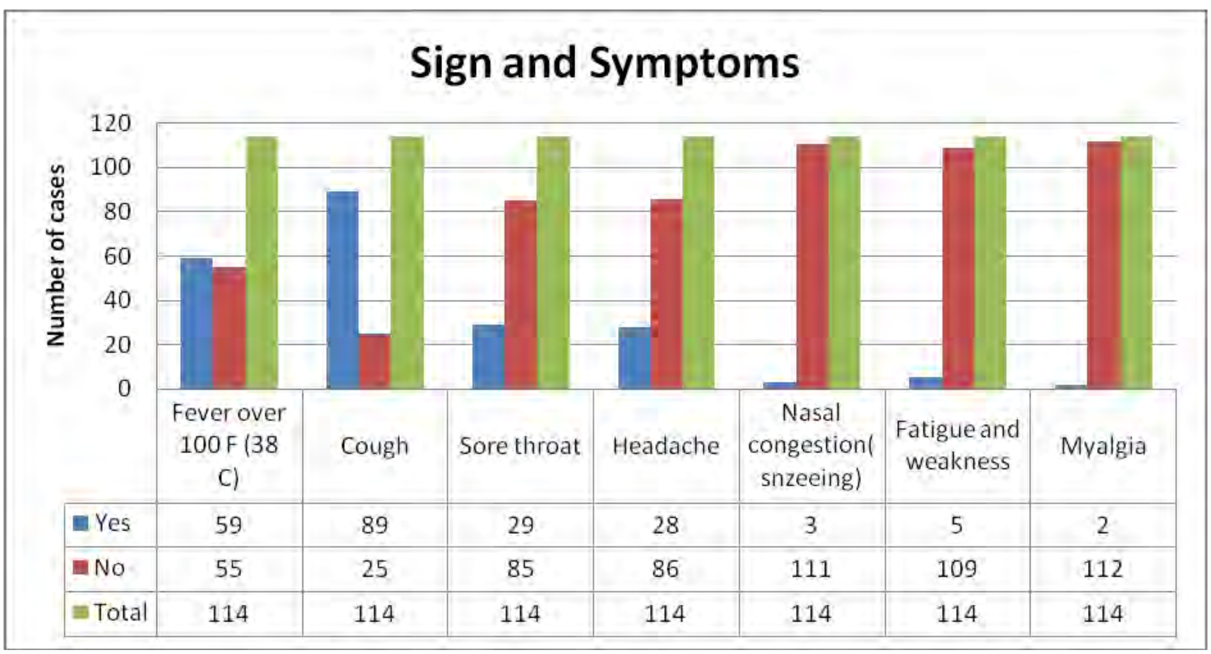

Figure 8: Influenza like Illness cases distribution by sign and symptoms during the outbreak, in rural and prison settings of south Gondar, northwest Ethiopia, February, 2016

Laboratory results:

We took a total of 27 throat swabs and were tested at NIC, virology laboratory for respiratory viruses. Of which sample PCR was done and 11(41%) of the suspect were turned positive Influenza A (H1N1) pdm09.

Table 8:Throat swab test result of suspected, Influenza like Illness among patients who were tested positive for influenza A(H1N1) pdm09 at EPHI, Addis Ababa, Ethiopia Feb, 2016.

ID	Sex	Age	Date Of Onset	Date of interview	Duration (Days)
3	M	17	13/2/2016	18/2/2016	5
4	M	42	16/2/2016	18/2/2016	2
7	M	22	17/2/2016	18/2/2016	1
8	M	26	16/2/2016	18/2/2016	2
12	M	26	16/2/2016	18/2/2016	2
13	M	17	16/2/2016	18/2/2016	2
16	M	14	13/2/2016	18/2/2016	5
19	M	20	16/2/2016	18/2/2016	2
24	F	13	14/2/2016	19/2/2016	5
26	M	10	14/2/2016	19/2/2016	5
27	F	20	17/2/2016	19/2/2016	1

Analytical:

A total of 48 cases and 96 controls were enlisted of which 22(15.3%) were females and 122(84.7%) were males having median age 23 years old for cases and 25 years for controls.

More than half 26(54.2%) of cases and 47(49.0%) of controls age groups were less than 25 years old. Among the study subjects 41(85.4%) and 81(84.4%) cases and controls were male respectively. Concerning occupational status 28(58.3%) of cases and 48(50.0%) of controls were farmers while 13(27.1%) of cases and 11(11.5%) of controls were students. Others were children‘s, merchant and no occupation constitute 7(14.6%) and 37(38.5%) were cases and controls respectively. Among the study subjects 31(64.6%) and 50(52.1%) of cases and controls were married respectively. Occupation was significantly associated with the occurrence of influenza with PV< 0.05 while the rest were not associated with the outbreak (Table 8).

Table 9 : Socio-demographic characteristics of Influenza like Ilness in rural and prison settings of South Gondar, northwest Ethiopia, February- 2016.

Variables	Cases (N=51)%		Controls (N=102)%		COR
	Number	Percent	Number	Percent	
Age in years					
<25 years	26	54.2	47	49.0	1:00
>= 25 years	22	45.8	49	51.0	0.8(0.40-1-62)
Sex					
Female	7	14.6	15	15.6	0.9(0.34-2.43)
Male	41	85.4	81	84.4	1.00
Occupation					
Farmer	28	58.3	48	50.0	3.1(1.21-7.83)*
Student	13	27.1	11	11.5	6.2(2.00-19.5)*
Others	7	14.6	37	38.5	1:00
Marital Status					
Married	31	64.6	50	52.1	0.5(0.29-1..21)
Single	17	35.4	46	47.9	1:00

It was found that 23(46.0%) of cases and 27(54.0%) of controls reported of attending mass gathering. Forty one (58.6%) and 29(41.4%) of cases had history of shaking hands with patient respectively. Concerning Living in the same room 10(62.5%) of cases and 6(37.5%) of controls were replied they live in the same room. On the other hand sharing kitchen was reported by 37(77.1%) of cases and 74(77.1%) of controls). All the following variables showed significant association with influenza out break with PV< 0.05 except sharing kitchen (Table 6).

Table 10: Risk Factors among visiting Influenza like Ilness patients in rural and prison settings of South Gondar, northwest Ethiopia, February, 2016.

Variables	Cases (N=47)%	Controls (N=97)%	COR (95%CI)
Attend mass gathering			
Yes	23(46.0)	27(54.0)	2.4(1.14-4.83)*
No	25(26.6)	69(73.4)	1:00
Shaking Hands			
Yes	41(58.6)	29(41.4)	13.5(5.43-33.69)*
No	7(9.5)	67(90.5)	1.00
Living in the same room			
Yes			
No	10(62.5)	6(37.5)	3.9(1.33-11.63)*
	38(29.7)	90(70.3)	1:00
Sharing Kitchen			
Yes	37(77.1)	74(77.1)	1:0(0.43-2.28)
No	11(22.9)	22(22.9)	1:00

The final model was constructed using backward binary logistic regression method. All variables which had shown statistically significant association during chi-square analysis such as attending mass gathering, shaking hands and living in the same room with cases were included. However, on multivariate backward logistic regression analysis, out of these three independent variables only attending mass gathering and shaking hands were found to be independent predictors for the occurrence of influenza A (H1N1) pdm09.

Compared to who were not attending mass gathering; those who attend mass gathering were more likely to develop influenza (H1N1) pdm09 (AOR= 2.8; 95%CI: 1.18, 6.81). Prisoners who shake hands of cases were more likely to develop influenza (H1N1) compared to those who did not shake hands of cases (AOR= 14.6; 95%CI: 5.69, 37.71)(Table 10).

Table 11: Independent predictors of Influenza like Illness outbreak in rural and prison settings of South Gondar, northwest Ethiopia, and February, 2016.

Variables	Cases (N=47)%	Controls (N=97)%	COR (95%CI)	AOR (95%CI)
Attend mass gathering				
Yes	23(46.0)	27(54.0)	2.4(1.14-4.83)*	2.8(1.18-6.81)*
No	25(26.6)	69(73.4)	1:00	1:00
Shaking Hands				
Yes	41(58.6)	29(41.4)	13.5(5.43-33.69)*	14.6(5.69-37.71)*
No	7(9.5)	67(90.5)	1.00	1.00
Living in the same room				
Yes	10(62.5)	6(37.5)	3.9(1.33-11.63)*	2.6(0.60-11.78)
No	38(29.7)	90(70.3)	1:00	1:00

*** Variables which shown significant association during the multivariate analysis**

Action taken (intervention):

On Feb 14, 2016, after the zonal health office received a rumor of this event and went to the Megendi kebele for verification. Immediately, the zonal health department team comes across 17 cases with symptoms of high grade fever, cough, head ache, myalgia, vomiting, and etc. The zonal health office decide to transport the cases for better follow up and diagnoses to Deberetabor hospital for admission in isolation tentative treatment center unit and the same isolation center at the prison center and Megendi Kebele for investigation and prevention methods. Then additional team from RHB & other partners joined the zone and district team and started the response activities to the situation. Response has been continued in coordinated way forming two sub-teams, such as; case management and investigation (surveillance) and later mass communication response team was added to fight the over exaggerated public panic.

The case management has been carried out considering respiratory anthrax and meningitis as the suspected cause of illness and death. However, respiratory anthrax and meningitis was ruled out and after clinical investigation was done, Influenza like Illness was more relevant to suspected as cause of the outbreak. The outbreak committee which is composed of multispectral disciplines collectively decides all patients keep isolated until the suspected causative agent is confirmed by laboratory. This decision was crucial with dual advantages to end with a short time of epidemic duration of the outbreak(less than 11 days) and to minimize fear of the risk of death and prevent spread the flu expansion to the total population of the area. The EPHI investigating team was an active member of outbreak committee conducted a series of daily meetings with valuable ideas to contain the outbreak with in 7 of epidemic days.

To summarize the Control and prevention measures taken:

- The RHB and the zones carried out timely response after the occurrence of the event. Debretabor University engaged in Farta woreda response activities, especially in the case management.
- Throat swabs were taken from patients for confirmation of the outbreak
- Isolation of cases in absolute isolation center until the source of the agent is confirmed by laboratory
- Managing of cases with supportive treatment and administering antibiotics
- leaflets prepared for community awareness creation activities
- Technical guidance to strengthen the coordination mechanism (to involve sectors other than health like education, police and communication in the sub- teams)
- Mobilizing Clinical management, investigation and social mobilization teams including WHO to woredas and zones for technical support in responding the outbreaks
- Epidemiological investigation continued including a case control study
- Setting infection prevention materials on scene (such as distribution of different type of masks to the patient and care providers ,Implementation of strike hand washing procedures and facilities)
- Media briefing at different levels to fight the over exaggerated public panic due to the death and other new for political consumption distributed by public media, and to teach the preventive mechanism for the flue, this was done by the mass communication committee which was one section of the outbreak committee.

5. Discussion

We identified a total of 114 ILI cases and 2 deaths in the affected areas described above. Of the total cases 100% were male from Debretabor Prison Center with attack rate of 5.6% while the 42 cases were in Megendi Kebele Villages (namely Ketemalay, Asayewguro, Gonderber and Kata) with attack rate of 5%, Of the 42 cases 52.4 % females and 47.6% were males. Case fatality rate in Megeandi villages was 4.8% and both were female siblings. When we observed the age groups affected during the outbreak age groups 15-24 and 25-34 were the most affected 37.7% and 19.3% respectively for Debretabor and Megendi. The manifestation of the sign and symptom during the outbreak also characterized by Cough, high grade fever and headache 78.1%, 51.8% and 25.4% respectively.

The Attack rate at Megendi kebele primary school nearby Villages and prison center is 4.6% and 5.5% respectively while attack rate at Ketemalay is 4.8%. Morbidity rate is higher at the prison because relatively over crowded population which does not much with the available resource to maintain proper environmental and personal hygiene. Out of 27 throat swabs were tested at NIC, virology laboratory for respiratory viruses. Of which sample PCR was done and 41% of the suspect were turned positive Influenza A (H1N1) pdm09. Of 37 countries in which 10 or more sentinel specimens were tested, 21 had positivity rates higher than 30%. Of the influenza-virus-positive specimens, 65% contained type-A viruses, with A(H1N1)pdm09 viruses accounting for 90% of those sub typed.

On the Megendi Kebele scenario, before the occurrence of two deaths on Feb 10, 2016 there was a gathering of people in an Orthodox Christian baptism ceremony of a baby in which the deceased, cases and non cases participated. Evidences from the line list and the discussion we made, there were some sick individuals on Feb 9, 2016 on the eve of the baptism. This indicates us the probability of epidemiological linkage and this was supported with the result of bivariate analysis.

Having close contact history by shaking hands with similar complaint(s) were 14.6 times more likely to develop influenza and also attending mass gathering was 2.8 times more likely to develop influenza. This can be by the fact that cross contamination plays a great role in infectious diseases.

Globally, increasing levels of influenza activity continued to be reported in the temperate zones of the northern hemisphere with influenza A (H1N1) pdm09 as the most detected virus.Europe updated on 19 February 2016 (Joint ECDC-WHO Influenza weekly update). Influenza A (H1N1) pdm09 has been the predominant virus detected since the start of the season, accounting for 90% of sentinel surveillance detections of influenza-like illness (ILI) and acute respiratory infection (ARI) in the WHO European Region. For week 06/2016, 44% of the specimens from sentinel sources tested positive for influenza virus. For week 06/2016, nine of 12 countries reporting data on severe acute respiratory infection (SARI) reported increased numbers of cases. These increases were associated with a predominance of influenza A(H1N1)pdm09 in tested SARI cases, mainly in the 15-64 year olds.

The other update of flue on the same season was, United States of America Updated on 19 February 2016 (Centre for Disease Control report).During week 06 2016, influenza activity increased in the United States. The most frequently identified type reported to be influenza A with influenza A (H1N1) pdm09 viruses predominating. Nationwide during week 06, the proportion of outpatient visits for influenza-like illness (ILI) was 3.1%, which is above the national baseline of 2.1%. The percent positive for laboratory confirmed influenza detections has increased, where 72.9% of positive influenza samples were of type A, of which 85.3% were influenza A (H1N1) pdm09.

Globally, influenza activity in the northern hemisphere continued to increase. High levels of influenza activity have been reported in some countries in Europe. In North America, northern Africa, central and western Asia, increasing activity predominantly of influenza A(H1N1)pdm09 virus was observed. In the temperate countries of northern Asia, activity was ongoing with various proportions of circulating seasonal influenza viruses. WHO has released the A (H1N1) pdm09 risk assessment (Global influenza Updated on 22 February 2016 WHO website).

6. Conclusion: The causative agent of the outbreak was confirmed by PCR test influenza A (H1N1) pmd09. The epidemiological and clinical investigations were excellent to suspect the causative agent and setting proper case definition. Regarding the nature of the population, Isolation of cases and using standards preventive measures play crucial role to end up the outbreak in short days. There were no medical records for deceased case to perform farther investigation even to take postpartum samples. Very crowded living rooms at the prison center and social gathering at the villages were a potential for epidemiological linkage with the outbreak. Having close contact history specially shaking hands with person with similar compliant was 14 times more at risk to have the disease than those do not have shaking hand history with person who have the disease (similar clinical picture). Hence, there is strong evidence that the disease transmitted from one person to another via direct hand shaking this is theoretically and experimentally supported by different literatures.

7. Recommendation

- Continuous health education how to prevent and minimize the spread of the disease should be given using different media to the people regularly.
- Sentinel ILI and SARI surveillance to gather quality data and monitor the subtype of the flu circulating in the areas.
- Regional Lab capacity building, regarding Flu detection should be a timely agenda at this time.

For long term recommendation; it is high time to plan and set policy for implementation of

- Vaccination; especially important for people at higher risk of serious influenza complications, and for people who live with or care for high risk individuals.

Reference

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Chapter Π: Surveillance Data Analysis

Meningococcal meningitis, surveillance data analysis, Ethiopia, 2010-2014

Abstract

Background: Meningitis is a disease that has had some form of impact on nearly every part of the world. In Ethiopia, meningitis outbreaks have been described in written reports since 1901.Since Ethiopia is located on the African meningitis belt, bordering with meningitis prone countries, it is reasonable to conduct such type of data analysis regularly, to asses overall trends of Meningococcal meningitis.

Methods: The study involved a retrospective collection of clinical and laboratory data from regional states. Secondary data was taken from Public Health Emergency Managment Meningococcal Meningitis data base. The study included all the suspected and confirmed meningococcal meningitis cases reported. We described the outbreak by time, place and person.

Result: A total of 7,799 cases reported as meningococcal meningitis (clinical& Lab confirmed) and 242 deaths were reported to PHEM. Of the total cases, 3564 (45.7%) were reported from SNNP. Thehighest incidence rate were recorded in Gambella with 67.8/100,000 population, while highest CFR (59.1%) was in Dire Dawa city administrative. The most affected age groups were infants less than 1 and children 1-4 years. Among those lab was done the Most cause of the meningitis was serotype type A and W135 contributing 48 % and 18.5 %, respectively.

Conclusions: The study showed that trends of meningitis case distribution were recorded the highest at the dry season of every year and progressively decreases at the wet or rainy season, showing meningitis onset and dry season have evidence of positive relationship .Infants and children experienced the highest risk, serotype A is still the most cause of meningitis. The analysis also shows us meningococcal meningitis occurring out of the meningitis belt. Therefore, this new phenomenon needs farther study collaborating with multi disciplines. Strengthen surveillance system and mass vaccination campaign also need special attention in order minimize morbidity and mortality.

Key Word: Meningococcal Meningitis; African Meningitis Belt; Ethiopia, 2010-2014.

1. Introduction

Meningitis is a disease that has had some form of impact on nearly every part of the world. Currently, the largest and most reoccurring outbreaks have been located in the semi-arid area of sub-Saharan Africa in an area known at the African meningitis belt, occurring in seasonal cycles between late November and late June, meningococcal epidemic season can vary in intensity due to location and the arrival of the rainy season. [1,] Within the AMB, epidemics of meningococcal disease often occur in cycles of eight to fifteen years.

Bacterial meningitis is an ongoing threat for the population of the African Meningitis Belt, a region characterized by the highest incidence rates worldwide. The determinants of the disease dynamics are still poorly understood; nevertheless, it is often advocated that climate and mineral dust have a large impact. Over the last decade, several studies have investigated this relationship at a large scale.

Bacterial meningitis (which we will refer to as meningitis) is a contagious disease transmitted from individual to individual by airborne droplets of respiratory or throat secretions. The highest burden of the disease occurs in the ―African Meningitis Belt", a region stretching from Senegal to Ethiopia with an estimated population of over 300 000 million people [2].

While Neisseria meningitis A is the main cause for large epidemics, serogroups W135, C and X are also responsible for localized outbreaks [3,4] as well as Streptococcus pneumoniae or *Haemophilus influenzae* type B. Increase in incidence is typically observed every dry season, with weekly incidence rates reaching up to 100 per 100 000 population in individual communities [5,6]. Even with appropriate treatment, the mortality rate fluctuates around 10 per cent, and 10–15% of survivors suffer long-term neurological sequelae [7]. Asymptomatic carriage is common, which most often does not lead to the consecutive development of the illness [8, 9].

Figure 9: The African meningitis belt. These sub-Saharan countries are at high epidemic risk for meningococcal meningitis

Source: Control of epidemic meningococcal disease, WHO practical guidelines, World Health Organization, 1998, 2nd edition, WHO/EMC/BAC/98.3

Despite a strong seasonality, the determinants of meningitis dynamics are still poorly understood. Various factors are likely involved in the underlying mechanism of the disease dynamic, including (re)introduction of consecutive strains [6, 10], vaccination impact, population dynamics and immunity [11–12]; climate and dust are often advocated as having a large impact. The epidemic season for meningitis coincides with the dry season and ends with the arrival of the African monsoon [2, 13, and 14]; early epidemic onset often correlates with high annual incidence [15].

Risk Factors

According to the WHO Meningitis Guideline**, Factors** that can increase risk of bacterial meningitis include:

Age: Infants are at higher risk for bacterial meningitis than people in other age groups. However, people of any age are at risk.

Community setting: Infectious diseases tend to spread more quickly where larger groups of people gather together. College freshmen living in residence halls and military personnel are at increased risk for meningococcal meningitis (caused by *Neisseria meningitidis*).

Certain medical conditions: There are certain diseases, medications, and surgical procedures that may weaken the immune system or increase risk of meningitis in other ways.

Working with meningitis-causing pathogens: Microbiologists who are routinely exposed to meningitis-causing pathogens are at increased risk.

Travel: Travelers to the meningitis belt in sub-Saharan Africa may be at risk for meningococcal meningitis, particularly during the dry season. Also at risk for meningococcal meningitis are travelers to Mecca during the annual Hajj and Umrah pilgrimage.

Epidemiology of Disease Due To *Neisseria Meningitidis*

Agent - *Neisseria meningitidis*

- Gram-negative diplococcus
- capsular polysaccharide antigens differentiate serogroups (A, B, C, X, Y, Z, 29-E, and W135)
- serogroups A, B, and C associated with epidemics
- subtyping identified certain strains (clones) associated with increased virulence and epidemic potential (e.g. serogroup A, III-1; serogroup B, ET-5)

Reservoir

- Humans
- asymptomatic carriage in nasopharynx common

Mode Of Spread

- person-to-person by direct contact with respiratory droplets of infected people
- most cases acquired through exposure to asymptomatic carriers, relatively few through direct contact with patients with meningococcal disease

Host Factors

- risk of invasive disease due to *N. meningitidis* higher in children, decreases with age
- All humans susceptible, but disease risk higher in persons with terminal complement deficiency, spleen ectomy.

Incubation Period: 1-10 days, usually <4 days (16)

2. STATEMENT OF THE PROBLEM

Ethiopia is in the African meningitis belt, and is regularly affected by both the endemic and epidemic forms of the disease. Outbreaks have been recorded since 1935. The most recent major outbreak affecting the whole country occurred in 1988-1989, with nearly 50 000 cases and 990 deaths, and an overall attack rate of 133 per 100 000. A major outbreak is anticipated in 1999-2000, and the regions of Amhara, Gambella and Tigray experienced an increase in the number of cases reported in March-April 2000. (WHO Disease Outbreak Reported March-April 2000).

Since Ethiopia is located on the African meningitis belt and bordering with meningitis prone countries it is reasonable to conduct such type of data analysis with regular course of time. Furthermore, Ethiopia is the seat of African union, ECA (United Nation Economic Commission for Africa) and multiple National, International organizations. It *is also* among the top five countries in the world hosting international conferences which are a factor for epidemiological links. Therefore; there should be a strong surveillance system on line with the growing economic development and ever increasing health concern.

3. LITERATURE REVIEW

Meningococcal disease is a contagious disease caused by the meningococcus (Neisseria meningitidis), a Gram-negative bacterium. There are two clinical forms of meningococcal disease. Meningococcal meningitis is the more common entity, especially during epidemics; outcome is good if appropriately treated. In contrast, meningococcal septicemia, in which bacteria are found in the blood stream, is less common but highly fatal, even when actively treated. Cases in which both meningitis and septicemia occur simultaneously are usually regarded as cases of meningitis.

Meningococcal meningitis, commonly designated as cerebrospinal meningitis, is the only form of bacterial meningitis which causes epidemics. Epidemics can occur in any part of the world. However, the largest epidemics occur mainly in the semi-arid areas of sub-Saharan Africa, designated the" African meningitis belt".

Apart from epidemics, meningococcal meningitis occurs sporadically throughout the world, with seasonal variations, and accounts for a variable proportion of endemic bacterial meningitis. In non-epidemic conditions, only laboratory investigation of cerebrospinal fluid (CSF), obtained by lumbar puncture, can reliably differentiate meningococcal meningitis from other types of bacterial meningitis.(16)

In Ethiopia, meningitis outbreaks have been described in written reports since 1901. Outbreaks were reported in 1935, 1940, 1950,1964, 1981 and 1989.The 1981 and 1989 outbreaks were the largest ever recorded in Ethiopia with 50,000 and 45,806 cases, and 990 and 1686 deaths respectively. The

1981 outbreak affected the northern and western part of Ethiopia. The 1988-1989 meningococcal meningitis outbreaks affected all regions. Since these major outbreaks a number of smaller outbreaks have occurred in the country most notably outbreaks in Amhara, Tigray and Gambella Regions in February 2000. Between March and August 2000 there was an outbreak in Addis Ababa with 850 cases and 33 deaths.

During 2001 major epidemic was recorded with 6964 cases and 330 deaths followed by another epidemic during 2003-2004 epidemic seasons which recorded a total of 3326 cases and 160 deaths from all regions and was not limited to the traditional meningitis belt areas of North West and South Western part of the country.

In the epidemic season 2005 a total of 1061 cases with 46 deaths were reported from four regions while epidemic in the year 2006 affected all Regions with a report of close to 3000 cases. Out of these cases 1300 cases (45%) with 43 deaths were reported from three regions, namely Oromia, SNNPR and Tigray[17].

According to WHO updating reports on Meningococcal disease: 10 April 2000, 21 February 2002 epidemic season Disease Outbreak report in Ethiopia As of10 April 2000 In the Amhara region (estimated population, 198 000), the health authorities have now confirmed a revised total of 70 cases (with 3 deaths) in Kobo Woreda (northern Wollo) between 1 January and 31 March 2000. Cases are being treated at the Alamata hospital and all 29 specimens analyzed yielded *Neisseria meningitidis* serogroup C sensitive to chloramphenicol, penicillin, erythromycin and tetracycline.

Part of the response strategy included vaccination of the target population aged 2-35 years; 36 500 people were vaccinated between 28 February and 12 March. No further cases have been reported. This is the second year the Kobo area has been affected. In 1999, a total of 269 cases (with 9 deaths) were recorded. Epidemic response had included vaccinating 60 500 people with polysaccharide A+C meningococcal vaccine.

In the Tigray region, the number of cases rose in the first week of February in villages along the main road between Kobo, Alamata and Mekele. Up to 12 March 2000, a total of 47 cases (with 6 deaths) were reported (case-fatality rate, 12%). Specimens analyzed have yielded *N. meningitidis* serogroup C. Patients in hospital were treated with IV chloramphenicol on the basis of clinical assessments. In all, 35 200 people aged 2-35 years were vaccinated in early March. During 1999 (Gc), a total of 7 cases (no deaths) was notified in the same area (where 4 000 people had been vaccinated).The Gambella region, near the border with Sudan, has reported 32 cases (with 5 deaths) due to *N. meningitidis* serogroup A.

In the same year report as of 17 August, a total of 855 cases and 19 deaths were reported in Addis Ababa since the beginning of the outbreak, which began in March 2000. *Neisseria meningitidis* serogroups A (90%) and C (10%) have been detected using latex agglutination tests in 311 of the patients. The age group most affected is < 30 years. According to available data, no major outbreaks had been reported in Addis Ababa since 1989. (18)

As of 3 February 2002- Meningococcal meningitis update, the Ethiopian Ministry of Health has reported a total of 1 332 cases of meningococcal disease including 85 deaths mainly in Southern Nations, Nationalities and Peoples Region (SNNPR) since the onset of the outbreak in September 2001. *Neisseria meningitidis* serogroup A has been laboratory confirmed. A vaccination campaign had been undertaken in three woredas (districts) in Sidama Zone, but there have been localized epidemics and an increase in the number of cases reported from other districts and zones in the Region.

In response, the Federal Ministry of Health has re-activated the Task Force on Epidemic Meningococcal Disease for the current epidemic season. The Task Force consists of WHO, Médecins sans Frontières (MSF- France, Holland, Switzerland and Belgium), International Federation of the Red Cross and Red Crescent Societies, Ethiopian Red Cross, United States Agency for International Development (USAID), UNICEF and European Union Humanitarian Office (ECHO); it is working to coordinate control activities including surveillance, case management, vaccination campaigns and logistics.

SNNPR is one of the biggest regions in Ethiopia, with an estimated population of over 12.5 million people. The high population density, current dry season and low immunization coverage exacerbate the potential for a major meningitis epidemic.

To prevent this from becoming a reality, the Ministry of Health on behalf of the Task Force is urgently appealing for funds to carry out a mass immunization campaign in 5 priority zones in

SNNPR: Hadia, Sidama, Gedeo, North Omo and South Omo. The total target population (aged 2-30) is estimated at 5 568 506. The appeal is for US$ 2.5 million to cover the cost of vaccine and autodestruct syringes, oily chloramphenical and reagents, and training of health workers in case management and epidemic response.(19)

4. Objective

4.1 General Objective

- The general objective of the analysis is to asses, describes the magnitude and distribution of Meningitis in Ethiopia from 2010- 2014.

4.2 Specific Objectives

- To assess the overall trend of meningococcal meningitis during 2010-2014
- To describe the distribution of meningitis by place, person and time for the period 2010-2014
- To describe the most common causes of serotypes associated with bacterial meningitis during outbreak

5. Methods

5.1 Study Area

Located in the Horn of Africa, The Federal Democratic Republic of Ethiopia lies at the crossroads between Middle East and Africa. Ethiopia is bounded by Eritrea to the north and Kenya to the south. The eastern part is bounded by Somalia and to the west lays Sudan and South Sudan. Ethiopia covers a vast land area of 1.1 million square kilometers and is the second most populous country in Africa with a population of more than 85 million (20).

Ethiopia is administratively sub-divided into nine regional states and two city administrations the national meningitis surveillance data collect Nationwide from all regional stats and the above mention cities.

Ethiopia has great geographical diversity; its topographic features range from the highest peak at Ras Dashen, 4,550 meters above sea level, down to the Afar Depression, 110 meters below sea level [21]. The climate varies with the topography, from as high as 47 degrees Celsius in the Afar Depression to as low as 10 degrees Celsius in the highlands. Ethiopia, as mention on the introduction is located at the end of AMB.

5.2 Study Design

The study involves a retrospective descriptive analysis of clinical and laboratory data collected by weekly and line list reporting forms from 2010-2014 reported through the public Health Emergency Management Surveillance system.

Population Study

The study sites were the 9 stats and two administrative cities with distinct geographical and climatic features of Ethiopia. Thus the study is carried out with the intention of providing results that can be generalized over whole of the Ethiopia. Therefore, the target population for this study is the whole Ethiopian population.

Meningitis attacked reports and related deaths throughout the country, including regional and zonal reports to PHEM and all compile in EHNRI meningococcal meningitis data base was included in the data analysis.

5.3 Sample Size

The study included all the suspected and confirmed meningococcal meningitis cases reported during2010- 2014 from regional health bureaus presented in EPHI. Purposive sampling technique was used to select regions in Ethiopia based on complete regional data of meningococcal meningitis, compiled in EPHI data base.

5.4 Ethical Consideration

A formal letter was submitted to the data manager of EPHI directorate in order to access the data. The Collected data only be used for academic purpose in confidential manner and any description that identifies the personality of the study units will not be utilized

5.5 Limitation ofthe data analysis

Since the study was based on secondary data the quality of the data can‘t definitely be assured. The system was also in its infancy stage in the country and under reporting and incomplete of variables was observed and may not show the overall burden of case in the study areas.

5.6 Variables

The variable includes the total Meningitis out patients in species (confirmed and clinical), the in-patients in species (confirmed and clinical) related with the Regions and Zones (Place) and also with Week, Months, and Year (Time). Deaths caused by Meningitis species also included in the variables.

Generally, Meningitis clinically treated, confirmed, outcomes (morbidity and mortality), age and sex (by person) were the variables.

5.7 Analysis and data arrangement

Calculation of relevant quantitative measures were conducted by excel and epi info version 7.1.3.0 to identify any outbreaks, differences with regions and zones and the Meningitis species related to seasons and the study area. I tried to ensure to have the right data records and performing quality control checks on each data field.

5.8 Expected Outcome

Trends of Meningitis in the country which may indicate the current status of the disease and the risk factors related to the status. It would help in the strengthening of Meningococcal meningitis control by exchange of experiences and searching the weakness between the regions. It also expected to evaluate the data collecting and handling system of the surveillances.

The retrospective data analysis was proving helpful information to understand the current prevalence of bacterial meningitis in study area. The effect of seasonal variability of meningitis, the age wise and gender wise distribution of disease burden was provide useful estimates on the recent trends of bacterial meningitis. Therefore, the results obtained from the study were helpful for future activity of Meningitis control program organizations, stakeholders and health policy makers.

5.9 Dissemination Strategy

Scientific report, manuscript and abstracts will be generated from this paper and will be disseminated to the responsible health partners and stakeholders

5.10 Sustainability ofthe Result

Networking and continuous surveillance will be planned to monitor and evaluate the changes and to practicing the recommendations given by this paper.

5.11 Case definition

Based on the Ethiopian National Guideline on Meningococcal Meningitis Surveillance and Outbreak Management, First edition, November 2013:

Suspected case: Any person with sudden onset of fever (>38.5 °C rectal or 38.0 °C axillary) and one of the following signs: neck stiffness, altered consciousness, or other meningeal signs such as bulging fontanel, convulsion.

Probable case: Any suspected case with turbid or purulent CSF or with microscopic examination showing Gram-negative diplococci.

Confirmed case: A suspected or probable case confirmed by isolation of Neisseria meningitidis from CSF or blood by culture, PCR or agglutination test were used.

6. RESULT

A total of 7,799 meningococcal meningitis cases and 242 deaths were reportedthroughout the country to PHEM, within the five years (2010 – 2014). Of the total cases, 3564(45.7%) were reported from SNNP, Oromia, Amhara and Tigray reported 2404 (30.8%), 662(8.5%) and 286 (3.7%), respectively. The rest (11.3%) were reported from other regions (See figure 1).

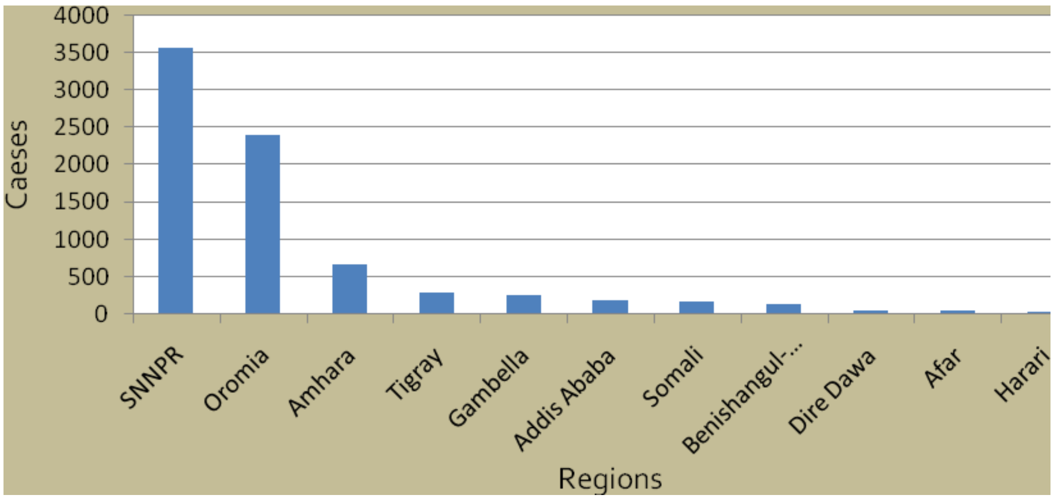

Figure 10: Total Meningitis Case Distribution by Regions, Ethiopia, 2010-2014

As we observe from the figure, total meningitis case distribution during the five years was recorded more from SNNP, Oromia and Amhara regional states.

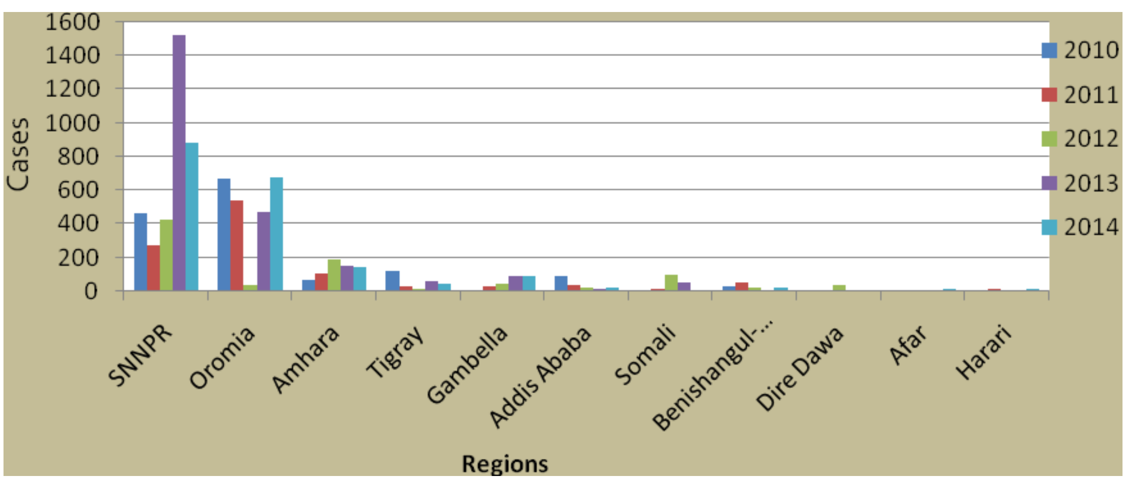

Figure 11: Distribution of Meningitis Cases by Region and Year

This figure reveals that the five years highest meningitis case was recorded during 2013 in SNNP regional states, at this time, meningitis outbreak were recorded in SNNP, Oromia and Tigray.

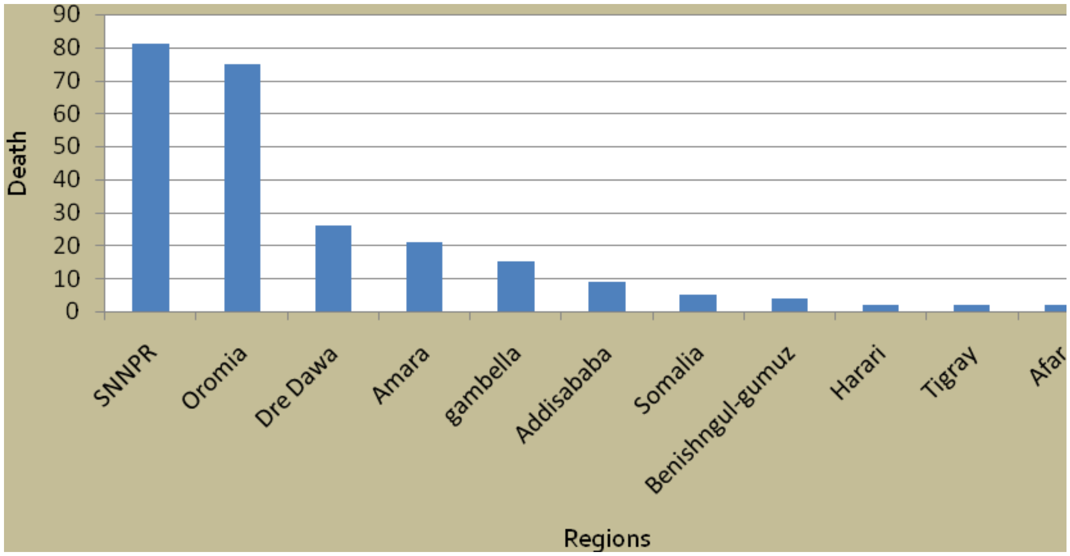

Figure 12: Distribution of Meningitis death by Region, Ethiopia, 2010-2014

The figure reveals that within the five years the highest numbers of death were reported from SNNR and decrease progressively to the right direction.

Table 12: Meningococcal meningitis Cases and Deaths – Ethiopia: 2010 -2014

	Total cases	Total death	Population	IR/100,000	CFR/100
SNNPR	3564	81	17857192	20.0	2.3
Oromia	2404	75	32240188	7.5	3.1
Amhara	662	21	19046226	3.5	3.2
Tigray	286	2	5003446	5.7	0.7
Gambella	265	15	390593	67.8	5.7
Addis Ababa	190	9	3101896	6.1	4.7
Somali	178	5	5178258	3.4	2.8
Ben-Gumuz	129	4	801026	16.1	3.1
Dire Dawa	44	26	397574	11.1	59.1
Afar	44	2	1607906	2.7	4.5
Harari	33	2	213870	15.4	6.1
Total	**7799**	**242**	**85838176**	**9.1**	**3.1**

NB: IR=Incidence rate, CFR= Case Fatality Rate

The National meningococcal meningitis case incident rate during the study period was 9.1 / 100,000 population, while the case fatality rate (CFR) was 3.1 %.

Among the regional states and administrative cities, the highest incidence rate were recorded in Gambella with 67.8/100,000 population, while the highest CFR (59.1%) was in Dire Dawa administrative city.

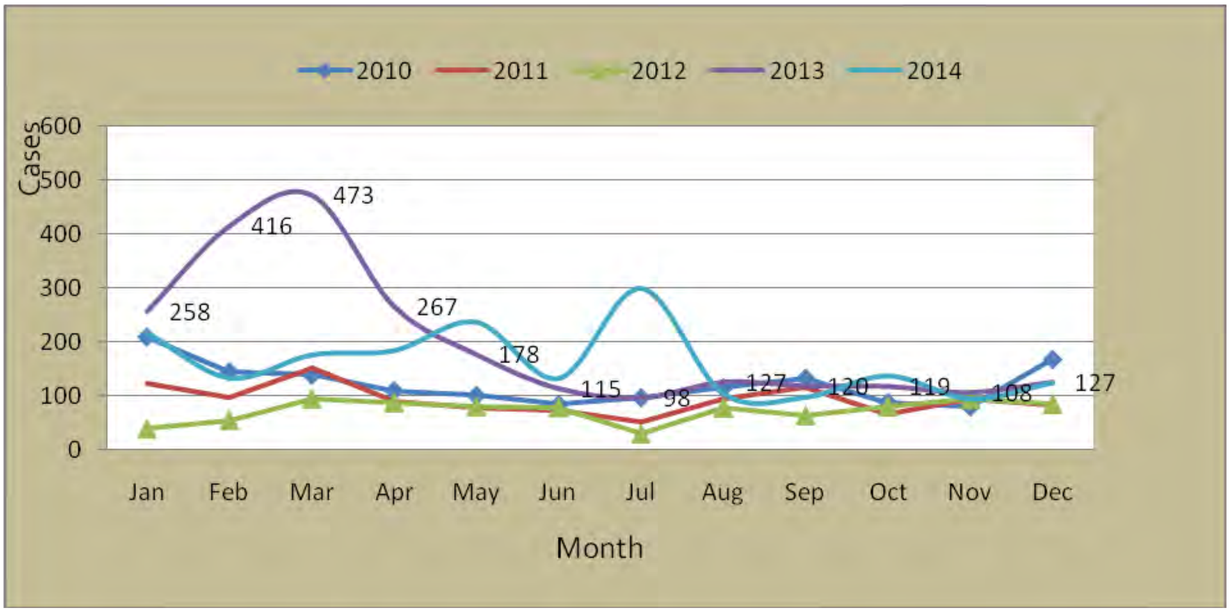

Figure 13: Trends of Meningitis Cases by Month and years, Ethiopia, 2010-2014

This figure revealed that three gross and slightly other small peaks were occurred during the five years, the first highest peak was observed between February and March, 2013, the second peak was occurred during July, 2014 and the third was during May, 2014.The two peaks were occurring during the dry season while the third peak is during wet season.

A total of 1454 Meningococcal meningitis cases 40 death were reported from three regional sates to PHEM through Line List in 2013. Of the total cases reported 918 (63.1 %), 527 (36.2) and 9 (0.61%) were from SNNP, Oromia and Tigray, respectively. From the total reported case 801(55%) were females and 656(45%) males.

Table 13: Meningococcal meningitis Cases and Deaths by Age groups, Ethiopia, 2013.

Age group	Cases	Death	Population	IR/100,000	CFR/100
<1	57	2	1300379	4.4	3.5
1-4	173	8	6744341	2.6	4.6
5-14	513	15	16750651	3.1	2.9
15-44	644	14	23693355	2.7	2.1
45+	67	1	6612100	1.0	1.5
Total	**1454**	**40**	**55100826**	**2.6**	**2.8**

The above table shows that the incidence rate and CFR in2013, during outbreak in three states. The Incidence rate under one year was 4.4/100,000 population and age group, 5-14 years were (3.1/100,000). It also shows the CFR at age group 1-4 years 4.6% and age group less than one year 3.5%.

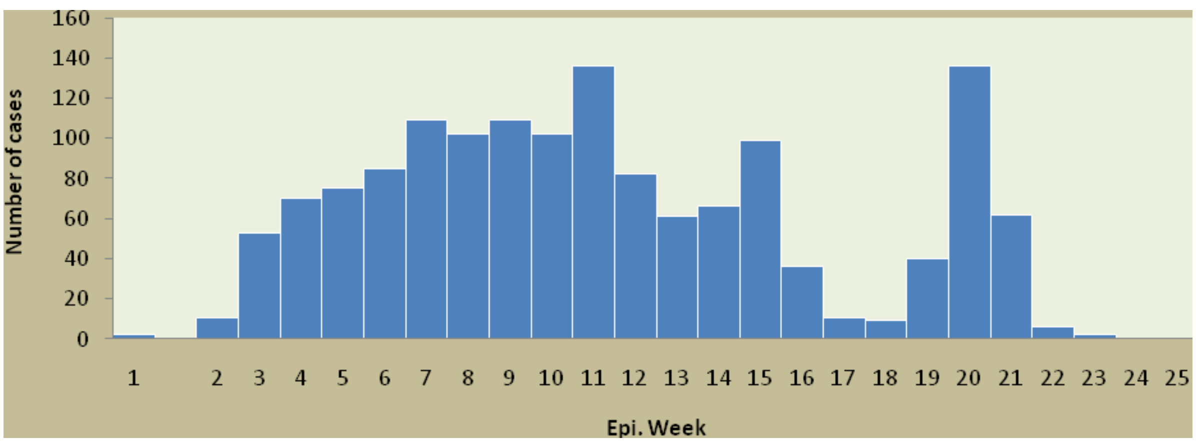

Figure 14: Weekly Trend Meningitis Case, SNNP, Ethiopia, 2013

This figure show the Characteristics of Epidemic curve for a propagated nature. It starts at the first week of January (index case) and ends at the third week of June and remains epidemic for about four months. The curve has two high peaks, the first was during the third week of March (Week, 11) and the second was during the fourth week of May (Week, 20).

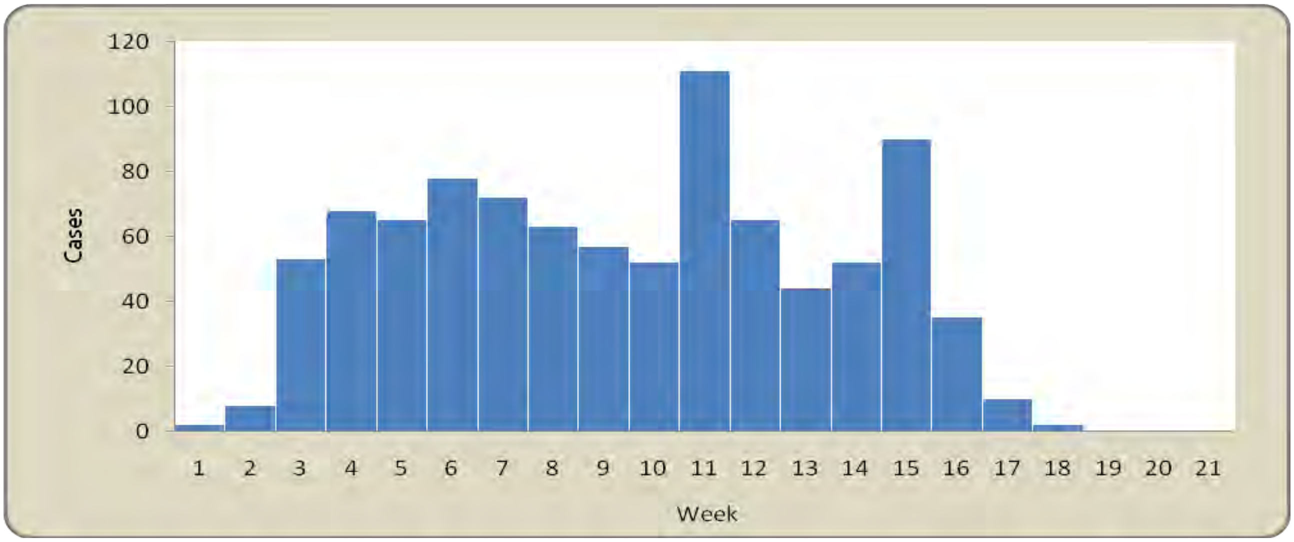

Figure 15: Meningitis Case load by week, Oromia, Ethiopia, 2013

The above figure reveals an Epidemic curve of common source out break with continuous exposure. The outbreak starts(index case) at the first week of January and ends at second weeks of May. This epidemic remains for about four months and two weeks within the dry season. The curve also has two peaks the first one was on March (week, 11) and the second peak was on April (week, 15).

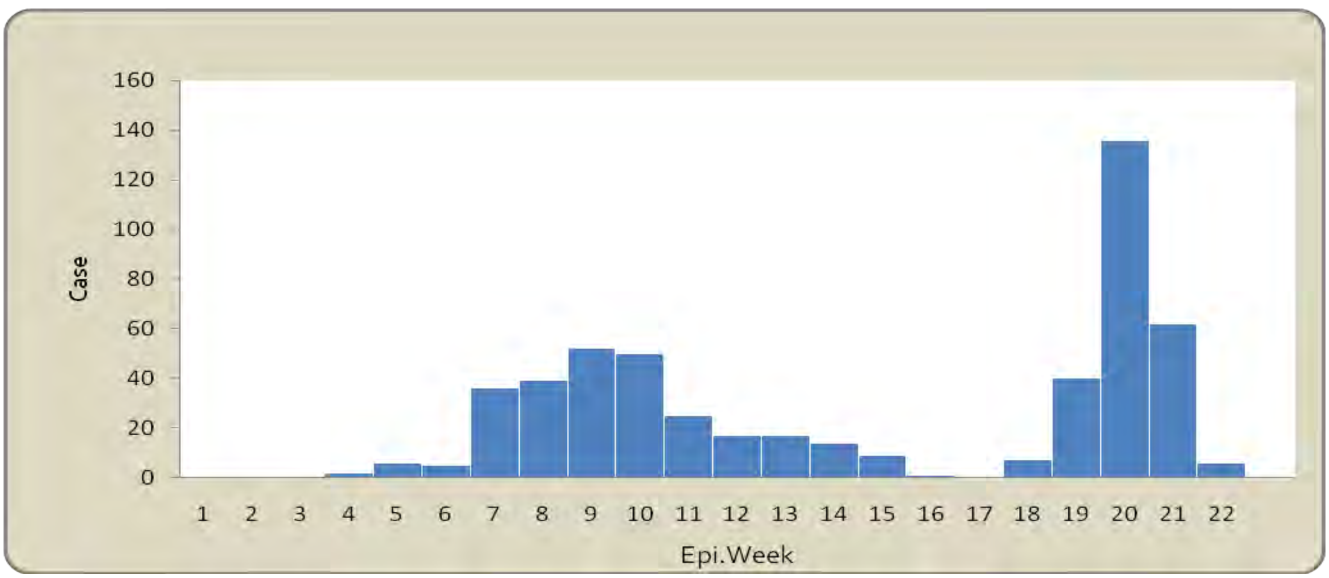

Figure 16: Meningitis Case load by week, Tigray, Ethiopia, 2013

This Epi-curve shows an Epidemic curve of common source outbreak with intermittent exposure. The outbreak starts on January (week, 4) and ends at May (week, 17) again starts at May (week18) and ends up at June (week, 22). Unlike the other curves, this curve has remarkable long peak on May (week, 20) and relatively short epidemic period.

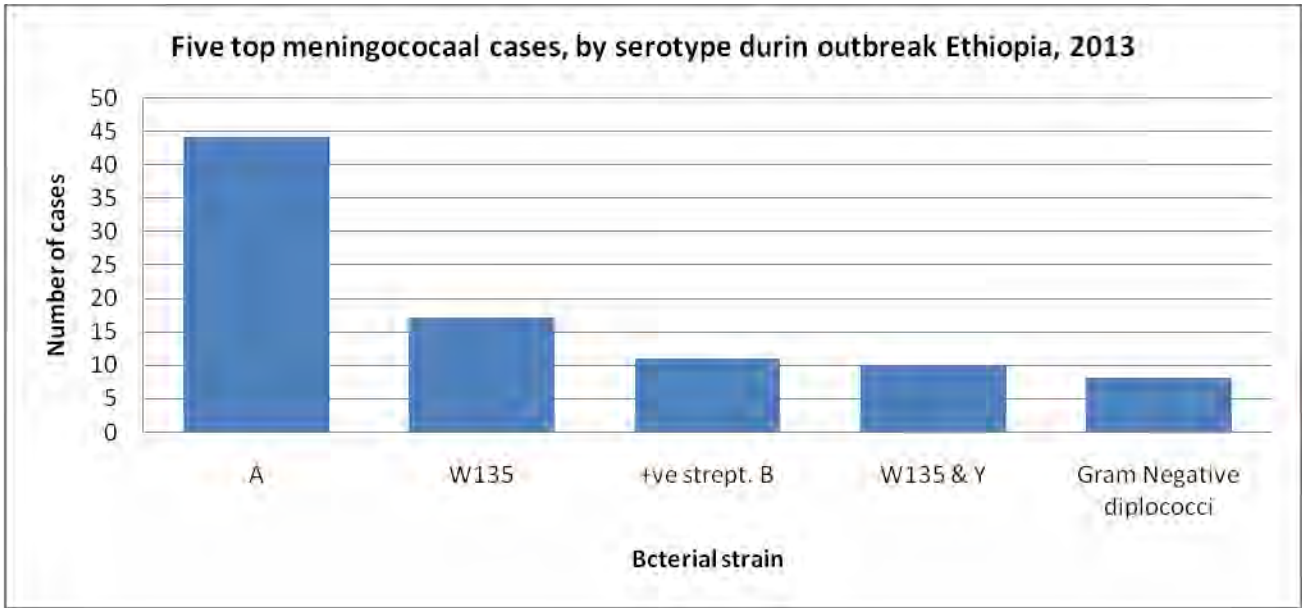

Figure 17: Top Five Top meningitis case serogroup, Ethiopia **2013**

The figure indicates that among the serogroup which cause the meningitis disease the highest case were due to serotype A and followed by w135.

