



**St. Paul's Hospital Millennium Medical College (SPHMMC)
Department of Public Health
Ethiopian Field Epidemiology and Laboratory Training Program**

Compiled Body of Works in Field Epidemiology

**By
Yosef Asrat (MD)**

**Submitted to the Department of Public Health, St. Paul's Hospital Millennium
Medical College in Partial Fulfillment for the degree of Master of Public
Health in Field Epidemiology**

September, 2019

Addis Ababa

**ADVISORS: 1. Shikur Mohammed
2. Dr. Kathleen Gallagher
3. Getachew Tilahun
4. Sisay Tanie**

**September 2019
Addis Ababa**

DECLARATION

I hereby declare that, this Field Epidemiology compiled body of work is my original work and has not presented for a degree another person in this or any other university and all source material used for this compiled body work have been duly acknowledged.

Name:

Signature_____

Date_____

The MPH in Field Epidemiology compiled body work has been submitted for examination with my approval as a university academic advisor

Name:

Signature_____

Date_____

St. Paul's Hospital Millennium Medical College (SPHMMC)

Department of Public Health

COMPILED BODY OF WORK IN FIELD EPIDEMIOLOGY

BY:

Yosef Asrat (MD)

ETHIOPIA FIELD EPIDEMIOLOGY TRAINING PROGRAM

DEPARTMENT OF PUBLIC HEALTH, ST. PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE

APPROVAL BY EXAMINED BOARD

_____	_____
Chair person, School Graduate Committee	

_____	_____
Advisor	

_____	_____
Examiner	

_____	_____
Examine	

Acknowledgements

I would like to express my heartfelt thanks to my mentors and advisors Mr. Shikur Mohammed, Dr. Kathleen Gallagher, Mr. Getachew Tilahun and Mrs. Sisay Tanie for their valuable comments, supervision and constant encouragements that always motivated me in working this out puts for fulfilment of my master of public health in field epidemiology.

I would also like to acknowledge SPHMMC, EPHI and CDC for their technical and financial support throughout two years of residency period.

My gratitude goes to all instructors of SPHMMC-Public Health department for their broad knowledge they shared us during class session and field assessments.

I would like to thank the FMOH, PPD staffs for their technical assistance, support provided to access data and timely provision of supportive letters to conduct data analysis.

Table of contents

Acknowledgement	i
Table of contents	ii
List of tables.....	iv
List of figures.....	vi
List of Annexes	viii
List of abbreviations	ix
Summary Foreword.....	xi
Chapter I – Outbreak/Epidemic Investigations	1
1.1. Malaria Outbreak Investigation and Management in Awash Fental Woreda, Afar Region, Ethiopia-September 2018.....	2
Chapter II – Surveillance Data Analyses Report.....	21
2.1. Trends in Non-Neonatal Tetanus Morbidity and Mortality, Ethiopia- September 2004-August 2008EC	22
Chapter III – Evaluation of Surveillance System	34
3.1. Evaluation of Malaria Surveillance System in Awash Fentale and Asayta Districts, Afar Region, Ethiopia- December 2018.....	37
Chapter IV – Health Profile Description Report	47
4.1. Health Profile Description of woreda 13, Kolfe Keraneo Sub City, Addis Ababa City Administration, Ethiopia 2008 E.C	48
Chapter V – Scientific Manuscripts for Peer reviewed Journals	77
5.1. Trends in Non-Neonatal Tetanus Morbidity and Mortality, Ethiopia- September 2012-August 2016	78
Chapter VI – Abstracts for Scientific Presentation	87
6.1. Trends in Non-Neonatal Tetanus Morbidity and Mortality, Ethiopia- September 2012-August 2016	88
6.2. Malaria Outbreak Investigation in Awash Fentale District, Ethiopia-September 2018.....	89

Chapter VII- Proposal for Epidemiologic Research Project	90
7.1. Prevalence and Associated Risk Factors of Head Injury among Trauma Patients of Addis Ababa Burn, Emergency and Trauma Hospital, Ethiopia May 16 to June 16, 2019	91
Chapter VIII – Other Additional Output Reports	111
8.1 Inappropriate use of Antibiotics and Its Associated Factors among Residents of Addis Ababa City, Ethiopia-August 2019	112

List of tables

Table 1.1: Confirmed malaria cases by months (July-October), In Awash Fentale Woreda, Zone 3, Afar, Ethiopia, 2018.....	9
Table 1.2: Malaria attack rate by kebeles , Awash Fentale Woreda, Zone 3, Afar region, Ethiopia 2018.....	10
Table 1.3: Demographic, , personal and environmental protection factors among malaria cases and unmatched controls, Awash Fentale Woreda, Zone 3, Afar, Ethiopia, 2018	11
Table 2.1: The number of tetanus cases by regions and year in Ethiopia, 2007-2008EC	15
Table 2.2: The total five years Tetanus incidence by indicators in Ethiopia, 2004 – 2008EC.....	18
Table 2.3: The five years incidence, death , and case fatality rate of Tetanus cases, Ethiopia, 2004– 2008EC	18
Table 2.4: Tetanus cases incidence, mortality rate and case fatality rate by region, Ethiopia, 2007 -2008EC	19
Table 3.1: Confirmed Malaria cases in Awash Fentale Woreda, Zone 3, Afar, Ethiopia, 2015-2018	24
Table 3.2: Confirmed Malaria cases in Asayta Woreda, Zone 1, Afar, Ethiopia, 2015-2018.....	24
Table 4.1: Distribution of students by sex in woreda 13, Kolfe Keraniyo sub city, Addis Ababa 2008EC	56
Table 4.2: Health facility distribution in woreda 13, Kolfe Keraniyo sub city, Addis Ababa 2008 EC	56
Table 4.3: Health centres human resource distribution by profession and educational level in woreda 13, Kolfe Keraniyo sub city, Addis Ababa 2008 EC	57
Table 4.4: Private health facilities human resource distribution in woreda 13, Kolfe Keraniyo sub city, Addis Ababa 2008 EC	57
Table 4.5: Vital statistics of the woreda 13 , Kolfe Keraniyo sub city, Addis Ababa 2008 EC ...	58
Table 4.6: Vaccination status in woreda 13, Kolfe Keraneo Sub city, Addis Ababa 2008EC	58
Table 4.7: Percentage of MCH activity in woreda 13, Kolfe Keraniyo sub city Addis Ababa 2008 EC	59
Table 4.8: Family planning utilization performance in woreda 13, Kolfe Keraniyo sub city , Addis Ababa 2008 EC	60

Table 4.9: Top ten leading causes of all OPD visit in woreda 13, Kolfe Keraniyo sub city, Addis Ababa 2008 EC	60
Table 4.10: Top ten leading causes of OPD visit for females in woreda 13, Kolfe Keraniyo sub city , Addis Ababa 2008 EC	61
Table 4.11: Top ten causes of OPD visits for children <5 years of age in woreda 13 , Kolfe Keraniyo sub city , Addis Ababa 2008 EC	62
Table 4.12: Activities performed in TB-HIV diagnosis and treatment in woreda 13, Kolfe Keraniyo sub city , Addis Ababa 2008 EC	63
Table 4.13: Distribution of new TB cases and treatment out come in woreda 13, Kolfe Keraniyo sub city, Addis Ababa 2008 EC	64
Table 4.14: Activity plan and performance for under five children in woreda 13, Kolfe Keraniyo sub city , Addis Ababa 2008 EC	65
Table 4.15: Liquid and solid waste management and housing situation in woreda 13, Kolfe Keraniyo sub city, Addis Ababa 2008 EC	66
Table 5.1: Confirmed Malaria cases by months (July-October), In Awash Fentale Woreda, Zone 3, Afar, Ethiopia, 2018.....	81
Table 5.2: Malaria attack rate per 1000 and Case Fatality Ratio by age and sex, Awash Fentale Woreda, Zone 3, Afar, Ethiopia, 2018.....	81
Table 5.3: Demographic, personal and environmental protection factors among malaria cases and unmatched controls, Awash Fentale Woreda, Zone 3, Afar, Ethiopia, 2018	Error!
Bookmark not defined.	82
Table 5.4: Malaria attack rate by kebeles, Awash Fentale Woreda, Zone 3, Afar, Ethiopia, 2018	84

List of figures

Figure 1.1: Map of Awash Fentale woreda, Zone 3, Afar Region, Ethiopia, 2018	6
Figure 1.2: Number of malaria cases by WHO Epi week, Awash Fentale Woreda, Zone 3, Afar, Ethiopia, Week 28 – 43, 2018.....	10
Figure 2.1: Number of Tetanus cases by year in Ethiopia, 2004 -2008EC	11
Figure 2.2: Incidence of Tetanus by Region in Ethiopia, 2007-2008 EC.....	12
Figure 2.3: Distribution of Tetanus cases by sex, age and year in Ethiopia, 2004-2008EC.....	13
Figure 2.4: Distribution of Tetanus cases by sex and year in Ethiopia, 2004-2008EC	13
Figure 2.5: Distribution of Tetanus cases by age and year in Ethiopia, 2004-2008EC.....	14
Figure 2.6: The proportion of the five year IPD Tetanus cases , in Ethiopia, 2004 – 2008EC	15
Figure 2.7: Distribution of Tetanus mortality by age, sex and year in Ethiopia, 2004-2008EC ..	16
Figure 2.8: Tetanus incidence rate, mortality rate and case fatality rate in Ethiopia, 2004-2008 EC	17
Figure 3.1: Map of Awash Fentale and Asayta Woredas , Afar region , Ethiopia 2018	20
Figure 3.2: Flow chart of the the Surveillance Reporting System and Feedback of Asayta and Awash fentale woredas, Afar Region, Ethiopia 2018.....	23
Figure 3.3: The proportion of malaria treatment in Awash Fentale and Asayta Woreda, Afar region, Ethiopia, 2018.....	23
Figure 3.4: The number of Malaria cases treated in Asayta and Awash Fentale Woreda, Afar Ethiopia 2018.....	24
Figure 4.1: Map of Kolfe Keraniyo sub city woredas, Addis Ababa 2008 EC	53
Figure 4.2: Population distribution by sex in Woreda 13, Kolfe Keraniyo sub city, Addis Ababa 2008 EC	54
Figure 4.3: Population distribution by age group in Woreda 13, Kolfe Keraniyo, sub city, Addis Ababa 2008EC	54
Figure 4.4: Percentage of religious organization in Kolfe Keraniyo sub city, Addis Ababa 2008 EC	55
Figure 4.5: Occupational status of people in the woreda 13, Kolfe Keraniyo sub city , Addis Ababa 2008 EC	55

List of Annexes

1.12. Annex: Questionnaire Malaria Outbreak Investigation and Management in Awash Fental Woreda, Afar Region, Ethiopia-September 2018.....	18
3.12. Annex: Questionnaire for Evaluation of Malaria Survellinace System in Awash Fentale and Asayta Woredas, Afar region, Ethiopia 2018.....	33
4.10. Annexes: Checklist for Health Profile Assessment of woreda 13 Kolfe Keraneo Sub City in 2008 E.C.....	73
7.8 Annex: Dummy table.....	104
Questionnaire.....	105

List of abbreviations

AaBET.....	Addis Ababa Burn, Emergency and Trauma Hospital
ACT.....	Artemisinin-based Combination Therapy
BSc.....	Bachelor of Science
CDC.....	Center of Disease Control and prevention
CFR.....	Case Fatality Rate
CHWs	Community Health Workers
CMR	Child Mortality Rate
CPT	Cotri-moxazole Prophylaxis Treatment
DM	Diabetic Mellitus
DPT3.....	Diphtheria, Pertussis and Tetanus 3
DPT4.....	Diphtheria, Pertussis and Tetanus 4
EC.....	Ethiopia Calendar
ED.....	Emergency Department
EFETP.....	Ethiopia Field Epidemiology Training Program
EFY.....	Ethiopian Fiscal Year
EPHI.....	Ethiopian Public Health Institute
EPI.....	Expanded Program on Immunization
FMOH.....	Federal Ministry of Health
GCS.....	Glasgow Coma Scale
GP	General Practitioner
HAART	Highly Active Anti Retro viral Treatment
HC	Health Center
HF	Health Facility
HI.....	Head Injury
HIV	Human Immunodeficiency Virus
HMIS.....	Health Management Information System
HO.....	Health Officer
HP.....	Health Post
ICU.....	Intensive Care Unit
IMR.....	Infant mortality Rate
INH.....	Isoniazid
IPD.....	In Patient Department
IPT.....	Intermittent Preventive Therapy
IRS.....	Indoor Residual Spray
IRT.....	Integrated Refresher Training
ITN.....	Insecticide Treated Bed Net
IUD	Intra Uterine Device
JUSH.....	Jimma University Specialized Hospital
KG	Kindergarten
LOC.....	Loss of Consciousness
MCH	Maternal and Child Health
MIS.....	Malaria Indicator Survey
MNTE.....	Maternal and Neonatal Tetanus Elimination
MTBI.....	Mild traumatic brain injury
NGO.....	Non-Governmental Organization

OPD.....	Out Patient Department
OPV	Oral Polio Vaccine
OR.....	Odds Ratio
OTP.....	Outpatient Therapeutic Feeding Program
PCV.....	Pneumococcal Vaccine
PF.....	Plasmodium Falciparum
PHEM.....	Public Health Emergency Management
FMOH.....	Federal Ministry of Health
PMI.....	President's Malaria Initiatives
PNC.....	Post Natal Care
PPD.....	Policy and Plan Directorate
PTB.....	Pulmonary Tuberculosis
PV.....	Plasmodium Vivax
RDT.....	Rapid Diagnostic Test
RRT.....	Rapid Response Team
RTA.....	Road Traffic Accident
RTI.....	Road Traffic Injury
Rx	Treatment
SNNPR.....	South Nation Nationalities and Peoples Region
SPHMMC.....	St. Paul's Hospital Millennium Medical College
TB.....	Tuberculosis
TBI.....	Traumatic Brain Injury
THI.....	Traumatic Head Injury
TIG.....	Tetanus Immune Globulin
TTL.....	Tetanus Toxoid Injection
TVET.....	Technical and Vocational Education Training
UHEWs.....	Urban Health Extension Workers
VCT	Voluntary Counseling and Testing
WHO.....	World Health Organization

Summary Foreword

Despite many collaborative efforts of governmental and non-governmental intervention activities preventable communicable diseases are still a public health problem national and globally. The Ethiopian government policy is more emphasis on prevention measures of communicable and non-communicable diseases. Ethiopian Field Epidemiology Training Program that adapted from the USA enables trainers to conduct disease surveillance and implement prevention and control measures of prioritized diseases.

I started studying field epidemiology in November 2016 and completed in October 2019 at St. Paul Hospital Millennium Medical College Public Health Department, Field Epidemiology Training Program. I was in FMOH for the field residence attachment and for the second year field residency my attachment was at EPHI. During my stay, I carried malaria outbreak investigations, Tetanus surveillance data analysis, malaria surveillance system evaluation, Kolfe Keraniyo woreda 13 health profile description, submitted two abstracts for conferences and presented both, scientific manuscript for peer reviewed journals prepared, conducted epidemiological research on head injury, one training and research proposal prepared on AMR and sent for small grant computation and participated in EVD preparedness in the second year of my attachment at EPHI.

I investigated malaria outbreak during field base residency. Descriptive and analytical epidemiology methods were used to describe magnitude of the diseases and identify risk factors associated with diseases. A total of 2,395 confirmed malaria cases were reported from Awash Fentale woreda Afar region from July to October 2018. We identified that low ITNs utilization, stagnant water, uncovered plastic household water containers and the presence of similar symptoms and signs at home were contributed for malaria outbreak in the woreda. We recommended proper ITNs utilization, strong environmental management and regular indoor chemical spray for malaria prevention.

Surveillance data analysis of *non-neonatal tetanus by using five-year data* was conducted nationally at FMOH. Despite limited resources control and prevention of tetanus had been on the right track that results in declining of morbidity and mortality. The incidence of tetanus cases had been declining since 2014. Still the incidence is higher than other African countries.

Age groups ≥ 15 years account more than 60% of the tetanus case with uniform sex distribution and had the highest mortality rate with male predominance.

I conducted *Malaria surveillance system evaluation at Asayta and Awash Fental woredas of Afar region*. Overall, from our assessment, the malaria surveillance system appeared weak and it didn't produce data which is useful for decision. The performance of the system didn't contribute to reduce malaria morbidity in Awash Fentale and Asayta woredas.

Health profile description was carried in Kolfe Keraniyo sub city, woreda 13, Addis Ababa 2018. Most of the socio economical aspect of the woreda13 is (in terms of educational, safe water and Economical status) in similar with other woredas within Addis Ababa and it is the reflection of the current city status. contraceptive acceptance rate and ANC (the total expected pregnancies attended 4th ANC) were below the national figure. Children were at high risk acquiring infectious diseases like Measles infection.

I prepared scientific manuscript for peer reviewed journals on Malaria outbreak investigation and management Awash Fentale woreda 2018. Two abstracts were prepared for scientific conference submission; *Malaria outbreak investigation and management in Awash Fentale Woreda, Afar region 2018* was presented in *EFELTP 3rd Annual Scientific Conference* and *Trends in Non-Neonatal Tetanus Morbidity and Mortality, Ethiopia- September 2012- August 2016* was presented in *International Conference on (Re-) Emerging Infectious Diseases, Addis Ababa, Ethiopia, March 2018*.

Epidemiological research project on *Prevalence and Associated Risk Factors of Head Injury among Trauma Patients of Addis Ababa Burn, Emergency and Trauma Hospital, Ethiopia June 16 to July 16, 2019* was conducted and the result shows that prevalence of head injury was high among working age illiterate and unemployed individuals the cause being RTA and this magnifies the possible socioeconomic impact of head injury as the productive age group of the society is primarily affected.

I prepared research proposal on *Inappropriate use of antibiotics and Its Associated Factors among Residents of Addis Ababa City, Ethiopia-August 2019* for small grant computation at Royal Society of Tropical Medicine and Hygiene.

Chapter I – Outbreak/Epidemic Investigations

1.1 Malaria Outbreak Investigation and Management in Awash Fental Woreda, Afar Region, Ethiopia-September 2018

Executive Summary

Background: Malaria is a life-threatening disease affecting the world's most under-developed countries and regions where basic healthcare infrastructure is lacking as well some developed countries. It is a major cause of morbidity and mortality in Africa, especially in sub-Saharan African countries. Malaria is a major public health problem in Ethiopia despite relatively low malaria prevalence compared to most other malaria-endemic countries in Africa. Afar is one of the malaria endemic regions in the country and it is commonest cause of morbidity in the region with 0.2%. Zone 3 is among 5 zones of the Afar region and experienced malaria epidemic during the past decades. Indoor residual spray was not conducted since 2016 in the woreda. This study is done to investigate and identify factors associated with the malaria outbreak that was reported by the health facilities and NGOs to the Awash Fentale woreda health office at WHO Epidemiological week 37 in 2018

Method: The study was conducted in Awash Fentale woreda, Zone 3, Afar region. The investigation was conducted from September 28 to October 5, 2018. Microscopy and RDT laboratory investigation conducted to confirm the disease. Magnitude of the disease was described by person, place and time. Previous years malaria data was doubled to establish threshold level. We conducted descriptive and unmatched case control study by systematic random sampling we selected 52 cases and 104 community controls by using StatCalc and collected the data by using semi structured questionnaire. Microsoft Excel 2016 and SPSS Version 24 were used to perform data entry and analysis and Arc GIS used to create map. We also conducted environmental assessment of potential mosquito breeding site through naked eye.

Result: From July to October 2018, a total of 4,572 blood smear tests was done by Microscopy and RDT for suspected malaria cases at all health facilities of Awash Fentale Woreda of which 2,395 were positive. Of the positive cases, 1,807 (75%) were positive for *P. Falciparum*, 553 (23%) were *P. Vivax* and 35 (2%) were mixed malaria. The Attack rate was 80 per 1000. Using bed net every night was (AOR: 0.2, P-value=0.01). Presence of stagnant water (AOR: 3.0, P-Value=0.02), Presence of anybody with malaria sign and symptom in the house before 2-3 weeks (Odds ratio: 2.8, P-value=0.03). Availability of uncovered plastic water container in or outside house was (AOR: 2.3, P-value=0.04).

Conclusion: There was malaria outbreak in Awash Fentale woreda of Zone 3. This outbreak scenario has clearly showed that, in order to prevent and control malaria infection the sustainable implementation of vector control intervention through well-organized malaria related strategies and programs are crucial. Inter-sectoral collaboration especially with the private mega project managers and close monitoring and evaluation of the vector control interventions are prerequisites for malaria control and elimination. A total of 10,950 Insecticide Treated Net (ITN) was distributed to the five kebeles. Communities were mobilized and taught on prevention and control measures of malaria disease. Due to the above collaborative interventions the outbreak was controlled.

Keywords: Malaria, Outbreak, Case-Control, Awash Fental

1.1 Introduction

Malaria is a life-threatening disease affecting the world's most under-developed countries and regions where basic healthcare infrastructure is lacking as well some developed countries. It is a major cause of morbidity and mortality in Africa, especially in sub-Saharan African countries [1]. Malaria is known to kill one child every 30 seconds, 3000 under five children per day [2]. In 2017 the region was home to 92% of malaria cases and 93% of malaria deaths and only five countries accounted for nearly half of all malaria cases worldwide [3].

Malaria is a major public health problem in Ethiopia despite relatively low malaria prevalence compared to most other malaria-endemic countries in Africa [4]. Unstable malaria transmission patterns make Ethiopia prone to focal and multifocal epidemics that have on occasion caused catastrophic public health emergencies. Even though three-fourth of the country's land with altitude of below 2000 meters above sea level is known as malarious, the cases are also increasing in the areas with above 2000 meters [5]. *Plasmodium Falciparum* and *Plasmodium Vivax* are the most dominant malaria parasites in Ethiopia. They are prevalent in all malarious areas in the country with *P. falciparum* (PF) representing about two-thirds to three-quarters of the cases. The major malaria vector incriminated in Ethiopia is *Anopheles arabiensis*; in some areas *A. pharoensis*, *A. funestus* and *A. nili* also transmit malaria [6].

Apart from being a major public health problem, the disease has also been identified as a potential impediment to the development of water harvesting, irrigation for agriculture and settlement in fertile underutilized low land areas with potential to enable the country achieve food security and improved household income [5]. Over the last decade, the burden of malaria has declined significantly due to improved coverage of high impact interventions [7]. Due to Ethiopia's complex topography and seasonal rainfall support largely seasonal short-term transmission, malaria is generally unstable that put the population non-immune [8].

Generally, malaria cases are peaked after two rainy season (March – May and July-September). The country has experienced the worst malaria epidemics in 1958 with three million cases and 150,000 deaths [9].

The Afar Region is characterized by the lowland areas (≤ 1500 m altitude) with hot or warm climate. Malaria transmission in the region is perennial due to the availability of large perennial river bodies and hot climate favoring the transmission throughout the year, with seasonal peak extending from August to December [10, 11]. The region is also prone to natural disasters such as droughts and floods and these have in the past contributed to increased malaria transmission, particularly along the banks of Awash River [12]. *Plasmodium Falciparum* (about 65%) and *Plasmodium vivax* (about 35%) are the two dominant malaria parasites prevailing in the region [13]. Afar is one of the malaria endemic regions in the country and it is commonest cause of morbidity in the region with 0.2% prevalence [4]. Zone 3 is among 5 zones of the Afar region and experienced malaria epidemic during the past decades. Indoor residual spray was not conducted since 2016 in the woreda. This study is done to investigate and identify factors associated with the malaria outbreak that was reported by the health facilities and NGOs to the Awash Fentale woreda health office at WHO Epidemiological week 37 in 2018.

1.2. Objectives

1.2.1. General objective:

- To describe magnitude of malaria outbreak and identify factors associated with this outbreak in Awash Fentale woreda.

1.2.2. Specific Objectives

- To verify existence of malaria outbreak in Awash Fentale woreda.
- To assess magnitude of the disease by person, place and time.
- To identify factors associated with contracting malaria during the outbreak.

1.3. Methods and Materials

1.3.1. Study Area and Population

The study was conducted in Awash Fentale woreda, Zone 3, Afar region. Awash Fentale woreda located in the southern part of Afar region and it is 217Km from Addis Ababa and the woreda is 980 meters above sea level at Longitude ($40^{\circ}09'.48''$ N) and Latitude ($08^{\circ}59'.35''$ E). According to 2007 Population Census, Awash Fentale Woreda of zone 3 has a total population of 29,775 of which 15,471 are males and 14,304 females. There are 2 Health Centers and 11 Health Posts found in the woreda [17].

Afar Region

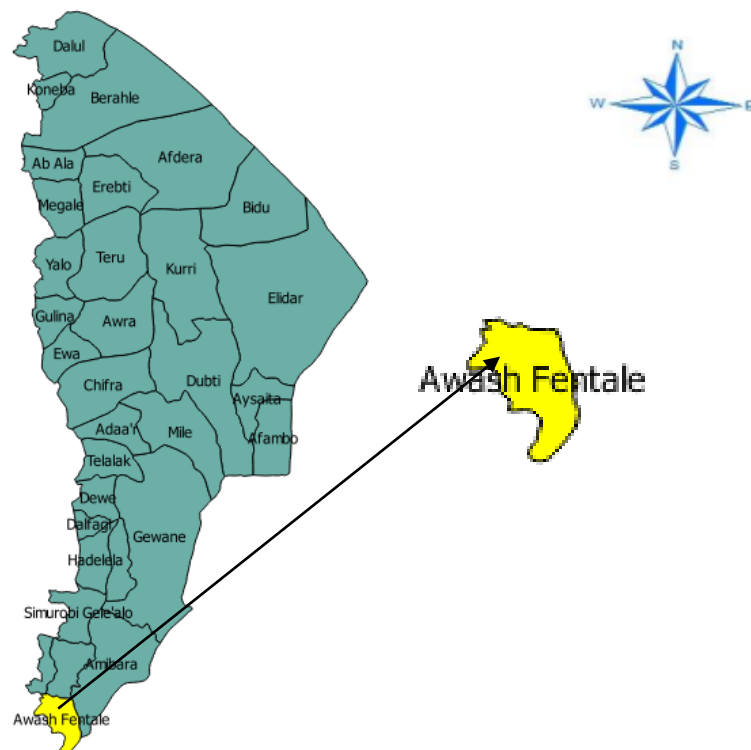


Figure 1.1 Map of Awash Fentale woreda, Zone 3, Afar Region, Ethiopia, 2018

1.3.2. Case Definitions

1.3.2.1. Community Case Definition

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

1.3.2.2. Standard Case Definition for Suspected Case

Any person with fever OR fever with headache, back pain, chills, rigor, sweating, muscle pain, nausea and vomiting diagnosed clinically as malaria Confirmed Case: suspected case confirmed by microscopy or RDT.

1.3.3. Study period

The investigation was conducted from September 28 to October 5, 2018.

1.3.4. Study Design

We conducted a descriptive study followed by unmatched case-control study in ratio 1:2 (52 cases and 104 controls).

1.3.5. Sample size

Sample size was calculated Epi-info 7 StatCalc function for unmatched case control study using the following assumptions.

These are: - Two Sided Confidence level =95%

Power (percent of chance of detecting) = 80%

Ratio of controls to case= 1:2

Odds ratio = 2.8

Proportion of case with exposure = 20.3 % [16]

Therefore, the sample size was 156 samples of 52 cases and 104 controls were selected.

1.3.6. Sampling techniques and procedures

Sampling frame was created, which means for cases from the collected line list names of all malaria cases who were identified in the last 3 weeks and for controls from neighbors of selected cases who did not develop malaria for the last three months. We assigned a number to each of the names of malaria cases in the sampling frame (line list of the cases). This was done using a Microsoft excel sheet. By systematic random sampling we selected 52 cases and these selected cases were divided for five data collectors and they took the list of cases each data collectors with one community member and went in to the kebeles and through house to house searching they recruit the samples into the study.

1.3.7. Inclusion criteria &Exclusion criteria

Inclusion criteria: - For Cases selected by systematic random from the line lists who have sign and symptoms of malaria infection and who agreed to participate in the study was included. Controls were resident of Awash Fentale woreda during the study period who were a neighbor to a case and who did not develop signs and symptoms of malaria.

Exclusion criteria: - Both cases and controls who didn't agree to participate in this study were excluded.

1.3.8. Variables

Dependent Variable

Malaria cases

Independent Variables

Age

Sex

Educational status

Occupational status

Living close to stagnant water

Using bed net every night

Uncovered plastic water container

Open deep well near to the house

Old tires in the compound

Anybody with malaria sign and symptom in the house before 2-3 weeks

Waste collection facility in the compound

Presence of gutter to collect rain water

1.3.9. Data collection method

The investigation was conducted through house-to-house searching for case in kebeles. We used semi-structured questionnaires which adopted and modified from previously investigated outbreak. We interviewed cases and controls, and collected the data. Data was collected by principal investigator, one district PHEM officer, and three health center worker. Orientation was given for data collectors on the questionnaire. When entering the data in to the computer the missing variables and consistency of filling of questionnaires and completeness of data checked out carefully.

1.3.10. Data entry and Analysis

Data was checked, entered and analyzed on computer using MS- Excel 2016 and SPSS statistics version 24 were used. We also used MS-Excel 2016 for sampling technique and procedures, and descriptive analysis, Arc GIS for mapping of study areas. Descriptive and advanced statically analyses were under taken. Due to absence of the previous complete five years data, previous year weekly malaria data was used to set epidemic threshold level by doubling weekly data and comparing with similar week of this year. During this outbreak investigation, number of malaria cases and deaths were collected from health facilities in daily and weekly basis. Magnitude of this outbreak was described by age, sex, kebele and month. Similarly, slide positivity rate was calculated as those positive for malaria among total examined. Bivariate and Multi variable Logistic regression analysis was conducted to find association of diseases with risk factors were measured and tested using OR (Crude and Adjusted), 95% Confidence Interval and P-value.

1.3.11. Laboratory Method

Laboratory technicians conducts thick and thin smears with a 100× oil immersion microscopy at two health centers of this Woreda. Health extension workers identified confirmed malaria cases by RDT at health post and community level during outbreak investigation.

1.3.12. Environmental Assessment

The environmental assessment was conducted in Bolyeta, Sabure and Kebena kebeles. The three kebeles were selected because this kebeles are neighbors for the sugarcane farm which is cultivated by Awash river irrigation project of the Kesem Sugar factory. The principal investigator, woreda malaria focal and clinical advisor of PMI project visited the selected kebeles and observed for the presence of mosquito larvae by their naked eyes in stagnant water bodies located in 200meters radius of the human settlement and water reservoirs (deep wells) and household water containers.

1.4. Results

1.4.1. Laboratory

From July to October 2018, a total of 4,572 blood smear tests was done by Microscopy and RDT for suspected malaria cases at all health facilities of Awash Fentale Woreda of which 2,395 were positive. Of the positive cases, 1,807 (75%) were positive for *P. Falciparum*, 553 (23%) were *P. Vivax* and 35 (2%) were mixed malaria.

1.4.2. Descriptive Epidemiology

A total of 2,395 (Attack Rate = 80 per 1000) confirmed malaria cases were reported from Awash Fentale Woreda of Zone 3 from July to October 2018 (Table 1.1). No deaths were reported from the woreda during this period. Slide positivity rate of the disease during this outbreak was 52 %. The outbreak was detected in mid-September of 2018. However, weekly reported malaria cases were crossed the epidemic threshold level in WHO Epidemiologic week 30 of July 2018 a total of 35 cases were reported for a threshold of 24 cases. The highest *Plasmodium Falciparum* cases were on September 2018 which was 1031(57%) the least being on July 2018 which was 82(5%).

Table 1.1: Confirmed malaria cases by months (July-October), In Awash Fentale Woreda, Zone 3, Afar, Ethiopia, 2018

Species	Months			
	July	August	September	October
PF	82	478	1,031	215
PV	24	103	398	29
Mixed	0	6	23	6
Total	106	587	1452	250

Age five years and older were more affected with attack rate of 106 per 1000 population (table 1.2). Similarly, malaria attack rate was higher in male (88 per 1000 population) than female in Awash Fentale woreda, 2018. Among a total of 2,395 malaria cases, 1,528 (63.8%) were confirmed at Health Centers and 867 (36.2%) were at Health Posts.

Table 1.2: Malaria attack rate per 1000 and Case Fatality Ratio by age and sex, Awash Fentale Woreda, Zone 3, Afar, Ethiopia, 2018

Variables		population	# of Case	# of Death	Attack rate/1000	Case Fatality rate(%)
Age	0-4	9,560	240	0	24	0
	>4	20,215	2,155	0	106	0
Sex	Male	15,471	1,362	0	88	0
	Female	14,304	1,033	0	72	0
Total		29,775	2,395	0	80	0

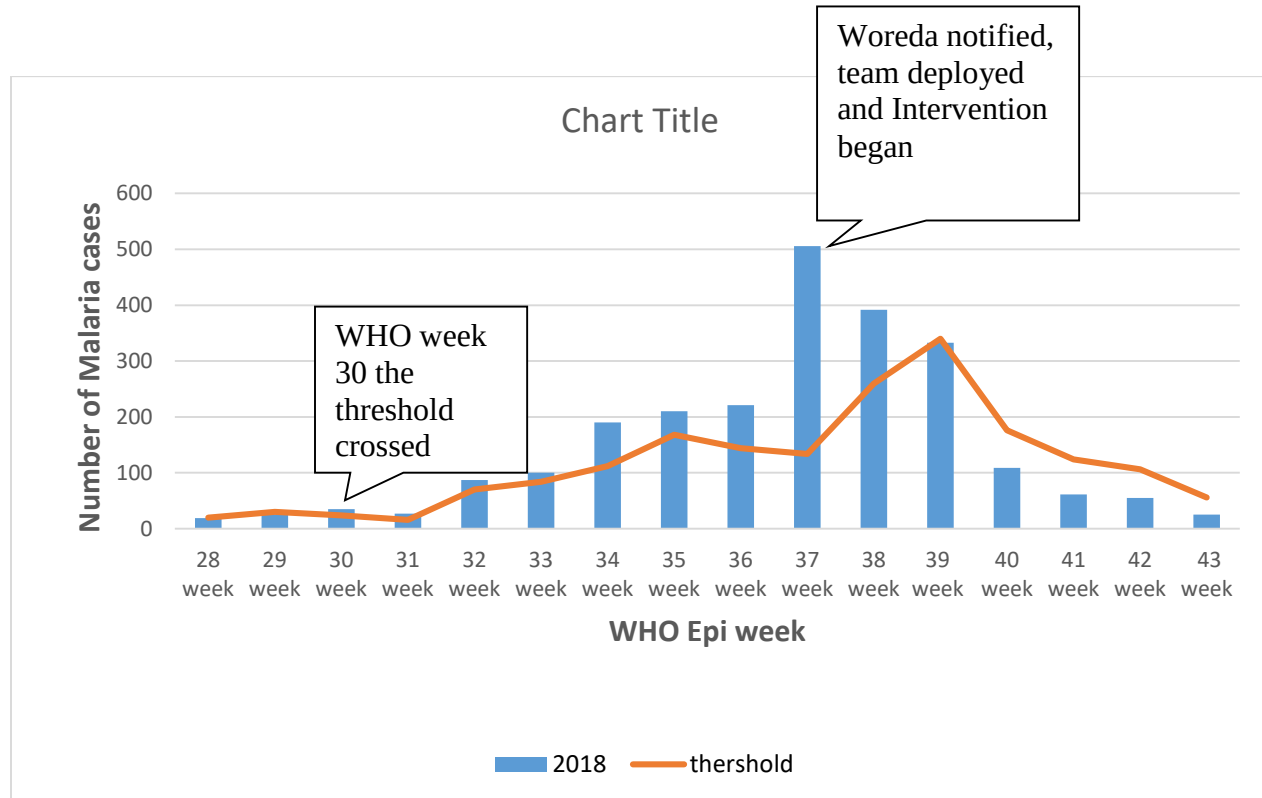


Figure 1.2: Number of malaria cases by WHO Epi week, Awash Fentale Woreda, Zone 3, Afar, Ethiopia, Week 28 – 43, 2018

All 5 kebeles of the Woreda are malarious area with altitude of < 2000 meters above sea level. Incidence rate was highest in Bolyeta (196 per 1000) kebele and followed by kebena (74 per 1000) and Sabure (64 per 1000) kebeles of the woreda (Table 1.3).

