St. Paul's Hospital Millennium Medical College Department of Public Health



Ethiopian Field Epidemiology and Laboratory Training Program (EFELTP)

Compiled Body of Works in Field Epidemiology

By

Teferi Yidenek

Submitted to St. Paul's Hospital Millennium Medical College in partial fulfillment for the degree of Master of Public Health in Field Epidemiology

March 2018

Addis Ababa

St. Paul's Hospital Millennium Medical College Department of Public Health

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Advisor

Yoseph Worku (MD, MPH)

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Approval by Examining Board

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Examiner

St. Paul Hospital Millennium Medical College, Department of Public Health

Declaration form

I, the under signed, declared that this is my bona fide original work, has never been presented in this or any other university, and that all the resources and materials used for the body of work with thesis have been fully acknowledged.

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Final body of work with thesis approval form

As members of the board of examiners of the final body of work with thesis open defense, we certify that we have read and evaluated the body of work with thesis prepared by Jafer Kezali under the thesis entitled “Determinants of TB among HIV positive adults on ART in Addis Ababa in public hospitals.” and recommendation for the degree of masters of public health in field epidemiology.

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Acknowledgement

First and foremost, I am very grateful to the God for giving me the health, wellbeing and the strength that were very fundamental for the successful accomplishment of this venture. From the bottom of my heart I am also thank in a very special way my advisor Dr.Yoseph Worku - St. Paul's Hospital Millennium Medical College public health department who worked with me vigorously, right from guidance on investigation phase to most technical phase of these outputs.

I would like to extend to Field mentor Mrs. Mastewal Worku for her technical support. My gratitude also goes to Mr.Mulatu Melese and Mr.Wondemu Gebeyhu for their cooperation and providing me the necessary logistic that I required.

I would like to put across my great full appreciation to the organizations: St. Paul's Hospital Millennium Medical College, Federal Ministry of Health, CDC/Ethiopia, Ethiopian Public Health Institutions, Amhara Regional Public Health Institutions, District Health Offices, Health facilities and all other sectors who gave me all technical as well as financial support during my all residency time.

The last but not the least that I want to place on record, my sense of gratitude to my companion and class mate those directly or indirectly contributed the bricks for realization of these output.

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List of Abbreviation

AAHB	Addis Ababa Health Bureau
AFP	Acute Flaccid paralysis
AIDS	Acquired Immunodeficiency syndrome
ALS	All Laboratory section
ANC	Antenatal care
ANRS	Amhara National Regional State
AOR	Adjusted Odd Ratio
APHI	Amhara Public Health Institute
Apr	April
ART	Attack Rate
ARF	Action Registry Form
ARHB	Amhara Regional Health Bureau
ART	Anti-Retroviral Therapy
AWD	Acute watery Diarrhea
BCG	Bacille Calmette-Guerin for Tuberculosis
BMI BOFED	Body Mass Index
BPR	Bureau of finance and economic development
C	Business processing and re engineering
CBN	Control
CD4	Community Base Nutrition
CDC	Cluster of differentiation 4
CFR	Center for Disease Control and Prevention
CHE	Case Fatality Rate
CHP	Chemistry
CHW	Community Health Profile
CIs	Community Health Workers
COR	Confidence interval
CPT	Crude Odd Rate
CRS	Cotrimoxazole preventive therapy
CSA	Congenital rubella syndrome

Deg	Central Statistical Agency
DRC	Degree
E.C	Democratic Republic of the Congo
EDHS	Ethiopian Calendar
EFELTP	Ethiopia Demographic and Health Survey
Env	Ethiopian Field Epidemiology Laboratory Training Program
EPHI	Environmental
EPI	Ethiopian Public Health Institute
EQA	Expanded Program on Immunization
ETB	External Quality Assurance program
EU/EEA	Ethiopian Birr
FE	European Union and European Economic Area
Feb	Field Epidemiology
FEFO	February
FMOH	First expire first out
FO	Federal Ministry of Health
FP	Format
GEN	Family Planning
GOV	General
GP	Government
H.pylori	General Practitioner
HAART	Helicobacter Pylori
HC	Highly Active antiretroviral Therapy
HCT	Health Center
HEWs	Hematocrit
HF	Health Extension Workers
Hgb	Health Facility
HH	Hemoglobin
HIT	House Hold
HIV	Health Information Technology
HO	Human Immunodeficiency Virus

HP		Health Officer
Hrs		Health post
ICSH	IDSR	Hours
IEC IFCC		International Council for Standardization in Hematology
IFRR		Integrated Disease Surveillance and Response
IGHL		Information Education Communication
IgM		International Federation of Clinical Chemistry and Laboratory Medicine
IMH	IMR	Internal facility requesting & reporting form
INH	IPT	Injibara General Hospital Laboratory
IRB	IRS	Immunoglobulin M
ISH	ISO	Immuno Hematology
ISTH	ITNs	Infant Mortality rate
IUBMB		Iso Nicotinyl Hydrazine (Isoniazid)
IUIS		Isoniazid preventive therapy
IUMS		Institutional Review Board
IUPAC	JA	Indoor Residual Spray
KM		International Society of Hematology
Lab		International organization for Standardization
LLINs		International Society of Thrombosis and Homeostasis
LQM		Insecticide Treated Nets
MA		International Union of Biochemistry and Molecular Biology
MCH		International Union of Immunological Societies
MCV		International Union of Microbiological Societies
MDRTB		International Union of Pure and Applied Chemistry
MIC		Job aid
MIS		KiloMeter Laboratory
Mm		Long Lasting Insecticidal Net
MMWR		Laboratory Quality Management
MOL		Manual
MR		Maternal and Child Health
MSDS		Measles Containing Vaccine

MUAC	Multi-drug-resistant tuberculosis
NGO	Microbiology
NNT	Malaria indicator Survey
OPD	Millimeter
OPV	Morbidity and Mortality weekly report
OR	Molecular
OTP	Management Review
PEP	Material safety data sheet
PF	Mid-Upper Arm Circumference
PFSA	Non Governmental Organization
PHEM	Neonatal Tetanus
PI *PK*	Out Patient Department
PLWHA	Oral Polio Vaccine
PM	Odds Ratio
PO	Outreach Therapeutic Progra
PO	Post exposure prophylaxis
PR	*plasmodium Falciparum*
PT	Pharmaceuticals fund and supply agency
PTB	Public Health Emergency Management
PV	Principal Investigator
QC	*plasmodium Knowlesi*
QO	People living with HIV/AIDS
RBC	*plasmodium Malariae*
RDT	Policy
RHB	*plasmodium Ovale*
RRF	procedure
SARS	Proficiency Test
SNNPR	Pulmonary Tuberculosis
SPHMMC	*Plasmodium Vivax*
SPSS	Quality Control
SSAR	Quality officer

T	Red blood Cell
TAT	Rapid Diagnostic Test
TB	Regional Health Bureau
TB/HIV	Requesting & Reporting format
TVET	Severe Acute Respiratory Syndrome
UNICEF	South Nation Nationality and people Region
VCT	Saint Paul's Hospital Millennium Medical College
VHF	Stastical package for the Social Sciences
VPD	Sex specific attack rate
WBC	test
WHO	Turnaround time
WoHO	Tuberculosis
ZHD μl	Tuberculosis and HIV co-infection
	Technical and vocational education training
	United Nation International Children's Emergency Fund
	Voluntary Counseling and Testing
	Viral Hemorrhagic Fever
	Vaccine preventable diseases
	White blood cell
	World Health Organization
	Woreda Health Offices
	Zonal Health Department
	Micro Liters

Summary

Despite of many intervention activities undertaking recurrent and emerging public health diseases are remain a public health problem globally especially in developing countries. 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 United States Centers for Disease Control and Prevention (CDC) Epidemic Intelligence Service (EIS) is one of the programs focusing on capacity building public health practitioners. The training enables trainers to conduct disease surveillance and implement prevention and control measures of prioritized diseases.

This compiled body of works contains many outputs which all of them were done during the residency time of the program. I stayed from October 2016 to March 2018 in St. Paul's Hospital Millennium Medical College, Department of Public Health- Field Epidemiology Training Program and at Amhara Public Health Institution, Bahir Dar Field Base. During my stay; I carried out one outbreak investigation; one surveillance data analysis; one surveillance system evaluation; one Woreda health profile description; three Standard Operating Procedures and one Lab Manual.

Chapter I: One outbreak investigations were conducted which is measles outbreak investigation in Merhabete woreda, North shewa, Ethiopia from April 25- May 23/2017. Descriptive and analytic Epidemiology was used to describe magnitude of the diseases and identify risk factors associated with diseases. Unmatched 1:2 case control study deign were employed and totally 150 individuals were included.

Chapter two:Four years (2012 to 2015) relapsing feversurveillance data was analyzed in North Gondar zone, Amhara, Jan, 2016.A total 819,888 cases (clinical and confirmed Malaria cases) were analyzed.

Chapter III: Evaluation of surveillance system was conducted at Dessie town, Amhara Region and cross- sectional descriptive study design was employed from Feb 7 to Feb 21, 2017. **Chapter IV: -** A descriptive cross sectional study was conducted to assess and describe the current health profile of Dangilla woreda, Amhara, from May15-June 15, 2016.

The five and six chapter contains activities done in addition to the main out puts which are mentioned as follows;

Chapter V: two Standard operating procedures for Injibara general Hospital Laboratory, this includes:

1. Procedure for H.pylori rapid test
2. Procedure for Gram stain test
3. Procedure for Microhematocrit

Chapter VI: Laboratory quality manual for Injibara general Hospital Laboratory

Chapter VII: Determinants of Tuberculosis in HIV-infected adults taking antiretroviral therapy (ART) among public Hospital in Addis Ababa, Ethiopia, a Case–Control Study Was conducted from October 23 to Nov 28, 2017. A total of 312 (104 cases and 208controls) were included in the study.

Meanwhile, since the program's philosophy is learning by doing, numerous activities were carried out at the field base, which greatly contributed to strengthen the public health Laboratory workforce capacity through training, performing daily activities, conducting disease surveillance and emergency planning, preparedness and response activities.

Chapter I: Outbreak Investigation

1.1. Measles Outbreak investigations In Merhabete Woreda, North shewa Zone, Amhara region, Ethiopia, 2017

Abstract

Background: Measles is an acute, highly contagious viral disease caused by measles virus. Measles still remains one of the leading causes of vaccine-preventable deaths in children <5 years of age worldwide. In Amhara region, measles is the major public health concern of vaccine preventable diseases. Merhabete was one of the measles outbreak affected woreda in Amhara region experienced since 12Dec 2016. The aim of investigation was to identify etiologic agent, risk factors and institute doable intervention measures.

Objective: To investigate and manage measles outbreak in Merhabete Woreda from April 25-May 23/2017.

Methods: We used unmatched case-control study design,50 cases with 100 controls. We collected the data using measles line lists, observation, and using semi structured questionnaires. The data were entered in Epiinfo7 and analyzed by to SPSS version 20. Odds Ratio, 95% CI and P-value were used to test the association.

Results: A total of 160 measles cases with one death were reported during the outbreak. The outbreak was confirmed for measles IgM antibody. The index case was a17 years of age un vaccinated male. Age specific attack rate is relatively higher in <5 age group (2.3/1000). The overall attack rate was 140/100,000 population. On multivariate analysis the independent risk factors for the illness were: Age (AOR 6.9 (95%CI 1.46-32.6)), travel history (AOR 3.2(95 CI 1.22-8.5)), Contact with measles case (AOR 3.9 (95%1.70-9.20)), Vaccination status (AOR 0.25(95%CI 0.097-0.65)) and living in the house with>6 people (AOR 3.3((95%CI 1.36-8.24)).

Conclusion and recommendation: This outbreak was the largest epidemic of measles affecting primarily those >15 years of age. The results support the view that failure to vaccinate rather than vaccine failure.The analytical result indicating that Contacts history, traveling history, previous vaccination status, living in the house with >6 people and age were the possible risk

factors to enhance the spread of the disease.We recommend provision of health education to the community and strengthening case management to contain the epidemics.

Keywords: Measles, Outbreak, vaccination, Ethiopia

Introduction

Background

Measles is an acute, highly contagious viral disease caused by measles virus (genus Morbillivirus of the Paramyxoviridae family) with incubation period of approximately 10–12 days from exposure to the onset of fever and other nonspecific symptoms and 14 days (with a range of 7–18 days),from exposure to the onset of rash. This highly contagious virus is transmittedprimarily by respiratory droplets or airborne spray to mucous membranes in the upper respiratory tract or the conjunctiva [1]. The disease is characterized by prodromal fever, conjunctivitis, coryza, cough, and presence of Koplik spots. A characteristic maculopapular rash appears on the third to seventh day beginning on the face and gets more generalized. Measles infected person is contagious from four days before to four days after the rash appears [1, 2].

In the 1990s it was estimated that about 45 million cases and one million measles deaths occurred worldwide [3]. However in 2008 the number decreased to an approximated 20 million or more cases and 164,000 deaths with over 95% of these occurring in low-income countries with poor health systems [4].Measles still remains one of the leading causes of vaccine-preventable deaths in children <5 years of age worldwide, especially in developing countries, with up to 20% of these deaths occurring in those <1 year. It usually does not kill children directly; however, as a result of its associated immune-suppression, measles can lead to lethal complications, such as pneumonia, croup, and diarrhea. Measles can also lead to lifelong disabilities, including blindness, brain damage, and deafness. The disease has remained the fifth leading cause of deaths among children less than five years of age, worldwide. It accounts for 44% of total deaths due to vaccine preventable diseases (VPD) among children less than 15 years, the highest mortality occurring in poor communities with malnutrition, overcrowding and low vaccination coverage [5].

Measles vaccination resulted in a 75% drop in measles deaths between 2000 and 2013 worldwide. In 2013, about 84% of the world's children received one dose of measles vaccine by their first birthday through routine health services – up from 73% in 2000. During 2000-2013, measles vaccination prevented an estimated 15.6 million deaths making measles vaccine one of the best buys in public health domain [6]. High coverage of vaccination of children below the

age of 15 years has led to reduction of measles cases by up to 99% in developed or industrialized countries. Developing countries are failing to achieve high vaccination coverage, hence frequent outbreaks of measles with high case fatalities as high as 3- 30%[7].

Estimates suggest that of the 0.12 million measles-associated death in 2012, 43 percent occurred in South East Asia and 36 percent in the sub-Saharan Africa. India alone accounted for14 percent of the deaths. In 2010, pneumonia and diarrhea together accounted for 33 percent of child deaths in South East Asia and 29 percent in sub-Saharan Africa [8]. An estimated 20 million children worldwide did not receive the first dose of vaccine in 2011. More than half of those children lived in five countries: the Democratic Republic of the Congo (DRC) (0.8 million), Ethiopia (1 million), India (6.7 million), Nigeria (1.7 million), and Pakistan (0.9 million). In 2011, large measles outbreaks were reported in all those countries and several others: in DRC (134,042 cases), Ethiopia (3,255 cases) ,India (29,339 cases), Nigeria (18,843 cases), Pakistan (4,386 cases) ,France (14,949 cases), Italy (5,189 cases), and Spain (3,802 cases). Most of these countries are in WHO regions which have committed to eliminate measles by 2015 or 2020[9].

Infant and under-five mortality are at 75 and 123 per 1,000 live births respectively. The high child mortality rate in Ethiopia is due to combined effects of a high incidence of infectious diseases and inadequate infant and young child nutrition. Measles accounts for 5% of child hood mortality [10]. Ethiopia introduced measles vaccination in 1980, as part of the Expanded Program on Immunization (EPI), with the first dose of measles vaccine administered at 9 months of age. The measles immunization coverage remained below 50% until 2003. Following accelerated efforts to improve performance by the FMOH with the support from EPI partners, the coverage has progressively improved since 2003. Administrative measles vaccination coverage increased from 44% in 2003 to 81% in 2010 at national level [10] but based on Ethiopia Demographic and Health Survey (EDHS) 2016 report the national and regional measles vaccination coverage was 54 % and 61.9% respectively [11].

In Amhara region, measles is the major public health concern of vaccine preventable disease. Starting from July 2016, eight zones of the region and 104woredas were affected by the disease with 1239 suspected cases and 3 deaths [12].

Likewise, Merhabeteworeda experienced measles outbreak since 12 Dec 2016 (WHO-week 49), onecases of measles were recorded in unvaccinated young child fromAlemketema 03 Kebele ofwho have travel history. Later on consecutive WHO weeks until the end of May 2017, Merhabeteworeda health office detected increasing number of cases of suspected measles for which sample was sent to regional measles laboratory to be tested for measles IgM. Without stopping, the cases were distributed to 22 kebeles in the Woreda. So, this outbreak investigation was carried out to identify the etiologic agent, describe measles magnitude and identify risk factors associated with measles outbreak in Merhabeteworeda and undertake appropriate public health control measures.

Objective

General objective

- To investigate and manage measles outbreak in MerhabeteWoreda from April 25- May 23/2017.

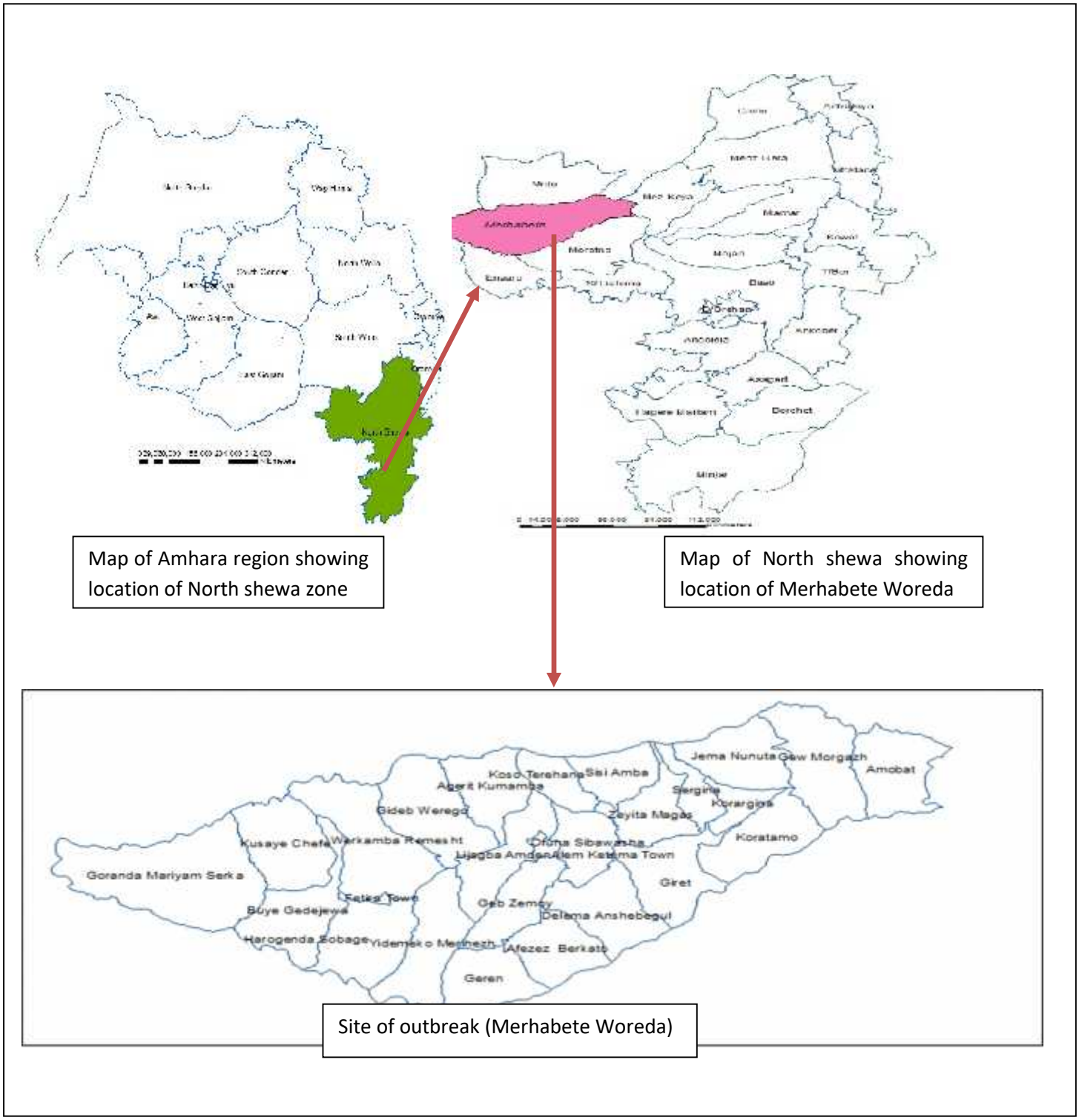
Specific objectives

- To confirm the existence of the outbreak
- To analyze the outbreak by of place, person and time
- To identify the potential risk factors of its transmission
- To design intervention measure to the outbreak based on the findings

Methods

Study area

Merhabeteworeda is the woredas found in North Shewa Zone, Eastern part of Amhara region. The woreda is at a distance of 268KM in North West direction from Addis Ababa, the capital city of Ethiopia and 828KM in Eastern direction from regional town Bahir Dar, and bounded by Mida woremo in the North, Moretna Jiru in South East, Ensaro in the South, MenzkeyaGebreal in the East and Oromia region in the West directions. The physical area of the woreda is about 1,058.19 Km^2. The average temperature of the Woreda is 17.6^{o}cand the average rainfall is943 Millimeter (mm). Administratively the woreda is divided in to 23 rural and 4 urban kebeles. The woreda has 1 hospital, 5 health centers and 27 health posts which are currently on service. The physical health service coverage of the woreda is 83.3 %(by health center and 100% by health post [13]. In 2016/17 the population estimate of this Woreda was 142,324 of which, 72,585(51%) were Female and 69,739(49%) were Male projected from census 2007 [14].



Map 1:Location of Measles outbreak, MerhabeteWoreda, Amhara, Ethiopia, 2017 [Source: Global Information System (ARC map), Ethiopia]

Study design and period

We used descriptive and case-control study design to investigate the outbreak. Unmatched case-control study design in the ratio of 1:2 was carried out for the determination of possible risk factors of the illness and controls. The study was conducted from 25April - 23May, 2017in MerhabeteWoreda, Amhara Region, Ethiopia.

Source Population

All patients and who fulfilled the standard case definition of measles in the Woreda

Study population

Measles patients (cases)and without measles cases (controls) that fulfilled inclusion criteriaduring study period in the affected kebele of Merhabete Woreda.

Inclusion criteria and Exclusion criteria

Inclusion criteria

Cases: Any resident of Merhabete Woreda who tested positive for measles IgM and/or Epidemiologically linked to Laboratory confirmed cases and had symptoms of measles from 25 April to 23 May 2017.

Control: A control was any resident of Merhabete Woreda during the study period and who did not develop signs and symptoms of measles.

Exclusion criteria

Cases: Those who were unconscious

Controls: Those who presented with one of the symptoms of measles as well as family members from same households were excluded.

Sample size determination

General formula for unmatched case-control study design

$$n_1 = \frac{(Z_{\alpha/2} + Z_{1-\beta})^2 \bar{p}\bar{q}(r+1)}{r(p_1 - p_2)^2} \qquad n_2 = r n_1$$

$$\bar{p} = \frac{p_1 + rp_2}{r+1} \qquad \bar{q} = 1 - \bar{p}$$

Sample size was calculated using Epiinfo 7 statcalc for unmatched case-control study, based on the following assumptions:

Two sided confidence level (1-α) = 95%

Power (% chance of detecting) = 80%

Ratio of controls to cases = 2

From previous study conducted in Tahitay Adiyabo District, Tigray Region indicates that[15];Proportion of controls with exposure =50%

Proportion of cases with exposure = 75%

Least extreme Odds Ratio to be detected = 3.0

Using Epiinfostatcalc sample size became

For cases = 50

For controls = 100

Total size = 150 (one case: two controls)

Sampling technique

Lists of cases were selected by using serial numbers from line list found in Woreda health office and sampled by systematic random sampling with a sampling interval of three (140/50). A lottery method was used to enroll eligible study participants into the study from the sampling frame. Convenience Sampling were used to select controls as they are available at the time of data collection who did not develop signs and symptoms of measles.

Variables

Dependent variable

- Measles infection

Independent variables

- Age
- Sex
- Vaccination status
- Contact history
- Travel history
- Educational status of Parent
- Knowledge of measles transmission
- Knowledge of measles Prevention
- Housing condition
- Share one bed for two or more children
- Living in the house with>6 people
- Respondent's education
- New person joined the house before two weeks
- House head occupation
- Share one bed for two or more child

Data collection tools and procedures

The data were collected by the principal investigator and one field Epidemiologist resident. Data was collected with line list, semi-structured questionnaire and observation. Semi-Structured questionnaire was used to collect data for case-control study and additional data was also collected by line list which was prepared to gather information about new cases and was maintained until the end of the outbreak and also additional cases were searched by HEWs (Health Extension Workers), Health centers (HCs) and Alem ketema Enat Hospital using mobile phone. Observational assessment such as the ventilation of the house and living condition of the families of both cases and controls were carried out. Also availability of refrigerator, vaccine carrier, ice pack and cold chain management were assessed and observed. Immunization coverage was collected from Woreda health offices. Cases were defined using WHO standard measles case definition, for analytic analysis 50 measles cases and 100 controls (case to control ratio of 1:2) were interviewed using standard questionnaire that includes; socio-demographic, Knowledge to disease, exposure and risk factors were included.

Operational Definitions

Epidemiologically linked case: Is a suspected case, which has contacts (possibly got the virus) with laboratory confirmed case or another epidemiologically confirmed case.

Index case: Suspected measles case that initiates the public health attention and of course, the first case who possibly the source of infection for the other cases emerging.

Knowledge about mode of transmission of measles: Individuals who scores (answers) 60% and above from the given option has a good knowledge of measles transmission and these who scores below 60% has poor knowledge of measles transmission [16]

Knowledge about measles Prevention: Individuals who scores (answers) 70% and above from the given option has a good knowledge of measles Prevention and these who scores below 70% has poor knowledge of measles Prevention [16]

Laboratory confirmed measles case: Is a suspected case which has laboratory results indicating infection, IgM positive or isolated for a measles virus.

Livings in the house with more than six people: Large household size composed of extended family with more than six especially it is common in the rural area of Ethiopia and we selected averagely six by discussing the family size with HEWs of the community.

Measles-related death: Is a death in an individual with confirmed (clinically, laboratory, or epidemiologically) measles in which death occurs within 30 days of rash onset and is not due to other unrelated causes.

Suspected measles case: Any person with generalized maculo-papular rash and fever plus one of the following: cough or coryza (runny nose) or conjunctivitis (red eyes).

Suspected measles cases at community level: Any community member should report when he/she come with a person with fever and rash to the health workers and should advice to visit health facility.

Unvaccinated Measles: Individuals who had no vaccination card/ record of vaccination on logbooks were considered to be unvaccinated.

House condition: The physical of the house whether a house supplied with fresh air or not that is a house with one or more window is considered as ventilated but without window is considered as not ventilated.

Data quality assurance

To assure the quality of data, the data was primarily collected by principal investigator. There were detailed discussions with co investigator on the questions and the collected data were checked on daily basis during the investigation. Prior to entering the data in to the computer all data were checked and cleaned for the missing variables, consistency of filling of questionnaires and completeness. Data cleaning were done using Epi Info version 7 by the principal investigator before the actual analysis. We used case based and line listing for describing measles cases in terms of time, place and person.

Laboratory investigation

Prior to the investigation period, blood samples were collected and CBC was done and also five serum samples were collected and sent to regional measles laboratory. As part of the investigation the result of laboratory analysis were requested from regional laboratory. Other cases were epidemiologically linked with laboratory confirmed cases.

Data entry and analysis

The data were entered by using Epi-Info version 7. The entered data was analyzed by SPSS version 20. Descriptive statistics were used to identify summary values of the variables and to analyze the frequency of different variables by person, place and time. Association between predictors and outcome variables were estimated by computing odd ratio (OR) and their 95% confidence interval (CI). Bivariate analysis was used to compute crude association and to identify candidate variables for multiple logistic regression. Multiple logistic regression was used to identify predictors of the outcome variables. Predictors of the outcome variables with a P-value <0.25 in bivariate analysis was candidate to be entered in multivariable logistic regression by back ward stepwise regression method. During the analyses association of illness with risk factors and exposure outcome were measured and tested using OR, 95% Confidence Interval and P-value, P-value less than 0.05 were taken as significant association. Finally the results were displayed using text, table and graph.

Ethical issues

The regional Public Health Emergency Management (PHEM) department wrote permission letter for the woreda health office in order to obtain approval on data collection. Oral informed consent was obtained from all participants or from their parents before conducting interview by explaining the purpose of the study and all agreed to participate to the study. Confidentiality was assured and no personal details was recorded or produced on this documentation, therefore the information provided by study participants was not known to others

Results

Descriptive Epidemiology

We identified a total of 160 measles cases from 12th –December- 2016 up to 23rd-May-2017. The overall attack rate was 140/100,000 population(160/115228) with a case fatality rate of 0.6%. Among the total number of measles cases, 69(43%) and 91 (57%) were females and males respectively and Sex specific attack rate (SSAR) for male and female were 16.1/10,000 and 11.7/10,000 population respectively. Only 59% of case visited health facility within three days of onset of illness.There were no measles cases above 45 years.

The index case was a 17-year old un vaccinated Male and seen in Alem Ketema Kebele 03 on 12-Dec- 2016. He visited the adjacent woredaEnsaro during a wedding ceremony which was already reporting suspected measles cases two weeks before his onset of rash.Of the total investigated cases, the predominant clinical symptoms were fever and rash 50 (100%) followed by Cough 48(96%) and Conjunctivitis / red eyes 47(94%). (Table 1)

Table1: Frequency of Measles by Clinical presentation MerhabeteWoreda, North Shewa, Amhara, 2017.

Clinical presentation	Frequency	
	Number	Percentage
Rash	50	100
Fever	50	100
Cough	48	96
Conjunctivitis / red eyes	47	94
Weakness	46	92
Sweating	41	82
Loss of appetite	40	80
Diarrhea	29	58
Coryza (runny nose)	24	48
Sore throat	21	42
Small white spots inside the cheeks	19	38

Description of measles cases by person

When we see the trend of cases, the absolute number show us more cases in the age group 15-44(69%) year followed by age 0-4(21%) year of age but the age specific attack rate is relatively higher in the under five age group(2.3/1000) and the least were in age 5-14 years (0.3/1000 population).

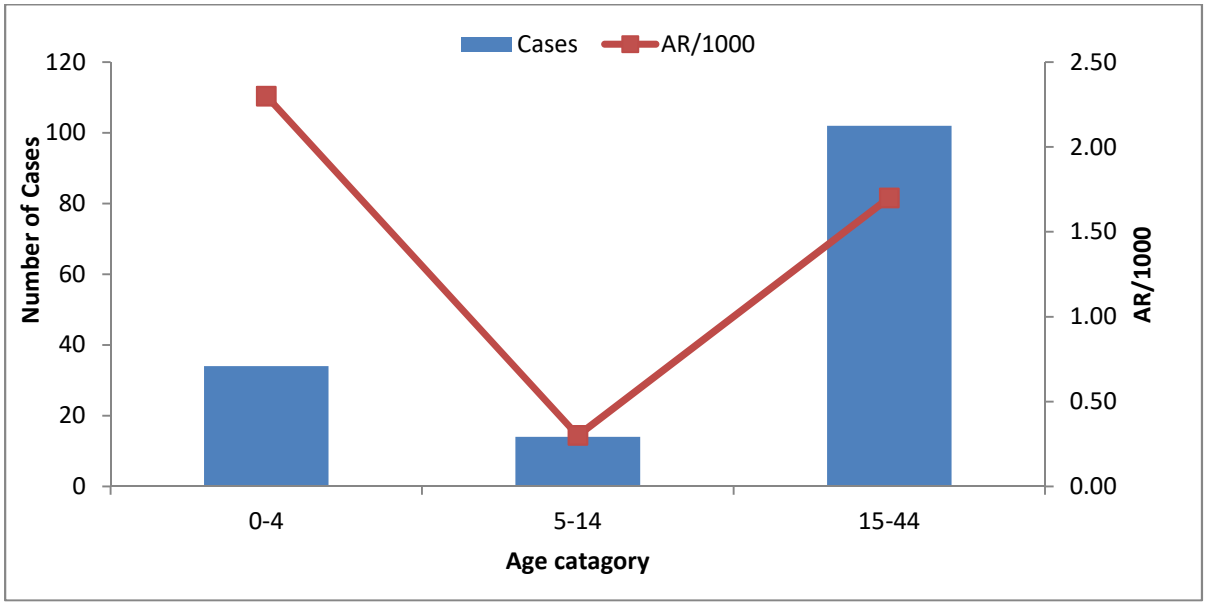


Figure 1:Age specific attack rate among cases, Merhabeteworeda, North Shewa zone, Amhara, 2017.

Description of measles cases by place

During the outbreak about 22(81%) kebele were affected by the measles epidemics from 12th – December 2016 up to 23rd-May-20117. Majority of the cases were from Delema Kebele 25(15.6%) followed by Giret Kebele 24(15%) but the most affected kebeles were Kora Tamo and Alem Ketema 03 kebeles with an Attack Rate of 480/100,000 and 400/100,000 respectively and one community death was reported at Kora Tamo kebele.

Table2: Measles cases, attack rates and case-fatality cases by kebeles, Merhabeteworeda, North Shewa zone, Amhara, 2017.

Kebele	Population	Case	Death	AR/100,000	CFR (%)
Delema	7299	25	0	340	0
Giret	6544	24	0	370	0
Kora Tamo	4339	21	1	480	4.8
Alem Ketema o3	3965	16	0	400	0
Yidemeko	6565	15	0	230	0
Geb	5990	12	0	200	0
Alem ketema 01	4731	7	0	150	0
Fetira	3111	6	0	190	0
Alem ketema 02	6017	5	0	80	0
Zeita	5908	5	0	80	0
Afezez	6205	4	0	60	0
Remeshit	7753	4	0	50	0
Sergina	2026	3	0	150	0
Worego	7194	3	0	40	0
Kosso	2767	2	0	70	0
Ofina	5416	2	0	40	0
Agerit	5970	1	0	20	0
BuYo	5510	1	0	20	0
Gew	5913	1	0	20	0
Kora Wunchit	2655	1	0	40	0
Lij Agiba	4649	1	0	20	0
YeSa	4701	1	0	20	0

Total	115.228	160	1		

Descriptions of measles cases by time

The onset of the outbreak was on 12 of December, 2016.The epidemic curve showed that the outbreak has several peaks of onset continued to occur up to 23 ofMay, 2017 (figure 3). As it has been shown from the epi-curve, the cases propagated to others neighbor Kebele and the maximum cases were reported in the Month of February 40% (64/160), also the peak numbers of cases 17 % (11/64) were reported on 19 Feb 2017.

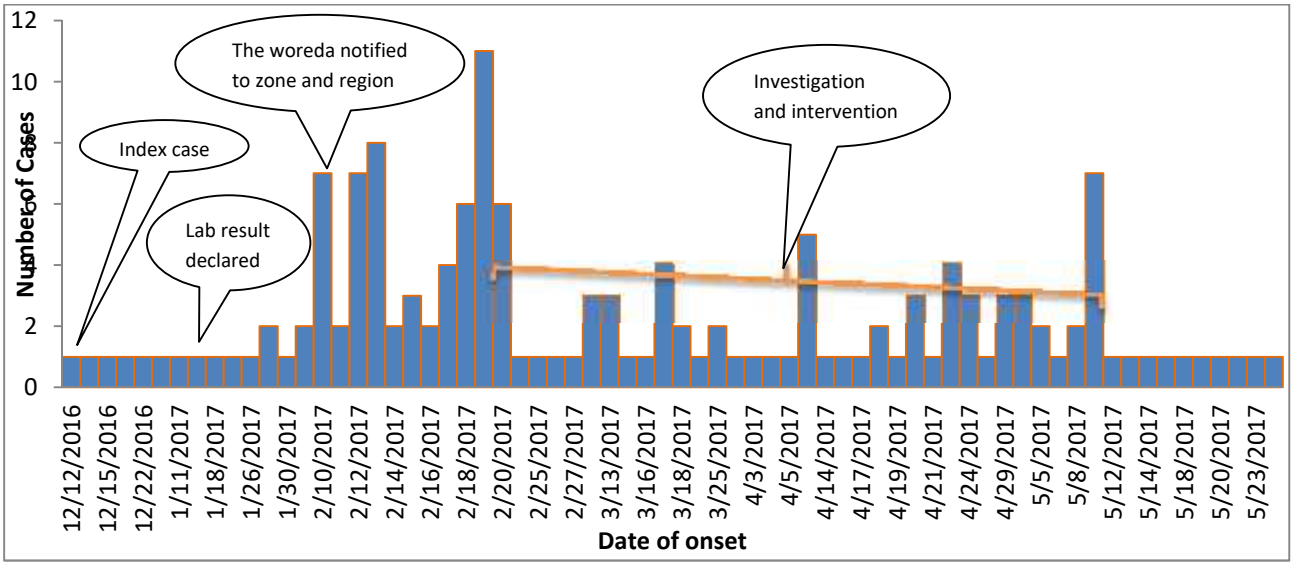


Figure 2:Distribution of Measles Cases by Date of onset of rash- Merhabeteworeda, North shewa zone, Amhara, 2017.

Vaccination status of the cases

The measles vaccination coverage was found to be low for the year 2013, 2014, 2015, 2016 and 2017. Accordingly, Woreda vaccination coverage was 48% in 2013, 54% in 2014, 59% in 2015, 63% in 2016 and 69% in six months of 2017 [13].Among the total measles cases (160) included in theworeda during the outbreak, 131(82%) of the cases were unknown vaccination history against measles, 16(9%) of the cases were un vaccinated, 11 (7%) of the cases received only single dose and 3 (2%) of the cases received two or more doses.

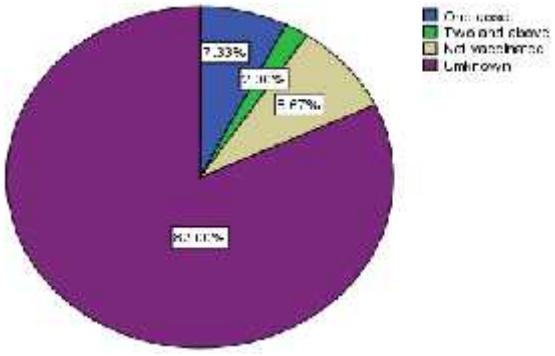


Figure2:Vaccination status of measles cases, Merhabete Woreda, North Shewa, 2017.

Analytical Epidemiology

Bivariate analysis

We applied unmatched case-control study of 50 cases and 100 controls for investigation from April 25- May 23, 2017.The mean age of the case was 20 years with range of 7 month-40 year. From the total variables considered as risk factors for developing measles cases, in Bivariate analysis illness was significantly associated with: age (COR 4.4(95%CI 1.26-15.72,p=0.021)), Living in the house with more than six people (OR 2.3,(95%CI 1.13-4.67,p=0.021)), Share one bed for two or more child (OR 2.4(95% CI 1.19-4.95,p=0.014)), History of travel before onset of illness (OR 3.7,(95%CI 1.65-8.55,p=0.002)), Vaccination status (OR 0.45(95% CI 0.21-0.97),p=0.034)) and Contact with measles case (OR 3.6,(95%CI 1.74-7.51,p=0.001)) were associated with more likely development of the disease.

Table3: Bivariate analysis of trigger factors of Measles, MerhabeteWoreda, Amhara, 2017

Variables		Case N=50(%)	Control N=100(%)	COR(95% CI), P-value
Age	0-4	8(16)	4(4)	1
	5-14	6(12)	16(16)	1.4(0.52-2.12),p=0.65
	15-44	36(72)	80(80)	4.4(1.26-15.72),p=0.021
Sex	M	26(52)	48(48)	1
	F	24(48)	52(52)	1.1(0.54-2.08),p=0.872
New person joined the	Yes	18(36)	25(25)	0.59(0.285-1.23),p=0.18

house before two weeks the onset of the disease	No	32(64)	75(75)	
Respondent's education	Illiterate	27(54)	48(48)	1.3(.644-2.51),p=0.52
	Literate	23(46)	52(52)	1
Living in the house with>6 people	>6 Persons	31(62)	45(45)	2.3(1.13-4.67),p=0.021
	<6 Persons	19(38)	55(55)	1
Housing condition	Ventilated	22(44)	58(58)	0.57(0.29-1.13),p=0.107
	Not ventilated	28(56)	42(42)	1
Share one bed for two or more child	Yes	25(50)	29(29)	2.4(1.19-4.95),p=0.014
	No	25(50)	71(71)	1
Vaccination status	Yes	12(24)	41(41)	0.45(0.21-0.97),p=0.042
	No	38(76)	59(63)	1
Educational status of Parent	Illiterate	31(62)	56(59)	1.3(0.64-2.57),p=0.48
	Literate	19(38)	44(41)	1
House head occupation	Farmer	35(70)	73(73)	0.86(0.41-1.82),p=0.7
	Others	15(30)	27(27)	1
Knowledge about mode of transmission ofmeasles	Yes	20(40)	54(54)	0.59(0.29-1.18),p=0.135
	No	30(60)	46(46)	1
History of travel before onset of illness	Yes	18(36)	13(13)	3.7(1.65-8.55),p=0.002
	No	32(64)	87(87)	1
Contact with measles case	Yes	36(72)	40(40)	3.6(1.74-7.51),p=0.001
	No	14(28)	60(60)	
Knowledge about measles prevention	Yes	17(34)	50(50)	0.5((0.26-1.06),p=0.074
	No	33(66)	50(50)	1

Multivariate analysis

Variables, those with a P-value <0.25 in the Bivariate analysis was again entered in to multivariate analysis phase to check out the presence of confounders, if any. On Multivariate analyses the risk factors that were significantly associated with illness were: Age(AOR 6.9 (95%CI 1.46-32.6; p=0.015)), travel history (AOR 3.2(95 CI 1.22-8.5; p=0.018)), Contact with measles case(AOR3.9 (95%1.70-9.20;p=0.001)),Vaccination status(AOR0.25(95%CI 0.097-0.65; p=0.005)) and living in the house with>6 people(AOR3.3((95%CI 1.36-8.24; p=0.009)).

The odds that measles disease was because of age 15-44 was 6.9 times as compared to age 0-4 (CI 1.46-32.6; p=0.015). people who traveled before onset of illness had 3.2 fold chance of acquiring measles during an outbreak compared to people without travel history during the same time interval (CI 1.22-8.5;p=0.018). Having contact with measles casebefore onset of the disease had 3.9 times as likely to acquired measles compared to people without contact during the mentioned time interval (CI 1.70-9.20; p= 0.001. Being vaccinated for Measles vaccine was 75% protective against measles diseases (CI 0.097-0.65; p=0.005). Living in the house with>6 people were 3.3 times chances of acquiring measles compared to these who lived in the house with<6 people (CI 1.36-8.24; p=0.009).

Table4:Multivariate analysis of trigger factors of Measles, MerhabeteWoreda, Amhara, Ethiopia, 2017

Variables		Case N=50(%)	Control N=100(%)	AOR(95% CI),P-value
Age	0-4	8(16)	4(4)	1
	5-14	6(12)	16(16)	0.6(0.18-1.97),0.46
	15-44	36(72)	80(80)	6.9(1.46-12.6),p=0.015
History of travel before onset of illness	Yes	18(36)	13(13)	3.2(1.22-8.5),p=0.018
	No	32(64)	87(87)	1
Contact with measles case	Yes	36(72)	40(40)	3.9(1.70-9.20),p= 0.001
	No	14(28)	60(60)	1
Vaccination status	Yes	12(24)	37(37)	0.25(0.097-0.65),p=0.005
	No	38(76)	63(63)	1
Knowledge about measles	Yes	17(34)	50(50)	0.76(0.32-1.79),p=0.539

Prevention	No	33(66)	50(50)	1
Knowledge about mode of transmission of measles	Yes	20(40)	54(54)	0.84(0.28-2.48),p=0.75
	No	30(60)	46(46)	1
Living in the house with>6 people	>6 Persons	31(62)	45(45)	3.3(1.36-8.24),p=0.009
	<6 Persons	19(38)	55(55)	1
Housing condition	Ventilated	22(44)	58(58)	0.65(0.28-1.48),p=0.307
	Not ventilated	28(56)	42(42)	1
Share one bed for two or more child	Yes	25(50)	29(29)	1.6(0.65-3.71),p=0.313
	No	25(50)	71(71)	1
New person joined the house before two weeks the onset of the disease	Yes	18(36)	25(25)	1
	No	32(64)	75(75)	2.0(0.84-4.85),p=0.114

Laboratory result of the outbreak

Among71 patients who were admitted at health facilities and investigated for CBC, 65(91%) patients have a decreased total WBCand lymphocyte count.Five blood samples were collected from patients at four different Kebeles in MerhabeteWoreda of North Shewa Zone in the period between 21 Dec to28 Dec 2016 and sent to the APHI for confirmation; all specimens were tested positive for measles IgM. All cases which occurred in the Woreda were epidemiologically linked with laboratory confirmed cases.

Environmental Investigation

We observed the general patient's environmental condition, including housing condition, sleeping rooms and housing ventilationof the cases and controls were observed.

Cold chain management

The cold chain management of the Woreda health offices, HCs and HPs for drug and vaccine storage were at 2-8^{0}c and also the class was ventilated during our visit. The temperature monitoring chart for cold chain was done on a regular manner except Geb HPs. Refrigerators temperature was read by only built in digital reading (All HPs and 2 HCs).

Interventions taken

- Technical assistance was given for health workers on case management, recording and reporting
- we participated on the Vaccination catch-up programs campaign and we have given measles vaccine for around 1,100 people
- We delivered health education for 1,400 people in social gathering areas like church, school and house to house
- Orientation was given to Woreda Health Office & Health Center Workers to contact tracing and complicated cases to manage at Health center
- we discussed with community leaders in alarming the community, health professionals and HEWs to strength the local surveillance system
- House to house case finding and supportive treatment were given for 60 households and for 68 cases

Discussion

According to the national measles guide line, three or more Laboratory confirmed cases were neededto declare an outbreak of measles. Therefore, we confirmed the existence of measles outbreak with a period prevalence of 1.4/1000 and 100% IgM positive among a total of ten clinically measles suspected cases in MerhabeteWoreda from 12 Dec 2016-23 May 2017. As a woreda, the prevalence was nearly the same as compared to the national health policy of Ethiopian Federal Ministry of Health [1] that targeted as one measles case per 1000persons. However, it was low as compared to the outbreak of measles occurred in South Africa with an incidence of 6.1/1000 for infants from 2009-2011[17]. An overall attack rate of the outbreak was 140 cases per 100,000 populations. A similar study conducted in Abaya District, Oromia Region has documented an overall AR=390 cases per 100,000 population [18] which is low comparable to our finding but much more higher than the finding documented at national level outbreak that was 6.5 and 14.6 per 100,000 population, in 2013 and 2014 respectively [19]. This might be due to low vaccination coverage reported at the Woreda. In this study, most of the cases 111(69%) of measles were in the age group of 15-44 years. The finding also indicates 15-44 years age group people were 6.9 times chances of acquiring measles compared to people of 0-4 age groups (CI 1.46-32.6; p=0.015)).This is Consistent with the study conducted explosive measles outbreak in Nyanza province, Kenya 2012, Paumio, M, Peltola, H, Valle, M, et al revealed that cases were high in unvaccinated older children compared to those who were completely vaccinated. This showed that there was age shift which might indicate the accumulation of susceptible hostwhich is not enough to develop herd immunity in the community and prevent an outbreak.It is possible to prevent them by timely immunization of susceptible individuals in populations at higher risk and also by improving overall levels of vaccine coverage in the population [19] but the highest attack rate was observed among children under the age of 5 years. This coincides with the measles outbreak investigated in South Africa that lied majority of the cases were infants and children aged 10-19 years [2] and also comparable with the observations made by other studies done on measles in DRC in 2010-2011 [20].