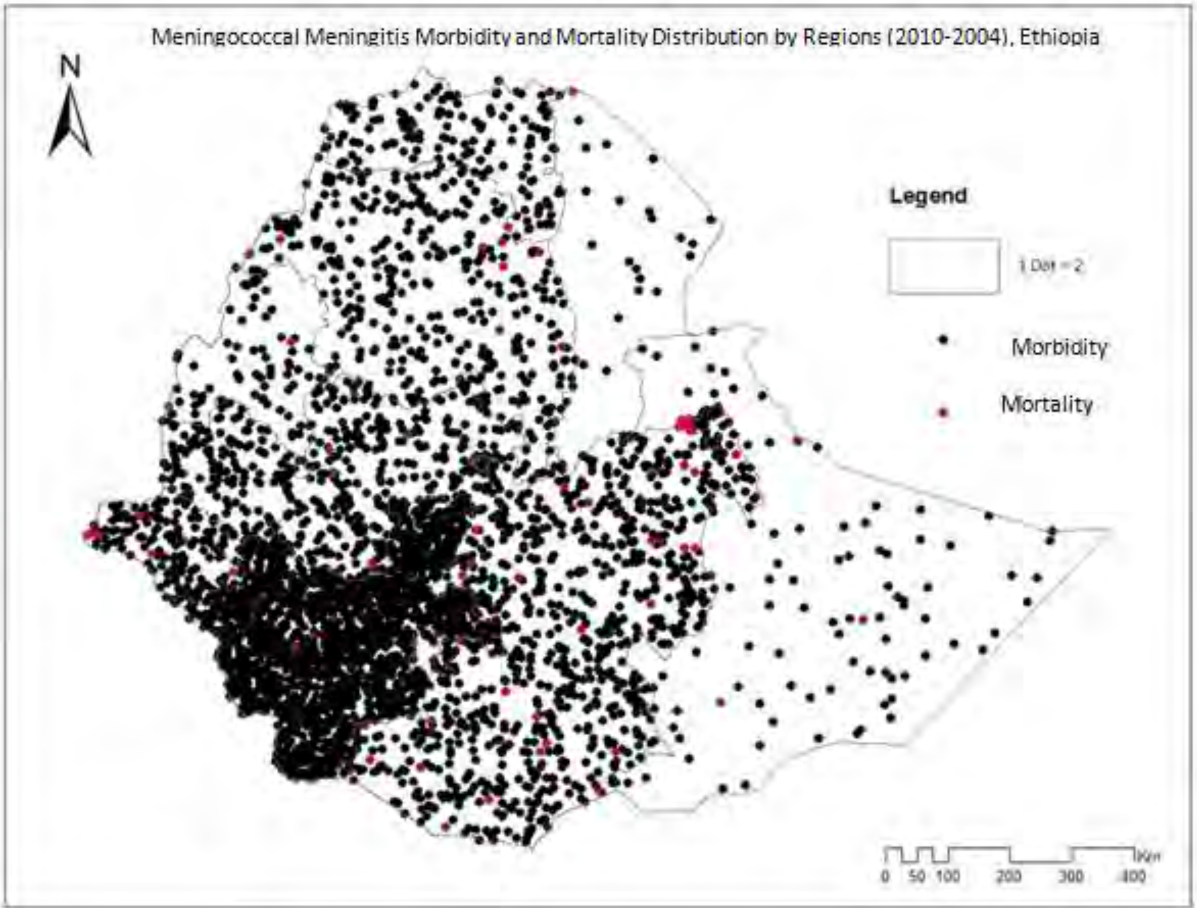

Figure 18: Shows Meningococcal Meningitis Morbidity and Mortality Distribution by Regions (2010-2014), Ethiopia.The Map reveals that the distribution of morbidity (with Black color) and mortality (with Red color) throughout the country during the study period

7. DISCUSSION

The aim of the data analysis was to explore the various demographical and epidemiological aspects of the bacterial meningitis in Ethiopia. The discussion was based on the result of 7799 cases and 242 deaths of meningococcal meningitis throughout the country, within a five year period (2010 - 2014) weekly report. From which 1454 cases were recorded during outbreak on national MMLL in 2013.

This data analysis shows that there is a strong relationship between dry seasons and meningococcal meningitis outbreak in Ethiopia. Regardless of the discrepancies of the number of cases in different states and administrative cities, meningococcal meningitis was remained seasonal with the highest number of cases during the dry seasonand decreasing during the wet or rainy season.

The result in figure 4,(trends of meningococcal meningitis by months and years) revealed that three gross and slightly other small peaks were occurred during the five years, the first highest peak was observed between February and March, 2013,(during which meningitis outbreak were recorded in the country at three regional states: namely; Oromia, SNNP and Tigray) the second peak was occurred during May, 2014 and the third was during July, 2014.The two peaks were occurring during the dry season in most regional states of Ethiopia, while the third peak was in July during which most of the country is wet season and looks unusual, but as described under the study area, Ethiopia has variety of Geographical area with deferent seasons therefore, it was more likely to observe meningitis case during July which is also a dry season in other(some) part of Ethiopia. Another important point is that all the three peak cases were started (index case) at the dry season not at the wet (rainy) seasons, therefore the relationship between meningitis onset and dry season have evidence of positive relationship. From this data analysis result, I conclude that the finding is parallel with the different scientific study conducted before regarding meningococcal meningitis and the relationship with climate (drey season). Even though, it is hard to conclude, my hypothesis for the result, it could also be associated with climate change and migration, but it needs farther study to conclude.

There is another evidence to mention regarding the trend of meningitis and seasons based on the epi-week during the outbreak in 2013.Regadless of the case number differences, three of the epi-curve shows that, all the incidence cases (index case) were start at the dry seasons

A number of studies show that, the influence of climate on meningitis dynamics was first suspected in 1940 by Sice´ *et al*. [22]. Since then, several studies have investigated the relationship between climate and meningitis using different approaches: qualitative [1, 2, 5, 6,] and recently quantitative [23–24]. The main conclusions of these studies were that (i) the intensity of the epidemics is related to the Harmattan wind [26, and 27] and its strength [25]; (ii) the onset of the epidemics is in phase with the winter maximum as defined by Sultan et al. [22] and with the arrival of the dust in the low layers of the atmosphere [26,27]; and (iii) the end of the epidemic season coincides with the arrival of the African monsoon [29 and 30]. The main hypothesis to explain climate impact on meningitis epidemics is an increase in the invasion rate (i.e. shift from carrier to infected status) [28] persistent low air humidity and high dust loads are believed to damage the pharyngeal mucosa and ease the colonization of the epithelium by the meningococcal [5, 6, 8, 14]. Additionally, increased incidence could be attributed to higher transmission levels, due for instance to changes in living habits, such as proximity of individuals as they take refuge from the dusty winds [6, 28]. Finally, co-occurrence of viral respiratory infections is expected to weaken the immune system and further ease the transmission and invasion by the bacteria [29]. This coincides with our knowledge of the seasonal variation in the incidence of meningococcal meningitis in the countries of meningitis belt.

The data analysis reveal that age grouped meningococcal meningitis incidence rates were highest among infants aged group less than one year (at the rate of 4.4 people/ 100,000 populations) followed by age group 1-4 years(2.6/100,000 populations) and lowest among adult age group above 45 years (at the rate of 1 person/100,000 population). Generally, infant less than one year were found to be more at risk to contract meningitis comparing with other age group in the analysis.

This data analysis also showed that age grouped meningococcal meningitis case fatality ratio (CFR) were highest among children at the age of 1-4 years (4.6%),Followed by infants under one year(3.5%) and the lowest among adult above the age of above 45 years (1.5%). Therefore, though the incident rate is highest among age group less than one year(4.1/100,00), case-fatality rate were highest among age group 1-4 years(4.6%), while incident and case-fatality rate were both lowest at adult age group above 45 years (1/100,00),(1.5%) respectively.

Different study show that the incident and case- fatality rate for the bacterial meningitis vary by region, country, pathogen, and age group. Without treatment, the case-fatality rate can be as high as 70 percent, and one in five survivors of bacterial meningitis may be left with permanent sequelae including hearing lose, neurological disability, or loss of limb(30).Incidence rate of *N. meningitis* are generally highest in children less than five years of age and in adolescents. *N. meningitis* can also cause a sever bacteremia, called meningococcemia.

Bacterial meningitis is generally a disease of childhood. A retrospective study conducted during 2007-2011; at University of Gonder Medical Hospital and Awassa referral Hospital reveal that the most commonly affected age group was found to be the infants and small children less than 4 years of age. Data from Gondar University Hospital show that almost half of the cases (49.5%) were either infants or children less than 4 years of age. Results from Awassa Referral Hospital show the highest incidence in young adults 15-24 years of age which make 27% of the total cases. Children less than 4 years of age, including the infants, make 22% of the cases (30). Within the various age groups, a higher incidence in infants has frequently been reported in literature. A 10-year study conducted in United States in California during 1998 to 2007 showed the highest incidence of bacterial meningitis in infants less than 2 months of age (31). For the year 2006-2007 the incidence was 80.7 cases per 100,000 populations. Children greater than 2 months and less than 2 years of age showed the second higher incidence (6.9 cases/100,000 populations) during the same year.A large scale retrospective study in Niger showed that in the year 1995-96 (32) the incidence of bacterial meningitis was highest in infants less than one year of age (638 cases per 100,000 population), this was followed by children between 1-4 years of age (490 cases per 100,000 population). Older children between 10-14 years and young adults also showed a higher incidence (each having 476 cases per 100,000 populations). In contrast to these studies, a study in North Gondar during 2001-2002 showed the highest incidence in young adults between 15-30 years of age (52% of cases) (33). Generally, these results point out at 2 peaks of age that have high susceptibility for bacterial meningitis i.e. small children and young adults. This also parallels with the findings in the data analysis.

The National meningitis case incidence and CFT rate as shown on the table were 9.1/100,000 populatinn.3.1 % respectively .comparing with other regional states and administer cities the highest incidence rate (67.8 /100,000 population) were observed in Gambella regional stat, while the highest CFR (59.1 %) in Dre Dawa administrative city. This finding draws our attention why causes the exaggerated figure in those areas. The probably reason could be multi factors which need farther study, but the most probable reason associated with this case can be the level of timely intervention, vaccination status coverage: efficacy, migration, climate change and drought are among the hypotheses we think .

The other intersecting result found from the data analysis was, during the epi weeks in 2013, among the top fourteen laboratories serotype results, the most cause of the meningitis were serotype type A and W135 contributed 48 % and18.5 %, respectively. This result is a hard evidence for the scientific literature review regarding the AMB and stated as follow. The worldwide distribution serogroups of *N.meningitis* is variable. In the Americans, Europe, and Australia, serogroup B and C are the most common, while serogroup A causes the majority of disease in Africa and Asia [30].Sometimes sero-groups can emerge, increasing in importance in specific country or region like serogroup C in China [31]. or serogroup Y in North America [32].

Serogroup A *Neisseria meningitidis* is responsible for recurring epidemics of bacterial meningitis in the African meningitis belt [30] Although epidemics caused by sero-group W135 have recently arisen, most of the cases in the region are still caused by serogroup A Meningococcal l[33].

Molecular epidemiological studies have shown that serogroup A strains are genotypically diverse, but specific complexes of related hyper virulent clones are responsible for a major part of the cases in the meningitis belt. Serogroup A meningococcushas historically been the main cause of epidemic meningococcal disease and still dominates in Africa during both endemic and epidemic periods. Elsewhere the major and most explosive epidemics of meningococcal meningitis have also been almost exclusively associated with serogroup A, as in Brazil (1974), North America and Europe prior to the mid-1950s, Finland (1974), Nepal (1983-1985), Rwanda (1978), Saudi Arabia (1987), Sudan and Ethiopia (1988-1989), Kenya, Uganda and Burundi (1989-1992), United Republic of Tanzania, or in West Africa especially in Burkina Faso and Mali (1995-1997), Niger and Nigeria (16).

Another study conducted and entitled Characterization of *Neisseria meningitidis* Isolates from Recent Outbreaks in Ethiopia and Comparison with those recovered during the Epidemic of 1988 to 1989 (34), revealed that: ―The meningitis epidemics in northern and southern Ethiopia in 2002 and 2003 were caused by serogroup A *N. meningitides* strains of ST-7, which were anti genetically and genetically very homogeneous.

Although only serogroup A meningococci were found in our study, serogroup W135 epidemics occurred in Burkina Faso in 2001 and 2002, and an outbreak of W135 meningococci was reported in a neighboring country, Sudan, in 2005 (35). The Ethiopian health authorities should therefore enhance their laboratory-based surveillance network in order to detect potential meningococcal strain heterogeneity to be able to provide the appropriate vaccine in time"

Limitation

Nevertheless, the data analysis was not without its own limitations. Some main limitations that were encountered during this data analysis are listed below.

Due to the lack of enough availability of laboratory facilities, not all the cases were confirmed by laboratory evidence of the bacterial organism. In such instances the diagnosis was based solely on the clinical diagnosis which may be less accurate than the laboratory assisted diagnosis.

Another limitation may be the retrospective nature of the study itself. This implies relying on the quality and quantity of information that had already been recorded. Some information loss may have occur at multiple steps starting from the data recorded by attending physician, laboratory staff and finally while recording the data onto the case record forms.

8. Conclusions

The trends of meningitis case distribution within the five years were recorded the highest at the dry season of the years and progressively decrease at the wet or rainy season, this trend is exactly meeting with the various scientific literature reviews at the AMB. Meningococcal disease remains highest in the country with incidence rate of 9.1 per 100,000 populations and with 3.1% of CFR during the five years. Infants and children experienced the highest risk of invasive meningococcal disease. The other fact that the data analysis showed was the cause of the meningitis, Serotype ―A" accounts 48% while W135 accounts 18.5% of the cause of the meningitis. This is also exactly coincide with the various scientific literature conducted on the AMB (28). Serogroup A cause the majority of infections in Ethiopia As it has already been mentioned in the literature that the most common serogroup of *N. meningitides,* in Ethiopia is serogroup A. The result of this analysis also shows the same fact. The most affected age groups by meningococcal meningitis during the outbreak were infants less than 1 year old and children aged1-4 years.

The highest Incidence rate cases during the five years was from Gambella, SNNP regional states with 67.8/100,000 and 20/100,000 populations respectively, while the most affected was Dre-Dawa administrative city and Harari regional stat with CFR of 59.1%, 6.1% respectively.sex ratio during the outbreak in 2013 meningitis cases were highest in female than male 801(55%) and 656(45%) respectively.

9. Recommendations

Based on the findings of the analysis we recommend the following points

A mass vaccination campaign, if appropriately carried out, is able to halt an epidemic of meningococcal disease due to sero-groups ―A" or ―C" within weeks. To plan and implement such campaigns, speed is essential since time is needed to obtain and distribute vaccine. Therefore, a program for acquiring vaccine should be established before an epidemic occurs

Further work on the surveillance data standardization across the country is needed;strengthening surveillance activities and establishing a better standardization of laboratory methods are required. Therefore, it is high time to have a modern laboratory setup in the country including at regional stats. To further develop the integration of laboratory data into surveillance data, close collaboration between networks of epidemiologists and microbiologists is needed.

Finally, To implement all the above mention points, PHEM should be strengthen its structure all over the country, with adequate train man power and conduct regular evaluation on the surveillance system itself. In short;

- Strengthening surveillance activities and establishing a better standardisation of laboratory methods used are required.
- To further develop the integration of laboratory data into surveillance data, close collaboration between networks of epidemiologists and microbiologists is needed.
- A mass vaccination campaign, if appropriately carried out, is able to halt an epidemic of meningococcal disease due to sero-groups –A –or –C” within weeks.
- Further Research should be initiated on the un clear issues raise on the discussion.

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Chapter III: Evaluation of Surveillance System

Evaluation of surveillance system in South East zone, Enderta Woreda Tigray regional sate, Ethiopia, 2015

Abstract

Background: Malaria is the leading health problem in Sub Saharan Africa. In Ethiopia, malaria is one of the leading causes of morbidity and it is endemic in most parts of the country with an altitude below 2,000 meter. Tigray region has many malaria hot spot areas which are affected repeatedly by malaria episode. Enderta woreda are among of the malaria affected areas; however, the surveillance system was not evaluated before. Therefore we conducted the evaluation to determine whether the objectives of the system are being met or not.

Objective: To assess key attributes of malaria surveillance system and to determine whether the objectives of the system are being met to generate evidence based information for the better improvement of the surveillance system. Thereby it helps to draw appropriate conclusion and forward recommendations to concerned bodies.

Methodology: The evaluation was carried out in 8 sampling unit with purposive and conveniently selected health institutions by the resent occurrence of outbreak. We reviewed surveillance data from 2015 – Feb 2016.Information on system attributes was collected using semi structured questionnaire. The surveillance system was evaluated according to CDC guideline for surveillance system evaluation.

Result: All sites were analyzed malaria data used for epidemic monitoring, detected change in malaria cases and determine malaria morbidity and mortality. Case detecting, registering and data reporting were 100% Completeness and timeliness was 100% at the visited Woreda. Complete data was analyzed as per the system of the PHEM the positive predictive value was 36%. In every Hp there is mobile phone for reporting purpose with a monthly bill of 100 ETB.

Conclusion: The Malaria surveillance system was able to detect change in malaria cases and outbreak. It is simple, flexible, acceptable and stable to all operators. However, the positive predictive value should be improved.

Key words: Malaria, Surveillance System Evaluation, Enderta Woreda, Tigray, 2015

1. INTRODUCTION

The purpose of evaluating public health surveillance systems is to ensure that problems of public health importance are being monitored efficiently and effectively. Public health surveillance systems should be evaluated periodically, and the evaluation should include recommendations for improving quality, efficiency, and usefulness. Evaluation of a public health surveillance system focuses on how well the system operates to meet its purpose and objectives. Public heath Surveillance is the ongoing systematic collection, analysis, and interpretation of outcome specific data for use in planning, implementing and evaluating public health policies and practices (1). A communicable disease surveillance system serves two key functions; early warning of potential threats to public health and programmed monitoring functions which may be disease specific or multi-disease in nature. Surveillance systems also serve to monitor trends of endemic diseases, progress towards disease control objectives, and to provide information which may be used to evaluate the impact of disease prevention and control program. The early warning functions of surveillance are fundamental for national, regional and global health security (1).

According to the latest estimates from WHO, there were 214 million new cases of malaria worldwide in 2015 (range 149–303 million). The African Region accounted for most global cases of malaria (88%), followed by the South-East Asia Region (10%) and the Eastern Mediterranean Region (2%). In 2015, there were an estimated 438 000 malaria deaths (range 236 000–635 000) worldwide. Most of these deaths occurred in the African Region (90%), followed by the South-East Asia Region (7%) and the Eastern Mediterranean Region (2%). Between 2000 and 2015, malaria incidence rates (new malaria cases) fell by 37% globally, and by 42% in Africa. During this same period, malaria mortality rates fell by 60% globally and by 66% in the African Region (2).

The disease remains one of the most important causes of human morbidity and mortality with enormous medical, economic and emotional impact in the world. More than half of the world's population is at risk of acquiring malaria, and the proportion increases each year because of deteriorating health systems, growing drug and insecticide resistance, climate change and natural disasters. Combating malaria is one of the millennium development goals; which is planned to halt the incidence of malaria by halve in 2015 (3).

Since 2004, Ethiopia's health systems for case management and surveillance have been greatly strengthened. There are three major overlapping and complementary Ethiopian health facility-based surveillance systems that provide information about malaria trends: the health management information system (HMIS) data, published in the annual Health and Health Related Indicator Report, the PHEM system data, published in the FMOH's Annual Review Meeting report.

In Ethiopia, under the PHEM surveillance system, one of weekly reportable diseases is malaria. It is one of the leading causes of morbidity and endemic in most part of the country with an altitude below 2,000 meter. About 75% of the land mass is potentially malarious and about 40 million people are at risk of infection. From the four Plasmodium species, Plasmodium Falciparum and Plasmodium Vivax species are the cause of disease, the risk of disease in Ethiopia is also highly variable by location that is affected by rainfall, altitude, and seasonal factors; malaria is classified as unstable, and host immunity to malaria is thought to be low in most parts of Ethiopia (4).

To reduce the overall burden of morbidity and mortality due to malaria in Ethiopia comprehensive approach to vector control, early diagnosis and prompt treatment and surveillance, prevention and rapid management of malaria epidemics when and where it occurs are being implemented by incorporating in the country health sector development program since 1999 (5).Tigray region has many malaria hot spot areas which are affected repeatedly by malaria episode. South East Zone one of Malaria hot spot area and in the zone, malaria epidemic occurred by the year 2015, which affected some of kebeles. There is abnormal phenomena in some of kebeles (In Enderta woreda) which have not malarias site before become emerging malaria sites. Hence, the aim this study was to evaluate the gap and strength of the surveillance system in the selected areas.

1.1 RATIONALE

Malaria is one of the leading causes of morbidity and mortality in Ethiopia. It is one of the main health problems of Tigray region state with recurrent epidemics in west zone hot spot areas. High number of malaria cases is reported from Enderta woreda in the past three weeks; in addition surveillance system was not evaluated in the woreda before. Therefore, this study was conducted to evaluate the functionality of the surveillance system and to identify the gap for the better improvement of the surveillance system. The other important reason to conduct this evaluation is to observe the trend of malaria case existence in areas that was not hot spot areas for malaria as observed during Mehere assessment in Enderta woreda, south east zone, in, 2015.

2. Objective

2.1. General Objective

- To assess key attributes of malaria surveillance system and evaluate the surveillance system meeting its objective so as to generate evidence based information for the better improvement of the surveillance system.

2.2 Specific Objectives

- To evaluate the attributes of malaria surveillance system in the selected Woreda
- To assess the performance of the surveillance system in line with set objective.
- To give possible recommendations based on the findings for the better improvement of the program
- To observe the trend of malaria within the five years

3. Materials and methods

3.1 study area and population

The evaluation was carried out in Tigray regional state south eastern zone, at Enderta woreda with a total population of 143746 of which 72293(50.3%) males and 71454(49.7%) females.

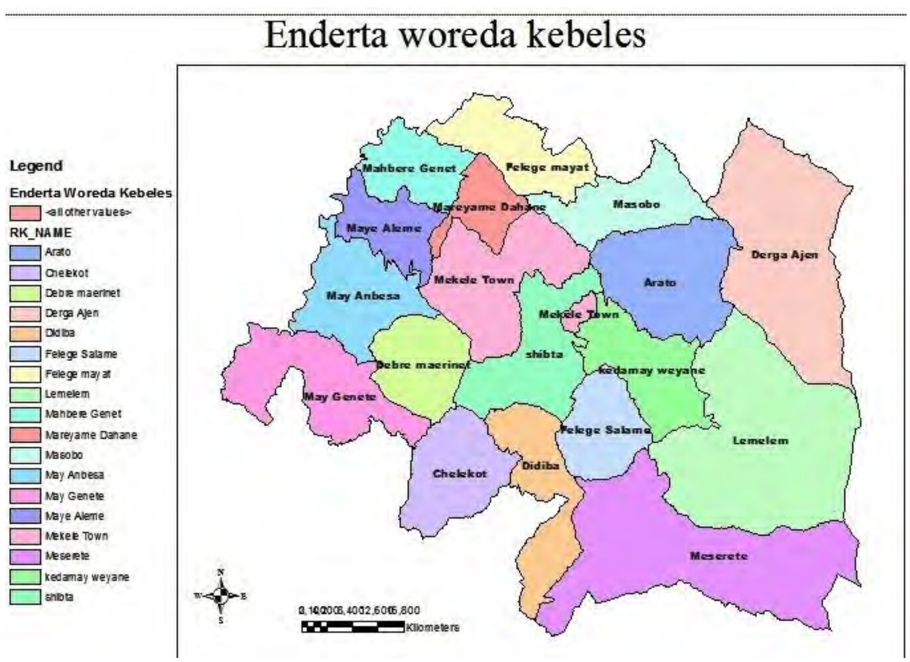

Figure 19: Area map of Enderta Woreda South East zone, Tigray regional sate, Ethiopia, 2015.

3.2 Study design and period

A descriptive cross-sectional study was employed from December 29, 2015-Jan 17, 2016.

3.3 Sample size and sampling technique

First, purposive Convenience Cross- Sectional Descriptive Study Design was used to select one woreda on the basis for its burden of malaria cases outbreak compared with others of malaria occurrence in malaria hot spot areas. Second, of the selected woreda, two health center and four health posts were selected presenting with good and poor surveillance practice as judged by regional and woreda health offices and based on the accessibility of the health facility. The study was conducted as per the Updated Guidelines for Evaluating Public Health Surveillance Systems, published by the Center for Disease Control and Prevention (CDC) for the evaluation of the surveillance system.

3.4Study units

The study subjects were the woreda health facilities (HC and Hp) health offices and the Regional Health Bureau. A total of 8 study units, two health center and from each HC two health posts will select conveniently. Moreover the Woreda health offices and the regional health bureau will include in the study.

3.5 Data collection method

The data were collected using semi-structure questionnaire and observation using check-list. Using these tools surveillance officers in the selected health facilities and staffs of the health institutions (PHEM officers and HEWs) will interviewed. Secondary data sources such as surveillance report completeness and timeliness as well as malaria surveillance data, supervision report, written feedbacks, preparedness plans will also reviewed. Information on system attributes will collect using CDC surveillance system evaluation guideline. . Data collected were transferred in to electronic version and descriptive analysis were performed using Spread sheet/excel.

3.6 Data analysis

The collected Quantitative data was entered and analyze using the Microsoft Excel and qualitative data was summarize to supplement the quantitative findings compared with the system attributing factors.

3.6 Ethical clearance

Ethical clearance to conduct the study was obtained from Ethiopian Health and Nutrition Research Institute. Letter of request was provided for the selected health department and health offices for their participation on the study.

3.7 Operational definitions

Simplicity: The simplicity of a public health surveillance system refers to both its structure and ease of operation surveillance system.

Acceptability: Reflects the willingness of individuals and institutions to participate in the surveillance system.

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

Representativeness: Is the ability of the system to describe health events accurately in terms of time, place and person.

Sensitivity: is the capacity of the system to detect the highest proportion of true cases

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

Timeliness: Is the ability of the system to trigger appropriate action in time.

Usefulness: Refers to the relevance of the system in terms of feeding informationfor action.

Positive predictive value: Is the proportion of reported cases that actually have the health-related event under surveillance.

Flexibility: Is the ability of the system to adapt to changing needs such as the addition of a new disease, the collection of additional data, and change in case definition.

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

4. Result

4.1 Purpose and operation of surveillance system

Among the 20 nationally modifiable diseases public health emergency managment, most (13) of the reportable disease were reported on immediately and the rest 7 diseases reported on weekly bases.

Malaria is one of the nationally modifiable diseases it‘s reported on weekly bases however during epidemic the reporting will be changed from weekly to daily.

The surveillance system capture data on cases of malaria suspected fever case, total malaria cases (confirmed and clinical) for outpatient, inpatient and deaths and confirmed malaria cases by species. The collected data reported from health center to health post through delegated person, telephone, email and mobile texting from health centers and hospitals to district health office through paper and at district level the data entered in electronic excel format and reported to the zonal health office and subsequently to regional health office. Similarly weekly and monthly feedback of the report will be given to each level.

The structure of Tigray region state holds malaria program and PHEM under disease prevention and control directorate. In addition the surveillance system works in coordination and collaboration with other departments and with different administrative offices present in Woredas and kebeles levels. In every health institutions there is at least one surveillance and malaria focal person which collects and sends report to the next reporting level. The purpose of Malaria surveillance is intended to detect epidemic/outbreak so that they were controlled timely during the outbreak in a short time.

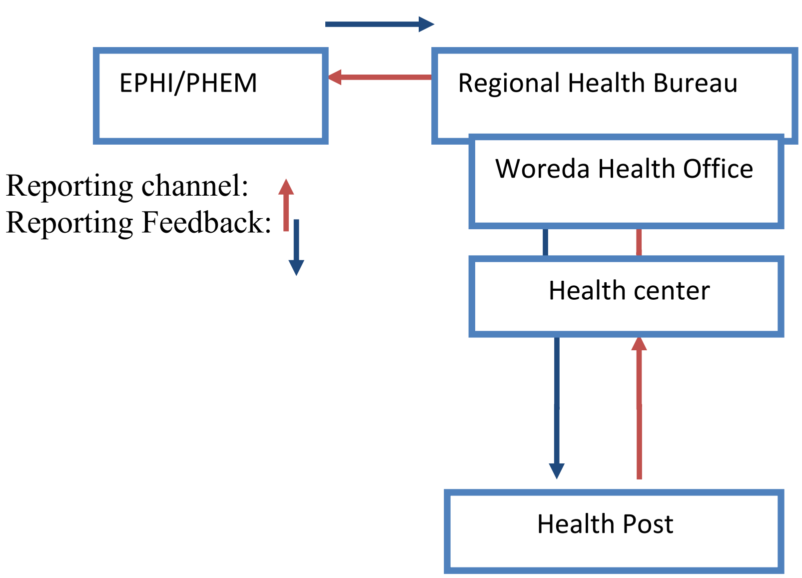

Figure 20: Flow chart of the surveillance reporting system and feedback of Enderta Woreda, Tigray region without zonal health office.

4.1.1 Population under surveillance

The population in the catchment area of all selected health facilities, including all health posts under the selected health centers was included. The surveillance system encourages community participation to detect and respond to disease epidemics through health extension program this program is playing a crucial role on the effectiveness of the surveillance system.

4.1.2 Case detection, registration and data reporting

The case definition of malaria was available in all visited health facilities and the understanding of the case definition at those visited health facility was good as explained by interviewee of health workers at the time of field visit and in all assessed health posts (100%) there was available community case definition, this make the surveillance system excellent as lower level health professional specially the HEWs simply understand the essence of case detecting and the repotting system.

Case definition for Malaria:

Suspected: A person with fever or fever with headache, back pain, chills, sweats, myalgia, nausea, and vomiting diagnosed clinically as malaria.

Confirmed: A suspected case confirmed by microscopy or RDT for plasmodium parasites

All assessed health facilities have clinical case registration log book. Observation of monthly report submitted to higher level was conducted and we found similar number of cases registered in clinical registration log book.

Reporting formats are available and no shortage encountered within the past six months period, at all visited Public health facilities. The reporting rate within the past 12 months for Health center was100% and for health post 100%. The reporting rate for the regional level was 100%**.**Report was sent to the next level through delegated person, telephone, mail and mobile texting. All HPs/HCs report to the Woreda Health Office from Monday to Tuesday Morning using weekly reporting formats and by Phone, and Woreda Health Office report to the Regional PHEM Office on Wednesday until mid-day using E-mail, this reporting schedule meet nationally seat standard.

Table 14: Five year reported case of malaria by month Enderta woreda Tigray, 2008 EC

Month	2004	2005	2006	2007	2008
July	119	120	13	25	5
August	159	58	18	25	18
September	186	65	6	10	35
October	148	55	11	22	96
November	56	53	23	21	61
December	48	41	33	27	16
January	90	37	47	14	N/A
February	69	26	15	26	N/A
March	61	17	5	12	N/A
April	44	10	4	14	N/A
May	29	24	3	2	N/A
June	65	19	13	8	N/A
Total	1074	526	192	204	231

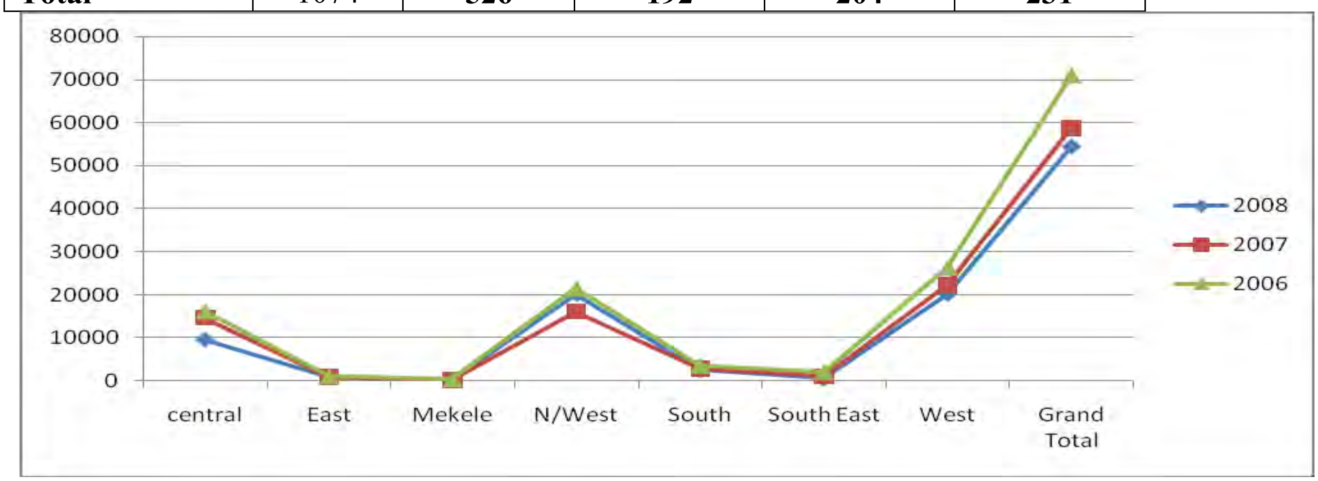

Figure 21: Trend of malaria reporting from all zones of Tigray from2006 to Jan, 2008 EC

4.1.3 Data quality

Data quality was assessed by completeness and timeliness of the reporting form. The timeliness of the report was 100%. The completeness of some key variables (malaria suspected cases and species type) was assessed to look at the data quality and it was 100 %.The information registered on the weekly reporting form matches with patient record at the health facility. This is also true at the regional level as I discuss with the PHEM and Malaria focal persons and I have seen reports.

4.1.4 Data analysis

In the assessed health facilities data analysis made on weekly basis by Malaria or PHEM officers and at health post level by health extension workers. The analysis was done only by time at health center and health posts level by using malaria epidemic monitoring chart. However in the assessed woreda analysis was done by time and place. The collected information is utilized to monitor action threshold which is done by doubling previous year cases or by using the third quartile of the five years morbidity data and for planning interventions.

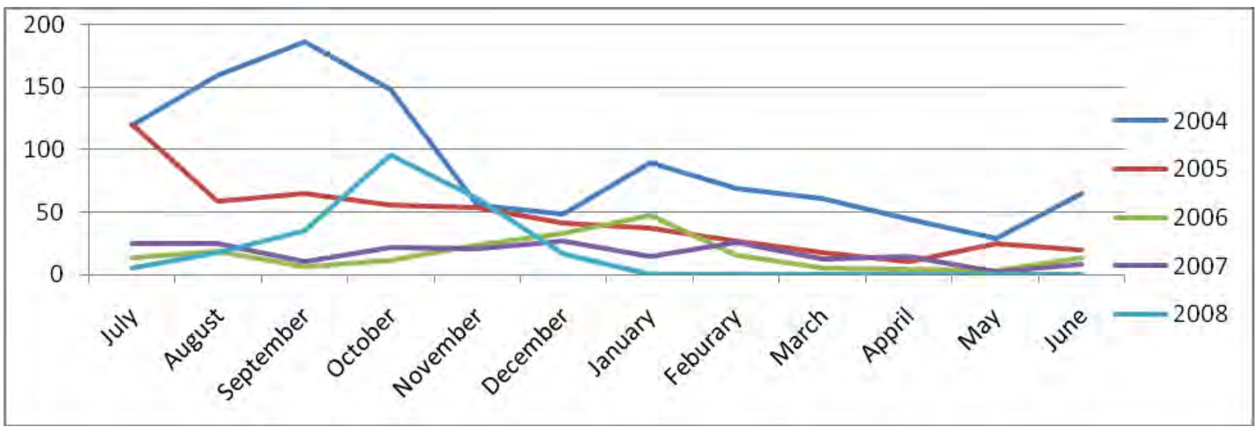

Figure 22: Five year trend of malaria data analysis by month Enderta Woreda from 2004-December 2008 EC.

4.1.5 Feedback and supervision

Feedback was given in all assessed health institutions to their respective health facilities; it is mostly given by phone and briefing during supervision. Written feedback was given in all assessed health facilities on monthly basis but there is inconsistence and documentation problem. We observed the written feedback and in all assessed health facilities written feedback was given when there was reporting problem and to notify that problem.

At regional level Supervision conducted twice within a year to the woredas health facilities according to the scheduled, at woreda level the health office had at least quarterly supervisory visit. Similarly, health center made supervision once a month in a normal situation ant twice a month if any change is evidence to their respective health post. All visited areas are 100 % achieved their planed supervision programs.

4.1.6 Epidemic preparedness and response

In regional level and the assessed woreda there is epidemic preparedness plan. All of the assessed health facilities have epidemic management committee and rapid response team. We observed the presence of epidemic management committee meeting minute. The meeting minute was available in regional level, in the woreda and health centers but handling documentation is poor on at the health center level.

There was outbreak of malaria on the visited woreda, before the visiting time a month ago by the year 2015. There was no shortage of drugs and supplies encountered during the outbreak time and the surveillance system was detected early on time.

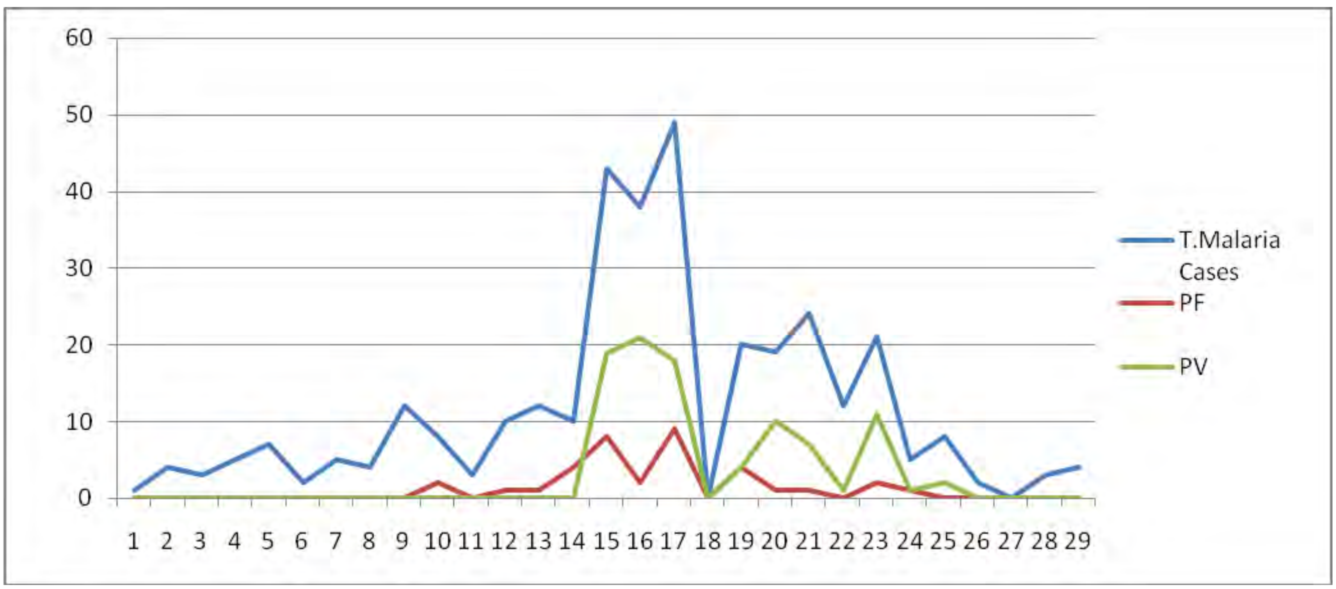

Figure 23: Weekly Malaria report Mygenet Hp Enderta woreda, south east Zone, Tigray, Ethiopia, 2008(EC).

In the assessed health facilities there was available budget used for epidemic response however in case of experiencing any emergency the region mobilize budget for response activity. Epidemic prevention and control activity is implemented based on the available local data by making analysis or by using clinical registration log book and weekly epidemic monitoring chats at health post level.

4.1.7 Resources used to operate the surveillance system

The system has supplies and equipment for laboratory diagnostic and data management, including microscope, rapid diagnostic test (RDT), Giemsa stain and slides, immersion oil, gloves, recording books and reporting forms, computers. The system also has adequate reporting formats and telephone communication available in all woreda health offices and its common material used to change surveillance reports.

There is available Malaria and PHEM guideline in all assessed health offices and health centers similarly there is IRT manual available in the assessed health posts. However, IRT manual is prepared by English language. All assessed health offices and facilities received training on disease surveillance which was given by Tigray Regional Health Bureau, WHO and JICA. There is at least one trained person at each health institution. However, the training was given before one year and above in addition there is turnover of trained staffs.

4.2 Surveillance system attributes

4.2.1Usefulness

The Malaria surveillance system presented in all assessed health institutions was able to determine the magnitude of the disease for planning and intervention. In addition, malaria trend analysis was made to detect epidemic which shows weekly count of malaria cases and epidemic threshold and it was posted at every health institution to monitor epidemic. The respondents confirmed that the surveillance system is helpful for early case detections and based on the information take actions to prevent epidemics. And claimed that the surveillance system is useful to determine the magnitude of morbidity and mortality due to diseases in the community, in addition to that, it is important to assess the effectiveness of prevention and control program for priority diseases.

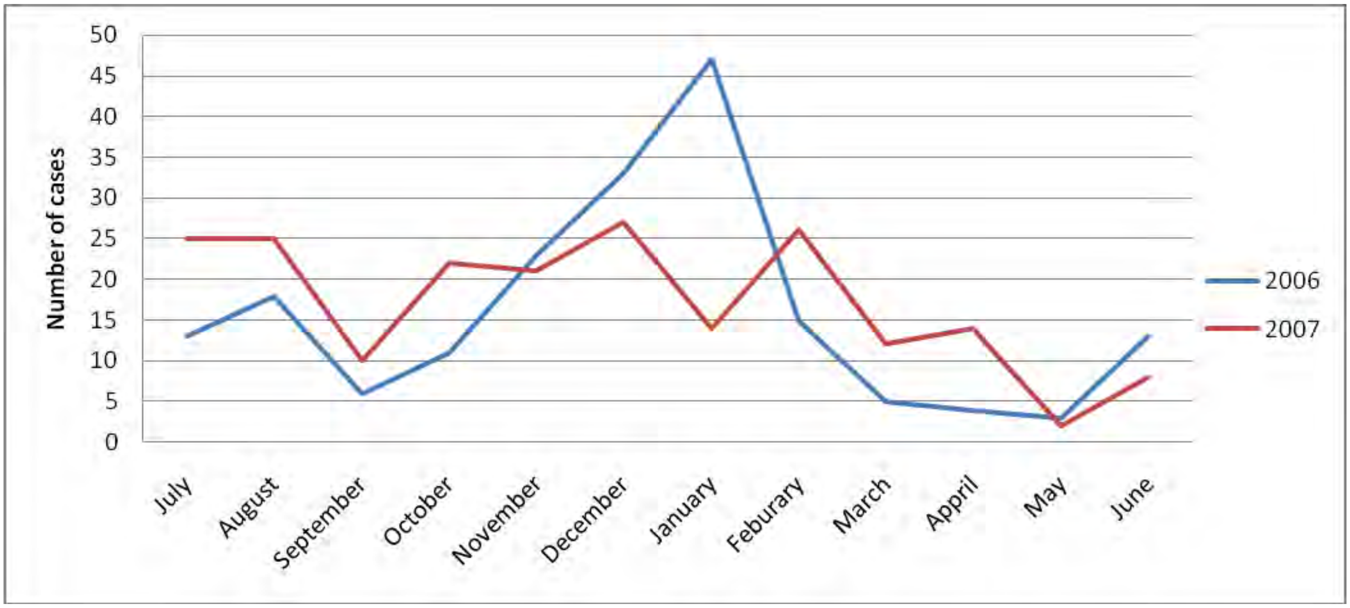

Figure 24: Malaria distribution trend by in Endreta woreda by month, 2006-2007 EC.

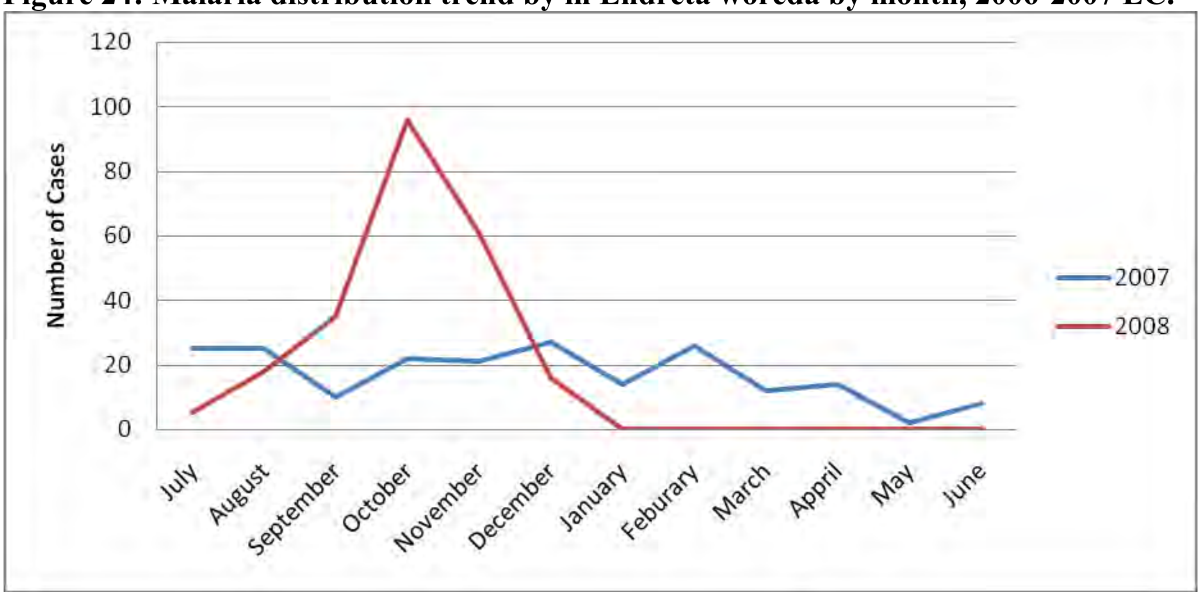

Figure 25: Malaria distribution trend by in Endreta woreda by month, 2007- Deccember, 2008 EC

4.2.2 Simplicity

All respondents in the assessed health institutions agreed the case definition of Malaria is simple and easy to understand. The process starting from data generation at the health facility level and reporting through defined reporting route as set by the guideline was clear and simple. In addition, collection of the data was simple and filling of the collected information on the paper based reports form were easy and took less than10-15 minutes. However district levels, due to the reports received from health center were paper based and the report sent from district to the next level was through electronic system and it took long time to fill.

4.2.3 Flexibility

The current reporting format used is more flexible to accommodate newly occurring health event. Change in the existing procedure of case detection, reporting and formats is difficult to adapt. All visited Health Office and Health Facilities declared that the reporting formats and procedures were flexible and could be used for other newly emerging health events (diseases) without much difficulty. This is due to the availability of a blank column for others. All respondents replied that the surveillance systems are easy to integrate with other systems. It is also easy to use technologies.

4.2.4 Acceptability

The reporting agents accept and well engaged to the surveillance activities, the reporting of Health posts and Health center is 100% within the past 12 months. The case definition and reporting tools were acceptable by all stakeholders. All Governmental reporting agents were 7 (100%) Health Centers and 10 (100%) Health Posts respectively have accepted and have been engaged in the surveillance system.

Table 15: Mygenet HP Five year malaria cases report by month Enderta woreda Tigray, 2008 EC

Month	2004	2005	2006	2007	2008
July	0	2	2	0	0
August	0	16	0	0	8
September	0	1	0	0	9
October	0	8	3	0	26
November	0	4	3	3	4
December	0	3	0	0	0
January	1	0	0	0	N/A
February	0	0	0	0	N/A
March	1	1	0	0	N/A
April	9	0	0	0	N/A
May	0	13	0	0	N/A
June	0	12	0	0	N/A
Total	11	60	8	3	47

4.2.5 Representativeness

Representativeness shows how far the routine surveillance report is covered by the health service delivery system and how many facilities are reporting to the offices. The representativeness of the surveillance system was assessed by health service coverage and by health seeking behavior for the disease. According to the woreda health office, in assessed area Hc and Hp coverage is 100. The population has good health seeking behavior for the disease.

4.2.6 Sensitivity

Sensitivity in surveillance refers to the proportion of actual cases in a population that are detected and notified through the system. But this couldn‘t be measured as the total number of persons with the disease in the community was not ascertained.

4.2.7 Positive predictive value

It is calculated by the proportion of malaria cases identified by the systems that actually have the disease. We were able to calculate the positive predictive value of the system by dividing the number of positive malaria cases confirmed by microscope by the total suspected malaria cases identified clinically during out break time in the assessed Woreda was36%.

4.2.8 Timeliness

The single most important measure of timeliness is whether data are submitted in time to begin investigations and implement control measures. Thus, timeliness of reporting was not measured according to the National PHEM Guidelines due to absence of date of receipt and date of report. According to the findings the surveillance report Timeliness of the woreda was 100% in the last three six (from July-December/2008 E.C) as per the woreda Health Office surveillance focal person. Even the regions reporting timeliness is 100%.

4.2.9 Stability

The surveillance system in the visited area is able to collect, manage and provide data properly without failure. However, most of the time data from health post is collected by phone communication and are compensated a 100 birr a month for mobile charge, from health center data are reported by hard copy and will be sent to woreda health office by delegating one health professional and the same from woreda to the region supported by electronics reporting system.

The most frequent challenge in the Hp is when trained surveillance personnel leave the position there will be difficulties in data collection and reporting which most of the time is a burden to the HC professionals.

The government allocate fund for surveillance activities and for outbreak response and in collaborating with the nongovernmental organizations allocate fund for surveillance, preparedness and response activity.

5. Discussion

Disease surveillance provides a means of monitoring disease incidence over time and, depending on the nature of the system, may be an appropriate instrument for detecting unusual patterns among incidence data. However, a properly designed system should bring forward significantly the chances of intervention disease control if the system is evaluated regularly.

Surveillance is a systematic collection, analysis, interpretation of health and health related data and the use of this data to monitor health problems for public health action. The main aim of the surveillance system is to detect outbreaks before causing any damage to the public; according to the set objective the surveillance system in Enderta woreda, I found it met its objective.

In Ethiopia, the interaction of mountainous terrain with variable winds, seasonal rains, and ambient temperatures creates diverse micro-climates. Ethiopian weather is also influenced by tropical Indian Ocean conditions and global weather patterns, including *El Niño* and *La Niña*. When a micro-climate creates local puddles, flooding conditions, and warm ambient temperatures that persist for several weeks within a malarious area with low population immunity, the resulting *Anopheles* mosquito proliferation may cause focal malaria transmission to accelerate, sometimes explosively (6). Therefore integration of the surveillance system with metrological information is paramount use full in prediction of epidemic. In addition, the intervention measures made to control or prevent malaria epidemic should be evaluated to improve and prevent failure in prevention and control strategy so that human resource skill should be built in prediction of epidemic and evaluation of intervention measure.

For a surveillance system to be useful, the information that is gathered should be analyzed and reported in a timely manner. Data analysis includes summarizing data into frequency tables, calculating rates, plotting simple graphs and comparing all information with earlier information. In the assessed health center and health posts the data was analyzed by time to monitor epidemic with reference to expected normal level of incidence and to control it in a timely manner. Analyzing data by places is where the outbreak/case builds up occurred and provides information on its geographical extent and help for availing intervention measures on the affected area. In the assessed health facilities the collected information were described by place even at health post and health center level.

According to Ethiopia PHEM guideline, there are two kinds of case definition one is prepared for health professionals other than health extension workers. The second one is called community case definition which was prepared by local language. Malaria is the only disease in the country which can be diagnosed and treated by health extension workers. Availability of case definition at health post level enhances the case detection and reporting and it was actually used it at the visited lower health facilities.

Between July 2013 and June 2014, the HMIS received malaria morbidity and mortality reports from 3,338 facilities (96%), out of the total public sector infrastructure of 156 hospitals and 3,335 health centers; this represents both a five-fold increase of health facilities and malaria reporting since 2004, and has facilitated the expansion of primary health service coverage to 94.5% of the population. In the twelve-month interval from mid-2013 until mid-2014, HMIS reported a total of2, 383.010, malaria (6).

Feedback is the important function of the surveillance system; it helps to improve the quality of the surveillance system as well as motivation for health workers. It is possible to give feedback by supervision, news letter, bulletin etc. In the assessed woreda and health facilities feedback was given to their respective health institutions through two ways; official letter and by phone. We observed the written letter of feedback and it was like letter which was written to improve reporting at different level. Though this is good start, it has to be improved for example by including analyzed data, geographic distribution of the disease and trend over time and assist in early disease prevention and control measures.

Since 2004, Ethiopia‘s health systems for case management and surveillance have been greatly strengthened. There are three major overlapping and complementary Ethiopian health facility-based surveillance systems that provide information about malaria trends: the health management information system (HMIS) data, published in the annual Health and Health Related Indicator Report, the PHEM system data, published in the FMOH‘s Annual Review Meeting report, and the unpublished annual malaria commodity micro-planning survey of district health officers.(6). As our result indicate almost the malariaSurveillance system Attributes attribute was 100% in the visited area.

The FMOH‘s PHEM system receives similar reports as the HMIS but includes malaria health post data from district offices on a weekly basis; this PHEM surveillance system now reports about 80% completeness as published in the Annual Review Meeting reports. From July 2013-June 2014, the PHEM reported 2,627,182 total malaria cases among all age groups including 2,210,298 laboratory confirmed cases (1,415,150 *P. falciparum* and 795,148 *P. vivax* cases), and 213 reported malaria deaths among all age groups.(FY2016). There for the visited area report completes was in a better way. The other report of the annual micro-planning survey provided about 99% reporting completeness from 16,786 public health facilities within malarious districts in the interval between July 2013 and June 2014.

Positive predictive value is the proportion of individuals detected by a system or test that actually have the disease of interest: low predictive value indicates many of the detected cases are not true cases, less specific case definition. The positive predictive value of Malaria in the assessed woreda during outbreak was (36%) and this should be improved.

The understanding of the Health Professionals and treatment seeking behavior of the community were found to be good for some diseases like malaria. In all Health Facilities, Health Center and Hp were available and posted the standard and community case definition of the majority reportable diseases.

The other important finding when we assessed the reason of the current outbreak in My genet (depicted in figure 3), we found that the distributed mosquito nets from woreda to the HC were not distributed to the Hp for use. This indicate us how use full if we properly and timely used the net .The other important event in this area is the construction of dam for the supply of drinking water for Mekele city and this a potential source for the breading of misquotes.

6. Conclusion

The Malaria surveillance system in Enderta was able to detect change in malaria cases and outbreak. It is simple, flexible, acceptable and stable to all operators. However, the positive predictive value should be improved. For the satisfactory result of the surveillance system the establishment of rural health HP and HPs staffed with paid HEWs plays a crucial role for the success.

7. Recommendations

To promote the best use of public health resources, all public health surveillance systems should be evaluated periodically. No perfect system exists; however, and tradeoffs must always be made. Each system is unique and must balance benefit versus personnel, resources, and cost allocated to each of its components if the system is to achieve its intended purpose and objectives. However, the following points for betterment of the system based on the finding we discussed so far.

- The sitive predictive value should be improved
- Human resource skill should be built in for predicting epidemic early and evaluating intervention measure

- Continuous supportive supervision should be in placed using checklist to increase the quality of the surveillance system.
- The surveillance system should have capacity in prediction of epidemic and evaluating intervention measures.
- The stability of the surveillance at HP level always needs a special attention due to the continuous turned over of the staff.
- Distribution of mosquito protecting material should be monitor strictly.
- When construction of dam is planning health official should be part of the planning to minimize mosquito breeding source

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Chapter IV: Health Profile

Hintalo-Wajrat Woreda, Tigray Regional State, Health profile Assessment Report 2015.

Executive Summary

Health profile is presentation and discussion of health related data and important health related indicators to describe the health and related socio-demographic factors in the geographic area under discussion. The health profile will be a living document, with sections added to the health unit and allow for better response to changing demography and health of the residents of the area

Health problems are worse in pastoralist areas of Ethiopia, due to many factors like poor economic status, low health service coverage, lower education, poor infrastructure and frequent occurrence of drought.Therefore, it was necessary to assess and describe the health profile to identify the health constraint and service status of the Woreda.

Interview using structured questionnaire were the main tools for primary and secondary data collection. The Woreda Health, Agriculture, Finance and Economic, Education, Water, Energy, Transport and the Woreda Administration Bureau were visited and asked to fill the questionnaires that related to their respective sector. Finally data were compiled and analyzed manually and using Microsoft Excel. The general objective of this health profile description was to describe key aspects of the health status and demographics of Hintalo/wojerat Woreda.