Table 1.3: Malaria attack rate by kebeles , Awash Fentale Woreda, Zone 3, Afar region, Ethiopia 2018

S.N	Kebele	Population	Male	Female	Age (0-4)	Age >4	Total case	Attack rate per 1000
1	Dudub	4,326	2,200	2,126	441	3,885	270	62
2	Doho	5,987	3,193	2,794	1,583	4,404	134	22
3	Sabure	10,061	5,521	4,540	2,119	7,942	644	64
4	Bolyeta	5,391	2,580	2,811	1,955	3,436	1058	196
5	Kebena	3,910	2,157	1,753	883	3,027	289	74

1.4.3. Analytical Epidemiology

During this unmatched case-control study, 52 malaria case-patients and 104 community controls were selected and interviewed from five kebeles of the woreda. Of 52 case-patients, 30 (58%) were males and 22 (42%) were female. Presence of person with similar malaria signs and symptoms in the house before 2 weeks of onset was (AOR: 2.8, P-value=0.3). The use insecticide treated bed net every night was (AOR: 0.2, P-value=0.01). Presence of stagnant water for mosquito breeding in 200meters radius was (AOR: 3.04, P-value=0.02). Availability of uncovered plastic water container in or outside house was (AOR: 2.3, P-value=0.04).

Table 1.4: Demographic, , personal and environmental protection factors among malaria cases and unmatched controls, Awash Fentale Woreda, Zone 3, Afar, Ethiopia, 2018

S.N	Characteristics		Cases (N=52)	Controls (N=104)	AOR	P-value
1	Educational status	Illiterate Literate	31 21	67 39	0.5	0.42
2	Occupational status	Employed Unemployed Student Pastoralist Farmer Other	4 5 11 26 2 4	6 10 23 48 6 11	1.0	0.08
3	Living close to stagnant water	Yes No	38 14	34 69	3.0	0.02
4	Using bed net (every night)	Yes No	15 37	44 60	0.2	0.01
5	Availability of uncovered plastic water container in or outside house	Yes No	39 13	24 80	2.3	0.04
6	Presence of open deep well in their compound or near to house	Yes No	20 32	50 54	1.5	0.09
7	Presence of old tires in the compound	Yes No	3 49	12 92	0.7	1.00
8	Presence of anybody with malaria sign and symptom in the house before 2-3 weeks	Yes No	31 21	10 94	2.8	0.03
9	Presence of waste collection facility in the compound	Yes No	19 33	19 85	1.3	0.75

10	Presence of gutter to collect rain water	Yes	16	53	0.5	1.10
		No	36	51		

1.4.4. Environmental Assessment

Among the observed three kebeles around eleven potential mosquito breeding sites were observed by naked eyes three from Sabure, three from Kebena and five from Bolyta, and eight out of the eleven sites had visible mosquito larvae for the naked eyes in the water it contains.

1.5. Discussion

The presence of stagnate water in the surrounding area is the major factor that may have contributed to the occurrence of this outbreak. Multiple risk factors were assessed during the investigation beside intervention activities. The presence of the *Kesem Sugar Factory* in the woreda contributed for the existence of malaria outbreak. This outbreak was detected at the end of September 2018 even though weekly malaria report was crossed threshold level at WHO Epidemiologic Week 30 of July 2018. In addition, with the mega sugar project the rainy season in Ethiopia occurs from July to Sept annually could causes stagnant water accumulation which usually serve as the source of drinking water for this pastoralist community even though it is associated with an increase in malaria incidence by creating favorable mosquito breeding sits. Unusual heavy rainfall followed by high temperature is considered as the cause of malaria epidemics [9].

There were no deaths reported in this outbreak. One possible reason may be strong case detection and management however further study would be needed to determine this fact. Correct utilization of mosquito nets, anti-malarial spraying, and appropriate use of personal preventative measures such as use of repellent and protective cloth will reduce incidence of malaria and our study supports this fact that 80% of the people who do not uses ITN every night were infected by malaria [8]. Absence of timely chemical indoor residual spraying was associated with higher risk of febrile illness in a study conducted in Amhara Regional States. The finding in this study is in line with our study finding that the woreda didn't conduct indoor residual spray since 2016 [14].

Stagnant water surrounding malaria affected village and their compound was one of the dominant risk factor for this malaria outbreak, which is consistent with previous reports in the literatures [13]. The other evidence that support this finding is the presence of mosquito larvae in the observed potential mosquito breeding sites. In addition to living closer to stagnant water the availability of uncovered plastic water containers in and outside the house, and the presence of anybody with malaria sign and symptoms in the house before 2- 3 weeks were highly associated with the occurrence of this outbreak and this finding is in line with different studies conducted in India, Sri Lanka and Northeastern Ethiopia [12,13,15].

Males were more like to be infected by malaria than females. This may be due to males stay outside home during night than females for different reasons such as protecting domestic animals and this finding is supported by other studies in the literatures [13].

1.6. Limitation

Mosquito larva species categorization was not conducted due to lack of expertise.

1.7. Conclusion

There was malaria outbreak in Awash Fentale woreda of Zone 3. This outbreak scenario has clearly showed that, in order to prevent and control malaria infection the sustainable implementation of vector control intervention through well-organized malaria related strategies and programs are crucial. Inter-sectoral collaboration especially with the private mega project managers and close monitoring and evaluation of the vector control interventions are prerequisites for malaria control and elimination.

1.8. Public Health Interventions

A total of 10,950 ITN was distributed to the five kebeles. Communities were mobilized and taught on prevention and control measures of malaria disease. Active case search and early management were done at community and health facility level. Due to the above collaborative interventions the outbreak was controlled.

1.9. Recommendation

- Insecticide treated bed net should be distributed for all households. Beside this, utilization of bed net should be monitored and optimized.
- Regular indoor residual spray per required standard should be kept in place.
- Identification and removal of potential mosquito breeding sites should be conducted by maximizing community participation and mega project managers.
- Trends of malaria cases should be monitored in weekly basis at all levels. This could help to detect malaria outbreak timely.
- Usually, malaria prevention and control will be effective by establishing community ownership. So that, doubling community effort in malaria prevention should be priority area of the woreda.
- Early management of malaria case in the health facilities is mandatory to prevent outbreaks.

1.10. Acknowledgement

I would like to acknowledge deeply my Academic and CDC mentors Shikur Mohammed (Asst. Prof. of Epid.) and Dr. Kathleen Gallagher (PhD) respectively and Mr. Birhanu (malaria focal person) for assisting me in investigation of this outbreak. Finally, PMI, EPHI and Afar Regional Health Bureau PHEM Core-Process should be thanked for their technical support.

1.11. References

1. World Health Organization: Malaria. Geneva, Switzerland: WHO; 2011.
2. Slide share; Nahla Al.Mazroei, India, 2011
3. World malaria report. Geneva: World Health Organization; 2018.
4. Federal Democratic Republic of Ethiopia Ministry of Health, Ethiopian National Malaria Indicator Survey 2015, Ethiopian Public Health Institute, Addis Ababa, Ethiopia, July 2016.
5. Ethiopia Roll Back Malaria Consultative Mission; Essential Actions to Support the Attainment of the Abuja Targets; Kassahun Negash; Ethiopia RBM Country Consultative Mission Final Report; 2004.
6. Federal Democratic Republic of Ethiopia Ministry of Health, National Strategic Plan for Malaria Prevention, Control and Elimination in Ethiopia 2011–2015, Addis Ababa, Ethiopia, 2010.
7. Yimer F, Animut A, Erko B, Mamo H. Past five-year trend, current prevalence and household knowledge, attitude and practice of malaria in Abeshge, Ethiopia. *Malar J.* 2015; 14:230.
8. Yemane B, Damen H, Helmut K. Epidemiology and Ecology of Disease and Health in Ethiopia. Ethiopia;2011.
9. Federal Democratic Republic of Ethiopia Ministry of Health, Draft Guideline for malaria vector control in Ethiopia; Diseases Prevention and Control Department, Addis Ababa, Ethiopia; 2002.
10. Dawit G. Prevalence and risk factors of malaria in Ethiopia, Ethiopia; 2012.
11. Daddi J, and Abebe A. Analysis of malaria surveillance data. *BioMed Central.* 2012.
12. African Medical and Research Foundation (AMREF). Report on malaria baseline survey in two woredas of zone 5 in afar region, northeast Ethiopia. *Lancet* 371:1-55, 2011.
13. Alemu HD. Malaria outbreak investigation in seba boru and melka soda woredas, guji and borena zones, oromia, Ethiopia. *American Journal of Health Research.* 2015, pp. 1-45.
14. Workineh KA, Andualem TM, Gize YA. Assessment of control measures and trends of malaria in burie-zuria district, west gojjam zone, amhara region, north west ethiopia. *Hindawi;* 2015, pp. 1-5.
15. Kiszewski AE, Teklehaimanot A. A review of the clinical and epidemiologic burdens of epidemic malaria. *American Journal of Tropical Medicine and Hygiene;* 2014, 71:128-135.
16. Gemechu S. Malaria Outbreak Investigation and Intervention in Ilu woreda, South-Western Oromiya, Ethiopia; 2013.
17. Afar regional health bureau, Regional Policy and Plane Directorate. Afar, Semera; 2018.

1.12. Annex

Malaria Outbreak Investigation and Management in Awash Fental Woreda, Afar Region, Ethiopia-September 2018

I. Socio-demographic information:

1. ID number of respondent _____
2. Sex; M ☐ F ☐
3. Age in years _____
4. Address; Region _____ Zone _____ Woreda _____ kebele
_____ village.....
5. Occupation;
Employed ☐ unemployed ☐ Student ☐ Pastoralist ☐ farmer ☐ Other ☐
6. Total family members _____
7. Ethnicity; Oromo ☐ Amhara ☐ Tigre ☐ Afar ☐ Other ☐
8. Religion; Orthodox, ☐ Protestant, ☐ Muslim ☐ Catholic ☐ other ☐
9. Marital status; Married, ☐ single ☐ Widowed ☐ Divorced ☐ Not Applicable ☐
10. Education status; Illiterate ☐ Primary, ☐ Secondary ☐ tertiary ☐ , non-formal ☐
11. Case status;
a) Case
b) Control

II. Clinical presentations: *(For case only)

1. What was the first symptom? _____
2. When was the 1st symptom started(date of onset of symptoms) DD/MM/YY _____
3. What were others symptoms?
 - a) Fever: Yes ☐ No ☐ , if yes duration of fever _____ Was it constant fever?:
Yes ☐ No ☐ or every other days fever? Yes ☐ No ☐
 - b) Vomiting : Yes ☐ No ☐
 - c) sweating,: Yes ☐ No ☐
 - d) Diarrhea : Yes ☐ No ☐
 - e) Anorexia: Yes ☐ No ☐

Ask the following signs (M to Y) for complicated malaria only

- c) Altered consciousness Yes ☐ No ☐ ,
- d) Not able to drink or feed Yes ☐ No ☐
- e) Convulsion Yes ☐ No ☐
- f) Difficult breathing Yes ☐ No ☐
- g) Bleeding Yes ☐ No ☐
- h) Jaundice (yellowish coloration) Yes ☐ No ☐
4. Did you visit health facilities? Yes ☐ No ☐ , if yes, when did you visit health facilities?
DD/MM/YY _____
5. Was your blood samples taken? Yes- ☐ No ☐
6. If yes Q 5, what was the result : Positive ☐ negative ☐
7. Did you get any treatment? Yes ☐ No ☐ , if yes, what treatment did you get?
 - (a) Coartem Yes ☐ No ☐ , was it for PF Yes ☐ No ☐ ,
 - (b) Chloroquine? Yes ☐ No ☐ , was it for PV Yes ☐ No ☐ ,

(c) Quinine tablets Yes ☐ No ☐, was it for pregnant and <5 Kg? Yes ☐ No ☐,

(d) Quinine injection Yes ☐ No ☐, was it for sever malaria Yes ☐ No ☐,

8. Other treatment given _____

9. Did you recover completely after the treatment? Yes-☐ No ☐

10. Place of residence during 2 weeks before onset of illness; _____

III. Risk Factors:

*(For both cases and controls)

1. Sleeping areas in side home _____ outside home _____

2. Do you stay outside over night? Yes-☐ No ☐

3. Is there anybody in your home with similar malaria signs and symptoms? Yes-☐ No ☐

4. Did you travel outside your village in the past 2-3 weeks? Yes-☐ No ☐

5. If Q 4 yes, indicate

(a) date of travel DD/MM/Y _____

(b) The place of travel _____

(c) Date when you returned back DDMMYY _____

(d) Were there sick patients (same symptoms) in the place where you have been? Yes-☐
No ☐

6. Do you have bed net in your household Yes-☐ No ☐, If is yes, how often do you use
Always ☐ Sometimes ☐ Never ☐

7. Do mothers and children given priority of using bed nets? Yes-☐ No ☐

8. Number of bed nets in your home _____

9. Was indoor chemical spray conducted last year prior to the outbreak? Yes-☐ No ☐

10. If Q 9 yes, how many times was sprayed? Once ☐ twice ☐ Three times and more ☐

IV. Environmental investigation

11. Place of stay during night; Inside home ☐ Outside home ☐

12. Is there any artificial water -holding containers close to your home and inside your home
those could be a potential for mosquito breeding sited? such as :

a. Old tires; Yes-☐ No ☐

b. Plant in the containers /flower –pots ;Yes-☐ No ☐

c. Plant with temporary water pools; Yes-☐ No ☐

d. Open deep well; Yes ☐ No ☐

e. Broken glass bottles; Yes-☐ No ☐

f. Cans; Yes-☐ No ☐

g. Uncovered plastic container; Yes-☐ No ☐

h. Gutter to collect rainwater; Yes-☐ No ☐

i. Uncovered water storage/ septic tank; Yes-☐ No ☐

j. Stagnant water Yes-☐ No ☐

13. Presence of larvae in breeding sites around the home or vicinity; Yes-☐ No ☐

14. Types of house; screened ☐ unscreened ☐

15. Do you use repellents? Yes-☐ No ☐,

16. Do you use protective clothing? Yes ☐ No ☐

17. Availability of Solid and liquid waste collection; Yes-☐ No ☐

18. Presence of unprotected irrigation;; Yes ☐ No ☐

19. Presence of Intermittent rivers cloths to the community Yes-☐ No ☐,

20. Presence of tick grass; Yes-☐ No ☐

V. Awareness assessment

21. Do know sign and symptoms of malaria? -----

22. How it transmitted? -----

23. How it can be prevented? -----

Chapter II – Surveillance Data Analyses Report

2.1. Trends in Non-Neonatal Tetanus Morbidity and Mortality, Ethiopia- September 2004-August 2008EC

Executive Summery

Background: Tetanus is a vaccine-preventable neuro infectious disease caused by toxin produced by *Clostridium Tetani* which is an obligate anaerobic gram-positive bacillus. Tetanus occurs sporadically and almost always affects non-immunized, partially immunized or fully immunized persons who fail to maintain adequate immunity with booster doses of vaccine. It is associated with a high morbidity and mortality rate, particularly in the developing world. A tiny breach in skin or mucosa may admit the spores. Spores germinate in the wound in anaerobic condition and the vegetative bacteria produce tetanospasmin. The global incidence of tetanus is still estimated at one million cases annually, with a case fatality rate ranging from 6% to 72%. Current tetanus control in Ethiopia involves expanding penta vaccine coverage, Tetanus Toxoid Injection for pregnant mothers, clean delivery, clean cord care, and mass vaccination programs (supplemental immunization activities). This paper assesses and presents the five-year tetanus report of the country, from 2004 to 2008EC in Ethiopia. It will highlight the changes, the current status and the magnitude of the problem in-between to the policy makers and stakeholders.

Method: Cross sectional descriptive study was conducted by reviewing five years data from the Health Management Information System reports obtained from September 2004-August 2008EC. Data cleaning had been done from the initial secondary data stored in Microsoft Excel. Descriptive analysis was done using Microsoft office Excel 2007 and EpiInfo 7.2.1.0.

Results: A total of 30,625 tetanus patients were registered; 26,903(88%) were outpatients, 15,255(49.8%) were male, and 16,101 (52.5%) were ≥ 15 years. The largest number of tetanus patients was reported in 2005EC (16,242, 53%). Incidence per 100,000 in 2004EC (6.86), 2005EC (19.1), 2006EC (2.88), 2007EC (4.61), 2008EC (2.56) and overall incidence of tetanus in Ethiopia was 7.2, with Afar Region being the most affected (95.2per 100,000). The national case-fatality rate was 3.8%. The mean annual tetanus mortality rate was 0.15 per 100,000. Among 669 deaths, 482(72%) were males. The case fatality rate was the highest in South Nation Nationalities and Peoples Region 15.9% and the annual mortality rate was the highest in Hareri (1.62 per 100,000).

Conclusion: Despite limited resources control and prevention of tetanus had been on the right track that results in declining of morbidity and mortality. The incidence of tetanus cases had been declining since 2006EC. Incidence of tetanus can be reduced further by Strengthening of primary immunization program and health education.

Key words: Tetanus, Trends, Morbidity, Mortality, Ethiopia

2.1. Introduction

Tetanus is a vaccine-preventable neuro-infectious disease caused by toxin produced by *Clostridium Tetani* which is an obligate anaerobic gram-positive bacillus. Tetanus occurs sporadically and almost always affects non-immunized, partially immunized or fully immunized persons who fail to maintain adequate immunity with booster doses of vaccine [1]. Even though a vaccine preventable disease, it is still a significant public health problem throughout the world and it is associated with a high morbidity and mortality rate, particularly in the developing world [2]. The diagnosis of tetanus is made on clinical ground as the organism is not cultured routinely and also detection of toxin is not carried out commonly [3]. Symptoms usually present from two days to several weeks after injury the shorter the duration, the more severe the attack and worse the prognosis. The common symptoms are lock jaw, rigidity of muscles of the body, board like abdominal wall, arching of back and spontaneous spasm of the muscles of the body which is triggered by the movements of the patient or by noise. Autonomous involvement may cause cardiovascular complications such as fluctuations in blood pressure and arrhythmias [4].

Clostridium Tetani produces spores which are resistance to heat, desiccation and disinfectants. The spores are also not completely destroyed by boiling but can be eliminated by autoclaving. Tetanus spores are ubiquitous in Ethiopia. However, tetanus occurs more in densely populated regions with hot, damp climates, and with soil rich in organic matter (eg. manure-treated soils); the intestines and feces of domesticated animals commonly harbor the spores [5, 6]. In agricultural areas, farmers may harbor *C. tetani*; studies show that these bacilli are normal flora of the gastrointestinal tract in 10 %–25 % of people [7]. Considering most Ethiopians reside as agrarians rurally, exposure to tetanus spores remains high [8]. Bare-foot walking can lead to tetanus-prone injuries [9]. A tiny breach in skin or mucosa (e.g. cuts, penetrating injury, burns, ulcers, ear piercing, banding of piles) may admit the spores. Spores germinate in the wound in anaerobic condition and the vegetative bacteria produce tetanospasmin. This neurotoxin enters the motor neuron and diffuses via retrograde axonal transport to the central nervous system and blocked inhibitory neurons resulting in muscular rigidity and spasm [10,11].

Higher case-fatality rates indicate low quality medical care for tetanus in Ethiopia. As in most developing countries, it can be inferred that factors contributing to higher incidence include poor access to health services, high incidence of non-clean deliveries and predominance of agrarian rural life with contiguity to farm animals (increasing exposure to tetanus spores), low literacy, and income [12].

The global incidence of tetanus is still estimated at one million cases annually, with a case fatality rate ranging from 6%to 72% depending on the availability of well-equipped intensive care unit [13]. The mortality caused by tetanus in various parts of the world is different. It is estimated that 578,000 infant deaths occurred due to tetanus and 140,000 deaths of young children and adults die annually due to tetanus and most deaths occurred in tropical countries [14-16]. The incidence of tetanus in the developed world is markedly low and is no longer responsible for significant mortality; this has been attributed to high level of health awareness in terms of vaccination and availability of human and material resources to manage the disease [17]. In 2009, the WHO African Region had 47 % of the global tetanus incidence. Around 69,000 people died from tetanus in 2004 in this region alone (42 % of the global tetanus mortality). The economic burden of tetanus in sub-Saharan Africa is staggeringly high [18]. A study conducted in Nigeria showed mortality rate of 42.9% [19]. Research done in Tanzania showed mortality rate of 43.1% [20].

In Ethiopia, the highest incidence of tetanus occurs between June and November, explained by agricultural engagements common during this period. Overall, the case-fatality rate (CFR) ranges from 27 %–50 % among non-neonatal tetanus [21]. A study conducted in Gondar, Ethiopia; on cases of tetanus admitted to the hospital during (2000-2008) showed overall mortality of 41.4% [22]. A retrospective study of 171 tetanus cases admitted to Jimma University Specialized Hospital (JUSH) during (1996-2009) was conducted. The cases were aged 13 and above years of age and 92.0% of all cases were aged 50 years or below. The mean age was 33 years and 75.0% of cases were males. None of the cases has prior tetanus immunization history. The case fatality rate was 38.0% and no age or sex difference was observed with regard to mortality [23].

Management of tetanus patients is too demanding, prolonged, and expensive both in terms of materials and manpower [24]. A way to alleviate these problems is by adopting a rigorous tetanus immunization discipline in our community. Information obtained through surveillance is used to assess progress toward the disease elimination goals. The information is also used to raise awareness of the importance of immunization and to characterize persons or geographic areas in which additional efforts are required to raise vaccination levels and reduce disease incidence. Prompt recognition of tetanus is important clinically because hospitalization and treatment are usually required. Prompt administration of tetanus toxoid and Tetanus Immune Globulin (TIG) may decrease the severity of the disease [25].

Current tetanus control in Ethiopia involves expanding penta vaccine coverage, TTI for pregnant mothers, clean delivery, clean cord care, and mass vaccination programs (supplemental immunization activities). Emphasis is being given to MNT elimination (MNTE) and infant DTP3 expansion in developing countries like Ethiopia, given the high mortality in these age groups, cost-effectiveness of the strategy, and immediacy of desired effect [26, 27]. DTP4 is preferred for early childhood boosters [28]. A recent fact-finding assessment of immunization programs of 6 sub-Saharan African countries categorized the Ethiopian program among medium-to-low performers. DTP3 coverage is among the core metrics of general progress of a government towards poverty reduction, health reforming infrastructures and commitment to its citizens' well-being [29].

This paper assesses and presents the five-year tetanus report of the country, from 2004 to 2008EC in Ethiopia. This study aims to analyze the trends and the level of the magnitude of Tetanus in the country, including the regions and administrative cities of Ethiopia. It will highlight the changes, the current status and the magnitude of the problem to the policy makers and stakeholders. The goals are to determine the Tetanus risks by stratifying the occurrence of disease by age, sex and regions; to find out the current status of the Tetanus burden; and to determine the changes in occurrence over time in order to scale up the Tetanus control efforts in the country. The focus of this paper is on the descriptive secondary data analysis of the regional and city administrations HMIS Tetanus report.

Rationale for the Study

In Ethiopia, like in most developing countries in the world, tetanus is endemic and remains an important health problem. Considering most Ethiopians reside as agrarians rurally, exposure to tetanus spores remains high. Harmful traditional practices done with non-sterile technique in Ethiopia, (i.e. gum pricking, milk teeth extraction, uvulectomy, and female genital mutilation) can predispose to tetanus. Bare-foot-walking can lead to tetanus-prone injuries. Tetanus is one of the most common causes of admission to intensive care unit (ICU) and is associated with high morbidity and mortality. The incidence of tetanus and its associated complications, control of the disease is far from adequate.

2.2. Objective

2.2.1. General Objective

To describe tetanus trend in Ethiopia from 2004 to 2008EC

2.2.2. Specific objectives

- To characterize the incidence of tetanus nationally.
- Describe the distribution of tetanus over time, in the country.
- To describe tetanus in terms of age and sex in regions of Ethiopia.
- To describe tetanus by morbidity and mortality in Ethiopia.

2.3. Method

2.3.1. Study area, population and period

The study was conducted in Ethiopia, which is located in Eastern Africa. Ethiopia has a 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, Dalul, 110 meters below sea level (CSA, 2009). The climate varies with the topography, from as high as 47 degrees Celsius in the Dalul to as low as 10 degrees Celsius in the highlands. Ethiopia's total surface area is about 1.1 million square kilometers with the total population of about 92,206,005 (CSA, 2016). Ethiopia has 9 regions and two administrative cities. Djibouti, Eritrea, the Republic of the Sudan, the Republic of the Southern Sudan, Kenya, and Somalia are bordering the country. HMIS data from 2004–2008EC was compiled, analyzed and interpreted.

2.3.2. Study design

A cross sectional descriptive study was conducted.

2.3.3. Data Source

Five-year secondary data were obtained from HMIS data from September 2004– August 2008EC. Variables such as sex, age, OPD cases of tetanus, IPD cases tetanus and tetanus death are included in the data base. Neonatal tetanus cases were not included.

Dependent variables are tetanus morbidity and mortality and Independent variables are age, sex and region.

2.3.4. Data Collection

All tetanus cases and deaths recorded in the HMIS systematically identified. The data include reports of health facilities of all regional and administrative cities of the country. Health posts, health centers and hospitals are included in the HMIS report network in the respective woredas, zones and regional administration hierarchy. Data abstracting check list is used to collect the data. Data collection done from August 15 to August 20, 2009EC.

Tetanus clinical case definition: In the absence of a more likely diagnosis, an acute illness with muscle spasms or hypertonia and diagnosis of tetanus by a health care provider; or death, with tetanus listed on the death certificate as the cause of death or a significant condition contributing to death.

Probable: A clinically compatible case, as reported by a healthcare professional. There is no definition for confirmed tetanus.

2.3.5. Data Management and Analysis

Data cleaning was done from the initial secondary data stored in Microsoft Excel using the same version. Descriptive analysis was computed using Microsoft office Excel 2007 and EpiInfo 7.2.1.0. The magnitude and frequency distribution of variables was worked out by crosstab. Finally, the data was described using tables and figures.

2.3.6. Ethical Consideration: Permission to conduct the analysis was obtained from Policy and Plan Directorate (PPD), FMOH.

2.4. Results

2.4.1. Tetanus Morbidity

Within the last five years (2004– 2008EC) a total of 30,625 tetanus cases were registered. Among the total clinically confirmed cases, 26903(88 %) were outpatients, 3722(12 %) were inpatient cases. In addition, male accounts 15255(49.8%) tetanus cases were males and 15370(50.2%) cases were females.

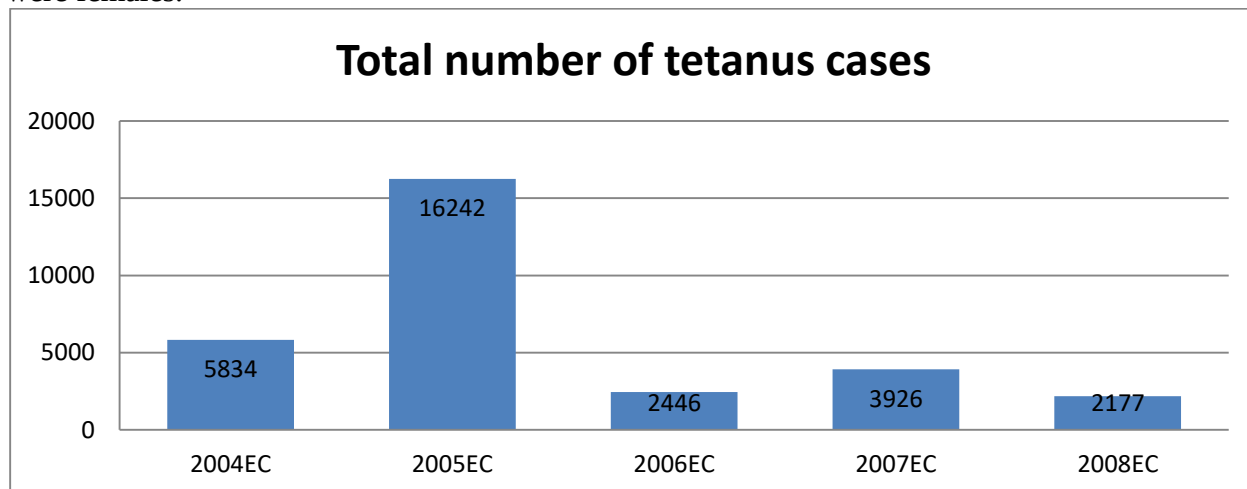


Figure 2.1: Number of Tetanus cases by year in Ethiopia, 2004 -2008EC

Nationally, there was a substantial increase in the number of tetanus cases in the first two years (2004-2005EC). The year with the most reported tetanus cases was 2005EC (16242, 53%).

Table 2.1: The number of tetanus cases by regions and year in Ethiopia, 2007-2008EC

Regions	Number of cases in years		Total	Percent (%)	Incidence rate
	2007EC	2008EC			Cases/100,000
Tigray	128	80	208	3.4	3.56
Gambella	37	44	81	1.3	18.5
Harari	39	33	72	1.1	29.2
Addis Ababa	107	153	260	4.3	7.5
Dire Dawa	33	25	58	0.9	12.4
Afar	1283	443	1726	28.2	95.2
Amhara	309	293	602	9.8	2.8
Oromia	970	611	1581	25.9	4.4
Somali	516	120	636	10.4	11
BeneshangulGumuz	174	16	190	3.1	17.8
SNNPR	326	359	685	11.2	3.5

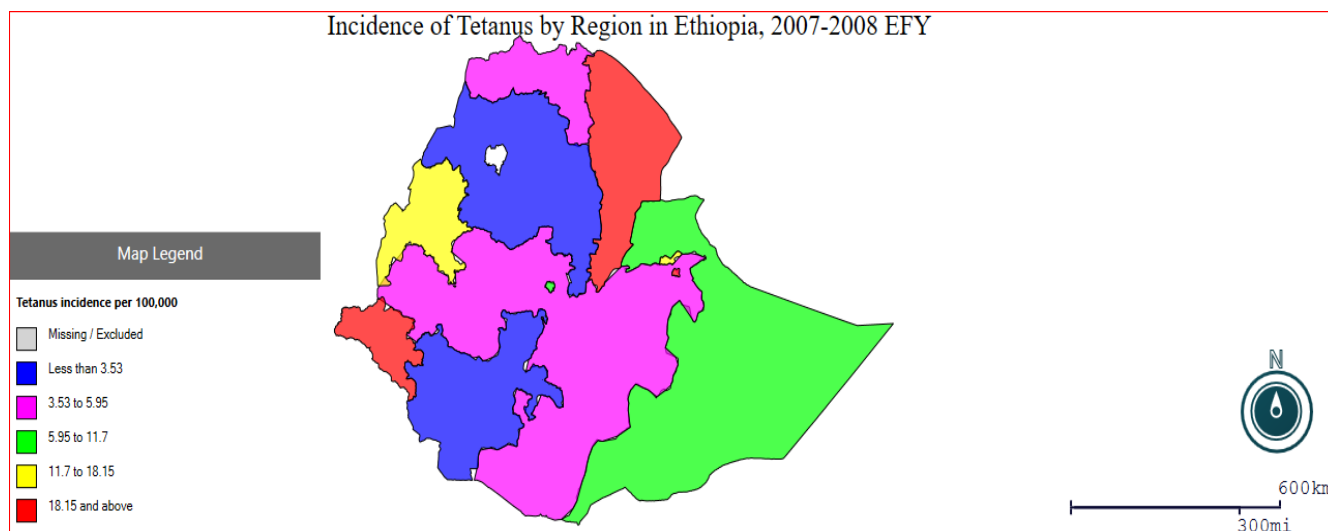


Figure 2.2: Incidence of Tetanus by Region in Ethiopia, 2007-2008 EC

Analysis of data by region show different magnitude of highest recording tetanus cases in different years. Afar and Oromia reported the greatest number of tetanus cases in 2007EC and 2008EC. In SNNPR, Gambella and Addis Ababa there is increase in the number of tetanus cases but in the other regions Tigray, Harari, Dire Dawa, Afar, Amhara, Oromiya, Somali, Beneshangul Gumuz there was a decline in the number of tetanus cases. A total estimate of 6103 tetanus cases was reported nationwide in 2007-2008EC in Ethiopia. The majority of cases were in Afar (28.2 %), followed by Oromia (25.9%) and SNNPR (11.2 %)

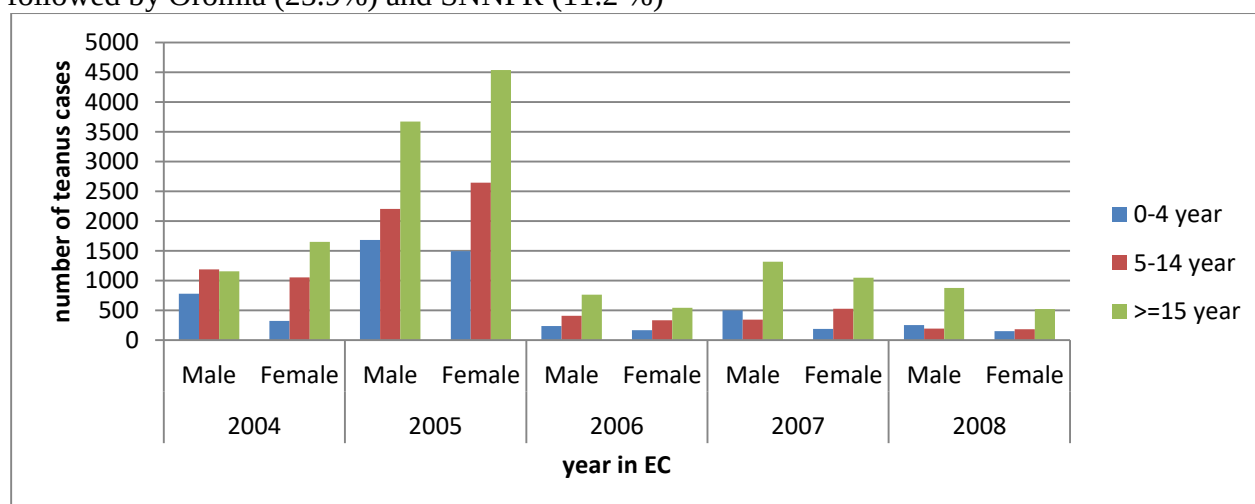


Figure 2.3: Distribution of Tetanus cases by sex, age and year in Ethiopia, 2004-2008EC

The age distribution of tetanus cases was 5,445(17.8%) for 0-4years, 9,079(29.6%) for 5-14years and 16,101(52.5%) for age >=15years. Males 0-4 years are more affected in 2005EC compared with females. Females 5-14 years have the highest number of tetanus cases in 2005EC compared with males. In general age groups >=15 years had the highest number of tetanus cases in 2005EC

with female predominance. The smallest number of tetanus cases was recorded in 2008EC: male age groups ≥ 15 years were predominant.