In this measles outbreak investigation one measles death was recorded and the CFR was 0.6%. This study is in agreement with the study done in Sudan with CFR of 0.9% [21] and much lower

than study done in DRC which is 1.4% [20]. This might indicate the level of the quality of case management was good during the outbreak time.

The distribution among male and female were 57% and 43% respectively, also the SSAR was higher for male than female which is 16.1/10,000 male population. The reasons why the excess Male from measles has not been reported earlier in other report, probably the higher prevalence rate in this study might be due to the fact that males engage in wedding, religious ceremony and activities of farming and irrigation which make them more prone to other asymptomatic measles cases.

Several factors contributed to the occurrence of this measles outbreak. The first and the most factors is being not vaccinated with measles containing virus at appropriate time of immunizationand absence of measles outbreak in the area for a long period of time left many older age groups susceptible for measles infection. When compared to study done in the Republic of Marshall Islands of pacific nation and Abaya woreda of Borena zone of Oromiya, from which 59% and 61% of affected children by measles outbreak were unvaccinated respectively, and this is in line with our finding in which 131 (82%) of measles case was un known there vaccination status against measles [18, 22].

There was no precise temperature measurement that; refrigerators temperature was read by only built in digital reading (All HPs and 2 HCs); this may not ensure the correct temperature.Immunization may not produce protection if the vaccine has been improperly handled or stored. Inappropriate storage may lead to reduction in the vaccine efficacy leading to significantly lowered vaccine effectiveness.

The diagnosis of measles always based on clinical and epidemiologic findings. Laboratory finding in the acute phase include reduction in the total white blood count with lymphocytes count. Based on the result of the laboratory test 91% of the admitted cases had a decreased white blood cell cunt with lymphocyte count. Of five serum samples send and tested at regional measles laboratory, five were positive for measles IgM. Hence, based on the result of the laboratory test in the woreda typical measles clinical manifestation and epidemiologically linked with laboratory confirmed cases, the outbreak was confirmed and cases were treated as measles.

The strategy for sustained measles morbidity and mortality reduction in national measles guideline indicates that > 90% routine vaccination coverage at nine months of age will be needed to prevent measles transmission among population [1]. A single dose of measles vaccine administered to a child older than 12 months induces protective immunity in 95% of recipients. To prevent measles outbreaks or interrupt transmission and hence eliminate measles, 95 % population immunity is needed [23, 24]. Therefore, the occurrence of this outbreak may be due to low herd immunity for measles infection

As multivariate analysis of this MerhabeteWoreda outbreak investigation shows, being vaccinated for measles infection were protective factor for developing the disease and statically significant. These vaccinated people had 25% chance to develop measles as compared with unvaccinated children with an adjusted odd ratio (AOR 0.25(95%CI 0.097-0.65; p=0.005))which is coincide with the study done in Tahitay Adiyabo District, Tigray Region OR 0.1 (95%CI 0.01 - 0.9) and Dhaka, Bangladesh 0.06 (95% CI=0.02-0.16) [15,24].

Measles is a highly contagious disease transmitted by respiratory droplet or air born spread. Secondary attack rate among susceptible household contact reach 75% - 90%. This finding revealed that contact history before 7-18 days of onset of the symptoms had 3.9 times chances of acquiring measles compared to people without contact during the mentioned time interval (CI 1.70-9.20;p=0.001). Our findings were in line with another case control study conducted in Cameroon which revealed that people having contact with suspected measles cases were seven times more likely to contract measles than those who do not have contact [25].

Anyone who is not protected against measles is at risk of getting infected when they travel to another place or areas where vaccine coverage is incomplete. The disease is brought into the different area by unvaccinated people who get infected in other place. The finding emphasizes that people with travel history were 3.2 times chances of acquiring measles compared to people without travel (95% CI 1.22-8.5; p=0.018).Our findings were in lined with another case control study conducted inDidesa Woreda, Oromia RegionOR 4.04 (95%CI 1.79-35.94; p=0.0064) [16].

Livings in the house with more than six people were associated with higher rates of measles disease. In the rural area it is common to have large household size composed of extended family. Living in the house with>6 people were 3.3 times chances of acquiring measles

compared to these who lived in the house with<6 people (CI 1.36-8.24; p=0.009). Our findings were in lined with another case control study conducted in TahitayAdiyabo District, Tigray Region which revealed that lived in a room with more than six persons were 6.7 times more likely to contract measles than those who lived <6 people [15].Predictor variables like age, contact history, travelling history, vaccination status and living in the house with>6 people that had significantly associated with measles outbreak in the affected woreda on bivariate analysis, were also significant in the multivariate analysis too.

The health seeking behavior is also minimal as it indicated that only 59% of case visited health facility within three days of onset of illness. This is lesser than the observations in Zaka District, Zimbuwabe where 91.8% of cases taught medical treatment within 3 days of onset of illness [25]. There were some individuals that think as a modern medicine aggravates the diseases and links its means of communication with some cultural beliefs so that not willing to take vaccine and have poor health seeking behavior as well as negative attitude towards vaccine and modern medicine. This may be due to poor awareness on immunization, diseases characteristics and different cultural influences. This all factors might contribute to the occurrence of measles outbreak in MerhabeteWoreda.

Study Limitations

- Recall bias on vaccination status
- Selection of the control group were difficult because they lived in the same community

Conclusion

A confirmed measles outbreak occurred with a typical clinical sign and symptom. This outbreak was the largest epidemic of measles in MerhabeteWoreda affecting primarily those >15 years of age. The results support the view that failure to vaccinate rather than vaccine failure contributed to the high infection rate in this outbreak and absence of measles outbreak in the area for a long period of time left many older age groups susceptible for measles infection. Accumulation of susceptible children shifted measles cases to older children. Consideration of local measles epidemiology (Older children cases) is important to strengthening vaccination priorities based on age groups most at risk to attain herd immunity. The analytical result indicating that Contacts with measles case, traveling history, Previous vaccination status and age were the possible risk factors to enhance the spread of the disease and increased susceptibility.

Recommendation

- Strengthening of supplementary vaccination campaign in older age groups might be effective in preventing future outbreaks
- Increase routine immunization coverage in the target age group
- Surveillance standards must also be maintained to ensure rapid detection of measles
- Provision of health education to the community to create awareness regarding the advantage of immunization and modern treatment
- Buy standardize temperature measurement for refrigerators (thermometer)
- Enhancing active case search, strengthening case management and social mobilization

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Date _____

IDNO_____

Annex 1: Measles outbreak checklist, Merhabete, Amhara, 2017

Hello. my name is TeferiYidenek work for the Amhara regional health bureau and I am doing an investigation of measles outbreak 'the purpose of this question to get an information for public health action the information you provide will remain confidential would you be willing to participate? Thank you

Respondent: Patient Family member (Mother, Father: Brother or sister or other relatives close to patient.)

Respondent's status1.Case 2.Control

1. Socio-demographic Characteristics

S/N	Question	Alternatives
1.1	Respondent Name	_____
1.2	Address	Region_____ Zone_____ Woreda_____ Kebele _____ Got (Ketena) _____ House No_____
1.3	Sex	1.Male 2.Female
	Age	Years____ Month_____
1.4	Respondent relation to case or controls?	1. Mother 2. Father 3. Guardian
1.5	Monthly income of the family	_____ETB/$
1.6	House head Occupation	1. Farmer 2.House wife 3.Student 4.Unemployed

		5. Daily laborer 6.Merchant 7. Government 8.Others(specify)
1.7	Educational level of parents	1. Illiterate 2.Read& write 3. Elementary 4.Secondary 5. College and above
1.8	Religion	1. Orthodox 2. Muslim 3. Catholic 4. .Protestant 5. Other_____

2. Clinical presentations (ONLY FOR CASES)

2.1	Do you have any of the following clinical features?	1.Rash 2. Cough 3. Conjunctivitis / red eyes 4. Others Symptoms _____
2.2	MUAC for <5yrs and lactating mothers	**1.**< 11cm **2.**11-12.5cm **3.**>12.5cm
2.4	Date of onset of rash	____/____/_____
2.5	Admission status	1-inpatient 2-outpatient
2.6	Date of admission	____/____/_____
2.7	DO you have any of the following complications?	1.Fever 2.Coryza(runny nose) 3.Diarrhea 4. Small white spots inside the cheeks 5. Malaise 6. Sore throat 7.Nasal Discharge 8.weakness 9. Sweating 10. Loss of appetite 11.Others ----------
2.8	Outcome of the patient	1. Live 2. Death

3. Treatment Information

3.1	Did you go to health facility for treatment?	1. Yes 2. No
3.2	If yes date seen at health facility?	____/____/_____
3.3	Did you receive any drugs?	1. Yes 2. No
3.4	If Yes, treatment taken	1.ORS 2.Antibiotics 3.Vitamin A 4.TTC ointment 5. Anti pyretic 6. Others----------

4. Laboratory information:

4.1	Was sample taken?	1. Yes 2. No
4.2	If, yes, date taken	____/____/_____/
4.3	Laboratory result	1.Positive for measles specific IgM 2.Negative for IgM 3. pending

5. Exposure Information

5.1	Do you have history of travel outside of your home beforeonset of the disease?	1. Yes 2. No
5.2	If Yes to where? (might be local or abroad) and when?	_____, ____/____/_____
5.3	How many family members Living in the house?	1. >6person 2. <6 person

5.4	Have you a contact history with the same sign and symptoms before onset of the disease?	1. Yes 2. No
5.5	Were the new person joined the home before two weeks the onset of the disease?	1. Yes 2. No
5.6	If yes for Q.5.5, when?	____/____/_____
5.7	A bed for two or more child?	1. Yes 2. No
5.8	Where did the patient socialize?	1. Market 2. School 3. Church 4. Mosque 5. Other (specify) _____
5.9	Were there other similar cases in the social group?	1. Yes 2. No
	If yes for Q 5.11, where?	_____
5.10	What it looks like the house condition?	1- ventilated 2- Not ventilated

6. Vaccination Status

6.1	Have you vaccinated for measles?	1. Yes 2. No
6.2	If yes source of information?	1. History 2.Vaccination card 3. Log book
6.3	If yes for 5.1, last vaccination date	____/_____/_____/
6.4	If your answer is No for question 6.1 what is the main reason that you/your child not vaccinated?	1.The health facility is far 2. I do not know the time of vaccination 3. The vaccine will hurt me /my child 4. The child is not yet 9 months

		5. The vaccine does not prevent measles 6. Other specify _____
6.5	If yes, dosage	1. Zero 2. One 3. Two &above
6.6	No of children eligible for vaccination in the house hold?	_____

7. Knowledge

7.1	Do you know measles virus?	1. Yes 2. No
7.2	Do you know the transmission of measles virus?	1. Yes 2. No
7.3	If yes for Q7.2, how is transmitted?	1. Through air 2. Food 3. Contact 4. fecal/oral route 5.Appeal of GOD 6.Others _____
7.4	Is Measles preventable disease?	1. Yes 2. No
7.5	If yes for Q7.4, how is prevented?	1. Vaccination 2. Traditional treatment 3. Modern medicine 4. Others_____

Thank you for your time!

Investigator_____Position_____Sign._____

Co-investigator_____positon_____sign._____

Chapter II: Surveillance data analysis

2.1. Surveillance data analysis of malaria in North Gondar zone, Amhara region, Ethiopia, 2012 - 2015

Abstract

Background: Malaria is a mosquito-borne disease caused by a parasite plasmodium and transmitted by female anopheles mosquitoes. It is the most highly prevalent tropical disease, with high morbidity and mortality and high economic and social impact In Ethiopia, malaria is one of the most important public health problems, with more than three-quarters of the landmass (altitude <2000 m) of the country is either malarious or potentially malarious, and an estimated 68% (>50 million people) of the total population resides in areas at risk of malaria infections.. In Ethiopia malaria is mainly seasonal with unstable transmission in the highland fringe areas and of relatively longer transmission duration in lowland areas, river basins and valleys. Plasmodium falciparum and P. vivax are the dominant malaria parasites distributed all over Ethiopia and account for about 60% and 40% of malaria cases, respectively Also, Ethiopia is implementing a range of malaria control interventions that aim to improving access and equity to preventive as well as curative health services, which include prompt and effective malaria treatment, selective vector control using LLINs and IRS

Methods: A descriptive retrospective data analysis of the North Gondar Zone Surveillance data pool was conducted from the zonal Public Health Emergency Management (PHEM) from 2004-2007 using Microsoft Office Excel and SPSS.

Results: Out of total 819,888 clinical and confirmed Malaria cases 735,505 were confirmed malaria cases by microscopy and Rapid diagnostic test (RDT), 3764 admissions and 41 deaths were reported. From the total Malaria OPD cases, majority of malaria cases were reported in 2005 with a total of 248205(30.3%) followed by 226873(27.7%) cases in 2007 E.C and the lowest cases 124061(15%) were reported in 2004 E.C. Among the 22 Woredas considered in the zone, overall, relatively largest number of malaria cases 137,997 (16.8%) were reported from

Metema district, Debark town has reported the smallest number of malaria cases, 1403 (0.17%) in the past four years.

The species distributions were: 526269 (72%) plasmodium falciparum, 209236 (28%) plasmodium vivax. The prevalence of the disease based on sex showed more males (69.4%) had malaria compared to females (30.6%) The distribution according age showed majority of the cases were above 15 years of age with a total of 593826 (72.5%), Patients 5 -14 years were 143077 (17.5%) and the under 5 years were 82985(10%). The age specific attack rate was high in >15 years of age 79/1000 followed by <5 years of age 43/1000 population. Malaria transmission was high during the major transmission season (September to November) and males' were more prone to malaria (69.4%) than female (30.6%).

Conclusion: Malaria remains as a public health problem in the study area with relatively high prevalence rate. It occurred with a fluctuating trend during the last four years' period, no consistent fall is observed in the trend. This could be an important indicative that the area is hardly on the track, with implications for need of great emphasis to malaria intervention. Therefore, health planners and administrators need to give intensive health education for the community and the about the control and prevention of malaria.

Key words: Climate variability, Confirmed malaria cases, North Gondar Zone

Introduction

Back ground

Malaria or a disease resembling malaria has been noted for more than 4,000 years. From the Italian for bad air malaria has probably influenced great extent human populations in human history. Ethiopia is an ideal case for studying the historical human culture of illness, the dynamism nature of disease ecology, and its complexity within malaria [1].

Malaria is a mosquito-borne disease caused by a parasite plasmodium and transmitted by female anopheles mosquitoes. It is the most highly prevalent tropical disease, with high morbidity and mortality and high economic and social impact. As the malaria parasites enter the blood stream they infect and destroy red blood cells. Destruction of these essential cells leads to fever and flu-like symptoms, such as chills, headache, muscle aches, tiredness, nausea, vomiting and diarrhea. These initial symptoms are non-specific: in other words, they are self-reported symptoms that do not indicate a specific disease process. Malaria remains one of the main global health problems of our time causing more than one million deaths per year [2].

The five plasmodium species that are known to infect humans but them each differ in many aspects of their biology and geographic distribution *PF (P. falciparum*): This is the most life-threatening species of malaria. Although present throughout much of the tropical and subtropical world, it is particularly common in sub-Saharan Africa *PV (P. vivax*): Though it's most common in India and Central and South America, it's found worldwide. Infections can sometimes lead to life-threatening rupture of the spleen. This type of malaria can hide in the liver and return later to cause a relapse years after the first infection. Special medications are used to eradicate *P. vivax* from the liver. *P. ovale*: It's rarely found outside Africa. Symptoms are similar to those of P. vivax. Like *PV (P. vivax), PO (P. ovale*) can hide in the liver for years before bursting out again causing symptoms *PM (P. malariae):* It's found worldwide but is less common than the other forms. This form of malaria is hard to diagnose because there are usually very few parasites in the blood. If untreated, the infection can last many years.*PK (P. knowlesi*): Found in Malaysia, this species can cause high levels of parasites in the blood, leading to organ failure or death [3].

Some population groups are at considerably higher risk of contracting malaria, and developing severe disease, than others. These include infants, children under 5 years of age, pregnant women

and patients with HIV/AIDS, as well as non-immune migrants, mobile populations and travelers. National malaria control programmers need to take special measures to protect these population groups from malaria infection, taking into consideration their specific circumstances. In 2015, 97 countries and territories had ongoing malaria transmission. WHO recommends protection for all people at risk of malaria with effective malaria vector control. Two forms of vector control – Long lasting insecticide treated nets (LLINs) and indoor residual spraying (IRS) – are effective in a wide range of circumstances [4].

According to the latest WHO estimates, released in December 2015, there were 214 million cases of malaria in 2015 and 438 000 deaths. In 2015, approximately 3.2 billion people – nearly half of the world's population – were at risk of malaria. Most malaria cases and deaths occur in sub-Saharan Africa. However, Asia, Latin America, and, to a lesser extent, the Middle East, are also at risk. In areas with high transmission of malaria, children under 5 are particularly susceptible to infection, illness and death; more than two thirds (70%) of all malaria deaths occur in this age group. Between 2000 and 2015, malaria incidence among populations at risk fell by 37% globally; during the same period, malaria mortality rates among populations at risk decreased by 60%. An estimated 6.2 million malaria deaths have been averted globally since 2001. Between 2000 and 2015, the under-5 malaria death rate fell by 65% globally, translating into an estimated 5.9 million child lives saved between 2001 and 2015 [4].

Sub-Saharan Africa continues to carry a disproportionately high share of the global malaria burden. In 2015, the region was home to 88% of malaria cases and 90% of malaria deaths. Some 15 countries – mainly in sub-Saharan Africa – account for 80% of malaria cases and 78% deaths globally. Since 2000, the decline in malaria incidence in these 15 countries (32%) has lagged behind that of other countries globally (53%) [4, 5].

In Ethiopia, malaria is one of the most important public health problems, with more than three-quarters of the landmass (altitude <2000 m) of the country is either malarious or potentially malarious, and an estimated 68% (>50 million people) of the total population resides in areas at risk of malaria infections. Also, Ethiopia is implementing a range of malaria control interventions that aim to improving access and equity to preventive as well as curative health services, which include prompt and effective malaria treatment, selective vector control using LLINs and IRS [6].

Annually, half a million microscopically confirmed cases of malaria are reported to the Federal Ministry of Health (FMOH) from basic health services. However, the actual number of malaria cases in the country is estimated to be more than 5 million each year. According to the2007/2008 report of the (FMOH), malaria was the leading cause of outpatient visit accounting for 12% of cases and the second cause of (10%) admission next only to admissions for delivery[5,6].

In Ethiopia malaria is mainly seasonal with unstable transmission in the highland fringe areas and of relatively longer transmission duration in lowland areas, river basins and valleys. Plasmodium falciparum and P. vivax are the dominant malaria parasites distributed all over Ethiopia and account for about 60% and 40% of malaria cases, respectively [6, 7].

Amhara Region is the second most populous region in Ethiopia next to Oromia With a population at 17.2 million people and with about 88% of the population living in rural areas [7]. Children under the age of five years constitute about 16% and approximately 23% are women from 15-49 years. The corresponding infant and under-five mortality rates of the region are estimated at 94 and 154 per 1000 live births, respectively. Malaria, is one of the major causes of morbidity and mortality, disproportionately affecting the most vulnerable and under-served group of the population [6, 8].

In Northern Gondar, malaria is one of the main diseases which reported as the major causes of morbidity and mortality. So the main objective of this data analysis is: to estimate the magnitude of the health problem and to see the trends and prevalence of malaria morbidity and mortality in Northern Gondar [8].

Malaria is a mosquito-borne disease caused by a parasite plasmodium and transmitted by female anopheles mosquitoes. It is a major public health concern and also epidemic prone diseases in Ethiopia as well in North Gondar of Amhara region in which most parts of its population is at risk which can cause highly devastating consequence. So undertaking the surveillance data analysis will help to estimate magnitude of the malaria disease in the regions and also early recognition of malaria epidemics and it enables to follow secular (long-term) trends of malaria disease in the North Gondar zone.

Objective

General objectives

- To conduct in depth review from North Gondar zonal health department on secondary data of the existing of malaria surveillance data in north Gondar zone

Specific objectives

- To assess the burden of malaria in North Gondar zone
- To determine the trend of malaria according to age and sex.
- To describe the data in terms of place and time
- To show most affected age groups due to malaria

Method

Study area and study period

North Gondar is one of the districts in Amhara regional state, which is located at a distance of 176 KM from the regional town (Bahirdar) and 726 Km from Addis Ababa. It is bordered on the south by Lake Tana , West Gojjam, Agew Awi and the Benishangul-Gumuz Region, on the west by Sudan, on the north by the Tigray Region, on the east by Wag Hemra and on the south east by South Gondar[9].

Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia (CSA), this Zone has a total population of 2,929,628, an increase of 40.26% over the 1994 census, of whom 1,486,040 are men and 1,443,588 women; with an area of 45,944.63 square kilometers, North Gondar has a population density of 63.76. While 462,700 or 15.79% are urban inhabitants, a further 2,148 or 0.07% are pastoralists. A total of 654,803 households were counted in this Zone, which results in an average of 4.47 persons to a household, and 631,509 housing units. The main ethnic group reported in North Gondar was the Amhara (97.84%); all other ethnic groups made up 2.16% of the population. Amharic was spoken as a first language by 98.32%; the remaining 1.62% spoke all other primary languages reported. 95.38% practiced Ethiopian Orthodox Christianity, and 4.29% of the population said they were Muslim. The average annual rain fall is 1161mm and the average temperature of 19oC.Altitudes with range 1500-2800m [9, 10]. The district has 567 health posts, 126 health centers, 4 Hospitals and 266 private health sectors which are currently on service. This study was carried out between April 11 and May 15, 2008 E.C.

Study design

A descriptive retrospective data analysis of the zonal Surveillance data pool was conducted from the zonal Public Health Emergency Management(PHEM) on the bases of weekly routine surveillance data to assess the prevalence of Malaria disease among patients visiting Governmental and private health sectors in North Gondar, from 2004-2007 E.C.

Operational definition of terms

Acquired Immune Deficiency Syndrome (AIDS):-is a syndrome caused by a virus called HIV that alters the immune system, making people much more vulnerable to infection and disease.

Anopheles mosquitoes: - is a name given for insects that transmits plasmodium from one person to another person.

Epidemiological week: - commonly referred to as an epi week or a CDC week, is simply a standardized method of counting weeks to allow for the comparison of data year after year.

Epidemic disease: - occurrence of disease more than expected in defined area and population over a specified period of time.

Human Immuno Deficiency Virus (HIV):-is a virus that gradually attacks the immune system which is our body's natural defense against illness.

Long Lasting Insecticide treated Nets:-is a net designed to block mosquitoes physically, that has been treated with residual insecticide for the purpose of killing and repelling mosquitoes.

Malaria: - a serious disease that causes chills and fever and that is passed from one to another by the bite of mosquito.

Parasite:- are an organism which lives in or on another organism and benefits by deriving nutrients at the other expense, sometimes the host is harmed by them and sometimes the relationship is neutral.

Plasmodium: - a type of protozoa, that causes malaria disease

Public Health Emergency Management: - is the process of anticipating, preventing, preparing for, detecting, responding to, controlling and recovering from consequences of public health threats in order that health and economic impacts are minimized

Rapid Diagnostic Tests: - is a medical diagnostic test that is suitable for preliminary or emergency medical screening and for use in medical facilities with limited resources

Secular trends:-a long term time frame, usually at least 10 years.

Surveillance: - on going close observation and collection of data or evidence for a specified purpose.

Data collection

A four years malaria surveillance secondary data was extracted from North Gondar zonal health departments of PHEM core process that was collected on weekly base from 2004-2007.

Data Analysis

Data gained from PHEM department was checked for its completeness, inconsistencies and missing values and entered in a computer then analyzes the data appropriately using Microsoft Office Excel and SPSS version 21. Finally the results were analyzed by descriptive statistical method and presented with tables, graphs and figures.

Dissemination Plan

Results of this study has been given and presented to St. Paul's Hospital Millennium Medical College department of Public Health and other concerned bodies including Amhara Regional Health Bureau, North Gondar zonal health department, so they can use the results for planning and implementation of intervention programs.

Ethical issues

This work was realized based on the ethical clearance of the PHEM department of Regional Health Bureau and confidentiality of the data was maintained.

Result

A total of 819,888 clinical and confirmed Malaria cases & 41 deaths reported during the four years period with a mean of 204,972 cases, range between 124,061 and 248,205 cases, standard deviation of 55,207and the standard error of the mean was 27603. From the total cases reported 3,764 (0.46%) were reported inpatient malaria cases with a mean of 941 cases and range between 334 and 1774 cases, standard deviation of 609 and the standard error of the mean was 304. Malaria was one of the leading causes of morbidity in the Zone, accounting 20% from all OPD visits (819888/4098311).

From the total Malaria OPD cases, majority of malaria cases were reported in 2005 with a total of 248205(30.3%) followed by 226873(27.7%) cases in 2007 E.C and the lowest cases 124061(15%) were reported in 2004 E.C

Among the 22 Woredas considered in the zone, overall, relatively largest number of malaria cases 137,997 (16.8%) were reported from Metema district, Second and third largest malaria case reported 101,316(12.4%) and 70814(8.6%) were from West Armachiho and Quara districts respectively. Debark town has reported the smallest number of malaria cases, 1403 (0.17%) in the past four years The majority inpatient deaths 44% (18/41), mortality rate 17.5/100,000 Population (18/102640) were reported from Gendwuha, followed by Metema 24.4 %(10/41), mortality rate 2.4/100,000 Population (10/414526) and Quara 7.3 %(3/41), mortality rate 0.7/100,000 Population (3/422376). The overall case fatality rate (CFR) was (5/100,000).

Out of total 819,888 clinical and confirmed Malaria cases 735,505 were confirmed malaria cases by microscopy and Rapid diagnostic test (RDT), 3764 admissions and 41 deaths was reported. The species distributions were: 526269 (72%) *plasmodium falciparum*, 209236 (28%) *plasmodium vivax*. The prevalence of the disease based on sex showed more males (69.4%) had malaria compared to females (30.6%)The distribution according age showed majority of the cases were above 15 years of age with a total of 593826 (72.5%), Patients 5 -14 years were 143077 (17.5%) and the under 5 years were 82985(10%). The age specific attack rate was high in >15 years of age 79/1000 followed by <5 years of age 43/1000 population.

From the total of 819,888 malaria cases reported majority of the cases, 137,997 (16.8%) were from Metema district, Second and third largest malaria case reported 101,316(12.4%) and

70814(8.6%) was from West Armachiho and Quara districts respectively. Debark town has reported the smallest number of malaria cases, 1403 (0.17%) in the past four years. From the year 2004-2007 the highest numbers of Malaria cases 43,832 were reported at Metema districts in 2006 followed by 42,213 cases in the same Districts of the year 2007 and the minimum cases 13 were reported at Beyeda in 2005. The total number of malaria cases by district in the past Four year is shown below in fig. 1

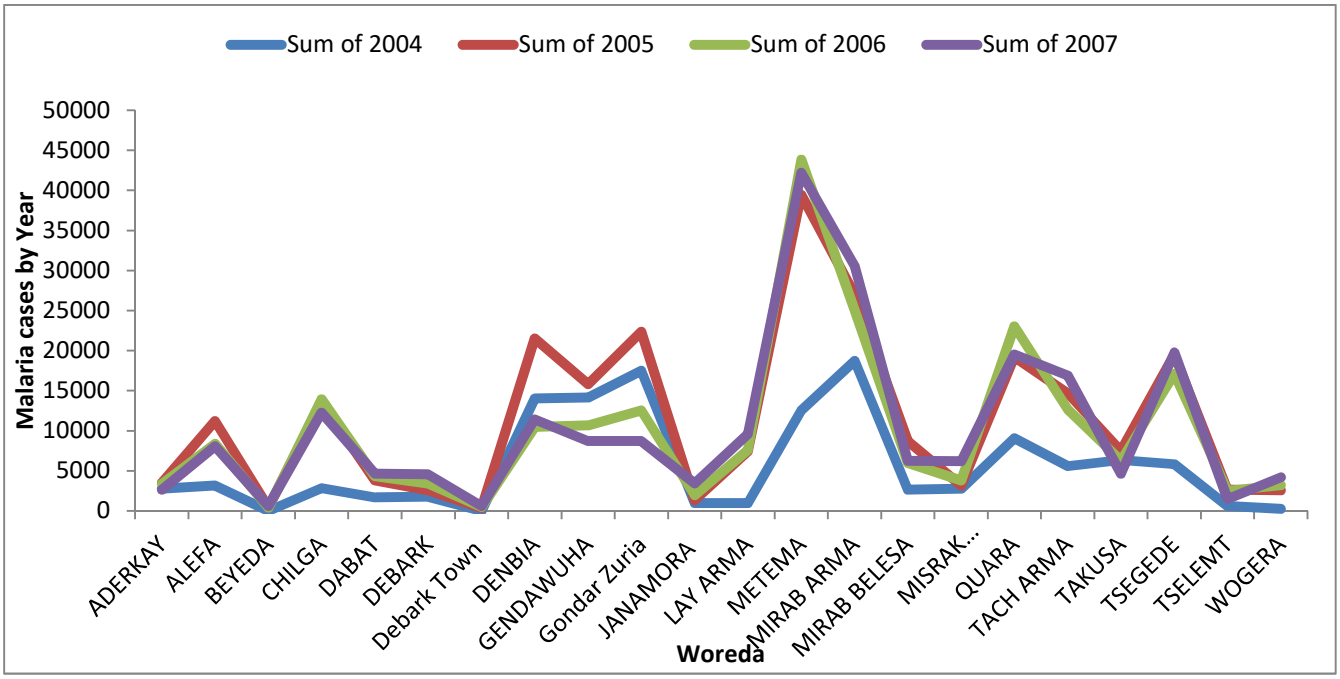


Figure3:Distribution of malaria cases by woreda North Gondar, Amhara, Ethiopia, 2004-2007 E.C

A total of 819,888 malaria cases in 22 Districts of North Gondar zone and 41 deaths were reported in 10 districts of North Gondar zone as shown below in figure 2. The highest Case Fatality Rate (CFR) 71/100,000 population and 36/100,000 Population was from Debark Town and Gendwuha respectively for the last four year. Chilga district has reported the smallest CFR (2/100,000 Population). Among the year 2004-2007the maximum level of Malaria CFR (173/100,000 Population) were found from Debark Town in the year of 2007 followed by 85/100,000 Population at Gendwuha in 2004. Seven Districts were reported death in 2006 followed by six Districts in 2005. There was no reported death for the rest 12 districts.

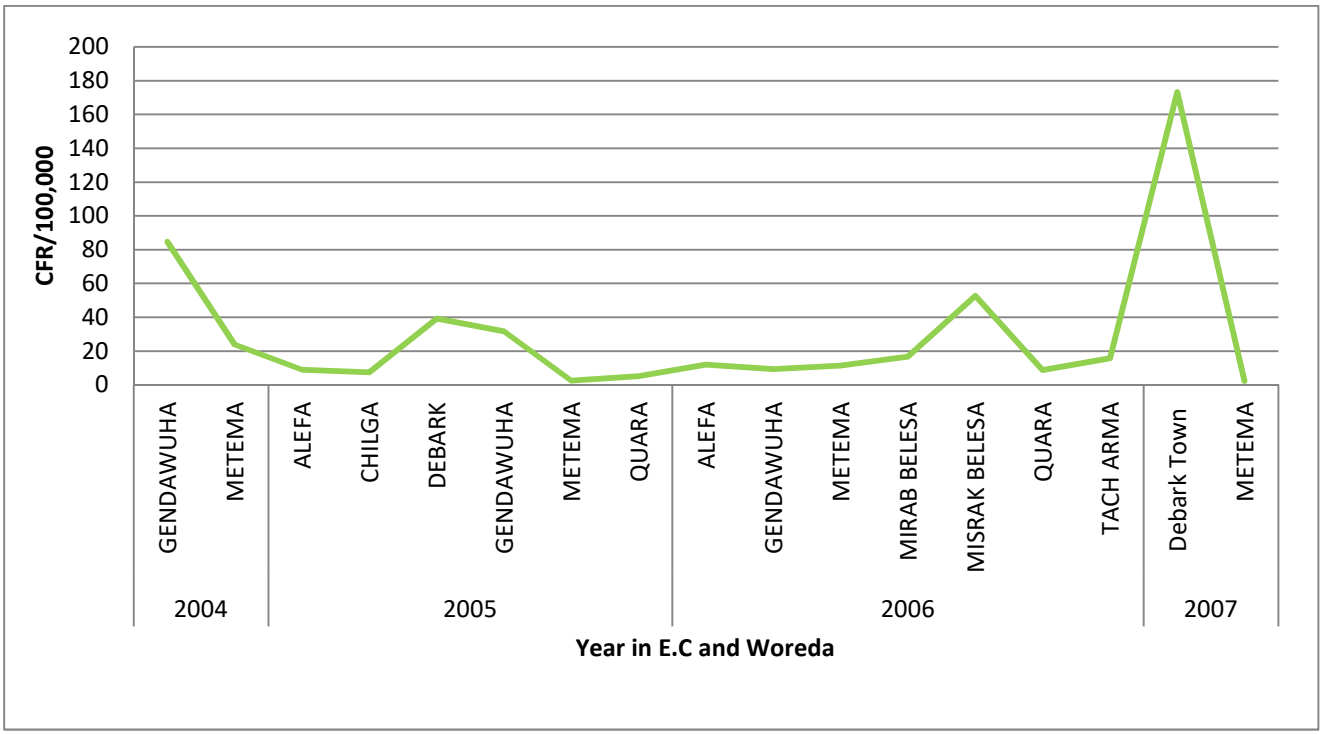


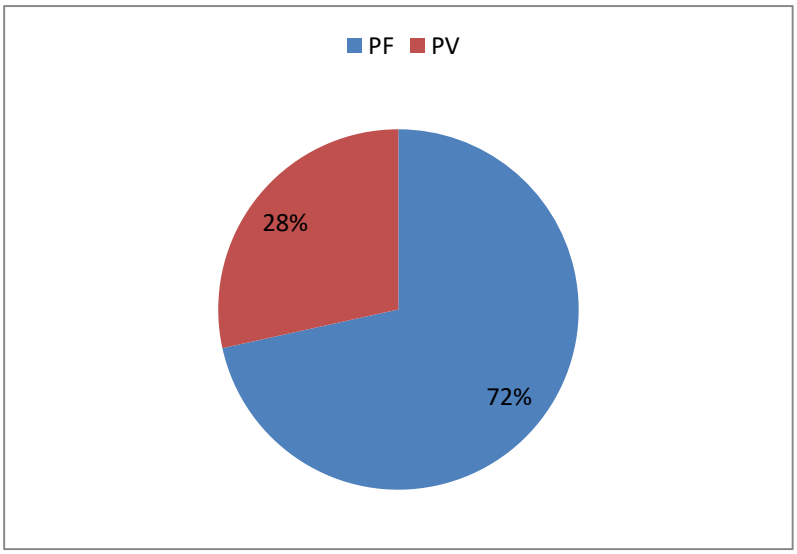
Figure4: Case fatality rate of malaria by woreda North Gondar, Amhara, Ethiopia, 2004-2007E.C

Table5: Distribution of Malaria cases and deaths by Woreda North Gondar, Amhara, Ethiopia, 2004-2007 E.C

Woreda	Total Malaria cases	Total Malaria death	Mortalityrateper100,000
ADERKAY	12304	0	0
ALEFA	30826	2	0
BEYEDA	1412	0	0
CHILGA	42553	1	0
DABAT	14399	0	0
DEBARK	12237	1	0
Debark Town	1403	1	0.5
DENBIA	57474	0	0
GENDAWUHA	49320	18	17.5
Gondar Zuria	61095	0	0
JANAMORA	7617	0	0
LAY ARMA	25523	0	0
METEMA	137997	10	2.4
MIRAB ARMA	101316	0	0
MIRAB BELESA	23552	1	0
MISRAK BELESA	15913	2	0
QUARA	70814	3	0.7
TACH ARMA	49806	2	0
TAKUSA	24753	0	0
TSEGEDE	62178	0	0
TSELEMT	7206	0	0
WOGERA	10190	0	0
Total	819,888	41	23

The majority inpatient deaths 18(44%), mortality rate 17.5/100,000 Population were reported from Gendwuha, followed by Metema10 (24.4%), mortality rate 2.4/100,000 Population and Quara 3(7.3%), mortality rate 0.7/100,000 Population. The overall case fatality rate (CFR) was 5/100,000.

In North Gondar zone, a total 819,888 Malaria cases of clinical and confirmed malaria were reported of this 526269 Malaria Cases positive for *Plasmodium falciparum* and 209236 were positive for *plasmodium vivax* by Microscopy and RDT within the last four years' period from 2004-2007E.C.The predominant Plasmodium species seen was *P. falciparum* (72%) followed by *P.vivax* (28%).The proportion of Malaria for each species in respective years were almost similar.



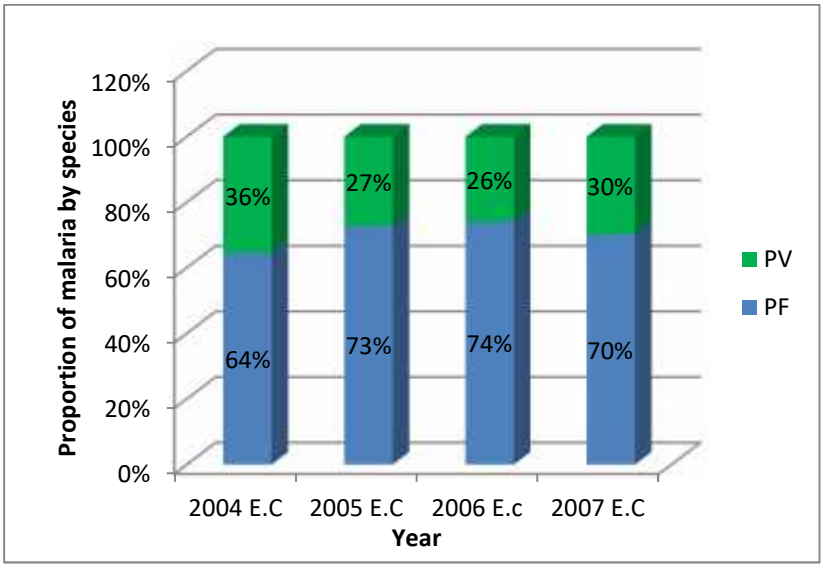


Figure5: Proportion of malaria cases by species North Gondar, Amhara, Ethiopia, 2004-2007 E.C

From the total Malaria OPD cases, majority of malaria cases were reported in 2005 with a total of 248205(30.3%) followed by 226873(27.7%) cases in 2007 E.C and the lowest cases 124061(15%) were reported in 2004 E.C.

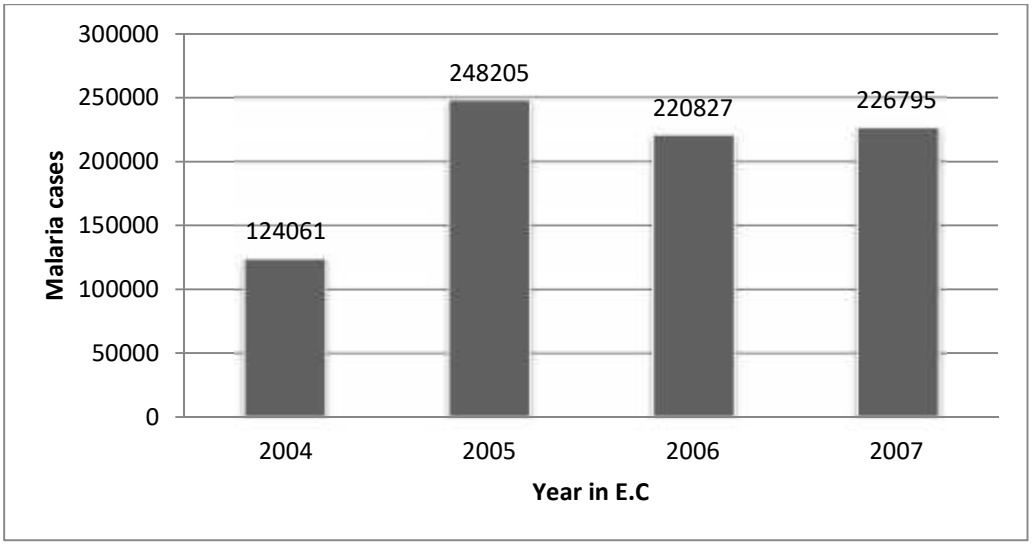


Figure6: Number of malaria cases by year North Gondar, Amhara, Ethiopia 2004-2007 E.C

In the period of 2004-2007, the proportion of malaria cases from all OPD visits during respective years were decreased. The highest the proportion of malaria case 25.7 %(124061/481793) were occurred in 2004 and the lowest proportion of cases 17.5 %(226873/1293748) were reported in 2007.

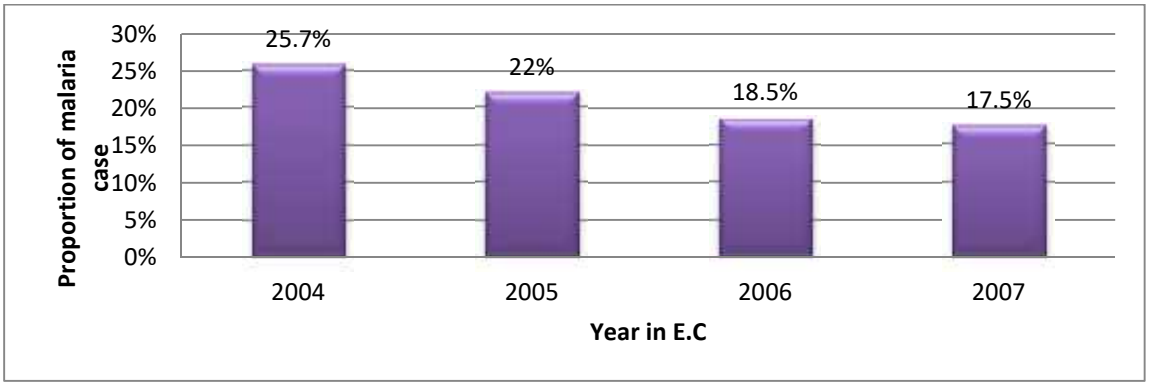


Figure7: proportion of malaria cases among all cases by year North Gondar, Amhara, Ethiopia 2004-2007 E.C

The majority of Malaria cases were reported 248,205(30.3%):- incidence rate 82/1000 in 2005 with followed by 226,873(27.6%):-incidence rate 74/1000 in 2007, 220,827(26.9%):-incidence rate 73/1000 in 2006 and 124, 061(15%):- incidence rate 42/1000 in 2004.

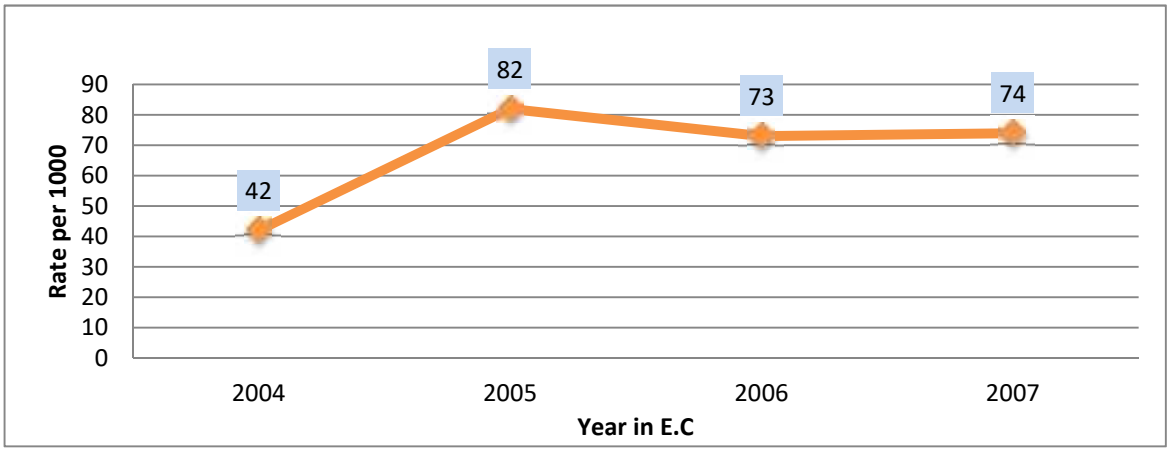


Figure8: Trend of total malaria cases by year North Gondar, Amhara, Ethiopia 2004-2007 E.C

The total inpatient Malaria cases from all malaria OPD cases were 0.46 %(3764/819888) for the past four years. The proportion of inpatient Malaria cases were increased from 2004-2005 this was due to an epidemic was happened in different districts of North Gondar Zone in the year of 2005. In the period of 2005-2007 the proportion of inpatient Malaria cases among all Malaria cases were decreased. The highest the proportion of Malaria cases1774 (0.71%) were reported in 2005 and the lowest proportion of cases 334 (0.15%) were found in 2007.