Hintalo-wojerat is one of the woreda in the Tigray of Ethiopia. It is Part of the one of the South East zone located in south of Mekele city and730 kmfrom Addis Ababa, the capital city of Ethiopia. It extends between 39`27`98``-39`87`76‘E latitudes and12`88`39``-13`44`54 E longitudes. The altitude of the woreda is lowest at 1,825 meter and highest at2, 625 meter with average altitude of 2, 225 meter. It has 22 kebeles. of them 2 towns and 20 rural residence with total surface area of 1933.09 km^2.the annual rainfall (average) is 933.75mm highest and with 336mm lowest. The woreda is bordered with Endetrta woreda, Alage Woreda, Afar region and Seharti Samre woreda to North, South, East and West respectively. Eventhough there descrypancy with the family folder (191,649), the woreda has a total population of 174,752 of which 85979 (49.2%) were male and 88773 (51.8%) were female. Most of the residents were Tigrigna nationalities and more than 99 % of them Orthodox, 0.98% Muslim and 0.2 protestant religion followers living in the woreda. The total household in the Woreda was 43,798 with an average family size of 4.4. Agriculture and Livestock rearing was the major agricultural practice in all the rural kebeles with some urban practice of trading activities. The health sector takes 9.0 %(6,467,268 ETB) excluding NGO funds while Education holds 48 % (34,506,677.02 ETB) of the Woreda budget in the year, 2007 E.C. The budget allocated for the health sector increases by 1.2 % from the previous year.

In the year 2014/15(2007 EC) the numbers of students enrolled were 87.419 of which 43,067(49.2%) & 44,352(50.8%) were males and females students respectively. In all levels female outnumbered male students, except students enrolled in 11-12 grade level school.

Safe water supply and latrine coverage in the Woreda was 48% and 71% with utilization rate of 92 % respectively. The coverage of transport with total accessibility of 334km of which 71 km paved and 263 graveled with flow of transportation per day 2.132 cars. From the 22kebeles 19 of them have access to transportation. Relatively the coverage of telecommunication is good and power supply in the Woreda is low, access to fixed telephone and mobile coverage was 546 lines and 8 mobiles respectively despite the coverage of mobile net work of the woreda which was 17(77.3%) of the kebeles have available net work. However; there is sufficient health infrastructure in the Woreda, the immunization coverage was 100%. .The Woreda has a total of 110 (69.6% of the standards) of health workers. Acute Upper Respiratory Infections and diarrheal disease were the top leading causes of OPD visit for three consecutive years in the adult and pediatries less than five years respectively in the area. All kebeles of the Woreda are under risk of malaria infection throughout the year. The Woreda TB and HIV/AIDS prevalence was 0.09% and 9.95% respectively.

Acute Upper Respiratory tract Infection, Diarrhea, and pnemonia were the leading causes of Morbidity in the Woreda which was attribute to lack of clean drinking water, poor sanitation and low public awareness of environmental health and personal hygiene practices and low coverage and utilization of ITN and IRS. Malnutrition was also the main problem of the Woreda. Therefore, all stakeholders need to do a lot to overcome all the mentioned health problems of the area.

1. Introduction

Health profile is presentation and discussion of health related data and important health related indicators to describe the health and related socio-demographic factors in the geographic area under discussion. The health profile will be a living document, with sections added to the health unit and allow for better response to changing demography and health of the residents of the area. The data in a profile reflect the health of a given community from many different angles[1]. A community can refer to a county, a locality within a county, a tribe, or a multi-county region.

The information may include data already collected and published about a community or information collected by the organizations or individuals creating the profile.As societies grow more complex and people are increasingly bombarded with health information and miss information, health literacy becomes essential. People with strong health literacy skills enjoy better health and well-being, while those with weaker skills tend to engage in riskier behavior and have poorer health.

Health Profiles are designed to help local government and health services identify problems in their areas and decide how to tackle them[2]. They provide a snapshot of the overall health of the local population, and highlight potential problems through comparison with other areas and with the national average. In general, health profile is summarized auditing and discussing health related data and important health related indicators to describe the health and related social, economical, political and cultural factors in the geographic area under discussion. Subsequently, it is vital for prioritizing major health and health related problems of the community at any level. It is for planning and for appropriate intervention and is an entry point for operational research. Stake holders of health and health related issues will access evidence based information from well compiled health profile, but such valuable information is may not found in Hintalo Wejearat Woreda, South east zone, Tigray, Ethiopia.

Rationale

Health profile assessment is a way to gain a snapshot of a community‘s current assets and needs by examining and recording community strengths, challenges, and resources. Therefore, an assessment of current health profile of a Woreda is important to provide a way for a coalition to get a better understanding of the community‘s health and what the current needs may be. H/wojerat Woreda is found in Tigray Regional State where most residents were Agriculturalists. Health problems are worse in rural areas of Ethiopia due to many factors like poor economic status, lower education, poor infrastructure and frequent occurrence of drought.Therefore, it was necessary to assess and describe the health profile to identify the health constraint and service status of Hintalo/ Wejerat Woreda.

2. Objectives

General Objective

- To develop H/wejerat Woreda health profile that could guide government health sector at all levels and different health partners to clearly identify communities health needs.

Specific Objectives

- To review existing health profile of Woreda
- To package and simplify complex health information in the Woreda
- To communicate the local burden of disease and other health related information in a practical, accessible format

3. Methods and Materials

From October 3-2015 health and health related data were collected in the Woreda. Interview and Structured Questionnaire were the main tools for primary and secondary data collection. Health and health related data were collected from all stakeholders that have direct or indirect connection with health. The Woreda Health, Agriculture, Finance and Economic, Education, Water, Energy, Transport and the Woreda Administration Bureau were visited and asked to fill the questionnaires that are related to their respective sectors. An interview was conducted to the relevant health worker and officials. Different health related records were also checked. In addition to this, data that were missed during the field visit were obtained by phone from the concerned persons of the sectors. Support letter was written to Tigray Health Bureau from EPHI to cooperate during the data collection period. Spreads sheet/excel, were used to analyze the data.

4. Results and Discussions

4.1 Background of the Woreda

Hintalo lies on a plateau in the Ethiopian Highlands near its eastern escarpment. It is just south of a steep hill formerly used for defense and just north of a wide fertile plain along the road from Addis Ababa to Mekele. Historically, Hintalo was the capital city of Enderta Province, located on a high plateau beneath the south face of Amba Aradam, which made the town a natural fortress. It was first mentioned in 1648 by the Yemeni ambassador Hasan ibn Ahmad al-Haymat, who described it as a "fortified town" . Local points of interest include the church of Mariam Nazara, built on ruins which local tradition asserts was a palace of 44 chambers built by Emperor Amda Seyon. The remaining ten rock-pillars and four chambers with roofs made of oval-shaped brick attest to the splendid nature of the building in its heyday (17).

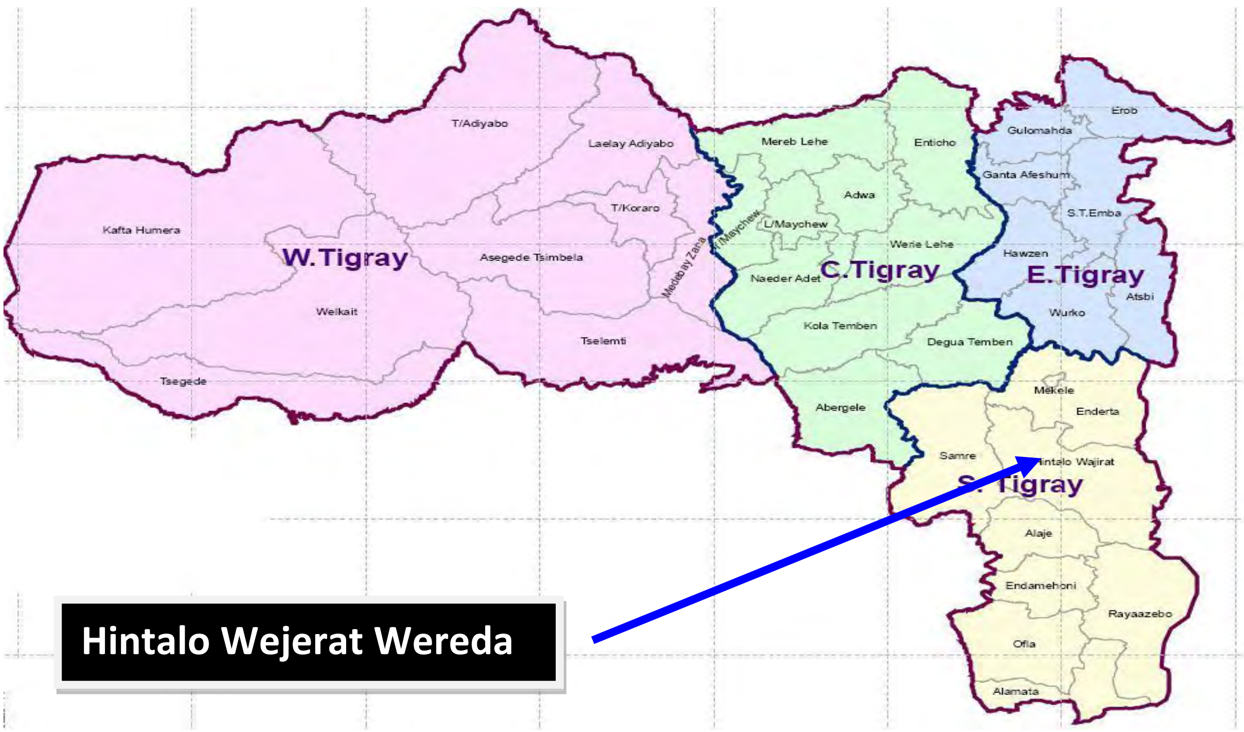
It was in November 1996 E.C in the 1st meeting of the Woreda counsel, the name HintaloWajrat was given to the wereda. The name is derived from the two ancient separate small weredas Hintalo and Wajrat. Before Mekelle city, these two sub Weredas have two large local markets. The market day of Hintalo was held on Wednesday and for Wajrat on Monday. It can be added that during the Derg regime the third town Adigudom was used as command station of the regime.

More over several places of Hintalo was administering by TPLF but Adigudom town remains to be military camp of the Derg. Based on the principle existed to make the Wereda proportional with other, in the counsel through there had been suggested two alternatives, HintaloWajrat or WajratHintalo for the naming after hot discussion, the council decided/declared/ the name of the wereda shall be named as wereda HintaloWajrat office of Adigudom.

Hintalo is founded in 464 E.C in the era of Axumait and king Alpha Omega. The foundation of village and its name is connected with the coming of Tesheatu Kudusan (the nine holly‘s) the nine holly came in the time emperor (king) Caleb. Including with the coming of the Tesheatu Kudusan, the village was established in the please where one of the emperors of Tigray lived called Emba Aradom (A mountain of Deterrent). Later on, this place where meat and alchole drinks sold, the TeshetuKudusan found that was unfavorable for them and it was not suitable for their belief, finally, they say Yehbota, Entalew (let us throw) this place, and they evacuate from the place, it is from this time HintaloWereda got its name, this naming do not come using scientific analysis and we left this for historians.(the source is found form the Woreda mass communication office in Tigrigna language and the author translated some part of it)

4.2 Geography and climate

Hintalo Wajrat is one of the woreda in the south east zone of Tigray. It is about, 198 km from Addis Ababa, the capital city of Ethiopia. It extends between 39`27`98``-39`87`76 E latitudes and12` 88` 39``-13`44`4‘ longitudes. It is located in the northwestern part of south east Zone. It is bordered by the Enderta Woreda in the North, with the Afar Regional State in the East; with Alage Woreda in the south and by Saharti Samre in the west. It founds on the main road from Addis Ababa to Mekele and covers 1,933.09 km^2. Most part of the Woreda has tropical agro-climate with 22.0 % Kola, 63.8% weinadega and 13.7% Dega. As other partt of Ethiopia even though it it is tropical climate, it is influenced by altitude and has the moderate temperate zone. As a result the mean annual temperature over the vast part of the Woreda is $20^0{}_c$ with the annual rainfall of336 up to 933.75 mm, a small rainy season during the months of April and May while summer along rainy season during the month of June, July, August and September.



Source, Tigray Regional Administrative Map

Figure 26: Hintalo/Wajrat Woreda, South East Tigray Regional State, Ethiopia

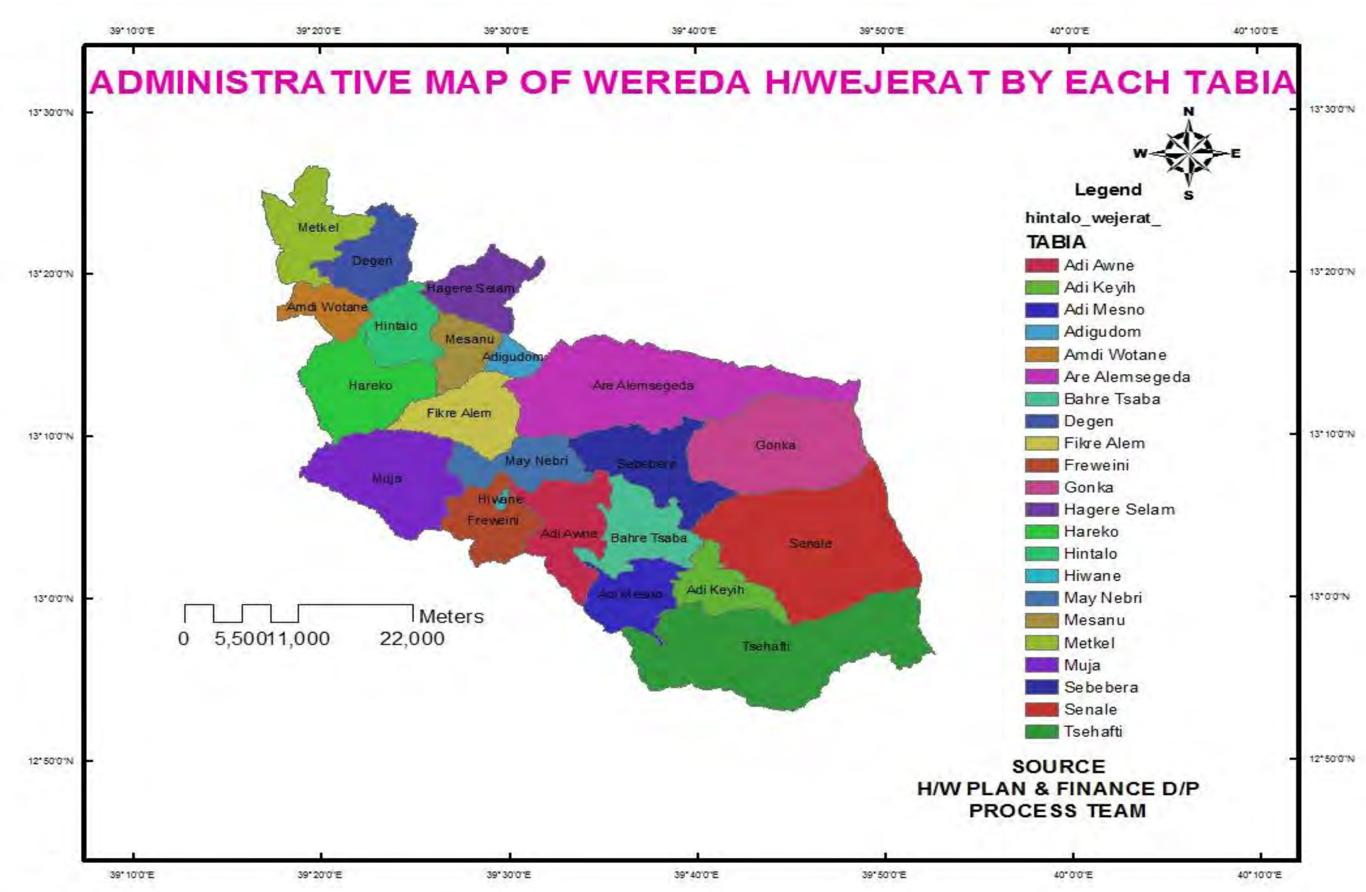


Figure 27: Administrative map of 22 kebeles found in Hintalo/Wajrat Woreda south east zone, Tigray Region, Ethiopia, 2015

In the Woreda there were a total of 22. All governmental sector offices were found in the Town of Adigudom.

4.3 Demography

According to the 2007 census and projections, in the year 2014/15 the size of Hintalo/Wajrat Woreda population, including 22 kebeles 174752 of which 85,979 (49.2%) male and 88,773 (50.8%) female which make more female than male in the sex ratioMost of the residents wereTigrian nationalities and more than 95% of them Muslim religion followers. The total household in the Woreda was 43,798with an average family size of 4.4.

Table 16: Demographic data by Kebeles, Sex and Residency, Hintalo/Wajrat Woreda, Ethiopia, 2015

		Total Population			House Hold		
S.N	Kebelle	M	F	Total	M	F	Total
1	Metkel	4590	4517	9107	1873	477	2350
2	Dejen	4434	4539	8973	1933	384	2317
3	Adiweyane	4667	4791	9458	1853	587	2440
4	Hintalo	3094	3080	6174	1379	213	1592
5	Hrekot	5013	5151	10164	2171	457	2628
6	Hagere selam	2310	3346	5656	1162	256	1418
7	Mesnu	1568	1605	3173	783	447	1230
8	Adi Gudom	5483	5832	11315	1449	809	2258
9	Fikre Alem	4277	4380	8657	1719	514	2233
10	Ara	5444	5635	11079	2036	849	2885
11	Mynebri	3041	3229	6270	1264	469	1733
12	Muja	4414	4404	8818	1786	491	2277
13	Fre weini	3573	3743	7316	1328	517	1845
14	Waza	4113	4194	8307	1625	469	2094
15	Adi Mesanu	3146	3317	6463	1317	349	1666
16	Adi Keyh	3810	3838	7648	1437	535	1972
17	Tsehafti	4041	4001	8042	1419	683	2102
18	B/Tseba	4683	4894	9577	2002	471	2473
19	Senaele	5222	5354	10576	1930	803	2733
20	Gonka	2080	2011	4091	716	306	1022
21	Sebebera	2580	2601	5181	964	368	1332
22	Hiwane	4396	4311	8707	600	598	1198
Total		85979	88773	174752	32746	11052	43798

4.4 Economic situation

Agriculture is the major agricultural practice in all kebeles (92%), which make a substantial contribution to the economy. Most rural residence farming, transport and rearing activities was source of income directly or indirectly link with them. Livestock diseases continue to have major impacts on the economy, either through direct loss of livestock and source of a disease to human. The Woreda Finance and Economy Office identified 1850(1.05%) Government Employees (civil servant), 66 (0.03%) Private own Employer, 186(0.10.4%) Daily Laborers 4163 (2.38%) were Jobless and the remaining are categorized under pastoralist and other type of activities in the Woreda.

4.5 Health budget allocation

Based on the information from the Woreda Finance & Economic Development Office,the annual budget allocated from the Region in the year 2014/15 for the Woreda was 10,500,000, ETB. Of that the amount budgeted to the Woreda Health Office was 6,467,268.11 (9.05%), ETB, next to education which has 34,506,677.02 (48.26%). A total of 500,000 ETB additional budgets has been allocated to the Woreda Health Office from donors and partners.

4.6 Education

Education is a key determinant of individual opportunities, attitudes, and economic and social status. Studies have consistently shown that educational attainment has a strong effect on reproductive behavior, fertility, infant and child mortality and morbidity, and attitudes and awareness related to family health, use of family planning, and sanitation[3]. In the year 2015/16, in the Woreda there were 3(K.G), 78 primary, 2 secondary, 3 preparatory schools and 1 TVET program were register. The wereda has a total of school age children of 45, 392. The numbers of school age students enrolled were 41,592(91.6%) of which 206369(49.8%) & 20956(50.2%) were males and females students respectively. In all levels female outnumbered male students, except students enrolled in 11-12 grade level school, for the other gross school educational enrolment observe (Table 11). The good new here is 91.6% of the school age of the woreda has accesses to education.

Table 17:Gross School educational enrolment, by sex, Hintalo /Wajrat woreda Tigray regional state, Ethiopia, 2005-2007 EC

Grade level	2005			2006			2007		
	M	F	T	M	F	T	M	F	Total
G1	3131	3017	6148	2963	3070	6033	3501	3264	6765
G1-4	10455	10772	21227	10066	10610	20676	10584	10833	21417
G5-8	6924	7916	14840	7129	8004	15133	7593	8173	15766
G1-8	17379	18688	36067	17195	18614	35809	18177	19006	37183
G9-10	2005	2026	4031	2452	2459	4911	2585	2623	5208
G11-12	436	315	751	503	338	841	627	453	1080

Based on Gender Parity Index (GPI) shown table 1, in all levels female outnumbered males students, except students enrolled 11-12 grade level school which is parallel with the national report in

2003E.C(4). According to this report, female primary school attendance was slightly higher than males and secondary school attendance was lower than males. Therefore, a lot needs to be done to fill the gap of male to female proportion in the primary school and secondary school.

Table 18: Dropout rate school education by sex H/wajrat woreda, Tigray regional State, Ethiopia from 2005-2007 EC

Grade Level	2005			2006			2007		
	M	F	Total	M	F	Total	M	F	Total
G1	14	7	21	11	10	21	0	0	0
G1-4	56	30	86	53	41	94	2	1	3
G5-8	89	59	148	57	49	106	5	0	5
G1-8	145	89	234	110	90	200	7	1	8
G9-10	44	34	78	114	64	178	23	10	33
G11-12	17	14	31	14	12	26	6	4	10

Table 19:School coverage H/Wejerat from 2003-2007 EC

grade level	2003	2004	2005	2006	2007
G1-4	30	32	30	27	28
G5-8	40	42	44	49	49
G1-8	1	1	1	2	3
G9-10	1	1	1	1	1
G11-12	0	0	1	1	1

4.7. Water Supply coverage

Hintalo/wajrat Woreda is found in the shade of Alage continuous mountains which have a rich underground water potential, but with low and unreliable distribution of rainfall. Despite this fact, the Woreda has enough surfaces and ground as a result, there was high activity to use for irrigation despite the pressures of the drought. The total safe water supply coverage in the Woreda was 64.25%, safe water coverage by kebele 48.0% and daily water consumption per day was 10 liter based on the Woreda Water and Energy Bureau information. The main sources of water in the Woreda were; deep well, shallow well hard dug well and spring pond.

Table 20:Type of safe drinking water source in Hintalo/Wajrat woreda, Tigray Regional Sate

S.N	Source of drinking water	Number	Non functional
1	**Hand pumping**	**370**	
2	**Machine**	**156**	
3	**Deep well**	**12**	
4	**Spring**	**111**	
5	**Roof harvesting**	**22**	
Total		**671**	156

Here the good experience I observe is for the remote area far from water source Hp the use water from rainfalls and hold ii in a big constructed tanker for hand and material washing on the post.

4.8. Transport, Telecommunication, Power supply

The coverage of transport with total accessibility of 334km of which 71 km paved and 263 graveled with flow of transportation per day 2.132 cars. From the 22kebeles 19 of them have access to transportation. Relatively the coverage of telecommunication is good and the power supply of the Woreda was low, access to fixed telephone and mobile coverage was 546 lines and 8 mobiles respectively despite the coverage of mobile net work of the woreda which was 17(77.3%) of the kebeles have available net work. The woreda also has one post office and bank with internet accessibility.

Woreda Health Office Structure

The Woreda Health Office structure was organized under three case teams, MCH and Environmental Health Case Team lead by the case team leader and Communicable Disease Control and Prevention Case Team directly under the Woreda Health Office Head. The functions of those teams are undertaking all management responsibilities to ensure smooth implementation of health services in the Woreda

4.9 Health Infrastructure

The numbers of health institutions administered under the Bureau of Health that directly provide services to all people of the Woreda. In 2007 E.C there were 7 health centers and 18 health posts and One Hospital, at the woreda. Based on the health extension program one Health Post serves for 5,000 people, one Health Center Serves for 25,000 people and one District Hospital Serves 100,000 people. This makes the Woreda health service coverage of100%.

4.10 Human resource; health workers and supportive staffs

The Woreda had a total of 175 and 26 supportive employees. The health workers found in the Woreda were; two one Practitioners , 14 Health Officer ,53 Nurses , 8 Mid wives , 9 Laboratory Technicians , six Pharmacists , one Environmental Health worker, two Health Information Technologists , and 64 Health Extension Workers (Table 6).

Table 21Professionals, Hintalo/Wajrat Woreda, Tigray Region, Ethiopia, 2015

S.N	Type of professionals	Unit	2003	2004	2005	2006	2007
1	Health officer	Person	05	06	7	8	14
2	Clinical nurse		57	51	50	49	53
3	Bsc, Nurse		-	1	2	3	5
4	Pharmacy technician		9	9	9	9	12
56	Laboratory technician		7	7	9	9	9
7	Environmental health		-	-	3	3	3
8	Midwifery, BSC		2	2	6	6	8
9	Midwifery, diploma		9	12	8	8	11
10	First aider		6	6	2	1	1
12	HEW		41	47	47	43	53
13	Supportive staff		5	6	6	5	4
14	Surgeon		-	-	-	1	1
15	Anesthetics		-	-	-	1	1
16	Ophthalmologist		1	-	-	-	-
	Total		**142**	**147**	**149**	**146**	**175**

4.11 Immunization Coverage

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[5]. 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[6]. The Woreda Health Office has been delivering vaccination for children for preventing and control of vaccine-preventable diseases. The immunization coverage in the Woreda in 2014/15 were for BCG, 5123 (80%) for Measles, 5169 (96%) for DPT3, 5576 (103%) for PCV3, 5692 (105%) for fully immunization (Table 7).

Table 22:Immunization Coverage by antigen, HintaloWoreda, Tigray Regional State, Ethiopia, 2014

S.N	Antigen	Plan to Vaccinate	Percent
1	BCG	5123	89
2	Measles	5169	96
3	Penta 1	5870	108
4	Penta 3	5576	103
5	PCV 1	5870	108
6	PCV 3	5576	103

The Woreda immunization coverage was satisfactory compared to the Region and the National immunization coverage.

4.12 Maternal Health Service

Proper medical attention and hygienic conditions during delivery can reduce the risk of complications and infections that can cause the death or serious illness of the mother and/or the newborn baby. An important component of efforts to reduce health risks to mothers and children is increasing the proportion of babies that are delivered in health facilities. In Hintalo Wajrat Woreda,ANC rate from the total expected pregnancy attended first ANC was 100% and attended fourth ANC 73%,percentage delivery by skilled attendance 63% and percentage of delivery attended by HEWs and TAB 2%and 9.5% respectively . Contraceptive prevalence rate was 62%.

One of the targets of the Ministry of Health, with respect to improving maternal and child health is to increase the contraceptive prevalence rate (CPR) to 66 percent by 2015[7].The Woreda contraceptive prevalence rate was promising to achieve the national program, A similar pattern was observed in other maternal and child health services. The Woreda post natal care coverage (76%) is higher than compared to the national report (42.1%) in 2003E.C.

4.13 Environmental Health and Sanitation

Environmental health programme is one of the main components of the current National Health Policy as it is evident that environmental factors are major determinants of public health outcomes. The main objective of the programme is to contribute to the attainment of a significant reduction in morbidity and mortality due to environmental health related conditions. Ensuring adequate sanitation facilities is another Millennium Development Goal that Ethiopia shares with other countries. Regarding Latrine coverage in the Woreda, there were 71%) in the year 2015 with utilization rate 33981(92%), solid and liquid waste management 34242(87%0 and 33725(86%) respectively. The Woreda health education has been focusing on raising awareness in the population on the relationship between their health and their surroundings.

4.14 Community Health Service

There was active involvement of the community in planning and implementing of all disease prevention and control activities in the Woreda. In this process, there were 53 HEWs, 15 traditional birth attendants (TBAs), 1130 Community Health Workers. There were also International and Local NGOs who support the Woreda community health service activities technically and financially.

4.17 Top ten leading causes of OPD visit (morbidity)

According to the information obtained from the Woreda Health Office, the ten leading causes of outpatient visit in the Woreda during 2003, 2004&2005 E.C are listed below in their descending order (Figure 1, Table 8 and Table 9).

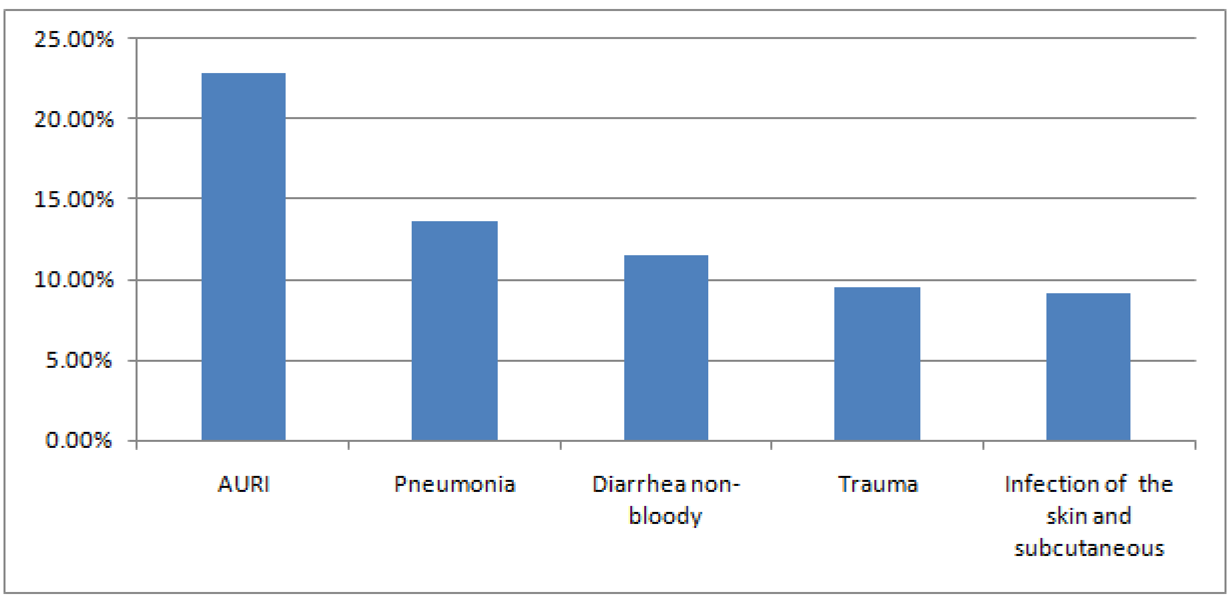


Figure 28: Five top causes of morbidity for Hintalo Wajrat woreda, Tigray region, 2007EC.

Table 23: Top Five causes of morbidity above 5, during 2007 E.C, Hintalo /Wajrat Woreda, Tigray Region, Ethiopia, 2015

	DEASESE(2007 EC)	No of cases	%
1	Acute upper respiratory infection	5363	23.88%
2	Trauma	2738	12.19%
3	Other or unspecified infection& parasite disease	2239	9.97%
4	Dyspepsia	2108	9.39%
5	Acute febrile illnesses	1987	8.85%

Table 24:Top five causes of morbidity under 5, during 2007 E.C, Hintalo /Wajrat Woreda, Tigry Region, Ethiopia, 2015

No	DEASESE(2004)	No of cases	%
1	Diarrhea non-blood	2737	27.87%
2	Pneumonia	2424	2468%
3	Acute upper respiratory infection	1546	115.74%
4	Dyspepsia	819	8.34%
5	Infection of skine	4685773	7.87%

As could be seen the above two tables and figure, Acute Upper Respiratory Infections were the first from the top ten leading causes of visit in the year 2007EC.

4.18 Top ten causes of admissions (Morbidity)

No death report was available on the woreda health office found

4.19 Endemic diseases

Malaria

Eighteen kebeles of the Woreda are under risk of malaria infection throughout the year with a 72,456 of total population under risk and the total malaria case/year was 1080.ITN coverage of the woreda was 75%

4.20 HIV/AIDS prevention and control

According to the 2014/15 of the Woreda Health Bureau Report, a total people screened for HIV was 17,397 and 3438 people got VCT service, PITC 5601 and PMTCT 5703 in the year. The HIV prevalence and Incidence rate were 1.4% and 0.57% respectively. Total PLWHA was 428, on ART 816 and on pre ART was 125.

The priority intervention area in the Woreda in relation to HIV/AIDS to date were IEC/BCC, condom promotion and distribution, voluntary counseling and testing (VCT), management of sexually transmitted infections (STIs), prevention of mother to child transmission of HIV (PMTCT), management of opportunistic infections, blood safety, infection prevention/universal precaution, care and support to the infected and affected.

4.21 TB and Leprosy

The Woreda TB prevalence was 5.2 per 10,000 populations with the mortality rate due to TB was 8.1% and other TB indicators are listed bellow in table 10.

Table 25፡TB Indicators, Hintalo/Wajrat Woreda Tigray Region, Ethiopia 2007 E.C

S.N	TB indicators	Coverage by %
1	Tuberculosis detection rate	49.4
2	TB treatment completion rate	88
3	Tuberculosis cure rate	84.5
4	TB treatment success rate	87.5
5	Total TB patients screened for HIV	100

Source: Hintalo/Wajrat Woreda Health Bureau

The target set nationally for TB control in EFY 2003 was to increase TB detection rate from 36% to 59%, TB treatment Success rate from 84% to 85%, and TB cure rate from 65% to 80% and increase the proportion of PLWHA screened for TB from 15% to 80%[4].In the Woreda in EFY 2005, TB detection rate and TB patients screened for HIV was slightly below the target set nationally for the year 2003 EFY, while TB treatment completion rate and TB treatment success rate was above the target set by the year.

There was zero leprosy case report in the Woreda in the year 2005 E.C., which is true since leprosy is more confined to the highland parts of the country.

4.22 Nutrition, Food Shortage and any Other Disasters

A total of 21700 (93.0%) children less than 5 years and mothers 3615(59%) of the plane to screne were screened for acute malnutrition in the year 2007 E.C. In order to prevent malnutrition in children, family and community should be the first line of protection. Community-Based Nutrition (CBN) aims to build up the capacity and the ownership of communities and families to make informed decisions on child care practices. The major implementation approaches include, growth monitoring, promotion and community conversation to assess the nutritional status of their children, analyze the causes of malnutrition and take action.(see the table below for detaile).

Table 26:Community Based Nutrition Hintalo Woreda, Tigray Region, Ethiopia, 2015

1. Total of children plane to screened from 6-59 months (Target)	**23336**
Total screened	21700
Coverage	93%
>12 cm	19823 (91.4%)
11-11.9 cm	1761 (8.1%)
<11	116 (0.5 %)
Edema	0
1. Total of mothers plane screened	6124
Total screened	3615
Coverage	59%
>21 cm	2579 (71.3%)
<21 cm	1036 (28.7 %)
Coverage	

Source, Hintalo wajrat Woreda Health, Office

N.B. Data from TFP, a national program incorporating treatment and management of severe acute malnutrition in primary health care services delivered from health post level to hospital level. Acute malnutrition in children under five is defined as MUAC<11CM and or the presence of bipedal oedema. Uncomplicated cases of severe acute malnutrition (SAM) are treated in the outpatient therapeutic program run from health posts and health centers (OTP). As could be seen from table 11, a total of 3615 (59 %) pregnant and lactating women were screened for malnutrition from all kebeles, 1036 (28%) of were in need on nutrition supplementation.

In the Woreda, there were 25 OTP and 2 SC sites and the total number admitted people to OTP were 441 in the year 2007 E.C. From the total people admitted to OTP all most all consisted of children 6-59 months age group. Regarding disaster situation, Drought, flood, crop pest, livestock disease were the biggest problems that affect the Woreda frequently. According to the Woreda Information Office Flooding always affected livestock grazing land, crops, human health, and infrastructure, as result flooding is the common natural hazard in the Woreda.

4.23 Essential drugs shortage

According to the Woreda Health Office, budget for drugs and other medical supplies was demand and purchased by the woreda as the system is follow decentralized approach.

5. Discussion

Acute Upper Respiratory tract Infection, Diarrhea, pneumonia and trauma were the leading causes of Morbidity in the Woreda which was attribute to lack of clean drinking water, poor sanitation and low public awareness of environmental health and personal hygiene practices.

In Hintalo-wajrat the total safe water coverage in the kebeles was 48% and most of the schools do not have water supply and most of those schools do not have functional toilet. Due to the absence of water at their school the students take water to the schools for their daily consumption or they do not take. As the result of absence of toilet, the students are forced to use open space to urination and/or defecation around the school or wait until they get home. Hand hygiene is the most important measure of prevention and control of infection and can reduce the burden of diseases. But, the practice of hand washing is very poor aggravated by the recurrent drought which result in critical shortage of water. A study conducted in kersa woreda, Eastern Ethiopia revealed that from those households participated in the study with latrine the habit of hand washing after defecation was reported to be about 5.1% (8). The existence of proper hand washing facilities affects the hand washing practice. When there is no water in the school, children cannot wash their hands.

Inadequate sanitation is mostly responsible for diseases which are transmitted through the fecal –oral route. Unimproved hygiene, inadequate sanitation, and insufficient and unsafe drinking water account for 7% of the total disease burden and 19% of child mortality worldwide. In Ethiopia about 75% of causes of OPD visits are largely due to the lack basic sanitation provisions (9). The important point here to mention is, among the five top listed trauma was one health problem; most of the reason was due to domestic dispute resulting from an appropriate behavior.

In Hintalo Wajrat Woreda, ANC rate from the total expected pregnancy attended first ANC was 100% and attended fourth ANC 73%,percentage delivery by skilled attendance 63% and percentage of delivery attended by HEWs and TAB 2%and 9.5% respectively . Contraceptive prevalence rate was 62%.One of the targets of the Ministry of Health, with respect to improving maternal and child health is to increase the contraceptive prevalence rate (CPR) to 66 percent by 2015[7].The woreda profile regarding ANC was good comparing with the previous years.

Combination of contraceptive use, improved transport, education and birth in a health facility can reduce 75% of maternal deaths (10). A study conducted in Ethiopia showed that majority of delivery

(78%) attended at home assisted by traditional birth attendants. Another case control study conducted in Bahirdar, Ethiopia showed that the likelihood of delivering at home was greater among mothers with inadequate knowledge of pregnancy related services, those who started attending ANC after 24 weeks of gestation, mothers having no formal education and rural residents (11).

Family planning reduces mortality and morbidity due to pregnancy and child birth. Family planning saves lives of women and children as well as improves the quality of life for all. It is one of the best investments that can be made to ensure the health and well-being of women, children, and communities. Family planning has great role in significant reduction of maternal mortality by reducing exposure to unintended pregnancy and unsafe abortion in developing countries where the majority of maternal deaths occur. The use of modern family planning methods has potential to reduce about 25%-40% of all maternal deaths in developing countries (12).In hintalo-Wajrat woreda the contraceptive acceptance rate is low (66%); this means the populations are not willing to use modern contraceptive methods. According to EDHS 2011, use of modern contraceptive methods among currently married women has increased from 6 percent in the 2000 EDHS to 27 percent in the 2011 EDHS this is largely due to the sharp increase in the use of injectable (13). Study conducted in Jimma revealed that knowledge and practice of modern contraception methods is low. Most women‘s contraceptive knowledge and practice was influenced by socio-cultural norms such as male/husband dominance and opposition to contraception, and low social status of women. A lack of formal education for women was identified as a key factor in preventing change in the patterns of contraceptive knowledge and use by women (14). Moreover, another study conducted in Ethiopia showed that inclusion of husband in family planning program will increase the use of modern contraceptive methods. Therefore, advocacy work has to be done for the community to improve the community acceptance of modern contraceptive method (15).

On education the woreda profile show us 91.6% of the school age of the woreda has accesses to education and the engagement of female is good ,but on high school (11-12) there was declaim in number comparing with male unlike to the primary school and this should give attention to correct

The health sector, infrastructure, human resource, immunization coverage, nutrition screening and maternal service performances as observed on the result portion is satisfactory. This report can compared with the Tigray bureau of health annual profile. It sates as follow, In EFY 2007, the physical health facility coverage reached the national and regional target with 712 HPs (96% coverage), 204 health centers (100% coverage), 20 primary hospitals, and 16 hospitals in the region (100% coverage), in addition to private hospitals and clinics according to the 2007 EC census population estimate of 5,055,999. Moreover, additional curative services are delivered by private hospitals, specialty clinics, pharmacies, drug shops and rural drug vendors (16).

6. Conclusion

In Hintalo-Wojrat woreda Compared to the last three years, communicable disease like Acute Upper Respiratory Infection, Diarrhea, pneumonia and trauma were the leading causes of Morbidity in the Woreda are the most frequently occurring disease both in adult and pediatric population. The recurrent drought attributes to lack of clean drinking water, poor sanitation supplemented by low public awareness of environmental health and personal hygiene practices. To sum up, there was better health improvement in ANC follow up as well as in immunization c in education enrolment overage and effective health management approach. Moreover there was good achievement in education.

7. Recommendations

- Health education to the population is needed regarding environmental health, personal hygiene and dispute handling.
- The coverage of safe drinking water, telecommunication and power supply should be improved.

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Chapter V: Scientific manuscript for peer reviewed Journal

Title: **5.1.Diarrheal Outbreak in Addis Raey training centre, Amibara woreda, Afar, Ethiopia, June, 2015**

Abstract

Background: Diarrheal diseases can be caused by numerous pathogens and transmitted through multiple vehicles. Worldwide, 780 million individuals lack access to improved drinking-water and 2.5 billion lack improved sanitation. Globally, there are nearly 1.7 billion cases of diarrheal disease every year. On June 3, 2015, a team from the EPHI was deployed to investigate for AWD outbreak in Amibara woreda of Afar region, Ethiopia.

Method: We conducted a descriptive study followed by unmatched case control study, useing a structured questionnaire to collect data from cases (51) and controls (102) to find out the risk association. We took water samples for Microbial analysis and 1102 Stool samples were collected for bacterial culture and parasitological investigations. Epi Info was used to calculate frequencies, odds ratios and SPSS to perform logistic regression to identify risk factors for diarrhea from 03 June-02 Jul 2015.

Result: Fifty-one cases and 102 controls were enrolled. On multivariate logistic regression analysis Cases attending patient (AOR=7.5; 95%CI: 2.43, 23.35), Lack of using soap after toilet or latrine (AOR = 5.2; 95% CI: 1.66, 16.34) were more likely to be affected by diarrhea. Copared to those who wash thir hands after toilet; those who washed their hands some times were more likely to develop diarrhea (AOR = 7.2; 95% CI: 1.95, 26.64). Also those who used latrine were more likely to be affected by diarrhea (AOR= 19.6; 95% CI: 6.47, 59.45).

Conclusion: The causative agent of the outbreak was confirmed by lab.Factors independently associated with the occurrence of diarrhea outbreak were attending patient, not using soap after toilets, washing hands some times after toilet and using toilet were found risk factor for the occurrence of this outbreak.Therefore,these findings underscore the importance of adequate access to safe water, sanitation, hygiene and environmental sanitation as well as continuous treatment of drinking water is highly recommended.

Key Words: Poor Snitation, diarrhea, outbreak, risk factors, pathogens, Afar, Ethiopia

2. Introduction

Diarrhea is the passage of three or more loose or liquid stools per day, or more frequently than is normal for the individual. It is usually a symptom of gastrointestinal infection, which can be caused by a variety of bacterial, viral and parasitic organisms. Diarrial Infection spread through contaminated food or drinking-water, or from person to person as a result of poor hygiene (1).

Dysentery is a general term for a group of gastrointestinal disorder characterized by inflammation of the intestines, particularly the colon. Characteristic features include abdominal pain and cramps, straining at stool and frequent passage of watery diarrhea or stools containing blood and mucus both are common but potentially serious disorder of the digestive tract occurs throughout the world(1).

It can be caused by number of infectious agents ranging from viruses and bacteria to protozoa and parasitic worms; it may also result from chemical irritation of the intestine. Dysentery is one of the oldest known gastrointestinal disorders, have been described as early as the Peloponnesian War in the fifth century B.C. Epidemics of dysentery were frequent occurrences among sailing vessels as well as in army camps, walled cities, and other places in the ancient world where large groups of human beings lived together in close quarters with poor sanitation. As late as the eighteenth and nineteenth centuries, sailors and soldiers were more likely to die from the "bloody flux" than from injuries received in battle. It was not until1897 that a bacillus (rod-shaped bacterium) was identified as the cause of one major type of dysentery (2).

Dysentery in the modern world is most likely to affect people in the less developed countries and travelers who visit these areas. According to the Centers for Disease Control and Prevention (CDC), most cases of dysentery in the United States occur in immigrants from the developing countries and in persons who live in inner-city housing with poor sanitation. Other groups of people at increased risk of dysentery are military personnel stationed in developing countries, frequent travelers, and children in day care centers, people in nursing homes, and men who have sex with other men (2, 3).

Infectious diarrhea remains a major risk to deployed military units worldwide in addition to their impact on travelers and populations living in the developing world (4, 5). Diarrheal disease is a leading cause of child mortality and morbidity in the world, and mostly results from contaminated food and water sources. Worldwide, 780 million individuals lack developing countries. Globally, there are nearly 1.7 billion cases of diarrheal disease every year (6). Diarrheal diseases can be caused by numerous pathogens and transmitted through multiple vehicles. Persons living in developing countries with poor access to safe water, sanitation, or hygiene infrastructure have increased risk of exposure to viral, bacterial, and parasitic pathogens that can cause diarrheal diseases (5).

This report describes an outbreak of diarrheal illness in Addis Raey training center, Amibara woreda Afar region, which came from a big city and towns throughout the country for the purpose of enabling jobless youngster to equip with skill to have a job on the mega projects of the country. On June 2, 2015, at the request of the Ministry of Health, a team from the EPHI was deployed to assist with the investigation. At that time, due to limitations in surveillance and diagnostic capacity and poor clinical setup, the scope and nature of the outbreak were unclear. An initial aim of the investigation was to improve our understanding of the temporal distribution of the diarrhea cases, and to implement a access to improved drinking-water and 2.5 billion lack improved sanitation. Diarrhea due to infection is widespread throughout mechanism for rapidly and reliably assessing the progression of the outbreak. We also aimed to identify diarrhea etiologies and risk factors for acquiring diarrhea, and to recommend appropriate strategies to prevent similar events from recurring.

Litrature Riview

A study conducted in Kersa district, located in Eastern Ethiopia. A community-based cross-sectional study was conducted by a group of researcher from college of health science, Haramaya University, Addis continental institute of public health, and School of public health Addis Ababa University; among 1456 randomly selected households with at least one child less than 5 years of age. The two-week prevalence of diarrhea among children under 5 years of age was 22.5%. Improper refuse disposal practices, lack of hand washing facilities, living in rural area, the presence of two or more siblings in a household, and age of the child were the major risk factors for diarrhea. This study demonstrated that diarrhea morbidity was relatively high among children less than five years of age residing in Eastern Ethiopia (8).

Diarrheal illness is one of the most common infectious risks among short-term travelers to the developing world, with some studies indicating over 50% of travelers being affected during a two week visit to an endemic country (9 and10). In a series of 784 American tourists traveling in the developing world for a median 19 days, 46% reported at least one episode of diarrhea (Hill, 2000), while Scottish tourists in Central and South America reported comparable rates of diarrhea (39.5%) (11). On the other hand, a cohort of 36 Peace Corps volunteers in Guatemala developed 4.7 episodes of diarrhea over a mean 1.8 years of follow-up; 6.1 episodes/person-year occurred in the first 6 months, declining to 3.6 episodes/person-year after 12 months (12).

Among military populations, there was diarrheal disease studies conducted in the Middle East during Operation Bright Star. In 1989, up to 44% of personnel reported diarrheal disease with ETEC (49%) as the predominant pathogen identified (13). During surveillance activities in 2001, 9.3% of troops reported a diarrheal episode in 2005; diarrheal disease was prevalent with 35 cases of diarrhea/100 person-months (14). In personnel deploying to Iraq or Afghanistan in 2003 to 2004, 78.6% of troops in Iraq and 54.4% of those in Afghanistan experienced diarrhea, with 80% seeking care from their unit medic; eating local food from non-U.S. sources was associated with an increased risk of illness (15). U.S. forces during missions conducted in Latin America showed an overall attack rate of 26%, with off-base travel and ice consumption being associated with higher reported disease rates (16). These studies have demonstrated the risk that diarrheal illness presents to military operations and the risks associated with local food sources.

Other study conducted in Tanzania, Lack of access to safe drinking water, together with inadequate sanitation and hygiene, has been identified to be the main contributor to diarrhea infection and deaths globally (17). In rural areas of developing countries, drinking contaminated water is an important cause of diarrhea (18). Lack of access to basic water supply and sanitation is a major problem in both rural and urban Tanzania. Less than half of the rural population in Tanzania has access to safe drinking water (19). Access to clean and safe water in rural areas has declined since 2001 – from 46% to 40% in rural areas (20).

Diarrhea was the fourth contributor of outpatient visit and the fifth cause of Mortality among children under the age of five years in the child gets about 5 episodes of diarrhea per year and the most frequently affected regions in the country are Shinyanga, Mara, Rukwa, Dodoma, Mbeya, Coast and Kigoma (22). The most recently study on prevalence of diarrhea among underyear 2009 in Tanzania (21).-five children was conducted in semi-urban wards of Mkuranga district and reported the prevalence of 32.7% (23). However, there is scarce information on the prevalence of diarrhea among children under-five years, and information on knowledge on causes of diarrhea among community members in rural areas of Mkuranga district.

2. Objective

2.1 General objective

To investigate determine diarrheal outbreak in Addis Raey, Amibara wereda, Afar region Ethiopia, June 2015

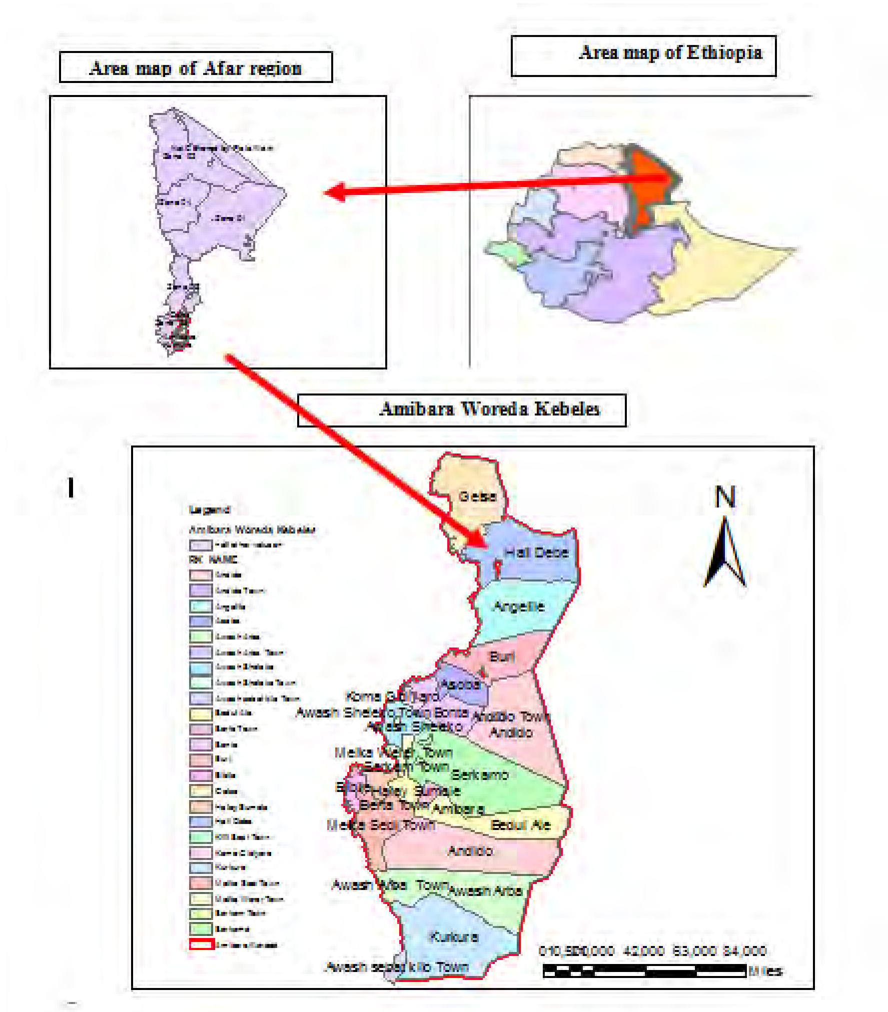
2.2 Specific Objectives

- To confirm the existence of the outbreak
- To identify the causative agent and mode of transmit ion of the outbreak
- To describe the outbreak in respect of time, place and person
- To take possible intervention measures as to contain the outbreak and prevent occurrence of further cases

3. Methods and Materials

3.1 Study area and Period

Addis Raey Camp is located in Afar regional State, Amibara woreda 43 K.M from Awash Sebat City and around 293 K.M from the capital city. Addis Raey Training center is a nongovernmental and non profitable organization which trains jobless citizen in different profession and technical fields in collaboration with different governmental stakeholders to build a capacity for the non employed young citizens who come most of them from low economic status including homeless from the street of big cities to have job on the megaprojects own by government and investors. According to the authority, the center so far graduated 7.560 and all of them have job opportunity on the ongoing governmental and other projects. In the implementation of this project government stakeholders such as Ministry of Defiance, Ministry of Agriculture, Revenue and Customs Authority and Ministry of Health have been playing their respective role. The camp has a total population of 10.000 people of which 9780(98%) males and 220(2%) are females (map: 1), the study was conducted from 03 June-02 Jul 2015.



Map 1: Map of Amibara Woreda, Afar region, addis Raey Training center, Ethiopia, 2015

3.2 Study design

We conducted unmatched case-control study to investigate the outbreak

3.3 Study population

- **Cases:** any person residing in the camp who had three or more loose or watery stool in a 24-hour‘s period, abdominal cramps, vomiting and nausea in the Addis Raey training center within the two weeks period of time prior to the outbreak (51 cases).

- **Controls:** were all people without diarrhea symptoms during the study (102 controls)

3.4. Inclusion and Exclusion criteria

Inclusion Criteria

- **Cases:** All 51 diarrheal cases sent by line list that had symptoms of diarrhea (watery, mucoid or bloody diarrhea, vomiting, abdominal cramps) from 03-18 June 2015 who agreed to participate in the study were included.
- **Controls:** Any resident of Addis Raey training center during the study period who was a neighbor to a case and who did not develop signs and symptoms of diarrhea and agreed to participate were included.

Exclusion criteria

- **Cases:** No refusal to participate in the study was encountered.
- **Controls:** Those who refused to participate were excluded as well as when more than one eligible in the family the elder were excluded.
- **Case Definition**
- Diarrhea: is defined as having three or more loose or watery stool in a 24-hour‘s period in the Addis Raey training center within the two weeks period of time prior to the outbreak.

- **Key terms**
- **Ameobiasis**, also known as **amebiasis** or **entamoebiasis**, is an infection caused by any of the amoebas of the *Entamoeba* group. It is a parasitic infection caused by the protozoal organism *E histolytica,* which can give rise both to intestinal disease (e.g., colitis) and to various extra intestinal manifestations, including liver abscess (most common) and pleuropulmonary, cardiac, and cerebral dissemination.
- **Giardiasis**, also known as beaver fever or giardial infection is an infection of the digestive system, caused by giardia lamblia, a single-celled organism (parasite).

3.5. Sampling

The sample size was calculated using Stat calc function of Epi-info version 7.1.4.0. Using the confidence level of 95%, power of 80%, and assuming a 32.6% prevalence of a previous contact with someone with diarrhea like disease in under five(24) and an OR 2.7, with 1:2 cases to controls a total of 51 cases and 102 controls were enrolled.We used a structured questionnaire that addresses possible exposures for the suspected diarrheal dysentery. We identified study subjects at health facilities both cases and controls were recruited at health center outpatient department, when they came to the clinic for medical support. Simple random sampling method was conducted without replacement and if more than one eligible in the camp one was taken by lottery method as control with nearst care taker to the case was given priority until the sample size was reached.