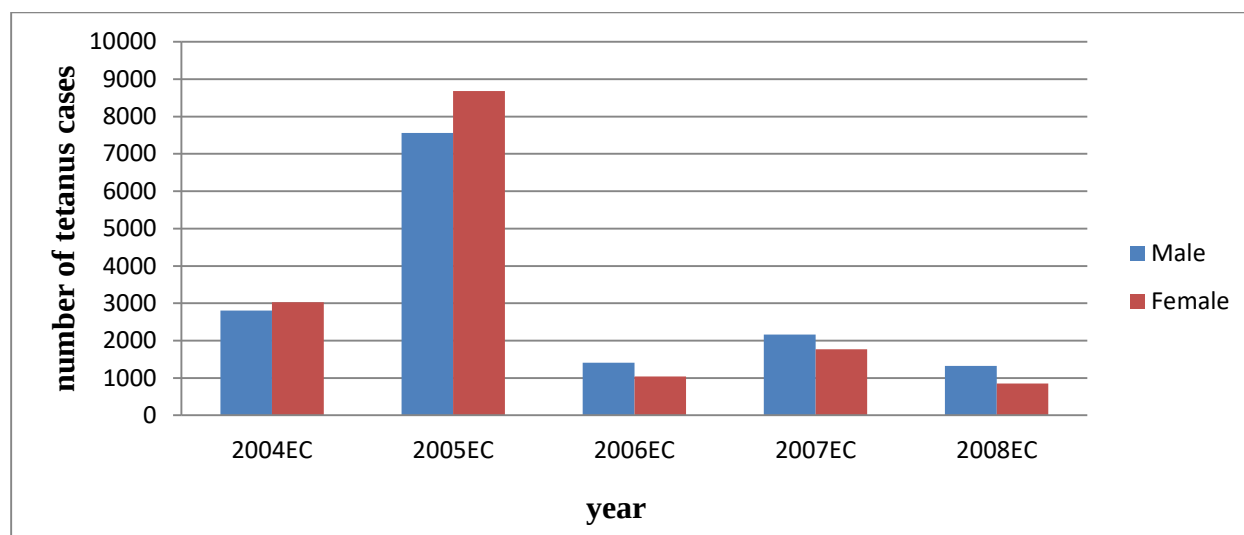


Figure 2.4: Distribution of Tetanus cases by sex and year in Ethiopia, 2004-2008EC

Of all tetanus cases reported between 2004-2008EC, 15,255(49.8%) tetanus cases were males and 15,370(50.2%) cases were female. During the first two years there is female predominance of case but starting from 2006EC up to 2008EC there is male predominance. The distribution of the cases was the highest in 2005EC but in subsequent years there was a remarkable decrease in the number of tetanus cases for both sexes.

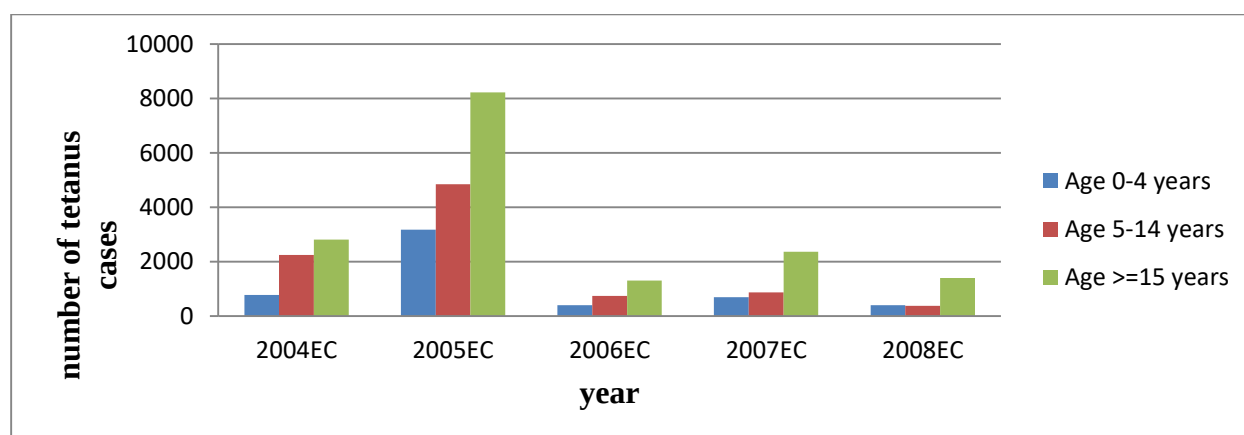


Figure 2.5: Distribution of Tetanus cases by age and year in Ethiopia, 2004-2008EC

Tetanus was more frequently reported in persons ≥ 15 years of age throughout the entire five-year period; persons aged 0-4 years were the least affected by tetanus. There was a remarkable increment in tetanus case during 2005EC followed by a dramatic decrease for all age groups.

During the total five years, 26,903(88%) cases were reported from OPDs and 3,722 (12%) were reported from IPDs. Despite the highest number of OPD tetanus cases in 2005EC the number of IPD tetanus cases was very low. The number of deaths was also very low in 2005EC. The smallest number of tetanus cases in OPD was in 2008EC. The highest number of IPD tetanus cases was in 2007EC. In 2004EC and 2007EC there were comparable IPD tetanus cases (25%) each which is the highest compared with the other years. The list number of IPD tetanus cases was in 2005EC (10%).

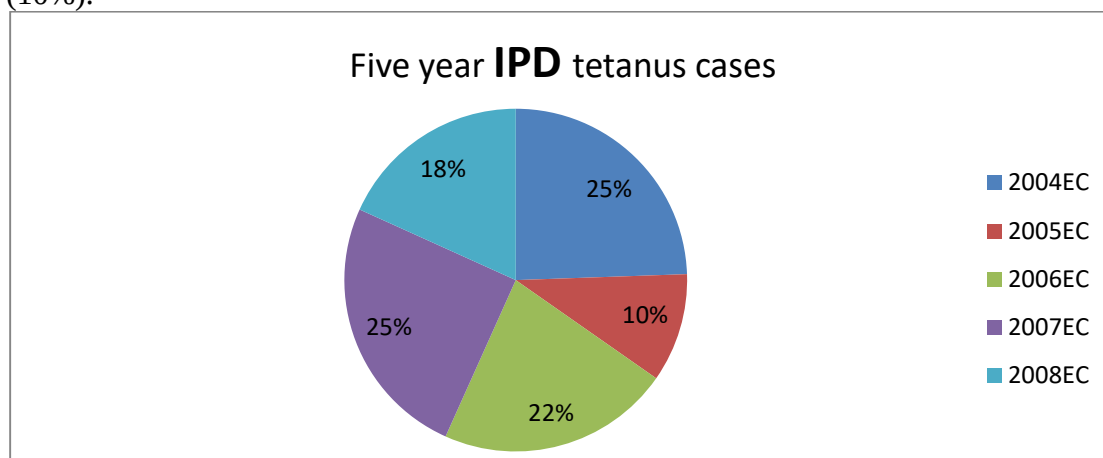


Figure 2.6: The proportion of the five year IPD Tetanus cases , in Ethiopia, 2004 – 2008EC

Table 2.2: The total five years Tetanus incidence by indicators in Ethiopia, 2004 – 2008EC

Indicators	Year					Average incidence
	2004	2005	2006	2007	2008	
The total Tetanus cases/100,000	6.86	19.1	2.88	4.61	2.56	7.2
Total Outpatient Tetanus case/100,000	5.79	18.65	1.91	3.52	1.76	6.32
Total in-patient Tetanus cases/100,000	1.07	0.45	0.97	1.09	0.8	0.88
Total Tetanus deaths/100,000	0.24	0.014	0.16	0.22	0.14	---
Tetanus in Males /100000	6.59	17.79	3.31	5.08	3.11	7.17
Tetanus in Females/100000	7.11	20.42	2.44	4.15	2.01	7.22

The overall five-year average incidence was 7.2 per 100,000. The highest incidence occurred in 2005EC (19.1 per 100,000) and the lowest was in 2008EC (2.56 per 100,000). The trends of tetanus cases incidence increased in the first two years, then declined from 19.1 per 100,000 in 2005EC to 2.88 per 100,000 in 2006EC. The overall incidence rates for inpatient and outpatient tetanus cases were 0.88 per 100,000 and 6.32 per 100,000 respectively. The total tetanus deaths per 100,000 were the highest in 2004EC (0.24 per 100,000). The average overall five-year incidence rate of tetanus in males and females was 7.17 and 7.22 per 100,000 respectively. The regional incidence calculation includes only 2007EC and 2008EC data because regional data was not available in the other years. The incidence of tetanus cases in the regions has a different magnitude from the lowest (Amhara, 2.8 per 100,000) to the highest (Afar, 95.2 per 100,000).

2.4.2. Tetanus mortality

Between 2004-2008EC there were 669 nationally reported Tetanus deaths. The mean number of tetanus deaths per year was 134. The national annual Tetanus deaths range between 12 (2%) in 2005EC and 207 (31%) deaths in 2004EC. The case fatality rate was high in 2006EC and 2008EC (5.6%). It was low in 2005EC (0.07%). The mean annual case fatality rate was 3.8%. The highest mortality rate was 0.24 per 100,000 in 2004EC and the lowest was 0.01 per 100,000 in 2005EC with mean annual mortality rate of 0.15 per 100,000.

Table 2.3: The five years incidence, death , and case fatality rate of Tetanus cases, Ethiopia, 2004– 2008EC

Years	No. of cases	No. of deaths	Percent		Incidence	Mortality	Case Fatality Rate (%)
			Cases%	Deaths%	Cases/100,000	Deaths/100,000	
2004	5834	207	19%	31%	6.86	0.24	3.5
2005	16242	12	53%	2%	19.1	0.014	0.07
2006	2446	139	7.9%	21%	2.88	0.16	5.6
2007	3926	187	12.8%	28%	4.61	0.22	4.7
2008	2177	124	7.1%	19%	2.56	0.14	5.6
Total	30625	669	100%	100%	7.2*	0.15*	3.8*

*average incidence, mortality and case fatality rate

Table 2.4: Tetanus cases incidence, mortality rate and case fatality rate by region, Ethiopia, 2007 -2008EC

Regions	Year				Incidence rate	Mortality rate	Case Fatality Rate (%)
	2007EC		2008EC		Cases/100,000	Death/100,000	
	No.cases	No.deaths	No.cases	No.deaths			
Tigray	128	2	80	7	3.56	0.17	4.3
Gambella	37	0	44	2	18.5	0.45	2.4
Harari	39	3	33	1	29.2	1.62	5.5
Addis Ababa	107	8	153	11	7.5	0.55	7.3
Dire Dawa	33	2	25	4	12.4	1.28	10.3
Afar	1283	0	443	0	95.2	0	0
Amhara	309	39	293	17	2.8	0.26	9.3
Oromiya	970	66	611	25	4.4	0.25	5.7
Somali	516	10	120	1	11	0.19	1.7
Beneshangul Gumuz	174	3	16	1	17.8	0.37	2.1
SNNPR	326	54	359	55	3.5	0.56	15.9

During the two years the higher number of tetanus deaths was reported from SNNPR 109 (35%), Oromia 91 (29.2%) and Amhara 56 (18%) with annual death rate of 0.56, 0.25 and 0.26 per 100,000 people respectively. The highest case fatality reported from SNNPR 15.9% followed by Dire Dawa 10.3% and Amhara 9.3% the lowest being Afar 0%. Harari had the highest mortality rate (1.62 per 100,000).

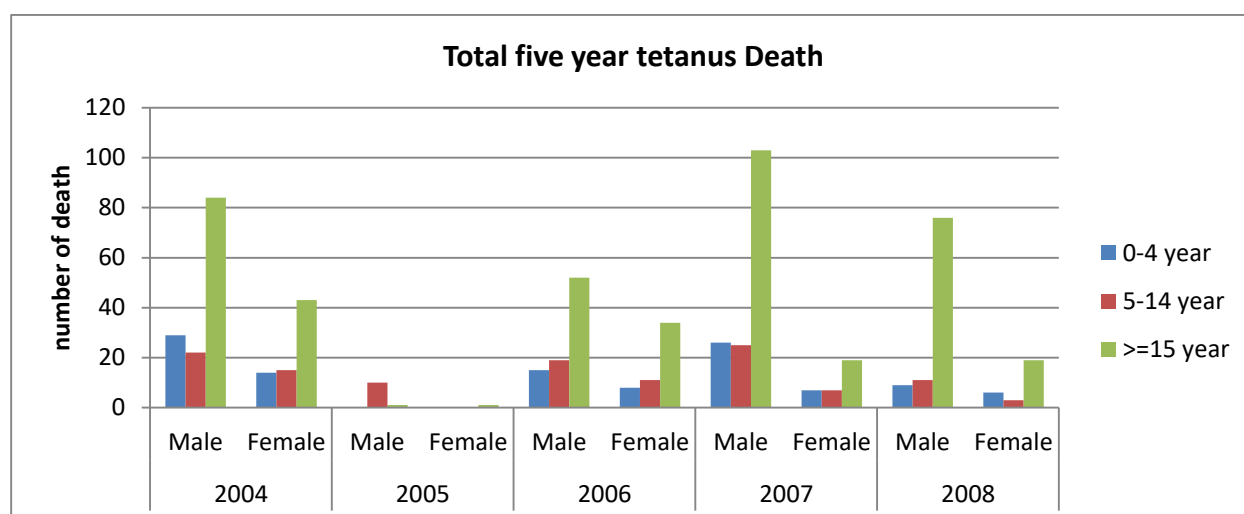


Figure 2.6: Distribution of Tetanus mortality by age, sex and year in Ethiopia, 2004-2008EC

Of 669 deaths over the five-year period, 482(72%) were males and 187(28%) were females. The highest number of deaths were recorded in age groups ≥ 15 years 432(64.6%), age groups between 0-4 years accounts 114(17%) deaths and between 5-14 years accounts 123 (18.4%) deaths.

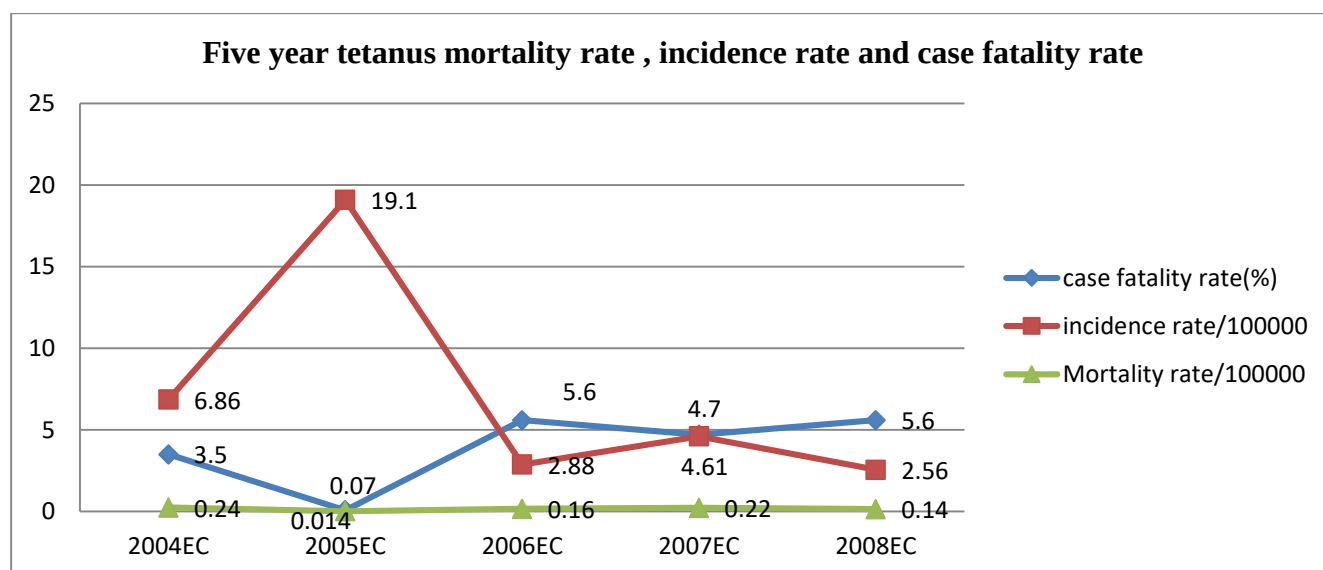


Figure 2.8: Tetanus incidence rate, mortality rate and case fatality rate in Ethiopia, 2004-2008 EC

2.5. Discussion

Tetanus is still prevalent in developing countries and constitutes significantly to high morbidity and mortality despite the documented effectiveness of tetanus vaccines and its availability since 1923. The incidence of tetanus cases has shown a slight upward trend for the first two years (2004EC – 2005EC) and dramatic drop-down trend in 2006EC, which decreased from 19.1 per 100,000 people in 2005EC to 2.88 per 100,000 people in 2006EC. The incidence again increased to 4.61 per 100,000 people in 2007EC then followed by significant decline 2.56 per 100,000 people in 2008EC. The mean annual incidence of tetanus cases in Ethiopia was (7.2 per 100,000 people) much higher than WHO prediction of African region 0.04 per 100,000 people [19]. The sex distribution analysis revealed that male cases accounts 15,255(49.8%) and female cases 15,370(50.2%) it contradicts with other studies done in Ethiopia, Nigeria and India which shows male predominance [30, 31, 32].

According to the age distribution of tetanus cases age groups ≥ 15 years accounts more than half of the total five years tetanus morbidity 16,101(52.5%) followed by 5-14years 9,079 (29.6%). This finding was consistent with other studies done in Ethiopia and India where as in most of the previous studies almost all patients were more than 40 years of age [33, 34].

The smallest number of tetanus cases in OPD was in 2008EC. The highest number of IPD tetanus cases was in 2007EC. This may be due to the increase community awareness about the disease condition in subsequent years or this may be due to the improvement of reporting system.

The incidence of tetanus cases in the regions had different magnitude from the lowest (Amhara, 2.8 per 100,000) to the highest (Afar, 95.2 per 100,000). This could be explained by the fact that Afar region is one the developing regions of Ethiopia which has poor health care delivery.

The average national five-year deaths were 134 people per year. The mean annual case fatality rate was 3.8%. In contrast to this study higher case-fatality rates were reported from Turkey (58%), Tanzania (73%), Nigeria (70%) and Ethiopia (38%) [35, 36, 37, 38]. The mean annual tetanus mortality rate was 0.15 per 100,000. The highest number of deaths were recorded in age groups ≥ 15 years 432(64.6%) age groups. Increasing age is one of the factors associated with increased mortality in tetanus [39]. With increasing age, there is a gradual decline in performance of various systems and the chance of co-morbidity increases. The mortality was higher in males than females which were contrary to another study which showed higher mortality for female Patients [40]. When we see the two years (2007EC & 2008EC) regional annual mortality rate Hareri was the highest (1.62 per 100000) followed by Amhara (0.26 per 100000) and Oromia (0.25 per 100,000 people). The lowest mortality rate was in Afar (0%). The highest case fatality reported from SNNPR (15.9%) followed by Dire Dawa (10.3%) and Amhara (9.3%) the lowest being Afar (0%). Despite the highest incidence of tetanus cases reported in Afar the mortality and case fatality rate was null. The reason could be early referral of tetanus cases to the neighboring regions due to lack of ICUs. The other possible explanation could be poor recording and reporting of tetanus mortality.

2.6. Limitations

- It was not possible to analyze the data by vaccination status of patients, site of trauma and seasonal variation because the HMIS reporting format lacks this valuable information.
- Shortage of references that indicates current burden and distribution of tetanus in Ethiopia.
- The data reported from 2004 to 2006EC lacks the important variable like region.
- Lack of completeness of data which could result in under estimation of the magnitude.
- There is issue of data quality especially data reports from the developing region seems unreliable.

2.7. Conclusion

Despite limited resources control and prevention of tetanus had been on the right track that results in declining of morbidity and mortality. The incidence of tetanus cases had been declining since 2006EC. Still the incidence is higher than other African countries.

Hareri and SNNPR had the highest mortality and case fatality rate respectively and this must be brought to the attention of institutions responsible for planning health care programs so that they prepare a plan to solve this problem.

.

2.8. Recommendation

- FMOH should evaluate and strengthen of its tetanus surveillance that is an important issue to design effective control programs, funding budgets and expenditures for the distribution of commodities for better clinical and epidemiological outcomes.
- The HMIS reporting forms should include important variables like vaccination status and site of the trauma in order to better understand the gaps and outcome of the intervention in the population.
- Capacity building of hospitals, establishment of well-equipped ICUs and intensifying public education about the disease and preventive strategies like immunization should be provided by the government and other partner organizations.
- The FMOH should focus its attention on age groups above 15 years and in SNNPR and Hareri where the highest case fatality rate and mortality rate is reported.
- Regular follow-up and feedback to reporting from health facilities to strengthen completeness and quality of weekly and monthly surveillance reports.

2.9. Reference

1. Sanford JP. Tetanus-Forgotten but not gone N Eng JMed 1995; 332:812-813.
2. Anuradha S: Tetanus in adults-A continuing problem: An analysis of 217 patients over 3 years from Delhi, India, with special emphasis on predictors of mortality. Med J Malaysia 2006, 61(1):7-14.
3. Brian SS, Henry FC. Bacterial, Chlamydia Infections. In: Stephen JM, Maxine AP. Current Medical Diagnosis and Treatment, 48th edi. Mc Graw Hill Lange, 2009:1265-1266
4. Davilla CAM, Davilla DF, Donis JH, Gonzalo X. Autonomic nervous system dysfunction in children with severe tetanus: dissociation of cardiac and vascular sympathetic control. Braz J Med Biol Res 2003; 36:815-19.
5. Atkinson W, Wolfe C, Hamborsky J, editors. Tetanus, in epidemiology and prevention of vaccine-preventable diseases. Washington: Public Health Foundation; 2011. p. 291–300.
6. Cherry J, Harrison R. Tetanus. In: Feigin RD, Cherry J, Demmler-Harrison GJ, Kaplan SL, editors. Textbook of pediatric infectious diseases. Philadelphia: Elsevier; 2004. p. 1766–76.
7. Bleck T. Clostridium tetani. In: Mandell GL, Bennett JE, Dolin R, editors. Bennett's principles and practice of infectious diseases. Philadelphia: Churchill Livingstone; 1995. 9-p. 2373–8.
8. Alene G. Harmful traditional health practices: a cross-sectional survey among under-five children in Dembia district, northwest Ethiopia. Ethiopia J Health Biomed Sci. 2010; 2:83–93.
9. WHO. Podoconiosis: endemic non-filarial elephantiasis. 2012
10. Brian SS, Henry FC. Bacterial, Chlamydial Infections. In: Stephen JM, Maxine AP. Current Medical Diagnosis and Treatment, 48th edi. Mc Graw Hill Lange, 2009:1265-1266.
11. Bleck TP. Clostridium tetani. In: Mandell GL, Bennett JE, Dolin R. Principles and practice of Infectious Diseases, 4th eds. New York Churchill Livingstone, 1995:2173-2178
12. Roper M, Vandelaer J, Gasse F. Maternal and neonatal tetanus. Lancet. 2007; 370:1947–59
13. Oladiran I, Meier DE, Ojelade AA, Olaolun DA, Adeniran A, Tarpley JL: Tetanus continuing problem in the developing world. World J Surg 2002, 26(10):1282-85
14. Parry EHO (1984) Principles of Medicine in Africa. Oxford University Press. pp: 297-306.
15. Harrison Principles of Internal Medicine (2009). pp: 898-900.
16. Stephen SA Nelson's Textbook of Pediatrics (2007). pp: 951-953.
17. Mchembe MD, Mwafongo V: Tetanus and its treatment outcome in Dares Salaam: need for male vaccination. East African Journal of Public Health 2005, 2: 22-23.
18. George AO, Ogunbiyi AO, Amanor-Boadu S, Oluwole OA, Kumuyi O. Tetanus in Nigeria: the economic burden. Trop Doct. 2005; 35:126–7.
19. Onwuchekwa Arthur Chukwubike, Asekomeh Eshiofe God's powers (2009) A 10 Year Review of Tetanus in Adults at a Nigerian Tertiary Hospital.
20. Phillip L Chayla, Joseph M, Ramesh M. Ten-Year's Experience with Tetanus at a Tertiary Hospital in Northern Tanzania: A Retrospective Analysis of 102 Cases
21. Amare A, Melkamu Y, Mekonnen D. Tetanus in adults: clinical presentation, treatment and predictors of mortality in a tertiary hospital in Ethiopia. J Neurol Sci. 2012; 317:62–5
22. Taddese A, Gebresellsie S (2009) Cases Review at Gondar University Hospital. Ethiop. Med. J. 47: 291-297.

23. A Four Years Record Review of Tetanus Cases Admitted to Jimma University Specialized Hospital (JUSH), Southwest Ethiopia: A Slip of Tetanus Case Management? Assegid Sahilu, Ismael Kedir, Yemane Ayele Jimma University, Ethiopia 2015 Vol. 2 No. 1: 1
24. Komolafe MA, Komolafe EO, Ogundare AO: Pattern and outcome of adult tetanus in Ile-Ife, Nigeria. *Niger J ClinPrac* 2007, 10(4):300-303.
25. CDC. Tetanus among injecting-drug users — California, 1997. *MMWR* 1998; 47:149–51.
26. Health and Health Related Indicators, 2009/10. Federal Ministry of Health - Ethiopia, Ethiopian Calendar 2002.
27. UNICEF- Ethiopia. Immunization plus. Polio, measles and MNTE activities. Available at: www.unicef.org/ethiopia/immunization.html. Accessed August 7, 2017
28. Using early childhood booster doses to maintain the elimination of Neonatal Tetanus. Steinglass R. Based on a paper delivered at the World Health Organization (WHO) Neonatal Tetanus Elimination Technical Consultation, Geneva, 1997
29. Bawah AA, Phillips JF, Adjuik M, Vaughan-Smith M, Macleod B, Binka FN. The impact of immunization on the association between poverty and child survival: evidence from Kassena- Nankana District of northern Ghana. *Scand J Publ Health*. 2010; 38:95–103.
30. Adekanle O, Ayodeji OO, Olatunde LO. Tetanus in a Rural Setting of South-Western Nigeria: a Ten-Year Retrospective Study. *Libyan J Med* 2009; 4:100-4.
31. Habte-Gabr E, Mengistu M. Tetanus in Gondar Public health college hospital, Ethiopia: a review of 72 cases. *Ethiop Med J* 1978; 16:53-61.
32. Ramachandra L, Shobha KL, Arun Kannan P. A retrospective clinical study on the factors which affected Tetanus. *The Internet Journal of Microbiology*. 2009; 7(1)
33. Pawar AB, Kumawat AP, Bansal RK. An epidemiological study on the Tetanus cases which were admitted to a referral hospital in Solapur. *Indian Journal of Community Medicine*. 2004; 29(3):115–116.
34. Tadesse H, Deribew A, Woldie M. Predictors of defaulting from completion of child immunization in south Ethiopia, May 2008—a case control study. *BMC Publ Health*. 2009; 9:150.
35. Ergonul O, Erbay A, Eren S, Dokuzoguz B. Analysis of the case fatality rate of tetanus among adults in a tertiary hospital in Turkey. *Eur J Clin Microbiol Infect Dis* 2003; 22(3):188-90
36. Ajose FOA, Odusanya OO. Survival from adult tetanus in Lagos, Nigeria. *Trop Doct* 2009; 39:39.
37. Mchembe MD, Mwafongo V. Tetanus and its Treatment Outcome in Dar Salaam: Need for Male Vaccination. *East Afr J Public Health* 2005; 2:22-3
38. Amare A, Yami A. Case-fatality of adult Tetanus at Jimma University Teaching Hospital, Southwest Ethiopia. *Afr Health Sci*. 2011; 11:36–40.
39. Bunch TJ, Thalji MK, Pellika PA, Aksamit TR. Respiratory failure in tetanus – case report and review of 25 years experience. *Chest* 2002; 12:1488-92.
40. Ojini FI, Danesi MA. Mortality of tetanus at the Lagos University Teaching Hospital, Nigeria. *Trop Doct* 2005; 35: 178-181.

Chapter III – Evaluation of Surveillance System

3.1. Evaluation of Malaria Surveillance System in Awash Fentale and Asayta Districts, Afar Region, Ethiopia- December 2018

Executive Summary

Background: The evaluation of public health surveillance systems should involve an assessment of how well the system operates to meet its purpose and objectives. An estimated one million people in Africa die from malaria each year. In Ethiopia it is one of the leading causes of mortality and morbidity and it is endemic in most parts of the country with an altitude less than 2,000 meter. Afar region has many malaria affected areas. Zone1 (Asayta woreda) and Zone 3 (Awash Fentale woreda) are among malaria affected woredas. Recent malaria outbreak on September 2018 in Awash Fentale woreda was an entry point for this evaluation. In addition, the surveillance system had never been evaluated.

Method: A cross sectional descriptive study design was applied from December 1-14/2018. From Asayta woreda health office one health center, three health posts and one hospital from Awash Fentale woreda health office two Health centers and three health posts were included in the study. Data was collected using a semi-structured questionnaire. Health professionals at health facility and health posts were interviewed, surveillance officers at woreda level interviewed. The data was entered and analyzed in Microsoft Excel 2016 and presented in graphs and tables.

Result: Zonally from September 2017 to September 2018, a total of 13,674 case were tested for malaria of this 5,077 cases were treated for malaria. Of these, 4,651 (92%) were confirmed malaria (3,618 (78%) cases were PF and 1,033 (22%) cases were PV) and the rest 426 (8%) cases were screened and treated clinically. The standard case definition of malaria was available one in ten of the facilities and shortage of Weekly reporting formats was encountered in eight out of twelve health facilities. Reports were sent to the next level through telephone and mobile phone texting. Among the visited facilities the surveillance data was not analyzed according to the standard. In both woredas there is no written epidemic preparedness plan. High turnover of trained staffs (one staff leave out of five staffs) was seen in the seven health facilities.

All health facilities have necessary laboratory equipment for malaria diagnosis. Completeness for health facilities were 85% and woreda was 95%. In all visited health facilities from woreda health office written feedback were not given in the past six months. The surveillance system of Malaria is weak it didn't help to detect outbreak in Awash Fental woreda on September 2018.

Conclusion: Overall, from our assessment, the malaria surveillance system appeared weak and it didn't produce data which is useful for decision. The performance of the system didn't contribute to reduce malaria morbidity in Awash Fentale and Asayta woredas.

Key Words: surveillance, Malaria, Afar, Ethiopia

3.1. Introduction

Surveillance is a core function of public health practice and defined as “The ongoing, systematic data collection, analysis, interpretation of health data, timely information dissemination to those who need to know and act upon that information, application of information to public health programs which is essential to the planning, implementation and evaluation of public health practice for action to reduce morbidity, mortality, improve health of the community and providing a basics for research and so on [1].

The FMOH/ PHEM of Ethiopia identified 20 top priority diseases which are epidemic prone, of international concern and diseases on eradication and elimination programs for surveillance activities. These diseases are monitored by PHEM through available means of communication-telephone, paper based reporting etc. These diseases are set to be reported as mandatory notification (which are immediately reportable) diseases and routine surveillance (which are to be reported weekly). Malaria disease is one of these 20 priority diseases reported as weekly in Ethiopia [2]. The evaluation of public health surveillance systems should involve an assessment of system attributes, including simplicity, flexibility, data quality, acceptability, sensitivity, predictive value positive, representativeness, timeliness, and stability and the system focus on how well the system operates to meet its purpose and objectives [3].

Malaria is a life threatening parasitic disease transmitted by mosquitoes. The parasite transmitted from person to person through the bite of female *Anopheles mosquito* which is the most prevalent in Africa. The agent transmitted was found a one celled parasite called plasmodium species [4]. About 90% of all malaria deaths in the world today occur in Africa south of the Sahara. This is because the majority of infections in Africa are caused by *Plasmodium falciparum*, the most dangerous of the four human malaria parasites. It is also because the most effective malaria vector the mosquito *Anopheles Gambiae* is the most widespread in Africa and the most difficult to control [5]. An estimated one million people in Africa die from malaria each year and most of these are children under five years old [6].

In Ethiopia it is one of the leading causes of mortality and morbidity and it is endemic in most parts of the country with an altitude less than 2,000 meter. In Ethiopia malaria is highly seasonal in many communities but may have nearly constant transmission in some other areas. Peak malaria transmission occurs between September and December in most parts of Ethiopia after the main rainy season from June to August and second minor malaria transmission period from April to June, following a short rainy season from February to March [7]. According to the report of the regional infection prevention case team Afar region has many malaria affected areas. Zone1 (Asayta woreda) and Zone 3 (Awash Fentale woreda) are among malaria affected woredas.

In the Zones high number of malaria cases were reported from Awash Fentale and Asayta Woredas. Recent malaria outbreak on September 2018 in Awash fentale woreda was an entry point for this evaluation. In addition, the surveillance system had never been evaluated. Therefore, this study was conducted to evaluate the functionality of the surveillance system and to identify the gaps for the better improvement of the surveillance system.

3.2. Objectives

3.2.1. General objective:

To evaluate the surveillance system malaria in Awash Fentale and Asayta woredas.

3.2.2. Specific objectives:

- To describe the status of malaria surveillance system supportive activities.
- To assess core surveillance activities.
- To evaluate the attributes of the surveillance system of malaria.