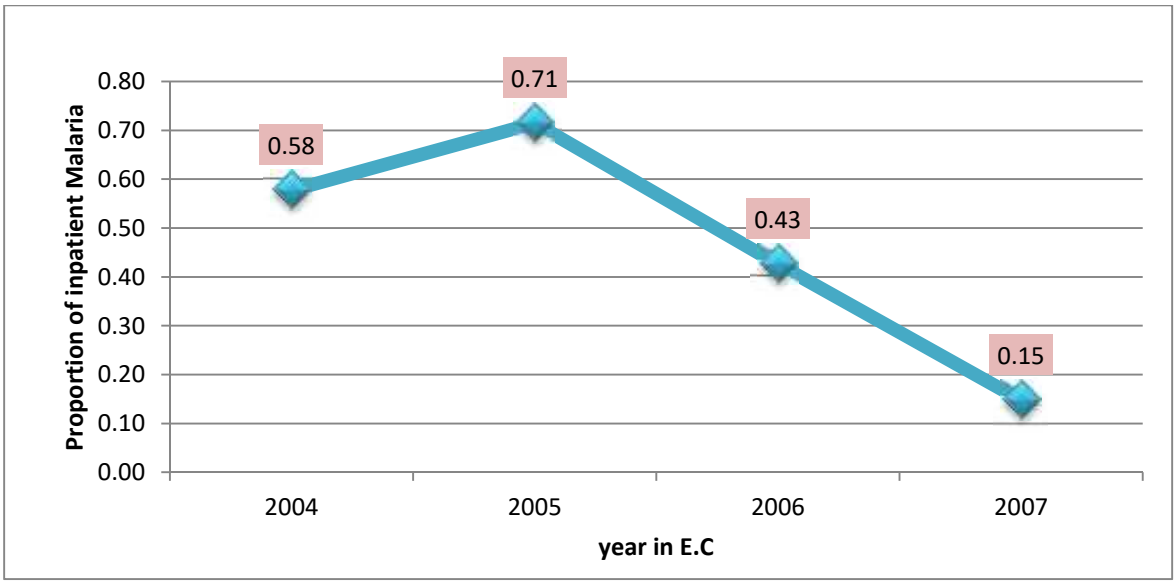


Figure9: Proportion of inpatient malaria cases from total malaria cases by year North Gondar, Amhara, Ethiopia 2004-2007E.C

For the last four year the number of malaria cases was reached at peak level in the second quarter of each consecutive year. There was high number of malaria cases 330,600(40.3%) reported in the second quarter of year 2004-2007E.C followed by 229,840(28%) cases in the first quarter of the same year. Among the year 2004-2007, the maximum number of malaria cases 12% (99,337/819,888) were reported in the second quarter of year 2007 followed by 94,442(11.5%) cases in the second Quarter of year 2005.

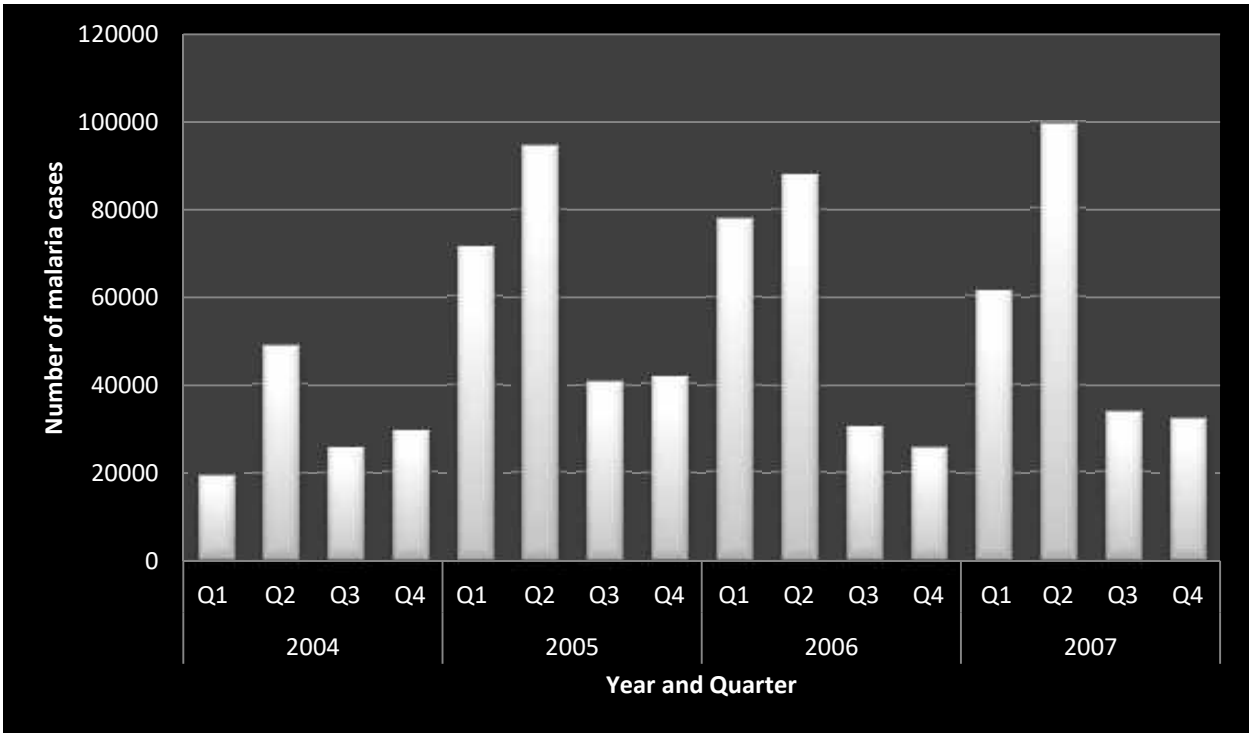


Figure10: Malaria cases by year and Quarter North Gondar, Amhara, Ethiopia 2004-2007 E.C

From 2004-2007E.C, the highest peak of malaria cases 41,888(5%) were observed in November 2007 followed by 37,285(4.5%) in November 2005, 35,466(4.3%) in November 2006 and 18,032(2.2%) in 2004. The lowest malaria cases 1996(0.24%) were reported in August 2004.

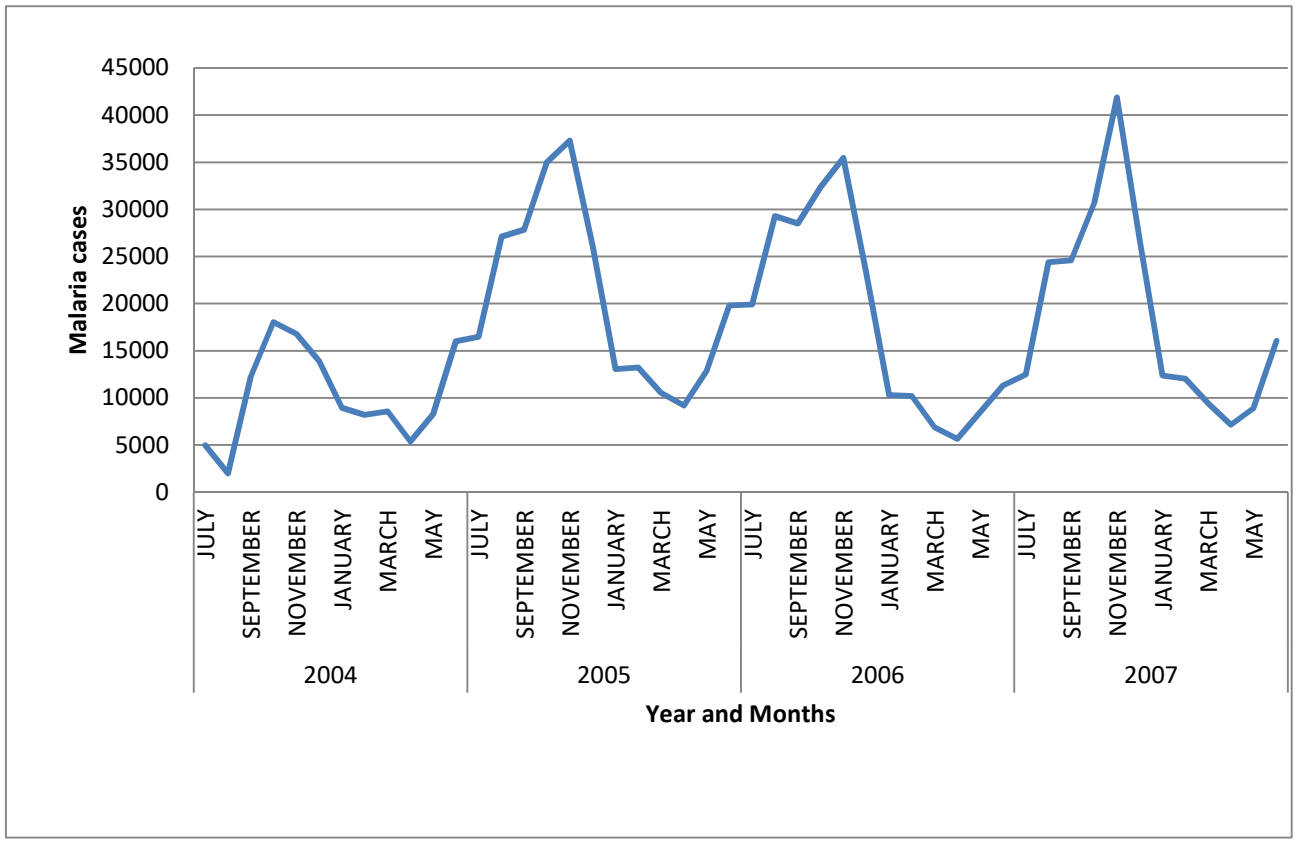


Figure11: malaria cases by year and Months North Gondar, Amhara, Ethiopia 2004-2007E.C

In North Gondar zone, from 2004- 2007 E.C the number of malaria cases were increased from week 11-19 and the maximum number of cases were reported from week17-19. The highest number of malaria cases 38,800(4.7%) were reported in Epi week 18 followed by 35,852(4.4%) and 35,631(4.3%) in Epi week of 19 and 17 year 2004-2007respectively. The minimum cases 5583(0.7%) were reported in week 40 of year 2004-2007. Among the year 2004-2007, the maximum number of malaria cases 14,080(1.7%) were reported in Epi week of 18year 2005 followed by 12,681(1.5%) in Epi week of 19 year 2006.

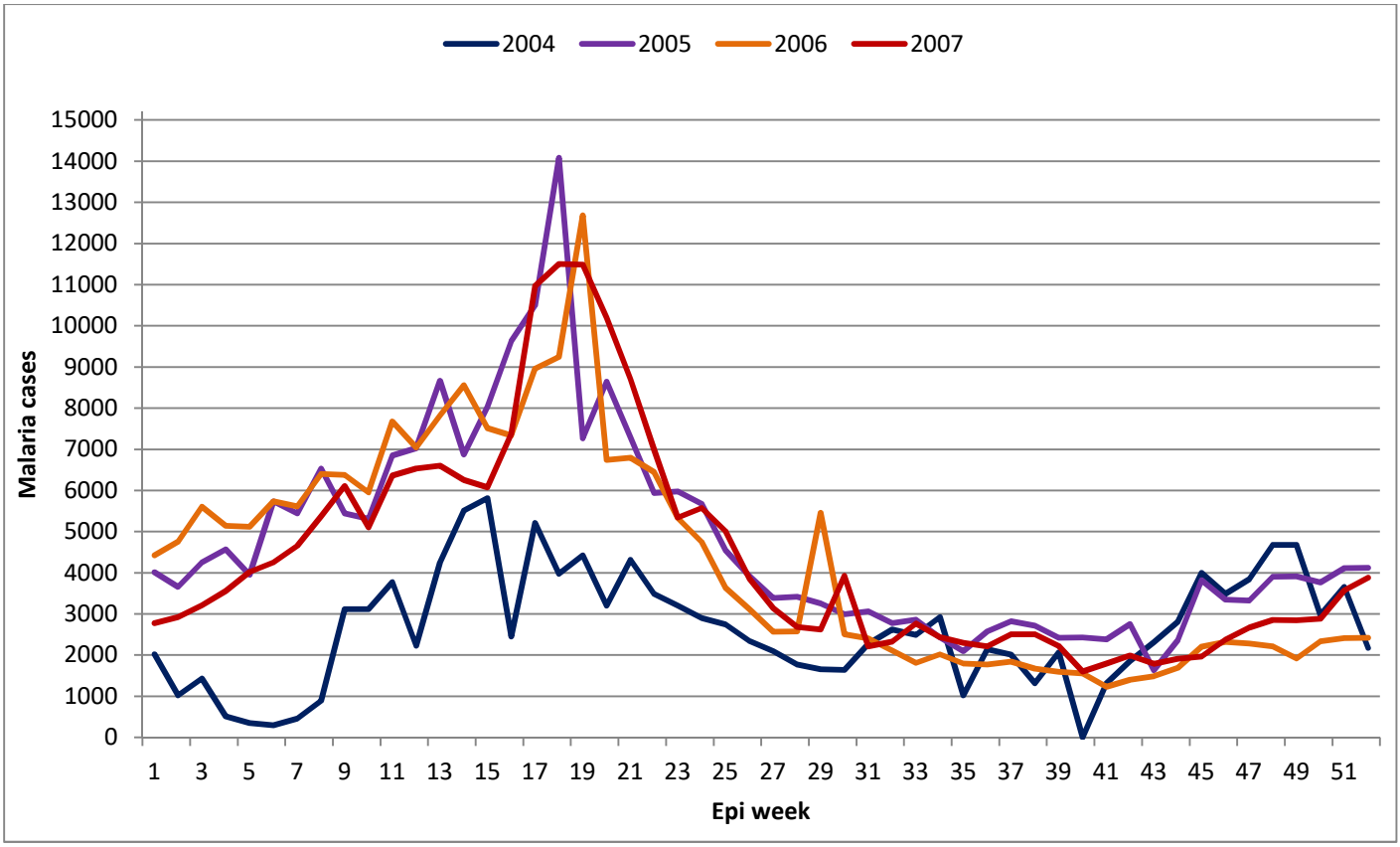


Figure12: Malaria cases by Epi week North Gondar, Amhara, Ethiopia 2004-2007 E.C

The distribution according to age showed majority of the cases were above 15 years of age with a total of 593,826 (72.5%), but below 15 years of age were 226,062(27.5%).The maximum Malaria cases 177,070(21.6%) were reported in above 15 years of age in the year of 2005 followed by 172,670(21%) in 2007. The age specific attack rate was high in >15 years of age 79/1000 Population followed by <5 years of age 43/1000 Population and 5-14 years of 38/1000 population.

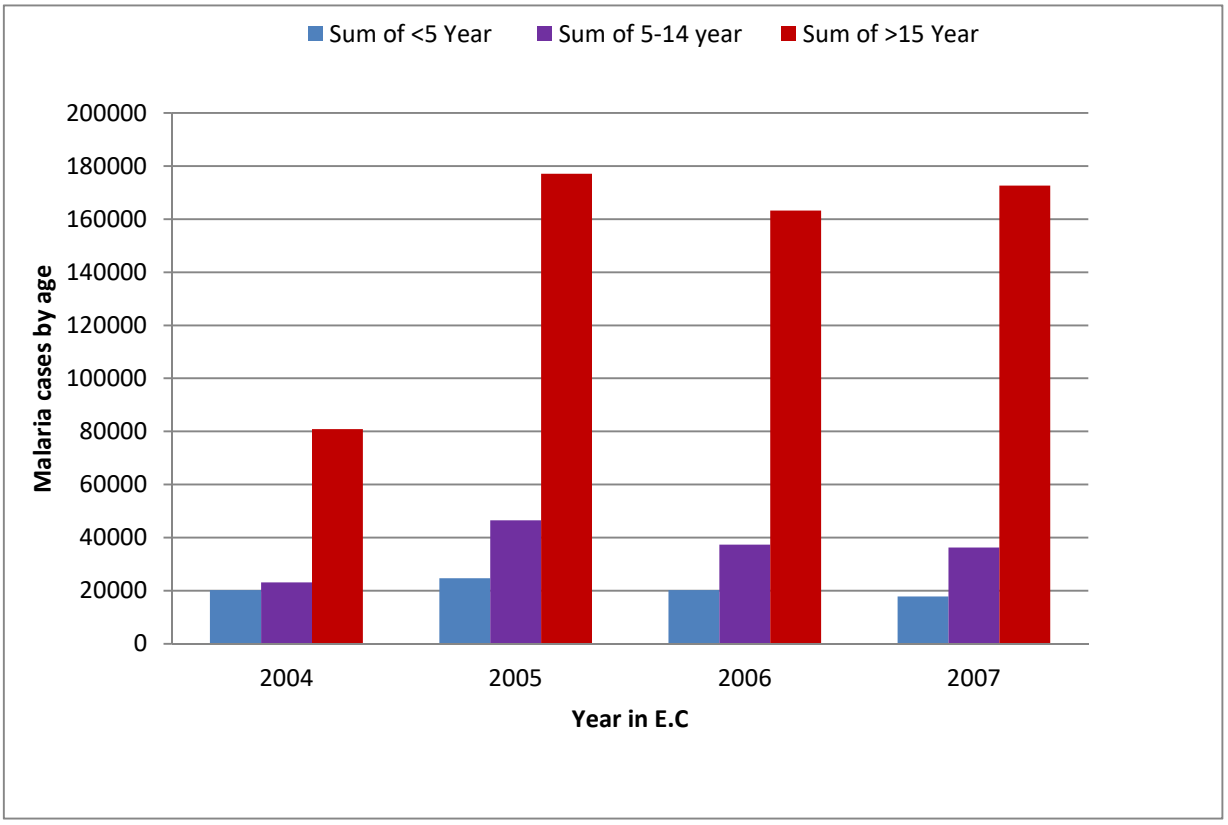


Figure13: Malaria cases by Age North Gondar, Amhara, and Ethiopia 2004-2007 E.C

Among sex distribution males were more prone to malaria (69.4%) than female (30.6%). The total number of both sexes in the past three year (2004-2006 E.C) is shown in the figure below.

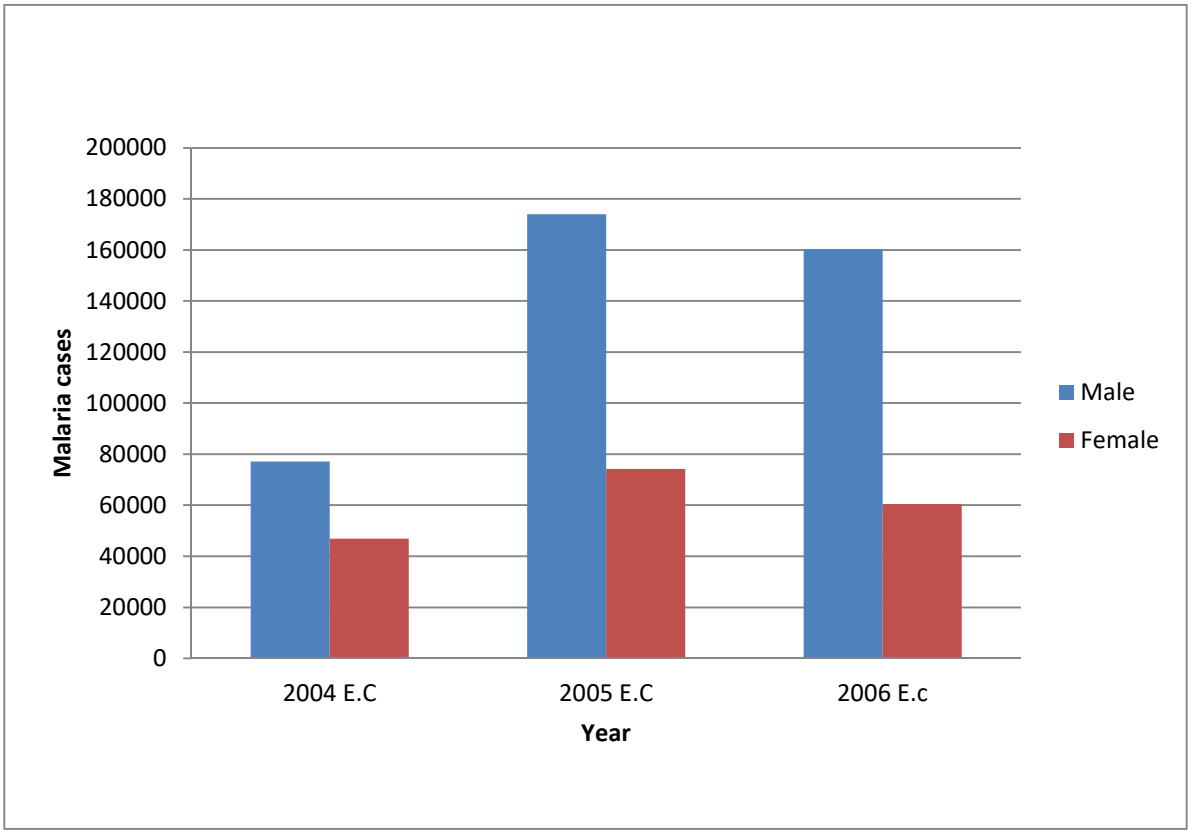


Figure14: Malaria cases by sex North Gondar, Amhara, Ethiopia 2004-2006 E.C

Discussion

Malaria is a huge public health problem in terms of morbidity and burden on health care facilities, accounting for the increasing percentage of outpatient consultations in most health facilities in different regions in Ethiopia [11]. The present data analysis result revealed that the burden of malaria was high in the study area where the most deadly species, P. falciparum, accounted for 72%. This is in agreement with findings revealed from Wolaita zone, southern Ethiopia (71.8%) [12].This is lower than other studies reported from Metema hospital, Northern Ethiopia (90%) [13] and Kola diba, Northern Ethiopia (75%) [14], but it is higher compared to a retrospective study done in Malaysia (70%) [15]. This difference may be due to the type of study design used, climatological differences, altitude variation, malaria diagnosis technique variation, skill of the laboratory personnel to detect and identify malaria parasites and other factors that affect malaria case occurrences in different study areas .However this study partly in line with the malaria parasite distribution in Ethiopia which indicates that Plasmodium falciparum and Plasmodium vivax are the two predominant malaria parasites, distributed all over the country and accounting for 60% and 40% of malaria cases, respectively[16].

An increase in the number of malaria cases from 2004–2007 E.C with the peak number of malaria cases 248,205 being reported in 2005 E.C because there was an epidemic that could have occurred in this particular year [17] and a decrease in the number of malaria cases 124,061 occurred in 2004 but for the last two years there was a slight increment of malaria case for the last two years as compared with 2005 increment this was the result of increased availability of effective drug for the treatment of malaria at national and local levels [18].

Among the 22 woredas considered in the zone, overall, relatively largest number of prevalent cases were reported from Metema districts, with the trend increasing consecutively for the years 2004 to 2006 E.C, although it declined for the last one year and this finding is coincidence with the finding from Wolaita zone, southern Ethiopia in which the number of cases were declined since 2011G.C [12]. These variations observed among woredas could be because of the presence of high malaria breeding sites attributed to relative agro ecological differences that might be making some parts of the area such as this woreda relatively malarious in the zone, relative differences in malaria intervention performance, documenting, and reporting and might be related to inconsistencies with efforts of malaria intervention activities.

Regarding the distribution of malaria prevalence by age groups, majority of reported cases were in the age group of ≥15 years (72.5%), followed by 5-14 years old (17.5%), <5years old (10%).This finding is in line with the finding from kola diba, Northern Ethiopia (50.1% for >15 and 20% for 5-14 years old) [14] and Wolaita zone, southern Ethiopia (58.8% for >15 years old)[12]. The predominance by the adult population could be normally related to the relative proportion of the adult population and is an important indication that the disease affected largely the productive age group in the study area and it might be associated with their daily activities and farming is extensive in different districts of North Gondar zone due to the fact that adults move to different areas for irrigation activities and collecting of crops and also young daily laborers move to this zone from different areas for application of herbicide and for gathering of Oil seeds like sesame. Because of high temperature in different area, daily activities are accomplished especially during night and early morning; this may expose them to the bite of mosquitoes. The presumed shift in prevalence among <5 age group could be due to the fact that more attention and care are given to children <5 years of age than the older children. Therefore the < 5 may be benefitting more from the control measures put in place such as sleeping under LLINs than the older children. Also children aged 5 - 15 years may be leaving the comfort of their homes for the first time for schooling or other purposes, hence are away from direct parental care and supervision.

According to reports and most of studies conducted abroad and here in Ethiopia, males are highly affected by malaria than females which is perceived to be attributed to the fact that males are usually engaged in outdoor activities that put them at greater risk of contracting the disease as compared to females' [19, 20].

In this surveillance analysis, the distribution among male and female were 69.4% and 30.6% respectively. This is in line with the other previous studies of kola diba (52.6% and 47.4%) [14] Wolaita zone (51 % and 49%) [12]. The higher prevalence rate might be due to the fact that males engage in activities which make them more prone to infective mosquito bites and stay outdoors in rural areas where mosquitoes are common as compared to females' counterparts which are mostly at home and protected from such infective bites. This might also be due to differences in the study area, relative differences with regard to gender roles, or other factors. It

might also be an important indicative that temporal changes might be avoiding gender differences.

In this study, annual malaria occurrence was observed to have seasonal variation in all of the study years. Malaria peak seasons occurred from September to December following the main rainy season in Ethiopia followed by June to August and a shorter transmission seasons from April to May following the short rainy seasons. Maximum peak level of malaria cases occurred in November 2007, 2006, 2005 and October 2004. October and November were found to be the most prevalent months. This is in agreement with other report [21], but this finding slightly deviates from other studies [22, 23]. The seasonality observed in the current study is in agreement with studies in different parts of Ethiopia, all of which reveal seasonal variation on incidence of malaria in the country, while most reveal annually occurring continuous bimodal transmission episodes [14, 18, 13]. The peak seasonal occurrence observed in this study is found to be coinciding with following the relatively high annual rainy seasons. It might be related to high transmission periods during these seasons, which might be explained by ecological characteristics and environmental factors facilitating vector breeding, temporal changes in herd immunity, vector characteristics, socioeconomic conditions, factors related to health care services, changes in life style, or other factors. The occurrence of malaria depends on adequate rainfall and temperature. In areas with a temperate climate, transmission of malaria is commonly limited to months in which the average temperature is above the minimum required for sporogony [24].

The overall prevalence of Malaria cases among all OPD visits were reported 20% but this study was quite high. The prevalence was significantly higher than the figures obtained in Amhara region and southern Nation, Nationality and people region (SNNPR) were reported prevalence of 4.6%and 5.4% respectively [25]. But the figures are however lower than Abia (Southeast) and Plateau (North central) states in Nigeria who reported prevalence of 36.1% and 36.6% respectively [26].).the higher prevalence in each of these woredas have its own peculiar geographic and weather features that favors for the perfect breeding of the anopheles mosquito which carries the malaria parasites. The total case fatality rate (0.005%) was reported in this zone was low as compared with other findings obtained in Kenya and Malaysia who reported case

fatality rate of 0.06% and 0.09% respectively[15,27]. The lower the case fatality rate might be increased awareness of the community about the disease to be treated as early as possible.

Limitation

1. Lack of Surveillance data from PHEM departments before 2004E.C and difficult to show disease trends before this year.

2. Lack of malaria data by sex for the year 2007E.C

Conclusion

Malaria remains as a public health problem in the study area with relatively high prevalence rate. It occurred with a fluctuating trend during the last four years' period, with its peak occurring during 2005E.C. across the years, no consistent fall is observed in the trend; overall, there was no remarkable decline in malaria in the last four years' period. This could be an important indicative that the area is hardly on the track, with implications for need of great emphasis to malaria intervention in line with achieving the global as well as the national objectives of reducing malaria burden. P. falciparum was the predominantly reported species. The highest malaria cases were observed in the age group of >15 years followed by 5–14 years. Seasonality was observed in occurrence of malaria, Malaria peak seasons occurred from September to December (spring, the main rainy season in Ethiopia) followed by June to August. This has serious consequences for Ethiopia's subsistence economy and for the nation in general. Therefore, health planners and administrators need to give intensive health education for the community and the about the control and prevention of malaria.

Recommendation

Based on the findings, the following recommendations will be given.

- Strong emphasis should be given to malaria prevention and control at zonal as well as woreda levels, with an effort to avert incidence of malaria in the study area; performance plans and achievements should be regularly and strictly reviewed and evaluated at each level.
- Malaria intervention measures should be strengthened and scaled up in the study area with comprehensively integrated activities implemented in line with the national malaria guidelines, striving towards the right track of the national and global objectives of reducing malaria burden.
- District health department must be allocate budget for timely spray of IRS based on the transmission seasons before cases increasing/ peak transmission, distribute Drugs properly and good utilization of LLINs so as to prevent epidemic before malaria flare up.

- Public awareness creation could be important through strong health extension activities integrated with the community.
- Special attentions need to be considered for some woredas such as Metema and West Armachiho, where malaria prevalence was observed to be consistently ever increasing throughout majority of the study periods.
- Seasonal variations should be well recognized with special focus given to the annual peak seasons (months), to prevent high malaria transmissions and potential outbreaks.
- Further studies should be conducted to determine or forecast potential epidemic patterns in the study area.

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Annex 2: North Gondar zone health department Public Health Emergency Management malaria report form

Woreda _____Zone_____Region _____

Reporting Week; Monday_____/_____/_____ to Sunday _____/_____/_____

Week No._____

Day/ Month / Year (E.C) **Day/ Month / Year** (E.C)

1. Record below the total number of cases and deaths for each disease/condition for the current week.

Disease/Event		**Out - Patient**	**In _ Patient**	**Death**
Total patients visited				
Total malaria suspected fever cases examined by Microscopy (BF)				
Total malaria suspected fever cases tested by RDT				
Total Malaria (confirmed and clinical)				
Microscopic (BF) Confirmed malaria cases by species	P. falciparum			
	P. vivax			
RDT Confirmed malaria cases by species	P. falciparum			
	P. vivax			
Total Malaria cases by age	< 5 year			
	5-14 Year			
	≥15 year			
Malaria cases by sex	Male			
	Female			

Note: Mixed malaria species should be included with **P.Falciparum** species

ChapterIII. Evaluation of surveillance system

3.1. Surveillance system evaluation of all disease under surveillance in Dessie town, Amhara region, Ethiopia, Feb, 2017

Abstract

Background: The definition for public health surveillance most often used by the Centers for Disease Control and Prevention (CDC) is the ongoing systematic collection, analysis, and interpretation of health related data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know. The final link in the surveillance chain is the application of data to prevention and control. The evaluation of public health surveillance systems should involve an assessment of system attributes and the evaluation should emphasize on those attributes that are most important for the Objectives.

Methods: Cross- Sectional Descriptive Study Design was used to evaluate the Dessie town health surveillance system from Feb 7 to Feb 21, 2017 in Dessie town. The surveillance focal persons and HEWs were interviewed using questionnaire. Convenience sampling technique was used to select one Administrative woreda. Quantitative data was entered and analyzed using Microsoft office Excel and the qualitative information was summarized to support the findings.

Objective: To assess the performance of surveillance system in detecting and predicting epidemics and monitoring trends of priority diseases in Dessie town administration health institutes, Amhara Region, Ethiopia, 2017.

Result: All Health Facilities do not analyze cases by time, place and person. 85.7%) of health facilities have national PHEM guidelines and none of them posted and used the case definitions of all priority diseases, except Measles, AFP/Polio, and NNT. The overall reporting rate for the last three months during the assessment was 95.8%. The laboratory confirmation for most of diseases under surveillance can be performed at regional levels. Clinical registers were available in all of the visited health facilities but they used one registry for all the priority diseases. All reporting sites collect and report all immediately reportable diseases on weekly reporting format. Only 14% of the health facilities had written emergency preparedness and response plan for any of the outbreak prone diseases relevant to the area. Dessie town health office responded that they

had experienced one type of rabies outbreak and also numbers of suspected outbreaks like measles in the town in 2016/17. All respondents agreed that the case definitions are simple and easy to understand.

Conclusion and recommendation

Over all the surveillance system of Dessie town administration has areas that need improvement for the proper functioning of the system to meet its objectives and purpose. Some of the health facilities are not operating according to the set objective. Therefore; those health facilities should implement nationally set standards.

Key Words: Surveillance, Evaluation, Dessie town

Introduction

Background

The idea of observing, recording, and collecting facts; analyzing them; and considering reasonable courses of action stems from Hippocrates[1]. However, the first real public health action that can be related to surveillance probably occurred during the period of Bubonic Plague (early 1300), when public health authorities boarded ships in the port near the Republic of Venice to prevent illness with plague-like illness from disembarking [2].

The definition for public health surveillance most often used by the Centers for Disease Control and Prevention (CDC) is the ongoing systematic collection, analysis, and interpretation of health related data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know [3]. The final link in the surveillance chain is the application of data to prevention and control.

A surveillance system includes the functional capacity for data collection, analysis, and timely dissemination of information derived from those data to persons in public health programs who can undertake effective prevention and control activities [4]. Although the core of any surveillance system includes the collection, analysis, and dissemination of data, the process can be understood only in the context of specific health events. A surveillance system should be established at the beginning of public health activities set up in response to an emergency. Public health surveillance classically comprises of six core activities (detection, registration, confirmation, reporting, analysis and feedback) that are made possible through four support activities (communication, training, supervision and resource provision) [4].Data originated from public health surveillance system can be used for immediate public health action, program planning and evaluation, and formulating research hypotheses[5]. Surveillance system evolves in response to ever-changing needs of society in general and of the public health community in particular [4]. To understand and meet those needs, an organized approach to planning, developing, implementing, and maintaining surveillance system is imperative. Health staff conduct surveillance activities at all levels of the health system so that they can detect public health problems of concern to their community. Surveillance priorities may be communicable and non-communicable diseases, conditions or events that include national or local priorities

such as acute outbreaks, maternal deaths or events associated with human health [6]. An essential function of a public health surveillance system is to be vigilant in its capacity to detect not only known public health threats with established case definitions and formal reporting channels, but also events or hazards that are not specifically included in the formal reporting system[7]. These may be events such as clusters of disease patterns or rumors of unexplained deaths. Public health surveillance is heavily dependent on clear case definitions that include criteria for person, place, and time and that are potentially categorized by the degree of certainty regarding as suspected or confirmed cases [8].

Efforts to establish disease surveillance system were initiated in Ethiopia in 1947 E.C when the Government issued quarantine rules [9]. Subsequently, several legal and administrative measures were taken to strengthen communicable disease surveillance. However, those efforts were not supported with appropriate resources, thus; surveillance was limited in scope and usefulness. In the health sector, various institutional arrangements were implemented to strengthen surveillance services. In 1948 E.C, an anti-epidemic service was established that later in 1951 E.C identified 35 priority diseases for surveillance; those diseases were classified into first class disease (immediately notifable) and weekly reportable, second-class diseases [9]. Those arrangements continued with several minor changes until the 1994 E.C health system reform. The health reform taking into account the resource constraints and the need for strengthening functional surveillance system selected nineteen priority diseases (including those under vertical programs) for surveillance [9].

The Federal Ministry of Health (FMoH) adapted a comprehensive strategy recommended by WHO for member states during the 48th assembly in 1998 for improving communicable diseases surveillance and response through Integrated Disease Surveillance and Response (IDSR) linking community, Health Facility, Woreda and National levels[10]. Accordingly, as a first step, a comprehensive assessment of the existing surveillance, epidemic preparedness and response system of the country was conducted in October 1999[11]. The assessment revealed that most disease prevention programs have vertical surveillance systems, resources are scarce for surveillance at all levels, quality of surveillance is compromised by uncoordinated and multiple use of data collection tools, data are not processed timely and completely to guide health

interventions, no data processing and utilization at the district level, there is hardly any feedback at all levels, and epidemic preparedness and management capability are weak [11].

The Ethiopian Ministry of Health has designed a new system to ensure rapid detection of any public health threats, preparedness related to logistic and fund administration and prompt response to and recovery from various public health emergencies [12]. The system is fully integrated, adaptable, all-hazards and all health approach national preparedness and response system. The system comprised of four major components which included: Public Health Emergency Preparedness, Early Warning, Response, and Recovery. The major component of the early warning is surveillance of diseases. As Surveillance is a cyclic process, it interacts and is linked with other major components and activities.

The purpose of evaluating public health surveillance systems is to ensure that problems of public health importance are being monitored efficiently and effectively. Public health surveillance systems should be evaluated periodically, and the evaluation should include recommendations for improving quality, efficiency, and usefulness [13]. 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 evaluation should emphasize those attributes that are most important for the objective.

The FMOH of Ethiopia identified21 top priority diseases or conditions which are epidemic prone, of international concern and diseases on eradication and elimination programs for surveillance activities. These diseases are monitored by a designated bodies 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 [14]. Currently, the Amhara Regional Health Bureau (ARHB) identified 13 immediately reportable diseases and nine weekly reportable diseases ARHB, in addition to the list of the national weekly identifiable diseases, included lishmaniasis in the regional list of weekly reportable diseases [15].

Rationale of the study

Public health surveillance systems should be evaluated periodically to assure the effectiveness and efficiency of the systems. In Dessie town surveillance system evaluation is not done recently and the status of public health surveillance system is not well known. Therefore, this study will be conducted to determine the status of core activities of the surveillance system, describe the specific attributes of the system and identify areas for improvements and to determine how well they operate to meet their stated purpose and goal.

Objectives of assessment

General Objectives

- To assess the performance of surveillance system in detecting and predicting epidemics and monitoring trends of priority diseases and provide recommendations for improvement in Dessie town administration Health Office, Amhara Region, Ethiopia, 2017.

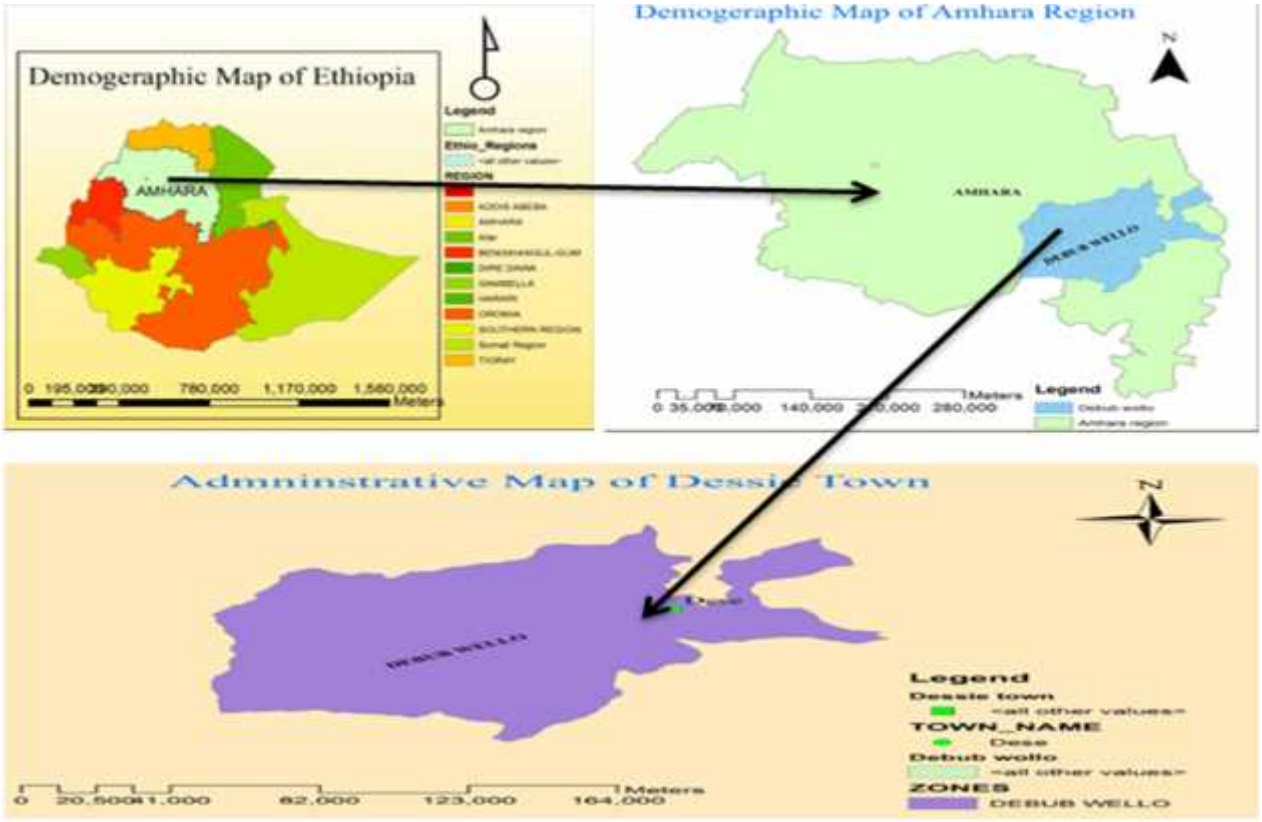
Specific Objective

- To assess the core activities such as case detection, reporting, analysis and response of surveillance system in the study area
- To evaluate the attributes of surveillance system.
- To assess major challenges of quality of surveillance system
- To assess the usefulness and utility of surveillance system in early detection of diseases and outbreaks

Methods

Study Areas

The Amhara Regional State is one of the regional states in the Federal Democratic Republic of Ethiopia (FDRE). Administratively, the Region is divided into 10 Administrative Zones and three administrative Towns. The study was conducted at Dessie town administration, which is found in South Wollo Zone of the Amhara regional state. Dessie town is one of administrative towns with 4 sub cities. The total population of Dessie town is 216,384 with 177,841 (82%) urban and 38,543 (18%) rural residents. It is located at a distance of 400 K.M from Addis Ababa, the Capital City of Ethiopia and 480 K.M from Bahirdar, Capital City of Amhara region [16].



Map 2: Location of Dessie town Administration, Amhara, North East, Ethiopia, 2017

Study Design

Cross- Sectional Descriptive Study Design was used to evaluate the surveillance system. The study was conducted as per the Updated Guidelines for Evaluating Public Health Surveillance Systems, published by the Center for Disease Control and Prevention (CDC) for the evaluation of the surveillance system [13].

Study period

The study was conducted from Feb 7 to Feb 21, 2017 in Dessie town.

Study unit

The study subjects were the health facilities: 2 governmental Hospital, 4 private Clinics, 7 Health Centers (HC), 7 Health Posts (HP) and Dessie town health Office which is engaged in the surveillance system.

Sampling Technique

Convenience sampling technique was used to select one administrative woreda in South Wollo zone on the basis of its easy accessibility and the relative high burden of disease. The respective health facilities were selected by simple random sampling method.

Data Collection Tools and Procedures

Data collection was conducted by the principal investigator. Semi-structured questionnaires were used to interview the town health Office and health facilities [PHEM focal person, Health extension workers (HEWs)] and personal observations of documents were conducted in the town of different health facilities.

Operational Definitions

Acceptability: Willingness of persons and organizations to participate in the evaluation of the surveillance system. It was measured quantitatively through reviewing completeness of report forms for the past three months and timeliness of data reporting

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

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

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

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

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

Flexibility; A flexible public health surveillance system can adapt to changing information needs or operating conditions with little additional time, personnel, or allocated funds.

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

Representativeness; A public health surveillance system that is representative accurately describes the occurrence of a health-related event over time and its distribution in the population by place and person.

Sensitivity; Sensitivity refers to the proportion of cases of a disease (or other health-related event) detected by the surveillance system.

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

Stability; 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.

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

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

Timeliness; Interval between the occurrence of an adverse health event and (i) the report of the event to the appropriate health agency, (ii) the identification by that agency of trends or outbreaks, or (iii) the implementation of control measures.

Usefulness; How helpful the system is to public health staff in taking actions as a result of interpreting and analyzing its data.

Data quality assurance

Study templates were developed after review of CDC surveillance system evaluation guideline and interview with key informants was conducted and all questionnaires were administered by me to keep the consistency of administering the questions.

Document review

The Principal Investigator reviewed abstracted and recorded data of outpatient (OPD) registers and laboratory (lab) registers. The abstracted register data was compared to the facility‘s aggregate weekly & daily reports and also reviewed supervision checklists. The purpose of the document review was to understand and assess the data reporting process, and to compare data across different sources to identify any problems with data quality and completeness.

Data Source

The data sources were Dessie town health office, Secondary Data or Surveillance Reports, Work Plan and Registration Books.

Data analysis

Quantitative data was entered and analyzed using Micro soft offices excel/ Spread sheet and the qualitative information was summarized to support the findings.

Ethical issue

Written permission letter was obtained from St. Paul’s Hospital Millennium Medical College (SPHMC) department of Public Health to Amhara Public Health Institution (APHI) and the consent letter was written to Dessie town health Office by Regional Public Health (RPH) Institution to cooperate the principal investigator for the matter of realizing that the evaluation is

beneficial and gap pointer to the town health facilities. Discussion was made about the purpose and method of the study with town health office head and PHEM department and convincing them to write a letter for selected health facilities (HF). The confidentiality of the data was maintained.

Dissemination of the Study

Results of this study has been given and presented to St. Paul's Hospital Millennium Medical College department of Public Health and other concerned bodies including Amhara Regional Public Health Institution, Dessie town health office, all visited health facilities and other stakeholders who are interested, so they can use the results for planning and implementation of intervention programs.

Results

Population under surveillance

According to the National PHEM Guideline, the total population living throughout the country is set to be under surveillance for all the twenty one priority diseases. Thus, the Dessie town administration follows the same structure; based on the 2015 Census conducted by the Central Statistical Agency of Ethiopia (CSA), this town administration has a total projected population of 216,384 to be under surveillance (16). Data was collected included the following variables; date of registration, name of health facility, name of patient, age, sex, address (kebele), and date of symptom onset or death. Detailed information about common risk factors were available

Table 6:Population under surveillance in the Region, South Wollo Zone and Dessie town administration, 2017.

Population under surveillance	Total projected population in 2015	Rural population	Urban population
Amhara	20,768,984	17,715,693	3,054,291
South Wollo zone	3,099,665	2,666,588	433,077
Dessie town administration	216,384	38,543	177,841

More than 80% of the population lives in the urban areas of the district. Dessie town administration has 2 government hospitals, 1 public health research laboratories, 7 health centers, 15 health posts (6 rural health posts), 3 private Hospitals and 4 different specialty clinics that give service for the community. The overall health services coverage of the town health centers were 81%. Based on the town health office information, the estimate that one health center giving service for up to 20,000 to 30,000 populations (averagely for 25,000 populations) and Dessie town administration has seven health centers which was serving for 216,384 population [175,000/216,384].

Table7: Lists of sites visited during the assessment in Dessie town administration, South Wollo, 2017.

S.No	Type HFs	Visited HFs	No of HFs visited
1	Governmental Hospital	❖ Dessie referral hospital ❖ Boru meda Hospital	2
2	Private Clinics	❖ Selam general Hospital ❖ Ethio general Hospital ❖ Bati general hospital ❖ Tossa Specialty Surgical and Medical Center	4
3	Health centers	❖ Dessie HC ❖ Buanbua wuha HC ❖ Gerado HC ❖ Tita HC ❖ Kurkur HC ❖ Boru silassie HC ❖ Segno gebaya HC	7
4	Health Posts	❖ Keleme derba HP ❖ Hottie HP ❖ Gerado endod ber HP ❖ Tita HP ❖ segno gebaya HP ❖ Tita HP ❖ Buanbuua wuha HP	7
5	Woreda health office	❖ Dessie town health office	1
	Total	21	21

Core activities

Case detection

All health facilities had posted and used the case definitions for Measles, AFP/polio, NNT, and Acute watery Diarrhea (AWD) among from 22 priority diseases except Ethio general Hospital, Bati general Hospital and Hottie health post. The case definitions of these diseases were easily understandable by most of the health care providers of the facilities and they were used to diagnose suspected cases of the listed diseases on their day to day diagnosing activities of patients. In some of the health posts, the community cases definition of these priority diseases was not distributed to the volunteer community health workers/Community Surveillance Officers, and monitoring of their surveillance activity by the Health Extension Workers was not good. The understanding of the available cases definitions by the health care providers was good, as demonstrated by some of the heath care providers at the time of the field visit and interview.