3.6. Data collection method

A structured interviewer-administered questionnaire was used to collect data on factors associated with contracting diarrhea, attending patient, not using soap after toilets, and washing hands some times after toilet and using toilet, sharing utilities and latrine utilization.

Descriptive: Dismantled Medical records were assessed and reviewed. Physicians working at nearby Mohamed Ali Hospital and Nurses of the training center were interviewed.We evaluated information concerning any recent change in the case definitions, reporting situations and laboratory diagnosis tools and population size. We defined suspected cases of unidentified diarrheal dysentery illness as any person with abnormal stool (watery, mucous and bloody), Abdominal cramp, loss of appetite, general weakness, dehydration, sometimes vomiting and Abdominal upset in Addis Raey Camp**.** Direct patient interview was conducted with some of the patients. Active case search was performed block to block. Discussion with the block residence committee was conducted. Treated cases with diarrheal dysentery were identified from ill handling and dismantled records to use line list from 14/05/2015-3/07/2015. Data were entered in Excel and descriptive analysis was done. We described the outbreak over time by date of onset. We calculated the attack rate by sex, age and place. Finally, bases on their clinical manifestation, severity of illness and residence setup we ruled out some of different parasites (such as Ameba Gardia) and Bacterial infection like bacilli and others and drug s were requested accordingly.

Analytical Study: We conducted analytical observational unmatched case control study (1:2). We designed a structured questionnaire that addresses possible exposures for the suspected diarrheal dysentery. We identified study subjects at health facilities Both cases and controls were recruited at health center outpatient department (OPD) when they come to the clinic for medical support and the control for help of their friends by using random sampling methods. We gave oral consent for study subjects. We interviewed 51 suspected cases and compared with 102 control subjects. Cases were defined as any person with any of the following sign and symptoms such as, an active watery diarrhea, dysentery, abdominal crump, dehydration, vomiting and fever with measured temperature of $\geq 38^0$ C. within the last 14 days history of on set. Controls were defined as any person having the same characteristics with case patients except history of the above clinical pictures. We calculated odds ratio and 95% confidence intervals using Epi Info. We entered data and analyzed by excel and Epi-info version 7.1.4.0

Physical Examination: We also assessed patients physically for farther information in order to critically list all possible differential diagnosis. Complete demographic and personal information of the patients were not obtained. Clinical manifestations and fever were also documented

Laboratory:

Water samples were taken for Microbial analysis; two water samples were collected aseptically from the main tanker and from the point of use. The samples were collected using sterile 500ml container obtained from EPHI public health laboratory. Aerobic Plate count (APC), coli form count, fecal coli form and *E.coli* type1 was done using World Health Organization (WHO) and reference methods.

Stool Culture

A total of 1102 Stool samples were collected forparasitological and 27 sample for bacterial culture investigations. Stool specimens were collected from eligible patients and shipped to National Bacteriology and Mycology reference laboratory using Cary Blaire transport media at 2-8C^0, and tested for common aerobic bacterial pathogens at clinical bacteriology Laboratory using Clinical Laboratory Standard Institute Guideline 2014 .

Environment Investigation

General Assessment of the Camp on residential area, Food Service, Water Supply, Latrines and Health facility Services were assessed.

3.7. Data analysis and clearance

The data was collected, entered and edited using Epi-Info version7 software and checked for completeness and consistency. Descriptive statistics were used to determine the frequency of different variables. Bivariate and multivariate logistic regression analysis was applied. Results were displayed using tables and graphs and it was interpreted using Odd ratio, P value <0.05 and 95% confidence interval.

3.8. Ethical issues

The Addis Raey managing committee request help to FMOH to investigate and to contain the outbreak .FMOH give order to EPHI to assigned a team of investigators with different team compositions in coordination with one expert from FMOH, organized from Ethiopian public health institute (EPHI) and deployed on Jun 3-2015 to the training center under close supervision of the health officials (FMOH and EPHI) having the objective to investigate and identify the causative agent, source and root of transmission and finally to come up with prevention and control measures.The purpose of the investigation was clearly explained for all respondents before clinical specimens and epidemiological data were collected. We told all respondents as the result of the study will be used only to prevent and control the outbreak. The specimen collected will not used for other purpose rather than investigating the causative agent for the outbreak.

4. **Results**

Descriptive Analysis

We identified 1814 reported cases of diarrheal report from May 14 to Jul 2, 2015. Of the cases 1763(97.2%) cases were males while the rest 51(2.8%) females. Crude attack rate (CAR) was 18.1% while Sex specific attack rate was (SSAR 23% and 18%) in females and in males' respectively. There was no any death reported.

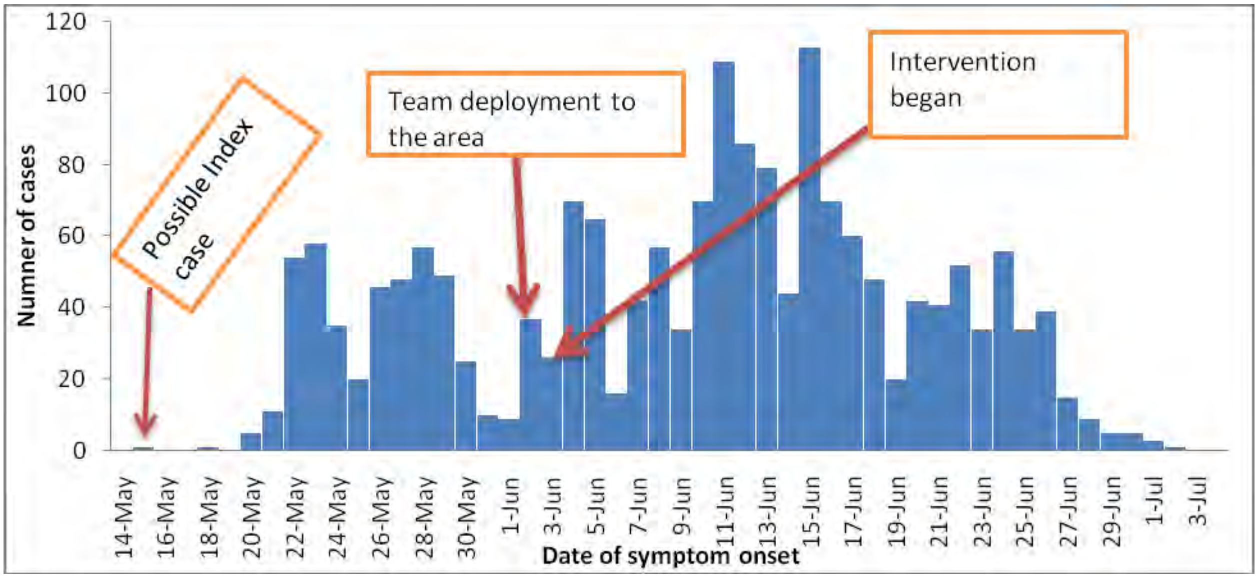


Figure 29: A common source of diarrheal outbreak cases distribution by date of onset, Addis Raey Training Center, Amibara Woreda, Afar, Ethiopia; July- 2015

Among the cases, younger age groups were more affected during the outbreak with attack rate of 59.2% and 33.7% for the age groups 15-24 and 25-34 respectively. Similarly, among the age group of 15-24 most of them were males 1763(ASAR 97.2 %) and 51 (ASAR 2.8 %) were females. Almost all of the Female cases (92.2%) were among this age group; the rest (7.8%) was with the age group 25-34. There is no case below or above the age of 15 and 52 respectively. (Table 26)

Table 27: Case distribution by age and the majority case are under age group of15-24 years.

Age groups	Male Cases	Female Cases	Total Cases	Percent
< 1	0	0	0	0.0%
1_4	0	0	0	0.0%
5_9	0	0	0	0.0%
10_14	0	0	0	0..0%
15_24	1026	47	1073	59.2%
25_34	607	4	611	33.7%
35_44	126	0	126	6.9%
45_54	4	0	4	0.2%
55_64	0	0	0	0.0%
> 65	0	0	0	0.0%
Total	1763	51	1814	100%

The distribution of stool characteristics registers during clinical examination, the higher frequency were watery diarrhea (47%) followed by Dysentery (33%) and Mucoid (20 %). (Figure 3).The distribution of the case between unites (shaleka) were almost the same in all four shalkas namely Abay, Tekeze, Hidase and Gibe.(Figure 4).

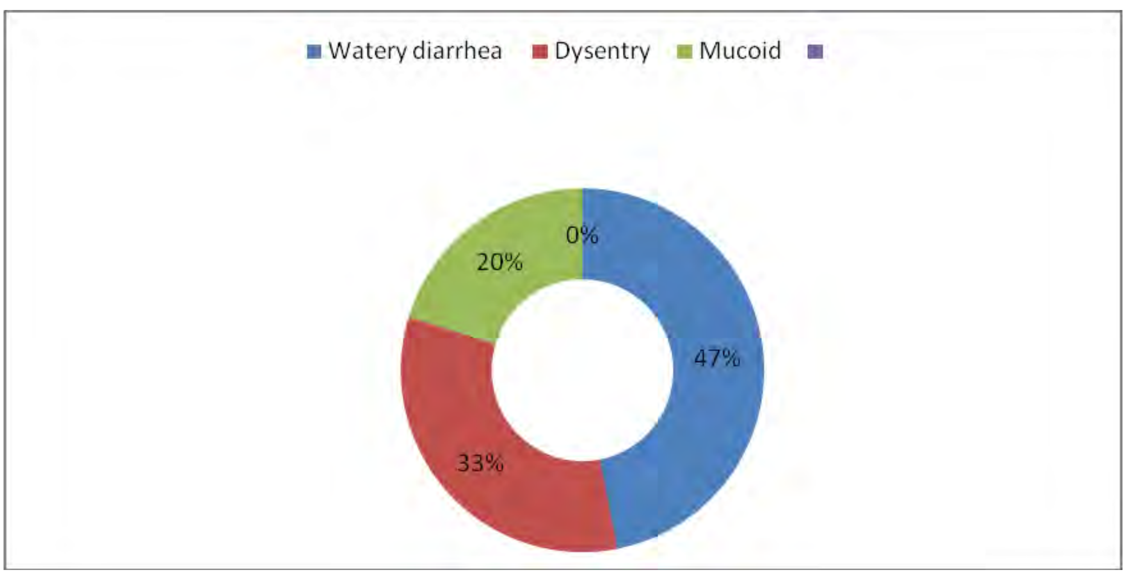


Figure 30: The frequency Distribution of Cases by Type of stool character during Clinical Visit (Only for case that has detailed description of stool character).

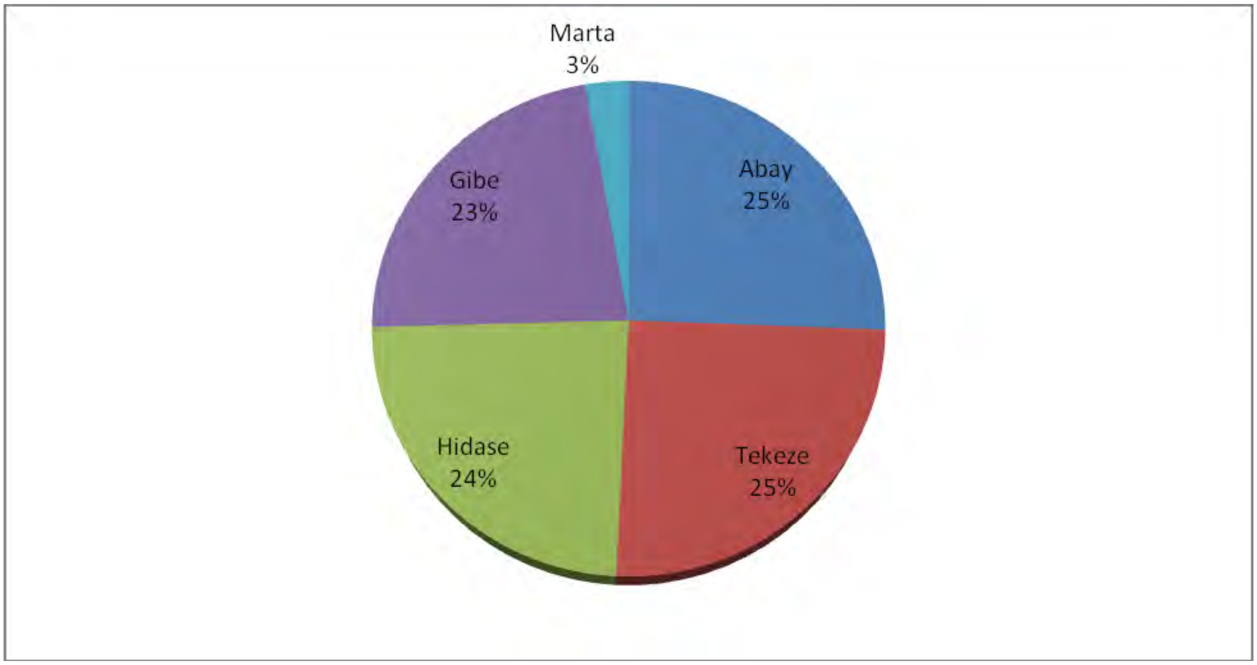


Figure 31: Cases distribution by place (Among the Shaleka*)
* A form of military organization in Amharic equivalent to regiment.

Environmental Investigation

General Assessment of the Camp on Residential Area, Food Service, Water Supply, Latrines and Health facility Services were assessed.The Environmental assessment reviled that most of the camp areas including kitchen, dining areas and latrines have poor sanitation. In addition there is no enough washing facility and latrines so that open defecation is common in the camp. Water storage materials are not regularly cleaned before use and patients identified with diarrheal illness participate in food and water handling and preparation. The camp has one kitchen, three cafeterias and uses the same water source. They have also 26 big blocks used to reside the trainees ,the male trainee are residing in 25 Blocks in which 7080 male trainee live (more than 250 in each Block) while the females (220) living together in one block. There was no proper clinical set up and pharmaceutical supplies. There was no clear referral system. There are extremely over crowded population which does not much with the available resource to maintain proper environmental and personal hygiene. There is one kitchen for the entire trainee with three cafeteria, 42 pipeline water, 120 showers, 221 hand washing facility, 198 close washing gantries (Genda) and 160 bathrooms for the entire trainee.(Figure33).

Figure 32: A sample photo of latrine used by the trainee with full of dirty overflowing sewrage and without slap.

Health facility

There was no proper clinical set up for the trainee; only two metal sheet constructed rooms were available with insufficient staffing of man power and with shortage of basic medical supplies (no antiseptic, disinfectant chemicals and drugs).poor hand washing facilities and very crowded waiting areas was evident. There was no clear referral system .After the problem existed, after our arrival and demand the clinic was staffed with three health officers, one Lab technician and one pharmacist from afar and Addis Ababa administrationHealthBureau with agreement of FMOH and the mention health bureaus .The center have no environmental professionals. Generally the medications and the supplies in the center were below optimal to deliver care for patient

.

Laboratory results:

Water analysis result

The Bacterial isolation conducted at EPHI showed that high Bacterial coli forms and E coli were identified from water used at the Camp. Of the two water samples analyzed for bacterial contamination using four parameters both storage tanker and point of use were unacceptable for use based on the required acceptability set by WHO Standards for un chlorinated water.(see tables 1& 2)for Point use and storage tanker

.

Table 28: Shows result of drinking water test taken from storage tanker and point of use.
Shows result of drinking water test taken from storage tanker and point of use.

Parameter	Result	Acceptable limit
At storage tanker		
APC at35 ^{0}c**	<1x10^{1}cfu/ml	
Coli form count*	35 MPN/100ml	
Fecal coli form*	35MPN/100ml	<1MPN/100ml
E.coli type 1	present	Absent
At point of use		
APC at35 ^{0}c**	<1x10^{1}cfu/ml	-
Coli form count*	160 MPN/100ml	-
Fecal coli form*	160MPN/100ml	<1MPN/100ml
E.coli type 1	present	Absent

*In the coli form count minimum detection level of <1 is considered as not detected.

** In the other count <1x10^1 is the standard reporting format for plates from all dilution of the sample has no colonies.

Stool culture results

From the total 27 stool specimens check by convectional culture techniques. Only 2 (7.4%) were positive for bacillary dysentery caused by shigella Flexinari serogroup B.

Parasitological examination results

Using direct microscopy at the Camp Clinic, We took a total of 1102 microscopic stool analysis, of which 450(40.8 %) case were positive for protozoa, parasitic and pus cells.

Among the positive results, the most circulating agent 166(36.9%) was Ameobia followed by Giardia 115 (26.6%) and pus cells 102(23.1%) (See table 3).

Table 29: Mixed cause diarrheal distribution by Microscopic stool analysis findings, Addis Raey training center, Afar, Ethiopia-July 2015

Type of Parasite	M(Pos*)	F(Pos)	Total	Positive%
Ameobiasis	155	11	166	36.9
Giardiasis	103	22	115	25.6
Puss cells	95	8	103	22.9
Ascariasis	18	0	18	4.0
T.trichuria	11	0	11	2.4
H.nana	10	1	11	2.4
Taniasis	5	0	5	1.1
S.mansoni	4	0	4	0.9
E.vermicularis	3	0	3	0.7
S.stercolaris	3	0	3	0.7
H.worm	1	0	1	0.2
Sub Total	**408**	**42**	**450**	**100.0**

Total Lab exam	Positive	Negative
1102	**450(40.8%)**	**652(59.2%)**

Analytical

More than half 29(56.9%) of cases and 62(60.8%) of controls age groups were less than 25 years old. Among the study subjects 44(86.3%) and 87(85.3%) were cases and controls respectively. Concerning educational status 25(49.0%) of cases and 49(48.5%) of controls were educated to the level of primary school.

Table 30: Socio-demographic characteristics of diarrheal disease in Addis Raye Camp, Afar 2015

Variables	Cases (N=51)%		Controls (N=102)%		COR
	Number	Percent	Number	Percent	
Age in years					
<25 years	29	56.9	62	60.8	1:00
>= 25 years	22	43.1	40	39.2	1.2(0.59-2.32)
Sex					
Female	7	13.7	15	14.7	1.1(0.41-2.85)

Male	44	86.3	87	85.3	1.00
Education					
Primary	25	49.0	49	48.5	1.0(0.52-2.00)
Secondary	26	51.5	52	51.5	1:00

Thirty two (62.7%) of cases and 31(30.4%) of controls were attending patients. Sharing of utilities were reported by 23(45.1%) of cases and 23(22.5%) of controls. Among cases 15(16.0%) were using soap after toilet while most 79(84.0%) of controls were using soap after toilet. Majority 45(88.2%) of cases and 43(42.2%) of controls were hand washing some times after toilet. Most 40(78.4%) of the cases were using toilet while 18(17.6%) of the controls were using toilet (Table 30).

Table 31: Risk Factors among visiting diarrheal disease patients in Addis Raye Camp, Afar 2015

Variables	**Cases (N=51)%**		**Controls (N=102)%**		**COR**
	Number	**Percent**	**Number**	**Percent**	
Attending Patient					
Yes	32	62.7	31	30.4	3.8(1.90-7.82)*
No	19	37.3	71	69.6	1:00
Sharing Utilities					
Yes	23	45.1	23	22.5	2.8(1.37-5.80)*
No	28	54.9	79	77.5	1:00
Using Soap after toilet					
Yes	15	16.0	79	84.0	1:00
No	36	61.0	23	39.0	8.2(3.85-17.63)*
Hand Washing after toilet					
Some times	45	88.2	43	42.2	10.2(4.02-26.29)*
Always	6	11.8	59	57.8	1:00
Latrine utilization					
Yes	40	78.4	18	17.6	16.9(7.33-39.28)*
No	11	21.6	84	82.4	1:00

* Variables which shown significant association during the multivariate analysis

The final model was constructed using backward binary logistic regression method. All variables which had shown statistically significant association during chi-square analysis such as attending patient, sharing utilities, washing hands after toilet,using soap after toilet and latrine utilization were included. However, on multivariate backward binary logistic regression analysis, out of these five independent variables only attending patient, washing hands after toilet, and using soap after toilet and latrine utilization were found to be independent predictors for the occurrence of diarrhea.

Compared to those who were not attending patient; those who attend were more likely to develop Diarrhea (AOR= 7.5; 95%CI: 2.43, 23.35). Those who were not used soap after toilets were more likely to develop diarrhea compared to those who were used soap after toilet (AOR= 5.2; 95%CI: 1.66, 16.34). Compared to those who wash their hands always after toilet; those who washed their hands some times were more likely to develop diarrhea (AOR=7.2; 95%CI: 1.95, 26.64) and compared to those who were not using toilet; those who were using toilet were more likely to develop diarrhea (AOR=19.6; 95%CI: 6.47, 59.45) .

Table 32: Independent predictors of diarrhea, in Addis Raye Camp, Afar, 2015

Variables	Cases (N=51)%		Controls (N=102)%		COR	AOR
	No	%	No	%		
Attending Patient						
Yes	32	62.7	31	30.4	3.8(1.90-7.82)*	7.5(2.43-23.35)*
No	19	37.3	71	69.6	1:00	1:00
Using Soap after toilet						
Yes	15	16.0	79	84.0	1:00	1:00
No	36	61.0	23	39.0	8.2(3.85-17.63)	5.2(1.66-16.34)*
Hand Washing after toilet						
Some times	45	88.2	43	42.2	10.2(4.02-26.29)*	7.2(1.95-26.64)*
Always	6	11.8	59	57.8	1:00	1:00
Latrine utilization						
Yes	40	78.4	18	17.6	16.9(7.33-39.28)*	19.6(6.47-59.45)*
No	11	21.6	84	82.4	1:00	1:00

*Variables which shown significant association during the multivariate analysis

Case management, Action taken (intervention):

After reviewing treatment protocol with Camp Clinicians medications were availed for case management and Diarrheal Surveillance was started at the camp clinic. After communicating with the camp management few hand washing facilities were availed at the dining area and health education on hygiene and sanitation was give by Army health professionals.

After observing the current status of the outbreak the following interventions are conducted.

⇒ Established a RRT committee from camp staffs and MOH Outbreak team (the action plan is attached on the annex)

⇒ The camp staffs started to avail washing facilities to trainees but yet not enough

⇒ Wetried to avail very necessary drugs and supplies from Mohamed Akle hospital and Worer health center and other available source to rescu critical patients.

⇒ Started diarrheal surveillance at the clinic

⇒ All food handlers are screened for Diarrhea

⇒ Other Activities on action plans are underway

⇒ Preparing of immediate need and summated to FMOH

⇒ FMOH gave prompt respond and supplied all requested materials

⇒ Health education was done with health professionals who came from MOND Planed for seven days.

⇒ The team conducted a series of meeting with Mohamed Akle hospital and doctors, Alshaiday managing director and management, and with MoND heath team

⇒ Water treatment regularly was highly recomanded

5. Discussion

It was found that a total of 1814 reported cases of diarrheal report from May 14 to Jul 2, 2015. Of the total cases 97.2% of cases were males while the rest 2.8% were females. The over all crude attack rate was 18.1% while sex specific attack rate was 23% and 18% for males‘ and females respectively. This can be due to high male tranee recruited for training. Among the cases, younger age groups were more affected during the outbreak with attack rate of 66.0% and 31.4% for the age groups 15-25 and 26-36 respectively. The laboratory results identified bacterial and numerous parasitic pathogens present in the stool samples from individuals that had reported diarrheal illness. The laboratory result for parasitological investigations, stool sample for bacterial culture and water sample for microbial analysis confirmed that the presence of parasites (dominantly Ameba (36.9 %) and Giardia (25.6%), bacillary dysentery caused by shigella Flexinari serogroup B (7.4%) and high Bacterial coli forms and E coli were identified respectively.

Independent Predictors of diarrhea were found to be attending patient, not washing hands after toilet; not using soap after toilet and latrine utilization. Compared to those who were not attending patient; those who attend were 7.5 times more likely to develop Diarrhea. As we described on the descriptive finding the analytical finding also support the source and mode of transmutation which is close contact with patents (attending patient and sharing utilities).This can be due to Shigellosis epidemics usually occur in areas with crowding and poor sanitary conditions, where person-to-person transmission or contamination of food or water by the organism is common (48, 49).

Those who were not used soap after toilets were 5.2 times more likely to develop diarrhea compared to those who were used soap after toilet. This study in line with a study done in Mexico City reported that 9% of the population was infected with *E histolytica* in the 5-year to 10-year period preceding the study. Various factors, such as poor education, poverty, overcrowding, contaminated water supply, and unsanitary conditions, contributed to fecal-oral transmission (33, 34). Compared to those who wash their hands always after toilet; those who washed their hands some times were 7.2 times more likely to develop diarrhea

We also found that patients who were using a bad or unclean latrine were 19.6 times more at risk to have the disease than those do not use the latrines on the center regularly; that means those who used open defecation were protective not to attain the disease. This controversial phenomenon happened due to ill construction, Shortage of water supply and inappropriate handling aggravated by background of the trainee and shortage of cleaning materials. Similar study was conducted among children aged less than five years in Botswana the result reveals, lack of hand washing after using toilet or latrine was more likely to be reported by cases (51).

During this outbreak, we also found that cases who did not report washing their own hands after using the toilet or latrine were 10.2 times more likely to develop diarrhea than control who did report washing their own hands. This can be by the fact that hand washing interventions plus provision of soap can reduce the incidence of diarrhea by up to 53% in developing world settings (52.53.54).

This study describes an outbreak of diarrheal illness among Addis Raey training center trainees in Amibara Woreda, Afar region. We identified an increasing trend of diarrheal illness patients throughout the camp and an association with environmental sanitation and personal hygiene. The camp was extremely over crowded beyond its capacity to trains more than10,000 (which was initially intended to serve for 2500) trainee with only one central kitchen, three cafeterias and one common ground water source with extended storage tankers. There were 26 blocks used to reside the whole trainees with ill constructed toilets which have not enough water supply to flash fecal materials after usage; as a result, most of the trainee flee from use of them. They were dirty with full of flies hovering over them. There were no enough detergents and soaps to wash hands and closes, so that Personal hygiene and environmental sanitation was in poor condition: combine with the background of the trainee which comes from the low socioeconomic status of the society, most of them from the street of big cities. This all fertile condition was epidemiologically hard evidence to raise the outbreak.

6. **Conclusion and Recommendation**

Conclusion

In conclusion, independent predictors of diarrhea were found to be attending patient, not washing hands after toilet; not using soap after toilet and latrine utilization. There was a mixed diarrheal disease outbreak in which Amebasis and Gardiasis accounts for most of the cases, no fatality was identified secondary to the current diarrheal outbreak. The source agent of the outbreak was confirmed by lab as depicts on the above result section. Poor environmental sanitation personal hygiene, overcrowding on food preparation, food and water handling, unhygienic utilization of latrine and un appropriate kitchen sewerage system an appropriate washing facility and having meal without washing hand contribute to the occurrence and spread of the outbreak. Despite the fact that, using latrine was protective for such type of disease, it was inversely play a role of potential source and mode of disease transition. The impactwas exacerbated by lack of adequate medical care.

Recommendations

⇒ Deployment of additional health professionals and strengthen surveillance system

⇒ Urgent construction of sanitary facilities specifically hand washing facilities, latrines should be expanded

⇒ The drainage system of the camp should be constructed

⇒ Environmental cleaning campaign and regular health education services should be provided by the camp

⇒ An environmental health professional should be regularly assigned to control the hygiene and sanitation status of the camp.

⇒ Water treatment with Chlorine

Other long term recommendation

⇒ Construction of a health center should be planed

⇒ Registers and all needed materials and support should be provided to start a surveillance system at Camp Clinic

⇒ Preparedness should be started for other seasonal illness such as Malaria

Title 5.2 Meningococcal Meningitis Surveillance Data Analysis –Ethiopia, 2010-2014

Abstract

Title: Meningococcal Meningitis Surveillance Data Analysis-Ethiopia, 2010-2014

Author: Addisalem M.[1, 2], Jima. D.[2], Alemayehu B.[3], Adamu A[2]

Authors Affiliation: [1]Ethiopian Public Health Institute, [2]Ethiopian Field Epidemiology Training Program, [3]Ethiopian public Health Association.

Background: Meningitis is a disease that has had some form of impact on nearly every part of the world. In Ethiopia, meningitis outbreaks have been described in written reports since 1901. Therefore, since Ethiopia is located on the African meningitis belt, bordering with meningitis prone countries, it is reasonable to conduct such type of data analysis regularly, to asses overall trends of Meningococcal meningitis.

Methods: The study involved a retrospective collection of clinical and laboratory data from regional states. Secondary data was taken from Public Health Emergency Managment Meningococcal Meningitis data base. The study included all the suspected and confirmed meningococcal meningitis cases reported. We described the outbreak by time, place and person.

Result: A total of 7,799 cases reported as meningococcal meningitis (clinical& Lab confirmed) and 242 deaths were reported to PHEM. Of the total cases, 3564 (45.7%) were reported from SNNP. Thehighest incidence rate were recorded in Gambella with 67.8/100,000 population, while highest CFR (59.1%) was in Dire Dawa administrative city. The most affected age groups were infants less than 1 and children 1-4 years. Among those lab was done the Most cause of the meningitis was serotype type A and W135 contributing 48 % and 18.5 %, respectively.

Conclusions: The study showed that trends of meningitis case distribution were recorded the highest at the dry season of every year and progressively decreases at the wet or rainy season, showing meningitis onset and dry season have evidence of positive relationship .Infants and children experienced the highest risk, serotype A is still the most cause of meningitis. The analysis also shows us meningococcal meningitis occurring out of the meningitis belt. Therefore, this new phenomenon needs farther study; strengthen surveillance and mass vaccination campaign system.

Key Word: Meningococcal Meningitis; African Meningitis Belt; Ethiopia, 2010-2014.

Introduction

Meningitis is a disease that has had some form of impact on nearly every part of the world. Currently, the largest and most reoccurring outbreaks have been located in the semi-arid area of sub-Saharan Africa in an area known at the African meningitis belt, occurring in seasonal cycles between late November and late June, meningococcal epidemic season can vary in intensity due to location and the arrival of the rainy season. [1,] Within the AMB, epidemics of meningococcal disease often occur in cycles of eight to fifteen years.

Bacterial meningitis is an ongoing threat for the population of the African Meningitis Belt, a region characterized by the highest incidence rates worldwide. The determinants of the disease dynamics are still poorly understood; nevertheless, it is often advocated that climate and mineral dust have a large impact. Over the last decade, several studies have investigated this relationship at a large scale.

Bacterial meningitis (which we will refer to as meningitis) is a contagious disease transmitted from individual to individual by airborne droplets of respiratory or throat secretions. The highest burden of the disease occurs in the ―African Meningitis Belt", a region stretching from Senegal to Ethiopia with an estimated population of over 300 000 million people [2].

While Neisseria meningitis A is the main cause for large epidemics, serogroups W135, C and X are also responsible for localized outbreaks [3,4] as well as Streptococcus pneumoniae or *Haemophilus* influenzae type B. Increase in incidence is typically observed every dry season, with weekly incidence rates reaching up to 100 per 100 000 population in individual communities [5,6]. Even with appropriate treatment, the mortality rate fluctuates around 10 per cent, and 10–15% of survivors suffer long-term neurological sequelae [7]. Asymptomatic carriage is common, which most often does not lead to the consecutive development of the illness [8, 9].

Figure 33: The African meningitis belt. These sub-Saharan countries are at high epidemic risk for meningococcal meningitis.

Source: Control of epidemic meningococcal disease, WHO practical guidelines, World Health Organization, 1998, 2nd edition, WHO/EMC/BAC/98.3

Despite a strong seasonality, the determinants of meningitis dynamics are still poorly understood. Various factors are likely involved in the underlying mechanism of the disease dynamic, including (re)introduction of consecutive strains [6, 10], vaccination impact, population dynamics and immunity [11–12]; climate and dust are often advocated as having a large impact. The epidemic season for meningitis coincides with the dry season and ends with the arrival of the African monsoon [2, 13, and 14]; early epidemic onset often correlates with high annual incidence [15].

Risk Factors

According to the WHO Meningitis Guideline**, Factors** that can increase risk of bacterial meningitis include:

Age: Infants are at higher risk for bacterial meningitis than people in other age groups. However, people of any age are at risk.

Community setting: Infectious diseases tend to spread more quickly where larger groups of people gather together. College freshmen living in residence halls and military personnel are at increased risk for meningococcal meningitis (caused by *Neisseria meningitidis*).

Certain medical conditions: There are certain diseases, medications, and surgical procedures that may weaken the immune system or increase risk of meningitis in other ways.

Working with meningitis-causing pathogens: Microbiologists who are routinely exposed to meningitis-causing pathogens are at increased risk.

Travel: Travelers to the meningitis belt in sub-Saharan Africa may be at risk for meningococcal meningitis, particularly during the dry season. Also at risk for meningococcal meningitis are travelers to Mecca during the annual Hajj and Umrah pilgrimage.

Epidemiology of Disease Due To *Neisseria Meningitidis*

Agent - *Neisseria meningitidis*

- Gram-negative diplococcus
- capsular polysaccharide antigens differentiate serogroups (A, B, C, X, Y, Z, 29-E, and W135)
- serogroups A, B, and C associated with epidemics
- subtyping identified certain strains (clones) associated with increased virulence and epidemic potential (e.g. serogroup A, III-1; serogroup B, ET-5)

Reservoir

- Humans
- asymptomatic carriage in nasopharynx common

Mode Of Spread

- person-to-person by direct contact with respiratory droplets of infected people
- most cases acquired through exposure to asymptomatic carriers, relatively few through direct contact with patients with meningococcal disease

Host Factors

- risk of invasive disease due to *N. meningitidis* higher in children, decreases with age
- All humans susceptible, but disease risk higher in persons with terminal complement deficiency, spleen ectomy.

Incubation Period

- 1-10 days, usually <4 days (16)

Statement of the problem

Ethiopia is in the African meningitis belt, and is regularly affected by both the endemic and epidemic forms of the disease. Outbreaks have been recorded since 1935. The most recent major outbreak affecting the whole country occurred in 1988-1989, with nearly 50 000 cases and 990 deaths, and an overall attack rate of 133 per 100 000. A major outbreak is anticipated in 1999-2000, and the regions of Amhara, Gambella and Tigray experienced an increase in the number of cases reported in March-April 2000. (WHO Disease Outbreak Reported March-April 2000)

Since Ethiopia is located on the African meningitis belt and bordering with meningitis prone countries it is reasonable to conduct such type of data analysis with regular course of time. Furthermore, Ethiopia is the seat of African union, ECA (United Nation Economic

Commission for Africa) and multiple National, International organizations. It *is also* among the top five countries in the world hosting international conferences which are a factor for epidemiological links. Therefore; there should be a strong surveillance system on line with the growing economic development and ever increasing health concern.

Literature review

Meningococcal disease is a contagious disease caused by the meningococcus (Neisseria meningitidis), a Gram-negative bacterium. There are two clinical forms of meningococcal disease. Meningococcal meningitis is the more common entity, especially during epidemics; outcome is good if appropriately treated. In contrast, meningococcal septicemia, in which bacteria are found in the blood stream, is less common but highly fatal, even when actively treated. Cases in which both meningitis and septicemia occur simultaneously are usually regarded as cases of meningitis.

Meningococcal meningitis, commonly designated as cerebrospinal meningitis, is the only form of bacterial meningitis which causes epidemics. Epidemics can occur in any part of the world. However, the largest epidemics occur mainly in the semi-arid areas of sub-Saharan Africa, designated the" African meningitis belt".

Apart from epidemics, meningococcal meningitis occurs sporadically throughout the world, with seasonal variations, and accounts for a variable proportion of endemic bacterial meningitis. In non-epidemic conditions, only laboratory investigation of cerebrospinal fluid (CSF), obtained by lumbar puncture, can reliably differentiate meningococcal meningitis from other types of bacterial meningitis.(16)

In Ethiopia, meningitis outbreaks have been described in written reports since 1901. Outbreaks were reported in 1935, 1940, 1950,1964, 1981 and 1989.The 1981 and 1989 outbreaks were the largest ever recorded in Ethiopia with 50,000 and 45,806 cases, and 990 and 1686 deaths respectively. The 1981 outbreak affected the northern and western part of Ethiopia. The 1988-1989 meningococcal meningitis outbreaks affected all regions. Since these major outbreaks a number of smaller outbreaks have occurred in the country most notably outbreaks in Amhara, Tigray and Gambella Regions in February 2000. Between March and August 2000 there was an outbreak in Addis Ababa with 850 cases and 33 deaths.

During 2001 major epidemic was recorded with 6964 cases and 330 deaths followed by another epidemic during 2003-2004 epidemic seasons which recorded a total of 3326 cases and 160 deaths from all regions and was not limited to the traditional meningitis belt areas of North West and South Western part of the country.

In the epidemic season 2005 a total of 1061 cases with 46 deaths were reported from four regions while epidemic in the year 2006 affected all Regions with a report of close to 3000 cases. Out of these cases 1300 cases (45%) with 43 deaths were reported from three regions, namely Oromia, SNNPR and Tigray[17].

According to WHO updating reports on Meningococcal disease: 10 April 2000, 21 February 2002 epidemic season Disease Outbreak report in Ethiopia As of10 April 2000 In the Amhara region (estimated population, 198 000), the health authorities have now confirmed a revised total of 70 cases (with 3 deaths) in Kobo Woreda (northern Wollo) between 1 January and 31 March 2000. Cases are being treated at the Alamata hospital and all 29 specimens analyzed yielded *Neisseria meningitidis* serogroup C sensitive to chloramphenicol, penicillin, erythromycin and tetracycline.

Part of the response strategy included vaccination of the target population aged 2-35 years; 36 500 people were vaccinated between 28 February and 12 March. No further cases have been reported. This is the second year the Kobo area has been affected. In 1999, a total of 269 cases (with 9 deaths) were recorded. Epidemic response had included vaccinating 60 500 people with polysaccharide A+C meningococcal vaccine.

In the Tigray region, the number of cases rose in the first week of February in villages along the main road between Kobo, Alamata and Mekele. Up to 12 March 2000, a total of 47 cases (with 6 deaths) were reported (case-fatality rate, 12%). Specimens analyzed have yielded *N. meningitidis* serogroup C. Patients in hospital were treated with IV chloramphenicol on the basis of clinical assessments. In all, 35 200 people aged 2-35 years were vaccinated in early March. During 1999 (Gc), a total of 7 cases (no deaths) was notified in the same area (where 4 000 people had been vaccinated).The Gambella region, near the border with Sudan, has reported 32 cases (with 5 deaths) due to *N. meningitidis* serogroup A.

In the same year report as of 17 August, a total of 855 cases and 19 deaths were reported in Addis Ababa since the beginning of the outbreak, which began in March 2000.

Neisseria meningitidis serogroups A (90%) and C (10%) have been detected using latex agglutination tests in 311 of the patients. The age group most affected is < 30 years. According to available data, no major outbreaks had been reported in Addis Ababa since 1989 (18).

As of 3 February 2002- Meningococcal meningitis update, the Ethiopian Ministry of Health has reported a total of 1 332 cases of meningococcal disease including 85 deaths mainly in Southern Nations, Nationalities and Peoples Region (SNNPR) since the onset of the outbreak in September 2001. *Neisseria meningitidis* serogroup A has been laboratory confirmed. A vaccination campaign had been undertaken in three woredas (districts) in Sidama Zone, but there have been localized epidemics and an increase in the number of cases reported from other districts and zones in the Region.

In response, the Federal Ministry of Health has re-activated the Task Force on Epidemic Meningococcal Disease for the current epidemic season. The Task Force consists of WHO, Médecins sans Frontières (MSF-France, Holland, Switzerland and Belgium), International Federation of the Red Cross and Red Crescent Societies, Ethiopian Red Cross, United States Agency for International Development (USAID), UNICEF and European Union Humanitarian Office (ECHO); it is working to coordinate control activities including surveillance, case management, vaccination campaigns and logistics.

SNNPR is one of the biggest regions in Ethiopia, with an estimated population of over 12.5 million people. The high population density, current dry season and low immunization coverage exacerbate the potential for a major meningitis epidemic.

To prevent this from becoming a reality, the Ministry of Health on behalf of the Task Force is urgently appealing for funds to carry out a mass immunization campaign in 5 priority zones in SNNPR: Hadia, Sidama, Gedeo, North Omo and South Omo. The total target population (aged 2-30) is estimated at 5 568 506. The appeal is for US$ 2.5 million to cover the cost of vaccine and autodestruct syringes, oily chloramphenical and reagents, and training of health workers in case management and epidemic response.(19)

Objective

General Objective

- The general objective of the analysis is to asses, describes the magnitude and distribution of Meningitis in Ethiopia from 2010- 2014.

Specific Objectives

- To assess the overall trend of meningococcal meningitis during 2010-2014
- To describe the distribution of meningitis by place, person and time for the period 2010-2014
- To describe the most common causes of serotypes associated with bacterial meningitis during outbreak

Methods

Study Area

Located in the Horn of Africa, The Federal Democratic Republic of Ethiopia lies at the crossroads between Middle East and Africa. Ethiopia is bounded by Eritrea to the north and Kenya to the south. The eastern part is bounded by Somalia and to the west lays Sudan and South Sudan. Ethiopia covers a vast land area of 1.1 million square kilometers and is the second most populous country in Africa with a population of more than 85 million (20).

Ethiopia is administratively sub-divided into nine regional states and two city administrations the national meningitis surveillance data collect Nationwide from all regional stats and the above mention cities.

Ethiopia has great geographical diversity; its topographic features range from the highest peak at Ras Dashen, 4,550 meters above sea level, down to the Afar Depression, 110 meters below sea level [21]. The climate varies with the topography, from as high as 47 degrees Celsius in the Afar Depression to as low as 10 degrees Celsius in the highlands. Ethiopia, as mention on the introduction is located at the end of AMB.

Study Design

The study involves a retrospective descriptive analysis of clinical and laboratory data collected by weekly and line list reporting forms from 2010-2014 reported through the public Health Emergency Management Surveillance system.

Population Study

The study sites were the 9 stats and two administrative cities with distinct geographical and climatic features of Ethiopia. Thus the study is carried out with the intention of providing results that can be generalized over whole of the Ethiopia. Therefore, the target population for this study is the whole Ethiopian population.

Meningitis attacked reports and related deaths throughout the country, including regional and zonal reports to PHEM and all compile in

EHNRI meningococcal meningitis data base was included in the data analysis.

Sample Size

The study included all the suspected and confirmed meningococcal meningitis cases reported during2010- 2014 from regional health bureaus presented in EPHI. Purposive sampling technique was used to select regions in Ethiopia based on complete regional data of meningococcal meningitis, compiled in EPHI data base.

Ethical Consideration

A formal letter was submitted to the data manager of EPHI directorate in order to access the data. The Collected data only be used for academic purpose in confidential manner and any description that identifies the personality of the study units will not be utilized

Limitation Of The Data Analysis

Since the study was based on secondary data the quality of the data can‘t definitely be assured. The system was also in its infancy stage in the country and under reporting and incomplete of variables was observed and may not show the overall burden of case in the study areas.

Variables

The variable includes the total Meningitis out patients in species (confirmed and clinical), the in-patients in species (confirmed and clinical) related with the Regions and Zones (Place) and also with Week, Months, and Year (Time). Deaths caused by Meningitis species also included in the variables. Generally, Meningitis clinically treated, confirmed, outcomes (morbidity and mortality), age and sex (by person) were the variables.

Analysis and Data Arrangement

Calculation of relevant quantitative measures were conducted by excel and epi info version 7.1.3.0 to identify any outbreaks, differences with regions and zones and the Meningitis species related to seasons and the study area. I tried to ensure to have the right data records and performing quality control checks on each data field.

Expeced Outcome

Trends of Meningitis in the country which may indicate the current status of the disease and the risk factors related to the status. It would help in the strengthening of Meningococcal meningitis control by exchange of experiences and searching the weakness between the regions. It also expected to evaluate the data collecting and handling system of the surveillances.

The retrospective data analysis was proving helpful information to understand the current prevalence of bacterial meningitis in study area. The effect of seasonal variability of meningitis, the age wise and gender wise distribution of disease burden was provide useful estimates on the recent trends of bacterial meningitis. Therefore, the results obtained from the study were helpful for future activity of Meningitis control program organizations, stakeholders and health policy makers.

Dissemination Strategy

Scientific report, manuscript and abstracts will be generated from this paper and will be disseminated to the responsible health partners and stakeholders

Sustainability of the Result

Networking and continuous surveillance will be planned to monitor and evaluate the changes and to practicing the recommendations given by this paper.

Case Definitions

Based on the Ethiopian National Guideline on Meningococcal Meningitis Surveillance and Outbreak Management, First edition, November 2013:

Suspected case: Any person with sudden onset of fever (>38.5 °C rectal or 38.0 °C axillary) and one of the following signs: neck stiffness, altered consciousness, or other meningeal signs such as bulging fontanel, convulsion.

Probable case: Any suspected case with turbid or purulent CSF or with microscopic examination showing Gram-negative diplococci.

Confirmed case: A suspected or probable case confirmed by isolation of Neisseria meningitidis from CSF or blood by culture, PCR or agglutination test were used.

Result

A total of 7,799 meningococcal meningitis cases and 242 deaths were reportedthroughout the country to PHEM, within the five years (2010 – 2014). Of the total cases, 3564(45.7%) were reported from SNNP, Oromia, Amhara and Tigray reported 2404 (30.8%), 662(8.5%) and 286 (3.7%), respectively. The rest (11.3%) were reported from other regions. (See figure 1)

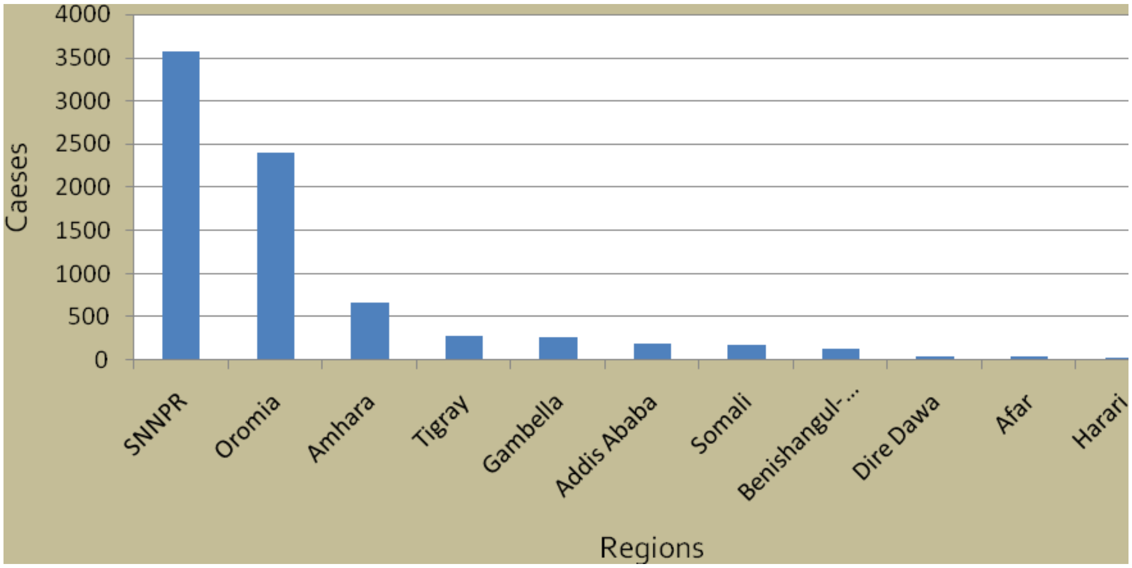


Figure 34: Total Meningitis Case Distribution by Regions, Ethiopia, 2010-2014

As we observe from the figure, total meningitis case distribution during the five years was recorded more from SNNP, Oromia and Amhara regional states.

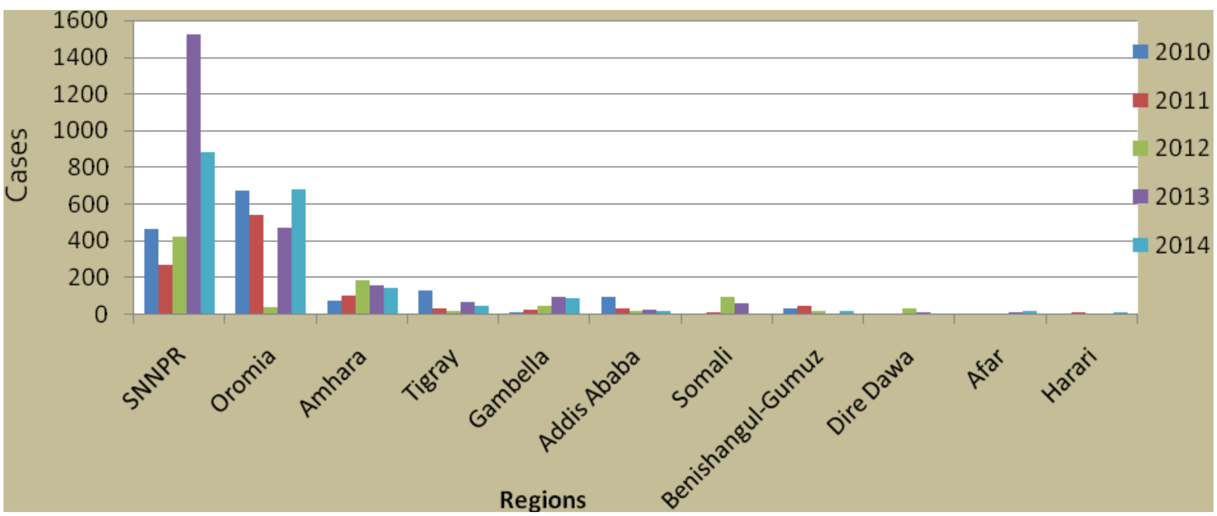


Figure 35: Distribution of Meningitis Cases by Region and Year

This figure reveals that the five years highest meningitis case was recorded during 2013 in SNNP regional states, at this time, meningitis outbreak were recorded in SNNP, Oromia and Tigray.

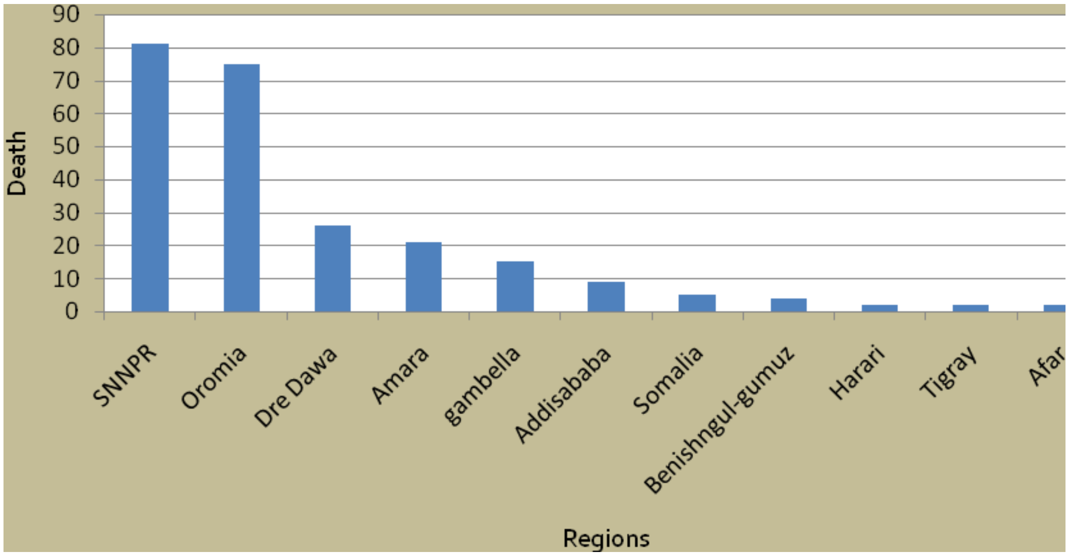


Figure 36: Distribution of Meningitis death by Region, Ethiopia, 2010-2014

The figure reveals that within the five years the highest numbers of death were reported from SNNR and decrease progressively to the right direction.

Table 33: Meningococcal meningitis Cases and Deaths – Ethiopia: 2010 -2014

	Total cases	**Total death**	**Population**	**IR/100,000**	**CFR/100**
SNNPR	3564	81	17857192	20.0	2.3
Oromia	2404	75	32240188	7.5	3.1
Amhara	662	21	19046226	3.5	3.2
Tigray	286	2	5003446	5.7	0.7
Gambella	265	15	390593	67.8	5.7
Addis Ababa	190	9	3101896	6.1	4.7
Somali	178	5	5178258	3.4	2.8
Ben-Gumuz	129	4	801026	16.1	3.1
Dire Dawa	44	26	397574	11.1	59.1
Afar	44	2	1607906	2.7	4.5
Harari	33	2	213870	15.4	6.1
Total	**7799**	**242**	**85838176**	**9.1**	**3.1**

NB: IR=Incidence rate, CFR= Case Fatality Rate

The National meningococcal meningitis case incident rate during the study period was 9.1 / 100,000 population, while the case fatality rate (CFR) was 3.1 %.

Among the regional states and administrative cities, the highest incidence rate were recorded in Gambella with 67.8/100,000 population, while the highest CFR (59.1%) was in Dire Dawa administrative city

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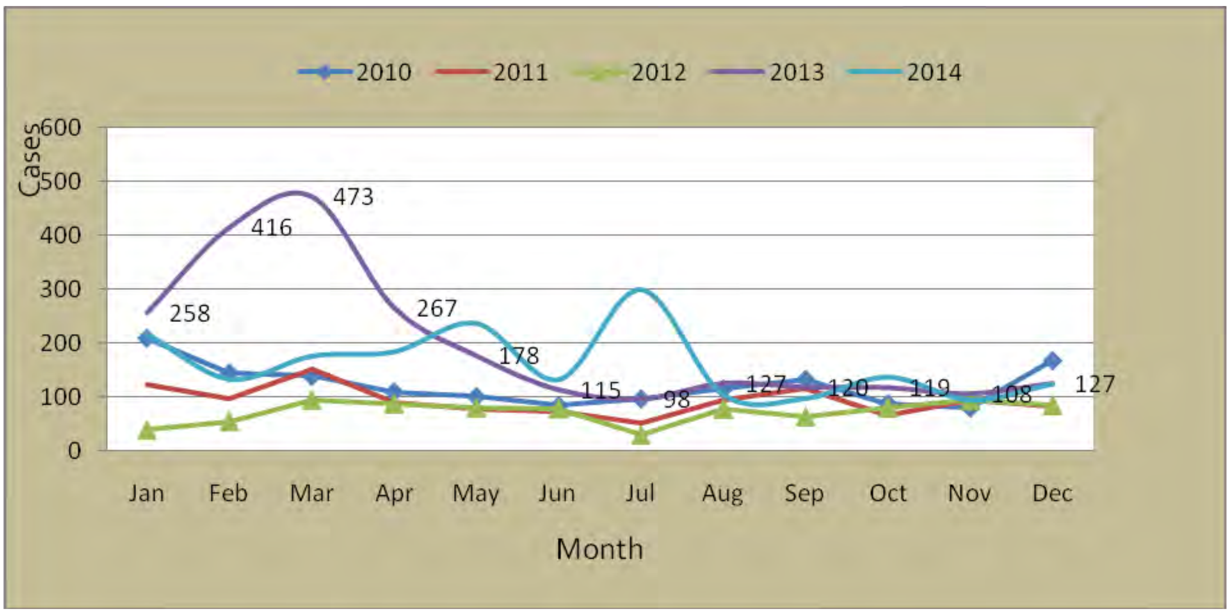


Figure 37: Trends of Meningitis Cases by Month and years, Ethiopia, 2010-2014

This figure revealed that three gross and slightly other small peaks were occurred during the five years, the first highest peak was observed between February and March, 2013, the second peak was occurred during July, 2014 and the third was during May, 2014.The two peaks were occurring during the dry season while the third peak is during wet season.