3.3. Methods and Materials

3.3.1. Study Area and Population:

The study was conducted in Afar region, Zone 1 and 3 which is located in the eastern part of Ethiopia. The two zones are located in South East part of Afar Regional State. The two zones have a total population of 861,898 and 16 woredas of which the study was conducted in two woredas (Awash Fentale and Asayta woredas). These woredas were selected for their Malaria cases burden (Awash Fentale woreda the prevalence of malria was 17.6% in 2018 and it was 3.7% in Asayta woreda) [8].

Afar Region

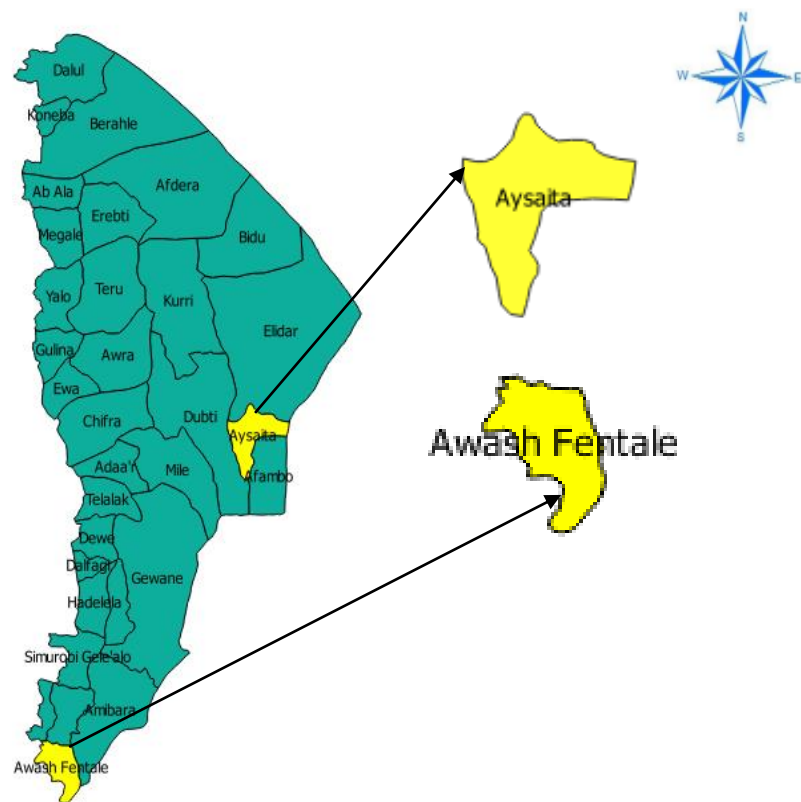


Figure 3.1: Map of Awash Fentale and Asayta Woredas , Afar region , Ethiopia 2018

3.3.2. Study Design and Period

A cross sectional descriptive study design was applied from December 1 to 14/2018.

3.3.3. Case Definitions

Community Case Definition

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

Standard Case Definition for Suspected Case

Any person with fever OR fever with headache, back pain, chills, rigor, sweating, muscle pain, nausea and vomiting diagnosed clinically as malaria Confirmed Case: suspected case confirmed by microscopy or RDT [1].

3.3.4. Selection of Study Area

From the region the two zones were selected based on burden of malaria cases compared with other zones of Afar region. Then within the two zones two woredas (Asayta and Awash Fentale woredas) were selected based on the burden of malaria cases. From Asayta woreda health office one health center, three health posts and one hospital from Awash Fentale woreda health office two Health centers and three health posts were selected purposefully.

3.3.5. Study units

The study units were woreda health offices and health facilities. A total of 12 study sites were included in the study, which includes one hospital, three health centers, six health posts and two woreda health offices were included in the study.

3.3.6 Data collection method and procedure

Primary data was collected using a semi-structured questionnaire. Health professionals at health facility and health posts were interviewed, surveillance officers at woreda level interviewed (malaria focal persons and health institution PHEM focal and health extension workers were interviewed). Secondary data sources such as surveillance report, completeness and timeliness, supervision report, written feedbacks, preparedness plans were also reviewed. The CDCs updated guidelines for evaluating public health surveillance system 2001 was used as a framework for the evaluation to achieve the stated objective of the study.

3.3.7. Data analysis

The collected data were entered and analyzed using Microsoft Office Excel 2016 and descriptive statistical analysis was performed and the results were presented using rates, frequency, charts, tables and graph. Staff turnover rate was calculated.

3.3.8. Ethical clearance

An ethical clearance was given from Ethiopian Public Health Institute to Afar region health bureau and the region facilitated and wrote to respective Woredas and the woreda to health post level.

3.3.9. Operational Definitions

Case detection: Is the process of identifying cases and outbreaks.

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

Case/outbreak Confirmation: Refers to the epidemiological and laboratory capacity for confirmation.

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

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

Usefulness: Refers to the relevance of the system in terms of feeding information for action at woreda and health facility level.

Simplicity: The simplicity of a public health surveillance system refers to both its structure and ease of operation as a surveillance system. The simplicity of surveillance system is explained by the case definition because it is important to detect early the disease or condition under surveillance. Hence, cases definition should be easily understandable by all levels of professionals.

Flexibility: Flexibility of a surveillance system is its capacity to adapt to changing information needs or operating systems within minimal additional time, personnel and funding.

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

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

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

Sensitivity: Refers to the capacity of the system to detect true cases or outbreaks through trends in the surveillance data.

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

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

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

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

3.4. Result

3.4.1. Malaria Surveillance System Supportive Activities

Afar Region, Zone 1 &3 surveillance system of 10 health facilities, two woreda health offices were assessed. The main focuses of the evaluation were the core activities, supportive functions and quality components of the surveillance system.

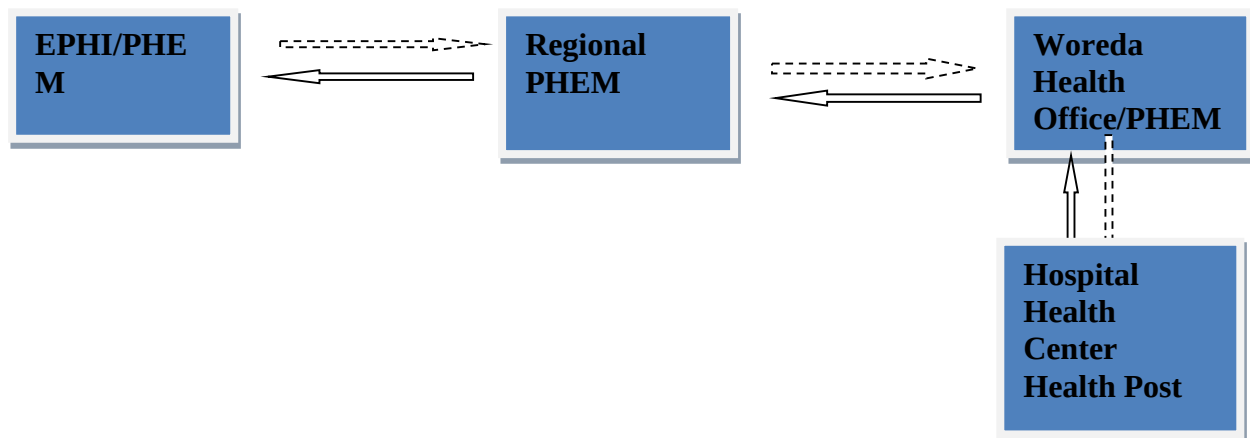


Figure 3.2: Flow chart of the the Surveillance Reporting System and Feedback of Asayta and Awash fentale woredas, Afar Region, Ethiopia 2018

In Afar region total land mass is malarious area and the zonal population is at risk of the infection. Zonally from September 2017 to September 2018, a total of 13,674 case were tested for malaria of this 5,077 cases were treated for malaria. Of these, 4,651(92%) were confirmed malaria (3,618 (78%) cases were PF and 1,033 (22%) cases were PV) and the rest 426 (8%) cases were screened and treated clinically.

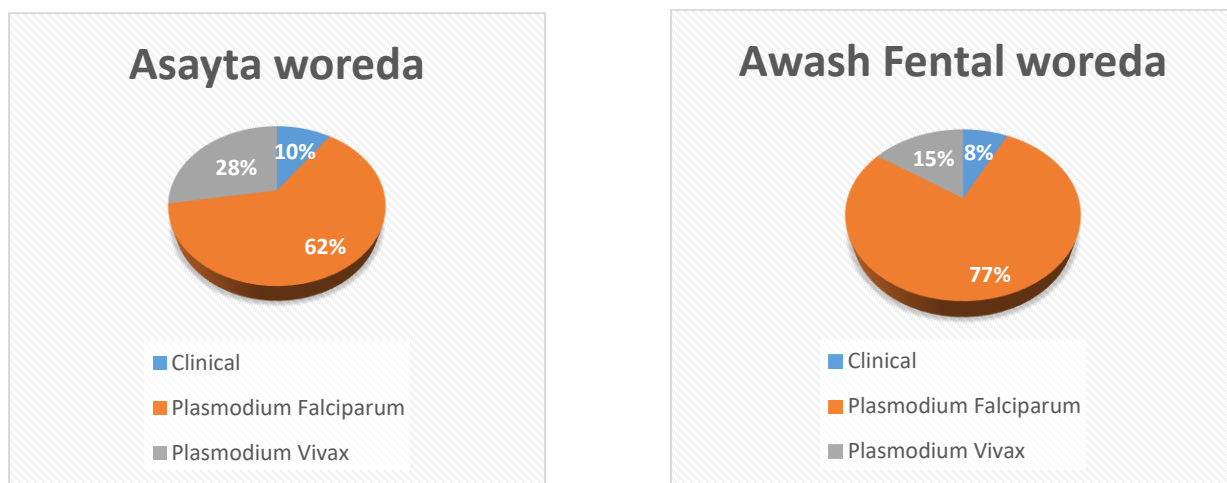


Figure 3.3: The proportion of malaria treatment in Awash Fentale and Asayta Woreda, Afar region, Ethiopia, 2018

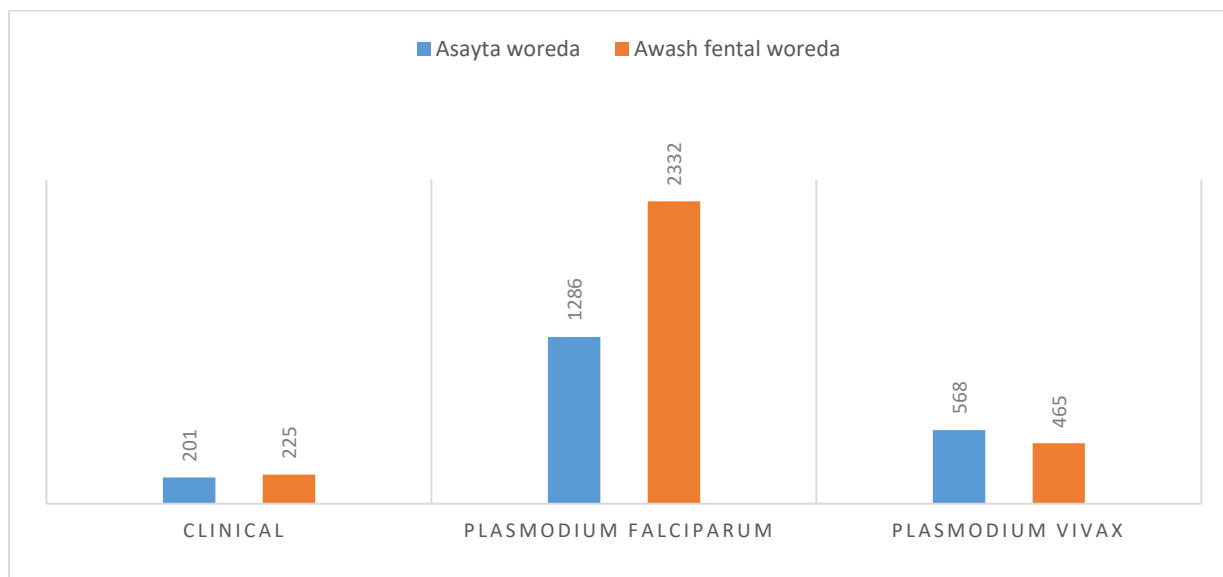


Figure 3.4: The number of Malaria cases treated in Asayta and Awash Fentale Woreda, Afar Ethiopia 2018

Table 3.1: Confirmed Malaria cases in Awash Fentale Woreda, Zone 3, Afar, Ethiopia, 2015-2018

Year	Malaria case			
	Pf	Pv	Mixed	Total Confirmed
2015	2,975	145	5	3,125
2016	3,014	288	12	3,314
2017	2,422	180	0	2,602
2018	2,332	465	35	2,832

Table 3.2: Confirmed Malaria cases in Asayta Woreda, Zone 1, Afar, Ethiopia, 2015-2018

Year	Malaria case			
	Pf	Pv	Mixed	Total Confirmed
2015	2,034	103	0	2,137
2016	1,113	28	10	1,151
2017	1,321	112	0	1,433
2018	1,286	568	6	1,860

The population under surveillance was all population in the selected hospital, health centers and health posts. Community participation on surveillance system and detection of disease were through health extension program.

Among visited health facilities three health facilities had one trained staffs on disease surveillance and epidemic management by Regional Health Bureau. But high turnover of trained staffs was seen in seven health facilities (one in five staffs leave his/her assigned position). All health

facilities have necessary laboratory equipment for diagnostic purpose and health posts have Rapid Diagnostic Test (RDT). Woredas, Health centers and hospital had electric service, motorcycle, telephone, stationary, printer (except in one health center), computer but no software for data analysis, and internet connection. All of the health posts had no the above resources except stationary materials.

Concerning information education and communication all health facilities had no posters, flipcharts. All the health centers had no generators, TV set. Malaria and PHEM guideline were available in one health center and one woreda health office. Integrated Refresher Training (IRT) manual were present in one health post.

3.4.2. Core Surveillance Activities

In all visited health facilities, the standard case definition of malaria was available in one out of ten health facilities. Line list was present only in one woreda. In health posts community case definition were unavailable in the health posts. Health extension workers don't use surveillance guideline for detection of cases of malaria.

Case definition for Malaria

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

Confirmed: A suspected case confirmed by microscopy or RDT for plasmodium parasites. All of the health facilities had clinical case registration log book and correctly register cases. Monthly reports of number cases submitted to next level coincides with clinical register log book. A shortage of Weekly reporting formats was encountered in 65% of health facilities within the last six-month period. In both woredas the reporting entities were Public health facilities, there is no private and NGO health facilities which report to woreda PHEM. The reporting rate within the past 12 months for Health center was 85% and for health post 75%. Reports were sent to the next level through telephone and mobile cell phone texting.

Data quality was assessed for the completeness of surveillance data. Key variables like total malaria, suspected malaria cases and type of species registered on the weekly PHEM reporting format was assessed for missing of variables and it was 75%.

Among the visited facilities the hospital and one health center were analyzing malaria data in time basis using malaria monitoring chart by surveillance focal persons. In woreda level data were analyzed by time in one of the woreda even though the data was not plotted on the monitoring chart. The data was not utilized to monitor action threshold which is crossing the normal line or doubling of cases compared to the same week of the previous year for planning.

In both woredas there is no written epidemic preparedness plan. In health centers and hospital there is no written case management protocol for malaria and there is shortage of necessary drugs and supply for epidemic management. All health facilities are not implementing malaria prevention and control measure based on surveillance data. Both woredas PHEM, have no written emergency preparedness plan. The hospital has Rapid Response Team (RRT). There was outbreak of malaria encountered in Awash Fentale woreda (Attack rate of 80 per 1000), WHO Epidemiologic week 30-43 weeks 2018. But there was no malaria outbreak in Zone 1 for the last five years. In case of any emergency, the woreda PHEM in collaboration with regional health bureau mobilize budget for response activity.

3.4.3. Malaria Surveillance System Attributes

Usefulness

The surveillance system of Malaria is weak it didn't help to detect outbreaks early in Awash Fental woreda on September 2018. The malaria monitoring chart which is posted in two woreda health offices and one health center, but not in the health posts. Those posted monitoring charts don't have threshold for monitoring.

Simplicity

Only one health center and one woreda health office have posted malaria case definition. It is difficult to know whether all health facility professionals understand the disease malaria and manage according to the standard guide line because the standard malaria guide line is not available in most of the facilities. It took them less than 10-15 minutes to fill the format or paper based and registers of the malaria cases.

Acceptability

The reporting agents are not well engaged with the surveillance activities. The reporting of health posts is 75%, health centers 85% within the past 12 months. The case definition and reporting formats were acceptable by all health facilities even though the tools are not available in each facility.

Representativeness

The representativeness of the surveillance system was assessed by health seeking behavior for the disease and health service coverage. In Zone 1 and 3 a total of two hospitals, 41 Health centers and 164 Health posts are available. Malaria is a common disease and one of the ten top diseases in the two zones.

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.

Timeliness

Data of malaria is not ready for planning purpose.

Completeness:

The completeness assessed by missing variables like total malaria, in the reported data and completeness for health facilities were 85% and woreda was 95%.

Stability

Weekly report collected by health facilities is communicated to woreda with their own call phone the phone charge is not compensated by the system. When trained surveillance focal person in health center and hospital leave the position there is usually difficulties in data collection and reporting. No allocated fund for surveillance except for outbreak response from government or non-governmental organizations.

Flexibility

A change in the existing procedure of case detection, reporting and formats is difficult to adapt.

Positive predictive value: Predictive value positive (PVP) is 37%.

Feedback and supervision

In all visited health facilities from woreda health office written feedback were not given in the past six months. At the regional level supportive supervision to woredas were conducted once within the past six months. The two health centers and the hospital have got supportive supervision once from woreda health office and regional health bureau respectively within the past six months. Health centers supervise twice only two health posts out of six health posts in the last six months.

3.5. Discussion

The main objective of the surveillance system is for early detection of outbreaks and takes timely appropriate action but Awash fentale Woreda didn't meet this objective because the surveillance system didn't detect the malaria outbreak in September 2018. Case definitions and reporting formats were not available in most of the visited health facilities at the time of visit. The national malaria guidelines and other essential guidelines were present in one of visited health facilities. Those facilities which have the national malaria guidelines and other essential guidelines were kept in inappropriate places and this finding are consistent with study conducted in Amahara region 2016 [9].

A surveillance data should be analyzed by person, time and place and summarized using appropriate descriptive epidemiology. In visited health centers, hospital, health post and woreda health office the data analysis was tried only by time to monitor epidemics. A study done in North Gonder contradicts this finding which is all the facilities use malaria monitoring chart and analysis data by time place and person according to the PHEM guide line. This difference between the studies is probably due to the fact that the implementation of the national malaria guide line is closely monitored by the Amhara region than Afar region. But the monitoring charts that are posted on the wall only have this year data which is inappropriate way of monitoring malaria surveillance [10]. Concerning data quality, the completeness and timeliness of reporting of the woredas were 95% and 85% for health facilities is in good track which is above the WHO minimum targeted (80%) for both public and private facilities [4].

The challenges in the reporting system were the inconsistent flow of communication because of utilities obstacles like telephone, network access and vehicle transport from facilities to districts. The average reporting completeness of the year 2017 was 90% when we compare with the finding in of a study done in wollo, Amhara region it is low but still better than WHO minimum target [4, 9].

Emergency preparedness and response plan was not available in all visited districts and health centers but the hospital had RRT but they are not functional hence they must be active always as routine tasks even though there was not allocated budget. This limits the health facilities ability to prevent and control malaria outbreaks.

Feedback helps to improve quality of surveillance system. It is possible to give feedback by supervision, newsletter, bulletin etc. Supervision was inconsistent and not scheduled and feedback was not given in the last six months by the Woreda or health centers for health posts. This shows how weak the malaria surveillance system was in the woredas.

Training is a key for improvement of surveillance system. In visited health facilities training were given for PHEM officer. But some of them were shifted to other activities or left the health facility. Therefore, the region should give regular trainings for new staffs at woreda and facility level about how to analyze surveillance data and how to conduct malaria surveillance.

3.6. Action taken by the Resident

Beside the community awareness education that was given by the partners, onsite orientation was given for Bolyeta health center health professionals about malaria case management and Laboratory diagnosis. The orientation also includes how to fill the weekly malaria monitoring chart.

3.7. Limitation

In doing this malaria surveillance system evaluation we couldn't include more woredas due to resource limitation. In addition, staff absence from their working station was huge challenge in collecting information for our research.

3.8. Conclusion

Overall, from our assessment, the malaria surveillance system appeared weak and it didn't produce data which is useful for decision. The performance of the system didn't contribute to reduce malaria morbidity in Awash Fentale and Asayta woredas.

3.9. Recommendations

- Training on basic epidemiology and malaria surveillance should be given by the regional health bureau.
- Community case definition should be posted in all the facilities.
- Different type of guidelines should be put in the right place.
- Check reports for content completeness before sending to the higher stakeholders.
- Data analysis should be conducted in each level of the system.
- Consistent supervisions and feedbacks should be provided for each health facility.

3.10. Acknowledgement

I would like to acknowledge deeply my Academic and CDC mentors Shikur Mohammed (Asst. Prof. of Epid.) and Dr. Kathleen Gallagher (Phd) respectively and Asayta and Awash fentale Woreda PHEM officers. Finally, PMI, EPHI and Afar Regional Health Bureau PHEM Core-Process should be thanked for their technical support.

3.11. Reference

1. Centers for Disease Control and Prevention. Updated Guidelines for Evaluating Public Health Surveillance Systems. MMWR, July 27, 2001; 50 (RR-13).
2. Public Health Emergency Management. Surveillance Evaluation guide line, Ethiopia; 2012.
3. Samuel L. Public health surveillance systems, Canada;2016.
4. Akande, T.M. etal (2016) epidemiology of malaria in Africa, African journal of clinical & experimental microbiology, Nigeria.
5. World Health Organization Regional Office for Africa and US Centers for Disease Control and Prevention. Technical Guidelines for Integrated Disease Surveillance and Response in the African Region, CDC, Atlanta; 2010.
6. Sinka, M. The dominant Anopheles vectors of human malaria in Africa, Europe and the Middle East; 2010; 1–34.
7. US President’s Malaria Initiative Ethiopia Malaria Operational Plan. Ethiopia; 2017.
8. Afar regional health bureau, Regional Policy and Plane Directorate. Afar, Semera; 2018.
9. Abebe G. Surveillance Evaluation of Malaria disease in North Wollo Zone, Amhar, 2016.
10. Mengistu T, Abiy G, Adamu A. Evaluation of malaria surveillance system in North Gondor Zone, Amhara Region. March 2018

3.12. Annex

Evaluation of Malaria Surveillance System in Awash Fentale and Asayta Woredas, Afar region, Ethiopia 2018

A. Health Office Level Questionnaire

Date_____ Region_____ Zone_____ District/town_____
Interviewer_____ Respondent_____ General
Location_____ Bordering areas: North_____ South_____ West_____
East_____ Latitude_____ Longitude_____
Altitude_____ Total population_____ male_____
female_____ <5 Health institution number: Hospitals_____ health
center_____ health posts_____ private hospitals_____ private clinics_____
drug stores_____ Human power General Practitioners_____ health
officers_____ nurses_____ midwives_____ supportive
staff_____ surveillance officers_____ Health coverage_____

1. Availability of National Surveillance Guidelines

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

2. Case Detection and Registration

2.1. Observed presence of the standard case definition for malaria: 1. Yes 2. No

2.2. Observed the weekly reporting forms: 1. Yes 2. No 3. NA

2.3. Observed line list (general/customized for malaria outbreak): 1. Yes 2. No

3. NA 3. Data reporting

3.1. Is the central level responsible for providing malaria surveillance forms to the health facilities?

1. Yes 2. No

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

1. Yes 2. No

3.3. If yes, list the form lacked_____

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

a. Public health facilities 1. Yes 2. No

b. NGO health facilities 1. Yes 2. No

c. Military health facilities 1. Yes 2. No

d. Private health facilities 1. Yes 2. No

e. Others_____ (specify)

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

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

3.7. How do you report malaria report to next upper level? 1. Mail
2. Fax 3. Telephone 4. Radio 5. Electronic 6. Other_____ (specify)

4. Data Analysis

4.1. Does the health office:

a. Describe malaria data by person? Observed description of data by age and sex: 1. Yes

2. No b. Describe malaria data by place? Observed description of data by tables, maps 1.

Yes 2. No c. Describe malaria data by time? Observed description of data by

time: 1. Yes 2. No

d. Perform malaria trend analysis?

Observed line graph of cases by time: 1. Yes 2. No

e. Do you use threshold for malaria 1. Yes 2. No

f. Which threshold setting method are you using? 1. Doubling method 2. Second largest

3. Others (specify)_____

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

g. How often do you analyze the collected malaria data? 1. Daily 2. Weekly 3. Every two weeks 4. Monthly 5. Quarterly 6. As needed

h. Do you have appropriate denominators for malaria? Observed presence of demographic data (E.g. population by kebeles and age groups) 1. Yes 2. No

5. Outbreak Investigation

5.1. Have you ever encountered malaria outbreak in the last six months 1. Yes

2. No 5.2. If yes, how many of the malaria outbreaks were investigated in the last six months_____

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

6. Epidemic preparedness

6.1. Existence of plan for malaria epidemic preparedness and response Observed a written plan of malaria epidemic preparedness and response: 1. Yes 2. No

6.2. Does the malaria EPRP have budget set-aside? 1. Yes 2. No

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

1 Chloroquine tablets 1. Yes 2. No

2 Chloroquine syrup 1. Yes 2. No

3 AL tablets 1. Yes 2. No

4 AL dispersible 1. Yes 2. No

5 Quinine tablets 1. Yes 2. No

6 Rectal Artisunate 1. Yes 2. No

7 Malaria epidemic monitoring charts 1. Yes 2. No

8 Quinine tablets 1. Yes 2. No

9 Quinine injection 1. Yes 2. No

10 Microscope slides and functional microscope 1. Yes 2. No

11 Slide rack 1. Yes 2. No

12 Lancets 1. Yes 2. No

13 Safety box (to dispose of used lancets) 1. Yes 2. No

14 Timer 1. Yes 2. No

15 Giemsa stock solution 1. Yes 2. No

16 Immersion oil 1. Yes 2. No

17 Cotton wool 1. Yes 2. No

18 Alcohol denatured 1. Yes 2. No

19 First-line insecticide 1. Yes 2. No

20 LLINs 1. Yes 2. No

21 Temephos 50% EC 1. Yes 2. No

22 Spraying pumps and accessories 1. Yes 2. No

23 Rectal Artisunate 1. Yes 2. No

24 Artisunate injection (intravenous or intramuscular): requires 5 ml Normal Saline for final dilution 1. Yes 2. No

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

6.5. Existence of a standard case management protocol for malaria Observed the existence of a written case management protocol for malaria 1. Yes 2. No

6.6. Is there a budget line for epidemic response? 1. Yes 2. No

6.7. Existence of epidemic management committee Observed minutes (or report) of meetings of epidemic management committee: 1. Yes 2. No

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

7. Response to epidemics

7.1. Ability of the health office to respond within 48 hours of notification of most recently reported malaria outbreak: Observed that the woreda/town/zone/region responded within 48 hours of notification of most recently reported malaria outbreak (from written reports with trend and intervention)

1. Yes 2. No 3. NA

7.2. Ability of the woreda epidemic management committee to evaluate its preparedness and response activities: Has epidemic management committee evaluated its preparedness and response activities during the recent malaria outbreak (Observe written report to confirm)? 1. Yes 2. No 3. NA

8. Feedback

8.1. Existence of a report or bulletin that is regularly produced to disseminate surveillance data: How many weekly bulletin or reports has the health office produced in the last six months?

_____ Observed the presence of a report or bulletin that is regularly produced to disseminate surveillance data: 1. Yes 2. No 3. NA

8.2. Existence of feedback system How many feedbacks were received from the higher level in the last six months? _____

Observed the presence of weekly feedback received from the higher level: 1. Yes 2. No 3. NA

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

Observed the presence of weekly feedback received from the higher level 1. Yes 2. No 3. NA

9. Supervision

9.1. Number of supervisory visit that was made in the last six months How many supervisory visits have you made in the last six months? _____

Observed the supervisory report 1. Yes 2. No 3. NA

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

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

Observed the supervisory report 1. Yes 2. No 3. NA

10. Training

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

10.2. Have you been trained in malaria surveillance? 1. Yes 2. No 3. NA

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

11. Resources

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

A. Data management materials 1 Computer 1. Yes 2. No

2 Printer 1. Yes 2. No

3 Photocopier 1. Yes 2. No

4 Data manager 1. Yes 2. No

5 Statistical package 1. Yes 2. No

B. Communications

1 Telephone service 1. Yes 2. No

2 Fax 1. Yes 2. No

3 Radio call 1. Yes 2. No

4 Satellite phone 1. Yes 2. No

5 Computers that have modems 1. Yes 2. No

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

D. Human power

1 Surveillance officer in number: _____

2 Malaria focal person: _____

E. Logistics

Bicycles 1. Yes 2. No

Motor cycles 2. Yes 2. No

Vehicles 3. Yes 2. No

12. Surveillance Co-ordination

12.1. Existence of focal unit for surveillance

Is there a focal unit for surveillance? [Observe organogram to confirm] 1. Yes 2. No

3. NA

13. Opportunities for integration

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

14. Satisfaction with the surveillance system

14.1. Are you satisfied with the malaria surveillance system? 1. Yes 2. No If no, how can the surveillance system be improved?

II. Questionnaire for attributes and level of usefulness

a. Total population under surveillance _____

b. What is the incidence of malaria in your area (2018)?

i. Cases _____ in 2018

ii. Deaths _____ in 2018

15. Level of usefulness

15.1. Does the malaria surveillance system help to detect outbreaks early? 1. Yes 2. No

15.2. Does malaria surveillance system help to estimate the magnitude of morbidity and mortality related to the disease, including identification of factors associated with the diseases?
 1. Yes 2. No
 15.3. Does the malaria diseases surveillance system permit assessment of the effect of prevention and control programs? 1. Yes 2. No
 Observe malaria interventions and diseases trends analyzed
 1. Available 2. Not available 3. NA

III. Describe Each System Attributes

16. Simplicity

16.1. Is the case definition of malaria easy for case detection by all level health professionals?

1. Yes 2. No

If no mention difficult with malaria case definition-----

16.2. Do you feel that additional data collected on a case are time consuming? 1. Yes 2. No

16.3. How long it takes to fill the format? a. <5 minute b. 10-15minuts c. >15 minutes

16.4. How long does it take to have laboratory confirmation of malaria? A. By RDT_____

B. By Microscope_____

17. Flexibility

17.1. Can the current reporting formats be used for other context (for elimination program) without much difficulty? 1. Yes 2. No

17.2. Do you think that any change in the existing procedure of malaria case detection, reporting, and formats will be difficult to implement? 1. Yes 2. No Comment:

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

18.1. Are the data collection formats for malaria clear and easy to fill for all the data collectors/ reporting sites? 1. Yes 2. No

18.2. Are the reporting site / data collectors trained/ supervised regularly? 1. Yes 2. No

Observe: Review the last months report Average number of unknown or blank responses to variables in each of the reported forms for

malaria_____ Percent of reports which are complete (that is with no blank or unknown responses) from the total reports_____

19. Acceptability

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

1. Yes 2. No

If yes, how many are active participants (of the expected too)? _____

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

A. Lack of understanding of the relevance of the data to be collected

B. No feedback / or recognition given by the higher bodies for their contribution; i.e. no dissemination of the analysis data back to reporting facilities

C. Reporting formats are difficult to understand

D. Report formats are time consuming

E. Other_____

20. Representativeness

20.1. What is the health service coverage of the area? _____%

- 20.2. Do you think, the populations under surveillance have good health seeking behavior for malaria/fever? 1. Yes 2. No
- 20.3. Who do you think is well represented by the surveillance data? 1. Urban 2. Rural
- 20.4. Are the private health facilities included in the surveillance? 1. Yes 2. No 3. NA
If No why? : _____
- 20.5. Are the NGO health facilities included in the surveillance? 1. Yes 2. No 3. NA
- 20.6. Are the military health facilities included in the surveillance? 1. Yes 2. No 3. NA

21. Timeliness

21.1. When do you report malaria report to the next level: _____

22. Stability

- 22.1. Was any new restructuring affected the procedures and activities of the malaria surveillance? 1. Yes 2. No
- 22.2. Was there lack of resources that interrupt malaria surveillance system? 1. Yes 2. No
- 22.3. Was there any time/condition in which the surveillance is not fully operating? 1. Yes 2. No

B. Health Facility (Hospital/Health Center/Clinic) Questionnaire

Type of the health facility: 1. Health Center 2. Hospital Name of health facility _____

Date _____ (MM/DD/YYYY)

Region _____ Zone _____ Woreda _____

Interviewer's Name _____ Respondent's Name _____

1. National surveillance guidelines

- 1.1. Is there a national manual for surveillance at this health facility? 1. Yes 2. No
- Observed national surveillance guidelines: 1. Available 2. Not available 3. NA

2. Case detection and registration

- 2.1. Does the health facility has a clinical register
Observed the existence of a clinical register 1. Yes 2. No
- 2.2. Does health facility correctly register cases? Observed the correct filling of the clinical register during the previous 30 days 1. Yes 2. No 3. Not applicable
- 2.3. Does health facility has standardized case definitions for malaria 1. Yes 2. No 3. Unknown
- 2.4. Is malaria cased definition posted on the wall/visible site? 1. Yes 2. No
- 2.5. Observed the respondent correctly diagnosing malaria using a standard case definition
1. Yes 2. No

3. Case confirmation

- 3.1. Does the health facility have the capacity to collect specimens for malaria confirmation (blood?) 1. Yes 2. No 3. NA
- 3.2. Observed the presence of materials required to collect blood and process for malaria
- 3.3. Does the health facility have functional cold chain 1. Yes 2. No 3. NA
- 3.4. Does the health facility have transport media 1. Yes 2. No 3. NA

4. Data reporting

- 4.1. Has health facility lacked appropriate surveillance forms at any time during the last 6 months? 1. Yes 2. No 3. unknown
- 4.2. Does the health facility have WRF at the time of the data collection? 1. Yes 2. No
- 4.3. Does the health facility have line list at the time of the data collection? 1. Yes 2. No
- 4.4. Does the line list have relevant variables? (observe) 1. Yes 2. No
- 4.5. Comparison of the number of malaria cases with the one reported on WRF:

4.5.1. Observed that the last monthly report agreed with the register for malaria? 1. Yes 2. No
3. NA

4.5.2. Number on Register for the last 30 days/one month_____

4.5.3. Number of malaria cases reported to the next level in the last 30 days/one month_____ 4.5.4. If there is difference in register and reporting form for the same weeks, put the percent difference in number of cases_____?