Case registration

Clinical registers were available in all of the visited health facilities (100%); but they used one registry for all the priority diseases which makes difficult to collect the data easily for all the diseases. All visited Hospitals and Health centers had outpatient and inpatient registers for recording of cases and the handling of those registers were good but all health Posts had only outpatient registers. There was no electronic system of registration and reporting of data at these levels. There was no rumor log book format in all health facilities except Dessie town health office Department and Buanbua wuha Health center. In all health facilities data was documented and kept on paper based formats and registers.

Case Confirmation

The laboratory confirmation for most of diseases under surveillance can be performed at regional levels. However, samples of a few diseases like Rabies and Polio were sent to National Laboratory to be examined at this level or to be sent to more advanced laboratories abroad. The region has two regional health research laboratories. These are used in the outbreak investigation and confirmation at their Capacities. They were able to do basic tests like gram stains, cultures and sensitivity, and quality assurance of facility level laboratories. All Hospitals and Health

centers Laboratory were participated in external Quality Assurance program (EQA) and had the role to confirm malaria by microscopy and confirmation of these cases took about 30-40 minutes. Also the laboratory had the capacity to collect samples for measles based on the guideline but Measles took greater than one month for confirmation and no more useful for timely intervention.

Data Reporting

The data was reported using standard Case based reporting formats. The town health office and the majority of visited health facilities reported that they did not run short of surveillance forms during the last six months except Bati General Hospital did not have any PHEM reporting format during the assessment. Weekly reports were sent to Dessie town health office from health facilities using hard copies and cell phones. Currently, the Amhara Region identified 22 priority diseases (13 immediately reportable diseases and 9 weekly reportable diseases).

Table8: List of Reportable Diseases/Conditions in Amhara Region, Ethiopia (source: Amhara Public Health Institution PHEM department 2017)

Immediately Reportable	**Weekly Reportable**
Acute Flaccid Paralysis(polio)	All the above +
Anthrax	Dysentery
Avian Human Influenza	Malaria
Cholera	Meningitis
Dracunculiasis / Guinea worm	Relapsing fever
Measles	Typhoid fever
Neonatal Tetanus	Typhus
Pandemic Influenza A (H1N1)	Malnutrition
Rabies	Maternal Death
Smallpox	Lishmaniasis
Severe Acute Respiratory Syndrome (SARS)	
Viral Hemorrhagic Fever (VHF)	
Yellow fever	

All the visited health facilities used the same reporting formats. Only the town health office department used a computerized system to monitor district completeness and timeliness reporting. Reporting of the identified disease should be either immediately or on weekly bases using their own reporting formats. During epidemics, the reporting procedures vary from the routine reporting. For the immediately reportable diseases, a single suspected case is considered

as a suspected outbreak. Therefore, suspected outbreak of those diseases should be notified from level to level Within 30 minutes of identification. There was suspected cases of Measles and rabies in the past one year and the suspected outbreak notified within 30 minutes to the next higher public authority, but in the area all reporting sites collect immediately reportable diseases through the weekly reporting format on weekly basis and report it to the next higher level. The study sites did not use appropriate reporting formats to report the diseases. They used weekly reporting format for daily reportable diseases. A simplified flow chart of the surveillance system showing data transmission channels from health facilities to the national level has been found and functioning at all levels. Using weekly standard reporting forms, health facilities report cases to the District level on Monday to Tuesday Morning of each week and the town health office report to the Zonal PHEM Office on Wednesday until mid-day, this reporting schedule meet nationally set standard.

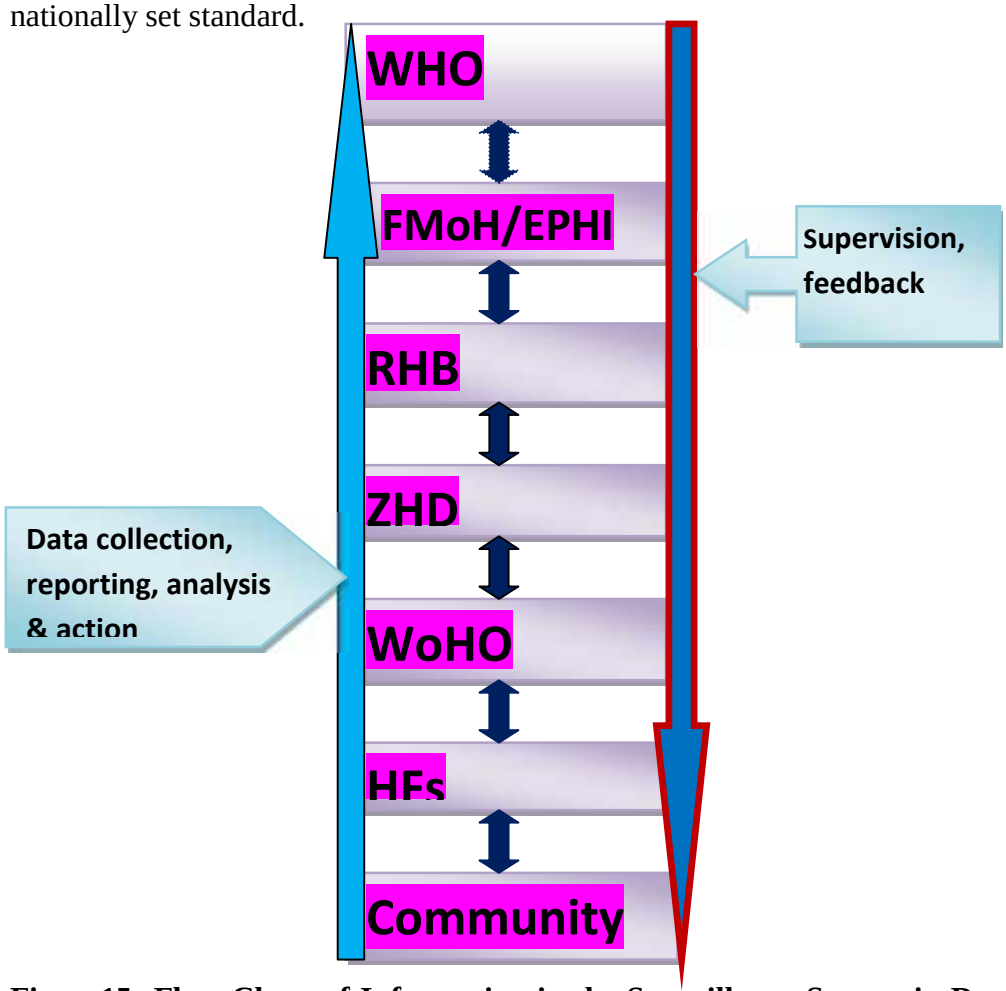


Figure15: Flow Chart of Information in the Surveillance System in Dessie town, Ethiopia, 2017

Table9: The Reporting Rates under Dessie town health Office by Epi-week, Ethiopia, 2017

Epi week	Hospitals		health Centers		Private clinics		All type of health facility	
	E	R	E	R	E	R	E	R
14	2	2	7	7	4	3	13	12
15	2	2	7	6	4	4	13	12
16	2	2	7	7	4	4	13	13
17	2	2	7	7	4	4	13	13
18	2	2	7	7	4	3	13	12
19	2	2	7	6	4	4	13	12
20	2	2	7	7	4	4	13	13
21	2	2	7	7	4	4	13	13
22	2	2	7	7	4	3	13	12
23	2	2	7	6	4	4	13	12
24	2	2	7	7	4	4	13	13
25	2	2	7	7	4	4	13	13
26	2	2	7	6	4	4	13	12
Average HF	2	2	7	6.7	4	3.76	13	12.5
Reporting rate /WK %		100	95.6		94		95.8	
		NB		**E:** Expected				
				R : Reported				

The town reporting Rates (%) in a week= [Number of Reports in 13 weeks in the town / Expected Numbers of Reports in 13 weeks]*100. The expected weekly reporting rates of all health facilities under Dessie town health office in the past 13 weeks prior to assessment were100% (Table 4).The overall reporting rate for the last three months during the assessment were 95.8%.

Data Analysis and interpretation

The Dessie town health office, all health Centers and Hospitals had computer but none of them used for data analysis. The town health office and all visited health facilities had denominators for total population, Male, Female and under five years children which are very important to calculate attack rates and determine burden of disease. The health Centers and hospitals send their result of analysis to the Woreda Health Office. The analysis result was not described by time, person and place. It only includes total cases, deaths and activities performed. Generally data was not analyzed at all health facility level. There was no adequately trained responsible person to analyze the data at heath facility level. At woreda level very limited basic data analysis has been done quarterly, every six months which was not routine, and graphs and charts showing trends of priority diseases were not updated. This is because they were required to report for the administrative level and not for real-time intervention of public health problems

Action threshold level was available at all visited health facility level on National PHEM guideline but the action threshold was not posted for all priority disease at the facilities level except Buanbua wuha health center which has defined action threshold for Malaria. Even though there are thresholds of 21 prioritized diseases on National PHEM guideline, some health facility focal persons did not know it properly. For example, among 17 health professionals who were asked for threshold levels for selected diseases, 12 (70%) of them responded correctly.

Epidemic Preparedness

None of the health facilities had written emergency preparedness and response plan for any of the outbreak prone diseases relevant to the area, but the town health Office, Boru meda Hospital and Buanbua wuha health center have it. All visited Health Centers and Hospitals have epidemic management committees with rapid response team, but the committee meets only during emergency and none of them produce minutes of the committees meeting. From the assessed hospitals and health centers none of them experienced shortage of drugs for the last six months. The town health office has emergency stock of drugs and supplies. It was not possible to get accurate information on the funding sources but there was some funding coming from the WHO through the regional health bureau for woreda surveillance activities but there was no known

specific budget line for epidemic response. There were no vehicles assigned for Emergency response. All health facilities had Information education Communication (IEC) materials for some selected priority diseases during the assessment.

Table10: Number of health facility and their emergency preparedness status, South Wollo Zone, Dessie town administration, Ethiopia 2017.

S.No	Variables	The town health Office (1)	Hospitals (2)	HCs (7)	HPs (7)
1	Availability of Written emergency preparedness plan	1(1)	2 (1)	7(1)	7(0)
2	Availability of emergency stocks of drugs and supplies	1(1)	2(2)	7(6)	7(7)
3	Presence of budget line for epidemic response	1(0)	2(0)	7(1)	7(0)
4	Experienced shortage of drugs during in the past year	1(0)	2(0)	7(0)	7(0)
5	Established Rapid Response Team (RRT)	1(1)	2(2)	7(0)	7(5)
6	Observed epidemic management (RRT) meetings minutes	1(0)	2(2)	7(0)	7(0)
7	Presence of epidemic management committee	1(1)	2(2)	7(6)	7(o)

Outbreak investigation

Dessie town health office responded that they had experienced one type of rabies outbreak and also numbers of suspected outbreaks like measles in the town in 2016/17. The outbreaks occurred in different Sub cities and Kebeles (2 urban Sub cities and 3 rural Kebeles) in the past six months prior to this assessment with a total number of 29 rabies cases (12 human, 11domestic animals and 6 wild animals) and there was one confirmed case.

The town health office tried to respond within 48 hours of report to the respective Kebeles & Sub cities and active case search were done from house to house and used the finding for intervention. All health facilities had no outbreak investigation checklist and line list except Boru meda Hospital, Tita, Buanbua wuha and Kurkur HC; however there was no written report or document from health facility about outbreak investigation seen during the assessment except the town health office. During rabies outbreak, interviewed health facilities personnel responded that they have used the standard Case based formats to investigate the cases; this was due to the availability of a blank space for others on the report formats.

Supportive function

Feedback

The woreda health office did provide written and verbal feedback quarterly for the Hospitals and health centers. All the visited sites interviewed reported that they did receive one or more feedback during the preceding six months. However, the Health Centers had not practiced written feed back to the their respective reporting health posts for the last 12 months, only verbal feed backs were given on the gaps but feedback to communities related to infectious diseases that had occurred in the community was almost nonexistent. Late or no feedback from central laboratory on sent specimen for confirmatory test has being a challenge for early detection; and they wonder why they are collecting the samples. Especially health centers did not have any feedback to know the status of the collected blood as no system exists to announce the laboratory result. Feedback from town health office to health Centers and governmental Hospitals were better than that from Zonal health department to town health office for the last one year. The town health office has given two written feedback for health Centers (86%) and governmental Hospitals (100%) but the town health office did receive only one written feedback from the Zonal Health Department (ZHD). The town health office did receive bulletins and reports from the next higher level and distributed to the respective lower health facility for the past one year.

Availability of a National Guidelines and Forms

From the assessment, we found that all health facilities (85.7%) except Hottie HP, Ethio General Hospital and Bati general Hospital have national PHEM guidelines and 90.5% of health facilities had a standard Case based and weekly repoting formats. The Woreda health department had PHEM guideline, reporting formats (weekly reporting format, line list, case investigation form and daily epidemic reporting format). All visited health centers and Hospitals have interrupted cold chain capacity, have guideline to collect and ship samples for most of these priority diseases to the respective regional or national laboratories.

Training

The town health office responded that most of the health facilities staffs (95%) working on surveillance units (PHEM focal person) got short term training or workshops of 2-3 days by district health officers and partners. At the health facilities, only the focal person assigned for surveillance was trained, but the health care providers did not get any orientation 2(100%) Hospitals PHEM focal persons were trained on public health surveillance system, 1(100%) of district and 6(100%) health centers got training on surveillance system. While 13.6% new recruited HEWs in the health post did not get training regarding some of the components of surveillance.

Supervision

The town health office had annual supervision plan and standard supervision checklists prepared at office level, however they did not accomplish as per the plan due to lack of vehicle for transportation and engagement in other activities. The town health office has been also supervised by the Zonal PHEM quarterly in 2016/17. The town health office conducted supervision twice in a month to the health centers and Hospitals in the year 2016/2017, however the health centers conducted supportive supervision only once in a month on surveillance activities for health posts. Shortage of vehicle, budget and logistics were attributed for incapability of conducting regular supportive supervision at facility level. Supervision checklists were available at health centers for their supervisory visits except Gerardo and Kurkur HC.

Communication facility

Communication materials like Telephone, E-mail, and fax were all available at the Town health Office level. All health posts and some health centers used their personal mobile for communication especially for surveillance data reporting. There was no a radio call system in rural areas of the visited health posts; which impacted the timeliness of reports of both immediately and weekly reportable diseases. Most of the health facilities (95%) had the address of PHEM officers of the woreda Health office.

Resources of the Facility

Resources for data management like computer with printer, motor cycles, stationeries, telephone, and logistics are available in the Town health Office. All visited Health Centers and Health Posts lacked internet access, Fax and Generators except Segno gebaya and Dessie health centers which had internet access and Generators. Even though, all visited Hospitals and health centers had computers and its accessories, they did not use for PHEM activities separately rather they use it for all activities. There was shortage of stationery items at some health posts. Twenty four hour electric power was nonexistent in all of the visited sites except Hospitals (both governmental and private hospitals), Segno gebaya and Dessie health center they used generator for their day to day activities.

Table11: Availability of resources for all activities including surveillance during assessment at district and health facility level, Dessie town health office, South Wollo, 2017

S/N	Resources	The town health office		Hospitals		Health Centers		Health Posts	
		N(n)	**%**	**N(n)**	**%**	**N(n)**	**%**	**N(n)**	**%**
1	Electricity	1(1)	100	2(2)	100	7(5)	83	7(5)	71
2	Computer	1(1)	66	2(2)	100	7(5)	83	7(0)	0
3	Printer	1(1)	100	2(2)	100	7(5)	83	7(0)	0
4	Stationery	1(1)	100	2(2)	100	7(6)	100	7(6)	86
5	Vehicle	1(1)	100	2(2)	100	7(0)	0	7(0)	0
6	Motor Cycle	1(1)	100	2(2)	100	7(3)	50	7(0)	0
7	Fax	1(1)	0	2(2)	100	7(0)	0	7(0)	0
8	Telephone	1(1)	100	2(2)	100	7(6)	100	7(0)	0

NB N**: Number of visited health facilities during the assessment**

n**: Number of availed resources in the respective health facilities**

Co-ordination

PHEM focal persons were available in all Hospitals and Health Centers, but not assigned only for surveillance activities. In each of the visited sites there was no responsible person for only surveillance activities but it was done by nurses/health officers who have many other responsibilities in the health facility

Surveillance system Attributes

Completeness

Completeness of reporting sites refers to the proportion of reporting sites that submitted the surveillance report irrespective of the time when the report was submitted. Hence, the percentage of completeness of reporting sites in the town health office was 96 % in 2016. Randomly selected reporting forms from different epidemiological weeks checked for completeness, Out of 60 available report forms checked for completeness 95% (57/60) were found complete. The weekly completeness of visited town health offices ranged from 75% to 100% in the past three month. The average completeness seems better as one goes up from Private clinics (94%) to HCs (95.6%) and Hospitals (100%) but the minimum report completeness by private clinics was (75%), HCs (85.7%) and Hospitals (100%) i.e. the number of private clinics that sent report divided by the number of total private clinics expected to report were low as compared with HCs and Hospitals, which was not all private clinics meet the WHO minimum expected reporting rate (80%) in all reporting weeks for the last 3 month. However we couldn't assess the report completeness for the health posts due to incompleteness and absence of copy of reported data at health centers.

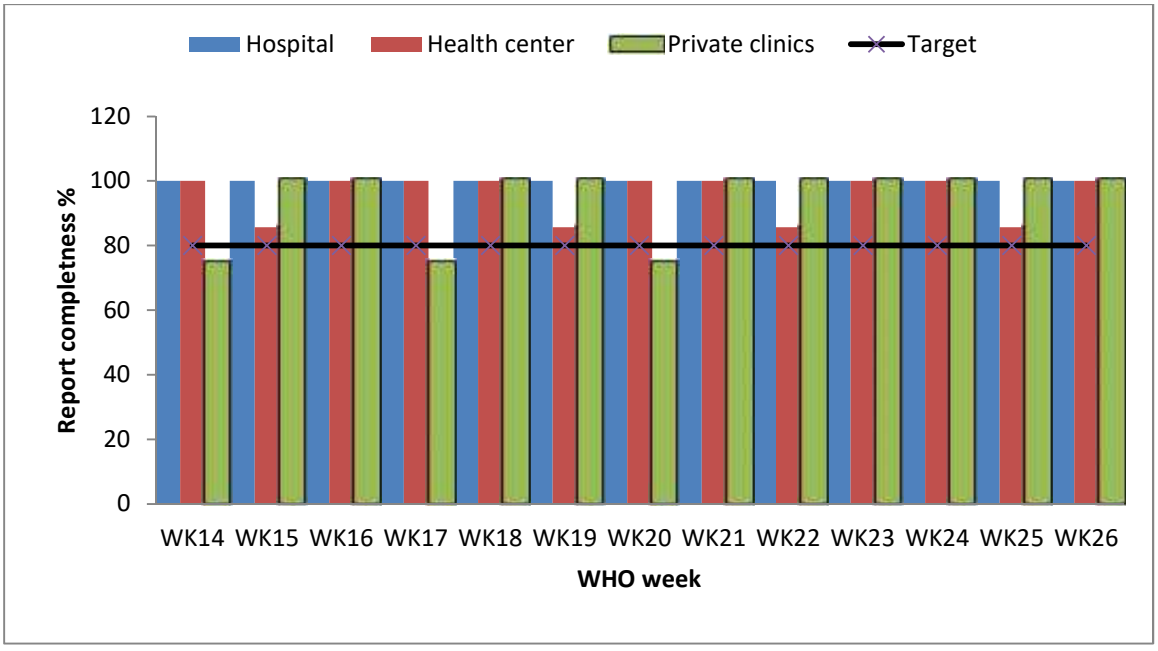


Figure16: completeness of Past three month Weekly report by types of health facility at Dessie town health office, 2017

Timeliness

The single most important measure of timeliness is whether data are submitted in time to begin investigations and implement control measures. Timeliness of weekly report is measured by dividing the number of facilities that sent report divided by the number of total facilities expected to report on time. When we assessed the timeliness report of the town, mostly reports came from the health facility to Woreda on Monday to Tuesday Morning of each week and the town health office report to the Zonal PHEM Office on Wednesday until mid-day. However, the data sent from different health facilities to Woreda-PHEM always not on time. According to the findings the surveillance report timeliness of the Dessie town was 96% in the last six months but it was difficult to know exactly report timeliness of health Centers which reported on timely, since the date sent to the health Centers from health posts were not recorded.

. **Usefulness**

At all visited health facilities, 86% of the respondents agreed that the surveillance system is helpful for early detection of outbreaks, measure the burden of a disease, Prioritize the allocation of health resources and to estimate magnitude of morbidity and mortality of selected diseases, and able to evaluate of prevention and control programs but 14% of the respondents didn't well understood the use of the surveillance system in public health and the utility of the system was still unsatisfactory.

Simplicity

Simplicity of the surveillance system was examined to see how case definitions of priority diseases are simple, easy and understandable and helpful for data organizing, entry and data analysis. All respondents agreed that the case definitions for all priority diseases are easy to understand and are applied by all health Professionals. But all health Professionals did not use and apply both community and standard case definitions of the majority of the reportable diseases. The reporting formats of priority diseases were also very easy to understand and fill data by all health Professionals. Respondents at all health facilities level told that it takes 15 - 20 minutes to fill weekly reporting format of priority disease and 10-15 to fill case based reporting formats of a single report. Similarly, respondents at HCs and Hospitals agreed that it takes about 10-15 minutes to transfer weekly reports through phone. The data collection is assumed to be

time taking particularly the weekly reporting from multiple reporting health facilities at the town health office which took 25 min or more to fill a report.

Acceptability

Active participation of agents in reporting system of surveillance activities in regular pattern is a major attribute for system's and important for public health intervention. All level of health personnel, especially those working at governmental health facilities have high willingness to participate in the surveillance system, but some reluctance was noted in Private Health Facilities. The reason for the poor participation of the Private Health Facilities is due to lack of understanding of the relevance of data to be collected and also poor monitoring system of governmental organizations. All governmental reporting agents were; 2 Hospitals (100%),7 Health Centers (100%) and 7 Health Posts (100%) respectively have accepted and have been engaged in the surveillance system. 90.5% of the reporting agents did use appropriate reporting formats.

Flexibility

Except one site that responded current reporting format is difficult to use for new diseases, all visited health facilities declared that the reporting formats and procedures were flexible and could be used for other newly emerging health events (diseases) without much difficulty. This is due to the availability of a blank column for others but the format did not have place to fill the important variables. All respondents replied that the surveillance systems were easy to integrate with other systems. It was also easy to use technologies. Some gaps raised by the respondents were no place is available for personal variables like age and sex in the current reporting format for weekly reportable diseases which makes difficult to analyze the personal variables

Data Quality

We observed complete reporting formats without blank or unknown response variables in the last six month in all visited health facilities and Woreda health Office. Demographic variables like age, sex, address, date of presentation and diagnosis were reported for all cases but address of reporting sites, date of onset and location when symptom started not recorded in Case based reporting formats. The problem was that immediately reportable diseases were not reported using the proper formats. Data were also reported using telephone on weekly basis. Collection and registration of data had some gaps like clinical registers are not uniform which compromised the quality of data. Quality of data was influenced by diagnostic test that the health professionals did not use standard case definitions for majority of reportable diseases. At health post level, due to some health extension workers were not good in English they did not understand some variables and phrases on reporting formats. Documentation of copies of report in sequential manner was poor at district and health facility levels.

Representativeness

Representativeness shows how far the routine surveillance report is covered by the health service delivery system and how many facilities are reporting to the offices. All the visited health facilities and Office replied that both the rural and urban community benefited from the surveillance systems equally. The routine surveillance covers all Governmental and some Private health facilities. The weekly reporting formats lack some important variables like age, sex and other possible risk factors which are important epidemiologically that help to develop information to take appropriate actions except malaria weekly reporting form which have age variables.

Stability

Stability is consistency (the ability to collect, manage, and provide data properly without failure) and accessibility (the ability to be operational when it is needed) of the public health surveillance system. According to this attribute the surveillance system at the district helps to collect manage and provide data properly and it was operational at any time, but the continuity of the system was repeatedly variable depending on the presence or absence of the particular professional assigned to the PHEM unit. This makes the stability of the system to be questionable. All interviewed

health facilities and Health Office personnel responded that any new restructuring like Business Process Re- engineering (BPR) did not affect the procedures and activities of the surveillance. Conditions like lack of resources didn't interrupt the surveillance systems for the past one year.

Sensitivity

Sensitivity in surveillance refers to the proportion of cases of a disease (or other health-related event) detected by the surveillance system. It was difficult to evaluate sensitivity of the system without knowing false negatives and positives that identified by the system. Due to this reason, it was difficult to measure sensitivity of the system at each level. Even if the case definition of rabies was available in a national PHEM guideline but the distribution of case definitions and community cases definition of this disease to health facilities and to the volunteer community health workers were very limited. For examples, in the case of rabies, the community traditionally had given loose case definition by themselves which caused the case definitions to be very sensitive.

Predictive value positive

The predictive value positive couldn't be calculated for all reportable diseases as the total number of individuals who are actually with the disease was not determined. It was not likely to measure the PVP of the surveillance system in our evaluation of the surveillance of these diseases.

Discussions

We found that a total population of 216,384 people were under surveillance in Dessie town from projections of 2015 national CSA, but all reported cases and deaths were not only from those catchment populations, there were cases who came from neighboring areas seeking treatment in Dessie Referral Hospital and Boru meda general hospital.

The understanding of the health Professionals and treatment seeking behavior of the community were found to be good for some diseases and weak for other diseases which influenced early detection and intervention of cases accordingly.

A public health surveillance system is dependent on a clear case definition to detect and report the health-related event under surveillance. Using standard case definitions ensures that every case is diagnosed in the same way, regardless of where or when it occurred, or who identified it. This allows for comparing the number of cases of the disease or condition that occurred in one time or place with the number occurring in another time or place [17]. The case definition of a health-related event can include clinical manifestations (i.e., symptoms), laboratory results, and epidemiologic information (e.g. person, place, and time), and/or specified behaviors, as well as levels of certainty (e.g., confirmed/ definite, probable/presumptive, or possible/suspected). The use of a standard case definition also increases the specificity of reporting and improves the comparability of the health-related event reported from different sources of data [18]. During the assessment we have observed standard case definition for measles, AFP, NNT and AWD in majority of visited sites, but none of them have others health events.

Laboratory experience of quality assurance program and participation in the surveillance system was found to be low. If the quality assurance is not performed it is difficult to measure the reliability and validity of test results delivered by the laboratory personnel. but the confirmation of cases in health facilities were severely affected by lack of good laboratory facilities and services in the town and transportation of samples to sub-regional, regional or central laboratories which takes longer time and resulting in significant delay to declare outbreak and initiate control interventions.

There was no electronic system of registration and reporting of data at these levels. Because of these problems it was difficult to get historical data at health facility level due to this data quality checking and later analysis were also affected. The use of reporting format for cases from health facilities to the town health Office were not according to the National PHEM Guide line. Immediately reportable priority diseases should be reported daily with daily reporting formats, in the area all health facilities reported on weekly reporting formats but they were reported daily. The reporting rate of the town health Office within 13 weeks were 96% which was very good from expected 80%; this was due to good performance of all reporting agents due to accessibility of transportation and availability of telecommunication to provide and send the information to the respective higher reporting level. Surveillance is information for action, therefore Surveillance data collection either by immediately or weekly reporting system is not an end by itself. The collected data should have to be analyzed, interpreted and used for action and decision making starting from local to the central level in order for the values of the data to be realized. Analyzing and interpreting public health Surveillance data are the link between the operation of a Surveillance system and the use of data from the system to implement public health action and disease control program [18]. At all level of the health facility, surveillance data were not analyzed frequently by time, place, and person. More over the computers in the health facilities were not used for data entry and analysis due to lack of training in data management.

The purpose of preparedness is to strengthen capacity in recognizing and responding to public health emergencies through conducting regular risk identification and analysis, establishing partnership and collaboration, enhancing community participation and implementing community-based interventions and strategic communication during the pre-emergency phase and ensuring their monitoring and evaluation [13]. However the preparedness of the majority of the facilities were poor as all assessed and many health facilities didn’t have written emergency preparedness and response plan. In addition 95% of the assessed facilities have not encountered emergency drug shortage in the past six months. Epidemic management committees and rapid response teams were formally established in majority of health facility based on the guideline, but none of visited sites have minute of meeting for epidemic management committee and did not evaluate their preparedness and experience as per the guideline of the national and regional recommendation. An investigation for risk factors was also not common in all assesses sites. The response to an outbreak always focused on case management (put off fire) only. This might be

due to lack of budget line and others logistic for emergency management. This all hindered and undermined the proper investigation and response expected for epidemic prone diseases.

The town health Office provides feed back to their reporting units, still it was not satisfactory feedback mechanism from town health Office to health facilities, but the Health Centers had not practiced written feed back to their reporting units in the last 12 months.

Federal Ministry of Health and its stakeholders are responsible for designing and preparation of PHEM guideline and reporting formats. The town health office has provided these formats and guide line through Regional Health Bureau and NGOs during the last six months. We found that 85.7% of health facilities had national PHEM guidelines but the utilization of surveillance manuals and guidelines was not good at health facility levels.

Provision of training on disease surveillance, outbreak investigation, Surveillance data analysis and response is the back bone for early detection and control of any health events in the local area. In the town health office, all surveillance focal persons and HEWs didn't take standard training on the PHEM system rather than short sensitization with the integration of other programs. This may affect the quality of the reports and surveillance system as whole.

Supervision is a process of helping to improve work performance. Supervision is not an inspection. Rather, good supervision aims to sustain good quality services rather than finding things that are wrong [17]. Frequent supportive supervision are vital for the improvement of surveillance data quality, stability of the system and report completeness. However due to shortage of budget and vehicle supportive supervision on surveillance activities have not been conducted regularly based on their plan to their respective reporting health facilities. The town health Office and majority of visited health centers had plan for supervisions but didn't accomplish as per the plan. The Zonal Health Department conducted supervision twice to the town health Office in the year 2016 and the town health Office supervised all Health Centers and two Hospitals one times in a month during that year. Shortage of budget and logistics specific to the system is hindering supervision and capacity building activity at all health facility level.

There was PHEM focal person in all the visited sites but the focal persons had work overload and it was difficult to accomplish the task as needed. There was a poor practice of interpretation

and utilization of surveillance data at facility and district level, simply compile data from the next lower level and submitted to region without further analysis.

Effective public health responses depend on the ability of the surveillance system to provide reliable, timely and complete information to support action [18]. The minimum expected reporting timeliness is 80% as per recommendation of the national PHEM guideline. There were no registered documents to know and identify timeliness, but orally the town health Office surveillance focal person said that it was 96% in the last 12 months. However we couldn't able to determine the timeliness of visited health centers due to incompleteness of data on reporting period. Late reports are less important for Public health emergency management, Dessie town which was at higher risk of immediately reportable diseases like Rabies and measles, timeliness of report is very important to find out abnormal increases in the number of cases and to take immediate actions.

Regarding the report completeness the visited town health office was above the national minimum expected reporting rate (80%), but copy of reported data were not available at health centers to determine the report completeness of heath posts.

All respondents of the assessment agreed on the usefulness of the surveillance system for detecting outbreaks and responding accordingly to control it properly and users of the surveillance system had fairly good knowledge of the steps and procedures to report suspected cases of the disease and follow to confirm outbreak.

The simplicity of a public health surveillance system refers to both its structure and ease of operation. Surveillance systems should be as simple as possible while still meeting their objectives [18]. All respondents of the assessment said the system operation and the reporting formats were simple to use. It was also agreed by all respondents that the surveillance system is flexible for newly occurring health and health related events.

Acceptability of surveillance by health facilities found in the District was good. Among the health sectors available in the District were 100% active participant whereas some reluctance was noted in Private Health Facilities due to lack of understanding on relevance of data by these

facilities, lack of training, lack of regular supervision and feedbacks and poor monitoring system of governmental organizations.

Appropriate use of data and conclusions that can be drawn from surveillance data will depend on the quality of collected data. Data quality also reflects the completeness and validity of the data recorded in the public health surveillance system [18]. Examining the percentage of “unknown” or “blank” responses to items on surveillance forms is a straightforward and easy measure of data quality. Even though the reporting formats for weekly and immediately reportable diseases are well understood at all levels of the surveillance system, during the evaluation we have observed common data quality problems in all levels; mostly of blank spaces on the reported formats like address of reporting sites, the starting and ending dates of the week not recorded.

Stability of surveillance system is the reliability and availability (ability to be operational when needed) of the surveillance system without interruption [18]. Moreover being engaged on other activities other than surveillance at all levels were also affected the stability and proper functioning of the system to achieve its intended objectives and purpose.

The measurement of the sensitivity of a public health surveillance system of the area was varying for different diseases for different factors. For examples, in the case of rabies, the community medical care seeking behavior especially for rabies was very high which made the system very sensitive. Tradition in the town, like other Amhara region is that all children are expected to be infected with measles during their lifetime. Therefore, mothers did not typically seek medical care for their children with measles, unless the illness was followed by complications and for this reason the sensitivity of measles case detection was compromised. But by early detection of measles cases by professionals is still challenging though very well identified by the case definition

Conclusions

Periodic assessment of public health surveillance system is a key activity to identify strengths and gaps of the existing system and to assess its capacity to meet its purpose and objectives. Over all the surveillance system of Dessie town administration has areas that need improvement for the proper functioning of the system to meet its objectives and purpose. Some of the health facilities were not operating according to the set objective of surveillance for public health action. Both community and standard case definitions were not posted and not used in some of the visited health facilities for some of the reportable diseases and also were not reported with appropriate reporting formats

The overall structural set up of the surveillance system in the town was good, but in the creation of responsible unit /full time surveillance focal person were not assigned at each health facility level and majority of private health facilities were not engaged accordingly.

At District level the reporting rate was above the set target, but more effort needs to enforce all sites to report and include all health facilities in the system. In addition some health centers failed to record the number of reported and expected sites under their catchment area on weekly report format that helps to determine reporting rate (completeness). Moreover we identified some facilities in the system didn't follow the data collection days for weekly report as stated in the national PHEM guideline; Monday to Sunday collected data needs to be included in weekly report and should be sent to the next level on the day and time dedicated for each reporting level.

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

Limitations

- Unable to determine report timeliness of the health centers due to poor data quality (absence of variables needed timeliness)
- Lack of willingness by health extension workers of some health post to be assessed.

Recommendations

- Written emergency preparedness and response plane should have to be prepared at all levels of surveillance system. In addition all levels should have to establish Emergency response management team with identified role and responsibilities. Activities of the team need to be documented properly including the meeting minutes.
- In order to increase case detection of diseases, improve the system performance, reporting and data analysis on regular basis; it is needed to build the capacity of health care providers of both governmental and non-governmental health facilities through providing training. Particularly the training needs to be given for health extension workers.
- Regular scheduled supportive supervision and provision of regular feedback on surveillance activities should be needed at all level of the system for improvement of surveillance data quality, report completeness and stability of the system.
- Health facilities should have to avail standard and community case definitions of public health important diseases for health personnel and the community respectively.
- District health offices and health centers should have to record number of sites reported and number of sites expected to report on the reporting formats regularly. In addition a copy of the report should have to be kept (documented) at all levels of the system.
- The collected data should have to be analyzed by time, person and place and interpreted to be used for action and decision making by all levels of the system.
- Sufficient amount of reporting formats for health post needs to be distributed.
- All reporting sites should have to follow the PHEM guideline instruction and WHO weeks for days to be included in weekly report (Monday to Sunday). Moreover the District PHEM focal persons should have to create awareness on the reporting system through training and supervision.
- For the system to be stable and acceptable by all levels the national PHEM and regional health bureau should have to assign a budget specific to the system at district level.
- Laboratory results of specimens referred to national laboratory should have to be communicated as early as possible to confirm suspected outbreaks and take action timely.
- Surveillance focal persons should be assigned full time only for surveillance activities

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Annex 3: A semi-Structured questionnaire for priority disease surveillance system evaluation, Dessie town, Amhara, 2017

Introduction: Thank you for taking the time to speak with me today. My Name is Teferi Yidenek; I have been working in Amhara public Health Institute. I am conducting an evaluation of Country‘s priority diseases surveillance system and wanted to speak with people who are engaged in surveillance system. The aim of the evaluation is to evaluate how the system is functioning and whether the intended objectives are being met. Finally, recommendations will be forwarded to improve the system.

Questionnaire for health facilities

1. Background Information

1.1. Region_____

1.2. Zone _____

1.3. Woreda _____

1.4. Name of Health Facility _____

1.5. Respondent Name and position _____

1.6. Catchment Population _____

1.7. Address: Office no _____ Cell phone no _____ e-mail _____

1.8. Date_____

2. Case Detection

2.1. Do you have standard case definitions for the Country‘s priority diseases? 1. Yes 2. No

2.2. If yes, is it posted? 1. Yes 2.No

2.3. Does all professionals are aware of it? 1. Yes 2.No

2.4. If answer for 2.1 is No, for which disease(s) did you lack the case definition? _____

2.5**. Personal observation** about presence of standard case definition for selected priority health problems_____

3. Case Registration

3.1. Do you have a standardized register and rumor log book to record minimal data elements on targeted diseases and conditions? 1. Yes 2.No

3.2. **Personal observation** about presence of standard registers, Rumor log book for selected priority healthproblems_____

4. Case Confirmation

4.1. Where was laboratory confirmation of epidemic prone diseases done?

1. Hospital Lab 2.Regional lab 3. EPHI 4.other_____

4.2. For which epidemic prone diseases your laboratory can do case confirmation?

_____

4.3. Does your laboratory participate in external quality assurance program for epidemic diseases that can be confirmed at local level? 1. Yes 2.No

4.4. **Personal observation** for the presence of laboratory EQA feed backs_____

4.5. Was there guide line for specimen collection, handling and transportation to the next level?

1. Yes 2.No

5. Reporting

5.1. Do you have standard reporting forms recommended for the country's priority diseases?

1. Yes 2. No

5.3. Did you send surveillance data to the next level? 1. Yes 2.No

5.4. Was there any report of the immediately reportable diseases in the past one year?

1. Yes 2. No

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

a. Less than 1hour b. 2-24 hour c. 1- 2 days d. 3- 7 days e. After1 week

5.6. When are you expected to send weekly report to the next PHEM unit?

1. Monday 2.Tuesday 3.Wednesday 4. Thursday

5. Friday 6. Saturday 7.Sunday

6. Data analysis and interpretation

6.1. Had you trained on surveillance system? 1. Yes 2.No

6.2. Did you have computer? 1. Yes 2.No

6.3. Is it functional? 1. Yes 2.No

6.4. Did you have computer skill? 1. Yes 2.No

6.5. Did you analyze surveillance data of priority diseases? 1. Yes 2.No

6.6. For which Country‘s priority diseases have you analyzed the data? _____

6.7. Did you use computer to analyze these surveillance data? 1. Yes 2.No

6.8. If answer for 4.8 is yes, did you describe data by time, place and person? 1. Yes 2.No

6.9. How often do you analyze the collected data? 1. Daily 2.Weekly

3. Every 2 weeks 4.Monthly 5. Quarterly 6.As needed

6.10. Did you notify the results of your analysis to the next level? 1. Yes 2.No

6.11. Do you have an action threshold defined for Country‘s priority diseases? 1. Yes 2. No

6.12. For which Country‘s priority diseases defined an action threshold?

6.13. Personal Observation about the presence of Data presentation and defined action threshold_____

7. Epidemic Preparedness

7.1. Was there written plan of epidemic preparedness and response? 1. Yes 2. No

7.2. Has the Hospital had emergency stocks of drugs, vaccines, and supplies at all times in past 1 year? 1. Yes 2. No

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

7.4. If yes, Amount in ETB_____

7.5. Source of Budget 1.GOV 2. NGOs 3.Othres_____

7.6. Personal observation for presence of plan of epidemic preparedness and response _____

7.7. Was there contingency stock for the past 3-6 months? 1. Yes 2.No

7.8. Was there IEC materials and activities necessary for epidemics preparedness and response?

1. Yes 2.No

8. Outbreak Response and Control

8.1. Was an epidemic management committee built in your office? 1 .Yes 1.No

8.2. If yes for Q 8.1, did the epidemic management committee have regularly scheduled meeting time? 1. Yes 2.No

8.3. Does the district have a rapid response team for epidemic? 1. Yes 2. No

8.4 Personal observation for presence of plan of epidemic preparedness and response _____

8.5. Number of outbreaks suspected in the past year: _____

8.6. List the diseases: _____

8.7. Of those, number investigated: _____

8.8. Number of outbreaks in which risk factors were looked for: _____

8.9. Number of outbreaks in which findings were used for action: [observe in reports] _____

8.10. Number of districts that looked for risk factors [observe in reports] _____

8.11. Did you have line list for reporting outbreaks? 1. Yes 2.No

9. Feedback

9.1. Did you receive Feedback to higher level? 1. Yes 2.No

9.2. How did you receive your feedbacks? 1. Oral 2.Written 3.Others

9.3. Were there any bulletins or reports received from the next higher level? 1. Yes 2.No

9.4. Personal Observation about the existence of a report or bulletin that is regularly produced to disseminate surveillance data or received from next higher level**: _____**

10. Availability of a National Surveillance Standards and Guidelines

10.1 Were there national guidelines and standards for surveillance? 1. Yes 2. No

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

10.3. Did you have case management protocol for epidemic prone diseases? 1. Yes 2.No

10.4.Did you have SOPs for collection, packaging and referral of specimens of targeted epidemic prone pathogens? 1. Yes 2.No

10.5. **Personal observation** about the presence of National Guidelines and Manuals_____

11. Training

11.1. Did you take training on priority diseases surveillance within the last year?

1. Yes 2.No

11.2. If yes for Q 11.1, for which Country‘s priority diseases have you trained? _____

11.3. If yes for Q 11.1, how many staffs were trained? _____

11.4. What percent of your subordinate personnel have been trained in surveillance and epidemic management? _____

11.5. Did the laboratory personnel trained on innovative techniques of epidemic instigations and confirmation? 1. Yes 2.No

12. Communication facility

12.1. Which communication material did you have? 1. E-mail 2.wired phone 3.mobile

4. Radio fax 5.other----------

12.2. How do you send the data to the next level?

1. E-mail 2.Telephone 3.Fax or radio 4. Others _____

12.3. Did you have address of PHEM officers of the town health office? 1. Yes 2.No

13. Resources of the Facility

13.1. Were resources like computer with printer, motor cycles, stationeries, telephone for data management, and logistics available in the District Health Office? 1. Yes 2. No

14.Co-ordination

14.1.Was there a focal unit for surveillance at the District level? 1. Yes 2. No

14.2. Personal observation for the presence of organogram of FMOH to confirm_____

_____

Surveillance Attributes

15. Timeliness

15.1. Did you report the surveillance data to the next higher level on time? 1. Yes 2.No

15.2. Did you encounter any outbreaks suspected in the past year? 1. Yes 2.No

15.4. If yes for Q 17.3, within how many Hrs/Days did you notify to the next higher level?

_____

15.5. If yes for Q 17.3, within how many Hrs/Days did you verify it? _____

15.6.**Personal observation**_____

16. Usefulness

16.1. Did the suspected outbreaks detected early by the surveillance system? 1. Yes 2.No

16.2. Did the response initiated in a timely manner? 1. Yes 2.No

16.3. Was any epidemiological investigation conducted? 1. Yes 2.No

16.4. For what purposes did you use the surveillance data? _____

17. **Simplicity of the system**

17.1. Was the case definition of each priority disease easy? 1. Yes 2.No

17.2. Did the system allow all levels of professionals to fill data? 1. Yes 2.No

17.3. Did the system help to record and report data on time? 1. Yes 2.No

17.4. How long does it take to fill the format for each disease? _____

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

18. Acceptability

20.1. Did you believe the surveillance is important for public health intervention? 1. Yes 2.No

19. Flexibility

19.1. Can the current reporting formats be used for other newly occurring health event (disease) without much difficulty? 1. Yes 2.No

19.2. Did you think that any change in the existing procedure of case detection and reporting format will be difficult to implement? 1. Yes 2.No

19.3. Is the system easy to add new variables? 1. Yes 2.No

19.4. Is the system easy to integrate with other systems? 1. Yes 2.No

19.5. Is the system easy to add new disease on report? 1. Yes 2.No

20. Representativeness

20.1. Was the surveillance system enabled to follow the health and health related events in the whole community? 1. Yes 2.No

21. Stability

21.1. Was any new restructuring affected the procedures and activities of the surveillance?

1. Yes 2.No

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

21.3 Was there any time /condition in which the surveillance was not fully operating? 1. Yes 2.No

Chapter IV: Health Profile Description Report

4.1. Dangilla Woreda health profile, Awi Zone, Amhara, Ethiopia, 2016

Summary

Background: Health profile is vital for prioritizing prominent health and health related problems of the community. It is basic for planning and appropriate intervention; and it is an entry point for operational research. Stakeholders in health and health related areas of the community will have evidence-based information from well compiled health profile. In Ethiopia, particularly at the district level an organized health and health related indicator which determine the health status of the community is scarce and these contribute a gap in planning and taking evidence based information for action. The purpose of this document is to assess and describe the health and health related issues in Dangilla Zuria Woredaand communicate the local burden of disease and other health related information.

Methods: A descriptive Qualitative and Quantitative retrospective study design with record reviews were conducted from May15-June 15 2008 E.C in Dangilla Zuria Woreda. Health and health related data were collected using standard check list by interviewing and reviewing medical records in the District.

Result: In Dangilla woreda among 149,119 total population of which female constituted 76,259(51%) and 110,795(74.3%) people have access to safe water. There are 24,678 households among those 23,644(95.8%) of the households has latrine and only 38(56.7%) are functional. In the woreda 67 schools are present and among these 28 (41.8%) have water supply. The District has 29 kebeles which have a variable distance from Dangilla town. The age dependency ratio of the district was 74,579(100%). A total of 34 health institutions are available in the woreda and all are owned by government. In the woreda the proportion of pregnant women who had at least one ANC visit are 58.4% and 30.2 of births were attended by skilled health personnel besides 2.5% of births attended by HEWs. Family planning coverage of the woreda is 52%. In the woreda the full immunization coverage was 57. Acute upper respiratory infection was the leading cause of morbidity in the district accounting 16.5% and 16.7% in Male and Female adult at OPD in 2007E.C respectively but in 2006 E.C Acute febrile illness was the leading cause of morbidity in the district accounting 18.9% and 16.7% in Male and Female adult at OPD level

respectively. In children pneumonia was the first leading causes of morbidity at OPD 22.6% and 24.3% in the year of 2006 and 2007 respectively

Conclusion: In Dangilla Zuria woreda communicable disease like Pneumonia and diarrhea (no bloody) in <5 pediatrics, acute febrile illness and Acute upper respiratory infection in adults are the most frequently occurring disease in population. In addition in the woreda 58% of the schools do not have water supply and 43% of those schools do not have functional toilet therefore the woreda have to promote hygiene and sanitation for the community. Proportion of delivery attended by skilled health personnel was slightly increased and only 19.5% of delivery attended at home by traditional birth attendant (TBA) in this woreda.