A total of 1454 Meningococcal meningitis cases 40 death were reported from three regional sates to PHEM through Line List in 2013. Of the total cases reported 918 (63.1 %), 527 (36.2) and 9 (0.61%) were from SNNP, Oromia and Tigray, respectively. From the total reported case 801(55%) were females and 656(45%) males.

Table 34: Meningococcal meningitis Cases and Deaths by Age groups, Ethiopia, 2013.

Age group	Cases	Death	Population	IR/100,000	CFR/100
<1	57	2	1300379	4.4	3.5
1-4	173	8	6744341	2.6	4.6
5-14	513	15	16750651	3.1	2.9
15-44	644	14	23693355	2.7	2.1
45+	67	1	6612100	1.0	1.5
Total	**1454**	**40**	**55100826**	**2.6**	**2.8**

The above table shows that the incidence rate and CFR in2013, during outbreak in three states. The Incidence rate under one year was 4.4/100,000 population and age group, 5-14 years were (3.1/100,000). It also shows the CFR at age group 1-4 years 4.6% and age group less than one year 3.5%.

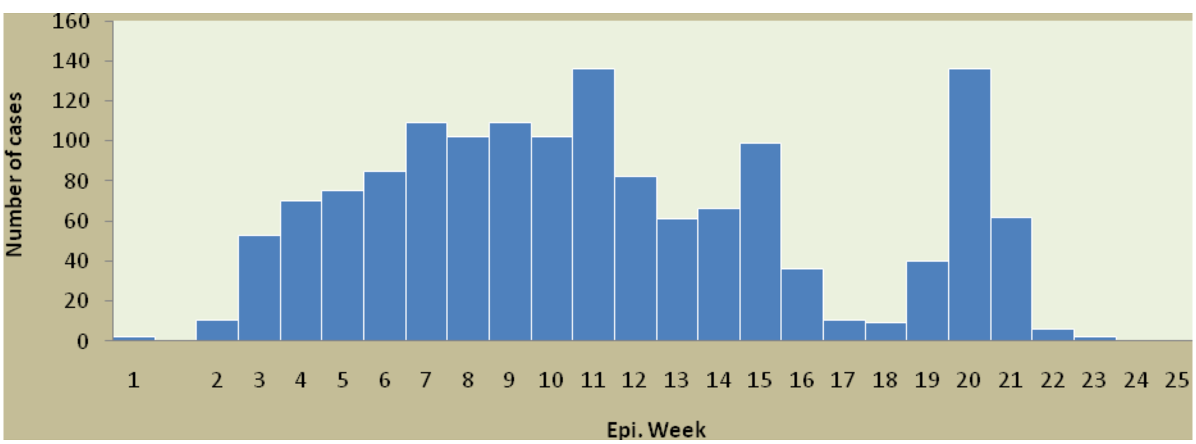


Figure 38: Weekly Trend Meningitis Case, SNNP, Ethiopia, 2013

This figure show the Characteristics of Epidemic curve for a propagated nature. It starts at the first week of January (index case) and ends at the third week of June and remains epidemic for about four months. The curve has two high peaks, the first was during the third week of March (Week, 11) and the second was during the fourth week of May (Week, 20).

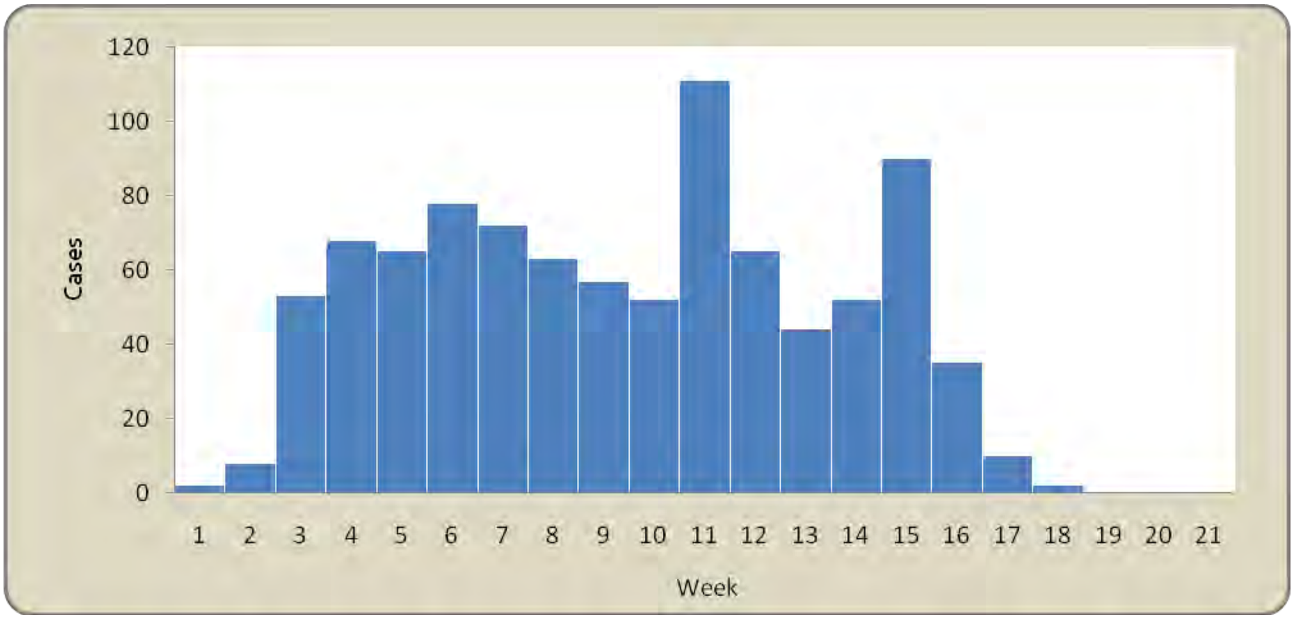


Figure 39: Meningitis Case load by week, Oromia, Ethiopia, 2013

The above figure reveals an Epidemic curve of common source out break with continuous exposure. The outbreak starts(index case) at the first week of January and ends at second weeks of May. This epidemic remains for about four months and two weeks within the dry season. The curve also has two peaks the first one was on March (week, 11) and the second peak was on April (week, 15)

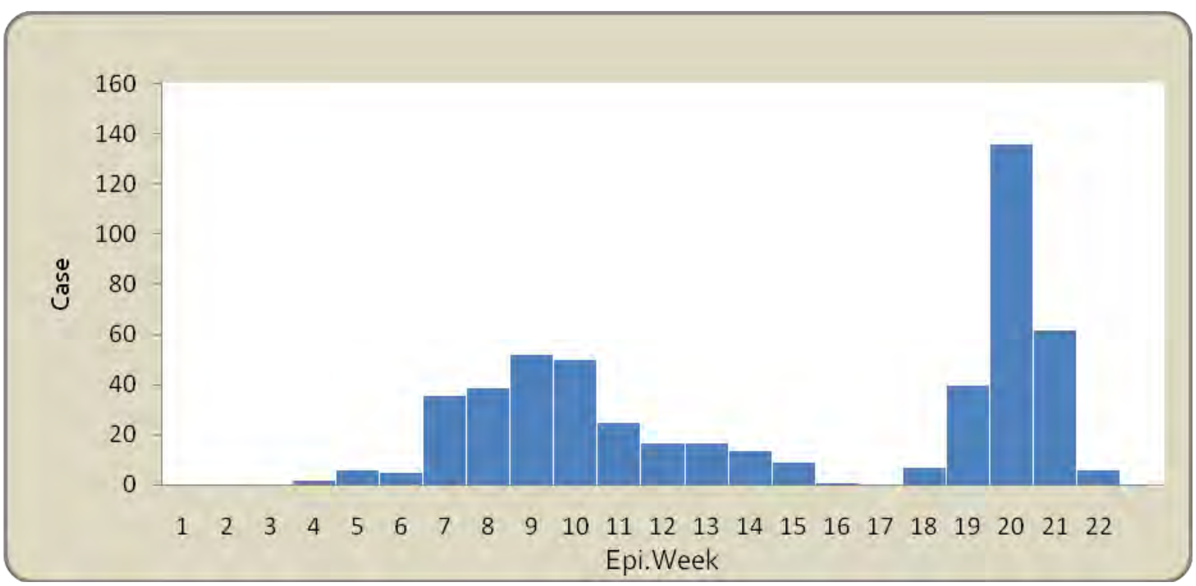


Figure 40: Meningitis Case load by week, Tigray, Ethiopia, 2013

This Epi-curve shows an Epidemic curve of common source outbreak with intermittent exposure. The outbreak starts on January (week, 4) and ends at May (week, 17) again starts at May (week18) and ends up at June (week, 22). Unlike the other curves, this curve has remarkable long peak on May (week, 20) and relatively short epidemic period.

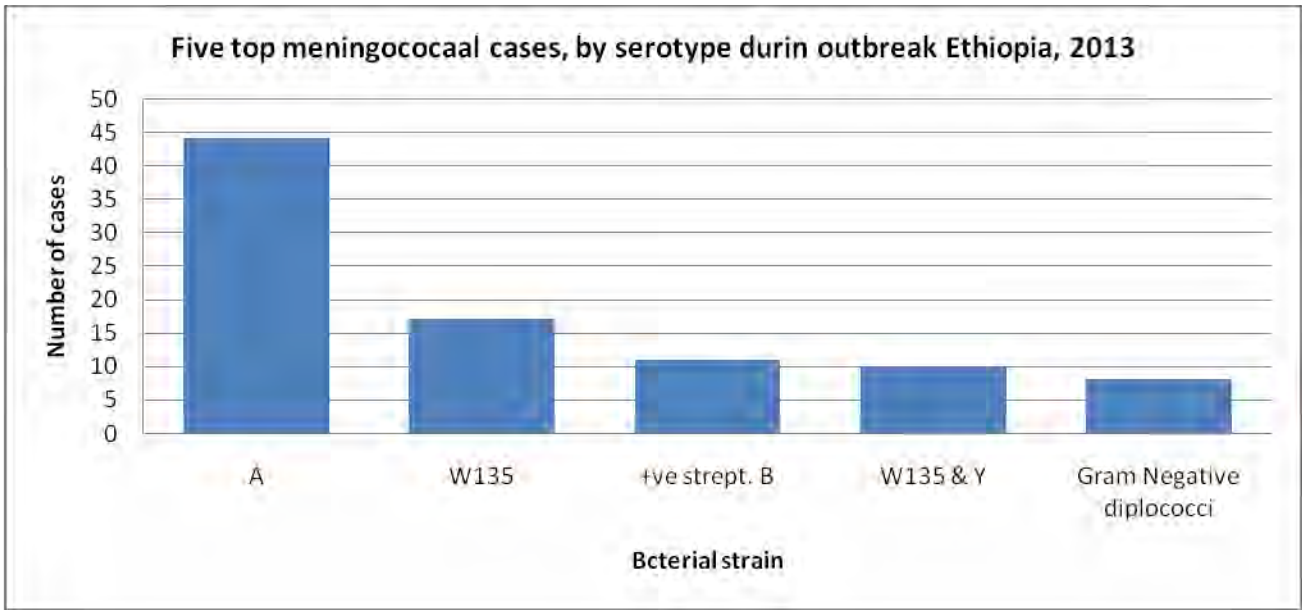
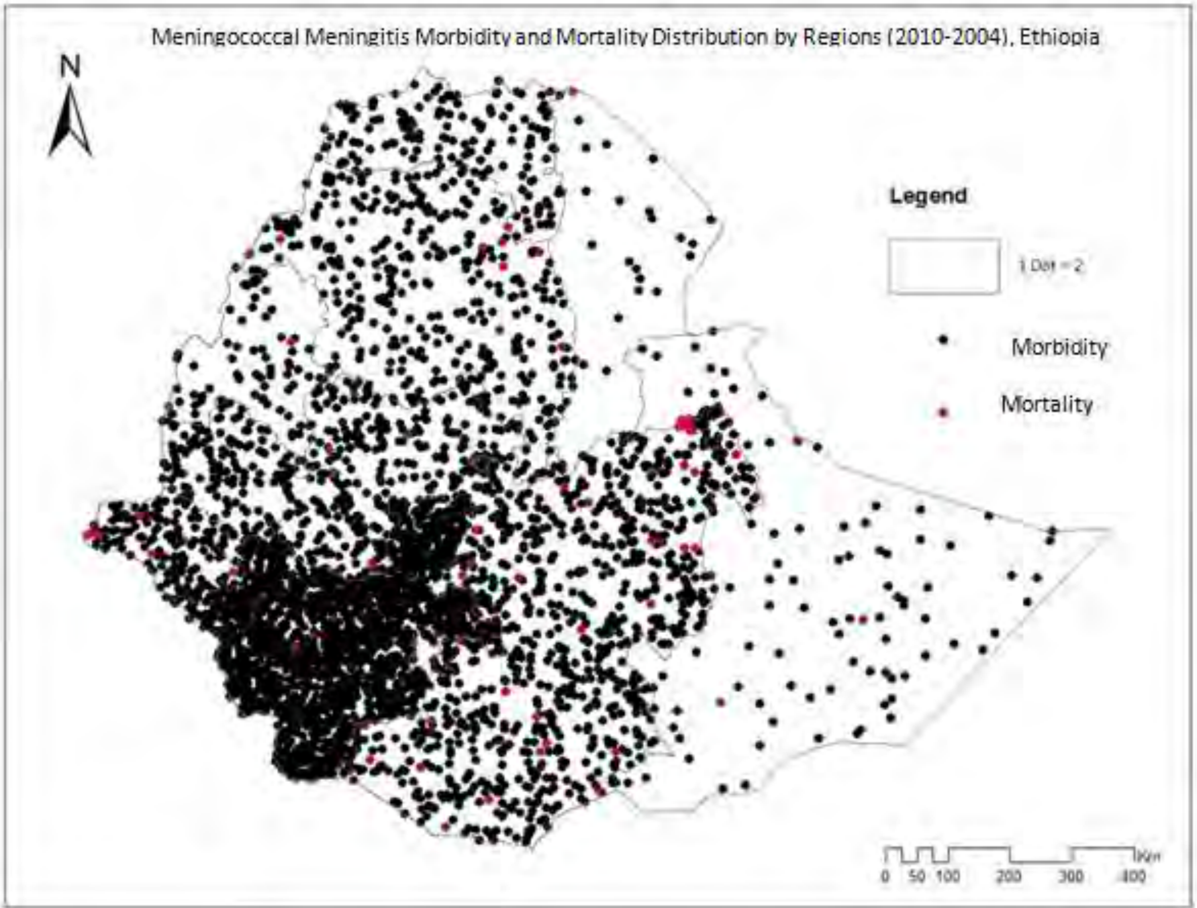


Figure 41: Top Five Top meningitis case serogroup, 2013, Ethiopia

The figure indicates that among the serogroup which cause the meningitis disease the highest case were due to serotype A and followed by w135.



Map.2. Shows Meningococcal Meningitis Morbidity and Mortality Distribution by Regions (2010-2014), Ethiopia.

The Map reveals that the distribution of morbidity (with Black color) and mortality (with Red color) throughout the country during the study period.

Discussion

The aim of the data analysis was to explore the various demographical and epidemiological aspects of the bacterial meningitis in Ethiopia. The discussion was based on the result of 7799 cases and 242 deaths of meningococcal meningitis throughout the country, within a five year period (2010 - 2014) weekly report.

From which 1454 cases were recorded during outbreak on national MMLL in 2013.

This data analysis shows that there is a strong relationship between dry seasons and meningococcal meningitis outbreak in Ethiopia. Regardless of the discrepancies of the number of cases in different states and administrative cities, meningococcal meningitis was remained seasonal with the highest number of cases during the dry seasonand decreasing during the wet or rainy season.

The result in figure 4,(trends of meningococcal meningitis by months and years) revealed that three gross and slightly other small peaks were occurred during the five years, the first highest peak was observed between February and March, 2013,(during which meningitis outbreak were recorded in the country at three regional states: namely; Oromia, SNNP and Tigray) the second peak was occurred during May, 2014 and the third was during July, 2014.The two peaks were occurring during the dry season in most regional states of Ethiopia, while the third peak was in July during which most of the country is wet season and looks unusual, but as described under the study area, Ethiopia has variety of Geographical area with deferent seasons therefore, it was more likely to observe meningitis case during July which is also a dry season in other(some) part of Ethiopia. Another important point is that all the three peak cases were started (index case) at the dry season not at the wet (rainy) seasons, therefore the relationship between meningitis onset and dry season have evidence of positive relationship. From this data analysis result, I conclude that the finding is parallel with the different scientific study conducted before regarding meningococcal meningitis and the relationship with climate (drey season). Even though, it is hard to conclude, my hypothesis for the result, it could also be associated with climate change and migration, but it needs farther study to conclude.

There is another evidence to mention regarding the trend of meningitis and seasons based on the epi-week during the outbreak in 2013.Regadless of the case number differences, three of the epi-curve shows that, all the incidence cases (index case) were start at the dry seasons

A number of studies show that, the influence of climate on meningitis dynamics was first suspected in 1940 by Sice´ *et al*. [22]. Since then, several studies have investigated the relationship between climate and meningitis using different approaches: qualitative [1, 2, 5, 6,] and recently quantitative [23–24]. The main conclusions of these studies were that (i) the intensity of the epidemics is related to the Harmattan wind [26, and 27] and its strength [25]; (ii) the onset of the epidemics is in phase with the winter maximum as defined by Sultan et al. [22] and with the arrival of the dust in the low layers of the atmosphere [26,27]; and (iii) the end of the epidemic season coincides with the arrival of the African monsoon [29 and 30]. The main hypothesis to explain climate impact on meningitis epidemics is an increase in the invasion rate (i.e. shift from carrier to infected status) [28] persistent low air humidity and high dust loads are believed to damage the pharyngeal mucosa and ease the colonization of the epithelium by the meningococcal [5, 6, 8, 14]. Additionally, increased incidence could be attributed to higher transmission levels, due for instance to changes in living habits, such as proximity of individuals as they take refuge from the dusty winds [6, 28]. Finally, co-occurrence of viral respiratory infections is expected to weaken the immune system and further ease the transmission and invasion by the bacteria [29]. This coincides with our knowledge of the seasonal variation in the incidence of meningococcal meningitis in the countries of meningitis belt.

The data analysis reveal that age grouped meningococcal meningitis incidence rates were highest among infants aged group less than one year (at the rate of 4.4 people/ 100,000 populations) followed by age group 1-4 years(2.6/100,000 populations) and lowest among adult age group above 45 years (at the rate of 1 person/100,000 population). Generally, infant less than one year were found to be more at risk to contract meningitis comparing with other age group in the analysis.

This data analysis also showed that age grouped meningococcal meningitis case fatality ratio (CFR) were highest among children at the age of 1-4 years (4.6%),Followed by infants under one year(3.5%) and the lowest among adult above the age of above 45 years (1.5%). Therefore, though the incident rate is highest among age group less than one year(4.1/100,00), case-fatality rate were highest among age group 1-4 years(4.6%), while incident and case-fatality rate were both lowest at adult age group above 45 years (1/100,00),(1.5%) respectively.

Different study show that the incident and case- fatality rate for the bacterial meningitis vary by region, country, pathogen, and age group. Without treatment, the case-fatality rate can be as high as 70 percent, and one in five survivors of bacterial meningitis may be left with permanent sequelae including hearing lose, neurological disability, or loss of limb(30).Incidence rate of *N. meningitis* are generally highest in children less than five years of age and in adolescents. *N. meningitis* can also cause a sever bacteremia, called meningococcemia.

Bacterial meningitis is generally a disease of childhood. A retrospective study conducted during 2007-2011; at University of Gonder Medical Hospital and Awassa referral Hospital reveal that the most commonly affected age group was found to be the infants and small children less than 4 years of age. Data from Gondar University Hospital show that almost half of the cases (49.5%) were either infants or children less than 4 years of age. Results from Awassa Referral Hospital show the highest incidence in young adults 15-24 years of age which make 27% of the total cases. Children less than 4 years of age, including the infants, make 22% of the cases (30). Within the various age groups, a higher incidence in infants has frequently been reported in literature. A 10-year study conducted in United States in California during 1998 to 2007 showed the highest incidence of bacterial meningitis in infants less than 2 months of age (31). For the year 2006-2007 the incidence was 80.7 cases per 100,000 populations. Children greater than 2 months and less than 2 years of age showed the second higher incidence (6.9 cases/100,000 populations) during the same year.A large scale retrospective study in Niger showed that in the year 1995-96 (32) the incidence of bacterial meningitis was highest in infants less than one year of age (638 cases per 100,000 population), this was followed by children between 1-4 years of age (490 cases per 100,000 population). Older children between 10-14 years and young adults also showed a higher incidence (each having 476 cases per 100,000 populations). In contrast to these studies, a study in North Gondar during 2001-2002 showed the highest incidence in young adults between 15-30 years of age (52% of cases) (33). Generally, these results point out at 2 peaks of age that have high susceptibility for bacterial meningitis i.e. small children and young adults. This also parallels with the findings in the data analysis.

The National meningitis case incidence and CFT rate as shown on the table were 9.1/100,000 populatinn.3.1 % respectively .comparing with other regional states and administer cities the highest incidence rate (67.8 /100,000 population) were observed in Gambella regional stat, while the highest CFR

(59.1 %) in Dre Dawa administrative city. This finding draws our attention why causes the exaggerated figure in those areas. The probably reason could be multi factors which need farther study, but the most probable reason associated with this case can be the level of timely intervention, vaccination status coverage: efficacy, migration, climate change and drought are among the hypotheses we think .

The other intersecting result found from the data analysis was, during the epi weeks in 2013, among the top fourteen laboratories serotype results, the most cause of the meningitis were serotype type A and W135 contributed 48 % and18.5 %, respectively. This result is a hard evidence for the scientific literature review regarding the AMB and stated as follow. The worldwide distribution serogroups of *N.meningitis* is variable. In the Americans, Europe, and Australia, serogroup B and C are the most common, while serogroup A causes the majority of disease in Africa and Asia [30].Sometimes sero-groups can emerge, increasing in importance in specific country or region like serogroup C in China [31]. or serogroup Y in North America [32].

Serogroup A *Neisseria meningitidis* is responsible for recurring epidemics of bacterial meningitis in the African meningitis belt [30] Although epidemics caused by sero-group W135 have recently arisen, most of the cases in the region are still caused by serogroup A Meningococcal l[33]. Molecular epidemiological studies have shown that serogroup A strains are genotypically diverse, but specific complexes of related hyper virulent clones are responsible for a major part of the cases in the meningitis belt. Serogroup A meningococcushas historically been the main cause of epidemic meningococcal disease and still dominates in Africa during both endemic and epidemic periods. Elsewhere the major and most explosive epidemics of meningococcal meningitis have also been almost exclusively associated with serogroup A, as in Brazil (1974), North America and Europe prior to the mid-1950s, Finland (1974), Nepal (1983-1985), Rwanda (1978), Saudi Arabia (1987), Sudan and Ethiopia (1988-1989), Kenya, Uganda and Burundi (1989-1992), United Republic of Tanzania, or in West Africa especially in Burkina Faso and Mali (1995-1997), Niger and Nigeria (16)

Another study conducted and entitled Characterization of *Neisseria meningitidis* Isolates from Recent Outbreaks in Ethiopia and Comparison with those recovered during the Epidemic of 1988 to 1989 (34), revealed that: ―The meningitis epidemics in northern and southern Ethiopia in 2002 and 2003 were caused by serogroup A *N. meningitides* strains of ST-7, which were anti genetically and genetically very homogeneous.

Although only serogroup A meningococci were found in our study, serogroup W135 epidemics occurred in Burkina Faso in 2001 and 2002, and an outbreak of W135 meningococci was reported in a neighboring country, Sudan, in 2005 (35). The Ethiopian health authorities should therefore enhance their laboratory-based surveillance network in order to detect potential meningococcal strain heterogeneity to be able to provide the appropriate vaccine in time"

Limitation

Nevertheless, the data analysis was not without its own limitations. Some main limitations that were encountered during this data analysis are listed below.

Due to the lack of enough availability of laboratory facilities, not all the cases were confirmed by laboratory evidence of the bacterial organism. In such instances the diagnosis was based solely on the clinical diagnosis which may be less accurate than the laboratory assisted diagnosis.

Another limitation may be the retrospective nature of the study itself. This implies relying on the quality and quantity of information that had already been recorded. Some information loss may have occur at multiple steps starting from the data recorded by attending physician, laboratory staff and finally while recording the data onto the case record forms.

Conclusions

The trends of meningitis case distribution within the five years were recorded the highest at the dry season of the years and progressively decrease at the wet or rainy season, this trend is exactly meeting with the various scientific literature reviews at the AMB. Meningococcal disease remains highest in the country with incidence rate of 9.1 per 100,000 populations and with 3.1% of CFR during the five years. Infants and children experienced the highest risk of invasive meningococcal disease. The other fact that the data analysis showed was the cause of the meningitis, Serotype ―A" accounts 48% while W135 accounts 18.5% of the cause of the meningitis. This is also exactly coincide with the various scientific literature conducted on the AMB (28). Serogroup A cause the majority of infections in Ethiopia As it has already been mentioned in the literature that the most common serogroup of *N. meningitides,* in

Ethiopia is serogroup A. The result of this analysis also shows the same fact. The most affected age groups by meningococcal meningitis during the outbreak were infants less than 1 year old and children aged1-4 years.

The highest Incidence rate cases during the five years was from Gambella, SNNP regional states with 67.8/100,000 and 20/100,000 populations respectively, while the most affected was Dre-Dawa administrative city and Harari regional stat with CFR of 59.1%, 6.1% respectively.sex ratio during the outbreak in 2013 meningitis cases were highest in female than male 801(55%) and 656(45%) respectively.

Recommendations

Based on the findings of the analysis we recommend the following points

A mass vaccination campaign, if appropriately carried out, is able to halt an epidemic of meningococcal disease due to sero-groups ―A" or ―C" within weeks. To plan and implement such campaigns, speed is essential since time is needed to obtain and distribute vaccine. Therefore, a program for acquiring vaccine should be established before an epidemic occurs

Further work on the surveillance data standardization across the country is needed;strengthening surveillance activities and establishing a better standardization of laboratory methods are required. Therefore, it is high time to have a modern laboratory setup in the country including at regional stats. To further develop the integration of laboratory data into surveillance data, close collaboration between networks of epidemiologists and microbiologists is needed.

Finally, To implement all the above mention points, PHEM should be strengthen its structure all over the country, with adequate train man power and conduct regular evaluation on the surveillance system itself. In short;

- Further work on the surveillance data standardisation across the country is needed.
- Strengthening surveillance activities and establishing a better standardisation of laboratory methods used are required.
- To further develop the integration of laboratory data into surveillance data, close collaboration between networks of epidemiologists and microbiologists is needed.

- A mass vaccination campaign, if appropriately carried out, is able to halt an epidemic of meningococcal disease due to sero-groups –A –or –C” within weeks.
- Raise awareness of health professionals at all levels
- Further Research should be initiated on the un clear issues raise on the discussion.

Chapter VI: Abstracts for Scientific Presentation

Title.1 Outbreak Investigation of Diarrheal Disease in Addis Raey Training Centre, Amibara Woreda, Afar Region, Ethiopia, April 2016.

Author: Hagos M.Addisalem.[1, 2], J. Daddi.[2], Alemayehu B.[3],

Authors Affiliation: [1]Ethiopian Public Health Institute, [2]Ethiopian Field Epidemiology Training Program, [3]Ethiopian public Health Association.

Background: Diarrheal diseases can be caused by numerous pathogens and transmitted through multiple vehicles. Worldwide, 780 million individuals lack access to improved drinking-water and 2.5 billion lack improved sanitation. Globally, there are nearly 1.7 billion cases of diarrheal disease every year. On June 3, 2015, a team from the EPHI was deployed to investigate for AWD outbreak in Amibara woreda of Afar region, Ethiopia.

Method: We conducted a descriptive study followed by unmatched case control study, useing a structured questionnaire to collect data from cases (51) and controls (102) to find out the risk association. We took water samples for Microbial analysis and 1102 Stool samples were collected for bacterial culture and parasitological investigations. Epi Info was used to calculate frequencies, odds ratios and SPSS to perform logistic regression to identify risk factors for diarrhea from 03 June-02 Jul 2015.

Result: Fifty-one cases and 102 controls were enrolled. On multivariate logistic regression analysis Cases attending patient (AOR=7.5; 95%CI: 2.43, 23.35), Lack of using soap after toilet or latrine (AOR = 5.2; 95% CI: 1.66, 16.34) were more likely to be affected by diarrhea. Copared to those who wash thir hands after toilet; those who washed their hands some times were more likely to develop diarrhea (AOR = 7.2; 95% CI: 1.95, 26.64). Also those who used latrine were more likely to be affected by diarrhea (AOR= 19.6; 95% CI: 6.47, 59.45).

Conclusion: The causative agent of the outbreak was confirmed by lab.Factors independently associated with the occurrence of diarrhea outbreak were attending patient, not using soap after toilets, washing hands some times after toilet and using toilet were found risk factor for the occurrence of this outbreak.Therefore,these findings underscore the importance of adequate access to safe water, sanitation, hygiene and environmental sanitation as well as continuous treatment of drinking water is highly recommended.

Key Words: Poor Snitation, diarrhea, outbreak, risk factors, pathogens, Afar, Ethiopia

Title: II. Influenza like Illness outbreak in rural and prison settings of south Gondar, northwest Ethiopia-2016

Author: Hagos M.Addisalem .[1, 2], J. Daddi.[2], Alemayehu B.[3], Desalegn. B [2,]

Authors Affiliation: [1]Ethiopian Public Health Institute, [2]Ethiopian Field Epidemiology Training Program, [3]Ethiopian public Health Association.

Background: Influenza is a major cause of sickness and death around the world and is one of the most important infectious diseases confronted the world today. It is a highly infectious viral disease which can occur as a pandemic, epidemic, outbreak and in form of sporadic cases. A report was received from the local health authority that there was influenza like illness in rural and a prison setting in South Gonder zone. A team was formed and sent to the two settings to conduct outbreak investigation for the illness reported for consequent public health interventions

Methods: Unmatched case control study design supported by descriptive cross-sectional study was employed. A structured questionnaire that addresses possible exposures for the suspected influenza was used. Epi Info was used to calculate frequencies, odds ratios and SPSS version 21 to perform logistic regression to identify risk factors for Influenza likeIllness. A case was defined as a person residing in South Gondar prisonsetting and in near by rural areas that developed signs and symptoms of flue. Throat swab were collected and tested for viral pathogens. Data were entered and analyzed using Epi-info version 7.1.4.0

Results: Outof 27 throat swabs tested at National virology laboratory for respiratory viruses 41%(11/27) of the suspected cases turned positive for Influenza A (H1N1) pdm09.A total of 48 cases and 96 controls were enlisted of which 15.3% were females and 84.7% were males with attack rate of 5.6%. The median age was 23 year old for cases and 25 years for controls.Having close contact history by shaking hands with similar complaint(s) (AOR=14.6; 95%CI: 5.69, 37.71) and attending mass gathering (AOR=2.8: 95%CI: 1.18, 6.81) were more likely to develop influenza (H1N1) pdm09 than those who did not shaking hands and attend mass gatherings.

Conclusions: Factors independently associated with the occurrence of flu outbreak were shaking hands with similar complaint(s) and attending mass gathering. Regarding the nature of the population, Isolation of cases and using standard preventive measures play crucial role to end up the outbreak in short days.

Key Words: influenza type A (H1N1) pdm09, South Gondar, Ethiopia.

Title: llI. Meningococcal Meningitis in Ethiopia: A Retrospective Record Review 2009-2013

Abstract

Title: Meningococcal Meningitis Surveillance Data Analysis-Ethiopia, 2010-2014

Author: Hagos M.Addisalem.[1, 2], Jima. D.[2], Alemayehu B.[3], Adamu A[2]

Authors Affiliation: [1]Ethiopian Public Health Institute, [2]Ethiopian Field Epidemiology Training Program, [3]Ethiopian public Health Association.

Background: Meningitis is a disease that has had some form of impact on nearly every part of the world. In Ethiopia, meningitis outbreaks have been described in written reports since 1901. Therefore, since Ethiopia is located on the African meningitis belt, bordering with meningitis prone countries, it is reasonable to conduct such type of data analysis regularly, to asses overall trends of Meningococcal meningitis.

Methods: The study involved a retrospective collection of clinical and laboratory data from regional states. Secondary data was taken from Public Health Emergency Managment Meningococcal Meningitis data base. The study included all the suspected and confirmed meningococcal meningitis cases reported. We described the outbreak by time, place and person.

Result: A total of 7,799 cases reported as meningococcal meningitis (clinical& Lab confirmed) and 242 deaths were reported to PHEM. Of the total cases, 3564 (45.7%) were reported from SNNP. Thehighest incidence rate were recorded in Gambella with 67.8/100,000 population, while highest CFR (59.1%) was in Dire Dawa administrative city. The most affected age groups were infants less than 1 and children 1-4 years. Among those lab was done the Most cause of the meningitis was serotype type A and W135 contributing 48 % and 18.5 %, respectively.

Conclusions: The study showed that trends of meningitis case distribution were recorded the highest at the dry season of every year and progressively decreases at the wet or rainy season, showing meningitis onset and dry season have evidence of positive relationship .Infants and children experienced the highest risk, serotype A is still the most cause of meningitis. The analysis also shows us meningococcal meningitis occurring out of the meningitis belt. Therefore, this new phenomenon needs farther study collaborating with multi disciplines. Strengthen surveillance system and mass vaccination campaign also need special attention in order minimize morbidity and mortality.

Key Word: Meningococcal Meningitis; African Meningitis Belt expands; Ethiopia, 2010-2014.

Chapter VII: Narrative Summary of Disaster Situation Visited

Meher Assessment Report conducted in Tigray Region, Ethiopia, 2015.

Executive Summary

Introduction: This Meher Assessment Report was conducted from 23 October-12 November, 2015, Tigray Region – Ethiopia. It covers health, nutrition, education and WASH, with the objective to assess the health, nutrition, WASH and educational status of the drought affected Woredas. It is an assessment conducted once in a year in all regions in under leadership of the Federal Disaster Response Management & Food Security Coordination Agency through its structure. The team comprising of DRMFSA, NGOs, UN agencies and other government bureaus set out to conduct this assessment.

Malnutrition in one or more of its various forms frequently characterizes emergency situation, both natural and man- made. Ensuring that the food and nutritional needs of drought affected population are adequately met is often the principal component of the humanitarian, logistic, management and financial response to an emergency. When the nutritional needs of population or population subgroups are not completely met, some forms of malnutrition soon emerge, usually among the most vulnerable groups (Children aged less than Five years, pregnant, elders and lactating mothers).

As a result of ensuing malnutrition and consumption of unprotected and unsafe water, the communities are exposed to water borne illnesses, outbreaks of vaccine preventable diseases, skin infections to mention but few. Therefore, Meher emergency need assessment is crucial to forecast and assess the magnitude of the emerging threats and accordingly to make necessary interventions, plans and preparations so that to early prevent unnecessary life and socio-economic damage.

Methods: The data was collected on key indicators that have impacts on human health and basic social service using structured questionnaires for all sectors and by conducting meeting and discussions with officials. An interview was undertaken with regional and woreda officials. In addition Review of existing relevant documents (secondary data) based on the agreed tools was also used.

A total of five zones and 21 woredas were selected by the assessment team and the selection criteria for the five zones and 21 woredas were based on their level of being affected by draught. Accordingly, Two woredas from North west Zone (Tselemti and T/Adiyabo.), five Woredas from

Central Zone (Mereb Leke, Ahferom, W/Leke, K/Tembien and T/Abergele),Seven Woredas from Eastern zone (K/Awelalo, A/Wenberta, Hawzien, S/ S/tsaeda Emba, G/Afeshum, G/mekeda and Erob), three Woredas from Southern zone (Ofla, R/Alamata and R/Azebo and four Woredas from South eastern zone (Enderta, H/Wajirat, S/Samre and D/Tembien) were assessed

Results: A total of 5 zones and 21 woredas were visited in regard to different variables of health, Nutrition, WASH and Education.

Health

Acute respiratory tract infection (11.89%), Malaria (11.55%), Diarrhea (8.35%), AFI (7.83%) and pneumonia (6.7%) were the five top causes of morbidity in the region. In the visited woredas, Water borne illness (diarrhea), respiratory tract infections (AURT, and pneumonia), malaria, skin infection and intestinal parasitosis are the major causes of morbidity in the under-five. In the above five age group, respiratory tract infection (AURTI and pneumonia), Water borne infection (diarrhea and dysentery), skin infections, malaria and acute febrile illnesses were top list of causes of morbidity

Most of the visited Woredas have all the major risk factors for malaria such as being endemic to malaria (100%), presence of malaria breeding sites (100%) and interrupted or potentially interrupting rivers (100%). ITNs distribution has covered more than 85% of households in all the visited Woredas. Most of the malarious woredas have conducted IRS in selected malarious kebelles.

Nutrition

The nutritional situation of the visited woredas can be fairly described based on the nutrition screening data provided from October 2015. Screening coverage malnutrition for children aged 6-59 months was more than 86% ranging from 48% in G/mekeda to 113% in T/Adiyabo, with 16,261 (5.5%) with Moderate Acute Malnutrition (MAM) and 12,390 (0.4) Sever Acute Malnutrition (SAM) cases, of which 21 were found to be edematous. While screening coverage of Pregnant and Lactating Women was 62.2%. Of those screened about 10,022(17%) have Middle Upper Arm Circumference (MAUC) <21cms. All visited Woredas have confirmed that all SAM cases are in program.

The screening coverage for South and S/East, North West and Central and Eastern zones were 98.3, 87.9 and 72.3 percent respectively. The screening coverage for Woredas from eastern zone was low (G/mekeda 48%, Erob 56%, Hawzien 66% and S/tsaeda Emba 76%) compared to the other zones

WASH

The assessment team has identified that 233 kebeles in 21 Woredas were affected by shortage of water due to the drought. An estimated of 669,479 people are currently affected by critical water shortage with additional 586,958 people are at risk mainly in parts of the above Woredas. It is also estimated that more than 586,958 people are at risk of water borne and sanitation related diseases including diarrhea.

Education

As a result of the current El-Nino effect, 22 schools (11 from east, 8 from central, and 3 from North West) have been physically damaged due to high wind effect. Due to this reason, a total of 11,845 (5,386 boys and 6,459 girls) students (3302 boys and 3752 girls from east, 2,841 and 1,063 boys & 1,778 girls from central and 1,950 that is 1021 boys and 929 girls from North west) have been affected and forced to attend their schooling under poor quality rooms. Though 1,012,204 (514,271 boys and 497,933 girls) students are registered during the 2015/16 calendar year, 29,907 students (15,190 boys and 14,717 girls) have not yet attended any class due to the prevailing drought situation, of course the severity varies from Woreda to Woreda and even from village to village

Conclusion: Scabies outbreak was reported in all the visited weredas including Mekelle and SAM cases show an increment trend in 2015 compared to 2014. Veno Occlusive Liver Disease (VOLD) has been reported from some of the visited Woredas of N/western zone and elimination of the Ageratum seed as its control mechanism was minimal. Due to presence of dry spell resulting in decreased crop production and poor recharging of ground water, it is expected that Malnutrition will rise up resulting in both severe acute malnutrition and vulnerability to infections diseases‗ spread including vaccine preventable, skin and water borne diseases.

There is a need to enhance surveillance, activate coordination mechanism, conduct health education on household water treatment (chemical or boiling) and allocate emergency fund.Immediate Targeted Supplementary Feeding (TSF) response to MAM (6-59 months children and PLW) will help them to improve their nutritional and health status and prevent deterioration to SAM. Early detection and admission of SAM cases and close Nutrition program and CMAM supply monitoring need to be given attention.

1. Introduction

The Tigray Regional state is located in the north part of Ethiopia with a latitude of 12°16' to 14° 49' N and longitude of 36° 27' to a 40° 00_E. Tigray has a total area of 41,409.95Km2 and an altitude with a range of 500-4000 meter above sea level. It is bordered by Eritrea to the north, Sudan to the west, the Afar Region to the east, and the Amara Region to the south and southwest (1). It has estimated population of 4,929,999 projected from 2007 Central Statics Agency population and housing census, of which females comprise 50.75%. From the total population 19.53% are urban inhabitants (2). It has a total of 7 zones, 46 weredas and 731 kebelles on which there are 22 hospitals (16 governmental and 6 private), 217 health centers, and 608 health posts. Malaria is the leading causes of (75% of its area is endemic to malaria) outpatient visit and admissions. Meher emergency need assessment is crucial to forecast and assess the magnitude of the emerging threats and accordingly to make necessary interventions, plans and preparations so that to early prevent unnecessary life and socio-economic damage.

Map1**: Map of Tigray region that shows the selected 21 weredas during the field visit in 2015**

2. Objectives

2.1. General Objective

To assess the potential hazards, at risk population and the capacity of the health system in managing the health emergencies of the Meher season, in selected weredas of Tigray region in 2015.

2.2. Specific Objectives

- To Assess the, type, magnitude, severity and likely of different risks to the populations
- To identify the existing capacity of the basic services and gaps
- To identify areas where emergency assistance might be needed
- To examine potential emergencies and develop necessary plans for fostering preparedness sectors to adequately address the potential emergencies;

3. Methods

This assessment was conducted as part of the non-food meher assessment in the drought affected areas of Tigray region. The data was collected on key indicators that have impacts on human health and basic social service using structured questionnaires for all sectors and by conducting meeting and discussions with officials. An interview was undertaken with regional and woreda officials. In addition Review of existing relevant documents (secondary data) based on the agreed tools was also used.

A total of 5 zones and 21 woredas were selected by the region and the assessment team was assign, the selection criteria for the five zones and 21 woredas were based on their level of being affected by draught. Accordingly, Two woredas from North west Zone (Tselmti and T/Adiabo.), five Woredas from Central Zone (Mereb Leke, Ahferome, W/Leke, K/Tembien and T/Abergele),Seven Woredas from Eastern zone (K/Awelalo, A/Wemberta, Hawzen, S/Ts/emba, G/afeshom, G/mekda and Erob), three Woredas from Southern zone (Ofla, R/Alamata and R/azebo and four Woredas from South eastern zone (Enderta, H/wajirat, S/Samra and D/Tembein) were assessed.

4. Results

In all sectors, the results are organized and presented at regional level and covering all the four basic social services namely health, nutrition, WASH and education.

4.1. Health

4.1.1. Demography

The total population of the visited woredas is 2,767,641 (1,358,388 male and 1,409,251 female) which accounts for 55% of the region's population (5,005, 599). About 400,110 of the population segment is under-five year children while pregnant women comprises 93,862 and reproductive age group population is 647628 (Table: 7.1). There are a total of 32,000 refugees 26,000 in Tselemti and 6,000 in T/Adiyabo). There are also a total of 2,400 IDPs in Mereb Leke.

Table 35:Demography of the visited Woredas of Tigray region, 2015

Indicators	Total Tigray Region	Total (21 Woredas)	% Assessed
Total population	5,005,599	2,767,641	55%
Male	2,462,748	1,358,388	55%
Female	2,542,850	1,409,251	55%
Under 5	730,818	400,110	55%
No. of women of reproductive age (age 15-49 yrs.)	1,171,310	647628	55%
No. of pregnant women	170,190	93,862	55%

4.1.2. Coordination, EPRP and emergency fund

From the visited Woredas 20 (90%) have Emergency coordination forums lead by the Woreda administrator but there is no evidence of meetings with minutes or have they provided coordination forum TORs.

The assessment team identified that all of the visited Woredas have Early Preparedness Responses for selected outbreak prone diseases and mostly have adequate level of emergency drug stocks and supplies for one month. Some visited Woredas lack PHEM related diseases guidelines and treatment protocols. Accessible Emergency Response Fund is available in 7 (33%) of the visited Woredas. The eight Woredas have 3,370,000 birr as accessible emergency fund.

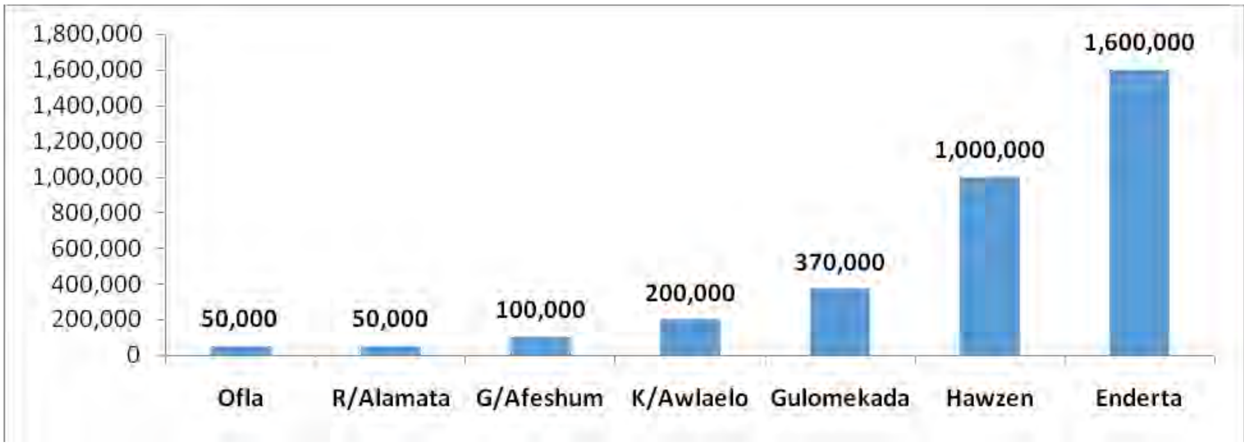


Figure 42: Accessible Emergency budget by Woredas, Tigray Region, 2015

4.1.3. Morbidity

Acute respiratory tract infection (11.89%), Malaria (11.55%), Diarrhea (8.35%), AFI (7.83%) and pneumonia (6.7%) are the five top causes of morbidity in the region. In the visited woredas, Water borne illness (diarrhea), respiratory tract infections (AURT, and pneumonia), malaria, skin infection and intestinal parasitosis are the major causes of morbidity in the under-five. In the above five age group ,respiratory tract infection (AURTI and pneumonia), Water borne infection (diarrhea and dysentery), skin infections, malaria and Acute febrile illnesses top the list of causes of morbidity.

4.1.4. Status of outbreak prone diseases

Malaria

Malaria is one of major causes of morbidity in Tigray region ranking second in 2007 EC with a total of 296,785 (11.55%) cases as outpatient and 5,417 inpatient cases. To prevent malaria epidemic, the region distributed 1,244,708 ITNs to 39 malarious Woredas including the 21 visited Woredas. The ITN distribution coverage is 99% at household level in malaria endemic Woredas. Similarly, malaria is one of the major causes of morbidity in both the under-five and above five populations in the visited Woredas. There were a total of 39,312 cases from June 2006 EC to October 2007 EC whereas there were a total of 31,542 cases from July 2007 EC to October 2008 EC. Generally, the burden of malaria in the visited Woredas shows declined trend in 2007/2008 EC compared to 2006/2007 EC. There was a report of slight increase in caseload in Glomekeda and Hawzien in Eastern zone. There was report of one death attributed to malaria in Tahitay Adiyabo Woreda in North Western zone.

Based on the format, it is not possible to do trend analysis by week and compare with the second highest in the last five years data. We have, however, noticed that in most of the visited Woredas trend analysis and comparison with the second highest year has been carried out and there was no indication of malaria outbreak .None of the visited Woredas have reported malaria outbreak from any of their unit structures (Kebeles/Tabias). The table below shows the trend of malaria in 2006 compared with available data in 2007 for the visited Woredas.

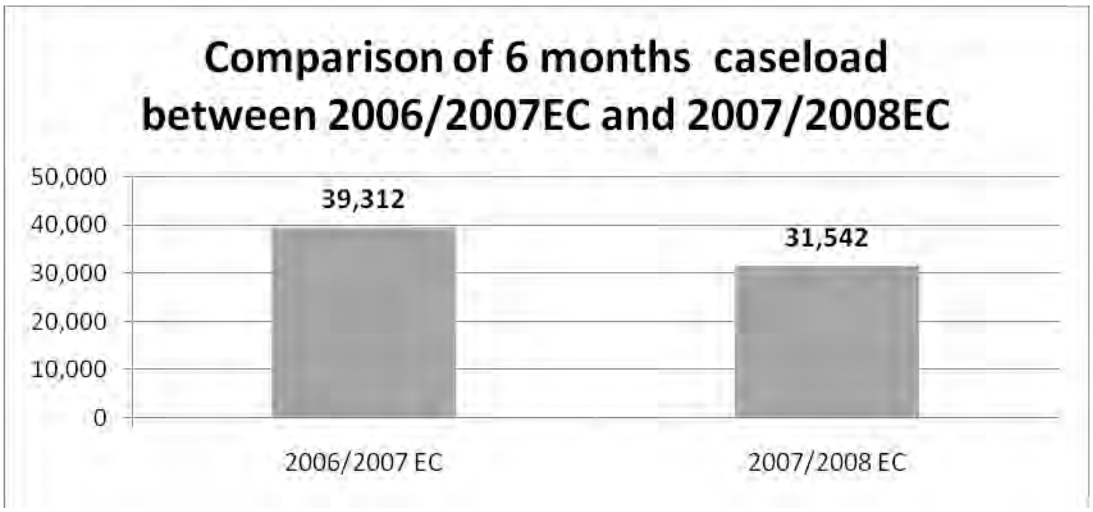


Figure 43: Malaria case loads in 2006/07 and 2007/08 EC in Tigray Region visited weredas

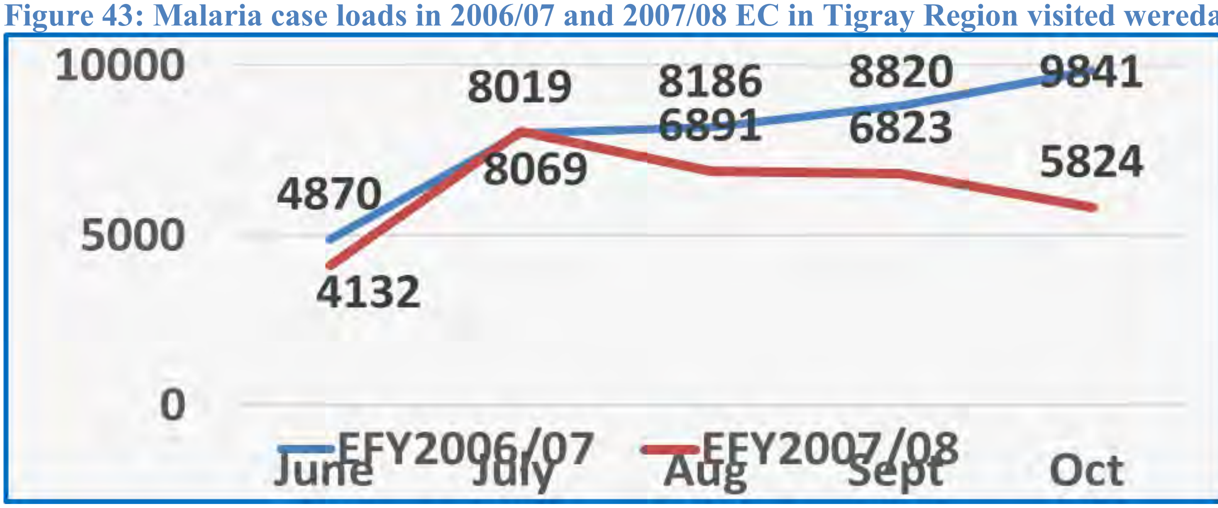


Figure 44: Trend of Malaria in 2006/07 and 2007/08, in the assessed weredas of Tigray Region, 2015

The visited Weredas have more than 85% ITN distribution and conducted IRS in the malaria endemic kebeles coupled with environmental management, health education and case management.

AWD

While Woredas have experienced slight rise in diarrheal illnesses, there was no a single report of suspected case of AWD in the visited Woredas from July 2007 EC to October 2008 EC. However, in view of the prevalent dry spell, the ensuing reduction in human water supply whereby the section of the population in the Woredas visited consuming river water and decreased production of crops, it is anticipated that AWD could be one of the outbreak risks unless preventive measures are taken. Most of the visited Woredas have identified AWD as one of the hazards in their EPRP and have as such quantified the drugs and supplies' requirement.

Meningitis

There was no report of meningitis outbreak from any of the visited Woredas. However, one case is reported from Enderta (South Eastern zone). There was no death from meningitis in any of the visited Woredas. Currently, conjugate meningitis A preventive vaccination campaign for age group 1 to 29 years is underway in 14 of the 21 Woredas in Eastern and South Eastern zones. As the rest of the visited Woredas had meningitis A prevention vaccination campaign in 2011. Tigray is situated in Meningitis belt and the visited Woredas are draught affected, the meningitis A vaccination being conducted will contribute towards protecting the communities.

Measles

There was no report of Measles outbreak in the visited Woredas, however, nine sporadic cases had been reported from some of the visited Woredas (Ofla, 3; S/samra, 3, Tahitay Adiabo,1, Kilt Welalo and Enderta 1). There was no measles related death from any of the Woredas. Measles vaccination coverage ranged from 49% to 100% and averaged at 82%. Of the visited Woreda Erob , Eastern zone has the lowest measles coverage. The average measles coverage of the 21 visited Woredas is below the 90% (the regional average). Measles SIA is being undertaken in 20 of the 21 visited Woredas even though the result is not yet reported fully at the time of preparation of this report. The SIA will increase the prevention measure against Measles outbreak in this time of impending food insecurity and ensuing malnutrition.

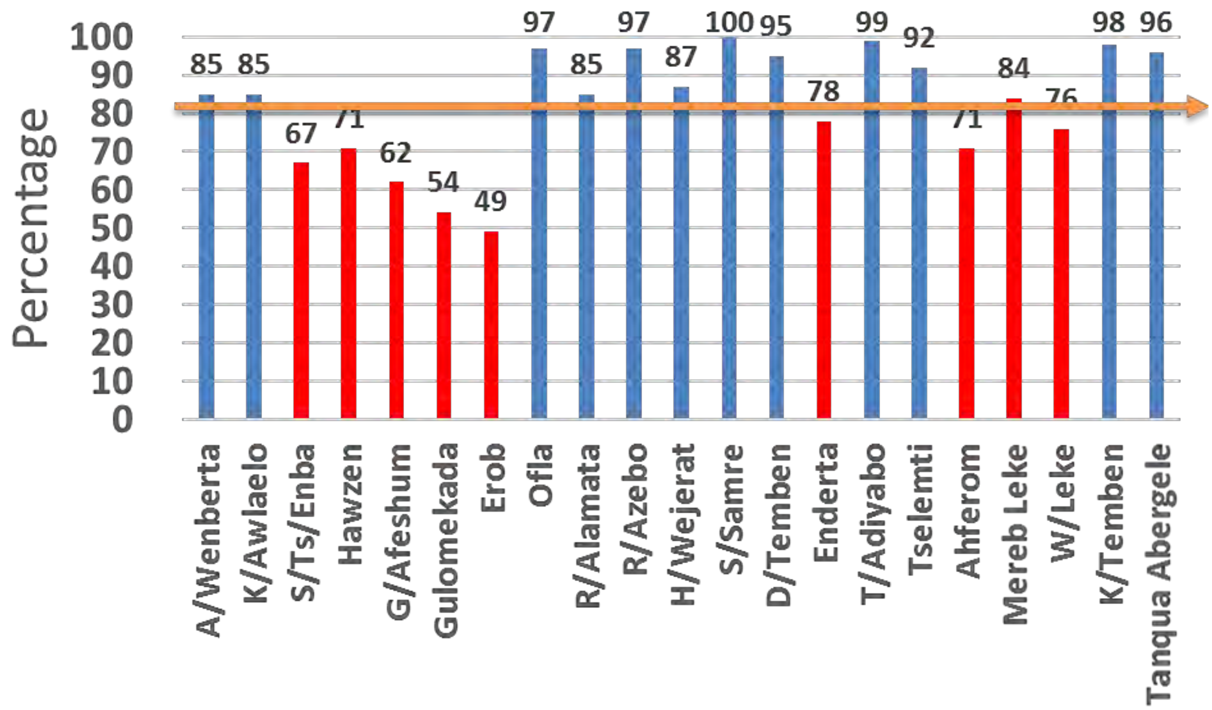


Figure 45: Measles vaccination coverage by Woreda, Tigray Region, 2015

Water borne diseases

There are reports of increase in diarrheal illnesses from some of the visited Woredas. Some Woredas have also slight increase in dysentery cases. In view of the dry spell and some residents of the visited Woredas consuming water from unsafe water sources, it is important to monitor diarrheal illnesses closely.