4.6. How many times the health facility does reported weekly report in the last six months?

4.7. How many of the weekly reports in the last six months were reported by WRF to higher next level? _____

4.8. What is reporting means used by health facility to report the malaria data to next upper level?

1. E-mail,

2. Telephone,

3. Fax or radio

4. Other (specify)_____

5. Data analysis

5.1. Does the health facility analyze malaria data? 1. Yes 2. No

5.2. If yes, who is responsible for malaria data analysis? _____

5.3. At what time interval malaria data is analyzed? 1. Daily 2. Weekly 3. Bi weekly. 4 Others (specify)_____ Analysis by personal variables

5.4. Observed description of data by age and sex and other personal variables 1. Yes 2. No
3. NA

Analysis by place variables

5.5. Observed malaria data described by place (locality, village, work site etc)? 1. Yes 2. No
3. NA

Analysis by time variables

5.6. Trend analysis: observed line graph of malaria cases by time? 1. Yes 2. No
3. NA

5.6. Have an action threshold set for malaria? 1. Yes 2. No

5.7. Which threshold are you using for malaria outbreak detection?

1. Doubling method 2. Second largest/third quartile 3. Others (Specify)_____

5.8. Do you have appropriate denominators for malaria data analysis? 1. Yes 2. No

Observed presence of demographic data at health facility

A. Total population 1. Yes 2. No

B. Population by age category 1. Yes 2. No

C. Population by sex, 1. Yes 2. No

D. Population by village, 1. Yes 2. No

6. Epidemic preparedness

6.1. Observed the existence of a written case management protocol for malaria? 1. Yes 2. No

6.2. Does the health facility has:

1 Chloroquine tablets 1. Yes 2. No

2 Chloroquine syrup 1. Yes 2. No

3 AL tablets 1. Yes 2. No

4 AL dispersible 1. Yes 2. No

5 Quinine tablets 1. Yes 2. No

- 6 Rectal Artesunate 1. Yes 2. No
- 7 Malaria epidemic monitoring charts 1. Yes 2. No
- 8 Multi-species RDTs 1. Yes 2. No
- 9 Bench aids for appropriate use of RDTs 1. Yes 2. No
- 10 Kebele maps with 1 km² grids 1. Yes 2. No
- 2.1. Does the health facility implemented malaria prevention and control measures based on surveillance data? 1. Yes 2. No 3. Unknown
- 2.2. Observed that the health facility achieved an acceptable case fatality rate for most recent outbreak 1. Yes 2. No 3. Unknown 4. Not applicable
- 2.3. Does the health facility have emergency preparedness and response plan (EPRP)? 1. Yes 2. No
- 2.4. What is the anticipated malaria Attack rate (AR) for the EPRP? _____
- 2.5. Observe that the EPRP addresses both the plan for preparedness and response? 1. Yes 2. No
- 2.6. Does the health facility have rapid response team (RRT) 1. Yes 2. No

3. Feedback

- 3.1. Has health facility received a report or bulletin from a higher level during the last six months on the data they have provided? 1. Yes 2. No
- 3.2. If yes, how many feedback bulletin or reports has the health facility received in the last six months? _____
- 3.3. Observed at least one report or bulletin at the health facility from a higher level during the last six months on the malaria data they have reported 1. Yes 2. No 3. Not applicable
- 3.4. How many feedback bulletin or reports has the health facility provided to health posts in the past 6 months? _____
- 3.5. Observed at least one report or bulletin at the health facility provided to health post in the last six months on the malaria data they have provided 1. Yes 2. No 3. Not applicable
- 3.6. Has health facility conducted meetings with community members to discuss results of surveillance or investigation data in the last years? 1. Yes 2. No
- 3.7. How many meetings has the health facility conducted with the community members in the last six months? _____
- 3.8. Observed the minutes or report of at least one meeting between the health facility team and the community members within the last six months 1. Yes 2. No 3. Not applicable

4. Supervision

- 4.1. Has health facility supervised by upper level in the last six months? 1. Yes 2. No
- 4.2. If yes, how many times have you been supervised in the last six months? _____
- 4.3. Observed supervision report or any evidence of supervision in last 6 months 1. Yes 2. No 3. Not applicable
- 4.4. Has the supervisor from the next higher level reviewed malaria surveillance practices appropriate to this level? 1. Yes 2. No
- 4.5. Observed supervision report or any evidence for appropriate review of surveillance practices 1. Yes 2. No 3. Not applicable

5. Training

- 5.1. Has the staff in the health facility trained on malaria surveillance and epidemic management? 1. Yes 2. No
- 5.2. If yes, how many of the health facility staffs were trained? _____

5.3. Specify?

When: _____

Where: _____

For how long: _____ the last training was given

6. Resources

6.1. Has the health facility have functional:

- | | | |
|----------------|--------|-------|
| a. Electricity | 1. Yes | 2. No |
| b. Bicycles | 1. Yes | 2. No |
| c. Motorcycle | 1. Yes | 2. No |
| d. Vehicles | 1. Yes | 2. No |

6.2. Data management: Has the health facility have: -

- | | | |
|---------------|--------|-------|
| a. Stationery | 1. Yes | 2. No |
| b. Calculator | 1. Yes | 2. No |
| c. Computer | 1. Yes | 2. No |
| d. Software | 1. Yes | 2. No |
| e. Printer | 1. Yes | 2. No |

6.3. Communication: Has health facility have: -

- | | | |
|-------------------------------|--------|-------|
| a. Telephone service | 1. Yes | 2. No |
| b. Fax | 1. Yes | 2. No |
| c. Radio call | 1. Yes | 2. No |
| d. Computers that have modems | 1. Yes | 2. No |

6.4. Information education and communication materials: Has health facility have: -

- | | | |
|----------------------------|--------|-------|
| e. Posters | 1. Yes | 2. No |
| f. Megaphone | 1. Yes | 2. No |
| g. Flipcharts or Image box | 1. Yes | 2. No |
| h. TV set | 1. Yes | 2. No |
| i. Generator | 1. Yes | 2. No |
| j. Screen Projector | 1. Yes | 2. No |
| k. Other (specify) | | |

7. Satisfaction with surveillance system

7.1. Are you satisfied with the malaria surveillance system? 1. Yes 2. No

7.2. If no, how can malaria surveillance systems be improved to bring satisfaction?

II. Questionnaire for attributes and level of usefulness

1. Total population under surveillance _____

2. What is the incidence of malaria in your area?

A. Cases _____ of last six months

B. Deaths _____ of last six months

2. Level of usefulness of malaria surveillance system

1.1. Does malaria surveillance system help to detect outbreaks early? 1. Yes 2. No

1.2. Does malaria surveillance system help to estimate the magnitude of morbidity and mortality related malaria, including identification of factors associated with the malaria? 1. Yes
2. No

1.3. Does the malaria surveillance system permit assessment of the effect of malaria prevention and control programs? 1. Yes 2. No

III. Describe Each System Attributes

1. Simplicity

1.1. Is the case definition for malaria easy for case detection by all level health professionals?

1. Yes 2. No

1.2. If no, mention difficulty with malaria case definition _____

1.3. Do you feel that data collected on malaria case are time consuming? Yes/No

1.4. How long it takes to fill the format? 1. <5 minute 2. 10-15minuts 3. >15 minutes

1.5. How long does it take to have laboratory confirmation malaria? _____

A. RDT _____ B. Microscope _____

2. Flexibility

2.1. Can the current malaria reporting formats can accommodate addition of new variables/indicators without much difficulty? 1. Yes 2. No

2.2. Do you think that any change in the existing procedure of malaria case detection, registration and reporting will be difficult to implement? 1. Yes 2. No

Comment: _____

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

3.1. Are the data collection formats for malaria clear and easy to fill for all the data collectors/ reporting sites? 1. Yes 2. No

3.2. Has the reporting site / data collectors trained/ supervised regularly? 1. Yes 2. No

Observe: Review the last months report Average number of unknown or blank responses to malaria variables in each of the reported

forms _____ Percent of reports which are complete (that is with no blank or unknown responses) from the total reports _____

4. Acceptability

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

1. Yes 2. No

4.2. If yes, how many are active participants (of the expected to)? _____

4.3. 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 _____

5. Representativeness

5.1. What is the health service coverage of the area? _____%

5.2. Do you think, the populations under surveillance have good health seeking behavior for fever?

1. Yes 2. No

5.3. Who do you think is well represented by the surveillance data? 1. Urban 2. Rural

6. Timeliness

6.1. When do you report weekly malaria report to the next level? _____

7. Stability

- 7.1. Was any new restructuring affected the procedures and activities of malaria surveillance?
1. Yes 2. No
- 7.2. Was there lack of resources that interrupt the malaria surveillance system? 1. Yes 2. No
- 7.3. Was there any time/condition in which the malaria surveillance is not fully operating?
1. Yes 2. No

C. Health Post Level Questionnaire

Region_____ Zone_____ Woreda_____

Date_____ (MM/DD/YYYY) Name of health post_____ Interviewer's Name_____ Respondent's Name_____

1. National surveillance guidelines

- 1.1 Is there Integrated Refresher Training (IRT) manual? 1. Yes 2. No
- 1.2 If yes, observe: 1. Available 2. Not available
- 1.3 Mention the reason for which the IRT manual is not available 1. Not given 2. Taken by staffs 3. Become out of service 4. Others_____ (Specify)

2. Case detection and registration

- 2.1. Does the Health Post have clinical register? 1. Yes 2. No
- 2.2. If yes, Observe: 1. Available 2. Not available 3. NA
- 2.3. Observe filling of the clinical register during the previous 30 days to make sure it is correct
1. Yes 2. No 3. Not applicable
- 2.4. Does the Health post have community case definition for malaria? 1. Yes 2. No
- 2.5. If yes, Does the health post have posted the community case definition for malaria on the wall?
1. Yes 2. No
- 2.6. Does the HEWs correctly using the community case definition for diagnosis of malaria (observe that the cases listed on the register for the last one month fulfill the community case definition for malaria) 1. Yes 2. No

3. Data reporting

- 3.1. Does the health post have weekly reporting format pad (WRF-HEWs) at all times over the last six months? 1. Yes 2. No 3. Unknown
- 3.2. Observe for the current presence of WRF-HEWs 1. Yes 2. No
- 3.3. Do the HEWs utilizing the WRF-HEWs for reporting 1. Yes 2. No
- 3.4. Number of malaria reports sent by health post to health center in the last six months_____ (Ask from HEWs)
- 3.5. Number of weeks in the last six months for which weekly report is sent by WRFHEWs_____ (Observe copies of WRF-HEWs present at health post)
- 3.6. Number of weekly malaria report sent to the health center on Monday in the last six months_____
- 3.7. Comparison of the number of malaria cases registered on register book and reported to the health center in the last six months
A. Number of cases registered on registration book for the last six months_____
- B. Number of cases reported to the health center in the last six months_____
- 3.8. What is the available means of reporting at the time of data collection?

1. Paper 2. Telephone. 3. Other _____ (specify)

3.9. Which of the above mentioned reporting means (Q3.8) are you using?

1. Paper 2. Telephone. 3. Other (specify)

4. Data analysis

4.1. Do you analyze malaria data? 1. Yes 2. No

If Yes, Observe description of data by age and sex 1. Yes 2. No 3. Not applicable

Observe description of data by place 1. Yes 2. No 3. Not applicable

Observe description of data by time 1. Yes 2. No 3. Not applicable

4.2. Observe for the availability of malaria epidemic monitoring chart 1. Yes 2. No

4.3. If yes, do the HEWs utilizing malaria epidemic monitoring chart? 1. Yes 2. No

4.4. Is there any evidence of malaria outbreak on the epidemic monitoring chart? 1. Yes 2. No

5. Epidemic preparedness and response

5.1. Does health post have?

1 Chloroquine tablets 1. Yes 2. No

2 Chloroquine syrup 1. Yes 2. No

3 AL tablets 1. Yes 2. No

4 AL dispersible 1. Yes 2. No

5 Quinine tablets 1. Yes 2. No

6 Rectal Artesunate 1. Yes 2. No

7 Malaria epidemic monitoring charts 1. Yes 2. No

8 Multi-species RDTs 1. Yes 2. No

9 Bench aids for appropriate use of RDTs 1. Yes 2. No

2.1. Is HEWs implementing malaria prevention and control measures by using local surveillance data?

1. Yes 2. No

2.2. Can you give me an example of evidence based decision you made by using malaria surveillance data? _____

3. Feedback

3.1. Are you getting feedback from health center or above level on malaria? 1. Yes 2. No

3.2. If yes, how often you got the feedback from health center? _____

3.3. How many feedback has the health post received in the last six months? _____ (Observe)

3.4. Do the HEWs have meetings with community? 1. Yes 2. No

3.5. If yes, is malaria prevention and control the agenda during the meeting? 1. Yes 2. No

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

3.7. Is the meeting minute available? (Observe) 1. Yes 2. No

4. Supervision

4.1. Has there been supervision on malaria from higher level? 1. Yes 2. No

4.2. If yes, how many times have you been supervised in the last six months by health center?

4.3. How many times have you been supervised in the last 6 months by woreda and above levels?

4.4. Observe for any supervision report or any evidence of supervision in last 6 months (regardless of the level providing supervision) 1. Yes 2. No 3. Unknown

5. Training

5.1. Have you received IRT? 1. Yes 2. No

- 5.2. If yes, when was the last time the IRT given? _____
5.3. If yes, how many of existing HEWs has received IRT? _____

6. Resources

- 6.1. Does the Health post have functional electricity 1. Yes 2. No
6.2. Does the health post have any means of transportation 1. Yes 2. No
6.3. If yes, specify the available means of transport _____
6.4. Does health post had regular supply of stationeries in the last six months?
1. Yes 2. No 3. Unknown

7. Satisfaction with surveillance system

- 7.1. Are you satisfied with the malaria surveillance system? 1. Yes 2. No
7.2. If No, what should be introduced or modified to make better functioning surveillance?

8. Attributes and level of Usefulness

- 8.1. Total population under surveillance in the catchment areas of the health post _____
8.2. Does the current malaria surveillance provide estimation of the magnitude of morbidity and mortality from malaria in the community under surveillance? 1. Yes 2. No
8.3. Does the current malaria surveillance provide timely estimation of the malaria burden to enhance early prevention and control? 1. Yes 2. No
8.4. Does the current malaria surveillance permit assessment of effect of malaria prevention and control programs? 1. Yes 2. No

III. Describe Each System Attributes

9. Simplicity

- 9.1. Is the malaria community case definition easy for case detection by HEWs? 1. Yes 2. No
9.2. Do you think that extensive training is necessary to use malaria community case definition by HEWs? 1. Yes 2. No
9.3. Do you feel that additional data collected on a case are time consuming? 1. Yes 2. No
9.4. How long does it take fill information on register book for single malaria patient?
A. <5 minute B. 10-15minuts C. >15 minutes
9.5. How long it takes to fill format? A. <5 minute B. 10-15minuts C. >15 minutes
9.6. Do you report malaria data to other apart from catchment health center? 1. Yes 2. No
9.7. If yes, to whom you report malaria data other than the catchment health center? _____

10. Flexibility

- 10.1. Do you think that any change in the existing procedure of malaria case detection, registration and reporting will be difficult to implement? 1. Yes 2. No
Comment: -

11. Data Quality:

(Completeness of the reporting forms/and validity of the recorded data)

- 11.1. Are the data collection formats for malaria clear and easy to fill? 1. Yes 2. No
11.2. Are the reporting site / data collectors trained/ supervised regularly? 1. Yes 2. No
Observe: Review the last month report
11.3. Average number of unknown or blank responses to for malaria variables in each of the reported forms _____

11.4. Percent of reports which are complete (that is with no blank or unknown responses) from the total report _____

12. Acceptability

12.1. Do you accept and well engaged in the surveillance activities? 1. Yes 2. No

12.2. If No, what is the reason for your poor participation in the surveillance activity?

i. Lack of understanding of the relevance of the data to be collected

ii. No feedback / or recognition given by the higher bodies for their contribution; i.e. no dissemination of the analysis data back to reporting facilities

iii. Reporting formats are difficult to understand

iv. Report formats are time consuming

v. Other _____

13. Representativeness

13.1. What is the health service coverage of the area? _____ %

13.2. Do you think the populations under surveillance have good health seeking behavior for malaria?

1. Yes 2. No

13.3. Who do you think is well represented by malaria surveillance data? 1. Urban 2. Rural

14. Timeliness

14.1 When do you report weekly malaria report to the health center? _____

15. Stability

15.1 Was any new restructuring affected the procedures and activities of the malaria surveillance?

1. Yes 2. No

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

15.3 Was there any time /condition in which the malaria surveillance is not fully operating? 1. Yes 2. No

Chapter IV – Health Profile Description Report

4.1. Health Profile Description of woreda 13, Kolfe Keraniyo Sub City, Addis Ababa City Administration, Ethiopia 2008 E.C

Executive summery

Introduction: A health profile is a detailed description of health and health related conditions. It can serve as a road map to the health and wellbeing of the community. It provides information for decision making, collaborative planning, manpower enrollment, and financial and other resource allocation with a firm emphasis on diseases prevention and health promotion. It gives significant information for health sector stakeholders, including non-governmental organizations, investors and community members in order to have clear and compiled health information about the woreda. Almost all woreda, in Addis Ababa do not have detailed summary data about their catchment population. Woreda 13 in Kolfe sub city is among those woreda. To fill this gap, a detailed health profile was conducted in woreda 13, Kolfe Keraneo sub city.

Methods: The work for the health profile was done from July 21, 2009 EC to August 01, 2009 EC and covered the EFY 2008 period. A health profile assessment was done using secondary data from Woreda13, Kolfe Keraniyo Sub city. Data was collected by key informant interview, and check list for secondary data. The data was analyzed using proportions, percentages, and ratios using Microsoft Excel 2007 software.

Results: There are two health centers, nine private medium clinics and no hospital in the woreda. The health system coverage was 100%. The population used on Kolfe Health center ratio was 1:61214 and Lomi Meda Health center was 1:36136. The immunization coverage based on the woreda target was 91%. The dropout rates penta1 to Measles was 224(11.5%). Child mortality rate was 2 per 1000 and maternal mortality rate was 0%, Antenatal care (ANC) fourth visit (64.5%), deliveries assisted by a skilled health personal was 88.2% and contraceptive acceptance rate was 27%. Tuberculosis (TB) detection rate was (77.2%), Cure rate (84.09%)and treatment success rate (61%), TB-HIV service (73%), cotri-moxazole prophylaxis therapy (100%), Anti-Retroviral Treatment (ART) (100%) and Isoniazid (INH) uptake for newly enrolled HIV patients was (22.2%).

Conclusion: Children are still at high risk of acquiring infectious diseases like Measles infection. ANC fourth visit, skilled attendant delivery and still birth measure the quality of maternal health services so that it needs improvement. Upper respiratory tract infection was the leading causes of disease in adults and under 5 years. URTI was series challenge and the leading cause of morbidity to entire populations in the woreda. TB-HIV activities in general, indicated as a weak performance in the woreda. The service provision method and customer handling practice are key area to improve maternal health, child health and other services. So it needs continuous monitoring and supportive supervision from sub city health office, Health education and strong defaulter tracing by health extension workers.

Key words: Health profile, Kolfe Keraneo, Woreda 13, Addis Ababa

4.1. Introduction

Health profile assessment is an advance of identifying roadblocks to the health and welfare of residents and residential districts. Health profile assessment findings will be related to clinical decision making with the health care scheme every bit as well as strengthening community disease prevention efforts. Health profile engages health care suppliers, health maintenance facilities, health related activities and governing bodies and broader communities by providing a base for making informed conclusions, with a firm emphasis on preventive diseases and reducing health disparities. Health is influenced by many factors, including the environmental condition, socioeconomic condition, educational status, and the power to access the health readiness. It is a foundation for health planning, mobilizing health resources and manpower as well as calling for appropriate public health interventions. Health profile is significant information for stakeholders, including NGOs, investors and community members in order to have clear and compiled health information about the regions. Woreda is the most practical unit to achieve universal health coverage, while implementing a wide variety of national and international health policies like HIV preventing and Health Extension Package that under pin the development of national policy and health sector reforms [1].

Addis Ababa lies at 9°1'48"N latitude and 38°44'24"E longitude. The city is located at the heart of the country, at an altitude ranging from 2,100 meters at Akaki in the south to 3,000 (9,800 ft) meters at Entoto Hill in the North. This makes Addis Ababa the third highest city in the world; Addis Ababa has a sub-tropical highland climate. The city has a complex mix of highland climate zones, with average temperature differences of up to 12.2°C, depending on elevation and prevailing wind patterns [2]. Addis Ababa is the largest as well as the dominant political, economic, cultural and historical city of the country established in 1887 by emperor Menilik II. It has the status of both a city and a state. It is the capital of federal government and a chartered city. Based on CSA population projection the total population in Addis Ababa is estimated as 3,433,999 by 2017 from which 52.6% of the population is females [2].

Administratively the city is divided in to ten sub-cities which are the second administrative units next to city administration. In terms of area coverage Bole is the largest sub-city followed by Akaki, Kality and Yeka. Addis Ketema is the smallest sub city followed by Lideta and Arada sub-cities. The sub-cities are also divided in to 116 woredas, which are the smallest administrative unit in the city [2]. Kolfe Keraneo is one of the ten sub cities in Addis Ababa covering a total of 61.25 sq. km. Based on CSA population projection the estimated population of the sub city is 546,219 (220,859 males and 235,360 female) [2]. There is one health post and 3 health centers, 43 private clinics, 8 hospitals, 5 pharmacies, 40 hotels, 5 police stations, 4 post offices, 4 telecommunication offices, 3 public toilets [2]. Administratively the sub city is divided in to 15 woredas. Kolfe Keraneo is one of the priority sub city due to repeated measles out breaks and in addition since woreda 13 is among the newly established woredas in the sub city and it has no baseline health profile assessment done previously. So this health profile assessment in woreda 13 Kolfe Keraneo sub city will help as a base line health profile assessment of the woreda, assess the disease risk, measure the performance of the woreda in health and health related activities and finally suggest preventive methods and incorporate the assessment results in planning for the future.

4.2. Objective

4.2.1 General objective

The General objective of this study is to assess the health related profile of woreda 13 Kolfe Keranejo sub city.

4.2.2 Specific objectives

- To describe the demographic characteristics of the population in woreda13 Kolfe Keranejo sub city in 2008EC.
- To describe health delivery infrastructures and health delivery status in woreda13 Kolfe Keranejo sub city in 2008EC.
- To describe the health status of the population in woreda13 Kolfe Keranejo sub city in 2008EC, using health and health related indicators.

4.3. Methods

4.3.1. Study area and period

The study area was woreda13, Kolfe Keraneo sub city which is one of the ten sub cities in Addis Ababa, Ethiopia. To develop this profile cross sectional study was conducted in the study period from September 18, 2007EC up to August 4, 2008EC. The data collection was done from July21, 2009EC to August 01, 2009EC.

4.3.2. Data Source

To develop this profile data was collected and reviewed from the following sources

- Woreda13 Kolfe Keraneo Sub City Health Office HMIS report.
- Woreda13 Kolfe Keraneo Sub City Education office.
- Woreda13 Kolfe Keraneo Sub City Bureau of Finance and Economic Development.
- Review of studies conducted in Kolfe Keraneo Sub City and Addis Ababa.

4.3.3. Data collection

The health profile assessment was prepared by using health profile assessment tool prepared by EFETP having mixed method data collection approach that includes informant interview, and check list for secondary data.

4.3.4. Standard Definitions

1. **Contraceptive acceptance rate (CAR):** proportion of women of reproductive age (15-49 years) who are not pregnant who are accepting a modern contraceptive method (new and repeat acceptors).
2. **Antenatal care (ANC) coverage:** proportion of pregnant women attended, at least once during the current pregnancy, by a health professional, for reasons related to pregnancy.
3. **Abortion care:** number of safe abortion services provided as far as the law permits as a proportion of expected pregnancies.
4. **Stillbirth Rate:** proportion of stillbirths from total births attended by skilled health attendants.
5. **Early Neonatal Death Rate:** proportion of deaths within the first week of life from total births attended by skilled health attendants in the facility.
6. **PMTCT antenatal coverage:** proportion of pregnant women who attend a facility that provides PMTCT services for at least one ANC visit.
7. **Proportion of moderate/severe malnutrition:** percentage of weights reflecting moderate/severe malnutrition amongst weights-for-age recorded for children under3 years of age.
8. **Pentavalent third dose (DPT3-HepB3-Hib3) immunization coverage:** proportion of surviving infants who receive a third dose of pentavalent vaccine before their first birth day.
9. **Measles immunization coverage:** proportion of surviving infants who receive a dose of measles vaccine before their first birthday.

10. **Full immunization coverage:** proportion of surviving infants who receive all doses of infant antigens before their first birthday.

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

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

13. **Tuberculosis (TB) case detection rate:** number of new pulmonary and extra pulmonary (all forms) TB cases detected, among the TB cases estimated to occur countrywide

14. **PMTCT testing rate:** proportion of pregnant women who receive ANC at PMTCT site who receive testing for HIV

4.3.5. Data Management

Health related data collected from the above organizations was entered and analyzed using Microsoft excel 2007 software. The results are presented using tables, figures and charts.

4.3.6. Ethical consideration

A formal letter was submitted to the data manager at each source organizations in order to get access to the data. As this study used secondary data, consent and other ethical measures are not applicable.

4.3.7. Dissemination of the Results

The study result will be disseminated to stakeholders using a report and can also be presented in different review meetings. It will be also submitted to St. Paul's Hospital Millennium Medical College, Department of Public Health.

4.4. Result

4.4.1 Socio Demographic Overview of the woreda 13

Woreda 13 is one of the sub woredas of Kolfe Keraneo sub city of Addis Ababa. Every sub woredas are joined with each other by cobblestone and asphalt roads. The woreda 13 is connected with other woredas and the sub city offices with asphalt road and high way ring road. The main means of transportation of the woreda people is taxis/minibus/ and city bus. Woreda 13 has access to telecommunication, pipe water supply (weekly based) and electricity (with some interruptions) [2].

Map of kolfe keraniyo sub city by woreda

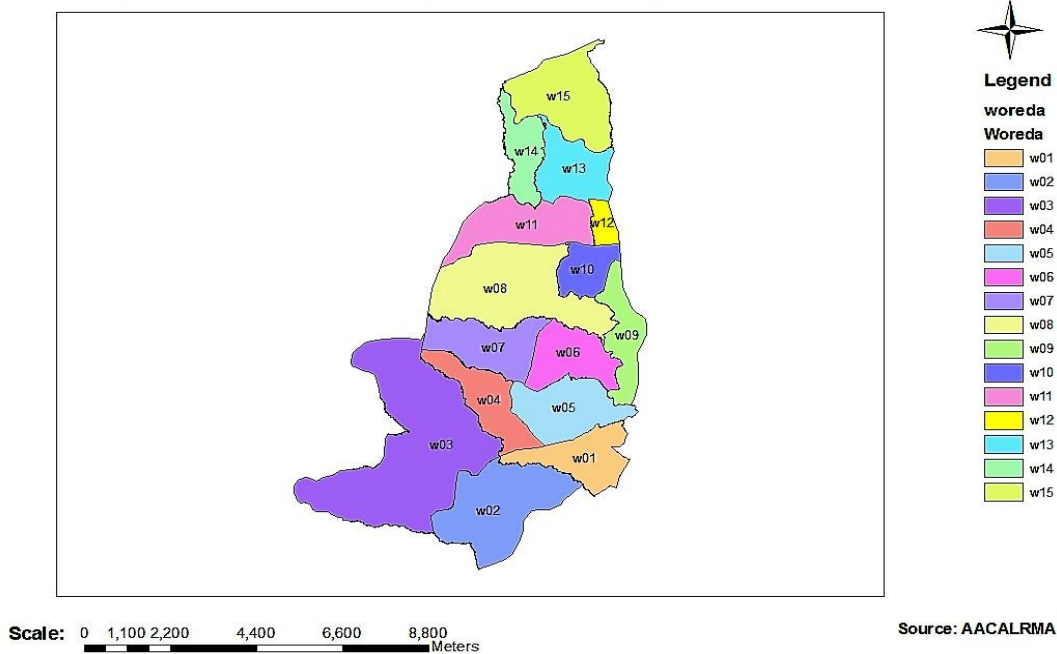


Figure 4.1: Map of Kolfe Keraniyo sub city woredas, Addis Ababa 2008 EC

4.4.1.1. Population

According to regional population projection the total population of the woreda 13 was 56,963 with 25,493(44.8%) male and 31,470 (55.2%) female. The male to female population ratio at the woreda was 0.8:1 [5].

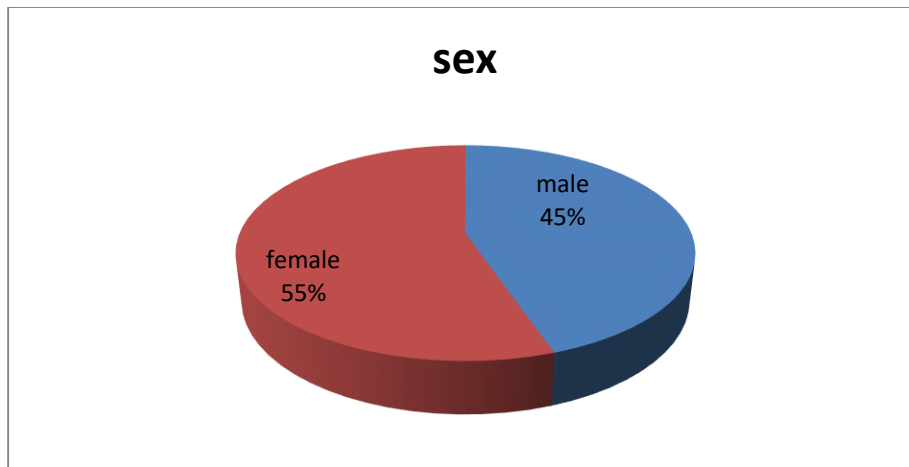


Figure 4.2: Population distribution by sex in Woreda 13, Kolfe Keraniyo sub city, Addis Ababa 2008 EC

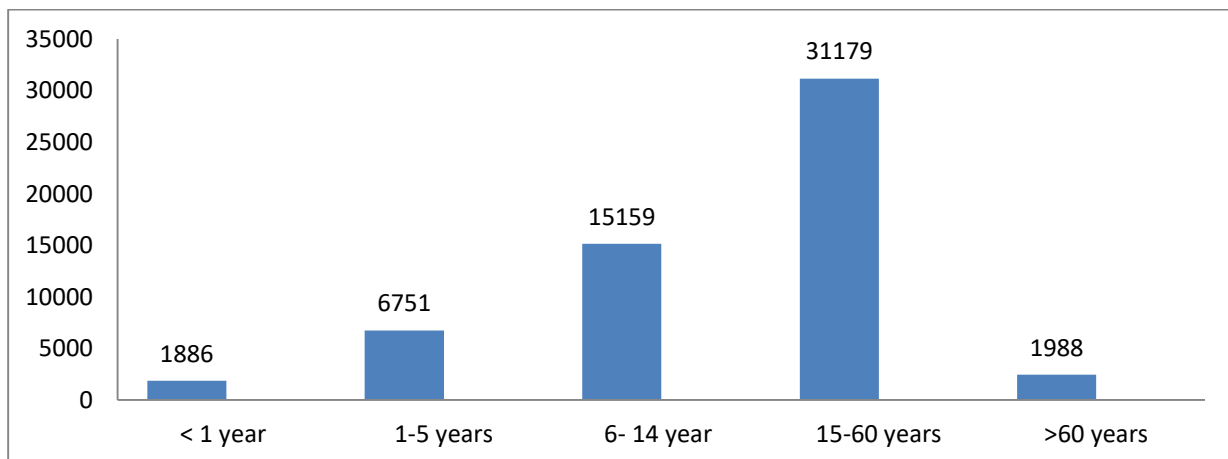


Figure 4.3: Population distribution by age group in Woreda 13, Kolfe Keraniyo, sub city, Addis Ababa 2008EC

4.4.1.2. Religion

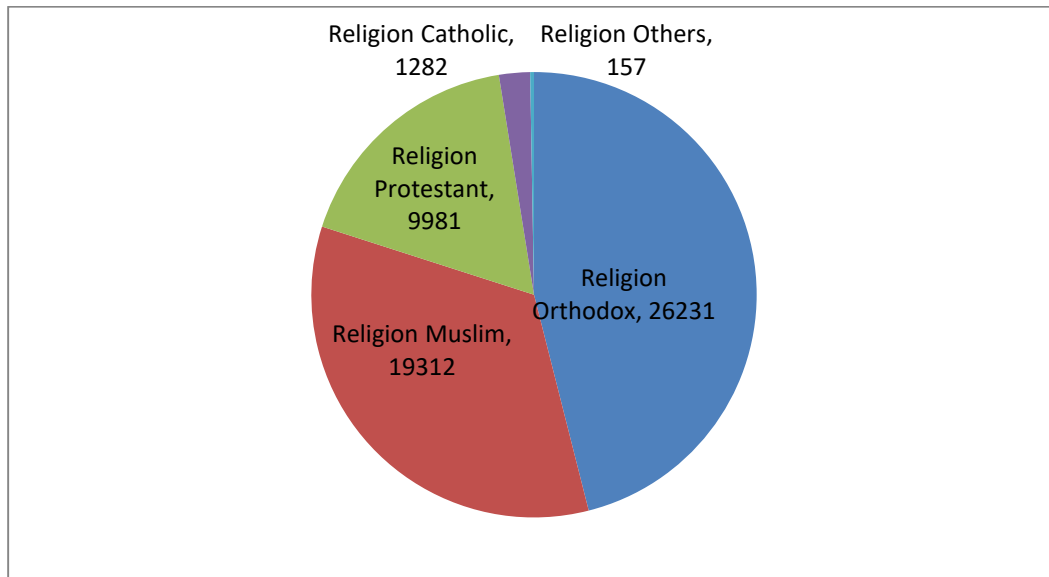


Figure 4.4: Percentage of religious organization in Kolfe Keraniyo sub city, Addis Ababa 2008 EC

4.4.1.3. Economic status/ occupational status

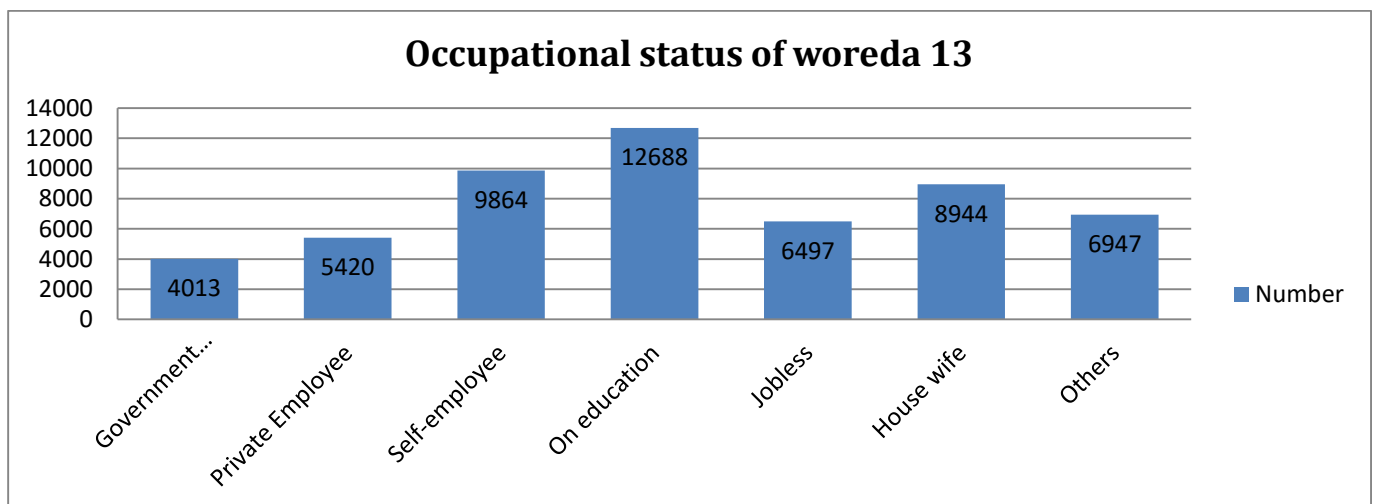


Figure 4.5: Occupational status of people in the woreda 13, Kolfe Keraniyo sub city , Addis Ababa 2008 EC

4.4.1.4. Educational Status

The woreda has a total of 29 schools, including 5 governmental and 24 private schools. The legal age of schooling in the woreda is 4 years for stage one kinder-Garten (KG) and seven years for primary school. Based on the woreda education office data there are 21 KG, 16 Primary and 4 secondary- preparatory schools in the woreda. A total of 11345 students attended their education with 5578 male and 5767 female students with only 1.2% dropout rate. The enrolment in KG 3443 (30.3%), primary school 4873 (43%) and (high and preparatory school) 3029 (26.7%) [9].