Introduction

Back ground

Health profile is a summarized auditing and discussion of health related data and important health related indicators to describe the health and related social, economical, political and cultural factors in the geographic area under discussion [1]. It is vital for prioritizing prominent health and health related problems of the community. It is basic for planning and for appropriate intervention; and is an entry point for operational research. Stakeholders of health and health related issues will have access to evidence-based information from well compiled health profile. Health Profiles is a programme to improve availability and accessibility for health and health-related information. Health Profiles provide summary health information to support local authority members, officers and community partners to lead for health improvement [2]. It is common knowledge that the health and socio-economic well-being of people are fundamentally linked to their natural and built environment [1, 3]. The profiles give a snapshot overview of health for each local authority.

A community health profile is a comprehensive compilation of information about a community. The data in a profile reflects the health of a given community from many different angles. A community health profile includes both previously identified health issues and the identification of new, emerging issues. A comprehensive community health profile includes: A narrative description of the given community, community strengths and challenges, demographic and economic data, health status data, community resources, including services, coalitions, and systems and interpretation of data presented, from both the perspective of the health council and the broader community. However, in low income countries like Ethiopia, such information especially at Woreda level is usually not complete and not comprehensive. The Woreda Health Profile will include an environmental health report that will outline environmental health indicators such as disease and injury prevalence, health hazard types and trends, and other emergent environmental factors that impact human health.

This profile describes the current health status of the Woredas. The purpose of this report was used to simplify and communicate information on public health problemsof the Woreda and to show the local burden of disease in a practical, accessible format for woreda health planning. Most of the information has been provided in tabular format with short explanatory captions and minimum text to provide 'picture' of the current demography and disease burden.

This profile provided to assist Woreda authority members and other organizations as well as citizens and policy makers to assess the health of their county population. This information has been presented as simply as possible so that people who are not health professionals can see a difference between their community and the state as a whole and begin the process of planning for better health.

Therefore this project work hopefully create an opportunity to access of compiled health and health related issues of the woreda for planning, prioritizing health program and health related problems and in order to them in one document for users.

Rationale of the study

The planning and management of health services in developing countries often proceeds within an environment of inadequate information about the health status of the population served and the occurrence of important determination of health. This is particularly the case at the district level where health service have traditionally underdeveloped and information system lacking. In Ethiopia, particularly at the district level an organized health and health related indicator which determine the health status of the community is scarce and these contribute a gap in planning and taking evidence based information for action. In Dangilla woreda health profile was not done before and also there is no organized health and health related information. Therefore describing the health profile of the Woreda is helpful to give evidence based information for prioritizing and instituting appropriate public health interventions in the Woreda.

Objective

General Objective

- To assess and describe the current health profile of Dangilla woreda and to compile and simplify health information, for priority setting, communicate local burden of disease in well made and accessible document, May 2008 E.C.

Specific objectives

- To describe the social, economic, demographic and geographic determinants health status of the community of Dangilla woreda
- To assess primary health care coverage of the Woreda
- To describe existing health infrastructure of the Woreda
- To assess human resources of the Woreda.
- To identify priority public health problems

Method

Study area and population

The study was conducted at Dangilla woreda, which is found in Agew Awi Zone of the Amhara regional state. The area is selected because its health profile yet not known and currently there is a need to have reproductive health and prevention of infectious disease (like HIV/AIDS, Malaria and TB) programmes. Based on the 2007 national census this woreda has a total population of 158,688, of whom 80,235 are men and 78,453 women; 27,001 or 17.02% are urban Inhabitants [4].

Study design

A descriptive Qualitative and Quantitative retrospective study design with record reviews were conducted to assess and describe the current health profile of Dangilla woreda, Amhara, from May15-June 15 2008 E.C.

Study subjects

The data was collected from woreda health office, woreda agricultural office, woreda educational office, water, Culture and tourism, finance, transport, electric power offices, Telecommunication, Post office and Bank and other offices based on data need.

Data collection and instrument

The health data was collected from Woreda health office and Dangilla health center as well as health related information was collected from different woreda administrative offices of the year 2007 E.C. The main mechanism of data collection is record review, interview of woreda health workers and other concerned body. The data collection has been extracted using semi structured questionnaire. The checklist is prepared in English and accommodates all the information on Geographical location, climatic condition and socio-demographic characteristics, main health services coverage (Immunization, Maternal health service coverage, water and sanitation coverage of the woreda) and ten causes of morbidity and mortality.

Ethical clearance

Health and Health related information of Dangilla woreda was collected after obtaining official letter from Amhara regional Health bureau Public health emergency management (PHEM) department as well as permission obtained from Dangilla woreda health office and other concerned bodies in the woreda during data collection.

Data analysis

Quantitativedata has been entered in a computer and analyzed appropriately using Microsoft Office Excel spread sheets. Finally the results have been presented with texts, tables, and figures.

Operational definition of terms

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

Child mortality rate:The death of infants and children under the age of five or between the age of one month to four years per 1000 live births.

Clean and safe delivery: Proportion of deliveries attended by HEWs and skilled health personnel

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

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

Crude birth rate: The number of births in a population during specified year is divided by the number of person-years-lived by the population during the same period. It is frequently expressed as births per 1,000 populations.

Crude Death Rate: The number of deaths in a population during specified year is divided by the number of person-years-lived by the population during the same period. It is expressed as births per 1,000 populations.

Institutional Delivery: Percentage of deliveries in public and private hospitals, clinics and health centers, irrespective of who attended the delivery at these facilities.

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

Fully immunized: Surviving infants who receive all doses of infant vaccine. The Infant vaccines are: BCG1, DPT (doses 1 -3), OPV (doses 1—3), HB (doses 1-3) and Measles vaccine before the child is one year of age.

Infant Mortality Rate (IMR): The number of deaths under one year of age occurring among the live births in a given geographical area during a given year, per 1000 live births occurring among the population of the given geographical area during the same year.

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

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

Postnatal care (PNC): The care given tomother and her newborn baby immediately after the birth and for the first six weeks by skilled health attendants including HEWs for reasons relating to post-partum

Skilled delivery: Proportion of deliveries attended by skilled health attendants; A skilled birth attendants an accredited health professional – such as a midwife, doctor or nurse – who has been trained in the skills needed to manage normal (uncomplicated) pregnancies,

child birth and the immediate postnatal period, and in the identification, management and referral of complications in women and newborns.

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

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

TB defaulter rate: Percentage of a cohort of new smear-positive TB cases registered in a given year that interrupted treatment for at least 2 months following treatment initiation/ default from initial treatment.

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.

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

Results

Historical background and culture

Amhara Region

The Amhara Region is located in the northwestern part of Ethiopia between 9°20' and 14°20' North latitude and 36° 20' and 40° 20' East longitude." [5] Its land area is estimates at about 170,000 square kilometers. Amhara borders Tigray Region in the North, Afar in the East, Oromiya in the South, Benishangul-Gumuz in the Southwest and the country of Sudan in the west.

Amhara is divided into 11 zones, and 140 Woredas. There are about 3429 kebeles (the smallest administrative units) [5].The historic Amhara region contains much of the highland plateaus above 1500 meters. In this region are located, the world-renowned Nile River and its source, Lake Tana, as well as historic sites including Gondar, and Lalibela [6].

Based on the 2008 E.C Census conducted by the Central stastical Agency of Ethiopia (CSA), the Amhara Region has a projected population of 20,769,984. 10,383,189 were male and 10,386,795 female. Amharic was spoken as a first language by 91.47%, and 3.46% spoke Awngi (Agewugna); the remaining 5.07% spoke all other primary languages reported [4]

Agew Awi Zone

Agew Awiis one of 11 Zones in the Amhara Region of Ethiopia. Agew Awi is named for the Awi sub-group of the Agew people, some of whom live in this Zone. Agew Awi is bordered on the west by Benishangul Gumuz Region on the north by North Gondar and on the east by West Gojjam. The administrative centre of Agew Awi is Injibara; other towns include Chagni, and Dangilla

The Zone is crossed by about nine permanent rivers which drain into the Abay (Blue Nile); other water features include two crater lakes Zengena and Tirba and Zimbiri marsh which is located 5 km south-west of Addis Kidan. [7].

Based on the 2008 E.C Census conducted by the Central Statistical Agency of Ethiopia (CSA), this Zone has a total projected population of 1,220,072 of whom 599,881 are male and 622,191 female. The two largest ethnic groups reported in Agew Awi were the Awi (59.82%) a subgroup of the Agaw, and the Amhara (38.44%); all other ethnic groups made up 1.74% of the population. Amharic was spoken as a first language by 53.38%, and 45.04% spoke Agewugna; the remaining 1.58% spoke all other primary languages reported. 94.4% practiced Ethiopian Orthodox Christianity, and 4.5% of the population said they were Muslim [4].

Dangilla Woreda

Dangilla is one of the oldest Districts in Amhara Region which was established in 1620.The District had no its own capital & Dangilla is serving as the District capital [8]. There are no documented historical places in the District by Culture and tourism bureau at national level, but there are 15 Natural and Manmade potential historical places like Wolete Petrose gedam, which is found Abadira, Wondefray kebele about 16 km from Dangilla town, Gilgel semu mekane kirs which is found Gaita kebele about 12.5 km from Dangilla town and Tiski water fall which is found in Gissa, Alefa kacha kebele about 18km from Dangilla town

The name of the District is related to the name of sheep (Dangilla sheep). Once upon a time there was a famous person whose name was James Bruce who travels to discover the Source of the Nile, when he observed the area there were many Sheep. So he declared that the area should be named Dangilla based on breed of Dangilla Sheep [9].

Geography and climate Dangilla

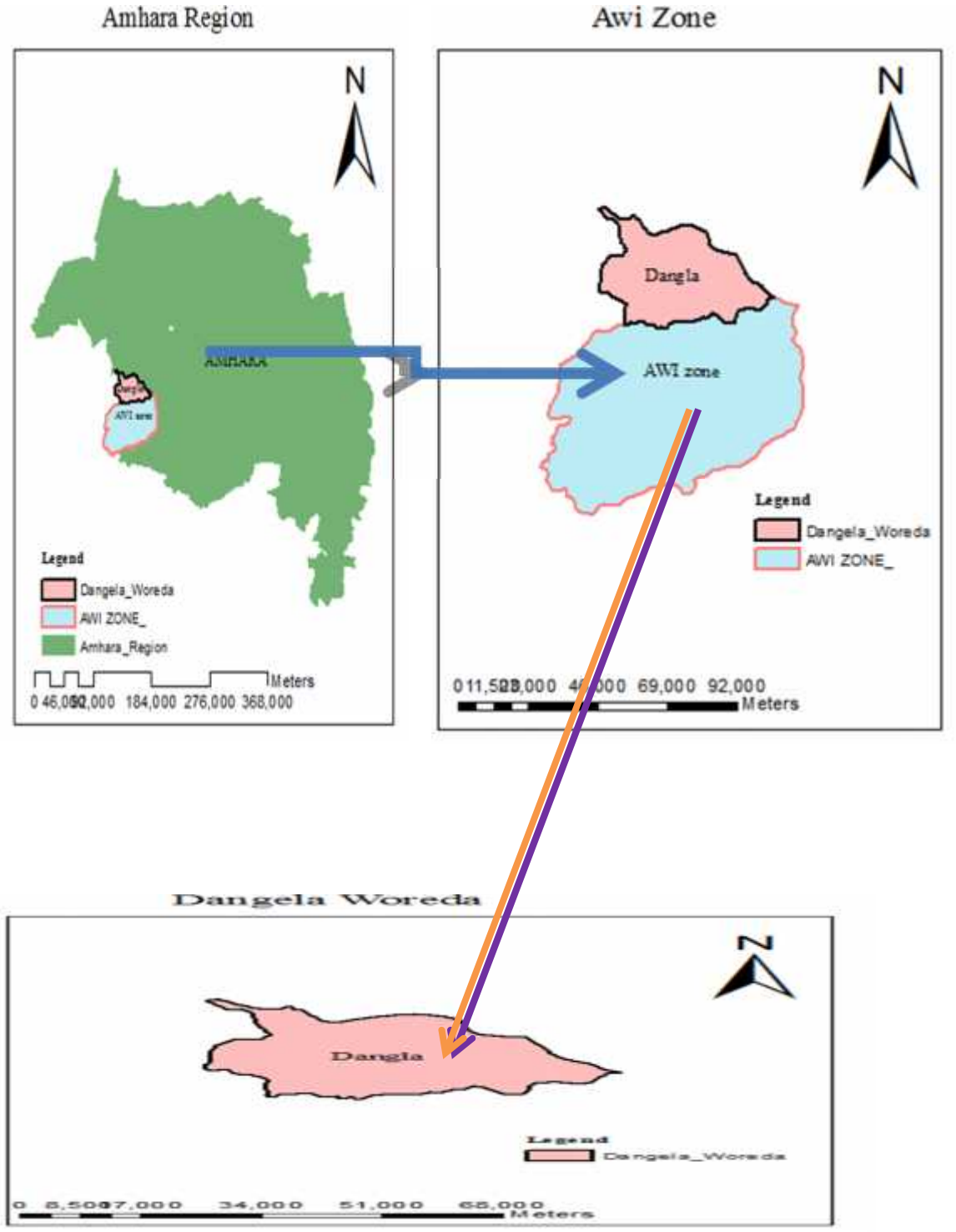
The Districttown is found on highway 68 kilometers south of Bahir Dar and northwestern part of Addis Ababa 490 kilometers. Dangilla Zuria District shares boarders with south

by Faggeta Lekoma, on the southwest by Guangua, on the North West by the Jawi, and on the Northeast by the West Gojjam zone. Towns in Dangilla Zuria include Chara 01 and Gissa 01.

The climatic condition of the District is 100% Woinadega. It covers about 73,613.7 hectares from the total area of Awi zone which 857,886 hectares is including Dangilla Town, with altitude ranging from 2137 meter above sea level. The geographic coordinates of the district is 11.267o North latitude & 36.833o East longitudes. The mean annual rain fall is 1600 mm; and the monthly temperature ranges from 17oC to 21oC.

Administrative and political organization

The District is divided in to 29 kebeles of this 27 are rural and 2 urban kebele). The District has its own council and representative in the Federal Parliament. All sector offices are found in Dangilla Town. The Amhara Development Association (ADA), Agriculture growth program (AGP), United Nations Children's Fund (UNICEF), Community based integrated natural resource management program (CBINRMP), WASH(water sanitation and hygiene) and World Health Organization (WHO) are the main supporting organizations in the District. The Ruling Political Party in the District is the Amhara National Democratic Movement (ANDM) Ethiopian People's Revolutionary Democratic Front (EPRDF)



Map 3 : Map of Dangilla Woreda, Awi Zone, Amhara Region, Ethiopia.

Socio-Demographic information

In 2007 E.C the population estimate of Dangilla Zuria woreda was 149,119 of this 72,860 are males and 76,259 are females from this 7,227 are urban population. In terms of population density Dangilla has a population density of 172.79 Km/2, which is greater than the Zone average of 107.44 persons per square kilometer and also compared with the national and regional figure 102 persons/ Km2,108.9 person/ Km2 respectively it is much higher. Around 97.9% of the population of the District is Orthodox Christian, and 1.88% Muslim and protestant. The two largest ethnic groups reported in Dangilla were the Amhara (78.65%), and the Awi (21.13%), one of the Agaw peoples; all other ethnic groups made up 0.22% of the population [5].

Approximately 7,227(4.8%) of the Dangilla Zuriapopulation resided in urban area during the study. The population distribution of the District was very variable ranging from 1737 in Qundisha kebele to 10,459 in Gissa Baiegziabher. Ten kebeles which have high population (Gissa Balegziher,Dibaka Sinkuri,Gissa Kansen,Gumdri,Abadira Agaga,Dengeshita Warkit,Alefa Kacha,Wondefay and Wumbri) constituted more than half (50.5%) of the total population of the District. The sex ratio of the District was 0.95:1.00(male: Female).

A total of 24,678 households were counted in this woreda and the average household size was estimated to be 4.46 persons to house hold. Most of the kebeles have variable distance from Dangilla Town, the nearest kebele was Damisa which is 5 kilometers from Dangilla Town and the farthest was Maylbach which is 24.1 kilometer away from Dangilla Town. About 82.7% of the kebeles were between 10-20 Kilo meters from the District Capital, Dangilla Town. The District had 27 rural and 2 urban, a total of 29 kebeles.

Table 12: Population distributions by kebele for 2007E.Cwith estimated population and distance in kilometers from the District Town (Dangilla).

S.No	Name of kebele	Male population	Female population	Total population	Distance of kebeles from Dangilla Town in Km
1	Abadira Agaga	3552	3929	7384	10
2	Afessa	2129	2229	4256	19.5
3	Alefa Kacha	3264	3386	6548	18.3
4	Badani	1778	1668	3344	15.8
5	Chara 01(Town)	1742	1834	3474	13
6	Dimssa Timam	1630	1710	3248	5
7	Dibaka Sinkuri	4366	4511	8775	16.5
8	Dengeshta Warkit	3341	3460	6693	7.6
9	Dubi	2153	2253	4304	8
10	Gayta	2190	2292	4380	12.5
11	Gisaa Kansen	4239	4376	8507	20
12	Gissa 01(Town)	1811	1905	3614	13
13	Gissa Balegziabher	5033	5528	10459	20
14	Gult Absheken	1878	1963	3749	13
15	Gumdri	4035	4126	8059	9
16	Jibana	2587	2696	5180	16
17	Ligaba	1775	1868	3541	10
18	Manguda	2128	2229	4255	16.5
19	Mayl Bach	1237	1309	2454	24.1
20	Muksi	2911	3027	5836	12
21	Quandisha	882	957	1737	12
22	Quancha Kuakurta	3054	3159	6125	15
23	Washa	2025	2123	4046	11.6
24	East Zelesa	1240	1322	2460	10
25	Wondefay	3198	3322	6418	16
26	Wufita Dati	2806	2920	5624	10

27	Wumbri	3162	3284	6344	20
28	Zunga	1229	1301	2438	14
29	Zurzur	1485	1572	2955	22.1
	Total Population	72860	76259	149119	

The sex ratio (Male: female) of the woreda is 0.95:1.00. Of the total population 69,276(46.4%) are below age of 15 years, 74,539(50%) are on the age range between15-49 and 5,304(3.5%) are above the age of 64 years and 33,811(22.7%) are female between the ages of 15-49 years. The population in the productive age group (15-64 years) constituted about 74,540(50%) of the total population. From the total population100% of the total population is dependent (for 100 economically active person, there are100 economically inactive people)

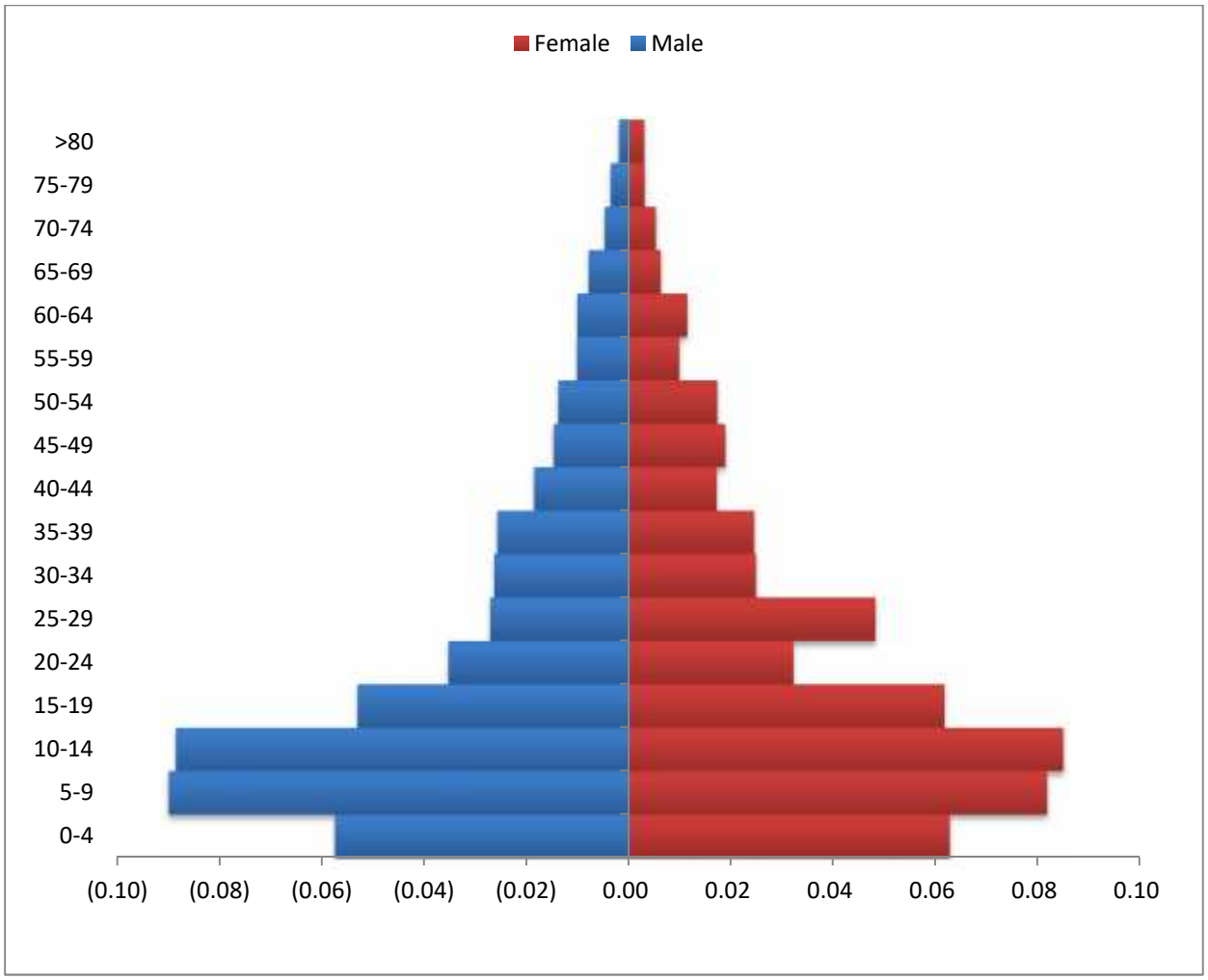


Figure 17 : Population pyramid of Dangilla Zuria District, Awi, Amhara Region, Ethiopia, 2007 E.C

Productivity and income

The District has fertile land which is suitable for agriculture. According to district agricultural office information, about 83% of the community in the district was based on mixed farming and from the total surface area of the district 55,137(74%) hectares were covered by cultivated area followed by 12,246(16%) Hectares were covered by grazing area. Most of the District population lives in rural area and on agricultural economy. The population density of the District was 200 inhabitants per square kilometer. The most common staple foods/crops in regular cropping season of the District: Maize, Dagusa (Melet), Teff, Barley & wheat and the productivity of the land was 931,310(37%), 365,847(14.6%), 249,429(10%), 89,735(3.6%), 8,400(0.3%) quintals respectively. Rearing of cattle, goat and sheep were common practice in the district beside crop production. The gross domestic product (GDP) of the District in Meher Season (regular crop season) was 2,500,000 quintals and 1,766,142 quintals from irrigation (in dry season) respectively. The total GDP of the District for 2007 was 4,266,142 quintals (total crop production). However, it was difficult to change this income in to dollar or Ethiopian Birr. According to district Trade office information 1,117(782 Male and 335 Female) people relies on trade. Few People in the district was based on Governmental employee, Private employee and daily laborer but the exact figure was not known.

Education

The intimate linkage between health and education has been firmly established in a number of studies, which taken collectively, offer some ideas about how education and health could potentially reinforce each other towards the rapid socio-economic development of the country. Epidemiological and health service research in Ethiopia has shown that illiteracy is usually associated with high health risks and low health seeking behavior. In addition to a wide range of diseases and child mortality associated with illiteracy or under-education, HIV/AIDS infection is also disproportionately high in out of school youth. Despite major progress in education, national literacy levels are still low. Based on 2007 E.C Woreda education office report, the District had 63 first cycles

School (Grades 1-4), 43 second cycle primary school (Grades 5-8) and 04 secondary school (Grades 9-10) and 02 preparatory schools in the District and there is no K.G, TVET and college in the Dangilla Zuria Woreda. From the total of 40,585 School age children targeted 37,485(92%) was the total enrolled Students in the District. First cycle has a total student population of 20,793 with 9,734 (46.8%) females. Elementary schools (grades1-8) had a total student population of 32,693 of which 16,058 (49%) were females. In high schools (grade9-12) there were a total of 4,782 students of which 2657 (55.5%) were females. In first cycle, there were a total of 331 teachers of which 170 (51.4%) were females. In the Woreda there were 1296 teachers of which 537(41.4%) were females. School dropout rate and repeat rate of the district from grade 1-8 were 534(1.6%), for Female students it was 223(0.7%) and 891(2.7%), for Female students it was 371(1.1%) respectively. But the proportion of students passed to the next class was 36,050 (96%). Education coverage for the District was 99.9%, but the literacy rate was not known. Dropped out of the Students were due to economic, need of labors from their family, health problems and loose of interest .Among 67 schools 28(41.8%) have water supply and 62(92.5%) have toilet facility however currently only 38 (56.7%) are functional.

Water

The District Water Resource Office was working to supply safe drinking water for the community in collaboration with different stakeholders and partners. Based on the Woreda Water resource office information among 149,119 total population 110,795(74.3%) people have access to safe water from this 72.4% of rural kebeles and 100% of urban kebeles have access to safe water. Most of the population in each kebele had access to safe drinking water. Four kebeles (two rural and two urban kebeles) had 100% access to safe drinking water. In addition to this, frequency of chlorination for drinking water sources was every 3 months based on the recommendation but still there was a certain segment of the community using unsafe water for drinking. The coverage of safe water supply was still below 50% (Washa, Zurzur and Gissa Balegziabher kebeles)

in some kebeles. The main water sources of the woreda are spring development, Hand dug well, shall well and rope pump well.

Table13: Distribution of drinking water sources in Dangilla Zuria District, Awi Zone, Amhara Region, Ethiopia, 2007E.C

S.No	Type of water source	Total	Functional	% of functional from total
1	Protected spring	35	34	97.14
2	Deep well	1	1	100
3	Hand dug well	537	528	98.3
4	Shallow well	12	11	91.7
5	Rope pump well	126	116	92
6	Rural pipe system	2	2	100

Table14: Safe water supply coverage by kebele in Dangilla Zuria District, Awi Zone, Amhara Region, Ethiopia, 2007 E.C

S.No.	Name of kebele	Kebele population	Percentage of people who have access to safe water supply
1	Abadira Agaga	7384	84
2	Afessa	4256	91.6
3	Alefa Kacha	6548	53.9
4	Badani	3344	61.9
5	Chara 01	3474	100
6	Dimssa Timam	3248	94
7	Dibaka Sinkuri	8775	52.9
8	Dengeshta Warkit	6693	86.7
9	Dubi	4304	79
10	Gayta	4380	52
11	Gisaa Kansen	8507	62
12	Gissa 01	3614	100
13	Gissa Balegziabher	10459	46
14	Gult Absheken	3749	92
15	Gumdri	8059	89
16	Jibana	5180	77
17	Ligaba	3541	63
18	Manguda	4255	82.9
19	Mayl Bach	2454	52
20	Muksi	5836	66.5
21	Qundisha	1737	82
22	Quancha Kuakurta	6125	88
23	Washa	4046	42.5
24	West Zelesa	2460	100
25	Wondefray	6418	59.5

26	Wufita Dati	5624	100
27	Wumbri	6344	64.14
28	Zunga	2438	83.8
29	Zurzur	2955	48
	Woreda	149,119	74.3

Electric power supply and telephone communication

Dangilla, the District Capital had 24 hour electric power supply, mobile and fixed telephone services, postal service and bank (Commercial Bank of Ethiopia, Abay Bank, Construction Bank and Abyssinia Bank). But different sectors like Telecommunication and Post office were not separate in to two districts. Dangilla Zuria Woreda did not have bank until recently. A total of 9,500 (38.5%) household from a total of 24,678 have access to electric power supply and 470 households have access to fixed telephone communication but access to mobile phone was not registered from Woreda Telecommunication office. All the 29 kebele offices have wireless telecommunication systems and are accessed by mobile telephone network and only 16 kebeles had electric power supply.

Transportation

In Dangilla woreda there are three type of roads, first class road (Asphalt), that connects the capital city of the region with Addis Ababa (the road is 6 meter width and it covers a distance of 20 km within the district), first Level gravel road that connect Dangilla to Jawi (which covers a distance of 70 Km and width of 10 meter) and second Level gravel road (feeder road) that connects kebele to kebele and kebele to the Woreda's capital which covers a distance of 127.6 Km and width of 6 meter. From the total 29 Kebeles only 21 kebeles were accessed by vehicle or motorcycle in all seasons.

Health system organization

Country health system

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

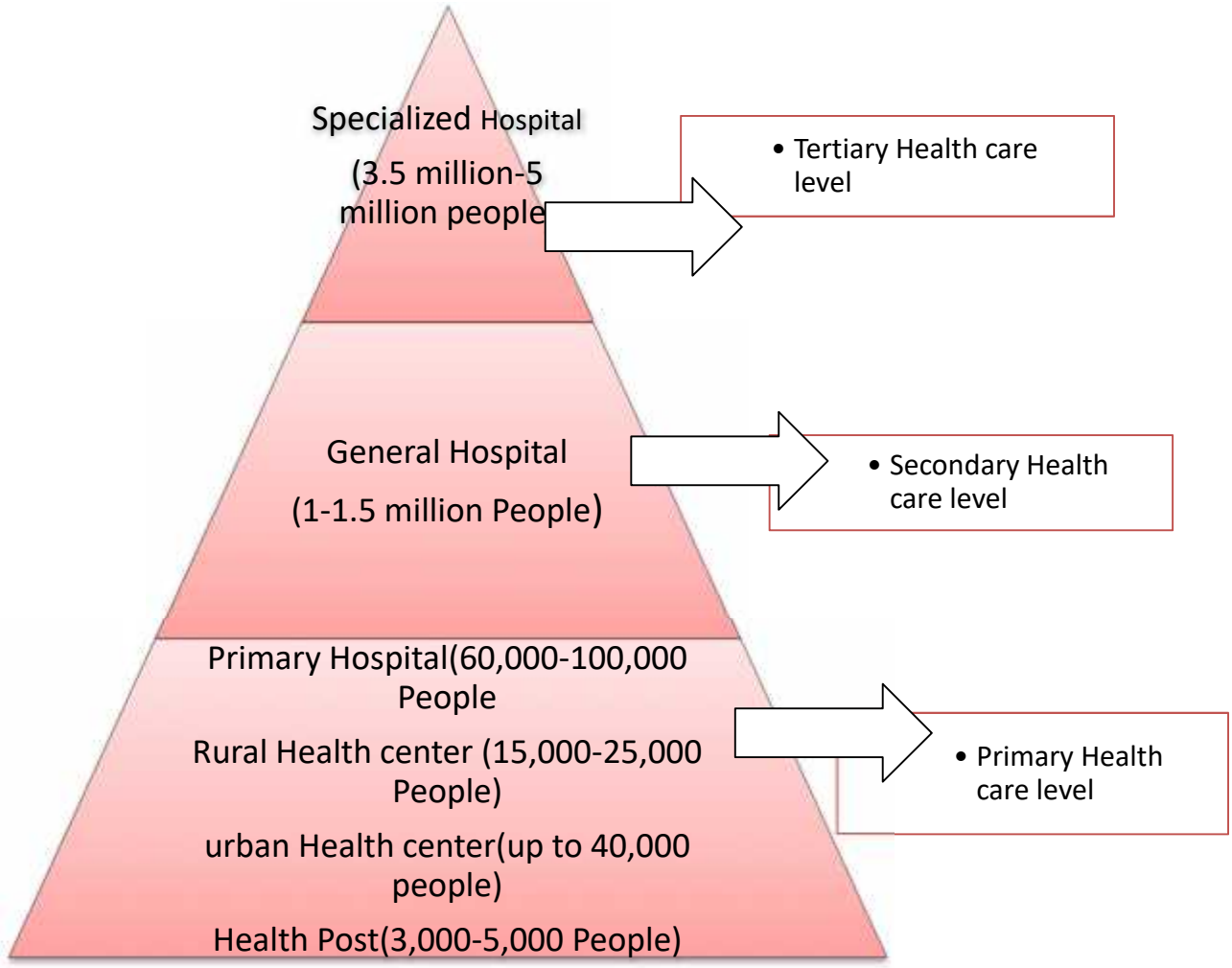


Figure 18 :Ethiopian Health tier system. (Source: Health Sector Transformation Plan 2016)

District health system

Organo-gram of the District Health Office

The District has one core process, five case teams with in the direct command of the District Health Office.

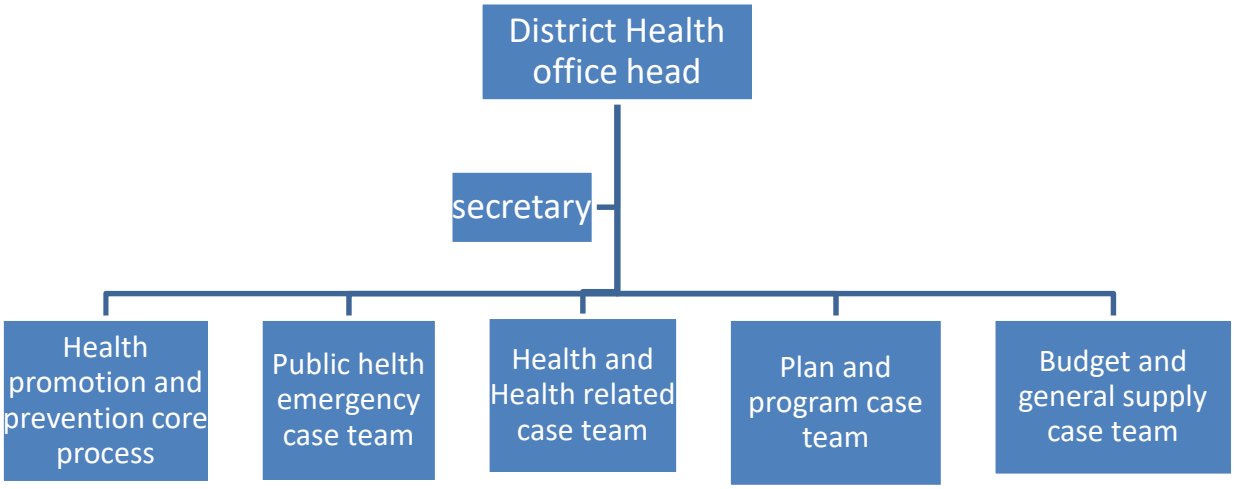


Figure19: Organizational structures of Dangilla Zuria District Health Office, Awi Zone, Amhara Regional State, Ethiopia, 2007 E.C

Health Infrastructure

There are 29 health posts and five health centers, but there is no hospital in Dangilla Zuria District. Regarding the availability of telephone service and electric power supply, five of the health centers and seven of the health posts have 24 hour electric power supply but five health centers and most of health post have access to mobile phone service. All the 29 kebele offices have are accessed by mobile telephone network. There was no private clinics, drug vendors and diagnostic laboratory in the District.

Table15: Number of health facilities by type in Dangilla Zuria District, Awi Zone, Amhara Region, Ethiopia, 2007 E.C

S.No	Type of Health facility	Service	Number
1	Health Centers	with sustainable/ 24 hour electric power	5
		without sustainable/ 24 hour /electric power	0
		with telephone service (mobile)	5
		without telephone service (cable based/mobile)	0
		with piped water supply	1
		without piped water supply	4
2	Health Posts	with sustainable/ 24 hour electric power	7
		without sustainable/ 24 hour /electric power	22

In the Woreda there are 34 health institutions among those 34 (100%) are owned by government and the health service coverage of the Dangilla Zuria woreda (rural)were67% and 78 % for Health centers andHealth posts respectively i.e. one rural health centers giving services for up to 15,000- 25,000 population (averagely for 20,000 population) but in the Dangilla Zuria woreda there are five health centers which was

serving for 149,119 population [100,000/149,119]and one health post giving service for 3,000-5,000 (averagely for 4,000 population) and there are 29 health posts in the Woreda [116,000/149,119].

The potential health service coverage by health centers andhealth posts in some kebeles were >100%, but in most kebeles it was between 50% and 97% which shows inequitable distribution of health facilities. The same is true for health centers. Gissa Health Center was serving for six kebeles with a catchment population of 39,720 (PHSC 50%, but Afessa Health Center was serving for only five kebeles, with a catchment population of 22,872 (PHSC 87%. In general, the potential health service coverage of the Districtfor Health centers andHealth posts were 67% and 78 % respectively, based on the estimate that one rural health center and five health posts giving service for 15,000 to 25,000 populations and one urban health center for up to 40,000 populations. The potential health service coverage of Health centers andHealth posts by kebele shown in table 5.

Table16: Potential Health Service Coverage of Dangilla Zuria District by kebele Awi Zone, Amhara Region, Ethiopia, 2007 E.C

Name of Kebele	Kebele population	No. of health facility		No. of population getting service from HC	Potential health service coverage (%)	
		HP	HC		HC	HP
Abadira Agaga	7976	1	1	26,020	77	50
Wondefay	7008	1				57
Wufita Dati	6264	1				64
Manguda	4772	1				84
Chara 01	2974		1	25,368	79	134
Dubi	4604	1				87
Badani	3584	1				112
Jibana	5372	1				74
Quancha Kuakurta	6225	1				64
Mayl Bach	2604	1				154
Gumdri	8085	1		35,147	57	49
West Zelesa	2760	1				145
Washa	6841	1				58
Gult Absheken	3741	1				107
Gayta	4862	1				82
Dengeshta Warkit	6983	1				57
Quandisha	1875	1				213
Wumbri	6618	1	1	22,866	87	60
Zunga	2650	1				151

Muksi	5170	1				77
Ligaba	3920	1				102
Afessa	4506	1				89
Dibaka Sinkuri	8767	1	1	39,720	50	46
Gissa Kansen	8077	1				50
Gissa 01	3614	1				111
Gissa Balegziabher	10159	1				39
Alefa Kacha	6392	1				63
Zurzur	2855	1				140
Woreda	149,119	29	5	149,119	67	78

Human resource: Health workers and supportive staffs

The District had a total of 91 health workers, 64 Health Extension Workers and 63 supportive/administrative/ employees a total of 218 workers during the study. Among those majority101 (65%) are Health extension workers and nurses. In the woreda there is neither General Practitioner (GP) nor specialist.

Table17: Health professional type and Number with professional to population ratio, Dangilla Zuria Woreda, Awi Zone, Amhara region, Ethiopia 2007 E.C

S.No	Category	Number
1	Specialist	0
2	G.P	0
3	HO	12
4	Nurse (Deg. And Dip.)	37
5	Mid wife (Deg. And Dip.)	12
6	Lab (Deg. And Dip.)	12
7	Pharmacy (Deg. And Dip.)	11
8	Env. Health (Deg. And Dip.)	4
9	HIT	3
10	Health education	0
11	HEWs	64
12	Supportive Staffs	
	Total	218

Table18: Population to Health Professional Ratio, Dangilla Zuria District, Awi Zone, Amhara Region, Ethiopia, 2007E.C

S.No	Category	Number of Health professional	Population to Health Professional Ratio		
			WHO standard	Current Amhara Region	Dangilla Zuria District
1	Health officer	12	1:10,000	1:14,817	1 :12,426
2	Nurses (Deg. and Dip.)	37	1:5,OOO	1:4,698	1 :4,030
3	Mid wife (Deg. and Dip.)	12	1:5,000	1:12,004	1 :12,426
4	HEWs	64	1:2,500	1:2,383	1 :2330

The HEWs to population ratio was almost equal to the current Amhara Regional status and WHO standards, but the clinical nurse to population ratio was better than the WHO standards. In other professionals, the proportion was not in line with the WHO standards, especially the midwife to population ratio.

Health

Maternal Health

In 2007 E.CANC achievement of at least one visit was 2,900 (58.4%), but at least 4 visits were 1166 (27.6). Proportion of skilled delivery was 1273(30.2%); Contraceptive acceptance rate was 15,295 (52 %). Over the year 2007,1273(30.2%) of births attended by skilled health personnel and 108(2.5%) of births attended by HEWs of the woreda. The postnatal service coverage of the District was 1886(44.7%). Data on other measures of fertility like crude birth, crude death rate, child and infant mortality rate are not available in the woreda.

Table19: ANC, Delivery attended by skilled attendants, clean and safe delivery (HEW) and PNC coverage, 2007E.C

Activity	Planned	Achieved	Coverage from plan (%)	Remark
ANC at least 1 visit	4966	2900	58.4	
ANC at least 4 visits	4221	1166	27.6	
Skilled Delivery	4221	1273	30.2	
Family Planning	29,471	15,295	52	CAR

Female in the reproductive age group (15-49 years) were estimated to be about 33,819 (22.7%) and non-pregnant women were estimated to be 30,991 (20.78%) of the total population in the District.

Children <1 year of age constituted about 2,908 (1.9%) and children <5 years of age constituted about 17, 892 (12%) of the total population. Vital statistics like total death, total births, under one and under five deaths were not recorded in the District and indices

for each specific indicator mentioned in the table 6 were from the national estimates, projected from the 2007 national census.

Table20: Distribution of population groups and vital statistics in Dangilla Zuria District, Awi Zone, Amhara Region, Ethiopia, and 2007 E.C

S. No.	Parameter	Number (%)	Remark
1	Total population	149,119	
2	Male	72,860	
3	Female	76,259	
4	Under 1 years old	2,908	
5	Under 15 years old	69,275	
6	Urban	7,227	
7	Rural	141,892	
8	Female 15-49 years old	33,819	
9	Pregnancy	4964	
10	Live birth	1382	
11	Non pregnant women	28,855	
12	Average house hold size	24,678	
13	Age dependency ratio	87%	
14	IMR/1000	No data	
15	Under 5 MR/1000	No data	
16	CBR/1000/year	No data	
17	CDR/1000/year	No data	

Immunization coverage

Immunization is one of the medical technologies used to protect the life of infants and children‘s against disease. EPI program is one of the programs conducted in diseases prevention and health promotion department in the district health sector

In 2007 E.C, 4583 people were targeted for immunization. Pentavalent which protect against diphtheria, tetanus, pertusis, hepatitis B and hemophilus influenza and immunization coverage for Pentavalent (penta 3) was 2,490 (54.3%), measles 2,604 (56.8%) and fully immunization coverage was 2,611 (57%). Pentavalent dropout rate was 2.1% and measles dropout rate was 2.3%. However, OPV 0 were not administered for infants at birth, OPV 2 and Penta 2 were not administered for infants at 10 weeks. In the woreda 49.8 % (2475) pregnant women who used TT2 vaccine.

Table21: Immunization coverage of children <1 year of age by vaccine, Dangilla Zuria Woreda, Awi Zone, Amhara Region, Ethiopia 2007E.C

S.No	Vaccine	Planned	Achieved	Coverage from plan (%)
1	Pentavalent	4,583	2,490	54.3
2	Measles	4,583	2,604	56.8
3	Fully immunized	4,583	2,611	57
4	OPV0	4,583	-	-
5	OPV1	4,583	2,546	55.5
6	OPV2	4,583	-	-
7	OPV3	4,583	2,493	54.4
8	Penta1	4,583	2,550	55.6
9	Penta2	4,583	-	-
10	Penta3	4,583	2,490	54.3
11	PCV1	4,583	2,550	55.6

12	PCV3	4,583	2,490	54.3
13	BCG	4,966	2,419	48.7
14	TT2+PW	4,966	2,475	49.8

Causes of Morbidity and Mortality

In Dangilla Zuria woreda acute upper respiratory infection, acute febrile illness and Helminthiasis are among the top leading causes of adult morbidity and similarly Pneumonia, diarrhea (non bloody) and acute febrile illnesses are top leading causes of morbidity in under five children.

Table22: Top 10 cause of morbidity in Male and Female adult, 2006 E.C

S.No	Type of Disease	Male	Female	Total	Percentage	Cumulative Percentage
1	Acute febrile illness	2606	1949	4555	17.9	17.9
2	Helminthiasis	2071	1578	3649	14.3	32.2
3	Acute upper respiratory infection	1815	1557	3372	13.2	45.4
4	Trauma	1728	695	2423	9.5	54.9
5	Disease of Muscloskeloton and connective tissue	1510	1401	2911	11.4	66.3
6	Dyspepsia	1052	1867	2919	11.5	77.8
7	Pneumonia	886	734	1620	6.4	84.2
8	Infection of skin and subcutaneous	876	540	1416	5.5	89.7
9	Other unspecified infections and parasitic	765	581	1346	5.3	95

	disease					
10	Urinary tract infection	488	795	1283	5.0	100
	Total	13,797	11,697	25,494	100	

Table23: Top 10 cause of morbidity in Male and Female adult, 2007 E.C

S.No	Type of Disease	Male	Female	Total	Percentage	Cumulative Percentage
1	Acute upper respiratory infection	3298	2923	6221	17	17
2	Acute febrile illness	3264	2784	6048	16.5	33.6
3	Helminthiasis	2610	2057	4667	12.8	46.4
4	Disease of Muscloskeloton and connective tissue	2271	2284	4555	12.5	58.9
5	Dyspepsia	1828	1288	3116	8.5	67.3
6	Trauma	2027	897	2924	8.0	75.3
7	Infection of skin and subcutaneous	1431	1016	2447	6.7	82
8	Pneumonia	1250	1037	2287	6.3	88.3
9	other unspecified infections and parasitic diseases	1230	1024	2254	6..2	94.5
10	Urinary tract infection	725	1288	2013	5.5	100
	Total	19,934	16,598	36,532		

Table24: Top 10 cause of morbidity in pediatrics /< 5 2006 and 2007 E.C

S.No	Type of Disease	Male	Female	Total	Percentage	Cumulative Percentage
1	Pneumonia	2022	1549	3571	23.6	23.6
2	Acute febrile illness	1419	1051	2470	16.3	39.9
3	Diarrhea (No bloody)	1293	1046	2339	15.4	55.3
4	Malaria	558	1133	1691	11.2	85.2
5	Infection of skin and subcutaneous	941	539	1480	9.8	74
6	Acute upper respiratory infection	999	356	1355	8.9	64.2
7	other unspecified infections and parasitic diseases	350	664	1014	6.7	91.9
8	Diarrhea (bloody)	273	261	534	3.5	95.4
9	Helminthiasis	270	169	439	2.9	98.3
10	other unspecified disease of digestive system	181	69	250	1.7	100
	Total	8,306	6,837	15,143	100	

Disaster (natural and manmade)

There was no any disaster (natural/ manmade) and outbreak were not occurred in the last one years.