Veno Occlusive Liver disease (VOLD)

The disease started in T/Koraro Woreda, Kelakil village, now it expanded within the Woreda and to other six rural Woreda (Medbay Zana, T/Koraro, T/Adyabo, L/Adiabo, Tselemti,A/Tsimbla). The assessment team found out that VOLD cases are being reported in North-west zone (17 cases in 3 months), and 96 (69%) of the 139 Kebeles are affected. It was also reported that the prevention activities are not being carried out as per the technical team‘s recommendation. There is no full acceptance of the causative agent (a weed named as ―**Ajiratum**") and commitment to controlling or eradicating it. The victims of VOLD don‘t think that the treatment being provided to them is efficacious enough according to zonal briefing.

Scabies

Scabies is reported from 22 Woredas (including Mekelle) in the region with a total of 16,804 cases. Some of the visited Woredas have reported scabies cases. However, all the 21 Woreda are at risk of Scabies but five rural Woredas (Raya Alamata, H/Wejirat, Ahferom, , Enderta, Ofla,) and Mekelle Town are more at risk as per the current trend. In some Woredas, there is poor surveillance of diseases outside the IDSR diseases including scabies. There is also report of knowledge/skill in diagnosing the disease.

4.1.5. Possible Risk factors for outbreak prone diseases

Most of the visited Woredas have all the major risk factors for malaria such as being endemic to malaria (100%), presence of malaria breeding sites (100%) and interrupted or potentially interrupting rivers (100%). There is no depletion of prevention and control of malaria in any of the visited Woredas. ITN distribution has covered more than 85% of households in all the visited Woredas. Most of the visited malarious woredas have conducted IRS in selected malarious kebeles.

However, there was neither malaria outbreak nor increase in caseload in the visited Woredas during the period from June 2007 to October, 2008 EC. The trend also doesn't show unusual upward increase or was there doubling compared to the second highest year data.

The visited Woredas have had meningitis vaccination (Conjugate Men A) administered to the majority of the target population with more than 84% coverage (with in the target population of 1 to 29 years old) and SIA of measles carried out with the majority of the target population between 6 and 59 months. The regional measles vaccination coverage is 90% for the fiscal year 2007. Central and Eastern zones have measles vaccination coverage below 90% at 87.5% and 74% respectively. North western and Southern zones have measles vaccination coverage higher than 90% at 107.1% and 92.8% respectively.

The basic latrine coverage in the visited Woredas ranges from 79 to 100% and averages at 94%. The regional latrine coverage is 89%. The improved latrine coverage ranges from 3% in Tselemti to 84% (Atsibiwenberta) and average at 45%. Latrine utilization ranges from 65% to 100 % and is 90% at average. Safe water coverage for the visited Woredas ranges from 37% to 86% (Average 65%).

Supplies

It was found that there were enough supplies of key drugs and supplies except ORS and TTC eye ointments in Mereb Leke and Werie Leke, ringer lactate in Tselemti and Mereb leke, doxycycline and consumables in Mereb leke, Vitamin A in D/Tembien and Merebleke and CTC and meningitis RDTs in all visited Woredas. Some Woredas (10, 47%) have reported to have LP sets in their Primary Hospitals. G/Afeshum, Ofla, R/Alamata, Enderta, K/Tembien and T/Abergele lack RH Kit (CEOmNC) Enderta.

HIV in emergencies

There are 124 Health facilities providing HIV services like PMTCT, VCT and Post Exposure Prophylaxis. People with HIV/AIDS are more vulnerable than the general public in the time of food insecurity resulting from reduced crop production due to draught and thus require special attention to their food needs and HIV/AIDS related services. They are also at increased risk of developing complications and vulnerable to disease outbreaks. Moreover, in times of emergencies like draught and malnutrition, the HIV/AIDS prevention and care might be neglected and there is a risk of negative coping mechanisms such as resorting to commercial sex workers which should be addressed. The assessment team has learnt that HIV/AIDS in emergencies are being given due attention in the visited Woredas and they are prioritized for emergency relief.

Table 36: HIV services in the visited Woredas, Tigray Region, 2015

HIV services	Services provided
Number of HFs Providing VCT/PEP/PMTCT Services	124
Number of Persons Seeking VCT	89,237
Number of women Offered PMTCT	67,590
Number of IEC Materials Distributed	17,139
Number of Condoms Distributed	1,342,463

Table 37:Type of risks and at risk population by Woreda, Tigray Region, 2015

Woredas at risk	Type of risk	At risk population
In all 21 Woredas (329 kebeles, xx%)	Malaria	1, 458,983
All Woredas	Measles	2,635,749
All Woreda	AWD	1,168,896

All Woredas	Meningitis	2,767,641
Six rural Woreda(Medbay Zana, T/Koraro, T/Adyabo, L/Adiabo, Tselemti,A/Tsimbla)	VOLD	788,124
All the 21 Woreda-(but five rural Woredas (Raya Alamata, H/Wejirat, Ahferom, , Enderta, Ofla,) and Mekelle Town are more at risk	Scabies	3,020,234

Table 38:Financial requirement for drugs and supplies in selected woredas of Tigray Region, 2015

Type of health emergency	Total estimated beneficiaries(Calculated cases)	Required finance	
		Birr	USD
Malaria	29,180 (5,836 severe cases, 20%)	94,823,288	4,472,796.60
AWD	2,338 cases (20% being Severe , 468 cases)	378,151	17,837.31
Measles	24,355 cases (20% severe, 4,871 cases)	10,692,967	504,385.24
Meningitis	8,303 cases (20% severe cases, 1,661)	55,575,325	2,621,477.59
VOLD	7881 cases (1% of 788,124)	4,410,515.84	208,043.20
Scabies	60,405 cases (2% of total population at risk)	13,000	613.21
Total		165,893,246.84	7,825,153.15

Table 39:Financial requirement for capacity, supportive supervision and communication Tigray region, 2015

S/N	Activities	unit	Quantity	Unit Cost	Total Cost Budget	Actors/ Sources
1	Sensitization of zonal and woreda Political leaders at region level for 3 days @210 Birr per day	persons	780	955.00	744,900.00	Federal and Regional Governments, UN Agencies and All other Partners
2	Sensitization of Religous nd Community leaders for	persons	1,750	525.00	918,750.00	

	3 days @100 Birr per day					
3	Training for Health workers on integrated epidemic prevention and case management for 6 @210 Birr per day	persons	650	2,045.00	1,329,250.00	
4	Supportive supervision by woreda & regional experts for 10 days per quarter @210 Birr (DSA and Fuels)	persons	120	12,100.00	1,452,000.00	
5	IEC/BCC material on AWD, Malaria, Meningitis, Measles … production and distribution	item	100,000	12.50	1,250,000.00	
6	Disseminate key messages on AWD, Malaria, Meningitis, Measles using local radios	episode	720	1,500.00	1,080,000.00	
	Total cost (Birr)				**6,774,900.00**	
	Cost in USD		**-**		**319,570.75**	

Table 40፡Summary of financial requirements of health services, Tigray Region, 2015

S/N	Item	Financial requirement	
		Birr	USD
1	Financial requirement for drugs and supplies	165,893,246.84	7,825,153.15
2	Financial requirement for capacity, supportive supervision and communication	6,774,900.00	319,570.75
Total		172,668,146.84	8,144,723.90

4.2. Nutrition

4.2.1. Nutritional screening

The overall purpose of the final Meher assessment process was to verify the effect of Meher seasonal rains and its effect on the livelihoods of the community (both food and non-food components) at the end of the season and identify potential expected gaps to ensure appropriate and effective humanitarian planning and responses, which will lead to reducing morbidity, mortality and acute malnutrition in the most vulnerable areas both for food and non-food components.

Nutrition is one part of the non-food assessment it helps to assess the nutritional status in the drought affected woredas. As the assessment is shortly planned and required to bring as fast as possible current status, basic data was collected on nutrition with same field observation and discussion at tabia and Woreda level with service providing communities.

The screening coverage of 6-59 months of the Region from the October 2015 mass screening was 82% which is best coverage from the previous months with 4% (22,407) MAM and 0.42% (2401) SAM out of which 49 of them were edematous. While screening of PLW showed 57%; of which 13,494 (13%) of them were with MUAC <21cms.

The nutritional situation of the visited woredas can be fairly be described based on the nutrition screening data provided from the October 2015 by Woredas since the screening coverage for children 6-59 months was more than 86% ranging from 48% G/mekeda)-113% (T/adiabo), 16,261 (5.5%) with MAM and 12,390 (0.4) SAM cases, of which 21 were found to be edematous. While screening coverage of PLW was 62.2% with 10,022(17%) MUAC <21cms. All visited Woredas have confirmed that all SAM cases are in program.

The screening coverage for South and South East, North West and Central and Eastern zones were 98.3, 87.9 and 72.3 percent respectively. The screening coverage for Woredas from eastern zone was low (G/mekeda 48%, Erob 56%, Hawzien 66% and S/tsaeda Emba 76%) compared to the other zones (see table below)

Table 41:Mass screening coverage of nutritional status of children aged 6-59 months and PLWs, Tigray region, 2015

Woredas	Coverage%	6-59 months children			PLW	
		GAM%	SAM%	Edema(n)	Coverage (%)	MUAC < 21 cm %
K/awlalo	90	5.31	1.0	1	44	24
A/wenberta	91	3	0.1	0	56	12
S/t/emba	76	7.5	0.6	4	44	25
Hawzene	66	3.6	0.3	0	37	21

Golomekeda	48	5.3	0.3	0	19	14
Gantaafeshom	79	8.77	0.4	0	37	4
Erob	56	4.8	0.0	0	42	23
Eastern Zone	72.3	5.5	0.4	0.7	39.9	17.6
R/azebo	99	3.57	0.08	0	88	13
R/almata	90	5.4	0.14	0	74	10
Ofla	95	5.02	0.09	0	78	6
D/tembien	103	9.88	0.24	2	105	33
S/samre	103	6.74	1.05	5	90	17
Enderta	99	6.01	0.59	0	70	16
H/wjirat	99	7.19	0.39	0	45	38
M/leke	83	5.3	0.55	4	65	13
T/abergelle	94	2.87	0.31	2	76	8
K/ tembien	95	6.04	0.35	2	82	20
W/leke	71	5.67	0.22	0	50	25
T/adiabo	113	1.15	0.22	0	84	4
Tselemti	77	10.12	0.85	1	59	24
Ahferom	82	3.17	0.13	0	61	11
Average	86.1	5.5	0.4	1.0	62.2	17.2

4.2.2. Nutrition situation based on TFP admission

The TFP admission has shown increment by 902 cases (23.4 %) in 2015 (May to October) compared to 2014 (May to October). Comparing September 2015 to October 2015, admission has increased by 452 cases (40.9%) and the possible reason for the increment in October 2015 are better screening coverage and effects of the draught with some possible contribution of Data quality.

Woredas which shows SAM cases increments were M/Leke (88.4%), K/Awlalo (46.3%), S/samre (43.6), D/tembien (38%) and Tselemti (37.2%) when comparing (May- October) 2014 to (May-October) 2015. Number of SAM cases inS/Samare (127), M/Leke (58), Tselemti (46), Enderta (41), K/Awlalo (44), Hintalo wojerat (36) and W/Leke (36) have significantly increased comparing October 2015 with September 2015. (Table: 8)

Table 42:TFP admission trend May 2014 to October 2015, Tigray region

Woreda	MAY		June		July		Aug		Sep		Oct		Total		#	%
	2006	2007	2006	2007	2006	2007	2006	2007	2007	2008	2007	2008	2006	2007		
Kelte Awlalo	10	22	20	16	17	16	4	20	14	35	36	79	101	188	87	46.3
A/Wonberta	4	3	5	5	12	12	11	21	12	20	0	3	44	64	20	31.3
S/S/Emba	15	8	10	20	18	7	7	6	1	9	31	12	82	62	-20	-32.3
Hawzene	5	11	4	15	13	9	4	11	6	15	4	3	36	64	28	43.8
Golomekeda	7	1	11	3	7	5	4	6	7	10	9		45	25	-20	-80.0
Gantaafom	0	11	14	0	18	10	6	5	0	9	10	10	48	45	-3	-6.7
Erob	3	3	5	1	3	2	3	0	5	5	8	1	27	12	-15	-125
Eastern	44	59	69	60	88	61	39	69	45	103	98	108	383	460	77	16.7
R/ Azebo	20	25	20	22	39	16	19	23	34	38	35	57	167	181	14	7.7
R/ almata	33	21	34	15	38	69	28	78	29	51	36	64	198	298	100	33.6
Ofla	19	12	12	10	16	9	21	35	14	29	17	57	99	152	53	34.9
D/Tembien	18	12	26	19	7	36	3	23	27	20	12	40	93	150	57	38.0
S/samre	69	73	45	68	35	40	51	64	51	70	38	197	289	512	223	43.6
Enderta	0	16	43	13	16	15	21	23	40	46	38	87	158	200	42	21.0
H/ wjirat	10	20	23	25	60	26	23	29	50	54	105	90	271	244	-27	-11.1
M/leke		17		10		29	23	30		27		85	23	198	175	88.4

T/abergelle	86	44	43	26	57	34	37	25	48	37	83	45	354	211	-143	-67.8
Kolatemben	78	124	69	75	59	114	61	112	61	68	77	70	405	563	158	28.1
Werieleke	12	17	9	10	15	22	16	23	15		70	36	137	108	-29	-26.9
T/adiabo																
Tselemti	22	40	33		54	86	41	80	52	93	73	139	275	438	163	37.2
Ahferom	4	18	3	9	33	34	17	35	20	15	23	28	100	139	39	28.1
Average	415	498	429	362	517	591	400	649	486	651	705	1103	2952	3854	902	23.4

There are a total of 532 TFP sites (493 sites are OTP and 39 TFU/SC) in the visited Woredas. However, out of 39 SC sites 6 (Feresmay, Nebelet, Megab, Dewhan, Aragure and Mermyiti HCs) are nonfunctional due to supply shortage/kit, no trained personnel and shortage of room to give the service. (Table:).

Table 43:Number of OTP/SC Sites and reporting rate for October 2015, Tigray Region

	OTP	SC	TFP	Reported	Report Rate
Kelte Awlalo	22	2	24	24	100
Asbi Wonberta	22	2	24	24	100
S/S/Emba	33	2	35	35	100
Hawzene	28	2	30	25	83
Golomekeda	19	2	21	21	100
Gantaafom	20	1	21	20	95
Erob	11	1	12	12	100
Eastern Zone	155	12	167	161	96
R/ Azebo	23	2	25	23	92
R/ almata	18	2	20	20	100
Ofla	29	2	31	31	100
D/Tembien	30	1	31	31	100
S/samre	21	2	23	23	100
Enderta	17	2	19	18	95

H/ wjirat	25	2	27	27	100
M/leke	21	3	24	24	100
T/abergelle	22	2	24	24	100
Kola tembien	32	2	34	34	100
Werieleke	27	2	29	28	97
Tahtayadiabo	21	1	22	22	100
Tselemti	23	2	25	25	100
Ahferom	29	2	31	30	97
Average/total	493	39	532	521	98

Nutrition supply

All visited Woredas had at least one month supply of RUTF except H/ Wejerat, Tselemti, Kolatembien and Merebleke

All visited woredas had at least one month supply of F100 except Tselemti, Merebleke, Enderta, Atsibiwenberta and Erob and F75 except Tselemti, Mereb leke, Enderta, Atsbiwonberta, Ganta afeshum and Erob.Only G/Mekeda and Hawuzien had ReSomal. Amoxicillin syrup and Vit A caps was available in all Woredas (See Annex).

Children managed in CMAM programs were linked to TSF only in the TSF Woredas, but children in some Woredas (T/Adiabo, K/awlaelo, Hawzien, R/Alamata, Ofla, and S/samre) were not linked as there was no TSF program. From October 2015 mass screening, a total of 36,761 MAM case (22,903 under five and 13,858 PLW) were reported and require TSF service.

4.2.3. Possible Risk factors of Emergency Nutrition:

The potential risk factor for the occurrence of the malnutrition is drought and there are also other aggravating factors (Diarrhea, shortage of safe water etc…)

A total of 113,189 MAM cases of children aged 6-59 months and PLW are at risk of malnutrition due the drought were reported from the mass screening conducted in Oct 2015. To provide with TSF for the MAM cases, 2322.174 Mt of supplementary food is required for 10 months (Table: 10)

Table 44:Ten months TSF requirement, Tigray region, 2015

Nutrition - TSF Component						
TSF requirement						
	Population at Risk					
	# of MAM	PLW	Total	Food Request (Mt/Month)	Duration 10 months	Remark
Regional Total	113,189	29,714	142903	232.217	2322.174	

Table 45:CMAM Supply needs, Tigray region, 2015

TFP requirement			
CMAM at risk	11,318	Cost in USD	Remark
31 Woredas	11,318	888,219.20	There are supplies which we couldn't get estimated cost for.

4.3. Water, Hygiene and Sanitation (WASH)

4.3.1. Overall situation of sanitation and hygiene

The assessment team deployed in 21 Woredas in 5 zones (all zones except Western zone) identified that the water supply sources are highly affected by the drought and the communities living in these Woredas are affected not only by the shortage of water for human but also for livestock consumption. The livestock are means of livelihood for people living in different Woredas especially T/ Abergele, Raya Azebo, R/Alamta, Tselemti, T/Adyabo, K/Awelalo and M/Leke.

The malfunctioning rate for some Woredas increased unusually due to the decreasing of ground water level associated with the drought, as a result submersible pumps, generators, and switch boards are not functioning properly. A significant number of shallow wells and hand dug wells decreased their yield especially in the low land areas bordering Afar, Amhara and Eritrea. The communities living in the 233 kebeles in the visited 21 Woredas unusually fetch water from a distant water supply sources that spending 3-6 hours on average, in some kebeles queuing time also increased.

In general, the average safe water supply coverage among assessed woredas is very low which accounts for only 56%. Accordingly, Woredas such as Tahtay Adyabo and Tselemti are areas with least water supply coverage; However, Woredas such as Atsbi Womberta, S/S/Emba and W/lekeare relatively with better water supply coverage compared to the other Woredas.

The household latrine coverage in visited Woredas was also assessed and it is found to be 93% but the quality remains in question because most lack hand washing like tip tap. Some communities are still practicing open defecation (for instance Enderta Woreda's HHs latrine coverage is 79%).

4.3.2. Current WASH related Emergency/Hazard

The assessment team has identified that 233 kebeles in 21 Woredas were affected by shortage of water due to the drought. An estimated of 669,479 people are currently affected by critical water shortage with additional 586,958 people are at risk mainly in parts of in the above Woredas. It is also estimated that more than 586,958 people are at risk of water borne and sanitation related diseases including diarrhea.

Table 46:Communities currently affected/at risk of WASH emergency due to draught, Tigray Region, 2015

Zone	Woreda	Total no of kebeles in the woreda	Emergencies			
			No of Drought affected kebeles	No of population affected by acute water shortage	No of population at risk of acute water shortage	Population at risk for Water borne diseases
South	Raya Alamata	14	7	14,051	14,051	14,051
	Ofla	21	8	20,250	20,250	20,250
	Raya Azebo	18	11	57,152	57,152	57,152
South Eastern	Hintalo Wajerat	23	15	52,500	52,500	52,500

	Doga Temben	24	10	18,480	18,480	18,480
	Samere Seharti	23	13	37,808	37,808	37,808
	Enderta	17	11	28,520	28,520	28,520
Eastern	Kilete Awalo	19	7	19,059	30,238	30,238
	Saesa T/Amba	26	13	22,838	19,857	19,857
	Asbi Wonebrta	17	10	24,983	24,983	24,983
	Hawzen	24	25	17,972	41,299	41,299
	Ganta Afeshume	19	20	5,833	5,833	5,833
	Gulo Mekeda	17	11	23,613	23,613	23,613
	Erop	8	7	33,112	33,112	33,112
Central	Tanqu abergele	20	9	34,389	34,389	34,389
	Kola Temben	27	13	30,002	30,002	30,002
	Wori Lehe	33	9	42,368	42,368	42,368
	Mereb Lehe	21	13	80,665	16,961	16,961
	Aheferom	33	10	50,629	15,252	15,252
N/ W/	Teselmti	22	6			

Tigray				33,363	28,214	28,214
	Tahetay Adeyabo	18	5	22,392	22,392	22,392
Total		444	233	669,979	597,274	597,274

4.3.3. Status of water supply schemes

The region is highly vulnerable to recurrent drought and water and sanitation related diseases emergencies which are highly aggravated by poor water supply and sanitation coverage of the region. Moreover, significant numbers of existing water supply schemes are also not functional. Accordingly, the assessment finding showed that 1,136 water supply schemes (18.8%) are not functional mainly because of lowering of ground water table; broken schemes due to poor operation and maintenance schemes, water quality problem, mismanagement and high exploitation of water supply schemes. Lack of spare parts, operation and maintenance tools to maintain the non-functional water supply schemes, lack of skilled human resource at Kebelle/Woreda level, lack of budget to establish new water supply schemes and maintenance activity, inadequate follow up & inventory on the status of existing water supply schemes as it is clearly seen in the assessment,, and limited/absence of NGO's working on WASH are common problems identified in the assessed 21 Woredas (See the detail below table).

Table 47:Status of water schemes by Woreda, Tigray Region, 2015

Zone	Woreda	Number of Functional Water supply schemes			Number of Nonfunctional water supply schemes		
		Hand Dug wells/SW fitted with hand pump	Spring devt'	Motorized scheme	Hand Dug wells/SW fitted with hand pump	Spring devt't	Motorized scheme
South	Raya Alamata	146	28	0	18	13	0
	Ofla	250	101	0	27	15	0

	Raya Azebo	77	4	0	14	0	0
South Eastern	Hintalo Wajerat	383	58	0	170	41	0
	Doga Temben	152	69	0	53	10	0
	Samere Seharti	428	21	0	71	7	0
	Enderta	191	23	0	51	1	0
Eastern	Kilete Awalo	245	6	7	8	0	4
	Saesa T/Amba	233	30	0	58	4	5
	Asbi Wonebrta	164	6	0	101	7	0
	Hawzen	500	0	0	161	0	0
	Ganta Afeshume	303	51	0	10	8	7
	Gulo Mekeda	110	19	0	67	9	0
	Erop	177	0	0	56	0	0
Central	Tanqu abergele	96	1	0	50	0	0
	Kola Temben	210	10	0	17	0	0
	Wori Lehe	178	0	0	17	0	0
	Mereb Lehe	319	0	0	35	0	0
	Aheferom	142	4	0	11	2	0
N/ W/ Tigray	Teselmti	13	6	0	4	3	0
	Tahetay	143	0	0	1	0	0

	Adeyabo						
Total		4460	437	7	1000	120	16

4.3.4. Institutional WASH situation

Based on the assessment findings schools and health institutions are also at risk of drought (water shortage). Most schools have no their own safe water supply sources for the students and teachers, they are using the available water sources whether potable or not with the community. Among visited Woredas a total of 613 schools are affected/at risk of water shortage. Similarly, most health institutions also have no their own water supply and this situation created difficulties in the health care delivery system. Regarding institutional latrine facilities; most formal school and health institution latrine facilities are also not separated. Moreover, hand washing facilities were not available both in schools and health institutions (See the detail in Annex 3 and 4).

4.3.5. Hygiene and Sanitation situation

Regarding hygiene and sanitation situation, the region is more prone to water borne & sanitation related diarrheal diseases due to the current drought. The assessment showed that hygiene promotion activities at all level was not given due emphasis. Diharea risk factors are existed such as absence of latrine and hand washing facilities, unsafe and inadequate water supply, less awareness on basic sanitation and personal hygiene. Therefore, water and sanitation related diseases including diharea outbreak remains a threat.

Coping strategies

The communities living the affected kebeles in the visited Woredas are sharing the nearby functional water schemes/sources both for human and livestock consumption. The regional water resources bureau allocated budget for rehabilitation and new construction water harvesting structures such as pond, and mini dams for livestock consumption and also by treating the water for human consumption at critical time. Unfortunately the amount of rainfall in the main rainy season was very small and the water harvesting structures are not filled with water/most of them are dry. However, the communities also use by treating water in the available ponds.

Coordination (Woreda, zone, and region)

The regional government has established command post at all level/region to Kebelle. The members meet every week especially in those Woredas affected by drought. In addition, the regional WASH ETF is actively involved in the drought response activities by liaising with the federal sector ministries, NGOs and UN agencies. The team meets biweekly and also as required on weekly basis. However the assessment team identified that WASH coordination at Woreda level needs to be strengthened, although there are encouraging initiations in few Woredas.

Table 48:Summary of WASH emergency interventions, Tigray region, 2015

Intervention Activities	Beneficiary number			Available	Gap	Resources Required in birr (Available+ Gap)
	Total	Male	Female			
Rehabilitation/ maintenance/ expansion of existing schemes	88,310	43,272	45,038		29,353,104	29,353,104
Construction of new water supply schemes/SW/RWS	221,903	108,732	113,170	2,000,000	122,179,400	124,179,400
Water trucking	154,613	75,760	78,853		32,400,000	32,400,000
Water purification and treatment chemicals	146,740	71,902	74,837	1,140,000	4,808,123	5,948,123
Water collection & storage containers	146,740	71,902	74,837		1,173,916	1,173,916
Hygiene promotion materials, education, etc	586,958	287,609	299,349		1,398,600	1,398,600
Construction of sex segregated institutional	14,000	6,860	7,140		3,220,001	3,220,001

(school & health facilities) latrines with hand washing facility.						
Capacity Building	1332	653	679		1,332,000	1,332,000
Total	1,360,596	666,690	693,903	2,721,189	195,865,144	199,005,144

4.4. Education

4.4.1. Overall Education findings

Both from the secondary data collected and focus group discussions held, it is revealed that the school registration is below the plan in almost all Woredas of the region and the main reason for this under achievement is the current drought condition. As indicated in table 4 below, totally *1,012,204 students (85%) against 1,191,391 annual plan* have been registered so far though the deadline for registration has been extended up to Nov 11, 2015. According to the data obtained from 5 zones in the Tigray region nearly *183,142* students or about *15%* of the annual plan are not yet registered. Of the total number of students registered, *293,920 (29%) students* currently needing immediate support. This figure is expected to rise and lead to high dropout if the situation continues like this and no appropriate intervention is applied. It seems this is the determinant factor for those students whether to continue this year‘s education or not, as some Woredas (for instance Tanqua-Abergele) are already informed us after the field visit through telephone that students are about to leave the school unless immediate response is given to the drought impact. For Woreda/school level detailed information, please refer the attached annexes.

Table 49: Total number of registered students in the assessed Woredas, Tigray Region, 2015

Sr No	Grade	Plan			Achieved			%
		M	F	T	M	F	T	
1	Child to Child	96,317	95,270	191,587	68,262	67,433	135,695	71%
2	"O" Class	47,127	45,957	93,084	32,924	31,896	64,820	70%
3	KG	1,775	510	2,285	895	912	1,807	79%
4	ABE	8,458	6,214	14,672	7,231	6,330	13,561	92%
5	Grade 1	69,617	65,214	134,831	71,094	59,782	130,876	97%
6	G1-4	208,738	198,775	407,513	196,706	184,591	381,297	94%
7	G5-8	165,130	164,419	329,549	153,192	149,910	303,102	92%
8	G1-8	373,868	363,194	737,062	349,898	334,501	684,399	93%
9	G9-10	49,976	52,492	102,468	43,299	46,350	89,649	87%
10	G11-12	25,966	24,267	50,233	11,762	10,511	22,273	44%
Regional Total		***603,487***	***587,904***	***1,191,391***	***514,271***	***497,933***	***1,012,204***	***85%***

Drought has resulted in shortage of household food availability, water and shortage of livestock feed this in-turn reduce households income. Families with low economic capacity may reluctant to send children to school, which contributed to lower school enrolment, as compared to the annual plan. According to the Woreda officials report drought is one of the main reasons for the low school registration. The situation may worsen in the near future if appropriate response is not taken by either of the relevant bodies. This is because it is assumed even the currently available water sources will get dried up and people may deplete their stock. Thus the condition will be aggravated the rate of school dropouts and create attendance instability.

The effect is manifested by late and lower enrolment rate of students and the Woreda education officers & teachers are also worried on the prospective of education that the currently registered students may be dropped or increase absentee.

As a result of the current El-Nino effect, *22* schools (*11* from east, *8* from central, and *3* from North West) have been physically damaged due to high wind effect. Due to this reason, a total of *11,845*

(*5,386* boys and *6,459* girls) students (*3302* boys and *3752* girls from east, *2,841* and *1,063* boys &*1,778* girls from central and *1,950* that is *1021* boys and *929* girls from North west) have been affected and forced to attend their schooling under poor quality rooms.

Table 50: Number of Schools partially affected as a result of emergency, Tigray region, 2015

Ser No	Zone	Drought	High Wind	Conflict	Flooding	Total affected students		
						Male	Female	Total
1	East	0	11	0	0	3,302	3,752	***7,054***
2	Central	0	8	0	0	1,063	1,778	***2,841***
3	North west	0	3	0	0	1,021	929	***1,950***
Grand Total		***0***	***22***	***0***	***0***	***5,386***	***6,459***	***11,845***

Similarly because of the hardship many teachers are also reported to be leaving; accordingly, *172 (79 boys and 93 girls) from eastern zone and 18 (14 boys and 4 girls)* students from central zone have either not yet reported and/or quite. In the near future shortage of water will be the highest risk until the next rainy season, may be May 2016. It was therefore; told that unlike the previous years, there may be increased dropout rate.

Table 51:Number of teachers not reported yet to work, Tigray Region, 2015

Sr No	Zone	Number of Teachers employed			# of teachers currently available for work			# of Teachers not yet reported to work			% of not reported
		Male	Female	Total	Male	Female	Total	Male	Female	Total	
1	East	3,238	2,753	***5,991***	3,159	2,660	***5,819***	79	93	***172***	3%
2	South	0	0	***0***	0	0	***0***	0	0	***0***	
3	South east	0	0	***0***	0	0	***0***	0	0	***0***	
4	Central	3127	2342	***5,469***	3113	2338	***5,451***	14	4	***18***	0%
5	North west	1178	799	***1,977***	1178	799	***1,977***	0	0	***0***	0%
Regional		***7,543***	***5,894***	***13,437***	***7,450***	***5,797***	***13,247***	**93**	***97***	***190***	1%

total										

As indicated in the table below, data‘s on education in emergency were collected from twenty three (23) hot spot Woredas found in the five zones of Tigray regional state. From the totally registered students in their respective zones, the proportion of needy students are as follows: *41%* of the east zone, *15%* of the south zone, *37%* of the south east zone, *33%* of the central zone, and *23%* of the north west zone.

According to the current Meher assessment conducted *293,920* students (*149,915* boys and *144,005* girls) and *1,382* schools are affected by drought and shortage of water.

Table 52:Summary of students needing support because of emergencies, Tigray Region, 2015

Ser No	Zone	# of Woreda	Total # of schools	# of affected schools	Total # of students in assessed woredas			Total # of students needing support			% of students needing support
					M	F	Total	M	F	Total	
1	East	7	379	226	116,627	114,822	231,449	48,833	47,183	96,016	41%
2	South	5	302	204	169,125	166,959	336,084	25,211	24,444	49,655	15%
3	South east	4	225	185	83,800	78,636	162,436	30,089	29,882	59,971	37%
4	Central	5	350	173	120,471	113,749	234,220	40,066	37,133	77,199	33%
5	North west	2	126	19	24,248	23,767	48,015	5,716	5,363	11,079	23%
Regional Total		***23***	***1,382***	***807***	***514,271***	***497,933***	***1,012,204***	***149,915***	***144,005***	***293,920***	***29%***

Woreda officials expressed their concern that there is high threat of school dropout and absenteeism in the near future in the entire assessed Woredas.

In view of encouraging both parents and the students to continue with their education, 3,730 students have got stationery materials support from different sources: In east Tigray zone 1,138 through community, school and NGO; in south 1,272 through schools; and in south east 1,320 through Woreda administrations, private investor and NGO. During the assessment, Woreda education officials and administrators reported that unless appropriate action is taken, families will send school age children to areas with better pasture and water to look after livestock.

Table 53:Number of students supported with school materials, Tigray Region, 2015

Ser No	Woreda	No. of children who has get Exercise book and pen			Supporting Agency
		Male	Female	Total	
1	East zone	587	551	**1,138**	Community, school and NGOs
2	South			**1,272**	Schools
3	South east			**1,320**	Wereda administration, private investor, NGO
Grand Total		**587**	**551**	**3,730**	

Items requested for support are food, water, stationary materials, bags, uniforms, stipend for house rent and capacity building training to regional and Woreda education expertise as well as head teachers on psych-social issues.

Though 1,012,204 (514,271 boys and 497,933 girls) students are registered during the 2015/16 calendar year, 29,907 students (15,190 boys and 14,717 girls) have not yet attended any class due to the prevailing drought situation, of course the severity varies from Woreda to Woreda and even from village to village.

Table 54: Number of students registered but not yet started, TigrayRegion, 2015

Sr No	Zone	Students not yet started schooling		
		Male	Female	Total
1	East	1,775	1,835	**3,610**
2	South	0	0	**0**
3	South east	0	0	**0**
4	Central	11,097	11,237	**22,334**
5	North west	2,318	1,645	**3,963**
Total		**15,190**	**14,717**	**29,907**

The assessment team also collect data‘s on WASH facilities of the schools in the hot spot Woredas. In the 23 assessed Woredas of the region, 226 schools from east zone, 204 schools from south zone, 185 schools from south east, 173 schools from central zone, and 19 schools from North West zone are found to be affected by the current drought.

In drought affected Woredas schools are often characterized by poor sanitation facilities and lack of water. For instance, in eastern zone from 379 schools 192 schools do not have water supply. Only 206 schools have separate latrine for boys and girls and only 187 schools have potable water that is 49% of the total schools in the zone. In south zone out of 302 schools, only 110 schools have water, 116 schools with separate and 109 single latrines. In south east zone out of the 255 schools water is available only in 91, separate latrine in 131 school, single block latrine in 81 schools where as 9 of them have no latrine at all. In central zone out of 350 schools 89 schools have water source, 261 schools no water at all. Likewise, 82 schools have separate latrine, 79 schools one block latrine and 189 schools do not have latrine at all. Out of the 126 target schools of North West zone, only 94 have latrine; of which 41 with separate latrine and 53 with single block. Similarly, only 25 has potable water supply.

Table 55: Regional level school sanitation facilities, Tigray Region, 2015

Sr. No	Zone	Total # of Schools	# of ABE schools With Latrine	# of schools With Latrine	# of shools with Single block	# of schools With Separate Latrine	# of schools without latrine	# of schools With potable drinking water	# of ABE schools With potable drinking water	# of schools without water source
1	East	379	9	310	104	206	69	187	0	192
2	South	302	0	225	109	116	77	110	0	192
3	South east	255	0	212	81	131	43	91	0	164
4	Central	350	11	161	79	82	189	89	0	261
5	North west	126	1	94	53	41	32	25	0	101
Regional Total		**1412**	**21**	**1002**	**426**	**576**	**410**	**502**	**0**	**910**

NB: - The total number of students affected by shortage of water is a subset of those affected by drought.

In addition to this, the issues of HIV/AIDS, Gender Based Violence (GBV) and child right were considered to see their statues in the emergency settings. Then data‘s are collected and analysis on each issue. Regarding HIV/AIDS, clubs are established and operating in 251 schools. Life skill based training provided to teachers and support staff. Issues related to GBV and child right in the emergency setting also assessed but, still there are no cases raised in this respect.

Table 56: Sensitization Requirement Summary (Jan - Dec 2016), Tigray Region

No	Interventions/ Activities	Requirements in USD
1	Provision of educational materials such as exercise book, pen, uniform and pencil	7,162,830.40
2	Awareness creation for school communities regarding how to handle education in emergency	76,826.40
3	Provision of industrial materials for school maintenance affected by wind (Corrugated Iron sheet and Nail)	52,227.50
4	Creating access to potable water through water tracking	139,671.00
5	Provision of school feeding	4,536,655.20
Total		**11,968,210.50**

Table 57: Activities needed for Capacity building on health emergency preparedness and response

responseS/N	Activities	unit	Qty	Unit Cost	Total Cost Budget	Actors/ Sources
1	Sensitization of zonal and woreda Political leaders at region level for 3 days @210 Birr per day	persons	780	955.00	744,900.00	Federal and Regional Governments, UN Agencies and All other Partners
2	Sensitization of Religous nd Community leaders for 3 days @100 Birr per day	persons	1,750	525.00	918,750.00	

3	Training for Health workers on integrated epidemic prevention and case management for 6 @210 Birr per day	persons	650	2,045.00	1,329,250.00	
4	Supportive supervision by woreda & regional experts for 10 days per quarter @210 Birr (DSA and Fuels)	persons	120	12,100.00	1,452,000.00	
5	IEC/BCC material on AWD, Malaria, Meningitis, Measles … production and distribution	item	100,000	12.50	1,250,000.00	
6	Disseminate key messages on AWD, Malaria, Meningitis, Measles using local radios	episode	720	1,500.00	1,080,000.00	
	Total cost (Birr)				6,774,900.00	
	Cost in USD		-		319,570.75	

Table 58: Vital drugs and supplies for Meningitis

S/	Epidemic	unit	Require	Availabl	Gap	unit	Total Cost	Actors/

N	derugs and supplies for meningitis		d Qty	e		cost	Birr	Sources
1	RL/DNS bag of 1000ml	Bag	15,277	0	15,277	5.00	76,385.00	Federal and Regional Governments, UN Agencies and All other Partners
2	Crystaline Peniciline (500 mg Vial) box of 100	Box of 100	688	0	688	600	412,800.00	
3	Ceftriaxone inj.of 1gm of 50vials	Box of 50	153	0	153	1,000	153,000.00	
4	Oily Chloramphenicol of 3gm vial; box of 50	Vial	8,307	0	8,307	6.00	49,842.00	
5	Paracitamole 500mg tab; tin of 1000 tabs	Tab	80	0	80	20	1,600.00	
6	Paracitamole susp.of 100ml bottle of 125mg/5ml	Bottle	1,528	0	1,528	5.00	7,640.00	
7	PNGT each	Each	69	0	69	9.00	621.00	
8	ANGT each	Each	917	0	917	12.00	11,004.00	
9	IV Cannula	Each	9,548	0	9,548	5.00	47,740.00	

10	Scalp Vein	Each	344	0	344	2.00	688.00	
11	Dextrose 40% of 20ml of 20amp	Box of 20	1,910	0	1,910	219.0 0	418,290.00	
12	AC Vaccine (vial of 50 dose)	Box of 50	44,559	0	44,55 9	800.0 0	35,647,200.0 0	
13	Vaccine Diluant of 50 ml vial; Box of 50	Box of 50	44,559	0	44,55 9	200.0 0	8,911,800.00	
14	AD syringe for vaccination 3ml; Box of 100	Box of 100	22,280	0	22,28 0	191.0 0	4,255,480.00	
15	Safety Box of discarding 100 syringe	Box of 100	22,280	0	22,28 0	250.0 0	5,570,000.00	
16	RDT kit of 20 tests	kit of 20	21	0	21	535.0 0	11,235.00	
17	Disposable glove (latex) box of 100	Box	5,400	0	5,400	60.00	324,000.00	
	Total Birr						55,575,325	
	Total USD						2,621,477.59	

Table 59: Vital Drugs and supplies for Measles

S/N	Drugs and supplies for measles	Unit	Required Qty	Available	Gap	Unit Cost	Total Cost Birr	Actors/ Source
1	RL/NS bag of 500ml	Bag	28,009	0	28,009	5.00	140,045.00	Federal and Regional Governments, UN Agencies and All other Partners
2	Crystaline Pencillien 1mil.IU/ vial box of 100 vials	Box	1,169	0	1,169	600.00	701,400.00	
3	TTC eye ointment 1%0f 100 tube	Tube	280	0	280	120.00	33,600.00	
4	Vitamin A of 200,000IU tin of 500 capsule	Tin	168	0	168	20.00	3,360.00	
5	Dextrose 40% of 20ml of 20amp	Amp	2,801	0	2,801	219.00	613,419.00	
6	Paracitamol 125mg/5ml bottle	Bottle	28,009	0	28,009	5.00	140,045.00	
7	IV Cannula	each	5,602	0	5,602	5.00	28,010.00	

8	Scalp Vein	each	896	0	896	2.00	1,792.00	
9	Amoxaciline 250mg/5ml susp, 100 ml/bottle	bottle	896	0	896	11.00	9,856.00	
10	Ciprofloxacine 500mg tab of 10 (strip)	Strip	5,602	0	5,602	8.00	44,816.00	
11	Measeles vaccine, vials of doses	Vial	140,043	0	140,043	20.00	2,800,860.00	
12	AD syringe for vaccination 3ml; Box of 100	Box	14,004	0	14,004	191.00	2,674,764.00	
13	Safety Box of discarding 100 syringe	Box	14,004	0	14,004	250.00	3,501,000.00	
11	Disposable glove (latex) box of 100	Box	6,800	0	6,800	60.00	408,000.00	
	Total Birr						10,692,967.00	
	Total USD						504,385.24	

Table 60: Vital drugs and supplies for AWD

S/N	Drugs and supplies for AWD epidemic	Unit	Required Qty	Available in the region	Gap	Unit Cost	Total Cost Birr	Actors/ Source
1	RL/NS bag of 1000ml	Bag	2,805	0	2,805	5.00	14,025.00	Federal and Regional Governments, UN Agencies and All other Partners
2	ORS [satchets]	Sachet	15,223	0	15,223	1.00	15,223.00	
3	Doxacycline 100 mg caps, 1000 per tin [Tin]	Tin	2	0	2	3,000.00	6,000.00	
4	PNGT (18Cm)	pcs	16	0	16	9.00	144.00	
5	ANGT	pcs	54	0	54	12.00	648.00	
6	IV Cannula	pcs	430	0	430	5.00	2,150.00	
7	Scalp Vein	pcs	48	0	48	2.00	96.00	
8	Amoxacilline 250mg/5ml susp,100 ml/bottle	Bottle	215	0	215	11.00	2,365.00	
9	RDT Kit of 20 tests for	kit	105	0	105	500.00	52,500.00	

	epidemic detection [5 per woreda]							
11	Disposable glove (latex) box of 100	Box	4,750	0	4,750	60.00	285,000.00	
10	CTC	# of sites	21	0	21		-	
	Total Birr						378,151.00	
	Total USD						17,837.31	

Table 61: Vital drugs and supplies for VOLD

S/N	Drugs and supplies for VOLD	Unit	Required Qty	Available in the region	Gap	Unit Cost	Total Cost Birr	Actors/ Source
1	Spriranolactone tablet of 25 mg pac of 100	Pac	7,500	0	7,500	10.60	79,500.00	Federal and Regional Governments, UN Agencies and All other Partners
2	Frusemide Tablet of 40 mg pac 100	Pac	7,500	0	7,500	10.60	79,500.00	
3	Frusemide injection of 20 mg	Ampoule	80,000	0	80,000	1.06	84,800.00	
4	Multivitamin tablets pac o 100	Pac	2,500	0	2,500	4.24	10,600.00	

5	Vitamin B complex tablets pac of 100	Pac	250,000	0	250,000	4.24	1,060,000.00	
6	Vitamin B complex injection of 2 mg	Ampoule	5,000	0	5,000	0.64	3,180.00	
7	Ceftriaxone injection of 1 mg	Ampoule	8,000	0	8,000	0.64	5,088.00	
8	Ampicillin injection of 500 mg	Ampoule	10,000	0	10,000	0.21	2,120.00	
9	Gentamicin injection of 80 mg box of 50	Box	6,000	0	6,000	80.77	484,632.00	
10	Ciprofloxacillin tablet of 500 mg pac of 10	Pac	800	0	800	5.30	4,240.00	
11	Normal Saline of 1000 ml box of 10	Box	1,000	0	1,000	458.77	458,768.00	
12	Ringer lactate 1000 ml box of 10	Box	1,000	0	1,000	458.77	458,768.00	

13	Dextrose in Water 5% of 1000 ml box of 10	Box	1,000	0	1,000	458.77	458,768.00	
14	Glucose 50% 50 ml box of 20	Box	400	0	400	221.54	88,616.00	
15	Diclofenac injection 75 mg	Ampoule	4,000	0	4,000	5.30	21,200.00	
16	Paracetamole tablet of 500 mg pac of 1000	Tablet	600	0	600	19.93	11,956.80	
17	Paracetamole tablet of 1000 mg	Tablet	400	0	400	19.93	7,971.20	
18	Paracetamole syrup of 100 ml	Bottle	1,000	0	1,000	23.32	23,320.00	
19	Albendazole tablet of 100 mg of tin 100	Tin	60	0	60	13.14	788.64	
20	IV canula 24 g	Each	6,000	0	6,000	6.15	36,888.00	
21	IV canula 18 g	Each	4,000	0	4,000	6.15	24,592.00	
22	Distilled water of 10 ml box of 50	Box	800	0	800	42.82	34,259.20	

23	Syringe with needle of 5 ml box of 100	Box	12,000	0	12,000	67.84	814,080.00	
24	Syringe with needle of 2 ml box of 100	Box	3,000	0	3,000	48.76	146,280.00	
25	NG tube pediatric	Each	3,000	0	3,000	1.06	3,180.00	
26	NG tube adult	Each	3,000	0	3,000	1.06	3,180.00	
27	Foley catheter	Each	2,000	0	2,000	2.12	4,240.00	
	Total Birr						4,410,515.84	
	Total USD						208,043.20	

Table 62: Vital drugs and supplies for Malaria

S/N	Drugs and supplies for Malaria epidemic	Unit	Required Qty	Available in the region	Gap	Unit Cost	Total Cost Birr	Actors/ Source
1	RL/DW bag of 1000ml	Bag	17,617	0	17,617	5.00	88,085.00	Federal and Regional Governments, UN Agencies and All other Partners
2	Coartem 24 tab blister/pack	pack	23,490	0	23,490	35.00	822,150.00	
3	Chloroquine 150mg tin of 1000	Tin	100	0	100	117.00	11,700.00	

	tab							
4	Quinine injection (of 10 ampule) Pack	pack	5,034	0	5,034	32.00	161,088.00	
5	Quinine 300mg tab pack of 100	pack	1,208	0	1,208	62.00	74,896.00	
6	Chloroquine syrup of 60ml bottle	Baottle	1,611	0	1,611	6.00	9,666.00	
7	Dextrose 40% of 20ml (ampule 20), pack	pack	2,013	0	2,013	219.00	440,847.00	
8	Paracitamol 500mg tab (tin of 1000)	Tin	282	0	282	20.00	5,640.00	
9	Paracitamol suspension 100ml bottle	bottle	5,369	0	5,369	5.00	26,845.00	
10	RDT kit of 40 tests	Kit of 40	33,557	0	33,557	488.00	16,375,816.00	

11	Disposable glove (latex) box of 100	Box	3,500	0	3,500	60.00	210,000.00	
11	LLITN	pcs	729,491	0	729,491	105.00	76,596,555.00	
	Total Birr						94,823,288.00	
	Total USD						4,472,796.60	

Table 63:Key drugs and supplies for skin infection (Scabies)

S/N	Drugs and supplies for Scabies	Unit	Required Qty	Gap	Unit Cost	Total Cost Birr	Actors/ Source
1	Benzyl benzoate 25%	litre	650	650	20.00	13,000.00	Federal and Regional Governments, UN Agencies and All other Partners
2	Sulphure					-	
3						-	
	Total Birr					13,000.00	
	Total USD					613.21	

Nutrition

Table 64: CMAM supply requirement with budget

Description	Unit	Ration	Total at risk	Total need	unit cost USD	total cost USD
Amoxicillin of 250mg tabs	each of 10 tabs	1	11,318	11318	1.4	15845.2
RUTF	Carton of 13.8Kg	0.9	11,318	10186	81.3	828121.8
OTP card English	Unit	1.1	3,395	3735	0.05991	223.7639
OTP card Tigrigna	Unit	1.1	7,923	8715	0.07	610.05
Registration book	Unit	0.005		10	2.07	20.7
OTP quick reference guide Tigrigna	Unit	0.005		200	1.18	236
F100	carton of 10.26kgs	0.013	11,318	147	137.7	20241.9
F75	carton of 12.3kgs	0.01	11,318	113	200.4	22645.2
ReSomal	pack of	0.002	11,318	3	91.53	274.59
Multi chart	Unit	1.1	1000	1100		0
Protocol for Management of SAM	Unit		1000	300		0
CMV	Carton	0.002	1000	2		0
Albendazol of 100 tabs	pack of 100 tabs	1.1		30		0
TFP opening Kit	Set	10		10		0
Mattress	each	1	200	200		0
Folic acid of 100 tabs	pack	1	60	60		0
NGTube	unit	1	600	600		0
Syringe of 50cc	each	0.01	1200	1200		0

Gentamycin amps of 40mg/2ml	ampul	5amps	600	600		0
Ampicillin ing of 1gm	vial		3000	3000		0
Chloramphenicol ing of 1gm	Vial		3000	3000		0
Iv cannula 23G	each		600	600		0
MUAC tape pack of 50	unit			20		0
						888,219.2

Table 65: Availability of Basic drugs and supplies

S.No	Woredas	Therapeutic supplies		Basic drugs					
		RUTF	F100	F75	Amox	Mebendazol	Vit A	ReSomal	Folic acid
1	K/Awaalo	Yes	Yes	Yes	Yes	Yes	Yes	No	No
2	A/wonberta	Yes	No	No	Yes	Yes	Yes	No	Yes
3	S/ts/emba	Yes	Yes	Yes	Yes	No	Yes	No	No
4	Hawzene	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	G/mekeda	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	G/afeshom	Yes	Yes	No	Yes	No	Yes	No	yes
7	Erob	Yes	No	No	Yes	No	Yes	No	No
8	R/azebo	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
9	R/almata	Yes	Yes	Yes	Yes	No	Yes	No	Yes
	Ofla	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
11	D/tembien	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

12	S/samre	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
13	Enderta	Yes	No	No	Yes	Yes	Yes	No	Yes
14	H/wjirat	No	Yes	Yes	Yes	Yes	Yes	No	Yes
15	M/leke	No	No	No	Yes	Yes	Yes	No	No
16	T/abergelle	Yes	Yes	Yes	Yes	Yes	Yes	No	No
17	K/tembien	No	Yes	Yes	Yes	Yes	Yes	No	Yes
18	W/leke	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
19	T/adiabo	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
20	Tselemti	No	No	No	Yes	Yes	Yes	No	Yes
21	Ahferom	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

WASH

WASH Preparedness and Response Plan

Drought Preparedness and response interventions

In response to the water supply problem caused by the drought; water trucking, rehabilitation/maintenance of existing non-functional schemes and establishment of new water supply schemes are planned to be implemented in identified and prioritized Woredas. Accordingly, 31 water trucks are proposed to provide water in identified Woredas where there is no other alternative to supply water (see table 3). In prioritized 21 Woredas 292 new shallow wells, 6 deep wells need to be constructed in the specified kebeles (see table 4). Moreover, 164 shallow wells, 49 springs, and 20 deep wells require rehabilitation (see table 5). As a result of these interventions a total of 312,343 people will be benefited.