Table 4.1: Distribution of students by sex in woreda 13, Kolfe Keraniyo sub city, Addis Ababa 2008EC

Schools	Male	Female	Total
Government	1,597	1,957	3,554
Private	3,981	3,810	7,791
Total	5,578	5,767	11,345

4.4.2. Health Resource, Infrastructure and Utilization

4.4.2.1. Health facilities

The two health centers also give services to neighboring woreda's population; Kolfe health center with the total population of 61,214 and Lomi Meda Health Center with the total population of 36136. Among these health facilities two health centers (Kolfe Health Center and Lomi Meda Health Center) serve the woreda population by OPD, IPD in some extent, and provide services like routine Immunization, ART, TB, TB-HIV, ANC, delivery, PNC and the like. Kolfe Health Center has many years of experience in delivering health service and is currently collaborating with St Paul hospital millennium medical college to provide caesarian section for obstructed labor. The health center to population ratio in Kolfe HC is 1:61,214. The health center to population ratio in Lomi Meda HC is 1:36,136. There are 73 supportive staffs that contribute to the proper implementation of health delivery system at the health centers [1, 6, 7].

Table 4.2: Health facility distribution in woreda 13, Kolfe Keraniyo sub city, Addis Ababa 2008 EC

Health facility	Type	Number
Public	Hospital	0
	Health center	2
Private	Health post (urban)	1
	Medium clinics	9
	Primary clinic	0
	Pharmacies	10
	Drug stores	6

Table 4.3: Health centres human resource distribution by profession and educational level in woreda 13, Kolfe Keraniyo sub city, Addis Ababa 2008 EC

Health facility	GP	HO	Nurse		Midwives		Lab. workers		Pharmacy workers		Anesthetist diploma	HEW	Other staffs	Total
			Bsc	Diplom	Bsc	Diplom	Bsc	Diplom	Bsc	Diplom				
Kolfe Health Center	1	11	10	30	3	9	2	11	1	9	1	16	43	
Lomimed a Health center	0	12	6	28	2	9	1	5	1	5	0	12	30	
Total	1	23	16	58	5	18	3	16	2	14	1	28	73	258

Table 4.4: Private health facilities human resource distribution in woreda 13, Kolfe Keraniyo sub city, Addis Ababa 2008 EC

Se. No	Profession	Number in Woreda13	Professional to Population Ratio
1	GP	1	1:28,482
2	HO	8	1:1,726
3	Nurse BSC	3	
4	Clinical nurses	11	1:606
5	Lab. Technician	11	1:1,838
6	Pharmacist	12	
7	Pharmacy technician	21	1:3,351
Total		67	

4.4.2.2. Vital statistics

Table 4.5: Vital statistics of the woreda 13 , Kolfe Keraniyo sub city, Addis Ababa 2008 EC

Indicators	woreda13	National(EFY2008)
Child Mortality Rate (per 1000)	2	59
Crude Birth Rate (per 1000)	20.3	33.6
Maternal Mortality Ratio	0	267
Contraceptive acceptance rate	27	71
ANC rate (how many of the total expected pregnancies attended 1st ANC)	100	98.4
Percentage of deliveries attended by skilled birth attendants	88.2	72.7
ANC rate (how many of the total expected pregnancies attended 4th ANC)	65	76
Percentage of deliveries attended by HEWs	0	3.9
Age dependency ratio (%working age population)	69.4	---

Source: HSTP I Annual performance report EFY 2008

4.4.2.3. Child health

The total number of infants in the woreda was 1,886. The immunization records at the woreda health centers showed that (1,886 infants from woreda 13 and 1,251 infants from neighboring woreda) 3,137 children had received BCG vaccine, 1,949 children to OPV1, 1,733 to OPV3, 1,949 to penta1, 1,733 to penta3, 2,418 to rotarix1, 1,810 to rotarix2, 2,927 to PCV1, 1,730 to PCV3 and 1,725 to Measles and fully vaccination and 2,484 children were protected from tetanus at birth through their mothers who got two and more doses of tetanus toxoid vaccine during and before pregnancy [5]. The National figure of penta 1 to measles dropout rate was 9% [12].

Table 4.6: Vaccination status in woreda 13, Kolfe Keraneo Sub city, Addis Ababa 2008EC

Type of Vaccine	Vaccination Status			Dropout	Vaccine Coverage	National (EFY 2008)
	1st	2nd	3rd			
BCG	3137			---	166%	----
OPV	1949		1733	---	92%	----
Pentavalent	1949		1733	216	92%	97.6%
PCV	2927		1730	1197	92%	97.2%
Rotarix	2418	1810		608	95%	---
Measles	1725			224 (11.5%)	91%	94.3%
Full Immunization					91%	90.9%

4.4.2.4. Maternal Health

Table 4.7: Percentage of MCH activity in woreda 13, Kolfe Keraniyo sub city Addis Ababa 2008 EC

Indicator	Target	Achievement		National (EFY2008) %
		Number	%	
Number of ANC Cases Registered	1426	1932	>100	
Pregnant women received at least first antenatal care visit	1426	1816	>100	98.4
Pregnant women received antenatal care at least four visits	1426	926	65	76
Number of pregnant women tested for HIV	1426	1308	96.4	95
pregnant women positive for HIV	45	6	13.3	---
HIV positive pregnant women eligible for HAART	45	26	57.7	62.1
pregnant women tested for syphilis	1426	1816	>100	---
pregnant women provided at least TT2	1426	1179	98	---
Pregnant women provided iron foliate	1426	1548	>100	---
Post Natal Care visited	1426	1812	>100	89.3
Deliveries conducted by skilled attendants	1426	1484	100	72.7
Number of live births	1426	1480	100	---
Number of still births	0	4	0.2	1.1
Total obstetrics/Maternal/deaths	0	0	0	5
Total Newborn deaths	0	0	0	28
comprehensive abortion care services	---	230	---	---
Number of safe abortions performed	143	216	94	---
Number of post abortion/emergency care	---	14	---	---
FP service for abortion cases	100	230	>100	---

Source: woreda 13 health office

4.4.2.5. Family planning

Table 4.8: Family planning performance in woreda 13, Kolfe Keraniyo sub city , Addis Ababa 2008 EC

Methods	Target	Achievement		National (EFY2008) %
		Number	%	
Total FP methods	15904	4347	27.33	---
Oral contraceptives	---	400	---	15
Injectable	---	367	---	52
Condom distribution	---	481	---	---
Implants	3817	1935	50.7	25
IUCD	5725	1066	20.24	3
Permanent tuba ligation	---	5	---	---

4.4.3. General Disease Burden

In the 2008EC a total of 52,714 cases had been managed in the outpatient department of health centers which are found within the woreda. Out of those cases 43,237 (82.0%) were ≥ 5 years and 9,477 (18%) were under five. OPD visitors by gender includes 19,618 (45.4%) were male patients

4.4.3.1. Top ten causes of morbidity

Table 4.9: Top ten leading causes of all OPD visit in woreda 13, Kolfe Keraniyo sub city, Addis Ababa 2008 EC

S. No	Diagnosis	Number in woreda 13	Percent	Diagnosis (EFY2007)	Number Nationally	Percent
1	AURI	7029	25.48	Acute Febrile Illness (AFI)	3,181,813	15.95
2	UTI	2727	9.8	Acute upper respiratory infections	3,180,754	15.95
3	HTN and related diseases	2609	9.46	Pneumonia	2,904,406	14.56
4	Dyspepsia	2427	8.8	Diarrhea (non-bloody)	2,152,190	10.78
5	Diarrhea (non-bloody)	2398	8.69	Trauma (injury, fracture etc.)	1,662,865	8.33
6	Unspecified diseases	2251	8.16	Dyspepsia	1,627,482	8.15
7	AFI	2223	8.06	Urinary tract infection	1,471,078	7.37
8	Disease of musculoskeletal	2202	7.98	Helminthiasis	1,389,747	6.96
9	Pneumonia	1987	7.2	Infections of the skin and subcutaneous tissue	1,211,620	6
10	Skin Infections	1728	6.27	Malaria (confirmed with P. falciparum)	1,165,843	5.8

Table 4.10: Top ten leading causes of OPD visit for females in woreda 13, Kolfe Keraniyo sub city , Addis Ababa 2008 EC

S.No	Diagnosis	Cases in woreda 13	percent	Diagnosis	Cases Nationally(EFY2007)	Percent
1	AURI	3497	24	Acute Febrile Illness (AFI)	1,552,622	16
2	UTI	1934	13	AURI	1,551,262	16
3	Dyspepsia	1553	11	Pneumonia	1,341,012	13.8
4	Musculoskeletal system diseases	1377	9	Diarrhea (non-bloody)	983,920	10.2
5	AFI	1341	9	Dyspepsia	980,658	10
6	HTN and related diseases	1304	9	UTI	888,385	9
7	Diarrhea (non-bloody)	1135	8	Helminthiasis	655,550	6.8
8	Skin Infections	866	6	Trauma (injury, fracture etc.)	578,932	6
9	Pneumonia	849	6	Diseases of the musculoskeletal system and connective tissue	571,257	5.9
10	Diabetes mellitus	809	5	Infections of the skin and subcutaneous tissue	564,259	5.8
	Total		100		9,667,857	100

Source: woreda 13 health office

Table 4.11: Top ten causes of OPD visits for children <5 years of age in woreda 13 , Kolfe Keraniyo sub city , Addis Ababa 2008 EC

S.No	Diagnosis	Number of cases woreda13	percent	Diagnosis	NO. of cases nationally (EFY 2007)	%
1	AURI	3385	37	Diarrhea (non - bloody, with dehydration, with blood)	1629673	30
2	Unspecified diseases	1563	17	pneumonia	1260430	23
3	Pneumonia	1539	17	Acute upper respiratory infection	897210	16
4	Diarrhea (non-bloody)	1126	12	Acute febrile illness	482860	9
5	Skin infections	687	8	Malaria (Confirmed with p.falciparum, confirmed with species other than P. falciparum, clinical without laboratory confirmation)	338874	6
6	Eye diseases	261	3	Infection of the skin and subcutaneous tissue	272489	5
7	Helminthiasis	224	2	Helminthiasis	223225	4
8	MAM	141	2	Other or unspecified disease of the eye and adnexa (other than cataract and glaucoma or for which cause cannot be specified)	152253	3
9	Diarrhea with blood(dysentery)	131	1	Otitis	108724	2
10	Diarrhea with dehydration	124	1	Trauma (injury, fracture etc.)	88825	2
	Total		100		5454563	100

Source: woreda 13 health office

4.4.3.2. TB and HIV

Table 4.12: Activities performed in TB-HIV diagnosis and treatment in woreda 13, Kolfe Keraniyo sub city , Addis Ababa 2008 EC

Activities	Woreda13 target	Achievement	%
TB patients screened for HIV	122	89	73
TB patients tested positive for HIV	58	16	27
TB-HIV co-infected Patients initiated CPT	16	16	100
TB-HIV co-infected Patients initiated HAART	16	16	100

Source: woreda 13 health office

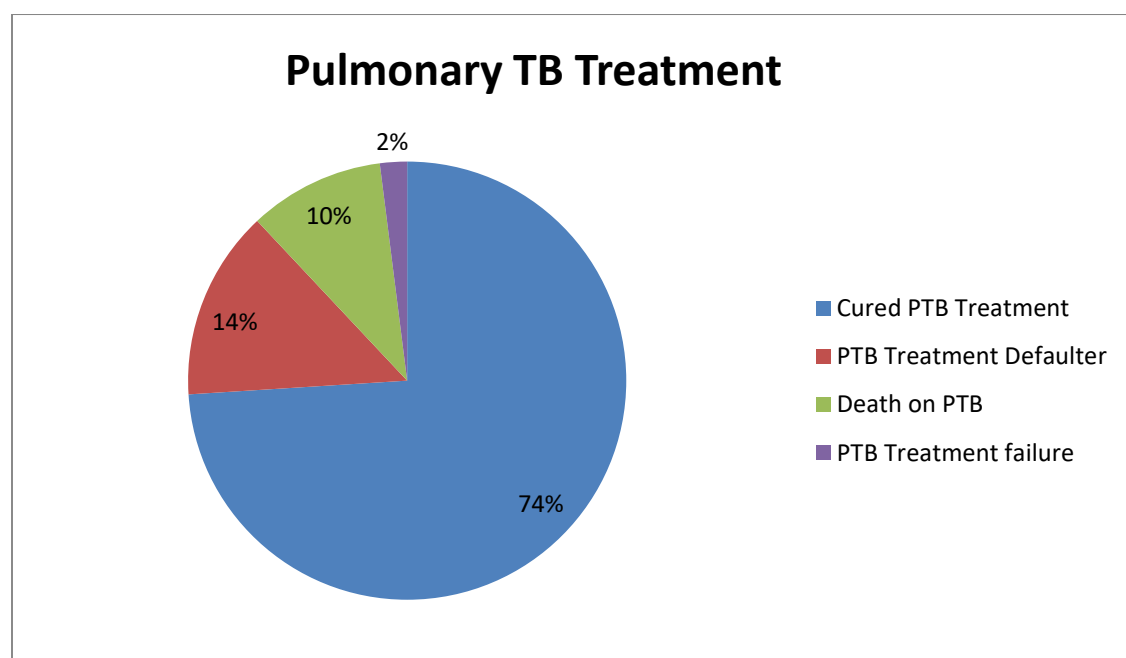


Figure 4.6: Proportion of Pulmonary TB treatment outcome in woreda 13, Kolfe Keraniyo sub city, Addis Ababa 2008 EC

Table 4.14: Distribution of new TB cases and treatment outcome in woreda 13, Kolfe Keraniyo sub city, Addis Ababa 2008 EC

Area	Number of new TB cases detected(all forms)	Number of bacteriological confirmed TB cases cured	Number of bacteriological confirmed TB case completed treatment	Case Detection Rate	Treatment success rate	Cure rate
Woreda 13	122	37	111	77.2%	61%	84%
National (EFY2008)	125,801	---	42,772	61%	92.2%	81.2%

Source: woreda 13 health office

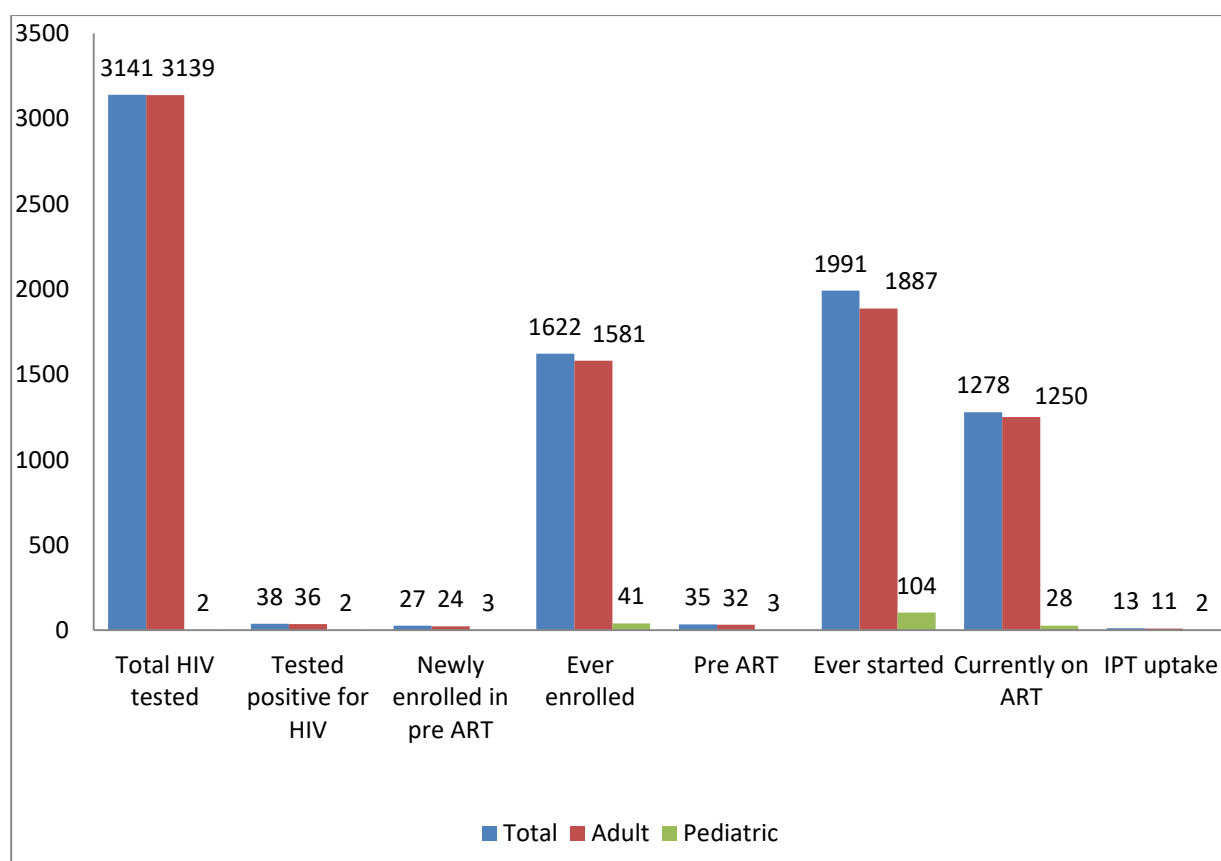


Figure 4.7: The distribution of HIV/AIDS status and ART by age in woreda 13, Kolfe Keraniyo sub city , Addis Ababa 2008 EC

4.4.3.3. Nutrition

There were a total of 25 severely malnourished children enrolled as Out Patient Therapeutic Program (OTP) in Kolfe Health Centers. Among those admitted children 20 (80%) were recovered and the rest 5 (20%) were defaulted [5].

Table 4.15: Activity plan and performance for under five children in woreda 13, Kolfe Keraniyo sub city , Addis Ababa 2008 EC

Activity	Plan	Performance	Woreda 13 (%)	National (%)
children screened for malnutrition	2522	3466	72.2	---
Number of admission for severe malnutrition	62	25	40.3	---
Number of children recovered	62	20	80	90
Number of children defaulted	0	5	20	1.7
Number of children died	0	0	0	0.2

4.4.4. Hygiene and Sanitation

4.4.4.1. Community Health Services

There are 28 UHEWs and 3 supervisors, and around 2480 model households. They introduced 15 health packages already designed by Addis Ababa City Administration for urban dwellers to the community. Urban health extension workers have responsibility to educate and demonstrate the residents of the woreda about these health packages thoroughly. Some of the major activities of UHEWs are: provision of health education about prevention of communicable and non-communicable diseases, how to manage solid and liquid wastes, how to handle personal, household and surrounding hygiene; assisting and facilitating mothers and care givers to take their children to the health institutions for vaccination; assisting and facilitating pregnant mothers to attend and get ANC, delivery and PNC service in the health facilities; screening and referring malnourished and any health conditions to the health facility; training model households and networking them to other community members; collecting and recording the health profile of the community [11].

4.4.4.2. Environmental Health and Sanitation

There were around 48 road cleaners, 78 household solid waste collectors and 8 management officers assigned in the woreda. The woreda solid waste management office designed one group of household solid waste collectors to serve 900 to 1000 households at least two times per week using three compactors in the sub city to load and reload the waste from the container sites. According to the office information, the woreda waste disposal activity was delayed 2 to 3 weeks until loading and reloading. The delayed waste disposal activity made delayed solid waste collection from households, facilitated to accumulate harmful pathogenic microorganism and created offensive bad odors around the area of solid waste containers [10].

Table 4.16: Liquid and solid waste management and housing situation in woreda 13, Kolfe Keraniyo sub city, Addis Ababa 2008 EC

Facilities	satisfactory	Not satisfactory	Total
Private latrine	8457	1334	9791
Communal latrine	1551	2145	3696
Households who have private bathing room	4865	5896	10761
Households who have communal bathing room	954	2664	3618
Households with liquid waste disposal	7443	2818	10261
Households with solid waste disposal	11696	913	12609
Households having light	12004	1239	13243
Households having ventilation	12172	1086	13258
Number of households used Open field defecation			10

Source: Woreda 13 solid waste management office

4.5. Discussion

Based on Ethiopia federal ministry of health standard the health center to population ratio is 1:28,482 this implies that woreda health coverage system is 100%. Woreda 13 health centers gave services for woreda 13 population of total population 61,251 which adds the neighboring woreda residents. In terms of professional allocation 1:28,482 for Doctors, 1: 1,726 for Health officers, 1:606 for Nurses, 1: 1,838 for Lab. Workers, 1: 3,351 for Pharmacists which seems more or less comparable with city Administration plan [5].

Ethiopia is a country of diversified multi ethnics, religious and cultural groups. Woreda 13 in Kolfe Keraneo sub city is one of the residential areas of these diversified people. Available data showed that Ethiopian Orthodox is the dominant religion with the 46%, followed by Muslim religion which accounts around 33.9%, and Protestant represents 17.5%. When we see the age and sex distribution of woreda 13 most the population is between 15-60 years of age. The male population accounts 45% of the total population which is different from the national figure 49.91% [5].

The main economic source of the population was small scale trade and other businesses. The small scale business includes restaurant, grocery, bar, coffee and tea shops, shop (kiosk), wood and metal works, beauty and cosmetic salon, etc. The income status of the community depends on one's economic involvement in different work fields [2].

Education is the primary source of knowledge and has a direct influence on health in the prevention of disease and risk reduction. The enrollment status indicates that more students are female than male, there are 5578 male and 5767 female students with only a 1.2% dropout rate. Woreda 13 is doing well in reduction of maternal mortality which is zero and child mortality rate was two per 1000 which was very low compared with national figure 59 per 1000. In addition, the woreda contraceptive acceptance rate is very low (27%) compared with 71% nationally and delivery attended by skilled birth attendant (88.2%) which is comparable to the coverage of the sub city (89%) but fare better than the national figure (72.7%). Percentage of post abortion FP service is 100% and it is one of the strongest activities in the woreda [5, 9].

Improving child health is one of the national strategies and in 2020 Ethiopia targets to reduce under five mortality rates from 64 to 30 per 1,000 live births, infant mortality rate from 44 to 20 per 1,000 live births and neonatal mortality rate from 28 to 10 per 1000 live birth [12]. There are many national and sub national strategies designed by FMOH collaborating with international and national partners. Among these strategies are improving routine immunization, effective management of under-five diarrheal diseases and pneumonia, and screening and management of malnutrition. Improving coverage of routine immunizations plays key role in reducing under five-year mortality. Currently, Ethiopia is providing ten antigens and vaccines as part of routine childhood immunization throughout the country. These ten antigens and vaccines include BCG, Oral Polio Vaccine (OPV), pentavalent vaccine (Diphtheria Pertussi Tetanus (DPT) + Hep-B and Hib), Pneumococcal vaccine (PCV), Rotavirus vaccine (Rotarix) and Measles. Recently Inactivated Polio Vaccine (IPV) has also been added. The full immunization coverage based on the woreda target was 91% which is higher than the national figure (90.9%) [12]. The dropout rate of penta1 to penta 3 is 11% and penta1 to Measles 11.5% which is higher than then national figure (9%). Antenatal care coverage of at least one visit is 100% in 2008EC. Proportion of women having an ANC visit for the fourth time is 65% which is low compared to the sub city target (100%) for that year and nationally (76%) [5]. ANC fourth visit, skilled attendant delivery and still birth measure the quality of maternal health services so that this need improvement. The service

provision method and customer handling practice are key area to improve maternal health services and child health services. So it needs continuous monitoring and supportive supervision from sub city health office, Health education and strong defaulter tracing by health extension workers.

Upper respiratory tract infection is the leading causes OPD visits for both adults and children. As we know diarrheal and pneumonia diseases were the leading cause of morbidity and mortality in under five children nationwide up to recent years. Data from the health centers showed that percentage of outpatient visits for diarrheal disease was 2.1% and for pneumonia cases was 2.9%. Reduction in the incidence of these diseases could be the result of introduction of Rotavirus vaccine and PCV [5].

Our country Ethiopia is among top ten TB burden countries in Africa. Data showed in the woreda that still there is significant number of TB cases circulating in the community. When we see TB detection rate it is 77.2% in the woreda better than the national detection rate (61%) despite good case detection rate the treatment success rate is 61% which is less than the national figure 92.2%. a lot has to be done in awareness creation and direct observation therapy services [5].

Effective screening and management of TB-HIV co-infection is basic strategy to reduce the TB mortality rate. Proportion of TB patients screened for HIV is 73% below the sub city target (100%). Initiation of cotrimoxazole prophylaxis therapy and antiretroviral treatment for TB-HIV co-infected patients is 100%. The woreda had low achievement in INH uptake for newly enrolled HIV patients (22%) [5].

Health services integration with the community is vital to diseases prevention and health promotion as well as services expansion and quality assurance. To facilitate this integration, organizing the women development army and strengthening 1 to 5 networking system is a key factor in government health policy [8]. Urban health extension workers have a key role in the community both in health service integration and awareness creation within the community. In addition, clean environment is vital to reduce diseases causing pathogens and to improve the overall health of the community. Woreda 13 solid waste management office tried to accomplish the objective of the City Administration by strengthening human resources, availing solid waste containers and managing waste disposal activities. There was no reflective tangible data about liquid waste management in the woreda. There are still open defecation habits in some households in the woreda.

4.6. Major challenges and gaps of health service

The following were some of the major challenges and gaps in health services and outcomes identified by our analysis:

- There is no liquid waste disposal system (sewerage line) in the woreda
- Low percentage of pregnant women for fourth ANC visit relative to first visit and very low contraceptive acceptance rate
- Low number of pregnant women tested for HIV
- Weak TB-HIV activities and low coverage of INH prophylaxis
- Data discrepancy between health centers annual report and HMIS
- Lack of organized and standardized data in the woreda
- Lack of mortality data from the Health Centers and the Woreda Health Office

4.7. Conclusion

Most of the socio economical aspect of the woreda13 is (in terms of educational, safe water and Economical status) in similar with other woredas within Addis Ababa and it is the reflection of the current city status. The result in the immunization program showed that it had gaps and children are still at high risk of acquiring infectious diseases like Measles infection. Upper respiratory tract infection was the leading causes of outpatient department visit for both adults and children. An emerging new infectious pathogen or re-emergence of existing infectious pathogen could be the possible source of this problem. The overall data management (including data collection and documentation) needs much improvement in all sector offices of the woreda.

4.8. Recommendation

Based on the above result the following points are recommended regarding the health status in woreda13, Kolfe Keraneo Sub City;

- The woreda 13 environmental sanitation bureau in collaboration with woreda 13 health offices they should construct liquid waste disposal system.
- Observing lack of hospital services and a relatively high outpatient load construction of hospital by government or in partnership with the private sectors is recommended
- The sub city should study the reasons for its lower maternal and child health indicators so as to devise a way for improvement
- Since Acute Upper Respiratory Tract Infection is the leading health problem health education on prevention and control of respiratory disease, hygiene and sanitation practices should be provided to the community in woreda 13 through health facilities and health extension professionals.
- Health professional working in health facilities residing in woreda13 Kolfe Keraneo Sub City should provide a continuous follow up, tracing mechanism and encouragement to HIV positive mothers identified at ANC services to deliver their babies at health facilities so as to prevent mother to child transmission of HIV and they should strive to create conducive environment for mothers and their children so as to fill the gaps that are noticed in the EPI program.
- Addis Ababa city administration health office and Kolfe Keraneo sub city health office, HMIS department should give a continuous mentorship and supervision to improve data quality at woreda and also should start implementation of HMIS in private health facilities of Addis Ababa, since a significant part of the population receives services from this facility.
- Data about mortality was not available and this has to improve. In addition, recording reporting from different health institution that are providing health service should be clear and complete.

4.9. References

- 1.** Health, R.o.R.M.o., the District Health System Re-Organization Guideline from a Managerial Perspective. June 2011.
- 2.** Addis Ababa City Administration, Bureau of Finance and Economic Development, Socio Economic Profile of Addis Ababa, 2011
- 3.** <http://www.aacc.gov.et/>, accessed on June 16,2017
- 4.** Health and Health Related Indicators Report, FMOH/PPD, 2007 E.C
- 5.** Kolfe Keraneo Sub-City health office annual service, OPD and IPD HMIS report
- 6.** Woreda 13 vital statistics registration office
- 7.** Woreda 13 FMHACA office
- 8.** Woreda 13 Human Resource and Capacity Building Office
- 9.** Woreda 13 Education Office
- 10.** Woreda 13 solid waste management office
- 11.** Woreda 13 health office UHEWs Profile
- 12.** The Federal Democratic Republic of Ethiopia Ministry of Health; Health Sector Transformation Plan, 2015/16 - 2019/20, October 2015

4.10. Annexes

Checklist for Health Profile Assessment of woreda 13 Kolfe Keraneo Sub City in 2008 E.C

Address: Woreda13 Kolfe Keraneo

Date of report

1. Demography and Vital Statistics

1.1. Total Population in the woreda13 kolefekeraneo Sub City

1.2. Total Male Population

1.3. Total Female Population

1.4. Total under five children in the Sub City woreda13

1.5. Total Women of reproductive age group

1.6. Average house hold size

1.7. Total new life birth in the year

1.8 Total mortalities in the year

2. Health Resource, Infrastructure and Utilization

2.1 Health professional ratio to population

Health Professionals

Number

Ratio per total population

General Practitioner

Specialist

Health Officer

Pharmacist

Pharmacy Technician

Nurse (B.Sc)

Nurse (Diploma)

Midwives (Diploma+BSC)

All Other Nurses

Lab.Technologist		
Lab Technician		
Radiographer		
X-Ray Technician		

Environmental (Diploma+BSC)	Health		
--------------------------------	--------	--	--

- 2.2 Total number of health centers _____
- 2.3 Total number of public General Hospital _____
- 2.4 Total number of public referral Hospitals _____
- 2.5. Total number of private clinics _____
- 2.6. Total number of private hospitals _____
- 2.7. Total number of Ambulances _____
- 2.8. Total number of Primary schools _____
- 2.9. Total number of Secondary schools _____
- 2.10. Outpatient attendance per capital _____
- 2.11. Rate of referral _____
- 2.12. Bed occupancy rates of hospitals in the sub city _____
- 2.13. Total budget of the sub city _____
- 2.14. Total budget of the health office _____

3. Maternal Health

- 3.1. Total number of expected pregnancies in the year _____
- 3.2. Contraceptive prevalence rate _____
- 3.3. Contraceptive acceptance rate _____
- 3.4. General fertility rate _____
- 3.5. Antenatal care coverage (4 rounds) _____
- 3.6. Proportion of deliveries attended by skilled professional _____
- 3.7. Caesarian section rate _____
- 3.8. Institutional maternal mortality rate _____
- 3.9. Total maternal mortality rate _____
- 3.10 Still birth rate _____
- 3.11. Postnatal care coverage _____
- 3.12. Top three causes of maternal death in the woreda (if available) _____

4. Child Health

- 4.1. Proportion of low birth weight _____
- 4.2. Proportion of moderate/severe malnutrition children _____
- 4.3. Pentavalent first dose (DPT1-HepB1-Hib1) immunization coverage _____
- 4.4. Pentavalent third dose (DPT3-HepB3-Hib3) immunization coverage _____
- 4.5. Measles immunization coverage _____
- 4.6. Full immunization coverage _____
- 4.7. Primary school coverage _____
- 4.8. Primary school completion rate _____
- 4.9. Top 10 causes of under-five morbidity and mortality

S.No	Top 10 causes of under-five morbidity	Top 10 causes of under-five mortality
------	---------------------------------------	---------------------------------------

- 1
- 2
- 3
- 4

- 5
- 6
- 7
- 8
- 9
- 10
- 4.10. Neonatal Mortality rate _____
- 4.11. Infant mortality rate _____
- 4.12. Child mortality rate _____

5. General Diseases Burden and Distribution

5.1. Top 10 causes of morbidity

S.No	Top 10 causes of morbidity in the general population	Top 10 causes of morbidity in female population
------	--	---

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

5.2. Top 10 causes of mortality

S.No	Top 10 causes of mortality in the general population	Top 10 causes of mortality in female population
------	--	---

1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

5.3. Top 3 Weekly IDSR reported diseases in the year

S.No	Reported IDSR disease	Total Number
------	-----------------------	--------------

1		
2		
3		

5.4. Number and cases of any report of immediately reportable diseases in the year_____

5.5 TB and HIV

5.5.1. Number of new TB cases (all forms) _____

5.5.2. TB Case detection rate _____

5.5.3. Health Facilities Providing VCT Services _____

5.5.4. Health Facilities Providing PMTCT Services _____

5.5.5. PMTCT testing rate _____

5.5.6. Health Facilities Providing ART Service _____

5.5.7. Cumulative ART care enrollment rate _____

5.5.8. Number of new HIV cases _____

6. Hygiene and Sanitation

6.1. Proportion of households with access of any kind of latrine _____

6.2. Proportion of households using an improved water source _____

6.3. Proportion of open defecation free kebeles _____

Chapter V – Scientific Manuscripts for Peer reviewed Journals

Abstract

5.1. Trends in Non-Neonatal Tetanus Morbidity and Mortality, Ethiopia- September 2012-August 2016

Background: Tetanus is a vaccine-preventable disease with high morbidity and mortality in developing countries. In 2015, an estimated 209,000 tetanus infections with 59,000 deaths occurred globally. Although infants in Ethiopia are routinely vaccinated against tetanus, booster doses of vaccine needed to provide lifelong protection are only provided to pregnant women and women of childbearing age to prevent neonatal tetanus. Ethiopia eliminated neonatal tetanus in 2017, but cases of tetanus still occur in other age groups. Our analysis aimed to highlight the magnitude of tetanus in Ethiopia over the past five years to inform policymakers and stakeholders.