Hygiene and sanitation

In 2007 E.C the latrine coverage and utilization rate in the District were 95.8% and 92.5% respectively. But the Data for solid and liquid waste Management was not registered.

Health education

Health education was given at health facilities and house to house by health care providers and the health extension workers (HEW) mainly on the prevalent health problems of the District i.e. nutrition, personal & environmental hygiene, harmful traditional practice, essential drug use, HIV/AIDS, Tuberculosis, Diarrheal diseases, Family planning.

Nutrition and food shortage

The District is one of the food secured areas in the Region; hence there were no supplementary feeding units in the District.

Health budget allocation

The total budget for the District Health Office, including health facilities was 20,204,200 Ethiopian Birr from the District total annual budget of 93,138,710 for the year 2007E.C.Dangilla woreda allocated annual budget to health sector 21.7%.

There are NGOs who support the woreda health office in different way of funds (4,492,092 ET Birr) and technical support such as: Agriculture growth program (AGP) supports the community in irrigation and Agriculture; United Nations Children's Fund (UNICEF) provides training on EPI and MCH also participates on Justice and education; Community based integrated natural resource management program (CBINRMP); involves in conservation of Natural resources, animal and bee rearing. WASH (water sanitation and hygiene); give support on sanitation and hygiene, rural water supply, building of latrine and deep wells and on education.

Essential drugs and other supplies

The District reported that there was no shortage of essential drug supply but diagnostic kits (HIV kits) were not easily accessible in market to purchase

Endemic diseases

Malaria

In the woreda there are 29 kebeles form this 10 are malarious and 48,915 populations were at risk in the year of 2007 E.C. The ITN coverage for each household was 100% but only six kebeles were treated with Insecticide Residual Spray (IRS) for the last one year. On the year 2007 a total of 3,956 malaria cases were reported with peak level of November, and December from this 225 (5.7%) cases were children below five years of age.

There was malaria case increment both in the major and minor transmission seasons in 2005 E.C i.e. September – November and April to June. But there was high malaria cases (1684) were reported in November 2005 and decreased Malaria cases have been seen from January-March 2005 but the smallest Malaria cases (215) were reported in 2007.

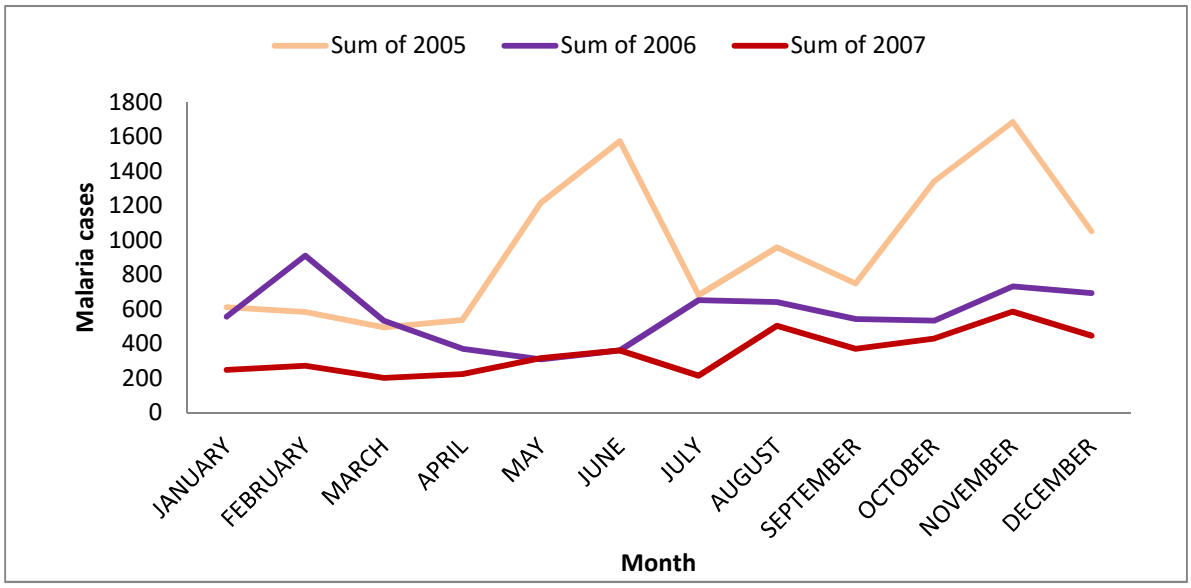


Figure20: Malaria cases of Dangilla Woreda by month and year, 2005-2007E.C

TB/leprosy

A total of 125 new TB cases were reported in the woreda of this 36 (28.8%) Pulmonary TB negative, 20(16%) are pulmonary TB positive, 69 (55.2%) were extra pulmonary TB cases. Tuberculosis detection rate, treatment success rate and cure rate were 32.9%, 95% and 95% respectively in the District. In the woreda from the total 125 TB cases 121(96.8%) were screened for HIV. There was one death but there were no defaulters and MDR tuberculosis patients in the District in the study period. There were one leprosy cases.

Table25: Distribution of tuberculosis cases in Dangilla Zuria District, Awi Zone, Amhara Region, Ethiopia, 2007E.C

Indicator	Planned	Achieved	Coverage from plan (%)
TB case detection rate (all forms of TB)	380	125	32.9
TB treatment success rate	20	19	95
TB cure rate	20	19	95
Defaulters	0	0	0
Leprosy	-	1	-

HIV/AIDS

There were increment of HIV test for VCT through the years 2006 – 2007E.C in the District and Males had a higher rate of being tested for HIV than females (56 and52.6% in the perspective years). A total of 4,209 people screened for HIV/AIDS in the year of 2007 E.C, among those 15(0.35%) were positive. In the woreda 88 people live with HIV/AIDS (PLWHA) and the prevalence is 0.18%. From the total 88 PLWHA positive

cases 83(94%) are enrolled in anti-retroviral therapy (ART) and 5 are on pre ART stage. Only one health center (Chara HC) was giving HARRT service. The District has also planned to give PMTCT service for at least one ANC visit for 4,966 mothers and achieved only 2,900 (58.2%) and 6 (0.21%) were positive for HIV/AIDS. However, there was no data for HIV prevalence and incidence.

Discussion

Acute upper respiratory infection was the leading cause of morbidity in the district accounting 16.5% and 16.7% in Male and Female adult at OPD in 2007E.C respectively but in 2006 E.C Acute febrile illness was the leading cause of morbidity in the district accounting 18.9% in Male adult followed by 16.7% in Female adult at OPD. In children pneumonia was the first leading causes of morbidity at OPD 22.6% and 24.3% 22.6% in the year of 2006 and 2007 respectively. Malaria was the second leading cause of morbidity next to pneumonia in the district accounting 16.5% in under five in 2006, this shows Malaria was one of the leading causes of morbidity in under five few years back.

The ITN coverage of the district was 100%, which was high compared to Malaria indicator Survey [MIS 2011(>85%)] to protect against anopheles mosquitoes bite and that might be the possible reason for malaria case reduction in different kebeles of the districts [10].

In terms of population density Dangilla has a population density of 172.79 Km/^{2}, which is greater than the Zone average of 107.44 persons per square kilometer and also compared with the national and regional figure 102 p/ Km^2, 108.9 p/ Km^2 respectively it is much higher [4].

In Dangilla Zuria woreda most (58%) of the schools do not have water supply and 43% of those schools do not have functional toilet and Most of the toilet do not have hand washing facility. The finding of school do not have water supply in this Woreda is lower with the study conducted in Efratana Gidem woreda (70%) but those schools do not have functional toilet which is in line with same study conducted on the above Districts (49%)[11].Due to the shortage of water at their school some students take water to the schools for their daily consumption. As the result of absence of toilet, the students are forced to use open space to urination and/or defecation around the school or wait until they get home

Inadequate sanitation is mostly responsible for diseases which are transmitted through the fecal – oral route. Unimproved hygiene, inadequate sanitation, and insufficient and unsafe drinking water account for 7% of the total disease burden and 19% of child

mortality worldwide. In Ethiopia about 75% of causes of OPD visits are largely due to the lack basic sanitation provisions [12]. Similarly in Dangilla woreda from top 10 cause‘s morbidity both in Adults and children, the top three (Acute upper respiratory infection,Acute febrile illness andHelminthiasisin Male and Female adult at OPD in 2006 and 2007E.C.Pneumonia, Malariaand Acute febrile illness in <5 pediatrics in 2006 where as Pneumonia, Diarrhea (No blood)and Acute febrile illness in <5 pediatrics in 2007) communicable diseases which can be prevented by improved hygiene and sanitation

HSTP (2015/2016-2019/20) had specific targets for hygiene and environmental health. Some of these are increasing the latrine coverage to reach 82% and to reach 100% in the handling and utilization status of existing latrine by the end 2019 [13]. In 2007 Dangilla woreda health reports showed that there has been high significant progresses in latrine coverage which has reached 95.8% and good to meet the target but the latrine utilization rate was 92.5% which is lower than

The potential on primary health care unit coverage of the woredafor Health centers andHealth posts were 67% and 78 % respectively. The coverage of the woredafor Health centers werelower than the current health service coverage of Amhara region for Health centers (80%) but the coverage of the woredafor Health posts were higher than the current health service coverage of Amhara region for Health posts (64%) [14].

Overall, the available professionals at Districts compared to the WHO targets shows that the target has been met for some of health professional. According to the woreda health office report, the number of health professionals have also significantly increased compared to the levels in the previous few years. Even if the number of health personnel has been increased in the woreda, there is a need of additional human resources in different profession for health centers and health posts to enhance health service coverage, to improve of environmental sanitation, to prevent communicable disease and to improve the health services of the community.

Immunization is one of the key interventions to achieving the Sustainable Development Goals (SDGs), especially the goal to reduce death among children less than five years of old. Childhood vaccination has been shown effective in protecting children against

vaccine preventable disease in low and middle income countries. Vaccine prevents more than 2.5 million child deaths per year [15].

The proportion of fully vaccinated children in Dangilla Woreda was about 57% which is higher than the 2011 EPI survey of the country [16]. This difference because of the coverage at country level includes inaccessible area for immunization. The percentage of children who are fully immunized remains far below the goal of 66% coverage set in the country's health sector developmental plan (HSDP) IV [17].

Measles vaccination coverage in the present study was 56.8% which is lower than that of the global health strategic plan of CDC from 2011-2015[18]

Antenatal care is more beneficial in preventing adverse pregnancy outcomes when received early in the pregnancy and continued through delivery. Early detection of problems in pregnancy leads to more timely referrals for women in high-risk categories or with complications; this is particularly the ground fact in Ethiopia, where three-quarters of the population live in rural areas and where physical barriers pose a challenge to providing health care service.

In Dangilla woreda the proportion of pregnant women who had at least one ANC visit was 58.4% in 2007 E.C. This finding is consistent with the survey report (54%) of John Snow Institute which runs a project known as Last 10 Kilometer in Amhara National Regional State [19]. This finding is also consistent with a study conducted in Metekel Zone (2009) where (49.8%) of the respondents had at least one antenatal care visit during their last pregnancy [20]. The finding of this study is also not consistent with the reports of EDHS 2011 [18] of Amhara National Regional State which was 33.6%. This difference might be partly explained by the fact that EDHS covered remote areas in the region. Skilled delivery was relatively high as compared with the previous experience i.e. 1273(30.2%). This is higher than the 2011 Ethiopian DHS and the 2012/2013 Regional annual report [21, 22]. This slight increment may be due to an increase awareness of mothers & decreasing of traditional malpractices by the community, the availability of a key health providers particularly Midwives, good management of health workers at health facilities or availability of transport. Based on Dangilla Woreda Health office plan

and program department, only 19.5% of delivery attended at home by traditional birth attendant (TBA) but this figure was low as compared with a study conducted in Ethiopia showed that majority of delivery (78%) attended at home assisted by traditional birth attendants, the reasons for not preferring health institution delivery were traditional birth attendants are seen as culturally acceptable and competent health worker, women‘s reported poor quality of care and previous negative experience with health facilities in addition to having low awareness on the advantage of skilled attendance at delivery, having little role for making decision and also economic constraints during referral were reported as main reasons [23]. Another case control study conducted in Bahirdar, Ethiopia showed that the likelihood of delivering at home was greater among mothers with inadequate knowledge of pregnancy related services, those who started attending ANC after 24 weeks of gestation, mothers having no formal education and resides in a rural area [24].

The postnatal service coverage obtained during the six weeks following delivery of the district was 1886(44.7%). This finding is in line with the survey report in Amhara region (44.5%) but which is higher than Ethiopia PNC coverage (34.3%) [2].The variation could be due to socio-demographic characteristics, methodology difference, implementation of the service and accessibility of health organizations.

Family planning reduces mortality and morbidity due to pregnancy and child birth. Family planning saves lives of women and children as well as improves the quality of life for all. It is one of the best investments that can be made to ensure the health and well-being of women, children, and communities. Family planning has great role in significant reduction of maternal mortality by reducing exposure to unintended pregnancy and unsafe abortion in developing countries where the majority of maternal deaths occur. The use of modern family planning methods has potential to reduce about 25%-40% of all maternal deaths in developing countries [25]. The contraceptive acceptance rate of the woreda is about 52 % which is lower as compared with the Amhara region contraceptive acceptance rate (88.6%) (26). this is higher than the contraceptive acceptance rate of the EDHS 2011[26]; this means the populations are willing to use modern contraceptive methods. According to EDHS 2011, use of modern contraceptive methods among

currently married women has increased from 6 percent in the 2000 EDHS to 27 percent in the 2011 EDHS this is largely due to the sharp increase in the use of inject able [27]. Study conducted in Jimma revealed that knowledge and practice of modern contraception methods is low. Most women‘s contraceptive knowledge and practice was influenced by socio-cultural norms such as male/husband dominance and opposition to contraception, and low social status of women. A lack of formal education for women was identified as a key factor in preventing change in the patterns of contraceptive knowledge and use by women [28]. Moreover, another study conducted in Ethiopia showed that inclusion of husband in family planning program will increase the use of modern contraceptive methods. Therefore, advocacy work has to be done for the community to improve the community acceptance of modern contraceptive method [29]. As I have discussed from the head of Woreda health office, the achievements in ANC, immunization coverage and family planning were not good as compared with other neighbor woredas this is because of the inclusion of 10 kebele population at end of 2007 before they were under Dangilla town administration but the population we used after inclusion as a denominator were decreased our achievement.

The absence of registered data on top 10 cause of mortality in adult and pediatric population in the woreda health office and at the health facility brought difficulty to determine the main causes of mortality.

Tuberculosis case detection rate was 32.9% which was below the regional 2012/2013 achievement and WHO standards which was 70% & 56% respectively. TB treatment success rate was 95% above the 2012/2013 regional achievement which was 88%. TB cure rate 95% was also above the 2012/2013 Regional achievement which was 71%.

Limitation of the study

1. Absence of mortality and birth rate records and reports in the District.

2. Unknown population size for school starting age in the district.

3. The previous 2 to 5 years Immunization coverage was not available and that was a challenge to see Immunization coverage progress in the Woreda.

4. In the Woreda, House hold income sources were not clearly documented and known.

Conclusion and recommendation

In Dangilla Zuria woreda communicable disease like Pneumonia and non-bloody diarrhea in <5 pediatrics, acute febrile illness and Acute upper respiratory infection in adults are the most frequently occurring disease in population. In addition in the woreda 58% of the schools do not have water supply and 43% of those schools do not have functional toilet therefore the woreda have to promote hygiene and sanitation for the community in addition the woreda have to work with other sectors which work in hygiene and sanitation to improve availability of water and toilet facility at schools.

There was a good start of health improvement in ANC follow up as well as in immunization coverage. Moreover there was moderate progress in family planning coverage, contraceptive acceptance rate. The woreda should continue on this progress to increase the coverageby giving health education for the community and by social mobilization.

Proportion of delivery attended by skilled health personnel was increased and only 19.5% of delivery attended at home by traditional birth attendant (TBA) in this woreda. Therefore, the District Health Office should give more emphasis for community awareness to maximize their coverage of safe delivery by health personnel. Statistical records like deaths, birth and life expectancy were not known and not recorded. There was shortage of HIV kits in the District, reported that there was shortage of some essential kits to responsible body to availed on time and should have proper records on births and deaths.. Tuberculosis case detection rate, was very low and that need serious attention and follow-up by the Woreda Health Office and Zonal Health Department.

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Annex 4: Woreda health profile data collection form

1. **Historical aspects of the woreda (Culture & tourism office).**

- Region _____
- Zone_____
- Woreda _____
- How & why the name given_____
- How and when the woreda was formed_____
- Any other historical aspect_____

2. **Geography and Climate (including map, altitudes, agro ecological zones etc)**

- Woreda map_____
- Location(distance) from Addis Ababa and Region Capital_____ Direction_____
- Altitude _____
- Surface Area in Hectar _____(_____% from the zone)

Geographical coordinate

- Latitude _____
- Longitude _____
- Annual rain fall(average)_____
- Annual temp(average)_____
- Climatic zones_____ (%) _____(%) _____(%)

Woreda boundaries

- North _____South_____
- East _____West_____

3. **Political and Administrative Organization**

- Total no. of kebeles:
- rural_____
- Urban_____
-

4. **Population and Population structures**

4.1.Demographic data

1. Total Population _____Male _____Female_____ sex ratio_____
2. Urban Total _____ Male _____Female_____
3. Rural Total _____ Male_____ Female_____
4. Population under 1yrs_____
5. Population under five yrs_____
6. Population < 15 years_____
7. Population >64 years_____
8. Women 15_49 years of age_____
9. Total population by kebeles (each kebele pop)_____
10. Population enumerated by H.E.Ws_____
11. Number of House hold_____

4.2.Population pyramid

Population data by age and sex								
Male	<1	1-5	6-14	15-24	25-34	35-49	50-64	>65
Female	<1	1-5	6-14	15-24	25-34	35-49	50-64	>65

4.3.Ethnic/language

1. Agew _____ (_____ %), Amhara_____ (_____ %),
2. Oromo_____ (_____ %), Tigre_____ (_____ %),
3. Others_____ (_____ %)

4.4.Religion

1. Orthodox _____ (_____ %), Muslim _____ (_____ %),
2. Protestant_____(_____%), Other _____ (_____ %)

5. Economy (mainstay of the economy, average income levels etc)

5.1.Main income sources

- Agriculture
  - Cultivated area_____
  - Grazing area_____
  - Cropping seasons_____
  - Land density_____
- Livestock_____
- Truism_____
- Trade_____
- Other business_____

5.2.House hold income source

1. Agriculture_____ (No.)
2. Government Employer_____(No.)
3. Private Employer_____(No.)
4. Daily Laborer_____(No.)
5. Different business_____ (No.)
6. Jobless _____ (No.)

- **Average Income HH/Yr_____**

6. Education and school Health

6.1. Number of educational institution

1. K.G._____
2. Primarily School_____
3. Secondary_____
4. Preparatory_____
5. College/ University_____
6. TVET_____

- Total School Age Children (target) _____
- Total Enrolment _____Male _____Female_____
- Total size of children for school starting age in the district_____

- School dropout in 6 months or year 2008 E.C _____
- If there is school dropout why _____

6.2.Educational status of the community

1. Total Educated people_____
    - Male _____
    - Female _____
2. School health activities:
    - Number of schools with water supply_____
    - Toilets:
        - Schools with functional latrines (male & female)_____
        - Schools with HIV/other Health clubs_____

7. Facilities

7.1.Transport

1. Accessibility (main roads)_____ _____
2. Type of road _____
3. How many kebeles have access to transportation _____
4. Flow of transportation per day_____

7.2.Telecommunication

1. How many people have access to fixed telephone? _____
2. How many people have access to mobile phone? (coverage)_____

7.3. Post Office_____

7.4. Bank_____

7.5. Power supply

1. How many house hold get power supply_____?

7.6. Water

1. Total safe water coverage _____ (___ %)
2. Safe water supply coverage by kebele _____(__%)
3. Main source of water supply _____
4. Kebeles getting safe water____ (__ %)
5. Population getting safe water_____ (__ %)
6. Daily water consumption per day per person_____

8. Infrastructure for health Facilities (Transport, Telecommunication, Power supply, water supply)

How many of the health centers have access to

Transportation_____ (____ %), Telecommunication_____ (____ %),

Electric power_____ (____ %) Water supply _____ (____ %)

8. Health Service

A. Type and Number of Health Institution

Type		**Number**	**Total No. of beds**
Gov. Hospital			
Gov. Health center	Type A		
	Type B		
Gov. Health posts			
Private H.Fs (clinics/diag. lab/drug stores)	Clinics (all type)		

	Diag. Lab.		
	Drug store		
NGOs	H.Ps		
	H.Cs		
	Hospitals		
	Clinics		

- Health institution to pop ratio:
  - Hospital: Pop----------.
  - HC: Pop----------
  - HP: Pop----------
  - Health service coverage----------

B. Type and Number of health professionals

Type	No.	Remark
Specialist		
G.P		
HO		
Nurses (Deg. and Dip.)		
Mid wife (Deg. and Dip.)		
Lab. (Deg. and Dip.)		
Pharmacy (Deg. and Dip.)		
Env. Health (Deg. and Dip.)		

HIT		
Health education		
HEWs		
Others		

- Doctor: pop. Ratio_____
- Nurse: pop. Ratio____
- Mid. Wife: pop. Ratio ____
- HEW: pop. ratio_____

9. Top causes of morbidity and mortality

1. Top ten leading causes of OPD visit for Adult and Pediatrics <5 (morbidity)

S.No	**Adult**	**# of cases**	**%**	**Pediatrics< 5 years**	**# of cases**	%
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

2. **Top ten causes of admissions for Adult and Pediatrics <5**

S.No	Adult	# of cases	%	Pediatrics< 5 years	# of cases	%
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

3. **Top ten causes of deaths for Adult and Pediatrics <5 (mortality)**

S.No	Adult	# of cases	%	Pediatrics< 5 years	# of cases	%

1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

10. Vital Statistics and Health Indicators

1. Infant Mortality Rate (IMR) _____(total <1 yr deaths this 2007/8E.C_____
2. Crude Birth Rate_____
3. Crude Death Rate_____ (total deaths 2007/8 yr____)
4. Maternal Mortality Rate_____(2007/8
5. total maternal deaths_____)

12. Maternal health coverage

1. Contraceptive prevalence rate_____
2. Contraceptive acceptance rate _____
3. ANC rate (how many of the total expected pregnancies attended 1st ANC) _____
4. ANC rate (how many of the total expected pregnancies attended 4th ANC) _____
5. Post natal care (PNC) Coverage _____
6. Percentage of deliveries attended by skilled birth attendants_____
7. Percentage of deliveries attended by HEWs_____

S. No	Indicator	Rural	Urban	Total
1	Total population			
2	Male			
3	Female			
4	Under 1 years old			
5	Under 5 years old			

6	Under 15 years old			
7	Productive age female (15-49 years)			
8	Pregnant women			
9	Live births			
10	Total fertility rate			
11	Crude birth rate			
12	Crude death rate			
13	maternal mortality rate			
14	Child mortality			
15	Under 5 mortality rate			
16	Infant mortality rate			
17	Dependency ratio			
18	Average household size			

13. Immunization Coverage (for children and Women);

1. BCG _____ (__ %).
2. OPV0____ (__ __ %), OPV1_____ (___ %), OPV2_____ (____ %), OPV3_____ (___ %)
3. Penta1_____ (__ %), penta2 _____ (___ %) penta3_____ (___ %)
4. Measles_____ (___ %).

5. PCV-10-1_____ (__ %), PCV-10-3_____ (___ %)
6. TT2+P.W_____ (__ %), TT2+ N.P.W_____ (___ %)
7. Rota 1_____ (____%), Rota2 _____(____%)
8. PAB_____

13. Disaster situation in the woreda

1. Was there any disaster (natural or manmade) in the woreda in the last one year? _____
2. Any recent disease outbreak/other public health emergency_____
3. If yes cases_____ and deaths_____

14. Environmental Health & sanitation.

- ✓ Latrine coverage_____ & utilization rate_____
- ✓ Solid waste management_____
- ✓ Liquid waste management _____
- ✓ others_____

- Health Education (what, when, where, how and who conducted health education)

_____

_____

_____

15. Health budget allocation:

- **Government**
    1. Total budget allocated for the district _____

2. Total budget allocated for health _____ (____ %)
3.

- **Funds from NGO**

  Total _____ (purpose/programs)_____

16. Community Health Services;

- Status of services provided by community health workers namely
  1. No.ofTBAs/TTBA_____andtheir responsibility_____
  2. No.ofCHWs/CHPs_____andtheirresponsibility _____
  3. Responsibility of HEWs_____

  Others_____

17. Endemic diseases;

A. Malaria:

1. Total malarious kebeles_____
2. Pop at risk_____
3. ITNs coverage (including current dist)_____
4. Is there IRS this year(No of kebeles)_____
5. Total cases/yr_____ deaths/yr_____,<5yr cases_____ deaths_____
6. Malaria supplies (Coartem, RDT, etc) shortage _____
7. Other issues_____

B. TB/Leprosy

1. Total TB cases_____
2. PTB negative_____
3. PTB positive_____
4. Extra PTB _____
5. TB detection rate _____
6. TB Rx completion rate _____
7. TB cure rate _____
8. TB Rx success rate _____

9. TB defaulter_____
10. Death on TB Rx_____
11. Total TB patients screened for HIV_____
12. Total Leprosy cases _____on Rx_____

C. HIV/AIDS;

1. Total people screened for HIV (last one year)_____
2. VCT_____ PITC_____PMTCT_____
3. HIV prevalence_____
4. HIV Incidence (new cases/yr)_____
5. Total PLWHA_____
6. ON ART _____on Pre-ART_____
7. Other HIV prevention activities_____

18. Nutrition (malnutrition related OTPs, SC,TSF,CBN and PSNP activities)/HO & Early warning

1. Total OTP sites_____, total admissions to OTP/yr_____
2. Total SC sites,_____, Newly opened/yr_____, total admissions to SC/yr_____
3. Is there TSF (targeted supplementary feeding) program in the woreda_____
4. CBN program_____ PSNP _____other_____
5. General food security condition_____

19. **Essentialdrugs(shortage**):-

_____

_____

_____

20. Discussion of the highlights and the main findings of the health profile assessment and description

---

---

21. Problem Identification and Priority Setting – set priority health problems based on the public health importance, magnitude, seriousness, community concern, feasibility ----------

22. Conclusions made about the health status of the Woreda based on the findings

_____

23. Action plan and recommendations- on how to address the problems identified clearly depicting responsibilities, required resource and timeline

Chapter V: Standard Operating Procedures

Injibara general Hospital laboratory standard Operating Procedure

6.1. Procedure for Gram stain test

	Name	Sign	Date
Prepared by	**Teferi Yidenek**		
Reviewed by	**Dagnaneh Milikit**		
Approved by	**Muluneh Kassahun**		

PROCEDURE CHANGE HISTORY:

Version #	Replaced Version		Prepared by	Revised by	Approved by
01	N/A	Name	Teferi Yidenek	Dagnaneh Milikit	Muluneh Kassahun
		Signature			
		Date	26/03/2017	27/03/2017	29/04/2017
Description of Changes:					
Location of Mater Copy:- Master File			Date of discontinuation:-		

ANNUAL REVIEW

Review Date	Name	Signature

1. Purpose

The purpose of this SOP is to provide the instructions and guidelines to perform, interpret and report the gram stain from different clinical specimens.

2. Principle

The first step in the processing of most clinical material is the microscopic examination of the specimen. Visible microorganisms or the lack thereof may denote the presumptive etiologic agent, guiding the laboratory in the selection of the appropriate isolation media and the physician in the selection of the appropriate empirical antibiotic therapy. The quality of the specimen and the measure of the inflammatory response can also be evaluated. In addition, the direct smear serves a quality control indicator for attempts to cultivate observed organisms.

The Gram stain is used to classify bacteria on the basis of their forms, sizes and cellular morphologies and Gram reactions. The test was originally developed by Christian Gram in 1884. The modification currently used for general bacteriology was developed by Hucker in 1921; it provides greater reagent stability and better differentiation of organisms.

Bacteria stain either gram positive or gram negative on the basis of differences in their cell wall compositions and architectures. *Gram positive species*have a thick peptidoglycan layer and large amounts of teichoic acids; they are unaffected by alcohol decolorization and retain the initial stain, appearing deep violet. *Gram negativespecies* have a single peptidoglycan layer on their cell wall; attached to an asymmetric lipopolysaccharide-phospholipid bilayer outer membrane interspersed with protein; the outer membrane is damaged by the alcohol decolorizer, allowing the crystal violet-iodine complex to leak out and be replaced by the counterstain.

Interpretation of gram-stained smears involves consideration of staining characteristics, cell size, shape and arrangement. These characteristics may be influenced by many factors, including culture age, medium, incubation, atmosphere, staining methods and presence of inhibitory substances.

3. Materials

Gram stain reagents: Crystal violet, Gram's iodine, Decolorizer, Safranin (Refer to Appendix I).

Slides, inoculating loops, sterile applicator sticks, NSS, transfer pipettes

Bunsen burner/microcinerator/slide warmer for heat-fixing slides.

4. Specimen

a. Clinical specimens in transport swabs or sterile containers
b. Broth and blood cultures; broth cultures are preferred when morphology is important.
c. Colonies growing on solid medium, <24h old from non-inhibitory media

5. Quality Control

Prepare Gram stain QC Slides : Inoculate TSB broth with colonies of S. aureus ATCC 25923 and E. coli ATCC 25922. Incubate at 35°C for a few hours to obtain a faintly turbid broth. Label several slides (Gram stain QC, preparation date). Make smears using 2 drops per slide spread to about 2 cm size. Air dry then heat-fix; store in a box at room temperature. Use slides for QC; refer to QC form (Annex B). Record results on QC form.

6. Procedure

A. Smear Preparation:

Use clean slides frosted on one end. Label slides appropriately using pencil, prepare smears according to type of specimen being processed. Sufficient materials must be applied to the slide so that chances for detecting and distinguishing microorganisms are maximized; however, avoid too thick smears. As a guideline, newspaper print should be visible through the smear.

1) Specimen received on swabs: Roll the swab gently across the slide.
2) Specimens received in sterile containers (e.g.,sputum, aspirates, exudates): Select purulent or blood-tinged portions of pus or sputum with a sterile applicator stick or swab. Spread the sample over a large area of the slide to form a thin film. Extremely thick or purulent specimens may be diluted in a drop of saline on the slide for easier smear preparation.
3) Colonies from solid media: Place a drop of sterile Normal Saline on slide. Transfer a small portion of colony with a sterile applicator stick or inoculating loop. Mix gently to emulsify.
4) Liquid specimens (e.g. body fluids) and broth cultures: Use a sterile pipette to transfer 1-2 drops to the slide. Spread drop into an even thin film.
5) Blood cultures with rubber septa: Disinfect rubber septum with 70% alcohol swab. Using a syringe with needle, aspirate 2 – 3 ml. Transfer 1 – 2 drops to the slide. Spread drop to an even film.

B. Smear Fixation: Air dry slides on a flat surface before fixation.

1) Heat fixation:. Pass air-dried slides two or three times through a flame. Do not overheat to avoid distortions. A slide warmer set at 60°C.may also be used to heat-fix several several slides at one time. Allow slide to cool before staining.
2) 95% Methanol may also be used to fix direct smears from clincal specimens (2 minutes)

   Air dry slide before staining.

C. Staining

Do not apply stains, water, or decolorizer directly to specimen area. Apply drops near the frosted end of the slide, allowing the reagent to flow over the remaining surface.

1. Flood the fixed smear with crystal violet for 30 seconds.
2. Decant crystal violet and rinse slide gently with running tap water.
3. Rinse off excess water with Gram's iodine, and then flood the slide with Gram's iodine for 30 seconds.
4. Rinse off iodine gently with flowing tap water.
5. Decolorize by letting the reagent flow over the smear while the slide is held at an angle or tilt slide. Stop when the runoff becomes clear. (1-5 seconds)
6. Adjust decolorization time to thickness of smear.
7. Remove excess decolorizer with gentle flow of tap water.
8. Flood with Safranin and allow to remain for 30 seconds.
9. Remove excess safranin with a gentle flow of tap water.
10. Drain slide and air dry in an upright position.

6.Examination of stained smears

1. Examine smear under low power to evaluate the general nature of the smear. Examine at least 10 low power fields and observe the presence of cells (PMN, RBC, epithelial cells).

   In a properly stained smear the background, epithelial cells and PMN appear red; gram positive organisms deep violet; and gram negative organisms pink or red.

2. Switch to oil immersion objective, and evaluate for the presence of bacterial cells as well as the gram reaction (gram positive or gram-negative), morphology (e.g., cocci or bacilli), and arrangements (e.g., chains, pairs, cluster) of the cells seen. Examine at least 20 oil immersion fields.

7. Interpretation

a. WBC's and RBC' s suggest infectious process.
b. Squamous epithelial cells and debris suggest an improperly collected specimen.
c. Gram reaction
    - Gram positive : deep violet
    - Gram negative : pink or red
    - Gram variable: both gram positive and gram negative cells with same morphology.

8. Reporting

A. Low power objective:

1) If no epithelial cells or PMN seen in a smear of a clinical specimen report as: " No epithelial cells seen" or "No PMN seen'.

2) If cells are seen, count each type of cell seen (PMN's, EC's) and report:

1 + :<1 cell/ LPF

2+ : 1 – 9 cells/ LPF

3+ : 10 – 25 cells/ LPF

4+ : >25 cells/ LPF

B. Oil immersion objective:

1) If no organims are detected in a smear of a clinical specimen, report as: "No organisms seen"

2) If microorganisms are seen, count bacteria and yeast and report as:

1 + : <1 / OIF

2+ : 1 – 5 / OIF

3+ : 6 – 30 / OIF

4+ :>30 / OIF

C. Specify gram stain morphology and resemblance to organism group consistent with the source if the presentation is classic; however, use caution when in doubt, as other species may mimic the typical presentations. Examples

Gram positive cocci in pairs consistent with Streptococcus pneumonie.

Smal gram-negative coccobacilli consistent with Haemophilus .

Gram-negative diplococci consistent with Neisseria.

D. For screening of lower respiratory specimens to assess acceptability for culture, refer to Appendix II.

E. For reporting of vaginal smears for BV, refer to Appendix III.

DECLARATION

I have read and understand this SOP and I agree to consistently follow the procedure as described.

S/N	Full Name	Signature and Date	Remark
1	Mulune Kassahun		
2	Addise Abera		
3	Arefayne Kassahun		
4	Muluken Dagnaw		
5	Ezezhw Maru		

6	Andualem Amare		
7	Dagnaneh Milikit		

6.2. Standard Operating Procedure for H. pylori stool AG test

	Name	Sign	Date
Prepared by	**Teferi Yidenek**		
Reviewed by	**Dagnaneh Milikit**		
Approved by	**Muluneh Kassahun**		

PROCEDURE CHANGE HISTORY:

Version #	Replaced Version		Prepared by	Revised by	Approved by
01	N/A	Name	Teferi Yidenek	Dagnaneh Milikit	Muluneh Kassahun
		Signature			
		Date	29/03/2017	30/03/2017	01/04/2017
Description of Changes:					
Location of Mater Copy:- Master File			Date of discontinuation:-		

ANNUAL REVIEW

Review Date	Name	Signature

Purpose	The stool ag test detects antigen presence in the feces that indicates an active H. pylori infection (rapid test for detection of H. pylori antigen in feces)

Abbreviations	H. pylori = Helicobacter Pylori C = control

	T=test

Materials

Reagents
1.25×1test strips, each sealed in a foil pouch 2.25sample tubes with 2ml of extraction buffer

Reagents stability and storage:

1. store at2-30°C.the strip is stable through the expiration date printed on the sealed

2. DO NOT FREEZE. All reagents are ready to use as supplied

Supplies
1.sample extraction buffer
2.H,pyloriag rapid test strip(feces)

Equipment
▪ A container to hold fecal specimen ▪ Negative and positive control ▪ Applicator stick

NOTE. specimen extracted may be stored at 2-8°C **for up to 5days .fecal sample may be stored at 2-8**°C **for72 hours .if longer storage is recommended, freezing at <-20°c is recommended.**

Special Safety Precautions	• **Use Universal safety precaution(wearing gloves lab coat and washing hands) when handling infectious materials** • **Extraction buffer contains 0.1∞ NaN3. Avoid contact with skin or eyes. Do not ingest.** • Do not use the compotes from any other type of test kit as a substitute for the components in this kit.

Quality

Control:- internal procedural control is included in the test. A control line appearing in the control region(C)is the internal procedural control.

Procedure	• Place the test strip on a clean, flat surface • Shake the sample collection tube vigorously to ensure an effective liquid suspension. • Hold the tube upright. Twist off the tip. dispense 3 drops of the extracted specimen slowly onto the sample pad drop by drop. Do not load all samples at once. • Start the timer • Results can be read in 15 minutes after adding the specimen.

Result Interpretation	

Step	Action
1	***NEGATIV RESULT***:- if only the C band is developed, the test indicates that no detectable H. pylori antigen is present in the specimen. The result is negative. ***POSETIV RESULT***:- if both C and T bands are developed, the test indicates for the presence of H. pylori antigen in the specimen. The result is positive. **<u>INVALID</u>**:- if no C band is developed, the assay is invalid regardless of color development on the T band only is invalid.

Principle	The linear Helicobacter pylori Ag strip is a lateral flow chromatographic immunoassay for the qualitative detection of H. pylori Ag in human fecal specimen. It is intended to be used by professionals as screening test and as an aid in the diagnosis of infection with H. pylori. Any reactive specimen with the linear H. pylori Ag strip must be confirmed with alternative testing method(s) and clinical findings. The linear H. pylori Ag strip is a sandwich lateral flow chromatographic immunoassay. when an adequate volume of extracted fecal *specimen* is dispensed in to the test strip, the specimen migrates by capillary action along the strip. H. pylori Ag if present in the specimen will bind to the anti-H. pylori conjugates. The immuncomplex is then captured on the membrane by the pre-coated antibody, forming a burgundy colored T band suggests that the concentration of H. pylori in the specimen is below the detectable level, indicating a H. pylori negative result.

Clinical Utility	H. pylori is associated with a variety of gastrointestinal diseases including non-ulcer dyspepsia, duodenal and gastric ulcer and active, chronic gastritis 1,2 .The prevalence of H. pylori infection could exceed 90∞ in patients with sign and symptoms of gastrointestinal diseases. The stool Ag test detects Ag presence in the feces that indicates an active H. pylori infection. It can also be used to monitor the effectiveness of treatment and the recurrence of the infection.

Related Procedures and Documents	• Specimens Collection and Processing Procedures • Serum antibody test

Declaration

I, the undersigned laboratory personnel, certify that I am conducting every steps of the procedures incorporated in this SOP after a prior reading.

S/N	Full Name	Signature and Date	Remark
1	Mulune Kassahun		
2	Addise Abera		
3	Arefayne Kassahun		
4	Muluken Dagnaw		
5	Ezezhw Maru		
6	Andualem Amare		

7	Dagnaneh Milikit		

6.3. Standard Operating Procedure for Microhematocrit

	Name	Sign	Date
Prepared by	**Teferi Yidenek**		
Reviewed by	**Dagnaneh Milikit**		
Approved by	**Muluneh Kassahun**		

PROCEDURE CHANGE HISTORY:

Version #	Replaced Version		Prepared by	Revised by	Approved by
01	N/A	Name	Teferi Yidenek	Dagnaneh Milikit	Muluneh Kassahun
		Signature			
		Date	27/03/2017	28/03/2017	29/03/2017
Description of Changes:-					
Location of Mater Copy:- Master File Date of discontinuation:-					

ANNUAL REVIEW

Review Date	Name	Signature

Purpose	This procedure provides clear instruction to measure haematocrit value

Abbreviations	HCT- Hematocrit Hgb- Hemoglobin RBC- Red blood Cell WBC- white blood cell

Materials

Reagents
N/A

Reagents preparation: N/A

Reagents stability and storage: N/A

Sample

Sample type	Amount required	Transport and Storage	Stability
Anti coagulated Whole Blood	Minimum of 100Ul	Keep at room Temperature.	8 hrs at room Temperature.

Limitations: Hemolaysed sample,

High volume of Anti-Coagulant

Inadequate volume of samples i. e less than 2/3.

Sample retention: Samples are discarded after 8 hrs

Special Safety Precautions

- Use universal laboratory safety practice.
- Need Precautions to avoid microhematocrit tube breakage. It will cause serious injury.

Maintenance **N/A**

Calibration

Calibrator	Level	Stability	Frequency	Preparation (y/n)
N/A				

Calibrator preparation: N/A

Note:

Microhematocrit centrifuge should be checked by using Tachometer for its constant speed, once in a Month

Quality Control

Control	Level	Stability	Frequency	Preparation (y/n)
perform duplicate tubes,	Normal	2 hrs		N

Control preparation:

Take the sample and run duplicate and the result should agree with in +/- 1.5 of each other.

Note:

Procedure

Step	Action
1	Collect a well mixed blood samples into a microhematocrit capillary tube at least ¾ full
2	seal at one end by using the sealer
3	Place each tube in the centrifuge with the sealed end away from the Centre and resting against the peripheral Rim.
4	Centrifuge for 4 Minutes at 10,000 RPM
5	Remove the capillary tube from microhematocrit centrifuge at the end of 4 minutes
6	put the microhematocrit capillary tube into the reader accordingly
7	Read the RBC volume in percent from the scale directly beneath the marked line indicator of the reader

Calculation: N/A

Result Interpretation	The result is interpreted the percentage of Packed Red Cells against the plasma.

Expected Values

Analyte	Reference Range		Toxic range	Analytical Range	Units
	Male	Female			
Whole blood	36%-50%	34%-44%	>60%		%

Limitations:	Haemoconcentration, Faulty centrifuge, heamolyzed samples, Inadequatesealing of capillary tube, Improper reading of results from the reading device.

Procedural Notes	N/A

Principle	To determine HCT from extremely small volume of blood specimens in a micro capillary tube after centrifuged in a special device (Microhematocrit Centrifuge) to obtain packed cells from the total volume which is directly Related to the percentage occupied packed cell volume or Hematocrit value.

Clinical Utility	It is a useful test for the screening of Anemia and to diagnose polycytemia Vera and to monitor treatment.

Related Procedures and Documents	N/A

Chapter VI: Laboratory Manual

INJIBARA GENERAL HOSPITAL LABORATORY, QUALITY POLICY MANUAL

Compiler:	**Signature:**
Approver:	**Signature:**
Effective Date: March 30, 2017	**Version No. 01**
Document No: IGHL/ALS/MPN4.2-001	**Copy No. ____**

Revision and Amendment

Annual Review of Document

Revision No.	Review Date	Reviewed by:		Approved by:	
		Name	Signature	Name	Signature

Version Change History/Description

Version. No.	Effective Date	Description of Version Change	Name & Signature of Reviewer	Name & Signature of approval

Amendment

Rev. No.	Page No	Description of Amendment	Amendment Date	Effective Date	Name & Signature of approval

General

This quality manual is only valid if all pages are stamped with the organization stamp and approved by the Laboratory co-ordinator of Injibara General Hospital Laboratory(IGHL), it is maintained as a controlled document.

Updates to this manual will be made by re-issuing the relevant section of this manual and adapting the revision procedure.

Foreword

Laboratory medicine encompasses testing services and associated practices for screening, diagnosis, treatment and prevention of numerous deadly diseases and health related problems. It helps to detect, identify, and promptly report all diseases of public health significance. Hence, laboratories are among the key components of any health care delivery system.

Thus to provide reliable and quality assured laboratory services, a strong quality management system is a key, so based on thus facts the IGHL develop the policy and principles with regard to the overall quality service provision through its endeavor for serving as a referral laboratory center for the Amhara Region and the nearby other administrative region in line with the provision of specialized diagnostic service, capacity building, External Quality Assurance and other organizational management process and procedures to meet the international and national standards with regard to quality management system based on ISO 15189:2015. IGHL's overall goal is to set international standards in laboratory diagnosis and get recognized through accreditation.

Finally, I believe that this quality policy manual will help to standardize the laboratory service and improve the quality of care in the health care delivery as well as yielding greater customer satisfaction out come.

Dr. Ayana Simachew

IGH Chief Clinical Officer

Term and Definition

Examination: - Set of operations having the object of determining the value or characteristics of a property

Laboratory coordinator: - Competent person(s) with responsibility for, and authority over, a lab

Measurement:-set of operations having the object of determining a value of a quantity

Post-examination procedures: - Processes following the examination including systematic review, formatting and interpretation, authorization for release, reporting and transmission of the results, and storage of samples of the examinations

Pre-examination procedures: - steps starting, in chronological order, from the clinician's request and including the examination requisition, preparation of the patient, collection of the primary sample, and transportation to and within the laboratory, and ending when the analytical examination procedure begins

Quality officer: - Responsible for the implementation and maintenance of the Quality Management System in IGHL.

Referral laboratory: - external laboratory to which a sample is submitted for a supplementary or confirmatory examination procedure and report

Revision number: - is number given for document when there is no a change in the document just to indicate periodically revision of document.

Safety officer: - A person who facilitates and control the implementation of laboratory safety practice.

Supportive document:- It is a document that helps to accomplish tasks or policy.

Validation: - is conformation through provision of objective evidence, that the requirements for specific intended use or application have been fulfilled

Verification: - is conformation through provision of objective evidence, that the specified requirements have been fulfilled

Version number: - is a number given for document when there is a change in the document (edition)

Terms and Definitions

Examination: Set of operations having the object of determining the value or characteristics of a property

General Director:

Laboratory Head: Competent person(s) with responsibility for, and authority over, a lab

Specialized and diagnostic core process owner: Person who manage the activities of diagnostic laboratory

Laboratories capacity building core process owner: Person who manage and oversee the overall laboratory quality management system

Measurement: set of operations having the object of determining a value of a quantity

Post-examination procedures: Processes following the examination including systematic review, formatting and interpretation, authorization for release, reporting and transmission of the results, and storage of samples of the examinations

Pre-examination procedures: steps starting, in chronological order, from the clinician's request and including the examination requisition, preparation of the patient, collection of the primary sample, and transportation to and within the laboratory, and ending when the analytical examination procedure begins

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Version number: is a number given for document when there is a change in the document (edition)

Introduction

Injibara General Hospital responsible for the provision of high level diagnostic laboratory testing services for clients and specimens referred from all health facilities in Amhara region and it serves as a Zonal higher reference laboratory center under the structure of regional health bureau.

This Quality Manual outlines and references the policies and procedure of Injibara General Hospital Laboratory (IGHL) as it relates to its commitment to the implementation of the laboratory quality management system. It applies to all activities and personnel within the center and conforms to relevant international standards for laboratory services. (ISO15189:2015)

The purpose of this manual is to describe the Quality Management System of IGHL through Quality Policies to meet the regulatory requirements and accreditation standards, and to ensure that the laboratory consistently deliver quality service to its customers.