Table 66:Emergency Water Trucking Requirement plan

Zone	Woreda	No. of drought affected Kebeles	No. of Beneficiaries	Number of water trucks required	Intervention Duration (months)	Available response	Gap	Unit Cost per truck per month (125,000-200,000)	Total Cost (Birr)
South	Raya Alamata	7	24,000	6	6	2	4	150,000	5,400,000
	Ofla	8	6,613	1	6	0	1	150,000	900,000
	Raya Azebo	11	24,000	6	6	5	1	150,000	5,400,000
South East	Hintalo Wajerat	15	12,000	2	6	0	2	150,000	1,800,000
	Doga Temben	10	0	0		0	0	150,000	0
	Samere Seharti	13	8,000	2	6	0	2	150,000	1,800,000
	Enderta	11	8,000	2	6	0	2	150,000	1,800,000
Easte	Kilete	7	16,000	4	6	3	1	150,000	3,600,0

rn	Awalo								00
	Saesa T/Amba	13	16,000	4	6	2	2	150,000	3,600,000
	Asbi Wonebrta	10	4,000	1	6	0	1	150,000	900,000
	Hawzen	25	0	0			0		0
	Ganta Afeshum	20	0	0			0		0
	Gulo-Mekeda	11	0	0			0		0
	Erop	7	12,000	2	6	2	0	150,000	1,800,000
Central	Tanquabergele	9	16,000	4	6	0	4	150,000	3,600,000
	Kola Temben	13	0	0	0	0	0		0
	Wori Lehe	9	0	0	0	0	0		0
	Mereb Lehe	13	4,000	1	6	1	0	150,000	900,000
	Aheferom	10	4,000	1	6	1	0	150,000	900,000
N/	Teselm	6	0	0	0	0	0		0

W/	ti								
Tigray	Tahetay Adeyabo	5	0	0	0	0	0	150,000	0
Total		233	154,613	36	78	16	20	2,250,000	32,400,000

Table 67: New water supply schemes establishment plan

Zone	Woreda	No of affected kebeles	Population at risk	No of required new shallow wells	No of Beneficiaries	Required cash(birr)
South	Raya Alamata	7	14051	3	1643.35	657,340
	Ofla	8	20250	1	599.5	239,800
	Raya Azebo	11	57152	25	12579.2	5,031,680
South Eastern	Hintalo Wajerat	15	52500	25	12625	5,050,000
	Doga Temben	10	18480	11	5708	2,283,200
	Samere Seharti	13	37808	28	14136.8	5,654,720
	Enderta	11	28520	12	6242	2,496,800
Eastern	Kilete Awalo	7	30238	7	3702.3	1,480,920
	Saesa	13	19857	2	878.45	351,380

	T/Amba					
	Asbi Wonebrta	10	24983	4	2235.55	894,220
	Hawzen	25	41299	10	5104.15	2,041,660
	Ganta Afeshume	20	5833	10	4958.05	1,983,220
	Gulo Mekeda	11	23613	10	5071.05	2,028,420
	Erop	7	33112	12	6145.2	2,458,080
Central	Tanqu abergele	9	34389	6	3231	1,292,260
	Kola Temben	13	30002	31	15502	6,200,680
	Wori Lehe	9	42368	16	8013	3,205,120
	Mereb Lehe	13	16961	7	3417	1,366,740
	Aheferom	10	15252	18	8964	3,585,680
N/West	Teselmti	6	28214	42	21161	8,464,200
	Tahetay Adeyabo	5	22392	8	4033	1,613,280
Total		233	597,274	292	145,949	58,379,400

Table 68: Rehabilitation of existing water supply schemes

Zone	Woreda	Beneficiaries benefited by rehabilitation	Rehabilitation of existing water supply schemes											
			Rehabilitation of existing SWs	Rehabilitation of existing motorized schemes(DW/SW)	Rehabilitation of existing spring dev't scheme	Replacement of Deep/Shallow well				EMWATkit	Operational cost(birr)	Available	Gap	Required budget for Rehabilitation + supplies
						submersible pumps	Generator	Switch board	Main Generator					
south	Raya Alamata	7000	4	3	0	1	1	1	5	1	5			1,430,000
	Ofla	1250	5		10	0	0	0	0					75,000
	Raya	9250	5	4	0	4	4	4	7	2	7			4,015,000

	Azebo													
South Eastern	Hintalo Wajerat	9000	12	3	22	2	2	2	2		2			1,715,000
	Doga Tembien	2500	10	0	6									80,000
	Samere Seharti	7000	20	1	0	2	2	2	2		2			1,635,000
	Enderta	1500	6	0	5	1	1	1	1	1	1			1,170,000
Eastern	Kilete Awalo	4,536	9	3		3	3	3	3	2	3			3,055,357
	Saesa	2,979	6	1		1	1	1	1		1			799,786

	T/Amba													
	Asbi Wonebrta	3,747	7	2		2	2	2	2		2			1,577,475
	Hawzen	6,195	12			0	0	0	0		0			61,949
	Ganta Afeshume	875	2			1	1	1	1		1			773,750
	Gulo Mekeda					1	1	1	1		1			765,000
	Erop	3,542	7			1	1	1	1		1			800,420
Central	Tanqu abe	4,967	10	0	0	1	1	1	1	2	1			1,514,668

	rgele													
	Kola Temben	4,500	9	0		1	1	1	1	1	1			1,160,003
	Wori Leke	6,355	13	0	2	1	1	1	1	1	1			1,188,552
	Mereb Leke	2,544	5	1		1	1	1	1	2	1			1,495,442
	Aheferom	2,288	5	1		1	1	1	1	1	1			1,142,878
N/W/Tigray	Teselmti	7,054	10		4	1	1	1	1	2	1			1,535,535
	Tahetay Adeyabo	3,359	7	1		3	3	3	3	3	3			3,383,588
Total		90,440	164	20	49	28	28	28	35		35			29,374,400

Table 69: WASH supply and water treatment chemical requirement plan

Zone	Woreda	Population at risk to waterborne disease	HH at risk to waterborne dis	Required Water treatment chemicals											Available	Gap	Required cash(birr)
				Intervention Duration (months)	Household level water treatment chemicals (for 3 months)		Water source Disinfectant (HTH Calcium Hypochlorite	Aluminium sulphate,50 kg (17% conc)	Jerrican (20 lit)	Bucket (20 lt)	Body Soap (250 gm)	Loundary soap (250 gm)	Fiber Glass Roto				
					Water PUR (Sachet)	Water guard (bottle)							5,000lt	10,000 lt			

		s	eases				75% granular) In Drum (50kg)										
south	Raya Alamata	14,051	2,810	6	158,074	3,513	3	3	281	281	1,686	1,686	3	3			425,282
	Ofla	20,250	4,050	6	227,813	5,063	3		405	405	2,430	2,430	1	1			377,785
	Raya Azebo	57,152	11,430	6	642,960	14,288	3	2	1,143	1,143	6,858	6,858	4	4			1,147,381
So	Hinta	52,500	10,50	6	590,62	13,12	3		1,05	1,05	6,30	6,300	2	2			936,050

uth Eastern	lo Wajerat		0		5	5			0	0	0						
	Doga Temben	18,480	3,696	6	207,900	4,620	3		370	370	2,218	2,218	0	0			280,987
	Samere Seharti	37,808	7,562	6	425,340	9,452	3		756	756	4,537	4,537	2	2			713,613
	Enderta	28,520	5,704	6	320,850	7,130	3	1	570	570	3,422	3,422	2	2			573,443
Eastern	Kilete Awalo	30,238	6,048	6	340,178	7,560	3	2	605	605	3,629	3,629	4	4			739,903
	Saesa T/Amba	19,857	3,971	6	223,391	4,964	3		397	397	2,383	2,383	4	4			581,835

	Asbi Wonebrta	24,983	4,997	6	281,059	6,246	3		500	500	2,998	2,998	1	1			449,443
	Hawzen	41,299	8,260	6	464,614	10,325	3		826	826	4,956	4,956	0	0			626,467
	Ganta Afeshume	5,833	1,167	6	65,621	1,458	3		117	117	700	700	0	0			89,512
	Gulo Mekeda	23,613	4,723						472	472	2,834	2,834	0	0			109,564
	Erop	33,112	6,622	6	372,510	8,278	3		662	662	3,973	3,973	2	2			642,516
Central	Tanqua abergele	34,389	6,878	6	386,876	8,597	3	2	688	688	4,127	4,127	4	4			802,749

	Kola Temben	30,002	6,000	6	337,523	7,501	3	1	600	600	3,600	3,600	0	0			455,880
	Wori Lehe	42,368	8,474	6	476,640	10,592	3	1	847	847	5,084	5,084	0	0			643,102
	Mereb Lehe	16,961	3,392	6	190,811	4,240	3	2	339	339	2,035	2,035	1	1			328,890
	Aheferom	15,252	3,050	6	171,585	3,813	3	1	305	305	1,830	1,830	1	1			302,565
N/W/Tigray	Teselmti	28,214	5,643	6	317,408	7,054	3	2	564	564	3,386	3,386	0	0			429,260
	Tahetay Adeyabo	22,392	4,478	6	251,910	5,598	3	3	448	448	2,687	2,687	0	0			341,565

Total	**597,274**	**119,455**	**120**	**2,505,263**	**143,415**	**60**	**3**	**11,945**	**11,945**	**71,673**	**71,673**	**31**	**31**	**0**	**0**	**10,997,792**

Table 70: Hygiene promotion materials requirement plan

Zone	Woreda	Total no of kebeles	Population at risk to water borne diseases	Types of hygiene promotion	Budget Required		
				BCC material/Poster brochure/ flyer	Available	Gap	Required cash(birr)
South	Raya Alamata	14	14,051	2940		44,100	44,100
	Ofla	21	20,250	4410		66,150	66,150
	Raya Azebo	18	57,152	3780		56,700	56,700
South Eastern	Hintalo Wajerat	23	52,500	4830		72,450	72,450
	Doga Temben	24	18,480	5040		75,600	75,600
	Samere Seharti	23	37,808	4830		72,450	72,450
	Enderta	17	28,520	3570		53,550	53,550

Eastern	Kilete Awalo	19	30,238	3990		59,850	59,850
	Saesa T/Amba	26	19,857	5460		81,900	81,900
	Asbi Wonebrta	17	24,983	3570		53,550	53,550
	Hawzen	24	41,299	5040		75,600	75,600
	Ganta Afeshume	19	5,833	3990		59,850	59,850
	Gulo Mekeda	17	23,613	3570		53,550	53,550
	Erop	8	33,112	1680		25,200	25,200
Central	Tanqu abergele	20	34,389	4200		63,000	63,000
	Kola Temben	27	16,961	5670		85,050	85,050
	Wori Lehe	33	15,252	6930		103,950	103,950
	Mereb Lehe	21	32,052	4410		66,150	66,150
	Aheferom	33	30,002	6930		103,950	103,950
N/ W/ Tigray	Teselmti	22	22,392	4620		69,300	69,300
	Tahetay Adeyabo	18	28,214	3780		56,700	56,700
Total		444	586,958	93240	0	1398600	1,398,600

Table 71: WASH Capacity/ training requirement plan

Zone	Woreda	Total no of kebeles	Training need on		Available	Gap	Resources Required in birr (Availble+Gap)
			Operation and maintenance on EMWAT Kit usage	Sanitation and hygiene			
South	Raya Alamata	14	14000	28000		42,000.00	42,000.00
	Ofla	21	21000	42000		63,000.00	63,000.00
	Raya Azebo	18	18000	36000		54,000.00	54,000.00
South Eastern	Hintalo Wajerat	23	23000	46000		69,000.00	69,000.00
	Doga Temben	24	24000	48000		72,000.00	72,000.00
	Samere Seharti	23	23000	46000		69,000.00	69,000.00
	Enderta	17	17000	34000		51,000.00	51,000.00
Eastern	Kilete Awalo	19	19000	38000		57,000.00	57,000.00
	Saesa T/Amba	26	26000	52000		78,000.00	78,000.00
	Asbi	17	17000	34000		51,000.0	51,000.00

	Wonebrta					0	
	Hawzen	24	24000	48000		72,000.00	72,000.00
	Ganta Afeshume	19	19000	38000		57,000.00	57,000.00
	Gulo Mekeda	17	17000	34000		51,000.00	51,000.00
	Erop	8	8000	16000		24,000.00	24,000.00
Central	Tanqu abergele	20	20000	40000		60,000.00	60,000.00
	Kola Temben	27	27000	54000		81,000.00	81,000.00
	Wori Lehe	33	33000	66000		99,000.00	99,000.00
	Mereb Lehe	21	21000	42000		63,000.00	63,000.00
	Aheferom	33	33000	66000		99,000.00	99,000.00
N/ W/ Tigray	Teselmti	22	22000	44000		66,000.00	66,000.00
	Tahetay Adeyabo	18	18000	36000		54,000.00	54,000.00
Total		444	444000	888000	0	0	1332000

Education

Table 72:Regional level required stationery materials

Number of students	Type of material	Unit of measure	Quantity/student	Total Quantity	Unit price (In USD)	Total price	Remark
293,920	Excersise book	No	10	2939200	0.48	***1,410,816***	
	Pen	No	10	2939200	0.24	***705,408***	
	Uniform	Set	1	293920	16.67	***4,899,646.40***	
	Pencil	No	5	1469600	0.10	***146,960***	
	Stationey total					**7,162,830.40**	

4.5. Limitations

Trained PHEM officer turn over and unable to get the important data regarding the priority diseases was faced in some weredas. Low screening coverage of malnutrition in some weredas of Eastern zone was reported, thus the cases reported may be not representative. Lack of compiled information and gender desegregated data from Education Woreda offices. In some Woredas appropriate personnel were not available due to competing priorities.

5. Conclusion

Scabies outbreak was reported in all the visited weredas including Mekelle and SAM cases show an increment trend in 2015 compared to 2014. Due to presence of dry spell resulting in decreased crop production and poor recharging of ground water, it is expected that Malnutrition will rise up resulting in both severe acute malnutrition and vulnerability to infections diseases‘ spread including vaccine preventable, skin and water borne diseases.

In the assessed zones of Tigray region, it is observed the current drought is beyond the capacity of the local communities Woreda administration. Agricultural products declined too much and many people have been already exposed to food shortage, water shortage and livestock feed shortage. And this is expected to continue till the next harvest. The impacts of drought also affect social services such as education and health. Currently most of the schools are working to protect any kind of interruption on the teaching-learning process. Some of the schools have distributed stationary materials like exercise book and pen. The Woreda education office also allocated budget for support. Non-governmental organizations and UN-agencies are also working to support students which are affected by drought.

6. Recommendations

- Strengthen disease surveillance system;-There is a need to provide supportive supervision and on-the-job-training on data recording, analysis and reporting. Also, there is need to strengthen the weekly reporting system by in the region.
- Coordination and Rapid Response Team:-There is a need to strengthen the rapid response team through provision of refresher training, allocating operational budget for RRT, transport, and strengthen the Woredaemergency task forces as well as coordination forums.
- Accessible emergency fund: avail emergency response fund in Woredas where it is not available
- Disease Prevention Activities:-There is a need to strengthen the diseases prevention activities in general and routine immunization programme, maintenance of cold chain system and ensuring continuous supply of vaccines. Guidelines for malaria, measles, and meningitis and AWD management should be distributed to all health facilities in all woredas.

- Strengthen the zonal health offices: The Zonal health offices visited have reported that they either lack human resource or have no financial resources to conduct monitoring and supervision or support the Woredas.
- Prepare weekly PHEM bulletin to provide feedback (RHB); there is a need to make the regional PHEM bulletin available to woredas as feedback mechanism.
- Regular monitoring and supervision(RHB, Zone)
- Preposition some key emergency drugs and medical supplies at woreda level (RHB) such as Meningitis RDT, LP set and CTC kits.
- Intersectoral collaboration should be established between health and agriculture to carry out the prevention intervention against veno occlusive disease.
- Reconcile the HMIS and PHEM data (Woreda); there is a need to reconcile the HMIS and PHEM data of malaria as the assessment team has noticed difference between the HMIS and PHEM data in some of the woredas.
- Improved latrine coverage: There is a need to increase the improved latrine coverage as there is high water borne illnesses (Diarrhea) in some Woredas in the face of relatively better basic latrine coverage.
- Equip and ready the primary hospitals to support outbreak investigation such as for meningitis and to manage outbreak of AWD, by making CTC platforms available and prepositioning CTCs.
- Provide timely reporting on activities (weekly & monthly reports) request of nutrition supplies
- Improve monthly screening coverage of 6-59 months children and PLW to
- Conduct Capacity building on Nutrition programs (CMAM,CBN & RHD) to HWs& communities
- Consider TSF program in the drought affected Woredas and continue in the existing TSF Woredas; starting from November 2015.

8. References

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Chapter VIII: Protocol/Proposal for Epidemiologic Research Project

Title: Under Five, Childhood Diarrheal, Morbidity and its Correlates in Kirkos Sub city, Addis Ababa, Ethiopia, 2016.

Summary

Background: Diarrheal disease is the second leading cause of death for children under five years old and it is responsible for killing around 760,000 under five children every year. As estimated by WHO more than 90% under- five diarrheal disease is due to poor sanitation, poor hygiene, and unsafe drinking water. The under five diarrheal prevalence is 13% in Ethiopia overall the country and 9.4% in Addis Ababa.

Objectives: The purpose of the study is to assess the water handling, Sanitation and Hygienic practice and its association with under-five childhood diarrhea in households of Kirkos Sub City, Addis Ababa, Ethiopia.

Methods: A cross-sectional quantitative method will be carried out. The study sample size is determined by single population proportion formula. Since the under-five diarrhea prevalence in Addis Ababa is 9.4% according to EDHS 2011, the 9.4% proportion is used. Therefore, at 95% confidence level, 4% margin of error and with design effect 2, the sample size is calculated and using simple random sampling method 448 households that have at least one under five children are selected as sample. Data will be collected using a pre-tested questionnaire by BSc Environmental health professionals.

Key words: - Prevalence, water, sanitation, hygiene, diarrhea, under-five, practice

1. INTRODUCTION

Background

Among under- five years old children diarrheal disease is the second leading cause of death. It kills around 760,000 under five children every year (1). There is on average 2.9 episodes of diarrhea per child per year and it is responsible for an estimated 1.87 million deaths among children under 5 years of age (2).It occurs worldwide. WHO estimate that more than 90% under five diarrheal diseases is due to poor sanitation, poor hygiene, or unsafe drinking water (3). Diarrhea is a rare occurrence for most people who live in developed countries where sanitation is widely available, access to safe water is high and personal and domestic hygiene is relatively good. World-wide around 1.1 billion people lack access to improved water sources and 2.4 billion have no basic sanitation. Data from over 50 countries show low levels of hand washing in many countries (4).

Worldwide diarrhea causes about 11% of under-five deaths with nine-tenths of these deaths occurring in Sub-Saharan Africa. Sub-Saharan Africa is where 1 in 3 children in the world is born and rapid growth of under-five population is occurring. In Sub-Saharan Africa 1 in 9 children dies before age five, more than 16 times the average for developed regions (5).

In Ethiopia, 13 percent of children under age five were reported to have had diarrhea, and 3 percent had diarrhea with blood. It was most common among children age 6–23 months (23-25 percent). Diarrhea prevalence is highest among children residing in households that drink from unprotected wells (18 percent), those residing in rural areas (14 percent), and children residing in Benishangul-Gumuz and Gambela (both 23 percent). In Addis Ababa the prevalence is 9.4% (6). More than half of the households in Ethiopia (57 percent) have access to an improved source of drinking water, with a much higher proportion among urban households (94 percent) than among rural households (46 percent). Only 4 percent of households use improved toilet facilities that are not shared with other households, 11 percent in urban areas and 2 percent in rural areas (7).

Hand washing may seem simple; it is one of the most important factors in stopping the spread of germs and staying healthy. Washing hands after using the bathroom, before and after preparing and eating food, whenever hands are visibly soiled, and more frequently during times of illness can help stop the spread of disease from person to person (8). Hand washing with soap, especially after defecation reduce diarrhea morbidity by 44%. The more households washed their hands with soap after defecation, the less they had diarrheal diseases (9). Hand washing with soap shows a reduction in diarrhea by 42–48%. Using improved water source reduces diarrhea among children under five children by 7%. Sanitation has effect of 36% reduction (10). Simple hygiene behaviors, especially hand-washing with soap, have been suggested to reduce the occurrence of water-washed infections (11). Though studies on the relationships between WASH factors and the occurrence of diarrhea in under-five children have been conducted and documented elsewhere, but there is a limited resource in Ethiopia, specifically in mothers and care givers of Kirkos sub city, Addis Ababa City administration. This cross-sectional study is designed to assess the water handling, sanitation and hygienic practices of mothers and care takers and occurrence of diarrheal disease among under- five children and association of the practice and under- five childhood diarrhea in Kirkos sub city, Addis Ababa, Ethiopia.

1.2 Statement of the Problem

Diarrhea is defined as the passage of three or more loose or liquid stools per day. It is usually a symptom of an infection in the intestinal tract, which can be caused by a variety of bacterial, viral and parasitic organisms (4). About 88% of diarrhea-associated deaths are attributable to unsafe water, inadequate sanitation, and insufficient hygiene. Most diarrheal germs are spread from the stool of one person to the mouth of another. These germs are usually spread through contaminated water, food, or objects (12).

Human excreta can contain over 50 known bacterial, viral, protozoan and helminthes pathogens. The majority of excreta-related infections are obtained through ingestion, less often through inhalation. Excreta-related infections travel through a variety of routes from one host to the next, either as a result of direct transmission through contaminated hands, or indirect transmission via contamination of drinking water, soil, utensils, food and flies (2).

Globally diarrheal disease is the second leading cause of death in under-five year children and it account for one in nine child deaths worldwide. It is responsible for 1.7 billion morbidity and 760, 000 mortality of children every year and kills 2,195 children every day more than malaria, measles, and AIDS combined (4).

The majority of child deaths happen in poor countries of Asia and Africa (90%), where safe water, sanitation and access to urgent medical care are limited (13). In Africa 9% of childhood deaths are associated with diarrhea which remains the second leading cause of under-five mortality attributed to poor water, sanitation and hygiene (14).

Ethiopian DHS 2011 shows that there is high prevalence of under- five childhood diarrhea country wide (13%) as well as in Addis Ababa (9.4%) (6). Children living in households without latrine facilities were about 92% more likely to develop diarrhea than children living in households with such facilities. The odds of getting diarrhea in children whose mothers had diarrhea increase in five-fold (8). Also children whose mothers can't read and write were more likely to have diarrhea when compared with children whose mothers were literate (15).

Only 4 percent of households in Ethiopia use improved toilet facilities that are not shared with other households, 11 percent in urban areas and 2 percent in rural areas. Eight percent of households (31 percent in urban areas and 1 percent in rural areas) use shared toilet facilities. The vast majority of households, 88 percent, use non-improved toilet facilities (97 percent in rural areas and 58 percent in urban areas). The most common type of non-improved toilet facility is an open pit latrine or pit latrine without slabs, used by 58 percent of households in rural areas and 44 percent of households in urban areas (7).

Studies and reports on child morbidity and mortality in Ethiopia show that diarrhea is a major public health problem. A comparative study conducted in Hawassa, Southern Ethiopia reported the prevalence of diarrhea in under- five children is 9% in model and 14%, in non model HHs (13). The same study done in Sheko district, Southern Ethiopia, shows the occurrence of diarrheal disease among children's whose families were non-model for health extension program was 25.5%, which is much more common than children's whose families were model for the program was 6.4% (15). Another study conducted in Mecha District, West Gojam, Ethiopia showed 18.0% prevalence of diarrhea among under-five children (8). A facility-based cross sectional study in Debrebirehan Referral Hospital revealed that the prevalence of diarrhea in under-fives was 31.7 percent (17).

Study conducted in Indonesia has identified the lack of an improved latrine, greater maternal age and lower maternal education as factors associated with under- five childhood diarrhea mortality (18).

Water and improved sanitation and hygiene (WASH) and child health have strong inter-linkages. Improvements in WASH can lead to vast improvements in the wellbeing of children. Improving access to WASH within communities can decrease both morbidity and mortality of children.

Improving access to safe drinking water and improved sanitation practice has immediate correlations to reducing diarrheal diseases in children, which are a major cause of child mortality. Frequent bouts of diarrhea weaken children, making them more vulnerable to the effects of malnutrition and of other serious diseases such as malaria and pneumonia. The most effective way to prevent diarrhea is through better access to clean water and sanitation services, and through improved hygiene practices, especially hand washing with soap. It is therefore crucial to improve WASH as a means of improving child health (14).

Kirkos sub city is one the very slum parts of Addis Ababa city. Identifying the association of water handling, sanitation and hygienic practices of mothers/care givers and under-five childhood diarrhea is very crucial for the effective implementation of WASH programs related to child health intervention programs for policy formulation and the general assessment of resource requirements and intervention prioritization.

This cross-sectional study is therefore designed to determine the water handling, sanitation and hygienic practices and its association with diarrhea among under-five children in households of Kirkos sub city.

1.3 Significance of the Study

Estimation of UNICEF says that 58% of deaths from diarrheal illnesses can be attributed to unsafe water and inadequate sanitation and hygiene practices. Interventions for improving the quantity and quality of domestic water supply, ensuring the use of improved sanitation and safe hygiene practices, can reduce diarrhea prevalence by one-third or more (19).

Hence, it is very important to see the relation and interaction of these factors to understand children‘s health condition. Very limited information on the magnitude and effects of socio-economic and environmental factors is incorporated in few studies conducted on childhood diarrhea. Therewere no similar studies conducted in the Kirkos sub city. According to the EDHS 2011 report, under-five childhood diarrheal prevalence was 9.4%.

As primary caregiver to under-five children in Ethiopia, mothers‘/care givers‘ water handling, sanitation and hygiene practice are important to minimize the effects of morbidity and mortality associated with diarrheal diseases. Determining the association of these factors with childhood diarrhea helps to find possible intervention methods. So, this study will have important policy implications for WASH and under-five childhood diarrhea intervention programs and with a view of adding to the existing body of knowledge in the study area in particular and in the country in general.

This study therefore sought as its objective to assess the water handling, sanitation and hygienic practices of mothers and care takers and occurrence of diarrheal disease among under- five children and association of the practices and under- five diarrheas in Kirkos sub city, Addis Ababa, Ethiopia. And it will assist/help programmers and implementers in adopting better programs.

2. LITRATUREREVIEW

2.1 Prevalence of Under- Five Children Diarrheal Morbidity

Worldwide diarrheal disease is the second leading cause of death in under-five year children and it account for one in nine child deaths worldwide. It is responsible for 1.7 billion morbidity and 760, 000 mortality of children every year and kills 2,195 children every day more than malaria, measles, and AIDS combined (4).

Evidence from 51 countries around the world showed existence of substantial variation in diarrhea prevalence across countries from 4.5% in Maldives to 26.2% in Bolivia. Households that used a shared toilet facility in most countries the prevalence of diarrhea was higher. Countries in Africa, those that use a shared toilet had a 10–32% higher prevalence of diarrhea than those that do not use a shared toilet. The prevalence of diarrhea was 10% lower among households that used a non-shared improved facility compared with facilities that were shared but otherwise improved (20).

In Ethiopia, according to the 2011 Ethiopian Demographic Health Survey, the prevalence of diarrhea among children under age five was reported as 13 percent. In Addis Ababa the prevalence was 9.4% (6). A comparative study conducted in Hawassa, Southern Ethiopia reported the prevalence of diarrhea in under five children is 40(9%) in model and 61 (14%), in non model HHs (16). The same study done in Sheko district, Southern Ethiopia, shows the occurrence of diarrheal disease among children‘s whose families were non-model for health extension program was 25.5%, which is much more common than children‘s whose families were model for the program was 6.4% which is much less than the study conducted in Hawassa (15). Another study conducted in Mecha District, west Gojam, Ethiopia showed 18.0% prevalence of diarrhea among under-five children (8). A facility-based cross sectional study in Debrebirehan Referral Hospital revealed that the prevalence of diarrhea in under-fives was 31.7 percent (17). Studies done showed the diarrhea prevalence among children aged under- five was 32.6% in rural Burundi (21) and 21% in Ghana (22). A study in Assosa District, Western Ethiopia showed one-third (33.2%) of under-five children had diarrhea during the past two weeks prior to the study (23).

The comparative study in Hawassa showed maternal diarrheal morbidity, covering drinking water collection container, covering drinking water storage container and maternal education as being risk factors related to under -five diarrhea (16).

2.2 Diarrheal Morbidity and Socioeconomic Factors

Several studies revealed that the age of the under five child has effect on the prevalence of under five childhood diarrhea, that is the likelihood of diarrhea in the two week period reaches its peak at 12–23 months of age and began to fall after 24 months of age (8,22,24). Another study showed that the risk of diarrheal morbidity being higher at age categories of 6–11 months and 12–23 months and lower on the age of 24 months and above compared to 0–5 months of age (25). With more similar fashion study in Indonesia reveal the diarrhea prevalence is higher in 6-11 month (12.4%) and 12-23 month (11.7) aged children and is lower in 48-59 month (4.6%) age group (18).

Maternal education status is highly associated with under five diarrhea prevalence; children whose mothers can‘t read and write were more likely to have diarrhea when compared with children whose mothers were literate (15, 21, 24). Similarly study in BenshanGul-Gumiz regional zone, North West Ethiopia shows children of none educated mothers were about two times more likely to have diarrhea when compared to children of mothers who had primary education and above (25). A prospective study in Bolivia showed for care givers having 5-10 years of formal education was protective for childhood diarrhea (26).

The income level is also has association; children in the poorest wealth quintile are at higher risk than those in the poor quintile and poor quintile worse than the middle quintile and so on (15, 17, 22). About mothers occupation children whose mothers were private workers were about two times more likely to had diarrhea compared to children whose mothers were housewives (17).

An observational study in rural Bangladesh reported households with mothers/care givers having formal education greater than grade 7 and having better wealth index were significantly associated with less child diarrhea (28).

2.3 Diarrheal Morbidity and Water handling, Sanitation and Hygienic Practices

A prospective case-control study conducted in Ibadan, Nigeria identified six important risk factors that could predispose under- five children to the incidence of diarrhea. The factors include: poor drinking water handling; lack of hand- washing with soap at critical times specifically after defecation and before food preparation; clogged drainage around or near the house; breeding places for flies/insects near the house; and total hygiene practice level (11).

Under five children Diarrhea is a rare occurrence for most people who live in developed countries where sanitation is widely available, access to safe water is high and personal and domestic hygiene is relatively good (4).

According to the data from nationwide inventory of sanitation facility the 2014 sanitation coverage status in Ethiopia is 73% of urban and 77% of rural population used unimproved sanitation facilities, with 8% in urban and 43% in rural communities practicing open defecation. In Addis Ababa only 11.4% in the urban slums and 41.2% of the city had access to improved sanitation. Most people in the urban slums (80.4%) used unimproved sanitation facilities and 8.2% practiced open defecation. Dry pit latrines (improved pit latrines and pit latrines) are the most common and widely used toilet facilities in Ethiopia (29).

According to Mini-EDHS 2014 more than half of the households in Ethiopia (57 percent) have access to an improved source of drinking water, with a much higher proportion among urban households (94 percent) than among rural households (46 percent). The most common source of improved drinking water in urban households is piped water, used by 87 percent of urban households (7).

Studies had showed a remarkable difference of childhood diarrhea among children that whose mothers/care givers not practiced handwashing at critical times with soap were more likely to develop diarrhea when compared to children whose mothers/care givers were practiced handwashing at critical time with soap (15, 30). Observational study in rural Bangladesh showed the importance of washing hands with soap and without and not washing hands. Children who lived in households where mothers/care givers observed at least one hand washed with soap after defecation experienced substantially less diarrhea compared with children who lived in households where only one hand was washed with water after defecation. In households where food is preparing without washing hands children had diarrhea in 12.5% of monthly assessments compared with 8.3% in households where one hand was washed with water only, 6.9% where both hands were washed with water only, and 3.7% where at least one hand was washed with soap (30). Washing hand with soap had showed a reduction in diarrhea by 42–48%; Water quality improvements can be expected to be associated with a reduction of some 17% in diarrhea risk and improving sanitation reduces diarrhea risk by about 36% (10).

Study conducted in Assosa District showed only water source for the communities, placement of water-storage container, and knowledge of mothers to have a strong statistically significant association with prevalence of diarrhea. Under-five children who use from unprotected water sources have 8 times higher odds of having diarrhea than those who use from protected sources (23).

Only 4 percent of households in Ethiopia use improved toilet facilities that are not shared with other households, 11 percent in urban areas and 2 percent in rural areas. Eight percent of households (31 percent in urban areas and 1 percent in rural areas) use shared toilet facilities. The vast majority of households, 88 percent, use non-improved toilet facilities (97 percent in rural areas and 58 percent in urban areas). The most common type of non-improved toilet facility is an open pit latrine or pit latrine without slabs, used by 58 percent of households in rural areas and 44 percent of households in urban areas (7).

A study conducted in Benin shows that more than 49 % of the household used unimproved water sources for their daily needs, only 8.7 % of the household had improved sanitation facilities at home and 9.7 % had improved hygiene behavior (30). A population-based study conducted in Indonesia to show an independent association between lack of an improved latrine and under-five child mortality showed that lack of an improved latrine has association with both histories of under-five child diarrhea morbidity and mortality (18). Children from those households who had no toilet facility are about six times more likelihood to have diarrhea than children from households who had toilet facility (25).

Evidence from demographic and health survey on child feces disposal shows among mothers 4.72 % reported their child used latrine for defecation while 27.84 % of children‘s stools were put/rinsed into toilet/latrine (31). Several studies revealed that maternal history of recent diarrhea had a significant association with under- five childhood diarrhea (8, 17). In another study in Debrebirehan town shows maternal diarrheal diseases were significantly associated with childhood diarrheal diseases (17). The analysis from a population-based study conducted in Indonesia showed about a 60% reduction of childhood diarrhea in households who disposed the stool of children in a safe way than those children from households who disposed stool in an unsafe manner (25).

A facility-based cross sectional study in Debrebirehan Referral Hospital showed that there is a significant association between method of water drawing and storage with under-five childhood diarrhea. Children who live in households where water was dipped out were more likely to have diarrhea compared to those who live in households where water was poured out. Those children who lived in households where uncovered water storage container was more like to have diarrhea than their counterparts. In the study, maternal diarrheal diseases were also significantly associated with childhood diarrheal diseases (17).

A community based cluster randomized trial conducted to assess the effectiveness of household water treatment with chlorine in reducing diarrhea among children under-five years of age in rural of Ethiopia shows that, household water treatment has a 58% overall reduction in the incidence of diarrhea. Household water chlorination reduces diarrhea disease burden in 63% and 53% among children 24 to 47 months and 12 to 23months respectively but the reduction was lesser in 0 to 11 month children (44%) (32).

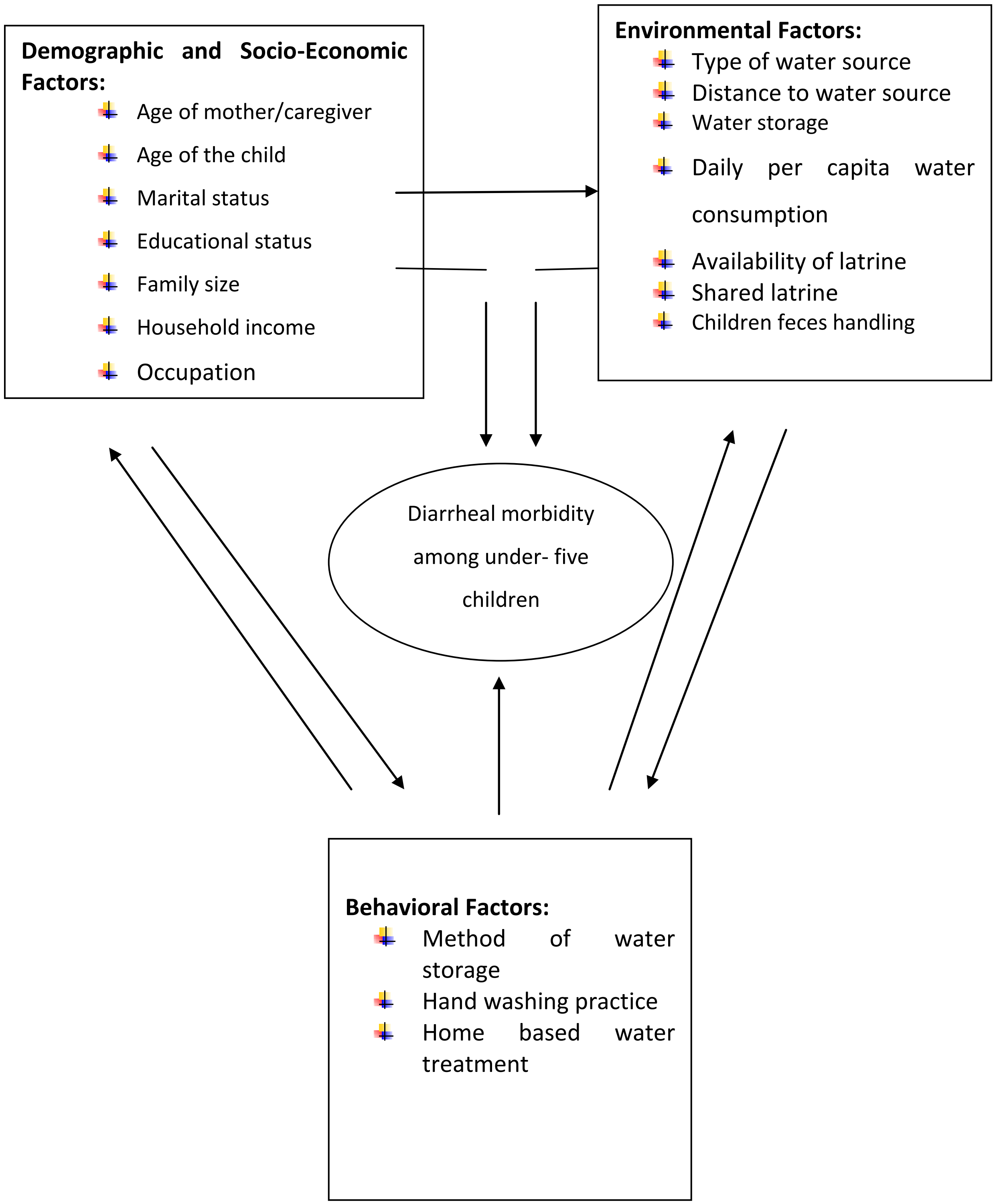

Figure 46: Conceptual Framework

3. OBJECTIVE OF THE STUDY

3.1 General Objective

- To assess the water handling, Sanitation and Hygienic practice and its association with under five childhood diarrhea in households of Kirkos Sub City, Addis Ababa, Ethiopia.

3.2 Specific Objectives

- To assess the water handling, Sanitation and Hygienic practices of mothers or care givers in household of Kirkos Sub City.

- To measure the prevalence rate of under five childhood diarrhea in Kirkos Sub City.

- To determine the association of water handling, Sanitation and Hygienic practices with under five childhood diarrhea Kirkos Sub City

4. METHODS AND MATERIALS

4.1 Study Area and Period

Kirkos sub city, the sub city is found in Addis Ababa town which is the capital of Ethiopia, is selected because it is the center of the capital city and its varied socio-economic characteristics. According to Central Statistical Agency projection in 2015 the total population of the sub city is estimated to be 264,337. About 122,974 are Male and 141,363 are Female. Age wise, 36.1% are females in reproductive age group and 5.5% are under five children. According to Addis Ababa city administration, Kirkos Sub City Health Office there are 41, 682 households in the sub-city.

The sub city is administratively divided in 11 woredas. Most of the woredas are known for their slum areas. Overcrowded houses, overflowing sewage around the houses, clogged drainage around or near the house, most of the latrine type are pit-latrine without slab and they are shared among households. The study period is from February to March 2016.

Study Design

A Cross-sectional quantitative study design will be employed to answer the proposed objective of this study.

Source Population: The Kirkos Sub City households those who have under five children

Study Population

The study population will include mothers who have under five children or care givers with under-five children at household level in Kirkos Sub City.

Inclusion criteria

Mothers who have under-five children or care givers with under-five children willing to participate that found in the study area will be included.

Exclusion criteria

Critically ill or suffering mothers or care givers of the index child, since it is unethical to take routine information from a suffering person or it is difficult to obtain complete information.

Sample Size determination

The study sample size is determined by single population proportion formula. Since the under-five diarrhea prevalence in Addis Ababa is 9.4% according to EDHS 2011, the 9.4% proportion (9.4% of the respondents' under-five years old children considered to be having diarrhea and 90.6% of the respondents' under-five years old children considered to be not having diarrhea within two weeks prior to the data collection) is used. Therefore, at 95% confidence level and 4% margin of error, the sample size is calculated below.

$$\mathrm{n} = (z_{\alpha/2})^2 * \frac{P(1-P)}{d^2}$$

Whereas:-

n= sample size

p= 0.094 assumed proportion of diarrhea among under five years old children. The proportion of 9.4% was considered for this study because of the Addis Ababa's under-five childhood diarrhea prevalence from the 2011 Ethiopian Demographic and Health Survey.

$z_{\alpha/2} = 1.96$ (Z score corresponds to 95% confidence level)

d= 4% (Margin of error)

$$n = (1.96)^2 * \frac{0.094(1 - 0.094)}{0.04^2}$$

$$n = 404$$

Multiplying by 2 which is a design effect and considering 10% non-response rate, the sample size will be; n= 404 + (404 x 10%) = 448 respondents

Sampling method

Probability sampling technique will be employed. In Kirkos sub city there are 11 Woredas. All the Woredas will be included in the study. Then the study units will be allocated proportional to size of each Woredas. Finally, simple random sampling technique will be used to select the study participants.

Data Collection

The data will be collected for seven days in each woredas. First the sub city will be divided into 11 based on the administrative structure, which is woreda, all the woredas will be included, and from each woredas households are assigned using simple random sampling and the amount are assigned proportionally according to the number household in the woreda.

Data collectors are 11 BSC Environmental health professionals, one professional per woreda will be assigned. Moreover, data collectors will be given training and orientation prior to data collection period and strict supervision and follow up is the daily bases.

Data Collection Tools

The data collection instrument (Structured questionnaire and checklist) will be developed to assess the water handling, Sanitation and Hygienic practice and its association with under-five childhood diarrhea in households.

The questionnaire and checklist will be prepared in English and then translated to Amharic to collect data and finally the Amharic also translated back to English to insure consistency. Pretest will be conducted in other Sub City for validation of questionnaire 15 days prior to actual data collection.

Study Variables

Dependent/outcome variables

- Diarrhea among under five children within the past two week prior to the study

Independent/explanatory variables

- Socioeconomic/ demographic status (includes family economic status, maternal/care giver age, education, ethnicity, number of children, marital status, religion etc.)

- Environmental factors (include type of water source, distance to the water source, amount of daily water consumption, method of water drawing and storage, availability of latrine, type of latrine, hand washing and the like)

- Maternal/care givers health status (includes occurrence diarrhea among the under five children‘s mothers/care givers within the past last two weeks)

Data Analysis

Data entry, cleaning, editing and analysis will be done using SPSS statistical software version 20. The frequency distribution of all variables will be examined to check for data entry errors (e.g. unrecognized or missing codes, out of range values). Degree of association between dependent and independent variables for each variable will be computed. Independent variables which had statistically significant association with the presence or absence of diarrhea diseases will be identified. The data will be described and presented using narrative text, charts, graphs and tables.

Data Quality Control Methods

To ensure the quality of data, first the questionnaire will be pretested. The pretest will be conducted in 5% of the participants at randomly selected sub city away from the study sub city. Training will be given for the data collectors and supervisors before the actual data collection. Every day after data collection, questionnaires will be reviewed and checked for completeness, accuracy and clarity by the supervisors and principal investigator. If there is any incomplete information it will be excluded from the entry.

Data Management

Every day after data collection, questionnaires will be reviewed and checked for completeness, accuracy and clarity by the supervisors and principal investigator. If there is any incomplete information it will be excluded from the entry. Coded data will be double entered into SPSS version 20 computer software package. After the entry of every questionnaire is completed, the soft copy of every questionnaire will be checked with its hard copy to see for the consistency. After the cross checking, cleaning will be made to avoid missing values, outliers and other inconsistencies before analysis. Cleaned data will be reentered to SPSS version 20 software package for analysis.

Operational Definition

Diarrhea: is defined as having three or more loose or watery stool in a 24-hour‘s period in the household within the two weeks period prior to the survey, as reported by the mother/caretaker of the child.

Prevalence of diarrhea: the total number of diarrhea cases at the time of the interview divided by the total number of under-five children included in the study area.

Ethical Considerations

Ethical clearance will be obtained from the Institutional Review Board of College of Health Science. Formal letter will be written to Kirkos Sub City from School of Public Health and this official written letter will be distributed to all Woredas. Verbal consent will be obtained from each study participants. Confidentiality will be maintained by omitting their names and personal identification. Study participants have the right to participate on the study or not and they can withdraw at any time of the study they wish. There is no risk to the study participants because of this study other than taking their time for interview not more than 40 minutes.

5. WORK PLAN

Table 1: Work Plan Breakdown

No	Activities	R.P.	November	December	January	February	March	April	May	June	July	August
1	Topic selection	P.I										
2	Proposal. Development	P.I										
3	Prop. defense and submission	P.I										
5	Ethical clearance from AMC and respective study sites	P.I										
6	Preparation of supplies and tools	P.I										
7	Selection and training of data collectors	P.I										
8	Pre test of questionnaire	D. C.										
9	Data collection	D. C.										
10	Data entry and cleaning	P.I										

11	Data analysis and result writing	P.I										
12	Submission of thesis up to result to advisors and coordinator	P.I										
14	Submission of thesis all part to advisors and coordinator	P.I										
15	Final thesis submission	P.I										
16	Thesis defense	P.I										
17	Dissemination of report	P.I										

Key: P.I = Principal Investigator, R.P= Responsible Person, D.C. = Data Collectors

Budget

Table 2: Budget Breakdown for Personal cost, Equipments and supplies cost, Transport and Communication cost and the Total Cost

Personnel costs					
Title	Qualification	Number of personnel	Rate in Birr	Duration of work in days	Total cost
Training of supervisors and data collectors	BSc. Env'tal health	2	200	1	400.00
	BSc. Env'tal health	11	100	1	1100.00
Data collection	BSc. Env'tal health	11	150	7	11550.00
Supervision	BSc. Env'tal health	2	200.00	7	2800.00
Sub total					15850.00

Equipment and Supplies				
Category	Units	Quantity	Unit cost	Total cost
Printing	Page	200	2.00	400
Duplication	Page	4000	1.00	4000.00
Stapler	Number	1	150.00	150.00
Staples	Pack	4	15.00	60.00
Eraser	Number	13	5.00	65.00
Pen	Number	13	5.00	65.00
Marker	Number	13	15.00	195.00

Pencils	Number	13	2.00	26.00
Binder	Number	13	50.00	650.00
Note book	Number	13	20.00	260.00
Sub Total				31,445.00

Transport and Communication				
Category	Unit	Quantity	Unity cost	Total cost
Cell-phone Card	Card	4	50.00	200.00
Transport	trip	50	20	1000.00
Sub total				1200.00

TOTAL BUDGET OF THE PROJECT	
1. Sub total cost for personnel	15850.00
2. Sub total cost for materials and supplies	31,445.00
3. Sub total cost for transport and communication	1200.00
4. Contingency (10%)	1148.15
Grand total	50,543.15

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Anex

Anex 1: Action plan prepared and indorsed by the diarrheal disease outbreak control committee Addis RAey camp

Introduction

This action plan is designed by the dysentery outbreak control committee which is encompasses members from FMOH, EPHI, ARHB, Adiss Raeye camp management in order to contain the current dysentery outbreak and to prevent recurrence of food/water born diseases in the Camp. The action plan is based on major clinical and environmental gaps identified by the assessment conducted by the team. The plan focuses on the major six areas identified as an immediate source of the outbreak which includes poor food and water safety, poor latrine utilization, no surveillance system, lack of awareness on personal hygiene and diarrheal disease and compromised clinical management. The team will have a daily meeting to monitor the progress of the plan implementation and the outbreak accordingly.

Objective: To control the current outbreak of diarrheal diseases and to establish a permanent system that prevents the recurrence of related outbreaks in the camp.

Action Plane Schedule

S. No	Major activities	Detailed Activities	Time Frame (to be revised)	Responsibility
1	**Strengthen Clinical Management**	Discus with the camp clinicians on dehydration management protocol	June 5	EPHI team
		Discus with camp clinicians on dysentery management	June 5	EPHI team
		Avail necessary medications and supplies	June 5-10	EPHI team and camp team
		Establish a referral agreement between the camp and M.A.M. Hospital		EPHI team
		Improve hygiene of the clinic	June 7	camp team
		Avail chlorine solutions for disinfections in the clinic	June 6	camp team
		Report anyone with diarrheal complain to be excluded from food preparation and handling	June 5	camp team

		Send selected stool samples for confirmation		EPHI team
2	**Improve Food Hygiene**	Screen all cockers for possible GI pathogens	June 5	Lab Team
		Exclude those with diarrheal complaints from food preparation and handling	June 5	camp team
		Clean restaurants sites	June 6-8	camp team
		Clean Kitchens	June 6-8	camp team
		Limit traffic flow to the kitchen	June 5	camp team
		Start supervision on washing of cooking utensils	June 5-6	All
		Avail hand wishing supplies at restaurants		camp team
		Start Supervised hand washing	June 6	All
3	**Improve water Safety**	Exclude those with diarrheal complaints from water handling and delivery	June 5	camp team
		Chemical treatment of water(just before use) using wuha agare or . . .	June 6-8	camp team
		Start supervision on washing of drinking caps . . .	June 6	All
		Treat water used for washing of drinking or cooking utensils		camp team
		Clean mini water stores used to transport water just before use every day	June 5	camp team
4	**Latrine Utilization**	Protect latrines from flays (cover)	June 5	camp team
		Hand washing facilities at latrines		camp team
		Clean latrines on regular bases	Regularly	camp team
5	**Surveillance**	Start using line listing format at the clinical level	June 5	EPHI team
		Prepare line list for the past 15 days (duration of the outbreak)	June 5	EPHI team
		Conduct descriptive analysis	June 5	EPHI team
		Monitor and use daily line list with the committee	June 6	
		Link the clinic surveillance system with the woreda surveillance system	June 6-8	EPHI team
6	**Health Education**	Prepare different rounds of health education for camp trainees on personal hygiene and diarrheal diseases	June 5	Defence,Health team
		Discuss with all section coordinators and health team on supervision of hand washing, washing utensils . . .	June 5-6	Defence,,health team
		Use different health education materials like posters if available at woreda H.O		Defence,health,team
		Coordinate one camping to clean the overall camp	June 8	Envta'l team

7.	**West Disposal**	One burning sites	June 6	Envta'l team
		Separate solid and west solids	June 6	Envta'l team

Anex 2: Questionnaires for Case - control study on Diarrheal outbreak in Addis Raey training center AmibaraWoreda, Afar Region, june.2015

Title: Suspected Acute Watery Diarrhea Outbreak Investigation-Amibara Woreda, Afar Region, Ethiopia, June 20115

Introduction: Hello, my name is... . I am a member of AWD outbreak Investigation team. Thank you for taking the time to speak with us today. We are investigating AWD outbreak occurred in Amibara Woreda . We are very interested in your experiences and your point of view.

Purpose: To identify etiologic agent and assess the risk factors of AWD outbreak in Amibara Woreda.

Procedure: If you agree to take part, this interview will take about 30 minutes of your time. There are two parts. First, we will ask you about demographic information of you and your family, knowledge you have on acute watery diarrhea, your history of acute watery diarrhea, water, sanitation and hygiene information and your feeding practice.

Second, we will ask you for a stool and drinking water samples to test for acute watery diarrhea causative agents in your stool and drinking water. We need only small amount of samples. The samples will be tested in Ethiopian Health and Nutrition Research Institute using a code so that no one will know about your results. All information collected during this study will be kept private and will only be known by the investigators.

Benefits: this project will help you and other people living in Amibara Woreda. We will use these results to prevent and control AWD outbreak in the woreda.

Risks: there is no risk to you from answering the questions or allowing us to take water and stool in samples.

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 investigation 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 and my house hold members. 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.