Methods: We conducted a retrospective analysis of nationwide reports of inpatients and outpatients diagnosed with tetanus from the Health Management Information System from September 11, 2012 to August 28, 2016. Neonatal tetanus was not included. Incidence, case fatality and mortality rates were calculated by using Epi Info 7.2.1.

Results: A total of 30,625 tetanus patients were registered; 26,903(88%) were outpatients, 15,255(49.8%) were male, and 16,101 (52.5%) were ≥ 15 years. The largest number of patients was reported in 2013(16,242, 53%). Incidence per 100,000 was (6.86) 2012, (19.1)2013, (2.88) 2014, (4.61)2015, (2.56) 2016. Overall incidence of tetanus was 7.2 per 100,000, with Afar Region being the most-affected (95.2 per 100,000). The national case-fatality rate was 3.8%. The mean annual tetanus mortality rate was 0.15 per 100,000. Among 669 deaths, 482(72%) were males. The annual mortality rate was the highest in Southern Nation Nationalities and Peoples Region (0.56 per 100,000).

Conclusion: Although the control and prevention of tetanus is on the right track, morbidity and mortality due to tetanus remains significant with thousands of cases and hundreds of deaths reported every year.

Key words: Tetanus, Trends, Morbidity, Mortality, Ethiopia

5.1. Introduction

Malaria is a life-threatening disease affecting the world's most under-developed countries and regions where basic healthcare infrastructure is lacking as well some developed countries. It is a major cause of morbidity and mortality in Africa, especially in sub-Saharan African countries [1]. Malaria is known to kill one child every 30 seconds, 3000 under five children per day [2]. In 2017 the region was home to 92% of malaria cases and 93% of malaria deaths and only five countries accounted for nearly half of all malaria cases worldwide [3].

Malaria is a major public health problem in Ethiopia despite relatively low malaria prevalence compared to most other malaria-endemic countries in Africa [4]. Unstable malaria transmission patterns make Ethiopia prone to focal and multifocal epidemics that have on occasion caused catastrophic public health emergencies. Even though three-fourth of the country's land with altitude of below 2000 meters above sea level is known as malarial, the cases are also increasing in the areas with above 2000 meters [5]. *Plasmodium Falciparum* and *Plasmodium Vivax* are the most dominant malaria parasites in Ethiopia. They are prevalent in all malarious areas in the country with *P. falciparum* (PF) representing about two-thirds to three-quarters of the cases. The major malaria vector incriminated in Ethiopia is *Anopheles arabiensis*; in some areas *A. pharoensis*, *A. funestus* and *A. nili* also transmit malaria [6].

Apart from being a major public health problem, the disease has also been identified as a potential impediment to the development of water harvesting, irrigation for agriculture and settlement in fertile underutilized low land areas with potential to enable the country achieve food security and improved household income [5]. Over the last decade, the burden of malaria has declined significantly due to improved coverage of

high impact interventions [7]. Due to Ethiopia's complex topography and seasonal rainfall support largely seasonal short-term transmission, malaria is generally unstable that put the population non-immune [8].

Generally, malaria cases are peaked after two rainy season (March – May and July-September). The country has experienced the worst malaria epidemics in 1958 with three million cases and 150,000 deaths [9].

The Afar Region is characterized by the lowland areas (≤ 1500 m altitude) with hot or warm climate. Malaria transmission in the region is perennial due to the availability of large perennial river bodies and hot climate favoring the transmission throughout the year, with seasonal peak extending from August to December [10, 11]. The region is also prone to natural disasters such as droughts and floods and these have in the past contributed to increased malaria transmission, particularly along the banks of Awash River [12]. *Plasmodium Falciparum* (about 65%) and *Plasmodium vivax* (about 35%) are the two dominant malaria parasites prevailing in the region [13]. Zone 3 is among 5 zones of the Afar region and experienced malaria epidemic during the past decades. Indoor residual spray was not conducted since 2016 in the woreda. This study is done to investigate and identify factors associated with the malaria outbreak that was reported by the health facilities and NGOs to the Awash Fentale woreda health office at WHO Epidemiological week 37 in 2018.

5.2. Methods and Materials

5.2.1. Study Area and Population

The study was conducted in Awash Fentale woreda, Zone 3, Afar region. Awash Fentale woreda located in the southern part of Afar region and it is 217Km from Addis Ababa. According to 2007 Population Census, Awash Fentale Woreda of zone 3 has a total population of 29,775 of which 15,471 are males and 14,304 females. There are 2 Health

Centers and 11 Health Posts found in the woreda [17].

5.2.2. Case Definitions

5.2.2.1. Community Case Definition

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

5.2.2.2. Standard Case Definition for Suspected Case

Any person with fever OR fever with headache, back pain, chills, rigor, sweating, muscle pain, nausea and vomiting diagnosed clinically as malaria Confirmed Case: suspected case confirmed by microscopy or RDT.

5.2.3. Study period

The investigation was conducted from September 28 to October 5, 2018.

5.2.4. Study Design

We conducted a descriptive study followed by unmatched case-control study in ratio 1:2 (52 cases and 104 controls).

5.2.5. Sampling techniques and procedures

Sample size was calculated Epi-info 7 StatCalc function for unmatched case control study. Sampling frame was created, which means for cases from the collected line list names of all malaria cases who were identified in the last 3 weeks and for controls from neighbors of selected cases who did not develop malaria for the last three months. We assigned a number to each of the names of malaria cases in the sampling frame (line list of the cases). This was done using a Microsoft excel sheet. By systematic random sampling we selected 52 cases and these selected cases were divided for five data collectors and they took the list of cases each data collectors with one community member and went in to the kebeles and through house to house searching they recruit the samples into the study.

5.2.6. Data collection method

The investigation was conducted through house-to-house searching for case in kebeles. We used semi-structured questionnaires which adopted and modified from previously investigated outbreak. We interviewed cases and controls, and collected the data. Data was collected by principal investigator, one district PHEM officer, and three health center worker. Orientation was given for data collectors on the questionnaire. When entering the data in to the computer the missing variables and consistency of filling of questionnaires and completeness of data checked out carefully.

5.2.7. Data entry and Analysis

Data was checked, entered and analyzed on computer using MS- Excel 2016 and SPSS statistics version 24 were used. We also used MS-Excel 2016 for sampling technique and procedures, and descriptive analysis, Arc GIS for mapping of study areas. Descriptive and advanced statically analyses were under taken. Due to absence of the previous complete five years data, previous year weekly malaria data was used to set epidemic threshold level by doubling weekly data and comparing with similar week of this year. During this outbreak investigation, number of malaria cases and deaths were collected from health facilities in daily and weekly basis. Magnitude of this outbreak was described by age, sex, kebele and month. Similarly, slide positivity rate was calculated as those positive for malaria among total examined. Bivariate and Multi variable Logistic regression analysis was conducted to find association of diseases with risk factors were measured and tested using OR (Crude and Adjusted), 95% Confidence Interval and P-value.

5.2.8. Laboratory Method

Laboratory technicians conducts thick and thin smears with a 100× oil immersion microscopy at two health centers of this Woreda. Health extension workers identified confirmed malaria cases by RDT at health

post and community level during outbreak investigation.

5.2.9. Environmental Assessment

The environmental assessment was conducted in Bolyeta, Sabure and Kebena kebeles. The three kebeles were selected because this kebeles are neighbors for the sugarcane farm which is cultivated by Awash river irrigation project of the Kesem Sugar factory. The principal investigator, woreda malaria focal and clinical advisor of PMI project visited the selected kebeles and observed for the presence of mosquito larvae by their naked eyes in stagnant water bodies located in 200meters radius of the human settlement and water reservoirs (deep walls) and household water containers.

5.3. Results

5.3.1. Laboratory

From July to October 2018, a total of 4,572 blood smear tests was done by Microscopy and RDT for suspected malaria cases at all health facilities of Awash Fentale Woreda of which 2,395 were positive. Of the positive cases, 1,807 (75%) were positive for P. Falciparum, 553 (23%) were P. Vivax and 35 (2%) were mixed malaria.

Table 5.2: Malaria attack rate per 1000 and Case Fatality Ratio by age and sex, Awash Fentale Woreda, Zone 3, Afar, Ethiopia, 2018

Variables		population	# of Case	# of Death	Attack rate/1000	Case Fatality rate(%)
Age	0-4	9,560	240	0	24	0
	>4	20,215	2,155	0	106	0
Sex	Male	15,471	1,362	0	88	0
	Female	14,304	1,033	0	72	0
Total		29,775	2,395	0	80	0

5.3.2. Descriptive Epidemiology

A total of 2,395 (Attack Rate = 80 per 1000) confirmed malaria cases were reported from Awash Fentale Woreda of Zone 3 from July to October 2018 (Table 5.1). No deaths were reported from the woreda during this period. Slide positivity rate of the disease during this

outbreak was 52 %. The outbreak was detected in mid-September of 2018. However, weekly reported malaria cases were crossed the epidemic threshold level in WHO Epidemiologic week 30 of July 2018 a total of 35 cases were reported for a threshold of 24 cases. The highest Plasmodium Falciparum cases were on September 2018 which was 1031(57%) the least being on July 2018 which was 82(5%).

Table 5.1: Confirmed Malaria cases by months (July-October), In Awash Fentale Woreda, Zone 3, Afar, Ethiopia, 2018

Species	Months			
	July	Aug	Sep	Oct
PF	82	478	1,031	215
PV	24	103	398	29
Mixed	0	6	23	6
Total	106	587	1452	250

Age five years and older were more affected with attack rate of 106 per 1000 population (Table 5.2). Similarly, malaria attack rate was higher in male (88 per 1000 population) than female in Awash Fentale woreda, 2018. Among a total of 2,395 malaria cases, 1,528 (63.8%) were confirmed at Health Centers and 867 (36.2%) were at Health Posts.

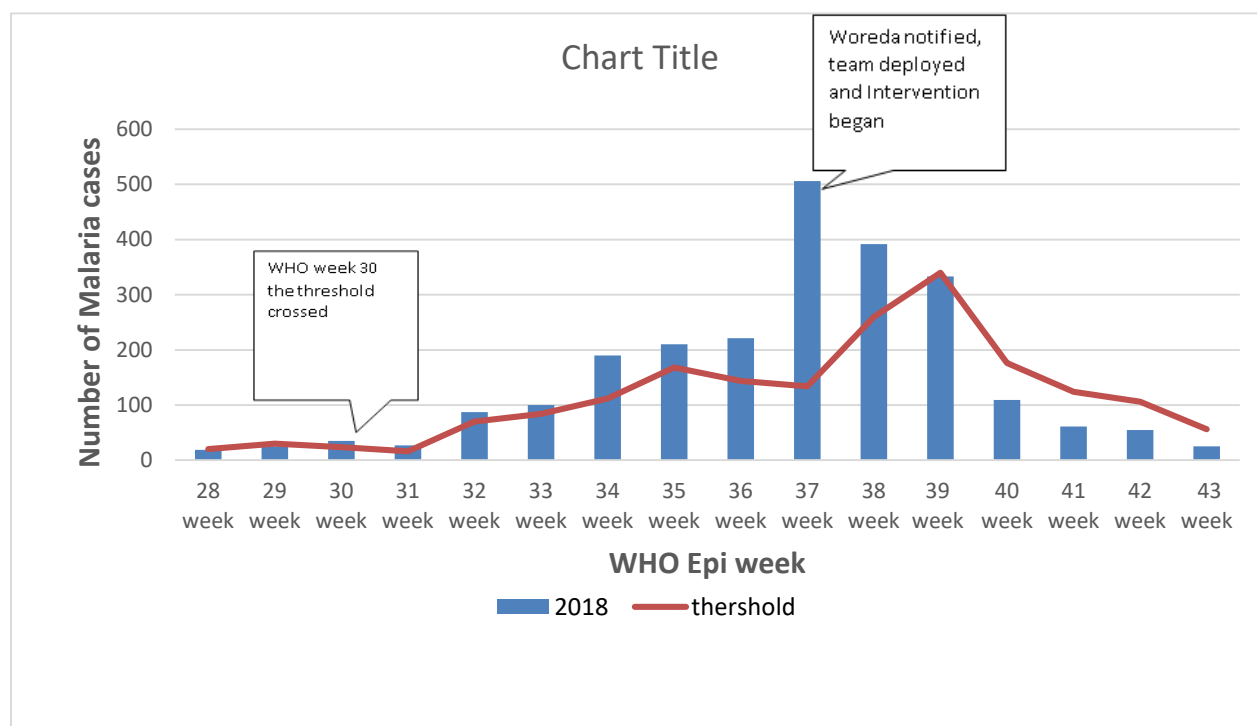


Figure 5.1: Number of Malaria cases by WHO Epi Week, Awash Fentale Woreda, Zone 3, Afar, Ethiopia, Week 28 – 43, 2018

All 5 kebeles of the Woreda are malarious area with altitude of < 2000 meters above sea level. Incidence rate was highest in Bolyeta (196 per 1000) kebele and followed by kebena (74 per 1000) and Sabure (64 per 1000) kebeles of the woreda (Table 5.3).

Table 5.3: Demographic, personal and environmental protection factors among malaria cases and unmatched controls, Awash Fentale Woreda, Zone 3, Afar, Ethiopia, 2018

S.N	Characteristics		Cases (N=52)	Controls (N=104)	AOR	P-value
1	Educational status	Illiterate Literate	31 21	67 39	0.5	0.42
2	Occupational status	Employed Unemployed Student Pastoralist Farmer Other	4 5 11 26 2 4	6 10 23 48 6 11	1.0	0.08
3	Living close to stagnant water	Yes No	38 14	34 69	3.0	0.02
4	Using bed net (every night)	Yes No	15 37	44 60	0.2	0.01
5	Availability of uncovered plastic water container in or outside house	Yes No	39 13	24 80	2.3	0.04
6	Presence of open deep well in their compound or near to house	Yes No	20 32	50 54	1.5	0.09
7	Presence of old tires in the compound	Yes No	3 49	12 92	0.7	1.00
8	Presence of anybody with malaria sign and symptom in the house before 2-3 weeks	Yes No	31 21	10 94	2.8	0.03
9	Presence of waste collection facility in the compound	Yes No	19 33	19 85	1.3	0.75
10	Presence of gutter to collect rain water	Yes No	16 36	53 51	0.5	1.10

Table 5.4: Malaria attack rate by kebeles, Awash Fentale Woreda, Zone 3, Afar, Ethiopia, 2018

S.N	Kebele	Population	Male	Female	Age (0-4)	Age >4	Total case	Attack rate per 1000
1	Dudub	4,326	2,200	2,126	441	3,885	270	62
2	Doho	5,987	3,193	2,794	1,583	4,404	134	22
3	Sabure	10,061	5,521	4,540	2,119	7,942	644	64
4	Bolyeta	5,391	2,580	2,811	1,955	3,436	1058	196
5	Kebena	3,910	2,157	1,753	883	3,027	289	74

5.3.3. Analytical Epidemiology

During this unmatched case-control study, 52 malaria case-patients and 104 community controls were selected and interviewed from five kebeles of the woreda. Of 52 case-patients, 30 (58%) were males and 22 (42%) were female. Presence of person with similar malaria signs and symptoms in the house before 2 weeks of onset was (AOR: 2.8, P-value=0.3). The use insecticide treated bed net every night was (AOR: 0.2, P-value=0.01). Presence of stagnant water for mosquito breeding in 200meters radius was (AOR: 3.04, P-value=0.02). Availability of uncovered plastic water container in or outside house was (AOR: 2.3, P-value=0.04).

5.3.4. Environmental Assessment

Among the observed three kebeles around eleven potential mosquito breeding sites were observed by naked eyes three from Sabure, three from Kebena and five from Bolyta, and eight out of the eleven sites had visible mosquito larvae for the naked eyes in the water it contains.

5.4. Discussion

The presence of stagnate water in the surrounding area is the major factor that may have contributed to the occurrence of this outbreak. Multiple risk factors were assessed during the investigation beside intervention activities. The presence of the *Kesem Sugar Factory* in the woreda contributed for the existence of malaria outbreak. This outbreak was detected at the end of September 2018 even though weekly malaria report was crossed threshold level at WHO Epidemiologic Week 30 of July 2018. In addition, with the mega sugar project the rainy season in Ethiopia occurs from July to Sept annually could causes stagnant water accumulation which usually serve as the source of drinking water for this pastoralist community even though it is associated with an increase in malaria incidence by creating favorable mosquito breeding sits. Unusual heavy rainfall followed by high temperature is considered as the cause of malaria epidemics [9].

There were no deaths reported in this outbreak. One possible reason may be strong case detection and management however further study would be needed to determine this fact. Correct utilization of mosquito nets, anti-malarial spraying, and appropriate use of personal preventative measures such as use

of repellent and protective cloth will reduce incidence of malaria and our study supports this fact that 80% of the people who do not use ITN every night were infected by malaria [8]. Absence of timely chemical indoor residual spraying was associated with higher risk of febrile illness in a study conducted in Amhara Regional States. The finding in this study is in line with our study finding that the woreda didn't conduct indoor residual spray since 2016 [14].

Stagnant water surrounding malaria affected village and their compound was one of the dominant risk factor for this malaria outbreak, which is consistent with previous reports in the literatures [13]. The other evidence that support this finding is the presence of mosquito larvae in the observed potential mosquito breeding sites. In addition to living closer to stagnant water the availability of uncovered plastic water containers in and outside the house, and the presence of anybody with malaria sign and symptoms in the house before 2- 3 weeks were highly associated with the occurrence of this outbreak and this finding is in line with different studies conducted in India, Sri Lanka and Northeastern Ethiopia [12,13,15]. Males were more likely to be infected by malaria than females. This may be due to males stay outside home during night than females for different reasons such as protecting domestic animals and this finding is supported by other studies in the literatures [13].

5.5. Limitation

Mosquito larva species categorization was not conducted due to lack of expertise.

5.6. Conclusion

There was malaria outbreak in Awash Fentale woreda of Zone 3. This outbreak scenario has clearly showed that, in order to prevent and control malaria infection the sustainable implementation of vector control intervention through well-organized malaria related strategies and programs are crucial.

Inter-sectoral collaboration especially with the private mega project managers and close monitoring and evaluation of the vector control interventions are prerequisites for malaria control and elimination.

5.7. Public Health Interventions

A total of 10,950 ITN was distributed to the five kebeles. Communities were mobilized and taught on prevention and control measures of malaria disease. Active case search and early management were done at community and health facility level. Due to the above collaborative interventions the outbreak was controlled.

5.8. Recommendation

- Insecticide treated bed net should be distributed for all households. Beside this, utilization of bed net should be monitored and optimized.
- Regular indoor residual spray per required standard should be kept in place.
- Identification and removal of potential mosquito breeding sites should be conducted by maximizing community participation and mega project managers.
- Trends of malaria cases should be monitored in weekly basis at all levels. This could help to detect malaria outbreak timely.
- Usually, malaria prevention and control will be effective by establishing community ownership. So that, doubling community effort in malaria prevention should be priority area of the woreda.

Early management of malaria case in the health facilities is mandatory to prevent outbreaks.

5.9. Acknowledgement

I would like to acknowledge deeply my Academic and CDC mentors Shikur Mohammed (Asst. Prof. of Epid.) and Dr. Kathleen Gallagher (PhD) respectively and Mr. Birhanu (malaria focal person) for assisting me in investigation of this outbreak. Finally, PMI, EPHI and Afar Regional Health Bureau PHEM Core-Process should be thanked for their technical support.

5.10. References

1. World Health Organization: Malaria. Geneva, Switzerland: WHO; 2011.
2. Slide share; Nahla Al.Mazroei, India, 2011
3. World malaria report. Geneva: World Health Organization; 2018.
4. Federal Democratic Republic of Ethiopia Ministry of Health, Ethiopian National Malaria Indicator Survey 2015, Ethiopian Public Health Institute, Addis Ababa, Ethiopia, July 2016.
5. Ethiopia Roll Back Malaria Consultative Mission; Essential Actions to Support the Attainment of the Abuja Targets; Kassahun Negash; Ethiopia RBM Country Consultative Mission Final Report; 2004.
6. Federal Democratic Republic of Ethiopia Ministry of Health, National Strategic Plan for Malaria Prevention, Control and Elimination in Ethiopia 2011–2015, Addis Ababa, Ethiopia, 2010.
7. Yimer F, Anmut A, Erko B, Mamo H. Past five-year trend, current prevalence and household knowledge, attitude and practice of malaria in Abeshge, Ethiopia. *Malar J*. 2015; 14:230.
8. Yemane B, Damen H, Helmut K. Epidemiology and Ecology of Disease and Health in Ethiopia. Ethiopia;2011.
9. Federal Democratic Republic of Ethiopia Ministry of Health, Draft Guideline for malaria vector control in Ethiopia; Diseases Prevention and Control Department, Addis Ababa, Ethiopia; 2002.
10. Dawit G. Prevalence and risk factors of malaria in Ethiopia, Ethiopia; 2012.
11. Daddi J, and Abebe A. Analysis of malaria surveillance data. *BioMed Central*. 2012.
12. African Medical and Research Foundation (AMREF). Report on malaria baseline survey in two woredas of zone 5 in afar region, northeast Ethiopia. *Lancet* 371:1-55, 2011.
13. Alemu HD. Malaria outbreak investigation in seba boru and melka soda woredas, guji and borena zones, oromia, Ethiopia. *American Journal of Health Research*. 2015, pp. 1-45.
14. Workineh KA, Andualem TM, Gize YA. Assessment of control measures and trends of malaria in burie-zuria district, west gojjam zone, amhara region, north west ethiopia. *Hindawi*; 2015, pp. 1-5.
15. Kiszewski AE, Teklehaimanot A. A review of the clinical and epidemiologic burdens of epidemic malaria. *American Journal of Tropical Medicine and Hygiene*; 2014, 71:128-135.
16. Gemechu S. Malaria Outbreak Investigation and Intervention in Ilu woreda, South-Western Oromiya, Ethiopia; 2013.
17. Afar regional health bureau, Regional Policy and Plane Directorate. Afar, Semera; 2018.

Chapter VI – Abstracts for Scientific Presentation

ABSTRACT

Authors: Yosef Asrat^{1*}, Shikur Mohammed²

¹St. Paul's Hospital Millennium Medical College, Public Health Department, Ethiopian FETP Resident, ²St. Paul's Hospital Millennium Medical College, Public Health Department

*Corresponding Author: yosef.asrat34@gmail.com

6.1. Trends in Non-Neonatal Tetanus Morbidity and Mortality, Ethiopia- September 2012-August 2016

Background: Tetanus is a vaccine-preventable disease with high morbidity and mortality in developing countries. In 2015, an estimated 209,000 tetanus infections with 59,000 deaths occurred globally. Although infants in Ethiopia are routinely vaccinated against tetanus, booster doses of vaccine needed to provide lifelong protection are only provided to pregnant women and women of childbearing age to prevent neonatal tetanus. Ethiopia eliminated neonatal tetanus in 2017, but cases of tetanus still occur in other age groups. Our analysis aimed to highlight the magnitude of tetanus in Ethiopia over the past five years to inform policymakers and stakeholders.

Methods: We conducted a retrospective analysis of nationwide reports of inpatients and outpatients diagnosed with tetanus from the Health Management Information System from September 11, 2012 to August 28, 2016. Neonatal tetanus was not included. Incidence, case fatality and mortality rates were calculated by using Epi Info 7.2.1.

Results: A total of 30,625 tetanus patients were registered; 26,903(88%) were outpatients, 15,255(49.8%) were male, and 16,101 (52.5%) were ≥ 15 years. The largest number of patients was reported in 2013(16,242, 53%). Incidence per100, 000 was (6.86) 2012, (19.1)2013, (2.88) 2014, (4.61)2015, (2.56) 2016. Overall incidence of tetanus was 7.2 per 100,000, with Afar Region being the most-affected (95.2per 100,000). The national case-fatality rate was 3.8%. The mean annual tetanus mortality rate was 0.15per 100,000. Among 669 deaths, 482(72%) were males. The annual mortality rate was the highest in Southern Nation Nationalities and Peoples Region (0.56per 100,000).

Conclusion: Although the control and prevention of tetanus is on the right track, morbidity and mortality due to tetanus remains significant with thousands of cases and hundreds of deaths reported every year. The incidence and mortality of tetanus can be reduced further by early detection and treatment of tetanus, improved and expanded immunization services, and health education focusing on good wound care.

Key words: Tetanus, Trends, Morbidity, Mortality, Ethiopia

6.2. Malaria Outbreak Investigation in Awash Fentale District, Ethiopia-September 2018

Author:

¹Yosef Asrat, ²Shikur Mohammed

Affiliation:

^{1,2}St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia

Contact information: Phone: +251913155435, E-mail: yosef.asrat34@gmail.com

Background: Malaria is a life-threatening disease affecting the world's most under-developed countries. Malaria is a major public health problem in Ethiopia. This study is done to identify factors associated with the malaria outbreak that was reported by the health facilities to the Awash Fentale district on September 2018.

Objectives: To describe magnitude of malaria outbreak and identify factors associated with this outbreak in Awash Fentale district.

Methods: We conducted unmatched case control study and selected 52 cases and 104 community controls in 1:2 ratios by simple random sampling. Microscopic and rapid diagnostic test conducted to confirm the disease. Data was collected by semi structured questionnaire. Using bed net every night and indoor residual spray are among the predictors and the outcome variable being having malaria infection. Odds ratio and 95% confidence interval were used for analysis.

Results: A total of 4,572 blood smear tests was done by Microscopy for suspected malaria cases at all health facilities of which 2,395 were positive 1,807 (75%) were Plasmodium Falciparum, 553(23%) were Plasmodium Vivax and 35(2%) were mixed malaria but there was no reported death. Using bed net every night was found to be protective effect for the disease (Odds Ratio: 0.2, 95% Confidence Interval: 0.1 - 0.8). Presence of stagnant water (Odds Ratio: 3.0, 95% Confidence Interval: 1.6 – 5.3), were associated with the disease.

Conclusions: The presence of stagnant water and low insecticide treated bed net utilization were attributed for the outbreak. Communities were mobilized and taught on prevention and control measures of malaria disease.

Chapter – VII: Proposal for Epidemiologic Research Project

7.1. Prevalence and Associated Risk Factors of Head Injury among Trauma Patients of Addis Ababa Burn, Emergency and Trauma Hospital, Ethiopia May 16 to June 16, 2019

Summary

Background: Injuries are a major problem in both developing and developed countries. Trauma is a neglected public health problem in developing countries with over 90% of the world's injury deaths occurring in low and middle income countries. Globally, traumatic head injury will exceed many other diseases as the main cause of disability and death by the year 2020 according to the World Health Organization (WHO) since it is a significant public health problem because it impairs brain function and it often results in negative long term or permanent physical, cognitive, behavioral, and emotional changes. Since 2010 Ethiopia has been committed to improve trauma care system via increasing pre hospital care system and training of the first cadre of emergency physician and nurses. There was no enough research conducted on head injury in the country's context, the prevalence of head injury is a common health problem that causes morbidity and mortality in the productive age group of population which directly affects the development of the country

Objective: To assess the prevalence and associated risk factors of head injury among trauma patients presented to AaBET hospital from June 16 to July 16, 2019, Addis Ababa, Ethiopia.

Method: Institution based, analytical cross sectional study will be conducted. All patients presented to AaBET hospital will be the source population for the study and All trauma patients presented to AaBET hospital from June 16 to July 16, 2019 will be the study population. A structured questionnaire will be adapted from the WHO (World Health organization) injury surveillance document and will be used after modified to fit the study population. For the data collection three nurses and two supervisors will be selected from AaBET hospital and two days training will be given for the data collectors and supervisors about the questionnaire by the principal investigator. The questionnaire will be translated in to Amharic language and those patients included in the study will be interviewed by data collectors and data abstraction tool will be used for patient card review.

Pretest of the structured questionnaire will be done on 5% of study sample at Ras Desta Hospital to check the validity and reliability of data collection tools and necessary modifications will be made based on the findings. Frequencies and cross tabulations will be used to summarize descriptive statistics of the data. Simple logistic analysis will be used primarily to check variables which have associations with the dependent variable. Variables found to have association with the dependent variable will be entered into multiple logistic regression for controlling the possible effect of confounders and finally the variables with significant association at $P\text{-value} < 0.05$ will be identified on the basis of Odds Ratio with 95 % confidence interval.

Budget: The study will be conducted from June 16 to July 16, 2019 with an estimated budget of 25,550 birr.

7.1. Introduction

7.1.1 Background

Injuries are a major problem in both developing and developed countries. Trauma is a neglected public health problem in developing countries with over 90% of the world's injury deaths occurring in low- and middle-income countries [1].

Traumatic Head Injury (THI) is defined as non-degenerative, non-congenital insult to the brain from an external mechanical force, possibly leading to permanent or temporary impairment of cognitive, physical, and psychosocial functions, with an associated diminished or altered state of consciousness [2].

THI defined by the Centers for Disease Control and Prevention is caused by a bump, blow, or jolt to the head or a penetrating head injury that disrupts the normal function of the brain [3]. Depending on severity using GCS, head injury classified into mild, moderate and severe head injury [4].

Globally, THI will exceed many other diseases as the main cause of disability and death by the year 2020 according to the World Health Organization (WHO) since it is a significant public health problem because it impairs brain function and it often results in negative long-term or permanent physical, cognitive, behavioral, and emotional changes [5].

A Centers for Disease Control and Prevention analysis of hospital, emergency department (ED), and vital statistics databases estimated that about 1.4 million people presented for medical care for a traumatic brain injury each year in the United States from 1995 through 2001. The analysis also found that approximately 50,000 (3.6%) of them died from their injuries, 235,000 (17%) were hospitalized, and 1.1 million (80%) were treated and released from the ED [6].

7.1.2 Statement of the Problem

Head injury is a major cause of trauma deaths and disabilities as well as a huge consumer of available health care resources [8]. It also has both short and long term economic impact on patient's life, his/her family and the society at large [9]. The burden of head injury is succinctly captured by the World Health Organization (WHO) global burden of injury. It ranked head injury among the top ten leading causes of death, with an estimated 5 million deaths annually and Africa men have the highest injury-related mortality rates in the world. Among African nations the rate of injury mortality in 2004 was the highest in Nigeria and the lowest in Egypt, South Africa and Ethiopia were second and third, respectively [10].

The incidence of Traumatic Brain Injury (TBI) worldwide is rising, mainly owing to injuries associated with the increased use of motor vehicles, particularly in middle-income and low-income countries. Estimates of TBI incidence show substantial variation between countries. Data from the CDC indicate that each year in the USA, 1.7 million people sustain a TBI. A 1.4 million of these injured individuals are treated in emergency departments, with around 275,000 hospitalizations and 52,000 fatalities. A meta-analysis of reports from 23 European countries revealed a hospital admission incidence of 235 per 100,000 people [11].

Head injury is a significant public health problem in Ethiopia and one of the most common reasons for emergency department visit with admission increasing from time to time [12]. In Ethiopia, the most common identified risk factors for severe head injuries were RTA (Road Traffic Accident), interpersonal violence and falling accidents [4]. Even if the government of Ethiopia has developed policies and strategies to minimize road traffic accidents, morbidity and mortality associated with severe head injury as result of RTAs are still very high [13].

7.1.3 Significance of the Study

Since 2010 Ethiopia has been committed to improve trauma care system via increasing pre hospital care system and training of the first cadre of emergency physician and nurses. There was no enough research conducted on head injury in the country's context, the prevalence of head injury is a common health problem that causes morbidity and mortality in the productive age group of population which directly affects the development of the country. The study will provide base line information on magnitude and associated outcomes of head injury cases. The result of this study will be used by concerned bodies for planning and evaluating how to prevent the head injury Addis Ababa Burn, Emergency and Trauma Hospital is the first emergency center established in the country. Given the intention of the country to improve the care of the injured we plan to conduct this analytical cross sectional study in AaBET and this will give us new insight on the prevalence and the associated risk factors of head injury.

7.2. Literature Review

Traumatic Head injury (THI) is an important global public health problem as a major cause of traumatic death and disability. The spectrum of severity of THI varies, but most THI is classified as mild traumatic Head injury (MTHI) followed by moderate and severe head injury, based on clinical and surveillance definitions. From a public health perspective, it is important to know the incidence of a condition in order appropriately to plan healthcare policy and provision. Furthermore, determining what factors increase the risk of MTHI is necessary to develop public health programs to prevent the problem and lessen the likelihood of disability [14].

In USA, the incidence of head injury at the emergency department was reported to be 394/100,000 people with a mortality rate of 19.3 per 100,000 [15]. In the United Kingdom, the attendance rate of HI at an emergency department showed that HI constituted 3.4% and the total attendance, and incidence was 453/100,000. [16]. According to a study which was conducted in Korea. The mortality rate of the head injury was 9.5%. The severity of head injury based on GCS was mild in 73.4%, moderate in 11.4%, and severe in 16.3% [17].

According to study which was conducted in Norway based on GCS and presence or absence of consciousness at time of examination to 492 (84%) mild, 16 (3%) moderate and 77 (13%) severe head injury. Sex specific incidence rates were 258 per 100,000 for males and 156 per 100,000 for females the causes of head injury were falls in 299 (51%), RTA in 126 (21%), assaults in 81(14%) and other in 79 (14%) cases [18].

A study which was conducted at Tertiary Care Hospital in India indicated that the majority of head injuries are due to Road Traffic Accident 298 (59.60%) cases followed by fall from Height 101 (20.20%) cases, Assault 21 (4.20%) and occupational head injury 79 (15.80%) cases, whereas other like gunshot comprised of 1 (0.20%) cases. The peak incidence of head injury was observed in the age group 21-30 years comprising 45% of the cases and it was also observed that 21% belonged to the age group 31-40 years. Out of 500 cases 383 (76.6%) were males while 117 (23.4%) were females [19]. A Study which was conducted in Egypt at Assiut University indicated that incidence of head injury was 3.07%. Head injuries due to road traffic accidents represents 60.9% (810 cases) and 35.8% of cases (290) were in age group between 20- 30 years, followed by the age group between 10-20 (22.2%) and 30- 40 (18.52%), the least affected age group was age greater than 60 (4.9%) and less than 10 (2.5%). Males affected more than females which accounts 85.7% of males and 14.3% of females with a ratio of 6:1 patient were classified according to Glasgow Coma Scale (GCS) into: severe (GCS < 8) which accounts (32%), moderate (GCS 9-12) accounts 22% and mild (GCS 13-15) accounts 46% [20]. According to a study conducted in Nigeria 13.0% had head injuries. There were 342 (79.9%) males and 86 (20.1%) females with male to female ratio of 3.9:1 and incidence was common in age between 21- 30years 33.8%, while the least were those between 71-80 years 0.7%. Road traffic accidents (RTAs) were the most common cause of injury accounting for 71.7% patients. According to this study, severity of head injury on Glasgow coma scale indicated that majority of patients suffered mild head injury [21].