It serves as a reference for laboratory personnel on all Quality System matters, providing direction on general policies, processes and responsibilities that govern & authorize the introduction of subsidiary quality-related documentation and protocols. All staff shall be informed in the use and application of this document and be advised incase of any changes.

This document also provides comprehensive evidence to all customers, stakeholders and employees that the IGHL's commitment to quality.

2. Scope

This quality manual describes the quality management system of the IGHL's laboratory diagnostic services**.** Its scope is for:

Internal use - to communicate the staff on laboratory's quality policy and quality objectives, to make the staff familiar with the processes used to achieve compliance with quality requirements. This should facilitate the implementation of the quality management system as well as ensure its maintenance and required updates during altering circumstances. This should also allow effective communication and control of quality related activities and a documented base for quality system audits.

External use–This is to inform the IGHL's external partners about the laboratory diagnostic service of quality policy as well as its implemented quality management system and measures of compliance with quality.

3. Vision, Mission and Value statement

3.1. Vision statement

"To see healthy, productive and prosperous population"

3.2. Mission statement

To protect and promote the health of the people of Amhara Region by addressing priority public health problems through problem focused research, advanced diagnostic service, capacity building, implementing and maintaining quality management system (QMS) according to ISO 15189:2015.

3.3. Values

Professionalism:

Application of skills and high standards

Integrity:

Firmness in more Principles,

Truthfulness at all time

Excellence:

Outstanding feature or quality obtaining reliable results,

State of superiority or eminence.

Commitment:

A pledge of promise or obligation

Efficiency:

The State or quality of being competent in performance,

Ability to accomplish a job with a minimum expenditure of time and effort

Teamwork:

Cooperative or coordinated efforts on the part of a group of persons acting together in the interest of a common course.

4. Management requirements

4.1. Organization and management responsibility

4.1.1. Organization

4.1.1.1 General

Injibara General Hospital Laboratory (IGHL) is committed to meet requirements of ISO 15189:2015 while performing work at its permanent facility.

4.1.1.2 Legal identity

IGHL is legally mandated by Amhara Regional State Health Bureau (ARHB) to operate as Injibara General Hospital Laboratory. It is a legal entity established by proclamation Number _____under public law reporting to Amhara Regional State Health Bureau.

ADDRESS:

Name of Lab: Injibara General Hospital Laboratory

City: Injibara Town: Kebele: 1

P.O. Box:_____

Phone No: +251-588-270430

Fax No: +251-582-266701

Email: _____

Injibara, Ethiopia

4.1.1.3 Ethical conduct

The management of IGHL has put in place an ethical conduct declaration for to ensure that staffs do not:

4.1.1.3 Ethical conduct

The management of IGHL has put in place an ethical conduct declaration form to ensure that staffs do not:

Fabricate or falsify laboratory results or get involved in any unethical activities that may result in clients to lose trust on the laboratory's competence, impartiality, judgment or operational integrity;

Get influenced by commercial, financial, political and other pressure that may adversely affect quality of their work;

Get involved in business or any activity that compete with IGHL activities without declaring to the management;

Analyze patient samples for investigations not requested by authorized clinician;

Use patient samples to carry out research which is not cleared by ethical clearance of committee of IGHL's Ethical Review Board.

Disclose patient confidential information to any unauthorized person for any reason.

Supporting documents: (these include conflict of interest sop, ethical conduct declaration, confidentiality and non disclosure agreement.)

4.1.1.4 Laboratory Manager

IGHL is directed by Laboratory manager (BSc), whose overall responsibilities includes but not limited to routine lab activities, administrative, advisory and organizational matters relevant to the services offered by the laboratory. The Laboratory manager may delegate selected duties and/or responsibilities to qualified personnel. The detailed roles and responsibilities of the Laboratory manager are found in job description.

4.1.2. Management responsibility

4.1.2.1 Management commitment

The management of IGHL is committed to develop, implement, maintain and continually improve the quality management system by ensuring that:

Monthly meetings are done where staff informed on the importance of meeting needs and requirement of patients, health facilities as well as requirements of Injibara General Hospital

Quality policy statement is established

All documents in use are updated

Quality objectives are established and a plan is developed to achieve them

Staff responsibilities and authorities are defined in their respective job description

Interrelationship between staff and management is defined in the organizational chart

Internal and external communication processes are established

A quality manager is appointed

Annual management review is conducted

All staff are assessed for competency in their assigned tasks

Adequate resources needed to conduct pre-examination, examination and post-examination activities are available

All staffs are trained quality management system

4.1.2.2 Needs of users

The management of IGHL ensures that services offered including advisory services continuously meet needs and requirements of patients and health facilities by addressing both negative and positive feedback received.

4.1.2.3 Quality policy

IGHL management is dedicated to providing the resources necessary to maintain the laboratory quality management system and to ensure the laboratory's participation in the laboratory quality plan. The laboratory is committed to continual improvement, meeting internal requirements and customer requirements, and providing a basis for the establishment and review of the quality objectives. Quality practices are communicated within the organization, understood and adhered to by all employees. The laboratory ensures a competent workforce to deliver quality results in a timely manner according to the ISO15189:2015 standard document. The management and staff of IGHL perform their work in the most professional and ethical way committed to good laboratory and clinical practices.

4.1.2.4 Quality objectives and planning

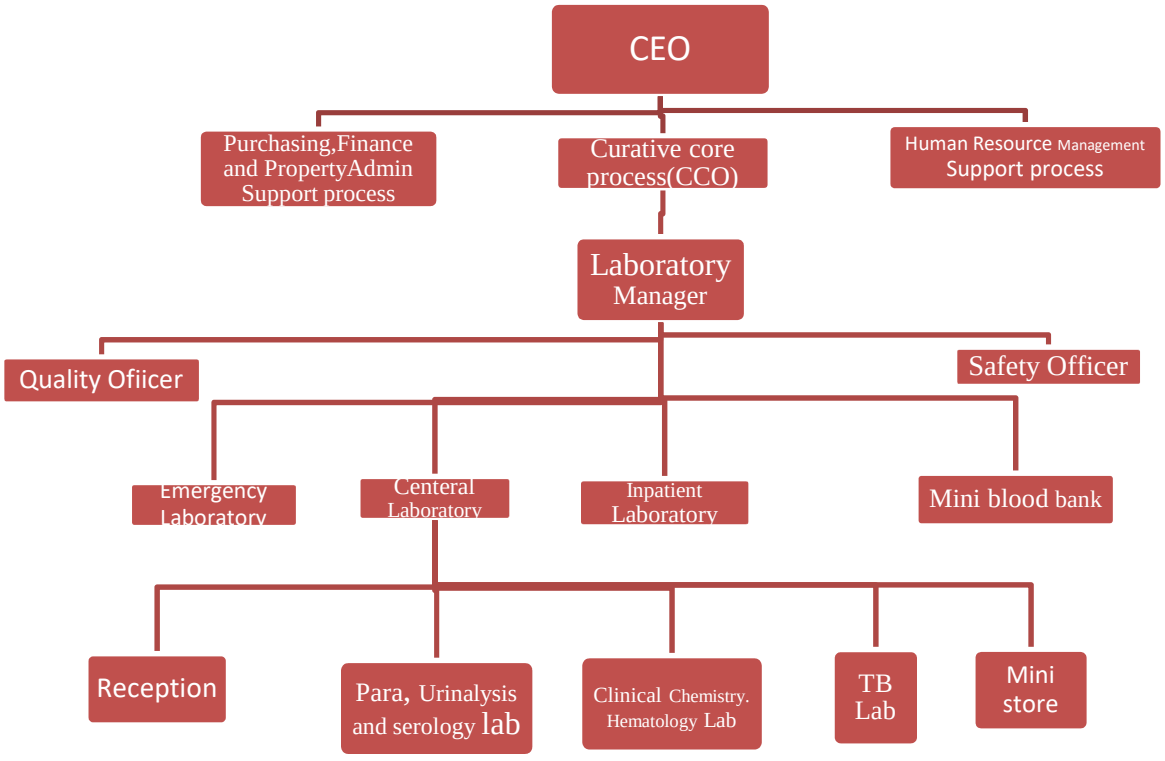
Quality objectivesare a plan that used to ensure all laboratory personnel competency with regard to LQMS implementation annually and to ensure quality assurance system implementation to all diagnostic tests. The management of IGHL sets and reviews measurable quality objectives annually during management reviews after collecting suggestions from staff. A plan which includes key activities for achieving the objectives is developed on form ISO 15189:2015)

during management review. The management ensures that the integrity of the quality management system is maintained when changes are being planned and implemented.

4.1.2.5 Responsibility, authority and interrelationship

The management has defined responsibilities and authorities of staff in their respective job descriptions. The staff read and acknowledge by signing the job descriptions witnessed by the Laboratory Manager before they are filed in individual personnel files.

The interrelationships between management and staff are defined in the organizational chart Shown below.



4.1.2.6 Communication

Communication is vital for the effective performance as well as continual improvement of a Quality Management System. It is in this regard that IGHL management has established communication mechanisms that will ensure that stake holders requirements (both internal and external) are met. All communications (outgoing and incoming) are logged or filed whichever is appropriate.

Internal Communication

To achieve collective ownership of the system by both Management and staff, IGHL management involves all staff in every aspect of the development and implementation of the QMS. For effective communication within the Hospital laboratory, Management has adopted channels of communication, which include but not limited to the following:

- Memos, letters, notices
- Meetings
- Oral communication
- Verbal or written instructions (e.g. through Quality Manual, Lectures).
- Periodicals (Bulletin)

External Communication:

Communication with external stakeholder is in the form of but not limited to letters, newspaper publication, electronic mail, telephone and meetings. Hospital laboratory staffs are authorized to offer telephonic consultations on technical matters within the scope of their responsibilities to external facilities. Records of all communications shall be kept.

Supporting Documents

Document Unique ID	SOPs
	Communication SOP
	Minute Form
	Memo Form
Document Unique ID	Formats

4.1.2.7 Quality manager

The management of IGHL has appointed a quality manager who is responsible to ensure that processes needed for the quality management system are established, implemented and maintained as well as to promote awareness of needs and requirements of patients and health facilities in the laboratory. The quality manager reports to Lab manager. The detailed responsibilities of quality manager are stated in the job description.

Supporting documents

Document Unique ID	Document Name
	Quality manager job description

4.2. Quality management system

IGHL has a documented Quality Management System which comprises of policies, procedures, instructions, forms, job descriptions, external reference and regulatory documents and records. IGHL management ensures that all members of staff have been trained on QMS and understood it upon employment and as when necessary. QMS allows for the control and common understanding of activities, processes, and systems are operated with in IGHL. All relevant QMS documents are made available at each Department for easy implementation.

Supporting Documents

Document Unique ID	Document Name

4.2.2 Documentation

IGHL has established documents needed for its quality management system that include:

Statement of quality policy and quality objectives

Quality manual, safety manual, laboratory hand book and specimen management guideline

Procedures and records required by ISO 15189:2015

Supporting documents of the quality manual

Copies of international, national and regional regulation documents such as ISO 15189:2012, civil servant and good governance regulations

4.2.2.2 Quality manual

The Quality Manual is maintained by the Quality Manager. The Quality Manager is also responsible for ensuring that up to date versions are available both to staff and to users of the service and that any changes are communicated to all personnel concerned. All staff should understand and governed by policies stated in this quality manual.

IGHL's quality manual is composed of: policy statement a description of the scope of quality management system organizational chart job descriptions which define roles and responsibilities of management including laboratory director and quality manager description of the documentation structure used in quality management system policies addressing all requirements of ISO 15189:2015 and their supporting documents.

4.2.2.3 Documentation structure

IGHL quality management system documents fall in to a three-tier structure which comprises of polices in first level, procedures/job aid in second level and forms , records, reference books , equipment manuals and other external documents in third level as illustrated in pyramid below.

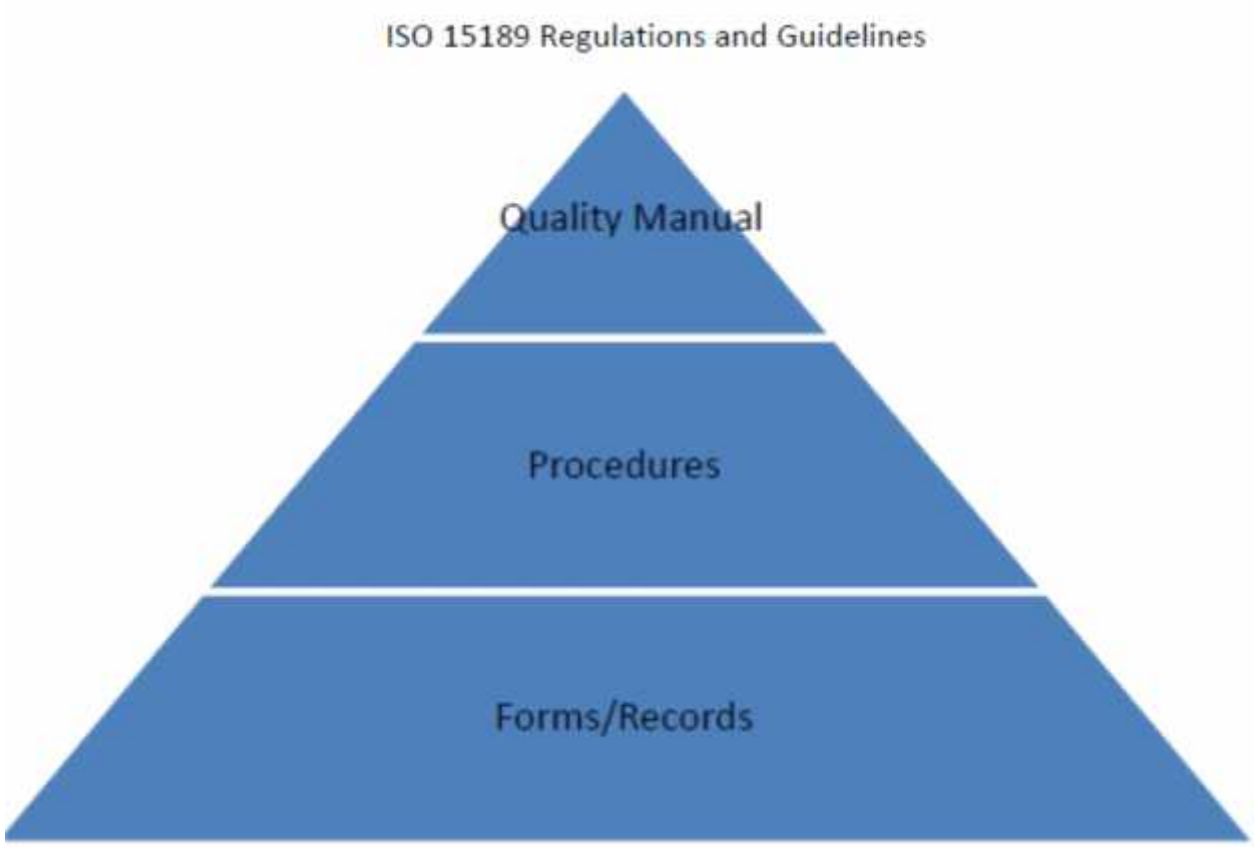


Figure 2: Hierarchy of QMS Documentation

Policy: describes the organization goals and intentions "what is done and why"

Process: is set of interrelated or interacting activities that transforms inputs into out puts "how it happens" it will be presented as a flow chart or table that describes operations in the laboratories path of work flow or activities with-in a quality system essential.

Procedures/Job aids: provide step by step instruction "how to do it"

Form: capture information and results generated as the process procedures

Records: result from captured information on a form

External documents: documents of external origin adopted into the system to support polices

The quality manager distributes copies of quality manual and supporting documents to each section so that staff can have easy access. All staffs are trained on the use of quality manual and supporting documents.

4.3. Document control

The laboratory ensures that documents are managed from creation and receipt to archival and destruction, according to national laws, local regulations and international standards. The quality manager reviews and approves all requests for amendments to existing documents and the development of new procedures, processes, and policies. Staff is not permitted to make temporary amendments to documentation without the prior consent of the quality manager. When new or modified policies, processes and procedures are instituted, staff requires retraining.

All laboratory documents are reviewed on an annual basis. The responsibility for the annual review lies with the quality manager. The quality manager is responsible for the distribution of new documents, retrieval of old documents and maintenance of amendments documents. All documents are stored in a safe environment to avoid deterioration and confidentiality. All documents are uniquely identified according to title, version, and number of pages to total pages, effective date, document number and authority for use. The quality manager reviews all documents to ensure that they are standardized and fulfill all requirements of ISO 15189:2015 before they are approved. IGHL has developed a procedure for document control SOP which gives more detail on document control from creation to destruction.

Archival of Documents

IGHL is responsible for proper archiving of documents according to procedure IGHL/ALS/SOP4.3-001. The laboratory retains or archives documents according to the document retention time in this manual. All documents deemed obsolete are destroyed and documented.

	Type documents	Retention time	
1	Manuals, SOPs, formats and job aids	2 years after discontinue date	
2	Reference books		
3	Guidelines		
4	Standards		

Supporting Documents

Document Unique ID	Document Name
IGHL/ALS/SOP4.3-001	Document control SOP
	Master index

4.4. Service agreements

IGHL considers individual requests for examination brought in by patient as agreement. The Hospital Laboratory also makes an agreement with the health facilities that bring samples by referral system on behalf of their patients. IGHL has developed a procedure for establishing and review of agreements for providing medical laboratory services. The Chief Executive Officer signs agreements on behalf of IGHL with respective head of health office on behalf of health facilities or organizations seeking services. The service agreement consideration states details in the service agreement SOP. If there is any deviation in agreement, there will be notification for customers.

4.4.2. Review of service agreements

The customers or service providers may initiate the review process. The conditions agreed upon in the initial agreement are reviewed and if there are any changes to any of the conditions, all parties agree before signing the new agreement. The review is captured on service agreement review form. When there is an amendment or change on agreement, the signed parties should notify to their respective staff.

Supporting documents

Document Unique ID	Document Name
	Procedure for service agreement
	Communication log
	Service agreement review form
	Patient notification SOP

4.5. Examination by referral laboratories

4.5.1. Selecting and evaluating referral laboratories and consultants

IGHL is responsible for selecting the referral laboratory and referral consultants, reviewing the quality of performance annually and ensuring that the referral laboratories or referral consultants are competent to perform the requested examinations based on the criteria set in our SOP. Samples can be referred under any of the following circumstances such as equipment breakdown, reagents stock-out, test not performed routinely by the laboratory and inadequate staff.

4.5.2. Provision of examination result

IGHL is responsible for all test results from referral laboratories to ensure they reach the customer within at agreed turn-around time. The laboratory uses referred samples log to track samples and results from referral laboratories. IGHL does not edit or put additional remarks to reports from referral laboratories but forwards it to customer as received, keeping a copy in respective section for a period as defined in the document and record retention times. In cases where correct interpretation or clarification of results is required, IGHL collaborates with referral laboratories without any extra charge to the patient.

Supporting document

Document Unique ID	Document Name
	Format for list of approved laboratories
	Procedure for referral laboratories
	Referral samples log

4.6. External services and supplies

IGHL acquires all of its reagents and consumables and some of its equipment from PFSA, the only government supplier and the Chief Executive Officer ensures that performance of PFSA is reviewed annually using checklist. IGHL receives equipment as donations from partners through APHI and /or ARHB. IGHL also acquires some of its equipment from private supplier through tendering system. The private suppliers are selected based on stated criteria in the procedure for selection and evaluation of external service and supplies and specific equipment specification set based on national standards.

IGHL ensures that all received reagent, consumable and equipment meet expected standards and are suitable for intended use in accordance with checklist for receiving equipment, reagent and consumable. A procedure for selection and evaluation of external services and suppliers is available.

Supporting document

Document Unique ID	Document Name
	Evaluation of supplier checklist
	Procedure for selection and evaluation of external service and supplies
	Checklist for receiving of equipment
	Checklist for receiving reagents and consumable

4.7. Advisory service

The management of IGHL has authorized technical staff through their job descriptions to provide advice to customers on sample management, choice of examinations and effective use of laboratory, correct interpretation of examination results, limitations of examination procedures, individual clinical cases and sample integrity and their effect on examination result.

A Laboratory hand book containing the above information in more detail is distributed to all referring health facilities. Table below gives the summary of advisory services and staff who authorize to give the services.

4.8. Resolution of complaints

IGHL is responsibility for monitoring customer complaints obtained through bi-annual customer satisfaction survey, suggestion box and book monthly and via telephone or directly forward to any of laboratory management member at any time. All complaints are compiled by assigned personnel and resolved by IGHL management. IGHL has a procedure for resolution of complaints which is followed when resolving complaints from patients, health facilities and other customer/stakeholders as well as internal complaints from staff. During staff meetings, Staffs are informed to raise their complaints any time by way of filling in complaint form anonymously and submitting it through suggestion box which is opened monthly. Complaints are addressed by laboratory management during their monthly meetings and feedback is given to staff / to individual who is raised the complain.

Supporting document

Document Unique ID	Document Name
	Procedure for resolution of complaint
	Complaint form

4.9. Identification and control of non-conformities

IGHL is committed to the identification, documentation, correction, and prevention of nonconforming events in all aspects of the quality management system including pre-examination, examination and post-examination processes. Procedures are in placing that:

Designate the individuals responsible and actions necessary for handling nonconformities

Ensures that each nonconforming event is documented, recorded, and reviewed at identified intervals, a root cause analysis performed, and that corrective action is taken and documented;

Define when testing procedures and data reporting will be withheld due to nonconformities and when, and under what conditions, examination can resume

Defines the steps taken when examination data resulting from a nonconforming event has already been released.

Supporting document

Document Unique ID	Document Name
	Procedure of identification and manage nonconformities
	Non-conformity form
	Non-conformity log

4.10. Corrective action

All nonconforming events (from occurrence reports, claims, audit reports, patient/customer complaints, failed proficiency testing, etc.) are recorded, tracked, trends identified, and root cause analysis performed. The appropriate corrective actions are taken for nonconformities. The results of an occurrence assessment are communicated to Laboratory management and become part of periodic management review. The objective is to ensure continuous improvement of the quality system.

Supporting documents

Document Unique ID	Document Name
	Procedure for corrective action
	Non-conformity form
	Root cause analysis form

4.11. Preventive action

The IGHL take action to prevent non-conformance which shall be identified from potential sources, whether technical or affecting quality management system. When a potential non-conformance is identified, the Hospital lab reviews the data and implements preventive actions allowing the institute to anticipate eventual nonconforming events in its activities. Preventive action includes the use of data from external assessments, internal audit results, quality records and complaints to detect, analyze and eliminate potential causes of nonconformities. A follow up of the actions implemented for improvement is ensured in the same way as described in Nonconforming Event Management. The quality manager is responsible for reviewing data on a monthly basis including trend analysis. Potential non-conformities are identified through trend analysis and preventive actions are developed and implemented accordingly.

Supporting document

Document Unique ID	Document Name
	Procedure for preventive action

4.12. Continual improvement

IGHL management continually improves its quality management system in accordance with improvement procedure. All operational and technical procedures are reviewed annually. IGHL establishes mechanisms to continually improve effectiveness of its quality management system including support processes, operational processes and management processes. These include but not limited to annual management reviews, corrective and preventive actions, review of quality policy and quality objectives, implementation of quality indicators, risk assessment and Customer feedback.

The Laboratory manager ensures that action plans for the above activities are developed, documented on minute's template and implemented within agreed timelines. The quality manager ensures that annual internal audit is conducted with an objective to review effectiveness of continual improvement actions. IGHL management meets with stakeholders annually to discuss continual improvement activities that concern outcomes of patient care. When the continual improvement activities identifying opportunities for improvement, IGHL management ensures that they are addressed regardless of where they occur. The Laboratory manager communicates any improvement plans and related goals during monthly staff meetings.

Supporting document

Document Unique ID	Document Name
	Meetings minutes template

4.13. Control of records

IGHL has a system for control of records which defines how quality and technical records are identified, collected, indexed, accessed, stored, maintained, amended and safely disposed. The management of IGHL ensures that staffs create records at the same time of performing each activity. This is achieved through daily supervision and oversees by quality officer in each department. IGHL allows amendment of records by hand. This is done in blue or black ink by striking through wrong entry with one neat line and entering the correct entry next/above the wrong entry, signing or initialing and putting the date and time of amendment. Use of correction fluid is strictly not allowed. IGHL has defined periods of retaining quality and technical records generated through implementing quality management system in the following table. IGHL ensure safe storage of records to prevent their damage by fire, mites or water. The institute is also safe guarded from unauthorized persons gaining access to records. All quality and technical records are available for discussion in laboratory management reviews.

	Type records	Retention time	
1	Result records (print outs & work sheets)	2 years	
2	Result records (registration book)	10 years	
3	Temperature records	2 years	
4	Preventive maintenance (daily, weekly, monthly) records	2 years	
5	Service repair (Major repairs, parts replacement and annual maintenance)	Lifeof instrument	

6	Quality assurance, control &PT records	2 years	
7	Calibration records	2 years	
8	Method verification records	Lifeof instrument	
9	Normal range change records	2 years	
10	Employees continuous education, training, competency	2 years	
11	Employee medical records	Life time	

Supporting documents

Document Unique ID	Document Name
	Procedure for record control
	Documents and records retention times

4.14. Evaluation and audits

Evaluation and Internal audits are conducted at the request of management and at predetermined scheduled annually. This is to ensure that the laboratory's activities comply with the requirements of ISO 15189:2015. The Quality Manager is responsible for planning and organizing the evaluation and audits. Evaluation and audits are conducted by personnel who are qualified and independent of the activity being audited.

IGHL performs ongoing quality assessments such as:

Periodic review of examination requests, suitable methods and sampling requirements

Monitoring and evaluation of customer feedback, staff suggestions and impact of potential failures on examination results and customer expectations

Monitoring of determined quality indicators, corrective actions undertaken, and follow-up;

Participation in proficiency testing program and review of the corresponding reports

Participation in internal and external audits.

The laboratory strives to continuously improve the quality of laboratory performance, the effectiveness of the quality management system and the reliability of test data. The laboratory does its best to identify and resolve any nonconformity that may affect laboratory performance

and patient outcome. All results of evaluation and audit activities are discussed in the management review.

4.14.2. Periodic review of requests, and suitability of procedures and sample requirements

The head of each department of IGHL compile annual report of all examination requests received in their respective department indicating what test were done and what was not done and stating the reasons . This information is discussed in Laboratory management review with intention of either expanding scope of services according to need or considering referring sample which are not cost effective to run. The head also review sample volume, collection devices and preservative requirements needed for appropriate in accordance with available examination procedures.

4.14.3. Assessment of user feedback

IGHL seeks both positive and negative feedback from its patients, health facilities and other customers through bi-annual customer satisfaction survey, suggestion box and book by monthly and via telephone or directly forward to any of laboratory management member at any time. The quality manager is responsible for summarizing the feedback into report that are shared with laboratory management and maintaining the records of all action taken. Names of patients and health facilities are not included in summary report for confidential information.

Supporting documents

Document Unique ID	Document Name
	Resolution of complaints procedure

4.14.4. Staff suggestions

IGHL encourages its staff to raise suggestions for improvement in their respective sections in staff suggestion form. Suggestions can be submitted through the suggestion box if the staff prefers anonymity or can be handed to any of the laboratory management members. The suggestions are discussed during monthly management meetings and an action agreed is implemented and communicated to staff during monthly meetings. The quality manager/assigned personnelmaintain records of staff suggestions and action taken.

Supporting documents

Document unique ID	Document Name
	Procedure for staff suggestion

4.14.5. Internal audit

The quality manager schedules internal audit in the annual quality plan. All activities including pre-examination, examination and post-examination are audited once a year to ensure that they conform to requirement of ISO 15189:2015 and to the laboratory quality management system as well as to ensure effective implementation and maintenance of the system. Internal audit conducted by trained personnel of both management and technical requirements at the same time maintaining objectivity by ensuring that they do not audit their own activities.

The quality manager plans the audit activities which include defining objectives, scope, criteria, methods and assigning auditors to different sections and stating the actual audit dates. The planning is done at least three weeks before the audit on internal audit plan template and distributed to all staff concerned. Internal auditors verify effectiveness of corrective action for previous audit before undertaking the new one. The team leader of the internal auditors compiles final audit report drawing conclusion on whether objectives were met and presents it in Laboratory management meetings. The focal person for each section is responsible for doing corrective actions within time frame agreed with internal auditor. A procedure for internal audit has been developed which defines responsibilities and planning of audit as well as reporting results and maintain records.

Supporting documents

Document Unique ID	**Document Name**
	Procedure for conducting Internal Audit
	Internal Audit Report Form
	Internal Audit Assessment Checklist

4.14.6. Risk management

IGHL evaluates impact of work processes and potential failures on examination results as they affect patient safety and come up with the action plans to prevent, reduce or eliminate the identified risks. The evaluation and action plans are documented on the risk assessment form. A

procedure has been developed defining evaluation processes as well as coming up with improvement plan.

Supporting documents

Document Unique ID	Document Name
	Procedure for risk management
	Risk management checklist

4.14.7. Quality indicators

IGHL establishes quality indicators to monitor and evaluate performance throughout critical aspects of pre-examination, examination and post-examination processes. The process of monitoring quality indicators are planned, which includes establishing the objectives, methodology, interpretation, limits, action plan and duration of measurement. The indicators are periodically reviewed, to ensure their continued appropriateness. The Hospital Lab, in consultation with the users establish turnaround times for each of its examinations that reflect clinical needs.

Supporting document

Document Unique ID	Document Name
	Quality Indicators Form
	Quality indicator SOP
	Improvement work plan

4.14.8. Review by external organizations

When reviews by external organizations indicate the Hospital lab has nonconformities or potential nonconformities, the IGHL takes appropriate immediate actions and, as appropriate, corrective action or preventive action to ensure continuing compliance with the requirements of the ISO15189. Records of these are kept of the reviews and of the corrective actions and preventive actions taken. IGHL follows its procedure for corrective action to address all non-conformities identified by external organizations such as accreditation body, health authorities, funding program, and/or public health program. The quality manager maintains records generated

.

Supporting documents

Document Unique ID	Document Name
	Staff suggestions from
	Internal audit plan template
	Annual quality plan
	Internal audit report form
	Procedure for internal audit
	Risk assessment form
	Procedure for risk management
	quality indicator planning work sheet
	Monthly sectional quality indicatory form
	Quarterly quality indicator form
	Procedure for corrective action/Preventive action

4.15. Management review

The management of IGHL reviews the effectiveness, continued suitability and adequacy of its quality management system in support of patient care annually as scheduled in the annual quality plan. The IGHL management conducts an annual review, which includes at least the following agenda items considers the following items of information.

a) The periodic review of requests, and suitability of procedures and sample requirements;

b) Assessment of user feedback

c) Staff suggestions

d) Internal audits

e) Risk management

f) Use of quality indicators

g) Reviews by external organizations

h) Results of participation in inter-laboratory comparison programmes (PT/EQA);

i) Monitoring and resolution of complaints

j) Performance of suppliers

k) Identification and control of nonconformities;

l) Results of continual improvement including current status of corrective actions and preventive actions;

m) Follow-up actions from previous management reviews;

n) Changes in the volume and scope of work, personnel, and premises that could affect the quality management system;

o) Recommendations for improvement, including technical requirements;

p) Review of quality policy and quality objectives for continued suitability.

4.15.1. Review activities

The quality manger prepares the annual report at least two months before the management review defining reports needed for discussion and people responsible for preparing reports. As much as practical the reports are prepared showing trends over time for easy interpretation and following patterns.

4.15.2. Review output

The output of the management review includes minutes of discussions made and action plans for improvement of quality management system activities, definition of the quality objectives for the next year, establishment of new quality indicators in concordance with the new quality objectives, improving services to patients and health facilities and identification of resource needs and allocations. All staffs are informed of discussions made in Lab management review including action taken in general staff meetings. The laboratory manager makes quarterly follow ups implementation of action agreed in management review.

Supporting documents

Document Unique ID	Document Name
	Annual quality plan
	Annual report preparation form

5. Technical requirements

5.1. Personnel

IGHL has a procedure for personnel management which is followed when managing personnel from the point of recruiting up to retirement. The Hospital Lab manager maintains personnel files with technical record while human resource supportive process owner maintains the administrative records. The Lab manager informs/request the need of personnel for human resource supportive process then submits a completed staff recruitment form to the human resources department that describes the appropriate education, training, experience, and skills needed for the available position based on civil service rule.

Supporting documents

Document Unique ID	Document Name
	Job Descriptions and qualifications
	Orientation and Training
	Competency assessment tools

5.1.2 Personnel qualification

IGHL management has documented personnel qualifications for each position which also reflect the education, training, experience, and skills needed for the position. All technical staff performing specimen collection, examination procedures and releasing patient result have diploma and above in laboratory technology at a minimum requirement.

Supporting document

Document Unique ID	Document Name
	Qualification profile folder

5.1.3 Job description

IGHL has a job description for all positions that describe responsibility and authority for personnel.

Supporting documents

Document Unique ID	Document Name
	Job description template

5.1.4. Personnel Orientation

The laboratory manager ensures that all new staffs joining the laboratory are introduced to the different sections, staff facilities, health and safety requirement, terms and conditions of employment and occupational health services during the first month of employment using orientation check list.

Supporting documents

Document Unique ID	Document Name
	Orientation checklist

5.1.5. Training

IGHL provide training for all personnel which include:

a) Quality management system annually

b) Assigned work processes and procedure by expertise before staff start working in the section

c) Laboratory information system (LIS) by super-user or IT staff once before using LIS

d) Health and safety annually

e) Ethics by human resource manager once before starting work

f) Confidentiality of patient information

Personnel undergoing training are supervised by the respective expertise until competency assessment is done. The effectiveness of the training program is reviewed by use of training feedback from the trained staff, competency assessment and/or practical evaluation implementation of the training conducted.

Supporting documents

Document Unique ID	Document Name
	Training documents

5.1.6. Competency assessment

Following training in their respective sections, laboratory experts are assessed for technical competency by assigned competent staff. Staff competencies cover technical and practical skills and general knowledge. Competency of each new employee (within 6 months) is assessed and verified before permitting to perform testing and report results.

The management members (Lab manager, quality manager, Safety Officer) are assessed for competency in their assigned management roles. Competency assessment is done annually and anyone who fails is offered additional training then re-assessed. The criteria for competency assessment are defined in the procedure of personnel management.

Supporting documents

Document Unique ID	Document Name
	Technical Competency assessment form

5.1.7. Reviews of staff performance

IGHL uses a government balanced score card system designed by Regional Civil service guideline for staff performance evaluation bi-annually. Performance appraisal is planed and evaluated by Lab manager for each staff. Lab manager with human resource supportive process owner ensure performance evaluation is done.

Supporting documents

Document Unique ID	Document Name
	BSC evaluation template

5.1.8. Continuing education and professional development

IGHL provides continuous education opportunities in collaboration with APHI and /regional health bureau according to their performance and service year. The Lab manager of IGHL plan and coordinates in service trainings as part of continuous professional development and all staff are required to participate. The Lab manager is responsible for reviewing effectiveness of in service trainings by evaluating feedback from trained staff as well as following up to check practical implementation and gives feedback to the management team.

Supporting documents

Document Unique ID	Document Name
	CPD evaluation checklist

5.1.9 Personnel records

IGHL maintains the relevant educational and professional qualifications, training and experience, and assessments of competence of all personnel.

These records are readily available to relevant personnel and include but not be limited to:

Educational and professional qualifications

Copy of certification or license, when applicable

Previous work experience

Job descriptions

Introduction of new staff to the laboratory environment

Training in current job tasks

Competency assessments

Records of continuing education and achievements

Reviews of staff performance (balanced score card) and appreciation letter when applicable

Reports of accidents and exposure to occupational hazards

Hepatitis –B vaccine immunization, and others when relevant to assigned duties

The records listed above are stored in the Lab manager Office.

Supporting documents

Document Unique ID	Document Name
	Procedure for personnel management
	Staff orientation check list
	Technical competency assessment form

5.2 Accommodation and environmental conditions

IGHL provides sufficient space and reliable infrastructure to perform its work, to ensure the quality, safety and efficacy of the services provided, and to meet national safety regulations. The laboratory design provides an efficient and safe environment for the laboratory staff, other health care personnel, patients, and the community. Personnel are trained in the basics of safety and bio-risk management issues.

The Lab manager with Hospital management evaluates and determines the sufficiency and adequacy of the space whenever there is need to expand scope of services and/or new equipment is to be brought in.

Supporting document

Document Unique ID	Document Name
	Standards on evaluation adequacy of lab space

	Evaluation checklist

5.2.2. Laboratory and office facilities

The laboratory has several rooms, each designated for specific uses; offices, storage supplies, washrooms, patient collection area, and laboratory working areas.

Visitors entering laboratory beyond reception are identified with visitors ID card to control their access to technical sections, to patients sample and confidential information of patients and laboratory resources. All visitors authorized to gain access to the laboratory are issued with visitors ID card by the IGHL staff.

Floor plan of the laboratory:

Technical sections are equipped with enough electricity, light, ventilation and water supply to allow for the correct performance of examination procedure. Waste disposal bins and sharps containers are also available for safe disposable of solid waste while designated drainage system is used for disposing liquid waste.

Staff communicates effectively with each other through telephone, email and notice board memos. The laboratory is safe environment for staff and visitors by having firefighting equipment which is serviced annually by external contractors. Eye wash stations and spill kit in respective sections which are checked for functioning weekly and monthly respectively by section laboratory persons. Fire alarm, emergency showers and first aid kit which are common for all sections are checked for functioning monthly by safety officer.

5.2.3. Storage facilities

IGHL has enough storage facilities for reagents, consumables, samples, equipment, records and documents. Samples and reagents are kept in different refrigerators to avoid cross contamination. Special designated cabinet available for toxic, corrosive and flammable substances. Dangerous materials and hazardous wastes are disposed based on national FMHACA waste management and disposal regulation.

5.2.4. Staff facilities

IGHL has enough washrooms, clean supply of drinking water and storage facilities for personal protective clothing and equipment.

5.2.5. Patient sample collection facilities

IGHL has a separate patient waiting area and sample collection room where patients are served one at a time for privacy and confidentiality. Toilets are also available for patients and accompanying guardian. Sample collection room is equipped with air conditioner and temperature is monitored to prevent samples from being exposed to extreme temperatures. A first aid kit which is checked for functioning by reception staff is available in the sample collection room for use on staff and patient.

5.2.6. Facility maintenance and environmental conditions

Environmental temperatures are monitored twice daily and benches are decontaminated twice daily by laboratory experts in respective sections. Floors are cleaned once daily and ceilings and walls quarterly by janitors/cleaners. Different examination procedures are done in separate rooms to avoid cross contamination. IGHL environment is quite and no interruptions are there to disturb staff from doing their work.

Supporting documents

Document Unique ID	Document Name
	FMHACA waste management and disposal regulation
	health and safety guideline for public health laboratories in Ethiopia
	Temperature monitoring charts
	Eye wash station maintenance chart
	Emergency shower maintenance chart
	First aid kit monitoring chart
	Spill kit monitoring chart
	Bench and floor decontamination form

5.3. Laboratory equipment, reagents, and consumables

5.3.1. Equipment

The management of IGHLfurnished all equipment needed for the provision of laboratory services and ensures proper equipment selection, purchasing installation, calibration, validation, and disposal according to established procedures and manufacturer's instructions to meet the needs of the laboratory to perform quality diagnostic testing. IGHL does not use equipment outside its permanent control. The Lab management gets advice from bio-medical engineers when to replace equipment.

5.3.1.2 Equipment acceptance testing

5.3.1.2.1 Installation qualification

Bio-medical engineers from the supplying company perform installation of new equipment and generate all necessary records proving that installation passed. After successful installation, staffs are trained on operating and maintaining the equipment.

5.3.1.2.2 Operator qualification

Trained staff analyzes known samples on the equipment to ensure proper functioning of equipment. Section laboratory persons are responsible for ensuring operator qualification is done.

5.3.1.2.3 Performance qualification

Verification of the equipment performance as intended by the manufacturer and as expected by IGHL is done. All equipments are uniquely identified by their serial numbers and laboratory generated ID numbers.

5.3.1.3 Equipment instructions for use

IGHL has authorized its trained staff to perform examination procedures and manage the equipment. Equipment manuals are readily accessible to staff in each section. IGHL has a procedure for equipment management which gives guidelines and reference to equipment manuals for safe handling, transportation and storage of equipment to prevent its contamination or deterioration.

5.3.1.4 Equipment calibration and metrological traceability

IGHL calibrates its equipment by using Ethiopian metrological agencies. When this is not possible or relevant; the laboratory uses certified material for calibrating the equipment or calibration by another procedure.

5.3.1.5 Equipment maintenance and repair

Each section of IGHL has preventive maintenance program for its equipment which is developed based on manufacturer recommendations as given in equipment user manual. Annual and/or biannualservice of equipment by engineers is organized by EPHI which enter in to service agreement with the vendors for some equipment. IGHL makes service agreement for equipments which have no service agreement by EPHI.

Defective equipments are decontaminated and clearly labeled as “do not use” and date when equipment broke down and expected date of repair. The equipment decontamination takes place before performing any repairs or service and provides necessary space and personnel protective equipments.

After onsite service/repair or any equipment is taken out of the laboratory for services /repairs, section laboratory persons ensure its proper function by calibrating and running controls upon its return.

5.3.1.6 Equipment adverse incident reporting

Any adverse incidents and accidents that can be attributed directly to equipment are investigated by section focal person reported to IGHL Lab manager and the Lab manager reports to CEO of the Hospital who in turn reports in writing to EPHI or directly to the vendors.

5.3.1.7 Equipment records

IGHL maintains equipment records on equipment inventory form and in book of life. Equipment records are retained for periods defined in documents and record retention time. All equipment is uniquely identified by quality manager. Updating of the equipment inventory records is ensured by quality manager. The equipment records include but not limited to:

• Name of the equipment, model and serial number

• Identity of the equipment

• brand (manufacturer)

• contact information

• Location

• Date of purchase

• Date of receiving and date of entering into service

• Condition when received (New, used or reconditioned)

• Maintenance records

• Acceptance records

• Equipment performance records

• Equipment repair, modification or malfunction

Supporting documents

Document Unique ID	Document Name
	Equipment management SOP
	Equipment maintenance form
	Equipment user manuals
	Equipment acceptance criteria form

5.3.2 Reagents and consumables

IGHL ensures that the procedures for the receipt, storage, and inventory management of all reagents guarantee the quality of testing is not compromised.

5.3.2.2 Reagents and consumables – Reception and storage

A laboratory personnel assigned to the store is responsible for receiving and ensuring proper storage of reagents and consumables according to manufacturer recommendations. Reagents are received according to criteria in checklist.

5.3.2.3 Reagents and consumables – Acceptance testing

Quality control is done for each shipment or new lot of reagents received and records are maintained by respective laboratory personnel.

5.3.2.4 Reagents and consumables – Inventory management

IGHL mini store room ensures monitoring consumption of reagents and consumables. Stock level, expire date, lot number and balance are monitored using bin card. Section laboratory professionals update the reagent consumption every two weeks using bin card and ordered by Intra Facility Request and Reporting (IFRR) to Hospital Pharmacy store. Requesting and Reporting Format (RRF) is used to order reagents and consumables from Pharmaceutical and Fund Supply Agency (PFSA) every other month. Physical inventory of reagents and consumables is done once a year by designated inventory committee.

5.3.2.5 Reagents and consumables – Instructions for use

Each laboratory personnel maintains leaflet for reagents and consumables in their respective sections for making reference when required. A file of Material Safety Data Sheet (MSDS) is kept in store room and in each laboratory section.

5.3.2.6 Reagents and consumables – Adverse incident reporting

Any adverse incidents and accidents that can be attributed directly to reagents and consumables are investigated by section focal person or safety officer and reported to laboratory manager who in turn reports in writing to IGH Pharmacy store manager who in turn reports to PFSA and or directly to the vendors.

5.3.2.7 Reagents and consumables – Records

Reagent receiving checklist, bin card and reagent two weeks consumption log are used together to ensure records for reagents and consumables are maintained. In-house prepared reagents are identified by name of reagent, initial of person who prepared the reagent, date of preparation, expiry date and assigned lot number.

Supporting documents

Document Unique ID	Document Name
	Procedure for equipment management
	Procedure for reagent and consumable management
	Check list for receiving reagents and consumables
	Bin Card
	Equipment decontamination form
	Equipment inventory form

	Document and record retention time form
	Reagents daily consumption log
	Physical inventory count form
	Purchasing and inventory SOP

5.4. Pre examination processes

IGHL develops written documents related to information for patients and users, information's included on request form, and specimen management guideline.

5.4.1 Information for patients and users

IGHL develops a laboratory hand book giving details on information for patients and usersbased on ISO 15189: 2015 clause numbers 5.4.2

5.4.2 Request form information

The laboratory has the request form that contains information sufficient to identify the patient and the authorized requester, as well as providing pertinent clinical data according to local requirement. All the request forms developed and accepted as external annexed in specimen management guideline.

5.4.3 Primary sample collection and handling

IGHL laboratory provides written instructions for specimen management (collection, transport and handling).

5.4.3.1 Instructions for pre-collection activities

IGHL written instructions for specimen pre - collection addresses

completion of request form

preparation of the patient

type and amount of the primary sample to be collected with descriptions of the primary sample containers and any necessary additives

special timing of collection, where needed

Clinical information relevant to or affecting sample collection, examination performance or result interpretation.

5.4.3.2 Instructions for collection activities

IGHL develops instructions for collection activities of samples, labeling needs, storage conditions and disposal of materials used for collection.

5.4.4 Sample transportation

IGHL specimen transport follows national and international transport guidelines, and regulations.

5.4.5 Sample reception

IGHL laboratory establishes written specimen/sample acceptance and rejection criteria for each test offered and provides this information to its customers, as applicable. All specimens/samples are inspected according to these acceptance/rejection criteria. Specimens/samples that are not suitable for processing are rejected and notified for requester with reason for rejection.

If the specimen/sample is critical and cannot be rejected, the examination is performed and a notation is made on the report. In the case of critical specimens/samples, such as one of limited volume, the laboratory reception is consults with the requestor to prioritize testing.

A unique registration number is assigned to each specimen/sample to be analyzed. All patients' data is recorded.

5.4.6 Pre-examination handling, preparation and storage

If the specimen needs to be shared for different tests throughout the laboratory and/or storage purposes, each aliquot (sample) is labeled individually with the unique registration number. Samples are stored under proper temperature and safety conditions.

Supporting documents

Document Unique ID	Document Name
	Clinician hand book
	Procedure for verbal request
	Specimen management guideline

	Sample storage and transportation SOP
	Standard request form of different types

5.5. Examination processes

5.5.1. Selection, verification and validation of examination procedures

5.5.1.1 Policy

IGHL ensures to implement an approved examination procedure and use only validated and verified methods to produce accurate and reliable results. Latest version of examination procedure must be available and use at all time. All procedures must be documented and be available at the workstation for relevant staff. Performance characteristics for each examination have in place.