Participant Signature____________

Date________________________

Name of persons obtaining consent____________________

Signature of persons obtaining consent____________________

Date___________________________

Date_____________

A) Identifying/demographic information:

1. Full Name : ___________________ __________________ _________________________
2. Age :___________
3. Sex : M / F
4. occupation____________________
5. Address: Zone________Woreda__________ Kebele ____Phone number________
6. Room number________________________________
7. Room Size______________________
8. Batch __________

B) Clinical picture/illness information:

9. Have you got ill with Diarrheal Disease in the past one month
10. Frequency of diarrhea within 24 hours 1. Up to 3 loose stools/24 2. more than 3
11. Date of onset of symptoms _____________/______________/__________
12. Duration of illness before visiting health facility ________days / hours
13. Symptoms of the disease;

    10.1. Diarrhea: Yes / No; if yes number of episodes/24hours

    10.2. Vomiting; Yes / No

    10.3. Fever/chills Yes / No; if yes highest temperature___________

    10.4. Lethargy/altered state of consciousness: Yes / No

10.5. Dehydration: No / some / Sever

10.6. Other___________________

11. Did you know others with similar symptoms: Yes / No; if yes

Name________________ address______________________

12. Stool sample collected for laboratory diagnosis Yes / No: if yes result of

Stool direct microscopy__________________ and Culture______________________

13. Treatment Given/Taken Yes / No

14. did you recover completely: Yes / No

15. if yes; Date ____________/______________/__________

C) Drinking water information

16. From where is your drinking water source? River / pond / spring / well / pipe / other__________

17. Is there interruption of water supply? Yes / No

18. If yes: what alternative you used?_____________

19. Did you take other fluids like Teje or locally prepared fluids Yes/No

20. IF yes when did you take for the last time________________

D) Latrine usage:

19. Do you have access to latrine? Yeas / No

20. If yes; how often do use it? Always/sometimes/never

21. How clean is the latrine: clean/ not good/ bad

22. Do you wash your hands with soap/detergent after using latrine? Yes / No

23. How often do you wash your hand after you use latrin? Always/ Sometimes/Never

E) Travel history, restaurant usage, climate condition

24. Did you have any travel of & days before your illness? Yes / No

25. If yes; Location _________________________on date ______/_____/_______

Location _________________________on date ______/_____/_______

Location _________________________on date ______/_____/_______

26. Was there any person similar to your illness? Yes / No

27. Did you have close contact with the case/person with illness? Yes / No

28. If yes; how was your contact?

/Attending the patient / share utensils / common source of food or water/

29. Did you eat at a restaurant (outside of the Camp) in the 7 days before your illness? Yes / No

30. If yes; Restaurant's name & address ____________________________on Date_____/____/____

Restaurant's name & address ___________________________on Date_____/____/____

Restaurant's name & address ___________________________on Date_____/____/____

31. Was there any new metrological/climatic event like flood/heavy rain fall or drought for the last 1-2 weeks? Yes / No

32. Did the food handlers and cockers have a regular medical check up? Yes / No

33. Any new abnormal finding in the last medical checkup? YES/No

33. if yes; how often; Always/ Sometimes/Never

34. Do you wash your hands before having meal and preparing food? Yes / No

F. Feeding Practice

35. Do you eat raw/uncooked food? Yes/No

36. What raw/uncooked food are you eating 1. Raw meat 2.Raw tomato 3.Raw salad

37. What are you doing with the leftover foods? 1. Reheat and eat. 2.For domestic animals. 3. Dump in waste substance. 4. Other (specify) _________

Anex 3: List of Drugs requests to FMOH to contain the outbreak

No	Drug lists/items	Unit	Quty
1	Antiacid 475mg /5ml susp	Bottle	50 box
2	Albenidazol 200mg tab	2x5	10 box
3	Amoxicillin capsul 500mg	50x10	20box
4	Adrenalin injection 1mg	Amp	50 amp
5	Aciclovir200 mg tab	10x10	5pk
6	Ciprofloxacillin eye drop0.03	Tub	100tub
7	Chloramphenicol 250 mg cap	100x10	30box
8	Chlopheniramin 4mg tab	10x10	15 pk
9	Cetirizne 10mg tab	10x10	10pk
10	Ceftrazon1g injectio	Amp	100
11	Ciprofloxacillin 500mg tab	10x10	100pk

12	Cimetidin 200mg injection	2ml/10amp	20pk
13	Cotrimoxazol 480 mg tab	100x10	10box
14	Chloramphenicol eye drop	Tub	100tub
15	Cloxacillin 500mg cup	100x10 cup	10box
16	Clotrimazol ointment 15mg	Tub	50tub
17	Doxcyclilln 100 mg cups	20x10 cup	50 pk
18	Diclofenac 50 mg tab	10x10	200pk
19	Diclofenac 75mg/3ml inje	10x10amp	50box
20	Diazepam 5mg tab	10x10	2 pk
21	Dextrometrophan15 mg /5ml	Botl	480 botl
22	Ferrous sulphat +folic acid	100x10	5box
23	Ferrous guluconet 300mg	100x10	5box
24	Gentamycin 80mg/2ml inje	20x5x2ml	3box
25	Gentamycin eye drop	Tub	100 tub
26	Jeil gulucose 40%	5x10pe	5box
27	Guaifenesin syrup 100mg/5ml	Botl	100botl
28	Hydrocortison ointment 1%	Tub	50 tub
29	Lidocaine hydrochlorid 20ml	Bott	5botl
30	Clotrimazol ointment 15mg	Tub	50tub
31	H_2O_2	Bottl	15
32	Amitriptyline 25 mg tab	10x10	3pk
33	Diazepam 5mg tab	10x10	2 pk
34	Universal antido (charcoal	Powder	1 botl
35	Griseofulvin 250mg tab		
36	Hydralazin 5mg l1ml inj		
37	Gentamycin 80mg/2ml inje	20x5x2ml	3box
38	Gentamycineye drop	Tub	100 tub
39	Jeil gulucose40%	20mlx50pe	5box
40	Hyoscin 20mg /ml inje	10x10amp	5 box
41	Hydrocortison ointment 1%	Tub	50 tub
42	Indometacin cup 25 mg	10x10	20pk
43	Ibuprofin 400 mg tab	10x10 tab	30pk
44	Ketoconazol 15 mg ointment	Tub	50 pk
45	Ketoconazol 200mg tab	10x10tab	5pk
46	Metronidazol cup 250 mg	100x10 cup	50box
47	Metocloramppromd 10 mgtab	10x10tab	10pk
48	Norfloxacillin 400mg tab	10x10	100pk
49	N/S 1000ML	12Bag	15box

50	Phenobarbeton tb 100 mg	1000tab	1tin
52	Phenobarbeton tb 30 mg	1000 tab	1 tin
53	Promethazin 25 mg tab	1000tab	1 tin

54	Promethazin 25 mg/ml inje	10x10amp	100Amp
55	Sulbutamol inhalation	Ech	30ech
56	Pyloocain ointment	Tub	50 tub
57	Sulphur cream 50gm	Tub	30 tub
58	Formalin injection	Litr	½ ml
59	Water for inionject 10ml	10x10 /10ml	4 box
60	Multi vitamin tab	10x10 tab	60pk
61	Vitamin bcomplex 59mg/2ml injection	10x10 amp	10 box
62	Vitamin bcomplex tab	20x50 tab	5box
63	Tinidazoln 500 tab	20x12	50 pk
64	Tramadol 50mg/2ml injection	10x5 Amp/2ml	300 amp
65	Ringer lactet 1000ml	Bag	20box
66	Echtamol 15mg oint	Tub	10tub
67	Prazquantal 600 mg tab	2x50tab	15 pk
68	Xylometaxolin nasal drop	Each	50 botl
70	Witht filed 15 mg ointment	Tub	50 tub
71	D/W 1000ML INJEC	Bag	10 box
72	D/NS 100ML INJEC	Bag	30box
73	Amoxicillin+clavulainicacid 652mg	3x5tab	100pk
74	Omeprazole 20 mg cup	10x10cup	500pk
75	Cephalexin 500mg cup	10x10 cup	10pk
76	Bethametason 15g ointment	Tub	40tub
77	TAT 1500 IU INJECTION	500AMP	5000AMP
78	Plampnet	Ech	10000
79	Mebenidazol 200mg tab	12x20	10pk
80	Miconazol oral jel	Tub	20
81	Nioclosamid tab		10pk
1	Plaster roll		20
2	70% alcohol LITTER	LITTER	4
3	SURGICUL GLOVE 7.5	BOX	1000
4	FOLIC CATHETER 16	Each	10
5	Iodine litter	Litter	4
6	Otoscop	Each	2
6	Cut gut 2/o	Dosen	10
7	Kidnidish	Each	15
8	Cutgut 3/o	Dosen	20
9	Speculum vaginal	Each	5
10	Delivery coach	Each	2
11	Drum small and medium size	Each	4
12	IV stand	Each	5
13	Picup forceps	Each	3
15	Ambubag	Each	3
16	Sucker(secretion suker)	Each	2

17	Examination bed	Each	4
18	Suturing set	Each	5
19	Delivery set	Each	3
20	Trouly	Each	5
21	Bucket different colour	Each	10
22	Therometer	Each	5
23	Medication cup	Each	10
24	Instrumental try	Each	6
25	Spoon	Each	10
26	Jog	Each	5
27	Aprone	Each	5
28	Oxygen slender	Each	2
29	Autoclave	Each	2
30	Stretcher	Each	5
31	First aid kit	Each	3
32	Refrigerator of 500 litter	Each	2
1	Urine centrifuge	Each	2
2	General centrifuge		
3	Test tub glass of 50	Pk	50
4	Test tub plastic of 50	Pk	50
5	Slide frosted end of 50	Pk	100
6	Caver slid of100	Pk	50
7	Urine dipstick of 200	Pk	2
8	H.pylory test kit of 25	Pk	40
9	HBSAG kit of 25	Pk	40
10	HCV kit of 25	Pk	40
11	RPR kit OF 25	PK	40
12	RF kit OF 25	PK	40
13	HCG KIT OF 50	PK	20
14	Blood group anta A OF10ml	Pk	2
15	Blood group anta B of 10ml	Pk	2
16	Blood group anti O of 10ml	Pk	2
17	Hemoglobinometry with cuvates	Each	2
18	Hematocrit centrifuge	Each	1
19	Gluconometer Hemacue	Each	2
20	Pirex biker	Each	1000
21	Stool cup	Each	1000
22	Lancet of 100	Pk	10
23	Cbc machine with reagent	Each	1
24	CHEMISTRI photometry	Each	1
25	Test tube rack	Each	05
26	OLOMPUS Microscope	Each	01
27	CRSTAL VIOLET	Bottle	02

28	Lgol iodine	bottle	02
29	3% acid alcohol	Bottle	02
30	Safaranin	Bottle	02
31	Giemsa stain	Bottle	02
32	Beam balance	Each	02
33	Draining rack	Each	03
34	Staining rack	Each	03
35	Widal weilfelix reagent	Bottles	03
36	Staining jars	Each	05
37	Biohazard bags	Each	50
38	Slide boxes	Each	20
39	ESR stand	Each	03
40	Westergreen	Each	50
41	Pasteur pipets	Each	500
42	Micropipets of different quantity	Each	05

Emergency Drug List

No	Drug lists/items	Unit	Quty
1	Albenidazol 200mg tab	2x5	100 box
2	Antiacid 475mg /5ml susp	Bottle	50 box
3	Adrenalin injection 1mg	Amp	50 amp
4	Chloramphenicol 250 mg cap	100x10	30box
5	Chlopheniramin 4mg tab	10x10	20 pk
6	Ciprofloxacillin 500mg tab	10x10	100pk
7	Doxcyclilln 100 mg cups	20x10 cup	100 pk
8	Diclofenac 75mg/3ml inje	10x10amp	100 box
9	Cotrimoxazol 480 mg tab	100x10	10box
10	Jeil gulucose 40%	5x10pe	10 box
11	Universal antido (charcoal	powder	2 botl
12	Ibuprofin 400 mg tab	10x10 tab	30pk
13	Metronidazol cup 250 mg	100x10 cup	200 box
14	N/S 1000ML	12Bag	50 box
15	Water for inionject 10ml	10x10 /10ml	10 box
16	Tinidazoln 500 tab	20x12	150 pk
17	Ringer lactet 1000ml	Bag	30 box
18	70% alcohol LITTER	LITTER	4
19	SURGICUL GLOVE 7.5	BOX	1000
20	IV stand	Each	5
21	Therometer	Each	5
22	Stretcher	Each	5
23	Wehagare (water treatment)	Litter	20
24	Bleach	Litter	10
25	Urine centrifuge	Each	2
26	Test tub glass of 50	Pk	50
27	Test tub plastic of 50	Pk	50
28	Slide frosted end of 50	Pk	100
29	Hemoglobinometry with cuvates	Each	2
30	Hematocrit centrifuge	Each	1
31	Gluconometer Hemacue with cuvates	Each	2
32	Stool cup	Each	1000
33	Lancet of 100	Pk	10
34	Test tube rack	Each	05
35	OLOMPUS Microscope	Each	01
36	Giemsa stain	Bottle	02
37	Draining rack	Each	03
38	Staining rack	Each	03
39	Widal weilfelix reagent	Bottles	03
40	Staining jars	Each	05
41	Biohazard bags	Each	50

42	Pasteur pipets	Each	500

Anex 4: A structured interview using a standardized questionnaire tool for Case control study to investigate ILI outbreak at Amhara regional state South Gondre zone Farta Woreda, Megendi kebele, 2016

SECTION1. SOCIODEMOGRAPHIC DATA

1.1Case satatus Yes/No, Age------Sex Mal/Female ID------

1.2. Respondent subject,Rlative,Coworker

1.3. Date of interview-----------

1.4. What is your current marital status? (Circle one)

1. Single, 2. Married, 3. Divorced, 4. Widowed

1.5. Occupation(s):1. Faremer2. Government employee3. Student4. Other

1.6. Reporting facility 1= Debretabore Prison Center, 2= Megendi Kebele

2. RISK FACTOR

TRAVEL HISTORY

2.1. Did you travel OUTSIDE of your country of residence in the 10 days before symptom onset (COMMENT: the interviewer should state the time period here based on the answer in question)? 1 yes 0 no 9 unknown, if yes, Date of travel (dd/mm/yyyy): ____/____/____

If case, when was the first symptom onset (dd/mm/yyyy): ____/____/____

2 .2 Have you attend mass gathering in the past 14 days Yes or No, if yes event ------------ Location -----------and Date (dd/mm/yyyy): ____/____/____

HUMAN EXPOSUR

2.3. Did you have had close contact with a person showing ILI symptom in the past 14 days, yes or No.**if yes to what degree of contact is it**

A. Touching with hand (shaking) yes or No
B. Sharing a common bed, Yes or No
C. Sharing a kitchen

D. Living together in one room Yes or No

ANIMAL EXPOSURE

2.4 Did you personally participate in slaughtering animal in the past 14 days, yes or No

2.5 Did you visit livestock raring areas in the past 14 days, yes or NO.

FOOD EXPOSUR

2.6 Prior your illness, did you eat any of the following uncooked items

A. Fresh fruit, Yes or No, if yes list fruit--------

B. Vegetables Yes or NO, if yes list vegetables--------

2.7 Did you Cooke raw meat in the study period. Yes or No, if yes list type of meat--------

2.8 Did you drink milk any unpasteurized milk or milk product. Yes or No,if yes list them.

PREVIOUS HISTORY OF ILLINESS

2.9 Did you hospitalized for the following any chronic illness 1=yes, 0=no, if yes specify

A. Heart disease
B. Chronic lung disease
C. Asthma
D.TB
E. Pregnancy
F. Anemia

2.10 Did you receive an influenza vaccine in the past 12 months yes /no

SIGN AND SYMPTOMS

2.11 Has the patient sign and symptoms, yes /no, if yes specify

1. Fever > 38^0c
2. Cough
3. Sore throat
4. Headaches
5. Difficulty of swallowing
6. Muscle Pain
7. Joint Pains
8. Back pain
9. Nausia
9. Vomiting

10. Other___________

2.12 Date of onset symptoms (dd/mm/yyyy): ____/____/____

2.13 Date of admission (dd/mm/yyyy): ____/____/____

Anex 5:Evaluation tool (Questioner) surveillance system evaluation

I. REGIONAL /ZONAL LEVEL QUESTIONNAIRE

Identifiers: --------- Date: --------------------

Respondent name: ----------------------------------Responsibility ---------------------------

Surveillance system

1. Is there a national Measles guideline?

   A. Yes B. No C. Not applicable D. Unknown

2. Do you have standard case definitions for the Country's priority diseases like measles?

   A. Yes B. No C. Unknown D. Not applicable

3. Is the central level responsible for providing surveillance reporting forms to the health facilities?

   A. Yes B. No C. Unknown D. Not applicable

4. If yes, have you lacked appropriate surveillance forms (Case-based, Line list, weekly reporting form, and epidemic reporting form, rumor investigation) at any time during the last 6 months?

   A. Yes B. No C. Unknown D. Not applicable

5. What are the reporting entities for the surveillance system?

   A. Public health facilities
   B. NGO health facilities
   C. Military health facilities
   D. Private health facilities
   E. Others________________________

6. Percent of district reports (either directly or through an intermediate level) received during each reporting period at the central level during the past 3 months:

6.1. Number of reports in the last 3 months compared to expected number (completeness)

6.2. Weekly: ______/12 times the number of districts (timeliness)

6.3. Immediately: ________/------ times the number of districts

7. Is there any report of the immediately reportable diseases in the past 1 month?

   A. Yes B. No

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

   A. Less than 1 hour
   B. 2-24 hour
   C. 1- 2 days
   D. 3- 7 days
   E. After 1 week

9. How do you report? (Multiple responses are possible)

   A. Mail
   B. Fax
   C. Telephone
   D. Radio
   E. Electronic
   F. Other

<u>Data analysis</u>

1. Does the Zonal level: describes the data by person, time and places:

   A. Yes B. No C. Unknown D. Not applicable

2. Perform trend analysis? Observed , the analysis done and list for which disease analysis done

   ____

3. **If they do not made analysis for Measles, Ask the reason why they don't

   ____

4. Do you have an action threshold defined for, measles?

   A. Yes B. No C. Unknown D. Not applicable

5. Who is responsible for the analysis of the collected data? ________________________

6. How often do you analyze the collected data?

A. Daily

B. Weekly

C. Every 2 weeks

D. Monthly

E. Quarterly

F. As needed……..

7. Do you have appropriate denominators?

   A. Yes B. No C. Unknown D. Not applicable

8. Do you give feedback for woredas

   A. Yes B. No

9. If the answer is yes for Question 8 how often?

   A. Daily B. Weekly C. Every 2 weeks D. Monthly E. Quarterly

Outbreak Investigation

1. Number of outbreaks suspected in the past year or 6 month__________________
2. List the disease:____
3. Of those, number of investigated outbreaks :(Observe reports)_______________
4. Number of districts that looked for risk factors_____________________________
5. Number of districts that used the data for action____________________________

Epidemic preparedness (relevant for epidemic prone diseases)

1. Existence of a Regional/Zonal plan for epidemic preparedness and response

   A. Yes B. No C. Unknown D. Not applicable

2. Has the zone/woreda had emergency stocks of drugs, and supplies at all times in past 1 year (2012)?

   A. Yes B. No C. Unknown D. Not applicable

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

   A. Yes B. No C. Unknown D. Not applicable

4. Existence of a standard case management protocol for Measles

   A. Yes B. No C. Unknown D. Not applicable

5. Is there a budget line for epidemic response?

   A. Yes B. No C. Unknown D. Not applicable

6. Does the region have a rapid response team for epidemic?

   A. Yes B. No C. Unknown D. Not applicable

Response to epidemics

7. Ability of the regional level to respond within 48 hours of notification of most recently reported outbreak

   A. Yes B. No C. Unknown D. Not applicable

8. Has epidemic management committee evaluated its preparedness and response activities during the past year

   A. Yes B. No C. Unknown D. Not applicable

Feedback

1. How many feedback bulletin or reports has the regional level produced in the last year? ____
2. How many supervisory visits have you made in the last 6 months? ____________________
3. The most usual reasons for not making all required supervisory visits.

   ____
4. Have you been trained in disease surveillance?

   A. Yes B. No C. Unknown D. Not applicable
5. If yes, specify when, where, how long, by whom? ____
6. What percent of your subordinate personnel have been trained in surveillance? __________
7. Have you received any post-basic training in epidemic management?

   A. Yes B. No C. Unknown D. Not applicable

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

Resources

11. Data management

    A. Computer:

    B. Printer:

    C. Photocopier:

    D. Data manager:

    E. Statistical package:

12. Communications

    A. Telephone service:

    B. Fax:

    C. Radio call:

    D. Satellite phone:

    E. Computers that have modems:

Surveillance

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

    A. Yes B. No C. Unknown D. Not applicable

14. Is there budget source for surveillance in the regional/zonal level?

    A. Yes B. No C. Unknown D. Not applicable

15. If Yes, What is the proportion? ____

16. How could surveillance be improved?

    ____

17. Is there a focal unit for surveillance at the regional/Zonal level?

    A. Yes B. No C. Unknown D. Not applicable

18. What opportunities are there for integration of surveillance activities and functions?

Budget for surveillance

19. Is there a budget line for surveillance in the Regional Health Bureau budget?

    A. Yes B. No C. Unknown D. Not applicable

20. How could surveillance be improved?
____
____

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

Questionnaire for Attributes and level of Usefulness:

1. Total population under surveillance_____________
2. What is the incidence / Prevalence of Measles in your area/region
   - Measles ________cases _________Deaths ________

I. Level of Usefulness of the Surveillance System for these selected priority diseases

Does the surveillance system help?

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

   A. Yes B. No

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

   A. Yes B. No

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

   A. Yes B. No

4. Observe (confirmation): interventions and diseases trends analyzed

   A. Available B. Not available

II. Describe Each System Attributes:

i. Simplicity:

1. Is the case definition of measles easy for case detection by all level health professionals?

   A. Yes B. 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?

A. Yes B. No

4. How long it takes to fill the format?

   A. <5 minute B. 10-15minuts A.>15 minutes

5. How long does it take to have laboratory confirmation for measles?

ii. Flexibility:

1. Can the current reporting formats be used for other newly occurring health event (disease) without much difficulty?

   A. Yes B. No

2. Do you think that any change in the existing procedure of case detection, reporting, and formats will be difficult to implement?

   A. Yes B. No

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?

   A. Yes B. No

2. Are the reporting site / data collectors trained/ supervised regularly?

   A. Yes B. No

3. Observe: 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 (that is with no blank or unknown responses) from the total reports ____

Vi Acceptability:

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

   A. Yes B. No

5. If yes, how many are active participants (of the expected to)? _______________

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

   A. Lack of understanding of the relevance of the data to be collected

   B. No feedback / or recognition given by the higher bodies for their contribution; i.e. no dissemination of the analysis data back to reporting facilities

   C. Reporting formats are difficult to understand

   D. Report formats are time consuming

   E. Other:____

iv. Representativeness:

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

   ________(#) _________%

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

   A. Yes B. No

3. What do you think is well represented by the surveillance data? The urban/ the rural and what is the reason?

v. Timeliness

1. Timeliness of reporting the past one year (by Woreda) ---------------

vi. Stability

1. Was the new BPR restructuring affected the procedures and activities of the surveillance of these diseases?

   A. Yes B. No

2. Was there lack of resources that interrupt the surveillance system?

   A. Yes B. No

II. DISTRICT (WOREDA LEVEL) QUESTIONNAIRE

____

Identifiers: -------------------- Date: ----------------

province; ---------------------- Interviewer ------------------------

Respondent; ---------------------- Responsibility--------------------------

____

Surveillance system

1. Is there a national guideline for Measles and PHEM at this site?

A. Yes B. No C. Unknown D. Not applicable

Case confirmation:

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

A. Yes B. No C. Unknown D. Not applicable

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

A. Yes B. No C. Unknown D. Not applicable

Data reporting:

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

   A. Yes B. No C. Unknown D. Not applicable

2. 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)

3. Number of weekly reports submitted on time: ____/12 times the number of health facilities
4. Number of immediately reports submitted on time: __________/....... times the number of health facilities
5. How do you report (Multiple answers are possible):

   A. Mail D. Telephone

   B. Fax E. Electronic

C. Radio F. Other

6. How can reporting be improved? ____
____
____

Data analysis:

1. Percent of sites that: Describe data by person, Time and place (case based, outbreaks, sentinel)

   A. Yes B. No C. Unknown D. Not applicable

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

   A. Yes B. No C. Unknown D. Not applicable

3. If yes, what is it? _________cases ________% increase _______rate

   (Ask for 2 priority diseases) ____
   ____

4. Do you Have appropriate denominators observe presence of demographic data at site (E.g. population <5 yr, population by village,)

   A. Yes B. No C. Unknown D. Not applicable

5. Who is responsible for data analysis? ____

6. How often do you analyze the collected data?

   A. Daily C. Every 2 weeks

   B. Weekly D. Month

   E. Quarterly F.As needed

Outbreak investigation:

1. Number of outbreaks suspected in the past 6months:____________
2. Obs of those, number investigated (Observe reports and take copies if possible): _______
3. Has your district ever investigated an outbreak?

   A. Yes B. No C. Unknown D. Not applicable

4. Epidemic preparedness____

5. Do the districts written plan of epidemic preparedness and response A. Yes B. No C. Unknown D. Not applicable
6. Has the district had emergency stocks of drugs and supplies at all times in past 1 year?
   A. Yes B. No C. Unknown D. Not applicable
7. Has the district experienced shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)?
   A. Yes B. No C. Unknown D. Not applicable
8. Is there a budget line or access to funds for epidemic response?
   A. Yes B. No C. Unknown D. Not applicable
9. Percent of districts that have an epidemic management committee. Obs; Observed minutes (or report) of meetings of epidemic management committee
   A. Yes B. No C. Unknown D. Not applicable
10. Does the district have a rapid response team for epidemics?
   A. Yes B. No C. Unknown D. Not applicable

<u>Responses:</u>

11. Has the district implemented prevention and control measures based on local data for at least one reportable disease or syndrome?
   A. Yes B. No C. Unknown D. Not applicable
12. Does the district responded within 48 hours of notification of most recently reported outbreak (from written reports)
   A. Yes B. No C. Unknown D. Not applicable
13. Has epidemic management committee evaluated their preparedness and response activities during the past year? (Observe written report to confirm)
   A. Yes B. No C. Unknown D. Not applicable

<u>Feedback</u>

1. Is there written feedback reports has the district produced in the last year?
   A. Yes B. No C. Unknown D. Not applicable
2. How many feedback bulletin or reports has the district received in the last year?
   A. Yes B. No C. Unknown D. Not applicable

Supervision

3. How many times have you been supervised in the last 6 months?___________________
4. How many supervisory visits have you made in the last 6 months? ________________
   (Obtain required number of visits from central level)_____________________________
5. The most usual reasons for not making all required supervisory visits. (Text)
   ____
   ____
6. Percent of health personnel (in position of responsibility) trained in disease surveillance
7. Have you been trained in disease surveillance?
   A. Yes B. No C. Unknown D. Not applicable
8. If yes, specify when, where, how long, by whom?
   ____
9. What percent of your personnel in the district have been trained in surveillance and epidemic management? ____

Resources

1. Percent of sites that have Logistics
   A. Electricity B. Motor cycles C. Bicycles D. Vehicles
2. Data management
   A. Stationery B. Computer C. Calculator D. Printer
3. Communication
   A. Telephone service B. Fax C. Radio D. Computers that have modems
4. Information education and communication materials

   A. Posters
   B. Megaphon
   C. Generator
   D. Screen
   E. Projector (Movie)
   F. Other:

5. Hygiene and sanitation materials
   A. Spray pump B. Disinfectant
6. Surveillance coordination: ____
7. Is there a surveillance co-ordination focal point within the district epidemic management committee?
8. Satisfaction with surveillance system____
9. Are you satisfied with the surveillance system?
   A. Yes B. No C. Unknown D. Not applicable
10. If no, how can the surveillance system are improved?

HEALTH FACILITY QUESTIONNAIRE

Type of health facility:

Date: District:

Interviewer: Region/province:

Respondent: Name of health facility:

---

1. Is there a national manual for measles surveillance at this site?
   A. Yes B. No C. Unknown D. Not applicable

Case detection and registration

2. Percent of health facilities that have a clinical register
   A. Yes B. No C. Unknown D. Not applicable
3. Percent of health facilities that correctly register measles cases filling of the clinical register during the previous 30 days
   A. Yes B. No C. Unknown D. Not applicable
4. Do you have a standard case definition for measles?
   A. Yes B. No C. Unknown D. Not applicable

I. Case confirmation

5. Are you able to collect sputum Y N U N/A
   Stool Y N U N/A
   Blood/serum Y N U N/A
   CSF at this facility? Y N U N/A
6. Obs Observed the presence of materials required to collect
   Stool Y N U N/A
   Blood/serum Y N U N/A
   CSF Y N U N/A
7. Do you have the capacity to handle sputum, stool, blood/serum and CSF until shipment at this facility?
   A. Yes B. No C. Unknown D. Not applicable

8. Obs Observed presence of functional cold chain at health facility
   A. Yes B. No C. Unknown D. Not applicable
9. Is there transport media for stool at health facility
   A .Yes B. No C. Unknown D. Not applicable
10. Obs Observed presence of packing materials for shipment of specimens at health facility
    A. Yes B. No C. Unknown D. Not applicable

II. Data reporting

11. Have you lacked appropriate surveillance forms at any time during the last 6 months?
    A. Yes B. No C. Unknown D. Not applicable
12. Is that the last monthly report agreed with the register for measles diseases ; major public health importance
    a. Obs Measles Y N U N/A
13. Percent of sites that 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. How do you report?

    a. Mail d. Telephone

    b. Fax e. Radio

    c. Electronic f. Other

16. Strengthening reporting

    How can reporting be improved?
    ____
    ____

III. Data analysis

Percent of sites that:

17. Describe data by person ,place and time(outbreaks, sentinel)
18. Do you have an action threshold for any of the Country priority diseases?

    A. Yes B. No C. Unknown D. Not applicable

19. If yes, what is it (Ask for 1 priority diseases e.g measles)?
20. Who is responsible for data analysis? ____
21. How often do you analyze the collected data?

    a. Daily d. Monthly

    b. Weekly e. Quarterly

    c. Every 2 weeks f. As needed

22. Have appropriate denominators demographic data at site (E.g. population <5 years, population by village, total population)

    A. Yes B. No C. Unknown D. Not applicable

IV. Epidemic preparedness

23. Is there written case management protocol for 1 epidemic prone disease

    A. Yes B. No C. Unknown D. Not applicable

V. Epidemic response

24. Has the health facility implemented prevention and control measures based on local data for at least one epidemic prone disease?

A. Yes B. No C. Unknown D. Not applicable

VI. **Feedback**

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

A. Yes B. No C. Unknown D. Not applicable

26. How many meetings has this health facility conducted with the community members in the past six months?

A. Yes B. No C. Unknown D. Not applicable

VII. Supervision:

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

A. Yes B. No C. Unknown D. Not applicable

VIII. Training

28. Have you been trained in disease surveillance and epidemic management?

A. Yes B. No C. Unknown D. Not applicable

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

IX. Resources

Percent of sites that have:

30. Logistics

a. Electricity c. Motor cycles

b. Vehicles d. Bicycles

31. Data management

a. Stationery c. Computer

b. Printer d. Calculator

32. Communications

a. Telephone b. Service Radio call
b. Fax d. Computers that have modems

33. Information education and communication materials
    a. Posters e. Projector (Movie)
    b. Megaphone f. Generator
    c. Flipcharts or Image box g. Screen
    d. Other:
34. Hygiene and sanitation materials
    a. Spray pump, Disinfectant
35. Protection materials (list) ____
36. Are you satisfied with the surveillance system?
    A. Yes B. No C. Unknown D. Not applicable
37. If no, how can the surveillance system are improved? ____________________________
    ____

Health Post Level Questionnaire

Type of health facility

Date ------------------------------ District-----------------------------------

Interviewer ---------------------- Region/province-------------------------

Respondent ---------------------- Name of health facility------------------

---

1. Is there a national manual for measles surveillance at this site?
   A. Yes B. No C. Unknown D. Not applicable

I. Case detection and registration

2. Is there a clinical register book health facility?
   A. Yes B. No C. Unknown D. Not applicable
3. Is there health facilities that correctly register case the correct filling of the clinical register during the previous 30 days?
   A. Yes B. No C. Unknown D. Not applicable
4. Do you have a standard case definition for: Measles?

A. Yes B. No C. Unknown D. Not applicable

II. Data reporting

5. Have you lacked appropriate surveillance forms at any time during the last 6 months?

   A. Yes B. No C. Unknown D. Not applicable

6. Percent of sites that is accurately reported cases from the registry into the summary report to go to higher level

   A. Yes B. No C. Unknown D. Not applicable

7. Percent of sites that 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

   Weekly:

   Immediately:

8. Percent of HF 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

III. Data analysis

9. Perform trend analysis Observed line graph of cases by time

   A. Yes B. No C. Unknown D. Not applicable

IV. Epidemic response

10. Has the health facility implemented prevention and control measures based on local data for at least one epidemic prone disease?

    A. Yes B. No C. Unknown D. Not applicable

V. Feedback

11. How many feedback bulletin or reports has the health facility received in the last year? ___
12. How many meetings has this health facility conducted with the community members in the past six months? ____

13. How many times have you been supervised in the last 6 months? ____________________

VI. **Training**

14. Have you been trained in disease surveillance and epidemic management?

A. Yes B. No C. Unknown D. N/A

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

____

VII. Resources

Percent of sites that have:

16. Logistics
    a. Electricity c. Motor cycles
    b. Bicycles d. Vehicles
17. Data management
    a. Stationery c. Computer
    b. Calculator d. Printer
18. Communications
    a. Telephone service b. Radio call c. Fax d. Computers with modems

19. Information education and communication materials
    a. Posters d. Screen
    b. Megaphone e. Projector (Movie)
    c. Flipcharts or Image box f. Other:
20. Hygiene and sanitation materials
    a. Spray pump
    b. Disinfectant
21. Protection materials (list) ____

____

VIII. Satisfaction with surveillance system

22. Are you satisfied with the surveillance system?

A. Yes B. No C. Unknown D. Not applicable

23. If no, how can the surveillance system are improved? ______________________________

____

24. What opportunities are there for integration of surveillance activities

____

____

Annex 4. Health profil data collection tool

Health profile assessment questionnaire Hintalo-Wajrat Woreda, Tigray Regional State 2015

1. Historical aspects of the Woreda

- Woreda Name
- How & why the name given
- How and when the Woreda was formed_______
- Any other historical aspect about the Woreda_______________________

2. Geography and Climate

Woreda map____

- Location(distance) -------------Direction -----------------
- Altitude
- Surface Area ----------------
- Town __rural (land)

Geographical coordinate

- Latitude
- Longitude
- Annual rain fall(average)
- Annual temp(average)
- Climatic zones

3. Woreda boundaries

	Kebeles	Total Population	Sex		Residency	
S.N			Male	Female	Urban	Rural

4. Population pyramid

Population data by age and sex								
Male								
Female								
Total								

Characteristics	**Frequency**	**Percentage**
Ethnic/language		
Oromo		
Amhara		
Tigre		
Garage		
Others		
Religion		
Orthodox		
Muslim		
Protestant		
Others		
Occupation		
House Wife		
Student		
GOV employment		
Merchant		
Others		
Water Source		

Pipe		
River		
Wale		
Others		

5. Economy (mainstay of the economy, average income levels etc)

Main income sources

- Agriculture
  - Cultivated area___________________
  - Grazing area_____________________
  - Cropping seasons__________________
  - Land density_____________________
- Livestock
- Tourism
- Trade
- Other business

House hold income source

- Agriculture______ (#)
- Government Employer_______(#)
- Private Employer___________(#)
- Daily Laborer (#)
- Different business_____ (#)
- Jobless (#)
- **Average Income per year___________________________**

Characteristics	**Frequency**	**Percentage**
Educational institution		
K.G		
Primarily School (1-8)		
Secondary (9-10)		
Preparatory(11-12)		
College/ University		
TVET		
School health activities: Number of schools with Water supply		
Schools with functional latrines Male Female		
Schools with HIV/other Health clubs		

6. Educational Status

School Enrolment	**Sex**				**Total**
	Male		**Female**		
	Frequency	**Percentage**	**Frequency**	**Percentage**	**Frequency**
Illiterate					
KG					
1_8					
9_12					
TVT					
Collage/University					
School Age Children (target)					
Coverage					
School dropout in 6 months or year 2005					

7. Water coverage

Characteristics	Frequency	Percentage
Total safe water coverage		
Safe water supply coverage by kebeles		
Main source of water supply		
Kebeles getting safe water		
Population getting safe water		
Daily water consumption per day per person		

Other Facilities

Characteristics	Frequency	Percentage
Transport		
Accessibility (main roads)		
Type of road		
How many kebeles have access to transportation		
Flow of transportation per day		
Telecommunication		
How many people have access to fixed telephone		
How many people have access to mobile phone (coverage)		
Post Office		
Bank		
Power supply		
How many house hold get power supply		

8. 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__________

9. District health system

-The general health system structure of the Woreda (flow chart)

-Is there health management team (HMT) at Woreda levels? Yes/no

-If yes, describe the HMT in detail (composition, functions, etc)

- Do you have non-governmental organizations working on health and heath related issues? yes/no
- List the NGOs (and what they are doing) working on health and health related issues in your Woreda

10. Vital Statics and Health Indicators

- Infant Mortality Rate (IMR) __________(total <1 yr deaths this 2005yr)
- Child Mortality Rate______________(this year's total <15 yr deaths)
- Crude Birth Rate_________
- Crude Death Rate__________ (total deaths 2005yr _)
- Maternal Mortality Rate___________(2005 total maternal deaths______)
- Contraceptive prevalence rate
- Contraceptive acceptance rate _________
- ANC rate (how many of the total expected pregnancies attended ANC)
- Percentage of deliveries attended by skilled birth attendants
- Percentage of deliveries attended by HEWs
- Percentage of deliveries attended by TBA
- PNC rate(how many of the total expected Mothers attended PNC)
- Average family size

11. Immunization Coverage

S.N	Type of Vaccine	Vaccination Status			
		PLAN TO VACCINATE	ACHIEVEMENT	PERCENTAGE	RANK
1	BCG				
2	Penta 1				
3	Penta 3				
4	Measles				
5	PCV 1				
6	PCV 3				
7	Fully immunized				
8	TT2+NPW				

9	PAB				

12. Health Service
Type and Number of Health Institution

Type		Number	Total No. of beds	HF: Population Ratio
Gov. Hospital				
Gov. Health center	Type A			
	Type B			
Private H.Fs (clinics/diag. lab/drug stores)	Clinics (all type)			
	Diag. Lab.			
	Drug store			
Gov. Health posts				
NGOs	H.Ps			
	H.Cs			
	Hospitals			
	Clinics			
OGOs	Hospitals			
	Clinics			
Health service coverage				

Type and Number of health professionals

Type	Frequency	Percentage	Health Professional: Population Ratio
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			
Total			

13. Top causes of morbidity

Top ten leading causes of OPD visit (morbidity)

	DEASESE(2003)	No of cases	%
1	Acute upper respiratory infection		
2	Diarrhea non-blood		
3	Trauma		
4	Malaria clinically		
5	Disease of musculoskeletal system and connective tissue		
6	Acute febrile illness		
7	Urinary tract infection		
8	Dyspepsia		
9	Pneumonia		
10	Helminthes		

No	DEASESE(2004)	No of cases	%
1	Acute upper respiratory infection		
2	Diarrhea non-blood		
3	Acute febrile illness		
4	Malaria clinically		
5	Disease of musculoskeletal system and connective tissue		
6	Urinary tract infection		
7	Pneumonia		
8	Dyspepsia		
9	Malaria confirmed with PF		
10	Helminthes		

No	DISEASE(2005)	No of cases	%
1	Acute upper respiratory infection		
2	Malaria confirmed with FP		
3	Helminthes		
4	Diarrhea non-blood		
5	Acute febrile illness		
6	Urinary tract infection		
7	Trauma		
8	Pneumonia		
9	Malaria Clinical		
10	Disease of musculoskeletal system and connective tissue		

Top ten causes of admissions (Morbidity)

No	DISEASE(2005)	No of cases	%
1	Pneumonia		
2	Malaria confirmed with PF		
2	Diarrhea non blood		
4	Acute upper respiratory infection		
5	Dyspepsia		
6	Urinary tract infection		
7	Trauma		
8	Asthma		
9	Malaria other than PF		
10	AIDS		

14. Health budget allocation
Government

- Total budget allocated for the Woreda ______________(consecutive 5 years)
- Total budget allocated for health _________ (____ %)

years	Woreda budget	Health budget	%
2003			
2004			
2005			
2006			

Funds from NGO

- Total ____unknown_______ (purpose/programs)____________________

15. 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;

16. Status of Primary Health Care Components – with focus on the eight PHC elements and MDG

- MCH (Delivery, ANC, PNC) ____

Family Planning Methods

Methods	Frequency	Percentage
Oral Contraceptive		
IUCD		
Implant		
Injection		
Condom		

Is their EPI (outreach service?)

- Yes
- No

Conduct cold chain or vaccine management supportive supervision

- Yes
- No

If yes, do you have checklist?

- Yes
- No

Environmental Health and Sanitation

- Latrine coverage & utilization rate

Type of Latrine

Type of Latrine	Frequency	Percentage
Open field		
Pit Latrine		
Ventilated Pit Latrine		
Others		

Solid waste management
Is their solid waste container?

- Yes
- No

Is their solid waste container loader?

- Yes
- No

If yes, frequency of solid waste collection______________________________

- Liquid waste management only in Metehara sugar factory camp
- others____
- Health Education (what, when, where, how and who conducted health education)_________

17. Endemic diseases

Malaria:

- Total malarious kebeles & Pop at risk
- ITNs coverage (including current dist) Total requirement
- Is there IRS this year(No of kebeles)
- Total cases/yr deaths/yr 0,<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 PIHTC PMTCT
- HIV prevalence____
- HIV Incidence (new cases/yr)__________________________________

- Total PLWHA
- On ART   on Pre-ART
- Other HIV prevention activities_________________________________

Nutrition

- 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_________________

Anex 6: Data Collection Tools for meher (pre-harvest) assessment, 2015.

Rapid Meher assessment- Health Sector. Region /Zone

<table>
<tr><td colspan="2">Interviewer name__________________________________ _</td><td colspan="4">Institution:_________________________</td></tr>
<tr><td colspan="2">Interview Date: (dd) ____/(mm)________/2015</td><td colspan="4">Region:________________Zone:________________</td></tr>
<tr><td>Main contact at this location:</td><td colspan="2">Name:___________________ __</td><td>Position:_______ __</td><td colspan="2">Tel:_____________</td></tr>
<tr><td colspan="6">• COORDINATION</td></tr>
<tr><td colspan="4">• Is there a functional multisectoral coordination forum for the health sector?</td><td>Yes□</td><td>No□</td></tr>
<tr><td colspan="4">• Are all relevant government, NGOs and UN agencies represented?</td><td>Yes□</td><td>No□</td></tr>
<tr><td colspan="6">• Frequency of regular meeting? (Weekly, Every 2 weeks, monthly…..)________________________</td></tr>
<tr><td colspan="6">• Outbreak?</td></tr>
<tr><td colspan="4">Was there any outbreak/emergency nutrition in the last 3 months? If yes, specify the type of disease</td><td>Yes□</td><td>No□</td></tr>
<tr><td colspan="6">Type of outbreak __________Number of cases (Female)______(Male)______(total)_______Deaths ______</td></tr>
<tr><td colspan="6">Type of outbreak __________Number of cases (Female)______(Male)______(total)_______Deaths ______</td></tr>
<tr><td colspan="6">Type of outbreak __________Number of cases (Female)______(Male)______(total)_______Deaths ______</td></tr>
</table>

• **Mention anticipated epidemics**________________________,________________________,_______________________ If yes please indicate Zone/Woreda at risk and risk population per anticipated risk: *(Use the back side)*					
• **Public Health emergency Management**					
• Is there a Public Health and Nutrition Emergency Emergency Preparedness and Response plan?				Yes□	No□
If yes, is the plan budgeted/ funded?				Yes□	No□
• Is there a trained staff on PHEM basic level (Regional/Zonal/Woreda/HFs)				Yes□	No□
If yes specify number of trained personnel per level: **Region:** Female ______Male______**Zone:** Female_______Male______**Woreda**: Female_____Male_______					
• Is there a Regional/zonal trained Rapid Response team (RRT)?				Yes□	No□
• Is there a trained staff on Emergency nutrition management at all level ? yes --- No ---- If yes specify the number: Total___ Male : ____Female :-___					
E.	Drugs and medical supplies		Total requirement	Available	Gap
	• Meningitis vaccine				
	• Drugs:	Coartem			
		Artesunate (rectal)			
		Artesunate (Inj)			
		Artemether IM			
		Quinine (PO)			
		Quinine (IV)			

		Chloroquine			
		Ceftriaxione			
		Oily CAF			
		Doxcycline			
		Ringer lactate			
		ORS			
		Vit A.			
	iii.Nutrition: Therapeutic supplies and antibiotics	F100			
		F75			
		RUTF			
		Resomal			
		Routine antibiotics at SC/OTP (the list can be annexed)			
	iv.Lab supplies	RDT (Malaria)			
		Pastorex (Meningitis)			
		LP set			
		TI bottle			
	CTC Kit (AWD)				
	Medical Supplies	Gloves,			
		Syringe			
		PPE			
	Drugs and supplies for Emergency RH	Individual Clean Delivery Kits			

Section IV: Nutrition - TFP admissions at Regional/Zonal level May to October 2015

Month	Total SAM Cases		Total Number of TFP (OTP/SC) in the region/zone	Number of SC.	Number of OTP.	Total Number of OTP/SC reported.	Therapeutic Supplies enough Y/N (for the next1 mo)			Children Discharged from TFP referred to SFP Y/N
	2006 E.C.	2007E.C.					RUTF	F100	F75	
May										
June										
July										
Aug										
Sep										
Oct										

What were the major challenges in your Epidemic/emergency nutrtion response experience?

____

____

____

____

Summary: Requirements/Needs/ 2015

Region/Zone	Type of Health and nutrtion Emergency	Total estimated Beneficiaries	Required finance

Region	Zone	Woreda at Risk	Type of Risk	At risk Population

Comments:____

____

____

____

Rapid Meher assessment- Health Sector: Woreda level Questionnaire

<table>
<tr><td colspan="3">Interviewer name ________________________________</td><td colspan="3">Institution:____________________________</td></tr>
<tr><td colspan="3">Interview Date: (dd) ____/(mm)________/2015_______</td><td colspan="3">Region:_________________________________
Zone:_______________Woreda____________</td></tr>
<tr><td>Main contact at this location:</td><td>Name:_______________ _____</td><td colspan="2">Position:______ ___</td><td colspan="2">Tel:_____________</td></tr>
<tr><td colspan="6">SECTION I: SOCIO- DEMOGRAPHIC PROFILE</td></tr>
<tr><td rowspan="3">Woreda total population:</td><td colspan="2">M:___________F:______ _____</td><td>Under 5_______</td><td colspan="2">Total:____</td></tr>
<tr><td colspan="5">No. of women of reproductive age (age 15-49 yrs.) __________</td></tr>
<tr><td colspan="5">No. of pregnant women :_______________</td></tr>
<tr><td>• Special Population (if any):</td><td>Pastorals_ ___</td><td>Refugees___ _</td><td>IDPs____</td><td colspan="2">Migrant Workers___</td></tr>
<tr><td colspan="5"></td><td></td></tr>
<tr><td colspan="5">SECTION II: HEALTH PROFILE</td><td></td></tr>
<tr><td colspan="5">2.1. Coordination</td><td></td></tr>
<tr><td colspan="5">Is there a multi sectoral PHEM coordination forum? if yes how frequently meet--------------</td><td>Yes□ No□</td></tr>
<tr><td colspan="5">Is there a Public Health Emergency preparedness and response plan?Dose it include reproductive health?</td><td>Yes□ No□</td></tr>
<tr><td colspan="5">Is there accessible emergency response fund? If yes how much allocated-------------</td><td>Yes□ No□</td></tr>
<tr><td colspan="5">2.2. Morbidity (List top 5 causes of Morbidity) in the year 2007 EC (2014-2015GC)</td><td></td></tr>
</table>

• Morbidity below 5	• Morbidity above 5	
1.	1.	
2.	2.	
3.	3.	
4.	4.	
5.	5.	

2.3. List number of cases/deaths from Sene 2007 to Tikimt 2008 (June–Oct 2015)

Month	AWD		Malaria				Measles		Meningitis		Other (specify)
	Cases	Deaths	Cases		Deaths		Cases	Death	Cases	Death	
			2006	2007	2006	2007					
June											
July											
Aug											
Sept											
Oct											

2.4. Outbreak?

Was there any outbreak including emergency nutrition in the last 3 months? YES________ NO_____________

If yes, specify the type of disease

Type of outbreak _________________Number of cases _______Deaths ______(specify the time period)_________

Is there any ongoing outbreak of any disease? YES________ NO_____________

Type of outbreak _________________Number of cases _______Deaths ______(specify the time

period)_________		
Type of outbreak ________________Number of cases _______Deaths ______(specify the time period)_________		
Type of outbreak ________________Number of cases _______Deaths ______(specify the time period)_________		
2.5. Preparedness: Is there emergency drugs and supplies enough for 1 month? Or easily accessible on need?		
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 (measl es	Yes□ No□	
Vit A (measles)	Yes□ No□	
Coartem for Malaria	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 A WD)	Yes□ No□	
Are there emergency reproductive health kits in health facilities to provide Basic Emergency Obstetric and New Born Care?	Yes□ No□	If No, list the missing medicines and supplies__________ _________
Are there emergency reproductive health kits in hospitals to provide Comprehensive Emergency Obstetric and New Born Care?	Yes□ No□	If No, list the missing medicines and

			supplies___________ __________
Are there emergency medicines and supplies to support care of rape survivors?		Yes□ No□	
Main shortage (if any): Specify			
Is budget allocated for emergency Rapid response by the woreda?			
SECTION III: RISK FACTORS			
Diseases	**Risk factors for epidemics to occur**	**Yes**	**No**
Malaria	Malaria endemic area		
	Presence of malaria breeding site		
	Interrupted or potentially interrupting rivers		
	Unprotected irrigation in the area		
	LLINs coverage <80%		
	Indicate the coverage of IRS 2007		
	Depleted prevention and control activities		
	Number of malarious kebeles and total population in these Kebeles	Keb __________ pop ___	
Meningitis	Was there Meningitis epidemic in the last 3 years (If yes specify date)		
	Has vaccination been conducted in the past 3 years		
	If yes : Indicate the date and number of people vaccinated	Date	No
AWD	Was there AWD epidemic in the last three years (If yes specify date)		
	Latrine coverage		
	Latrine utilization		
	Safe water coverage		
Measles	Is there ongoing measles outbreak		

	What is the measles vaccination coverage of 2007, less than one year		
	Has SIA been conducted in 2007EFY		
	If yes, Indicate the month and number of children vaccinated including the age group Month-------------- 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 May to October 2015

Month	Total 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 enough Y/N (for the next1 mo)			Children Discharged from TFP referred to SFP Y/N
	2006	2007E.C.					RUTF	F100	F75	

	E.C.								
May									
June									
July									
Aug									
Sep									
Oct									

4.1Is there weekly SAM report? yes _____ No_______ if yes observe

4.2 Is training given on clinical SAM management? yes _____ No_______ if yes how many________________

4.3 Availability of protocol for management of SAM? yes _____ No_______

4.4 Is rapid nutritional screening conducted recently in all kebeles of the woreda? yes _____ No_______ If yes,Proxy SAM rate_____________proxy GAM rate_____________

4.5 Is there basic drug available (Amox, mebendazol, VitA,Resomal,Folic acid…?yes _____ No_______ if yes list can be annexed

4.6 Any other observations you made or any risks of emergency nutrition?

____

____

4.7 What were the major challenges in your emergency nutrition response experience?

____

____

____

____

Any comment

____

____

____

____

Anex 7: Information Sheet on proposal

Hello, how are you? My name is _______________. This is an interview to be done with you for a study that is being conducted at Addis Ababa University, School of Public Health.

The purpose of the study is to assess the water handling, Sanitation and Hygienic practice and its association with under- five childhood diarrhea in households of Kirkos Sub City, Addis Ababa, Ethiopia.

We would like to ask you some questions that are related to water handling, sanitation, hygienic practices and under-five childhood diarrhea. We believe that the results of this study will assist policy makers, planners and households for making considerations regarding household water handling, sanitation and hygienic practices. It will also help to prevent diarrhea among under-five year old children in relation to environmental health factors.

Your contribution has a great input for the study and I would greatly appreciate your participation. There is no possible risk associated with participating in this study. Your name will not be written in the questionnaire and please be assured that all the information you give will be kept strictly confidential. Your participation is completely voluntary.

Therefore, you will not be obliged to answer any question that you do not want to and you may end this interview at any time you want to. There are also no obligations for participating in the interview. The interview will take about few minutes.

Anex 8: Questionnaire Proposal / protocol for Epidemiologic Research Project: Under-Five Childhood Diarrheal. Morbidity and its, correlates in Kirkos Subcity, Addis Ababa, Ethiopia, 2016

Part I: Socio-demographic information

No	Questions and Filters	Coding Categories	Skip
Mother/Care giver			
1	Age	___________ years	
2	Marital status	1. Married	
		1. Single	
		2. Divorced	
		3. Widowed	
3	Educational status	1. Illiterate	
		2. Read and write	
		3. Attended formal education (specify)	
4	Religion	1. Orthodox	
		2. Protestant	
		3. Catholic	
		4. Muslim/Islam	
		5. Other(specify)	
5	Average monthly income	____________ Ethiopian birr	
6	Occupation	1. Housewife	
		2. Daily laborer	
		3. Government employee	
		4. Merchant	
		5. Private	

		6. Other (specify)	
7	Relation to the under-five child	1. Mother	
		2. Care giver	
8	Number of household members	_________	
9	Number of under-five children in the household	__________	
Under-five child			
10	Age of the child	__________ years	
11	Sex	1. Male	
		2. Female	

Part II: Water handling, Sanitation and Hygienic practices

No	Questions and Filters	Coding Categories	Skip
1	What is the main source of drinking-water for members of your household?	Piped water into dwelling 1	4
		Piped water to yard/plot 2	4
		Public tap/standpipe 3	2
		Tube well/borehole 4	2
		Protected dug well 5	2
		Unprotected dug well 6	2
		Protected spring 7	2
		Unprotected spring 8	2
		Rainwater collection 9	2
		Bottled water 10	1A
		Cart with small tank/drum 11	4
		Tanker-truck 12	4
		Surface water (river, dam, lake, pond, stream, canal, irrigation channels) 13	4
		Other (specify) 96 . .	
1A	What is the main source of water used by your household for other purposes, such as cooking and hand washing?	Piped water into dwelling ………….1	4
		Piped water to yard/plot ……………2	4
		Public tap/standpipe………………...3	
		Tube well/borehole…………………4	
		Protected dug well………………….5	
		Unprotected dug well………………6	
		Protected spring……………………..7	
		Unprotected spring………………….8	
		Rainwater collection…………………9	
		Cart with small tank/drum…………10	
		Tanker-truck………………………...11	
		Surface water (river, dam, lake, pond, stream, canal, irrigation channels)….12	
		Other (specify) 96 .	
2	Where is that water source located?	In own dwelling……….. . . . …….. 1	
		In own yard/plot………. . . . . ……..2	
		Elsewhere …… . . . .….3	
3	How long does it take to go there, get water, and come back?	No. of minutes [ ][ ]	
		Water on premises……………………1	
		Don‘t Know …………………………8	
4	Do you treat your water in any way to	Yes ……………………………….1	

	make it safer to drink?	No……………………………………..2		6
		Don't Know ………………………..8		6
5	What do you usually do to the water to make it safer to drink? Anything else? Record all items mentioned	Boil ……………………………………1		
		Add bleach/chlorine………………...2		
		Strain it through a cloth…………….3		
		Use a water filter (ceramic, sand, composite, etc.) ……………………4		
		Solar disinfection…………………...5		
		Let it stand and settle……………….6		
		Other (specify) …………….. 96		
		Don't Know ………………………98		
6	Does your household have a water storage container for drinking water? Interviewer: This includes the container used for transporting if it is also used for storage	1 Yes…………………………………1		
		2 No …………………………………2		11
7	What type of water storage container do you use at home? (More than one option is possible)	Clay pot 1		
		Jerrican 2		
		Plastic bucket 3		
		Iron bucket 4		
		Other/specify		
8	How does your household remove water from your drinking water storage container?	1 Tap…………………………………1		
		2 Cup/dipper/ladle/scoop…………….2		
		3 With hands…………………………3		
		4 With bottle…………………………4		
		5 Pitcher……………………………...5		
		6 Pour from the container……………6		
		7 Other (write down :…………)…...96		
9	Observation about storage: Interviewer: Circle "1" for the facilities that you observe without reading out loud. If respondent refused to show the container, go to next question.	1) Is the cup/dipper/ladle kept clean, off the floor and out of reach of children?	Yes 1	
			No 2	
			Don't know 3	
			Not applicable 4	
		2) Is the drinking water storage container covered?	Yes 1	
			No 2	
			Don't know 3	
			Not applicable 4	
		3) Does the drinking water storage container have a narrow-neck?	Yes 1	
			No 2	
			Don't know 3	

			Not applicable 4	
		4) Does the drinking water storage container look clean?	Yes 1	
			No 2	
			Don't know 3	
			Not applicable 4	
10	How often does your household usually clean the drinking water storage container?	1 Daily ……………………………..1		
		2 Several times per week……………2		
		3 Once a week ……………………...3		
		4 Once a month……………………..4		
		5 Once every half year……………...5		
		6 Less often than half yearly………..6		
		7 Don't know………………………98		
11	Do you think the water is clean? If not, would you tell me makes unclean?	Yes		
		No		
		Not clear (sediments in the water)1		
		It has color……………………………2		
		Smell……………………………3		
		Taste ……………………………...4		
		Other(specify)………………… 96		
12	Inthelast2 weekshasthewaterfromthissourcebeenu navailable?	Yes…..........days.................................1		
		No ……...2		
		Don't Know ……..............................8		
13	Would you kindly show me how your household disposes of used water?	1 Yes ………………………………..1 2 No (refused)………………………2		
14	Observation: What are the points of discharge of household's used water? Interviewer: Circle for the facilities that you observe without reading out loud. ASK the question if respondent refused to show the used water disposal system.	1) Piped sewer……………................... 1		
		2) Soak-away/cesspit/septic system…..1		
		3) Sanitation facility…........................ 1		
		4) Open channel…............................... 1		
		5) Street surface…............................... 1		
		6) Space outside premises…................ 1		
		7) Water body (river, etc.)…….. 1		
		8) Premises' yard or garden…............. 1		
		9) Other (please write down ……..……….................................) 96		
15	Observations about points of discharge of used water: Interviewer: Circle ―1" for the descriptions you observe without reading out loud. If respondent refused to show	1) Stagnant water pool………….......... 1		
		2) Swampy area….............................. 1		
		3) Lots of insects /mosquito breeding. 1		
		4) Bad smell………….......................... 1		
		5) Signs of residues (soap, green		

	the used water disposal system, go to next question.	slime)……………………………………… 1	
		6) Other (write down ..……………) 96	
		7) None …………………………………… 1	
16	What kind of toilet facility do members of your household usually use?(Observation) If ―flush" or ―pour flush" probe: Where does it flush to?	Flush/pour flush to:…………………1	
		piped sewer system…………2	
		septic tank …………………..3	
		pit latrine……………………4	
		elsewhere ……………………5	
		unknown place/not sure/Don't Know where…………………6	
		Ventilated improved pit latrine (VIP) 7	
		Pit latrine with slab …………………8	
		Pit latrine without slab/open pit …….9	
		Composting toilet ………………….10	
		Bucket ………………………………11	
		Hanging toilet/hanging latrine………12	
		No facilities or bush or field ……….13	20
		Other (specify)…………………… 96	
17	Do you share this facility with other households?	Yes …………………………………1	
		No …………………………………..2	20
18	How many households use this toilet facility?	No. of households if less than 10 [ ]	
		10 Or more households… . . . ……. 95	
		Don't Know……………………… 98	
19	Ownership of latrine?	Privately owned 1	
		Shared with neighbors 2	
		Other/specify ____ 96	
20	When [name of youngest child] passed stools, what will be done to dispose of the stools?	Child use toilet/latrine……………..1	
		Put/rinsed into toilet or latrine………2	
		Put/rinsed into drain or ditch……….3	
		Thrown into garbage………………..4	
		Buried………………………………5	
		Left in the open……………………..6	
		Other (specify)……………………..96	
		Don't Know………………………..98	
21	Do you have soap or something else that you use for hand washing in your household?	1 Yes, soap …………………………1	
		2 Yes, ash…………………………...2	
		3 Yes, sand…………………………..3	
		4 Yes, other (write down…………..)96	
		5 No …………………………………4	24

22	Have you used soap today or yesterday?	Yes…………………………………..1	
		No…………………………………2	
23	When you used soap today or yesterday, what did you use it for? Interviewer: Circle ‗1' for all mentioned – DO NOT READ OUT the answer. If ―washing my hands" is mentioned, probe what was the occasion without reading out the answers. Encourage by asking anything else after a reply.	1) Washing clothes…......................... 1	
		2) Washing my body …...................... 1	
		3) Washing child's bottom…............... 1	
		4) Washing child's hands….................. 1	
		5) Washing hands after defecating ….. 1	
		6) Washing hands after cleaning child 1	
		7) Washing hands before feeding child….. 1	
		8) Washing hands before preparing food..... 1	
		9) Washing hands before eating …...... 1	
		10) Washing hands before going out.. 1	
		11) Washing hands before receiving visitors ….. 1	
		12) Other (write down………………)…................ 96	
24	Have you haddiarrheainthelast2 weeks? {having three or more loose or watery stool in a 24-hour's}	Yes…………………………………..1	
		No…………………………………2	
		Don't Know……………………….98	
25	Has [name of child] had diarrhea in the last 2 weeks? {having three or more loose or watery stool in a 24-hour's}	Yes…………………………………..1	
		No…………………………………2	
		Don't Know……………………….98	

Addisalem Mesfin

Cell phone: 0911243303

E-mail: addisaleme@yahoo.com

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