According to the study which was conducted at JUSH interpersonal fight (38.5%) and traffic Accidents (36.5%) accounted for most of the injuries. Of all injuries, 15.4% were due to falling accidents mainly in children and distribution of the severity of injury measured with the initial Glasgow Coma Score (GCS) indicates that 37 (71%) of all patients were discharged with a good recovery Glasgow Outcome Scale (GOS) 5, 7.7%. with a disability and 21.2% died and All patients with initial GCS greater than 6 survived whereas almost all patients with initial GCS 6 and less were died and Patients with both nonreactive pupils at the initial examination died in

87.5% of cases. Only 10% of the patients who sustained injury from interpersonal fight had an initial GCS below 9 compared to 52.6% in RTI patients. In this study initial GCS of 10 (64.7%), (13.6%) suffered moderate head injury, while (21.7%) sustained severe head injury [22].

A study conducted in 2018 in Ethiopia shows the prevalence of head injury was 40.5% of trauma patients visiting the Surgical Emergency Department of Gondar University Referral Hospital. The cause of head injury was mostly related to interpersonal violence which accounts for 49 (46.7%), followed by RTA, which accounts for 28 (26.7%) and 13 (12.4%) were from a fall. the majority of head injury patients lie in the age group of 25–44years 101 (38.8%) followed by 51 (19.6%) in the age group 20–24 and 38 (14.6%) were in the age group 15–19. Head injury severity in this study was based on the Glasgow Coma Scale with the majority of patients sustaining mild head injury 56 (53.3%), 41 (39.1%) sustaining a moderate head injury, while 8 (7.6%) sustained severe head injury. The odds are 5.33 times greater of being a male likely to sustain a head injury as compared with female [23].

7.3. Objective

7.3.1. General Objective

- To assess the prevalence and associated risk factors of head injury among trauma patients presented to AaBET hospital from June 16 to July 16, 2019 Addis Ababa, Ethiopia.

7.3.2. Specific Objectives

- To determine the prevalence of head injury among trauma patients presented to AaBET hospital.
- Associated risk factors of head injury among trauma patients presented to AaBET hospital.
- To assess the outcomes of head injury among trauma patients presented to AaBET hospital.

7.4. Method

7.4.1 Study area and Period

The study will be conducted from June 16 to July 16, 2019 in Addis Ababa burn, emergency and trauma hospital(AaBET) which is an affiliate Hospital of SPHMMC and it was opened by the FMOH on August 2015 with the mission of managing burn, emergency cases and trauma. Annually, the hospital serves 5,000 to 7,000 patients with a total of 250 beds. It has a total of 209 health professional, with 161 Nurses, 28 Medical Doctors and 20 Specialists with different areas of specialty. In addition, 15 pharmacy professionals serve the hospital (SPHMMC, 2016) AaBET Hospital provides 24/7 specialty services in emergency medicine, critical care, trauma and acute care surgery, orthopedics, neurosurgery, and forensic medicine; patients presenting with complaints requiring additional specialty services (e.g., cardiology, gastroenterology) are stabilized and transferred to nearby SPHMMC.

7.4.2. Study Design

Institution based, analytical cross sectional study will be conducted.

7.4.3. Source Population

All trauma patients presented to AaBET hospital will be the source population for the study.

7.4.4. Study population

All trauma patients presented to AaBET hospital and fulfill the inclusion criteria from June 16 to July 16, 2019.

7.4.5. Inclusion and exclusion criteria

- **Inclusion criteria**
 - All trauma patients who have head injury who visits AaBET hospital from June 16 to July 16, 2019.
- **Exclusion criteria**
 - All trauma patients who presented to the hospital comates and without attendant will be excluded from the study.
 - All trauma cases diagnosed death on arrival without possible cause of death will be excluded from the study.

7.4.6. Sample size and sampling techniques

The sample will be calculated using single population proportion formula to obtain the sample size needed to estimate the prevalence of head injury in the population visiting AaBET hospital. Systematic random sampling technique will be employed to select the study participants. Among the trauma patients who visit the hospital and registered in the triage center we will include every third patient from the list in to the study.

$$n = \frac{(Z_{\alpha/2})^2 P(1-P)}{d^2}$$

Where;

n=minimum sample size required for the study.

Z=standard normal distribution (**Z**=1.96), **CI** of 95%.

P=Prevalence of Head injury patients visiting Gondar University Hospital Emergency department was **P**=14.8% [22].

d=Absolute precision or tolerable margin of error=5% (0.05).

$$n = \frac{(1.96)^2 \times 0.148 (1-0.148)}{(0.05)^2} = 194$$

By adding 5% non-respondent rate the total sample size is **204**

7.4.7. Variables

Dependent variable

- Head injury

Independent variables

- Age
- Sex
- Educational level
- Occupation
- Role of human intent
- Mechanism of injury
- Associated injury
- Alcohol consumption
- Marital status
- Residence

7.4.8. Definition of terms

Prevalence- The total number of cases of a disease in the given statistical population at a given time.

Head injury- Physical damage/ structural change to the scalp or skull due to any type of external force to the head.

Traumatic brain injury (TBI) - Alteration in brain function which is manifest as confusion, altered level of consciousness, coma, seizure, and etc.

GCS- Glasgow coma scale used for assessing the neurological status of the patient.

Trauma- Any serious injury to the body often resulting from violence or an accident.

Mild head injury- An injury to the head when Glasgow coma scale is between 13 and 15.

Moderate head injury- An injury to the head when Glasgow coma scales between 9 and 13.

Severe head injury- An injury to the head when Glasgow coma scale is less than or equal to 8.

7.4.9. Data collection tools and procedures

A structured questionnaire will be adapted from the WHO (World Health organization) injury surveillance document and will be used after modified to fit the study population and data abstraction tool will be used for patient card review. For the data collection three nurses and two supervisors will be selected from AaBET hospital and two days training will be given for the data collectors and supervisors about the questionnaire by the principal investigator. The questionnaire will be translated in to Amharic language and those patients included in the study will be interviewed by data collectors.

7.4.10. Data quality assurance

Before the data collection the questionnaire will be translated to Amharic and translated back to English to check its consistency. Pretest of the semi structured questioner will be done on 5% of study sample at Ras Desta Hospital to check the validity and reliability of data collection tools and necessary modifications will be made based on the findings. Prior to data collection period, training will be given for two data collectors and one supervisor. Onsite supervision will be given to solve any ambiguity with data collection tools and techniques and the filled check lists will be cross checked at the end of each data collection day for completeness.

7.4.11. Data processing and Analysis

Data cleaning will be carried out by the principal investigator. Data will be checked for completeness and will be entered to Epi-info version 7.2 statistical software and will be exported to SPSS version 24(Statistical Package for Social science) for further analysis. Frequencies and cross tabulations will be used to summarize descriptive statistics of the data. Simple logistic analysis will be used primarily to check variables which have associations with the dependent variable. Variables found to have association with the dependent variable will be entered into multiple logistic regression for controlling the possible effect of confounders and finally the variables with significant association at $P\text{-value} < 0.05$ will be identified on the basis of Odds Ratio with 95 % confidence interval.

7.4.12. Ethical consideration

Ethical clearance will be obtained from Ethical review committee of St. Paul's Hospital Millennium Medical College and permission and formal letter of cooperation will be secured from the SPHMMC Academic provost. Each respondent will be informed about the purpose of the study and informed verbal consent will be obtained from each study participants before the actual data collection. Those patients who agreed will be included in the study.

7.4.13. Dissemination plan

The result of the study will be given to the study setting and to SPHMMC, department of Public Health, and the finding will be disseminated to concerned bodies such as service providers, policy makers and other concerned stake holders. Finally, the manuscript will be published through reputable journal.

7.5. Budget break down

7.5.1. Stationeries

S. No.	Item	Unit of measurement	Quantity	Cost per unit	Total Cost per unit
1	Duplicating papers	Reams	5 Reams	500 birr	2500
2	Photocopy paper	Reams	5 reams	500 birr	2500
3	Pen	Dozens	5 dozens	100 birr	500
4	Pencil	Dozens	5 dozens	100 birr	500
5	Laser jet Ink	Pack	3 packs	2000	6000
7	Flash disk	8GB	3	500	1500
8	Total				13,500

7.5.2. Personnel

S. No	Item	Unit	Quantity	Cost per unit (birr)	total cost
1.	Data collector	Per questionnaire	204	40	8160
2.	Secretarial works	Per head	1	1000	1000
3.	Stapling	per head	2	200	400
4.	Total				9,400

Total budget

To be changed for	Price(birr)
Personnel	9,400
Stationary materials	13,500
Contingency (10%)	2,490
Total	25,550

7.6. Work Plan

S.N	Activities	Responsible Person	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
1	Topic selection	Principal investigator	x										
2	Topic approval	Research office		x									
3	Consulting advisors	Principal investigator						x					
4	Writing proposal	Principal investigator						x					
5	Submission of 1 st draft	Principal investigator						x					
6	Feed back	Advisor						x					
7	Submission of final proposal	Principal investigator							x				
8	Data collection	Principal investigator								x			
9	Analysis	Principal investigator									x		
10	Submission of 1 st result	Principal investigator										x	
11	Feed back	Advisor										x	
12	Submission of final result	Principal investigator											x

7.7. References

1. Gosselin RA, Spiegel DA, Coughlin R, Zirkle LG. Injuries: The neglected burden in developing countries. *Bull World Health Organ* 2009; 87:246-246
2. Dawodu ST. Traumatic Brain Injury (TBI)-Definition, Epidemiology, Pathophysiology. Medscape Reference: Drugs, Diseases & Procedures; 10 November, 2011. LLC. Available from: <http://www.emedicine.medscape.com/article/326510-overview#showall>. 2014.
3. Kreipke CW, Rafols JA. Cerebral Blood Flow, Metabolism, and Head Trauma: The Pathotrajectory of Traumatic Brain Injury. New York: Springer; 2012. p. 170.
4. Isabel Aenders, teshagerGashaw, Mathias Siebeck, Wolf Mutcher (2014) “head injury- Neglected public health problem”, (*Ethiop J Health Sci*. Vol. 24, No. 1), pp 27: A four-month prospective study at JUSH, Ethiopia, 2010.
5. Hyder AA, Wunderlich CA, Puvanachandra P, Gururaj G, Kobusingye OC. The impact of traumatic brain injuries: A global perspective. *NeuroRehabilitation* 2007; 22:341-53.
6. Carl R. Summers, Brain Ivins and Karen A. Schwab, “TBI in USA: an epidemiologic overview” (*mount sinai journal of medicine* 76; 105-110, 2009).
7. Miller L, Kent RM, Tennant A. Audit of head injury management in accident and emergency at two hospitals: Implications for NICE CT guidelines. *BMC Health Services Research*. 2004;4:7. DOI: 10.1186/1472-6963-4-7
8. Ketema I. Pattern of head injury among patients presented to adult emergency department of Jimma University Teaching Hospital, Jimma, South West Ethiopia. Available: <http://hdl.handle.net/123456789/7552>
9. World Health Organization (WHO), author measurement and health information data sheet. Geneva, Switzerland: WHO; 2004. Available: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3275868/>
10. Carl R. Summers, Brain Ivins and Karen A. Schwab, “TBI in USA: an epidemiologic overview” (*mount sinai journal of medicine* 76; 105-110, 2009).
11. Landes, M, Venugopal R, Berman S, Heffernan S, et al. Epidemiology, clinical characteristics and outcomes of head injured patients in an Ethiopian emergency center. *Afr J Emerg Med*, 2017; (7):130-4, <http://dx.doi.org/10.1016/j.afjem.2017.04.001>.
12. Indeshaw k, Biruk K. Pattern of head injury among patients presented to adult emergency department of jimma university teaching hospital, Ethiopia. 2015. Open Access Theses and Dissertation. <http://etd.aau.edu.et/dspace/handle/123456789/7552>
13. Tagliaferri, F., Compagnone, C., Korsic, M., Servadei, F. & Kraus, J. A systematic review of brain injury epidemiology in Europe, *ActaNeurochir*. (Wien) 148, 255–268 (2006).
14. Thurman D, Guerrero J. Trends in hospitalization associated with traumatic brain injury. *JAMA* 1999; 282:954–7.
15. Yates PJ, Williams WH, Harris A, Round A, Jenkins R. An epidemiological study of head injuries in a UK population attending an emergency department. *J Neurol Neurosurg Psychiatry* 2006;77: 699–701
16. Kyeong-Seok Lee, “Estimation of the incidence of head injury”, (*J Korean Med Sci* 2001; 16:342-6 ISSN 1011- 8934).

17. Ben Heskestad, Roald Baardsen, Eirik Helseth, Bertil Romner, Knut Waterloo, and Tor Ingebrigtsen, "Incidence of hospital referred head injuries in Norway: A population based survey from the Stavanger region" (Scand J Trauma Resusc Emerg Med. 2009; 17: 6).
18. Kumar, et al.: "Patterns of Head Injury", (International Journal of Scientific Study | February 2014 | Vol 1 | Issue 5), pp 5.
19. Afaf Farghaly, Roshdy El-Khayat, Wafaa Awad, and Safaa George, "Head Injuries in Road Traffic Accidents' Forensic Medicine and Clinical Toxicology, and Neurosurgery Departments, Faculty of Medicine, Assiut University, Assiut, Egypt.
20. Emejulu JK, Isiguzo CM, Agbasoga CE, Ogbuagu CN. Traumatic brain injury in the accident and emergency department of a tertiary hospital in Nigeria. East Cent Afr J Surg 2010;15: 28–38.
21. Abebe M, Alemseged F. Hematologic abnormalities among children on Haart, in Jimma University Specialized Hospital, Southwestern Ethiopia. Ethiop. J. Health Sci. [Internet]. 2009;19(9):83–9.
22. Tarkie Abebe Walle, Bewket Tadesse Tiruneh, Debrework Tesgera Bashah Prevalence of head injury and associated factors among trauma patients visiting surgical emergency department of Gondar University Referral Hospital, Northwest Ethiopia 2016: www.elsevier.com/locate/ijans.

7.8 Annex

7.8.1 Dummy table

Sex	Number	Percent
Male		
Female		
Total		

AGE	NUMBER	PERCENT
<5		
5-14		
15-24		
25-34		
35-44		
45-54		
55-64		
>64		

OCCUPATION	NUMBER	PERCENT
Employed		
Student		
Farmer		
Unemployed		
Other		
Unknown		

RESIDENCE	NUMBER	PERCENT
Urban		
Rural		

7.8.2. Questionnaire

Prevalence and Associated Risk Factors of Head Injury among Trauma Patients of Addis Ababa Burn, Emergency and Trauma Hospital, Ethiopia May 16 to June 16, 2019

Consent Form

My name is _____, I am a nurse working here in AaBET Hospital emergency OPD and now I am collecting data from our trauma patients for the research being conducted to determine the Prevalence and Associated Risk Factors of Head Injury among Trauma Patients by Dr. Yosef Asrat who is the Master of Field Epidemiology student in SPHMMC. You are selected as one of study subject by chance. The investigator employed me for this data collection to maintain your data strictly confidential. We believe that the findings of this study will have significant input in understanding the cause and outcomes of head injury. The interview will be done when you give permission, participation is totally voluntary. Name and other personal identifiers will not be recorded on data collection format and the information we got will be kept confidential and will also be used for this study purpose alone. You have full right not to be part of this study and you will not also be denied of getting any medical services from the hospital. If you have any questions about this study you may ask me or the principal investigator Dr. Yosef Asrat (Tel: 0913155435 or E- mail Yosef.asrat34@gmail.com) Are you willing to participate in this study?

1. Yes

2. No

Signature which shows that the respondent has consented (verbally) to take part in the study.

Identification No.		Date:	
I. Socio-demography of the participants			
A. Age:			
B. Sex: Male ☐ Female ☐			
C. Where do you live (Residence)?			
1. Urban ☐			
2. Rural ☐			
D. What is your educational background?			
1. Primary school ☐			
2. Secondary school ☐			
3. Tertiary ☐			
4. Illiterate ☐			
E. what is your Occupation?			

1. Employed	☐
2. Unemployed	☐
3. Student	☐
4. Pastoralist	☐
5. Farmer	☐
6. Other	☐

F. What is your Religion?	
1. Orthodox,	☐
2. Protestant,	☐
3. Muslim	☐
4. Catholic	☐
5. other	☐

G.What is your Marital status?	
1. Married,	☐
2. Single	☐
3. Widowed	☐
4. Divorced	☐
5. Not Applicable	☐

II. History of the patient who presented in the emergency department	
A.How did the patient arrive in the emergency department?	
1. Ambulance	☐
2. Taxi	☐
3. Private car	☐
4. Ambulatory	☐
5. Police	☐

B. Where were you when you get injured?	
1. Home	☐
2. School	☐
3. High way/street	☐
4. Other(specify)	☐

C. What were you doing when you were injured?	
1. Work	☐
2. Education	☐
3. Travelling	☐
4. Sport	☐
5. Other (specify)	☐

D. How was the injury inflicted on the patient?	
1. Traffic injury	☐
2. Sexual assault	☐
3. Fall	☐
4. Other blunt forces	☐
5. Gun shoot	☐
6. Stab/cut	☐
7. Fire /heat	☐
8. Choking / hanging	☐
9. Drowning	☐
10. Poisoning	☐
11. Other (specify)	☐
E. How was the injury occurred(intent)?	
1. Unintentional	☐
2. Intentional	☐
3. Self-harm	☐
4. Other (specify)	☐
F. Did you use alcohol within 6 hours of the incident?	
1. Yes	☐
2. No	☐

Prevalence and Associated Risk Factors of Head Injury among Trauma Patients of Addis Ababa Burn, Emergency and Trauma Hospital, Ethiopia May 16 to June 16, 2019

ስሙ.....እባላለው በሙያዬ ነርስ ስሆን የምሰራውም አቤት ሆስፒታል ድንገተኛ ክፍል ነው። አሁን የተለያዩ ጉዳት ከደረሰባቸው ከህሙማን መረጃ እየሰበሰብኩ ሲሆን መረጃውም የጭንቅላት ጉዳት ስርጭቶችን በተለያዩ ጉዳቶች ከደረሰባቸው ህሙማን ላይ ያለውን ስርጭት ለማወቅ የሚደረግ ጥናት አካል ነው። ጥናቱንም የሚያከናውነው ደ/ር ዬሴፍ አስራት ሲሆን የመጨረሻ ዓመት የፊልድ ኢፕዲዎሎጅ ተመራቂ ተማሪ ነው በ ቅ/ጳ/ሆ/ሚ/ሜ/ኮ። በዚህ ጥናት ውስጥ እርሰው በእጣ ገብተዋል። አጥኝው መረጃ ከእርስወ ለመሰብሰብ የመደበኛ ስለሆነ እዲተባበሩኝ በትህትና እጠይቃለሁ። ይህ ጥናት ስለ ጭንቅላት ጉዳት መንስኤ እና ውጤት ተጨባጭ መረጃዎች ይሰጣል ተብሎ ይታመናል። ስለሆነም በመጠየቁ መሳተፍ ወይም አለመሳተፍ መብትዎ እደሆነ አውቀው ተሳታፊ እንዲሆኑ ተጋብዘዋል። ስምዎ ሆነ ሌሎች መረጃዎች በጥንቃቄ የሚያዙ ስለሆነ መረጃዎ በሚስጥር ተይዞ ለጥናት ብቻ ይውላል። ጥናቱ ውስጥ ባይሳተፉም ምን አይነት የህክምና አገልግሎት የማይከለክሉም። ግልጽ ያልሆነ ነገር ካለ በዚህ አድራሻ አጥኝውን ማነጋገር ይችላሉ። ስልክ 0913155435 ኢሜል yosef.asrat34@gmail.com በጥናቱ ለመሳተፍ ፈቃደኛዎት?

1. ፈቃደኛ ነኝ
2. ፈቃደኛ አይደለሁም

ካር ቁጥር:.....

ቀን.....

1. እድሜ
2. ጾታ ሀ. ወንድ ለ. ሴት
3. የመኖሪያ ስፍራ ሀ. ከተማ ለ. ገጠር
4. የትምህርት ደረጃዎ ምን ያህል ነው?
 ሀ. የመጀመሪያ ደረጃ
 ለ. ሁለተኛ ደረጃ
 ሐ. ሦስተኛ ደረጃ
 መ. ያልተማረ
5. ሥራዎ ምን ድን ነው?
 ሀ. ተቀጣሪ ሰራተኛ
 ለ. ስራ አጥ
 ሐ. ተማሪ
 መ. ገበሬ
 ሰ. ሌላ
6. ሀይማኖትዎ ምን ድን ነው?
 ሀ. ኦርቶዶክስ ክርስቲያን
 ለ. ፕሮቴስታንት
 ሐ. ሙሥሊም
 መ. ካቶሊክ
 ሰ. ሌላ
7. የጋብቻ ሁኔታዎ?
 ሀ. ያገባ/ያገባች
 ለ. ያላገባ/ያላገባች
 ሐ. የሞተበት/የሞተባት
 መ. የፈታ/የፈታች
8. አደጋው እንዴት ደረሰብዎት?
 ሀ. በትራፊክ አደጋ
 ለ. በወሲብ ትንኮሳ
 ሐ. በመውደቅ አደጋ
 መ. በሌሎች የምት አደጋ
 ሰ. በተተኮሰ ጥይት
 ረ. በመወጋት
 ሸ. በእሳት አደጋ
 ቀ. በድብደባ
 በ. በመስመጥ አደጋ
 ተ. በመመረዝ አደጋ
 ቸ. ሌላ
9. አደጋው ሲደርስብዎ የት አካባቢ ነበሩ?
 ሀ. እቤት

- ለ. ትምህርት ቤት
- ሐ. አውራ ጎዳና ላይ
- መ. ሌላ ቦታ

10. በአደጋው ወቅት ምን አየሰሩ ነበር?

- ሀ. ስራ ላይ
- ለ. ትምህርት ላይ
- ሐ. ጉዞ ላይ
- መ. ስፖርት ላይ
- ሠ. ሌላ

11. አደጋው የደረሰበውን በምን ምክንያት ነው?

- ሀ. ያልታሰበ ድንገተኛ አደጋ
- ለ. ሆን ተብሎ የደረሰ አደጋ
- ሐ. በገዛ ራስ ላይ የደረሰ አደጋ
- መ. ሌላ

12. አደጋው ከመድረሱ በፊት ባሉት ስድስት ሳጃታት ውስጥ አልኮል ጠጥተው ነበር ?

- ሀ. ተጠቅመዋል
- ለ. አልተጠቀሙም

13. ወደ አቤት ሆስፒታሉ እንዴት ደረሱ?

- ሀ. በአምቡላንስ
- ለ. በታክሲ
- ሐ. በግል መኪና
- መ. በእግር ተጉዘው
- ሠ. በ ፖሊስ

Data Abstraction tool for patient cards

A. How sever was the head injury according to GCS score?	
1. Mild	☐
2. Moderate	☐
3. Sever	☐
B. What was the patient outcome after the injury?	
1. Treated and discharged	☐
2. Admitted	☐
3. Died	☐
4. Other (specify)	☐
C. What was the nature of the head injury the patient sustained?	
1. Penetrating Head injury	☐
2. Blunt Head injury	☐
3. Other (specify)	☐

D. What are the associated injuries the patient sustained?	
1. Skull fractures	☐
2. Neck injury	☐
3. Chest injury	☐
4. Abdominal injury	☐
5. Pelvic injury	☐
6. Other (specify)	☐
E. How was the trauma patient treated in the hospital?	
1. Non operative approach	☐
2. Surgery	☐
3. Medical treatment	☐
4. Other(specify)	☐

Chapter VIII – Other Additional Output Reports

8.1. Inappropriate use of Antibiotics and Its Associated Factors among Residents of Addis Ababa City, Ethiopia-August 2019

Project Summary

Summary: This project will investigate inappropriate use of antibiotic and its associated factors among the residents of Addis Ababa city. Because now a day's antimicrobial resistance is a global challenge. Particularly in developing countries like Ethiopia it has huge impact. This study will help policy makers and partners to focus on the key issues.

Significance: This research project will shed new light on how antibiotics are misused and point out the determinate factors for this problem. Such information is needed by policy makers, health professionals and partners. This research examines inappropriate use of antibiotic and its associated factors, and provides new knowledge with clear applications for prevention and control of inappropriate antibiotic use. The findings of this study will have significance for further research in AMR.

Methods: My research plan is composed of several “stages” that will be completed between July 1 and August 31.

1. **Obtaining the ethical clearance (July 1-July 5):** Obtaining ethical approval from Research Ethics Committee of St. Paul Hospital Millennium Medical College.
2. **Recruiting and training of data collectors and supervisors (July 6- July 15):** Five medical students (5th year) and two supervisors will be recruited for data collection.
3. **Pretesting and duplication of questioner (July 16- July 25):** The questioner will be pre tested and necessary modification will be made.
4. **Data collection (July 26 – August 10):** Approximately 10 questionnaires per individual per day will be filled.
5. **Data entry, analysis and a research report writing (August 11- August 31):** Data will be analyzed using SPSS version 24. I will present the results as a research report.

Budget: A 3,741 US\$ will be used as a wage and 624 US\$ is Contingency. 2,499 US\$ will cover transportation, paper duplication and incidental costs. Total budget requested is 6,864 US\$.

8.1. Background

Infectious diseases are the most common causes of morbidity and mortality, particularly in developing countries. Use of antimicrobials has contributed to the dramatic fall in morbidity and mortality from these diseases [1, 2]. Antimicrobial resistance (AMR) is a threat to all branches of medical and public health practice. It challenges the control of infectious diseases, jeopardizes progress on health outcomes by increasing morbidity and mortality and imposes huge costs on societies. Thus, the consequences of AMR may be felt harder in resource-poor settings [3, 4].

Ethiopia experiences a heavy burden of infectious diseases with a growing prevalence of disease morbidity and mortality. With the increased intensity of antimicrobial use following the increased burden of infectious disease in Ethiopia, AMR remains being a huge concern in the progress of treating infectious diseases. The misuse of antibiotics by health care providers', unskilled practitioners, and drug consumers, coupled with rapid spread of resistant bacteria and inadequate surveillance contributed to the problem [5].

According to WHO (World Health Organization), more than two third of all antibiotics are used in the community, of which about 30% is used inappropriately [6]. As a result, WHO recommended involvement of the community in tackling of antibiotic resistance through improving access to medical services, reducing unnecessary use of antibiotics, taking a full course of treatment, not sharing medications with other people, and not keeping part of the course for another occasion [7,17, 18]. Many previous studies documented factors associated with inappropriate use of antibiotics including culture [8], educational status [9], residency [10], marital status [9], age [11], health insurance [9] and level of satisfaction with the health care services [12, 13], and storing antibiotics at home [14]. A community based cross-sectional survey was conducted in Gondar Town in 2017. It showed that (35.9%) of them used antibiotics inappropriately [15]. A comparative cross sectional study was conducted in Bahir Dar city in 2014. Inappropriate use of antibiotics was 30.9%. Factors associated were low educational status, younger age, engagement with a job, and low knowledge on the use of antibiotic preparations of human to animals [16].

However, the extent inappropriate use of antibiotics and its associated factors has not yet been explored. Therefore, the aim of this study was to determine inappropriate use of antibiotic and its associated factors among the residents of Addis Ababa city, Ethiopia.

8.2. Methods

8.2.1. Study design and period

A community based cross-sectional survey will be conducted from July 1, 2019 to August 31, 2019 to determine inappropriate use of antibiotic and its associated factors among the residents of Addis Ababa city, Ethiopia.

8.2.2. Study area and population

The study will be conducted in Addis Ababa, Ethiopia. Addis Ababa city administration includes ten sub-cities; the sub-cities are also divided in to 116 woredas (districts). Based on the projection of the Central Statistics Agency (CSA, 2017), the total population of Addis Ababa city administration was 3,433,999 of these (52.6%) were females. Individuals living in the city administration during the study period will be the study population [19].

8.2.3. Inclusion and exclusion criteria

- **Inclusion criteria:** Households lived in the past six months will be included in the study.
- **Exclusion criteria:** Respondents with health care profession and those with communication defects (listening and speaking of the local language Amharic) will be excluded from the study.

8.2.4. Study Variables

Outcome variable (inappropriate use of antibiotics) and **Explanatory variables** (sex, place of residence, age, number of family, family monthly income, education status, occupation, marital status, level of healthcare service satisfaction and knowledge on antibiotics use).

8.2.5. Sample size determination and sampling technique

Single population proportion formula will be used.

$$n = \frac{(Z_{\alpha/2})^2 \times P(1-P)}{d^2}$$
 Where: n= Minimum sample size, P= Proportion of inappropriate use of antibiotics (30%), $Z_{\alpha/2}$ = 95% confidence interval
d=Margin of error (5%)

Possible non-response rate of 10% and design effect (2) will be considered to determine a final sample size of 708. Five Sub cities will be selected randomly to get a representative sample. Multistage stratified random sampling technique will be used to select households in the sub cities. The number of households to be interviewed in each Sub cities will be determined in proportion with the total number of households found in each Sub cities. A systematic random sampling

method will be used to select the study participants. Lottery method will be used to select a respondent whenever more than one eligible respondent found in the selected household.

8.2.6. Data collection tool

Structured questionnaire is prepared and will be used to collect data. The questionnaire comprises of socio-demographic variables of the study participants, and knowledge and use of antibiotics. Data collectors will hold strips of the antibiotics with them to show for respondents whether they can able to differentiate and select the type of antibiotics that they had been using in the last one year.

8.2.7. Operational definition

Antibiotic: is a type of antimicrobial agent made from a mold or a bacterium that kills, or slows the growth of other microbes, specifically bacteria. Examples include penicillin and streptomycin.

Inappropriate use of antibiotics: means use of antibiotics for self-medication and/or medication of family members (family medication) without prescription from health professionals, receiving antibiotics from anybody else and/or use of leftover drugs and/or use of prescribed antibiotics for any purpose other than prescribed for.

8.2.8. Data quality management

Pre-test of the questionnaire will be done in another place in the study area to ensure whether the study participants understand what the investigator intended to know. Data collectors will be trained and supervised daily by supervisors and principle investigator to collect quality data.

8.2.9. Data analysis procedures

Data will be entered, cleaned and analyzed using SPSS statistical package version 24. Descriptive statistics such as percentages, means and standard deviations will be used to describe the data. Uivariate and multivariable logistic regressions will be used to come up with predictors of inappropriate use of antibiotics.

8.2.10. Ethical considerations

The study will be conducted after obtaining ethical approval from Research Ethics Committee of St. Paul Hospital Millennium Medical College. The verbal consent will be included on the front page of the questionnaire below briefing statements of the study. When the participant confirmed his/her willingness, data collection will be carried out. Confidentiality and privacy will be insured for information collected from study participants by recording data anonymously.

8.3. Limitations

- Even though this survey planes to highlight an area of research where there is lack of literature in Ethiopia, caution should be exercised when generalizing to other regions in Ethiopia as the study is a cross-sectional and is going to be conducted in Addis Ababa, Ethiopia.
- Fewer similar published studies in Ethiopia might make the discussion less Comprehensive.
- As in all survey research, those who did not filled completely the survey may have beliefs and behaviors that differ from those that fully responded.

8.4. References

1. WHO. Step-by-step approach for development and implementation of hospital Antibiotic policy and standard treatment guidelines. 2011.
2. Abebe F, Berhe D, BerheA, Hishe H, Akaleweld M. Drug use evaluation of Ceftriaxone: the case of Ayder Referral Hospital, Mekelle, Ethiopia. *IJPSR*.2012; 3(7): 2191-2195.
3. Interagency task force on antimicrobial resistance: A public health action plan to combat antimicrobial resistance. 2011.
4. Leung E, Weil D, Raviglione M, Nakatania H. The WHO policy package to combat antimicrobial resistance. *Bull World Health Organ*.2011; 89: 390–392.
5. Abegunde DO, Mathers CD, Adam T, Ortegon M, Strong K. the burden and costs of chronic diseases in low-income and middle-income countries. *Lancet*.2007; 370: 1929-1938.
6. WHO. The world health report 2007. A safer future: global public health security in the 21st century, vol. 2007.
7. WHO. World Health Organization Report on Infectious Diseases Overcoming antimicrobial resistance. World Health Organization. 2000.
8. Cizman M. The use and resistance to antibiotics in the community. *Int J Antimicrob Agents*. 2003; 21(4):297–307.
9. Jafari F, Khatony A, Rahmani E. Prevalence of self-medication among the elderly in Kermanshah-Iran. *Global J. Health Sci*. 2015; 7(2):360–5.
10. Yu M, Zhao G, Stalsby Lundborg C, Zhu Y, Zhao Q, Xu B. Knowledge, attitudes, and practices of parents in rural China on the use of antibiotics in children: a cross-sectional study. *BMC Infect Dis*. 2014; 14:112
11. Grosso G, Marventano S, Ferranti R, Mistretta A. Pattern of antibiotic use in the community: non adherence and self-prescription rates in an Italian urban population. *Mol Med Rep*. 2012; 5(5):1305–10.
12. Fernandes M, Leite A, Basto M, Nobre MA, Vieira N, Fernandes R, et al. Non adherence to antibiotic therapy in patients visiting community pharmacies. *Int J Clin Pharm*.2014; 36(1):86–91.
13. Pechere JC. Patients' interviews and misuse of antibiotics. *Clinical infectious diseases*. 2001; 33 Suppl 3:S170–S173.
14. Togoobaatar G, Ikeda N, Ali M, Sonomjamts M, Dashdemberel S, Mori R, et al. Survey of non-prescribed use of antibiotics for children in an urban community in Mongolia. *Bull World Health Organ*. 2010; 88(12):930–6.
15. Daniel A, Abebe B, Sewunet A. Inappropriate use of antibiotics among communities of Gondar town, Ethiopia: a threat to the development of antimicrobial resistance. *Antimicrobial Resistance and Infection Control*.2017; 6:112.
16. Gebeyehu E, Bantie L, Azage M. Inappropriate Use of Antibiotics and Its Associated Factors among Urban and Rural Communities of Bahir Dar City Administration, Northwest Ethiopia. *PLoS ONE*.2015; 10(9).
17. You JH, Yau B, Choi KC, Chau CT, Huang QR, et al. Public knowledge, attitudes and behavior on antibiotic use: a telephone survey in Hong Kong. *Infection*.2008; 36:153–7.

18. Hawkings NJ, Butler CC, Wood F. Antibiotics in the community: a typology of user behaviors. *Patient Educ Couns*. 2008; 73:146–52.
19. CSA. Summary and statistical report of the 2007 population and housing census: population size by age and sex. Addis Ababa, Ethiopia. Central Statistics Agency (CSA); 2017.