5.5.1.2 Verification of examination procedures

The procedures developed in the laboratory have been through a documented verification process. The procedures used in the laboratory, that have been published in scientific reviews or transmitted by national or international reference centers, have been verified and documented under the laboratory's conditions and adapted when needed.

The methods and techniques used in the laboratory are described in the standard operating procedures (SOPs) and associated documents

5.5.1.3 Validation of examination procedure

IGHL uses only standard methods. IGHLdoes not perform any validation of methods.

5.5.1.4 Measurement uncertainty of measured quantity values

IGHL determines uncertainty of measurement values of its quantitative methods to be used when helping clinicians to interpret patient results, and to determine the inherent error in the system. The management defines expected values of measurement uncertainty of each quantitative method and these are compared with values obtained from annual estimates. IGHL develops a procedure for uncertainty of measurement to guide staff in estimating uncertainty of values. When clinicians or other stake holders request uncertainty of measurement of values IGHL cooperates.

5.5.2 Biological reference intervals or clinical decision values

IGHL adopts biological references from kit inserts/country studies on reference intervals and this has been communicated to health facilities through the Laboratory hand book. Critical values have been established in consultation with local clinicians and are also communicated to health facilities though Laboratory hand book. Whenever examination procedures are changed such that reference ranges and critical values are different, the Laboratory hand book is updated and clinicians are informed by laboratory management.

5.5.3 Documentation of examination procedures

IGHL documents all examination procedures used in its different sections that are available at each work station and kept centrally at the general quality officer's office. All examination procedures and job aids are controlled according to document control procedure. All examination procedures are written in standard format as defined in document control procedure which complies with the requirements of ISO 15189:2015. If IGHL intends to change any examination procedures such that results or their interpretations could be significantly different, the implications are explained to clinicians and health facilities before putting new procedure in service.

Supporting documents

Document Unique ID	Document Name
	procedure for verification of methods
	uncertainty of measurement values form
	procedure for uncertainty of measurement

5.6 Ensuring quality of examination results

5.6.1 Policy

IGHL implements quality management system to ensure that examinations performed are standardized. All staffs have declared in the ethical conduct form that they will strictly understand and follow the standardized methods and procedures.

5.6.2 Quality control

5.6.2.1 Policy

IGHL defines frequency and type of internal quality control procedures in each technical standard operating procedure that verify the attainment of the intended quality of results.

5.6.2.2 Quality control materials

IGHL uses commercial and/or in-house internal quality control materials that react to the examining system in a manner as close as possible to clinical sample. The frequency of examining quality control materials is defined in each technical standard operating procedure and is based on stability of the procedure and risk of harm to the patients from erroneous results.

5.6.2.3 Quality control data

IGHL develops a procedure for review of quality control data to guide staff on reviewing and interpretation of quality control results which prevents release of patient results in the event of quality control failure. When quality control chart and multi rule systems detect any random or systematic errors, preventive actions are put in place. Laboratory experts review quality control data on a daily bases while quality manager review the data monthly.

5.6.3 Inter-laboratory comparisons

5.6.3.1 Participation

IGHL participates in inter laboratory comparisons program such as external quality assessment program or proficiency testing for all its examination procedures according to regular EQA schedule. EQA samples are performed in the same way of patient samples. If results are unacceptable or do not fulfill the requirement, corrective actions will be taken and documented. Procedure for participation in EQA which defines instructions for participation and review of the performance has been developed. The EQA programs are adequate to check the entire examination process including pre-examination and post-examination process in a manner that resembles as close as possible to patient samples.

5.6.3.2 Analysis of inter-laboratory comparison samples

IGHL ensures that EQA samples are integrated into routine work flow in a manner that resembles handling of patient samples. The EQA samples are analyzed by laboratory experts who analysis routine patient samples using the same examination procedures. Laboratory experts are not allowed to communicate with other participating laboratories about EQA sample data until results are submitted. EQA samples are not referred to other laboratory for confirmatory tests nor are expert advice sought. Staffs are bound by ethical conduct declaration to abide by this regulation.

5.6.3.3 Evaluation of laboratory performance

IGHL's quality manager, section focal person and laboratory expert of respective sections involved in analyzing EQA samples are responsible for review of performance and implementing corrective actions when results are not acceptable. Quality manager and section focal persons monitor the effectiveness of corrective action taken through daily internal quality control and subsequent EQA. The section focal persons compile annual report on performance in EQA which is used as a preventive action to detect trends. The reports are presented and discussed in Lab management reviews.

5.6.4 Comparability of examination results

IGHL have a means of comparing equipment or examination methods performing the same tests in order to have confidence in using methods parallel to each other. Any differences in comparability and their effect to patient samples are discussed with clinicians. Section focal persons maintain comparability records and any actions taken as a result of problem identified.

Supporting documents

Document Unique ID	Document Name
	procedure for review of internal quality control results
	Procedure for participation in EQA
	ethical conduct declaration form
	Procedure for comparison of equipment or methods

5.7 Post- examination processes

5.7.1 Review of results

IGHL has procedures to ensure results are reviewed and released by authorized laboratory personnel. The review process takes into account results of internal quality control. IGHL laboratory information system does not automatically select and report results unless approved and released by authorized laboratory personnel.

5.7.2 Storage, retention and disposal of clinical samples

IGHL has a procedure for sample management which defines identification, collection, retention, indexing, access, storage, maintenance and safe disposal of clinical samples. The period of sample retention is defined in sample retention schedule. Samples are safely disposed in accordance with health and safety guideline for public health laboratories in Ethiopia.

Supporting documents

Document Unique ID	Document Name
	procedure for reporting and releasing result
	sample management guideline
	sample retention schedule
	Health and safety guideline for public laboratory in Ethiopia

5.8 Reporting of result

IGHL report results through the laboratory information system which ensures accuracy, clarity, unambiguously in accordance to procedure for reporting and releasing of results and as per examination procedures. Hard copies of result are printed from the laboratory information system by reception staff and send to health facilities. Result review process ensures checking of transcription or transmitting errors before results are released by authorized laboratory expert. Reports are released with reference ranges in SI unit where applicable, and accompanied by any relevant comments on integrity of sample. Reception staff notifies health facilities and patients of any delay in processing sample that could compromise patient care.

5.8.2 Report attribute

IGHL ensures laboratory results are effectively communicated and meet the users need where relevant:

Comments on sample quality that might compromise examination results are made

Comments on regarding sample suitability with respect to acceptance/rejection criteria are made

Critical results are timely communicated through telephone and flagged/highlighted on the report

Interpretative comments are made

5.8.3 Report content

IGHL report content meets requirements of ISO 15189:2015

Supporting documents

Document Unique ID	Document Name
	Procedure reporting and releasing result
	Acceptance and rejection criteria
	Report template

5.9 Release of results

5.9.1 Policy

A procedure for reporting and releasing of results has been developed which guide authorized laboratory personnel on how to release results and to whom. Results of patients with serious implications are not communicated directly to the patients. Such results are communicated to referring health facility for opportunity to better patient management. Staffs ensure that when suitability of primary sample is compromised, it should be indicated in the report. Laboratory experts are responsible for communicating critical results to health facilities by telephone and ensuring that the hard copy report gets to the facility in the shortest possible time. When interim reports are issued pending confirmatory test, laboratory experts ensure the final report is issued in the shortest possible time. When results are communicated through telephone, the laboratory experts ask the identity of the received person to ensure that results reach only authorized personnel. Such communications are captured in communication log.

5.9.2 Automated selection and reporting of results

IGHL does not operate a system which automatically selects and report results. All results are verified in the laboratory information system by authorized laboratory personnel before released. Presence of sample interference and warning messages or critical values are included during reporting of results.

5.9.3 Revised report

IGHL establishes a procedure how to revise original reports for reporting and releasing of results. Laboratory personnel authorized to revise reports ensure that: the revised report is clearly identified as revised and makes reference to the date and patients identity in the original reportthe requesting clinician is made aware of the revision and original report is recalled by laboratory focal person and revised report is re-issuedthe revised report shows date and time of the change and name of person responsible for the change the original report entries remain in the records when revisions are made

The section focal person maintains records of revised reports.

Supporting documents

Document Unique ID	Document Name

	Procedure for reporting and releasing of results
	Communication log

5.10 Laboratory information management

5.10.1 Policy

IGHL staffs have access to data and information needed to provide service which meets the needs and requirements of customers. Procedure for ensuring confidentiality of patient information is available and staff has also signed ethical conduct declaration preventing them from disclosing patient confidential information from unauthorized persons.

5.10.2 Authorities and responsibilities

The management of IGHL has authorized some of its staff through their job descriptions to perform one or all of the following:

- access patient data and information
- enter patient data and examination results
- change patient data or examination result
- release examination result and report

5.10.3 Information system management

IGHL operates a laboratory information system for collection, recording, reporting, storing and retrieval of examination data. The laboratory information system in use has been validated by the vendor and verified by the laboratory that it's suitability for its intended use. A procedure for the operation and maintenance of Laboratory information system is available giving instructions on the day to day activities use. All staffs are issued with password which has access levels to use the laboratory information system. This ensures the Laboratory information system is protected from unauthorized persons as well as from tempering or loss. The laboratory information system was installed by Polytech LIS vendor and (EID, EQA, Equipment maintenance, training and electronic Health databases). IGHL maintains records of changes/updates. IGHL customers are

not connected automatically to the laboratory information system; results are printed and issued as hard copy. IGHL has backup generator and uninterrupted power supply (UPS) connected to all computers to ensure service is not interrupted during power cuts. When the LIS system fails the laboratory will revert back to the manual system of recording patient data in work sheet and releasing manual report, and the patient's results in hardcopy are protected by locking in lock board. The laboratory has 24 hour security and monitors visitors by issuing them with visitors ID cards.

Supporting documents

Document Unique ID	Document Name
	Procedure for ensuring confidentiality of patient information
	procedure for the operation and maintenance of Laboratory information system

References

• ISO 15189:2012 – Medical Laboratories – Particular requirements for quality and competence

• QMS02 -A6, Quality management system: development and management of laboratory documents; approved guideline- six edition. February 2013

DECLARATION

I have read and understand this quality manual and I agree to consistently follow the guide as described.

S/N	Full Name	Signature	Date	Remark
1	Mulune Kassahun			
2	Addise Abera			
3	Arefayne Kassahun			
4	Muluken Dagnaw			
5	Ezezhw Maru			
6	Andualem Amare			
7	Dagnaneh Milikit			

Chapter VII:Research

7.1. Determinants of Tuberculosis in HIV-infected adults taking antiretroviral therapy (ART) among public Hospital in Addis Ababa, Ethiopia: A Case–Control Study

Abstract

Background: Tuberculosis (TB)is one of the world's most common causes of death in the era of human Immuno deficiency virus(HIV). It is among the leading causes of death for people living with HIV (PLWHIV) which shares about 25% of all causes of the deaths. Therefore, the aim of this study was to identify the determinants of TB/HIV co-infection among HIV-positive adults attending clinical care in Addis Ababa public hospitals.

Objective: To identify determinants for tuberculosis (TB) among HIV-infected adults; taking ART in Addis Ababa public hospitals from October 23 to Nov 28, 2017.

Methods: A hospital based un matched case control study were conducted among public hospitals in Addis Ababa from October 23 to Nov 28, 2017. A total of 312 individuals consented to participate in the study (104 cases and 208 controls). Cases were HIV-infected adults diagnosed with active TB and controls were HIV-infected adults without active TB. Systematic random sampling technique was used. Semi structured questionnaires and record review were instruments for data collection. The link between TB and determinants were assessed using backward logistic regression.

Result: A total of 312 were included in the study and more than half 185(59%) of them were females. Base line CD4 cell count <200 cells/µL (AOR 3.7; 95% CI (1.4-3.9), baseline WHO clinical stage 3 (AOR 3.0; 95% CI (0.97-9.1) and stage 4 (AOR 3.7; 95% CI (1.01-13.0) and baseline BMI <18.5 kg/m^2 (AOR 3.5; 95%CI (1.5-5.5),TB patient in the household (AOR 2.5; 95% CI (1.3-4.7), missed to take HAART (AOR 6.2; 95% CI (3.2-12) and alcohol drunker(AOR 2.7; 95% CI (1.4-5.1) were independent determinants for occurrence of TB. knowledge about transmission of TB/HIV (AOR 0.23; 95% CI (0.08-0.39) and IPT (AOR 0.27; 95% CI (0.14-0.51) had a protective against TB.

Conclusions and recommendations: The study came up with that TB/HIV co-infection was associated with the majority of clinical variables and some social characteristics in multivariate

logistic regression analysis. Expansion of HAART and IPT servic11e are some of the best measures for reducing TB.

Key words: Case-control study, HIV/AIDS, TB, TB/HIV co-infection

Introduction

Background

Tuberculosis (TB) is one of the world's most common causes of death in the era of human Immuno deficiency virus (HIV) (1). It is among the leading causes of death for people living with HIV (PLWHIV) which shares about twenty-five percent of all causes of the deaths (1). TB and HIV are called a "deadly duo" as HIV weakens the immune system and makes them more susceptible for TB infection. On the other hand, TB increases the progression of HIV to AIDS stage (2).HIV infection has contributed to a significant increase in the worldwide incidence of TB by producing a progressive decline in cell-mediated immunity and alters the pathogenesis of TB. Although HIV-related TB is both treatable and preventable, incidence continues to climb in developing nations where in HIV infection and TB are endemic and resources are limited (1, 3).

Tuberculosis (TB) is a leading cause of death among people living with HIV (PLHIV). Of the estimated 9.2 million new TB cases and 1.7 million deaths from TB in 2006, 709,000 cases (8%) and 200,000 deaths (12%) occurred in PLHIV (4). The African Region accounts for 85% of the global distribution of HIV-positive TB patients. Collaborative TB/HIV activities are essential to ensure that HIV-positive TB patients are identified and treated appropriately; and to prevent, diagnose and treat TB in PLHIV(4).

Although tuberculosis (TB) cases and deaths declined significantly between 2011 and 2015, one subpopulation of patients is being hit harder by TB infections more than ever. Individuals living with HIV showed a 40% increase in co-infection with TB over the same study period (5).

In recent years, there has been considerable progress, particularly in the African Region, with the provision of TB/HIV interventions. Patients with symptoms of TB and HIV seek and receive care from a wide variety of health-care providers outside the national TB and HIV/AIDS control programmes, depending upon availability, acceptability, costs and many other factors(4).

HIV is one of the most important factors contributing to the increase in active TB cases in sub-Saharan Africa. HIV infection increases the risk of rapid TB disease progression. There is evidence that adults and children co-infected with HIV and TB are at greatest risk of malnutrition, poor treatment outcomes, and death. Efforts to prevent, manage, and treat HIV and TB have been largely separate endeavors, despite the overlapping epidemiology. Continued and

improved collaboration between TB and HIV/AIDS programs is necessary to control TB more effectively among HIV-positive people and to make significant public health gains(6).

In many individuals infected with HIV, development of active TB disease is the first sign of AIDS. Active TB often occurs at a higher CD4+ (cluster of differentiation4) lymphocyte count than other HIV-related illness. TB is a potent factor in the progression of HIV/AIDS (7).

Addis Ababa city accounted for the highest prevalence rate of HIV from Ethiopia (8). The presence of high emigration and immigration from and to the city put at risk to both Tb and HIV. Clients attending HIV clinical care on ART were 21,578 PLHIV in the study hospital (St.peter, ALERT, Zewuditu, Yekatit 12 and Minilk hospital). Overall, 927 TB/HIV co-infected patients are in clinical care during the commencement of this study in these hospitals. Primary health care services, including diagnosis and treatment of Tb, voluntary counseling and testing (VCT), prevention of mother to child transmission (PMTCT), ART and opportunistic infections (OIs) treatment services are available in these hospitals (9).

Statement of the problem

TB is one of the top ten causes of illness, death, and disability worldwide and is the leading cause of death from a curable infectious disease(10).Tuberculosis is most commonly transmitted by inhalation of infected droplet nuclei, which are discharged in the air when somebody with untreated sputum-positive pulmonary TB coughs, sneezes and talks (11). It is estimated that approximately one-third of the world's population is infected with Mycobacterium tuberculosis (here after called latent TB), with 8.8 million new cases during 2005 alone (12).

There were an estimated 1.4 million TB deaths in 2015, and an additional 0.4 million deaths resulting from TB disease among people living with HIV. People living with HIV accounted for 1.2 million (11%) of all new TB cases (13). More than 80% of TB patients live in Asia and sub-Saharan Africa, considered by World Health Organization (WHO) to be "high burden countries" (12).

In the world's most affected region, eastern and southern Africa, the number of people on treatment has more than doubled since 2010, reaching nearly 10.3 million people. AIDS related deaths in the region have decreased by 36% since 2010. However, huge challenges lie ahead. In 2015 there were 2.1 million [1.8 million–2.4 million] new HIV infections worldwide, adding up to a total of 36.7 million [34.0 million–39.8 million] people living with HIV(14).Ethiopia is one of the 22 high burden countries (HBCs) and TB remains one of the leading causes of mortality. According to the 2014 WHO report, the prevalence and incidence of all forms of TB are 211 and 224 per 100,000 of the population, respectively. Excluding HIV related deaths; in 2013 TB mortality was estimated to be 32 per 100,000 of the population. About 13% of all new TB cases are also HIV co-infected. Moreover, Ethiopia is one of the high TB/HIV and multidrug resistant TB (MDR TB) burden countries. According to the recent national TB drug resistance surveillance report, 2.3% of new TB cases and 17.8% of previously treated TB cases were estimated to have MDR (15).

Tuberculosis was associated with some social demographic characteristics and clinical variables. Working age group patients were the most affected by both HIV and tuberculosis. There were also statistically significant differences on the prevalence of tuberculosis between males and

females, males being more affected. In addition, being deriver and single was also positively associated (16).

As expected, TB was found to be high among patients on WHO clinical stage III and IV, CD4 cell count <200/ml during ART initiation and patients who had not received INH (Iso Nicotinyl Hydrazine) prophylaxis. An overall diagnostic approach as well as INH prophylactic preventive measures should be strengthened to manage cases as early as possible to reduce TB incidence (16).

In resource-limited settings, the health care systems are overwhelmed by the preventive, therapeutic and diagnostic challenges of the 'HIV–TB syndemic'. In Ethiopia, the dual epidemics have drained resources and overburdened the already very limited health work-force (17). HIV increases life time risk of developing TB (18). Studies indicated that certain HIV-infected people develop TB, while others do not. This phenomenon iterates that being HIV positive is not a mere factor for being infected with TB, and there are various determinants factors that contribute to the TB/HIV co-infection (19, 20). These factors vary contextually which necessitate conducting the present study.

Previous studies have identified socio-demographic, clinical, life style and environmental determinants for TB (21, 22). However, among HIV-infected adults, the determinants for TB are still not well described, particularly in a resource-limited setting. Determinants for TB among HIV-positive adults vary from one setting to another. Therefore, a context specific study in a high-burdened TB/HIV region is indicated.

Most reviewed literatures have principally tended to address determinants of active tuberculosis in HIV/AIDS patients: factors such as socio-demographic variables, host-related variables and Environmental determinants (16, 23) but those literatures were missing other important clinical factors (Hemoglobin level, Body Mass Index (BMI), other chronic disease) that are crucial determinants of Tuberculosis in HIV/AIDS patients. Therefore, this study designed to differentiate the risk factors among HIV /AIDS patients who were on ART in the study area.

Significance of the study

Despite the increasing number of TB/HIV co-infection in Ethiopia, little is known about what predisposes patients on antiretroviral therapy (ART) to TB co-infection. At present, there is no information on the risk factors of TB among HIV-positive adults in Addis Ababa city administration. Hence, the finding of this study was conducted to provide information about risk factors to improve areas of health care services regarding the prevention and TB/HIV management. The study also serves as a baseline for further studies, directly or indirectly could benefit the policy makers, researcher, participants, and the community in general.

Literature Review

Determinant of Tuberculosis

Socio-demographic and economic factors

In 2014, 20 countries in the European Union and European Economic Area (EU/EEA) that were included in the logistic regression analysis, HIV infection was more frequently reported in male TB cases than in female TB cases (5.2 versus 4.3%; OR 1.23; 95% CI 1.07–1.41). The most affected age group was the one from 25 to 44 years with 8.3% reported as HIV-positive (24).

Study done in North East Ethiopia revealed that, on multivariable logistic regression, the proportion of HIV infection in TB suspects was significantly lower among ethnic Afar [OR 0.16 (95% CI: 0.070.37)] than Amhara; on the other hand, being literate was independently associated with a significantly higher proportion of HIV infection OR2.21 (95% CI: 1.054.64(25)

Study done in North West Ethiopia stated that, Married HIV-positive adults were also less likely to develop TB than those who were never married (P= 0.002, CI= 0.27- 0.75) (23). Retrospective cohort study done in South west Ethiopia, factors associated with the Tb/HIV co- were commercial sex worker, rural resident and recorded as bed-ridden. Commercial sex workers were nearly 6 times (AOR, 5.6; 95 % CI, 1.2–25.8) higher at risk of death than government employee. The relative probability of Tb/HIV co-infection mortality among those with bed-ridden status was higher than (AOR, 3.9; 95 % CI, 1.5–10.3) functional work status. The association of Tb/HIV mortality among rural residents was 3.4 times (AOR, 3.4; 95 % CI, and 1.4–8.4) higher than among those who were urban residents (26).

A retrospective study conducted at Metema Hospital revealed that, univariate and multivariable logistic regression analysis was performed to identify socio-demographic and clinical predictors for HIV/TB co-infection among the study participants. The results showed that there was no significant association between HIV/TB co-infection, and the selected demographic and clinical determinants (P > 0.05) (27).

Clinical factors

A case control study done in North west Ethiopia showed that, HIV-positive adults receiving HAART (AOR 0.25; 95% CI 0.13 to 0.51), CPT (AOR 0.32; 95% CI 0.19 to 0.52) and IPT (AOR 0.22; 95% CI 0.11 to 0.42) were less likely to develop TB, but presence of a TB patient in the family (AOR 2.66; 95% CI 1.25 to 5.66), and CD4 count <200 cells/μL (AOR 7.22; 95% CI 3.39 to 15.37)) were independent determinants for increased TB occurrence (23).A case control study done in west Ethiopia showed that Low CD4 cell count (<200 cell/mm3) was significantly associated withTB infection, (OR=2.35, 95% CI (1.23, 4.48). Compared to the respondent who had CD4 count greater than 500 cells/mm3, those who had CD4 count below 200 and 200–500 cell/mm3 were 2.3 and 1.4 times more likely to develop TB infection, respectively. Those who were in WHO clinical stages three and four were two times more likely to develop TB than those in stage one and two OR = 2.09, 95% CI (1.33, 3.28) (28).

A cross-sectional study done in North West Ethiopia revealed that, tuberculosis suspects who were underweight (BMI<18.5 kg/m) were sixteen times [AOR=16.26, 95 % CI=4.5–67.9) more likely to develop smear positive pulmonary tuberculosis than those who had normal weight (29).

As to functional status is concerned, a retrospective cohort study done in southwest Ethiopia; bedridden patients had four times (AOR, 3.9, 95 % CI: 1.5–10.3) an increased risk of mortality than in working status (29) but study conducted in Bahir Dar reported that bedridden patients were nearly four times at risk of dying than in work functional status (AOR = 3.88; 95 % CI: 2.15–7.02) (30).

Individual related and Environmental determinants

Previous study done in South Africa showed that, current smoking was significantly associated with a more than 3-fold increase in the odds of PTB compared to never smoking after adjustment (AOR 3.2, 95%CI: 1.3±7.9, P = 0.01). For participants reporting former smoking, the adjusted odds ratio was increased but not statistically significantly (AOR 1.8, 95%CI: 0.8±4.4, P = 0.18). Education above the fifth grade level was associated with a decrease in odds of smoking history among participants (31).

Cross-sectional study done in Burkina Faso stated that, TB risk factors among PLWHAs were urban setting (p=0.002), TB history (p<0.001), higher number of persons living in the household (p=0.003), previous imprisonment (p=0.002), knowledge toward TB/HIV (p<0.001), poor geographic access to care (p=0.003) and past or present history of pulmonary asthma (p=0.048) (32).

A case control study done in North West Ethiopia stated that, chewing khat (AOR 2.22; 95% CI 1.11 to 4.41), being a smoker (AOR 5.47; 95% CI 2.26 to 13.22) and drinking alcohol (AOR 2.49; 1.29 to 4.80) were independent determinants for increased TB occurrence. Subjects with a separate kitchen in the house (AOR 0.48; 95% CI 0.28 to 0.83) were less likely to develop TB. Patients who live with a TB patient in the household (AOR 2.66; 95% CI 1.25 to 5.66) were more likely to develop TB (23).

A cross-sectional study conducted among prisoners of North Gondar zone showed, TB suspects who had contact with active TB patients in their vicinity were about five times (AOR=5.03, 95 % CI=1.05–19.30) more likely to develop smear positive pulmonary tuberculosis than those who had no history of contact with known tuberculosis patients (33).

Conceptual framework

The theoretical framework of the study is based on the previous study that the possibility of individuals infected with HIV/AIDS to get infected with tuberculosis is highly dependent on their knowledge of TB and HIV co-infection, Environmental determinants, socio-demographic and socio-economic status and Individual-related and Clinical determinants. The frequency of regular monitoring CD4 level and use of ART decrease morbidity and mortality rate among TB co-infection patients and this in turn would increase their productivity. Likewise knowledge influences the degree of practices towards control and prevention of TB and HIV co-infection. This also indicates that when individuals are aware of the overall aspect of TB co morbidity, their health service seeking behavior will positively change. Therefore, the framework shows that it is the responsibility of health care delivery institutions, health professionals, government bodies, and different stakeholders to tackle the problem by taking different measures such as poverty reduction, equipping the health facilities with equipment and supplies, increasing awareness of the community on the problem, and formulating appropriate policy (23, 26, 28).

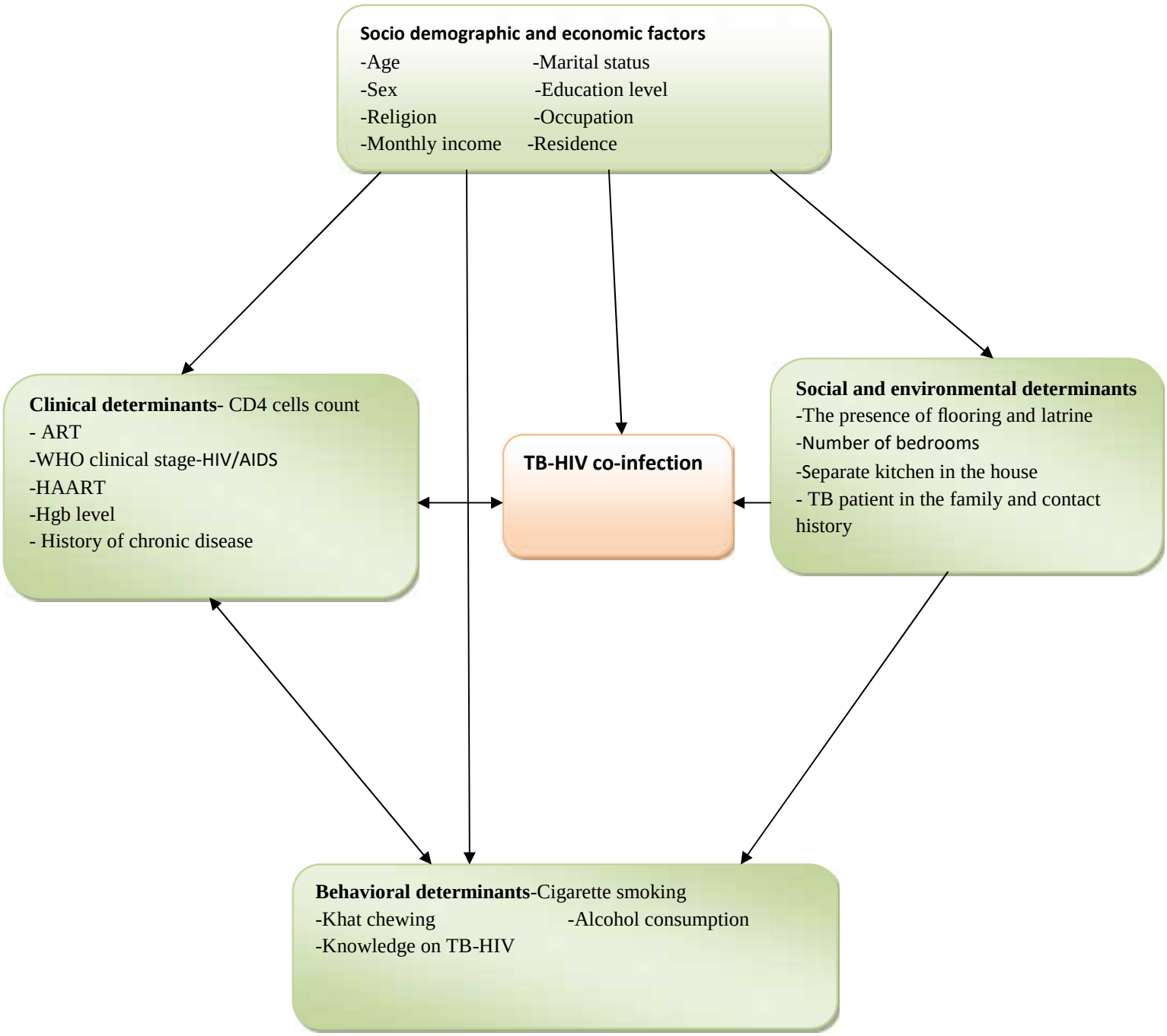


Figure21: Conceptual framework for Tuberculosis and HIV/AIDS co-infection related determinants, Addis Ababa, Ethiopia.

Objective

General Objective

- To identify determinants for tuberculosis (TB) among HIV-infected adults; taking ART, from October 23 to Nov 28, 2017, Addis Ababa, Ethiopia

Specific Objective

- To determine the socio-demographic and socio-economic determinants associated with TB co-infection in HIV /AIDS patients
- To find out social and environmental determinants associated with TB co-infection in HIV /AIDS patients
- To identify behavioral related determinants associated with TB co-infection in HIV /AIDS patients
- To identify clinical determinants associated with TB co-infection in HIV /AIDS patients

Methods

Study area

Addis Ababa is the capital and largest city of Ethiopia and its catchment area comprises a population of 3,515,679 of which 1,828,153(52%) were females and 1,687,526 (48%) were Males projected from census 2007 (37). An average of 5.3 persons to a household is residing in the city. It has 10 sub cities with their authorized administration and the City covers 527 square kilometers. The largest ethnic groups reported in the town were the Amhara (56%), Oromo (19%), Gurage (16%) and the Tigray (5%). The city has 10 Hospitals and96 health centers which are currently on service. The physical health service coverage of the city is 100 % by health centers (9).

Study design and period

A hospital based un matched case control study was conducted to assess determinants of Tuberculosis in HIV-infected adults among public Hospital in Addis Ababa from October 23 to Nov 28, 2017, Addis Ababa, Ethiopia

Population

Sources of population

All HIV patients who are diagnosed to have active TB and aged ≥15 years that attended TB/HIV medical treatment in Addis Ababa

Study population

TB-HIV Patients (cases) and HIV adults on ART without TB(controls) who were members of the selected hospitals attending TB/ART clinic in the study period and who fulfills inclusion criteria

Study subject

TB-HIV Patients in the selected hospitals attended TB clinic in the study period, which fulfilled inclusion criteria and actually selected to participate in the study

Case definition

Case: HIV-infected adults on ART diagnosed with active TB by any TB diagnostic technique (Microscopy, chest X- ray, biopsy and fine Needle Aspiration (FNA)) and received TB treatment during the data collection.

Control: HIV-infected adults on ART and without any sign of TB

Inclusion criteria

Cases

TB TB/HIV co-infected patients on ART and aged 15 and above

Controls

HIV-infected adults on ART without TB and aged 15 and above

Exclusion criteria

Cases

- Suspected case but not confirmed TB
- Those patients who were seriously ill, had a mental problem and transferred from other health facilities without complete information
- Those patients who had tuberculosis before but cured

Controls

- Subjects who were presented with these symptoms of TB
- Patients who were seriously ill, had a mental problem and transferred from other health facilities without complete information
- Patients who had tuberculosis before

Sample size determination

Two proportion formula for unmatched case-control study design were used

$$n_1 = \frac{(Z_{\alpha/2} + Z_{1-\beta})^2 \bar{p}\bar{q}(r+1)}{r(p_1 - p_2)^2} \qquad n_2 = r n_1$$

$$\bar{p} = \frac{p_1 + r p_2}{r+1} \qquad \bar{q} = 1 - \bar{p}$$

Sample size was calculated using Epiinfo 7 statcalc for unmatched case-control study, based on the following assumptions

Two sided confidence level (1-α) = 95%

Power (% chance of detecting) = 80%

Ratio of controls to cases = 2

Least extreme Odds Ratio to be detected = 2.0

From previous study conducted in Western parts of Amhara region indicates that (23);

The proportion of low CD4 cell count was for the cases (P1) = 58%.

The proportion of low CD4 cell count was for the controls (P2) =40.5%

The sample size was calculated for exposure status of different variables to obtain adequate number of study subjects. The largest sample was taken among these exposure variables.

Sample size for cases (n1) = 104

Sample size for controls (n2) = 2n1= 208

Total sample size=312

Sampling technique

Five hospitals were selected among the ten hospitals of the city that give TB/HIV services by simple random sampling technique. Samples proportional to HIV patients on ART in selected hospitals were allocated. To select the study subjects, lists of cases and controls were prepared using unique identification numbers from records found in TB/HIV clinics and sampled by systematic random sampling using the registers sampling frameand lotterymethod was used for the 1st participant (104 cases and 208 controls).

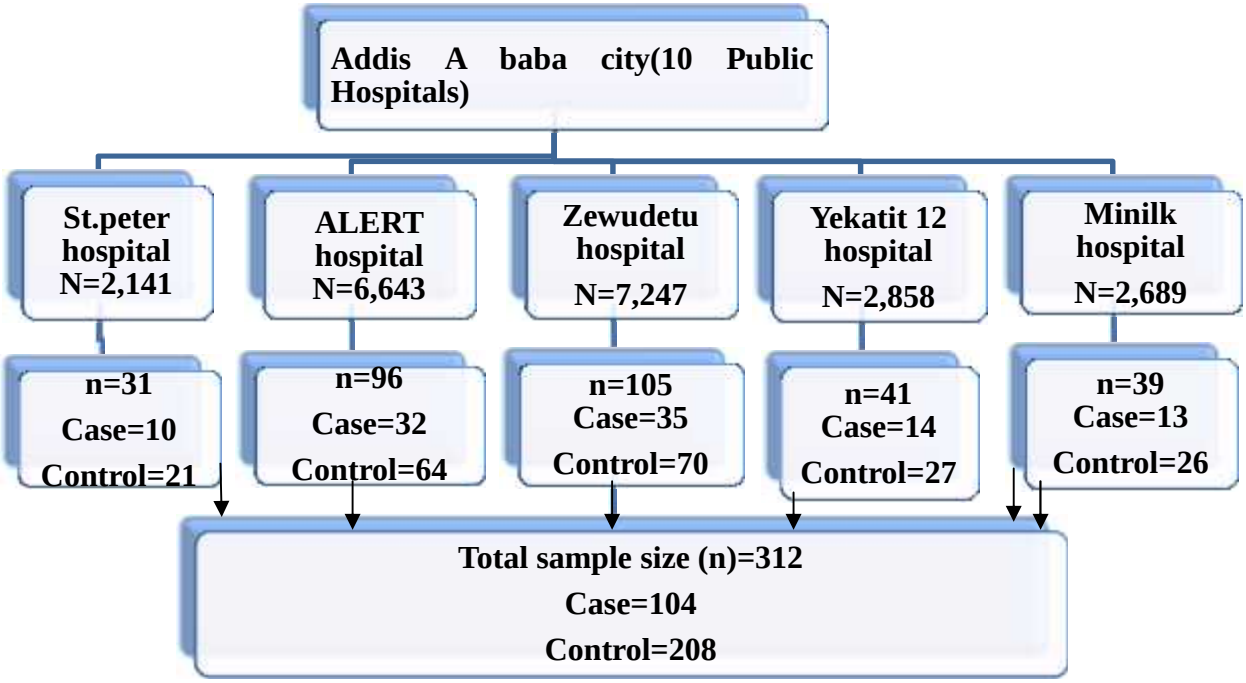


Figure22: Oregano grams of sampling technique in sampling process

Data collection

Data was collected from two sources: Face to face interviews (five trained nurses) were conducted with study participants by using semi structured questionnaires that was prepared in English, translated into Amharic and back translated. Data was collected on government working days and the participants were interviewed after they received routine clinic services. The interview was made in a separate room to ensure privacy and to facilitate discussions between the interviewer and the respondent. The primary data was collected to assess socio-demographic and socio-economic determinants, behavioral-related determinants, social and environmental determinants. Trained nurses also collected data from patients' records to assess clinical variables: highly active antiretroviral therapy (HAART), CD4 cell count, BMI, Hemoglobin level, CPT and IPT. Data collection procedures were supervised by investigators and public health professionals.

Management of data quality

In order to keep the reliability of data collection instrument, the research questionnaires were designed carefully to address the research topic and data collectors were trained about data collection instrument and process. The questionnaires were prepared in English, translated into Amharic and back translated to check consistency and ease of understanding. The questionnaires were pre tested on 5% of the cases and 5% controls in another hospital which provided ART service and which was not part of the study. During pre-test the questionnaires were checked for its clarity, simplicity, comprehensiveness and coherence based on the feedback that obtained from the respondents and necessary adjustments were made in the data collection instrument by incorporated additional comments. All data were checked and cleaned for the missing variables, consistency of filling of questionnaires and completeness before data entry. Data collection processes were supervised regularly by the investigator and supervisor to avoid any issues that arise during the data collection.

Study variables

Dependent variable

- TB/HIV co-infection

4.8.2. Independent variables

- Socio-demographic and socio-economic determinants: - age, sex, marital status, religion, educational level, occupation, residence and income.
- Social and environmental determinants: - the presence of flooring, latrine, house condition, separate kitchen in the house, patient in the family and contact history.
- Behavioral-related determinants: - Cigarette smoking, khat chewing, alcohol consumption and knowledge of TB and HIV/AIDS
- Clinical determinants: - CD4 cells count, Hemoglobin level, pneumonia history, other chronic disease BMI(Body Mass Index), HAART and WHO clinical stage

Operational definitions

A person with substance abuse (chewing khat, alcohol consumption or smoking):- will be defined as an individual who is currently using the substance or has a history of regular substance abuse.

Ambulatory: - able to perform activity of daily living

Bedridden: - not able to perform activity of daily living

Body Mass Index (BMI): Is a measure of body fat based on weight in relation to height and applies to men and women aged >=15 years (<18.5, ≥18.5kg/m)

CD4 count: - a way of measuring immune-competency by counting the lymphocyte that carries the CD4 molecules and CD4 count <200 is considered as low (<200, 200–499 and ≥500 cells/µl)

Formal education: - received formal education starting from grade one.

Functional status: - will be categorized as work (able to perform usual work),

Hemoglobin level: The amount of hemoglobin molecule in a volume of blood (<10, 10–12 and ≥12.5mg/dL)

House condition: The physical of the house whether a house supplied with fresh air or not that is a house with one or more window is considered as ventilated but without window is considered as not ventilated.

Illiterate: -couldn't read and write

Knowledge about transmission of TB/HIV: These individuals who scores (answers) above the mean from the given option has a good knowledge transmission of TB/HIV and these who scores below the mean has poor knowledge about transmission of TB/HIV (23).

Read and write only: Could read and write but received no formal education

Risk Factor- A feature of somebody's habits, socio-economic, environmental, host related or personal history that increases the probability of TB disease or harm among HIV patients.

TB suspected: Subjects who will not actively screened for TB and if the patient will present with any one of these symptoms case (cough, weight loss, night sweating and fever).

TB/HIV Co-infection:-The existence of TB/HIV disease at a time

Tuberculosis- is an infectious disease that causes small rounded tubercles to form on mucous membranes, especially pulmonary tuberculosis that affects the lungs.

Data entry and analysis

The data was entered by using Epi-Info version 7. The entered data was analyzed by SPSS version 20. Bivariate analysis was used to compute crude association and to identify candidate variables for multiple logistic regressions. Multiple logistic regressions were used to identify predictors of the outcome variables. Predictors of the outcome variables with a P-value <0.2 in bivariate analysis was candidate to be entered in multivariable logistic regressionand independent variables were identified. During the analyses, association between predictors and outcome variables were tested by using OR (Odd ratios), 95% Confidence Interval and P-value, P-value less than 0.05 was taken as significant association. Model fitness was tested by Hosmer-

Lemeshow Goodness-of-fit method and the fit of the model was checked: a poor fit of the model if the p value is <0.05 and good fit, if the p value is >0.05.

Ethical Consideration

The study was conducted after getting an approval from Institutional Review Board (IRB) of the St. Paul's Hospital Millennium Medical College, Department of Public Health. An ethical clearance and official letter as to perform the study was obtained from the department of public health to the Addis Ababa regional health bureau, St.peter hospital and ALERT hospital. The regional office Research and Ethics Committee given supportive letter to Yekatit 12 hospital, Minilk hospital and Zewuditu memorial hospital; then each hospital administrator was wrote permission letter to the respective TB/HIV clinics as to start the study. All study participants were informed about the study and assured about the confidentiality, protection and anonymity of data. Written consent was obtained from each study participant prior to data collection and they participated voluntarily in the study.

Results

A total of 312 (104 cases and 208controls) were included in the study. More than half 185(59%) of them were females. The median age was 37 years with a range of 16-40 year. Two hundred ninety-three (94%) were urban dwellers and 201(64.4%) attended formal education.

Bivariate analysis

Socio-demographic and socio- economic determinants

Compared to the respondent who attended College and above, those illiterate (COR 3.4; 95% CI (1.3-6.0) and read & write (COR 2.4; 95% CI (1.05-5.4) were more likely to develop TB though did not reach significance after controlling for the confounders in multivariate analysis. Married patients (COR 0.40; 95% CI (0.18-0.86) were less likely to develop TB than patients who had never been married though did not reach significance after controlling for the confounders in multivariate analysis.. However, age sex, residence, income and occupational status were not a determinant for TB (Table1).

Table 26: Socio-demographic and socio- economic determinants of TB among HIV-positive adults in Addis Ababa public hospitals, Ethiopia, 2018

Variables		Case(N=104) n (%)	Control(N=208) n (%)	COR(95% CI),P-value
Age	15-34	39(37)	84(41	1
	>35	65(63)	124(60)	1.13(0.69-1.8),p=0.62
Sex	M	38(36)	88(42)	1
	F	66(64)	120(58)	1.3(0.78-2.06),p=0.33
Marital status	Single	12(12)	40(20)	1
	Married	41(39)	55(27)	0.4(0.180.86),p=0.019
	Divorced	42(40)	86(43)	0.61(0.29-1.3),p=0.19
	Widowed	9(9)	27(13)	0.9(0.33-2.4),p=0.83
Level of Education	Illiterate	16(16)	16(8)	3.4(1.3-6),p=0.012
	Read & write	27(26)	52(26)	2.4(1.05-5.4),p=0.037
	Elementary	23(22)	37(18)	1.6(0.68-3.8),P=0.28
	Secondary	27(26)	65(31)	1.9(0.84-4.4),P=0.12
	College and	11(11)	96(46)	1

	above			
Income	<30USD	57(55)	96(46)	1.28(0.80-2.05),p=0.29
	>30USD	47(45)	112(54)	1
Residence	Urban	97(93)	196(94)	1.2(0.45-3.1),p=0.73
	Rural	7(7)	12(6)	1
Occupation	Driver	10(10)	18(9)	2.4 (0.74-5.8),p=0.14
	House wife	12(12)	23(11)	1.4 (0.47-4.4),p=0.51
	Student	7(7)	22(11)	0.68 (0.27-1.7),p= 0.41
	Unemployed	15(15)	24(12)	1.2(0.47-3.1),p= 0.71
	Daily laborer	19(19)	41(20)	0.89(0.32 -2.4),p=0.82
	Merchant	27(27)	33(16)	1.7(0.55-5.5), p= 0.34
	Private employee	8(8)	21(10)	1.06(0.37-3.0),p= 0.91
	Government	6(6)	26(13)	1

Social and environmental determinants

Higher proportion of the cases (63.5%) had TB patients in the family when compared to the controls (42%). The results showed that, study participants who had lived with infected TB cases in the family (COR 1.9; 95% CI (1.2-3.1) were more likely to develop TB. Sixty six (63.5%) of the cases and 157 (75.5%) of the controls did have separated kitchen. Subjects with a separate kitchen in the house (COR 0.56; 95%CI (0.34-0.94) were less likely to develop TB though did not reach significance after controlling for the confounders in multivariate analysis. Higher proportion of the controls had a good knowledge about transmission of TB/HIV and knowledge about relationship between TB and HIV when compared to the cases. Having knowledge about transmission of TB/HIV (COR 0.48; (0.24-0.96) and knowledge about relationship between TB and HIV (COR 0.47; 95%CI (0.24-0.92) decreased the chance of acquiring TB infection by 47% and 48% respectively. Cases were more likely to be smokers (COR 1.7; 95% CI (1.01-2.9) and alcohol drunker (COR 2.1; 95% CI (1.3-3.4). However, Contact history with the TB patients,

housing condition, floor of the house, walls of the house electricity supply, smoking and chewing khat were not a determinant for TB (table 2).

Table 27: Social and environmental determinants of TB among HIV-positive adults in Addis Ababa public hospitals, Ethiopia, 2018

Variables		Case(N=104)n (%)	Control(N=208)n (%)	COR(95% CI),P-value
TB patients in the family	Yes	63(61)	88(42)	1.9(1.2-3.1),p=0.007
	No	41(39)	120(58)	1
Contact history with the TB patients	Yes	53(51)	88(42)	1.4(0.88-2.3),p=0.14
	No	51(49)	120(58)	1
Family members living in the house	<4 people	62(60)	113(54)	1.2(0.77-2.0),p=0.38
	>4 people	42(40)	95(46)	1
Housing condition	Ventilated	62(60)	115(55)	1.1(0.74-1.9),p=0.47
	No ventilated	42(40)	93(45)	1
Walls of the house	Mud	70(67)	110(53)	1.26(0.78-2.0),p=0.335
	Cement	34(33)	98(47)	1
Floor of the house	Mud	44(42)	70(34)	1
	Cement	60(58)	138(66)	1.3(0.80-2.1),p=0.28
Separate kitchen	Yes	66(64)	157(75)	0.56(0.34-0.94),p=0.028
	No	38(36)	51(25)	1
Electricity supply	Yes	95(91)	176(85)	1.9(0.88-4.2),p=0.102
	No	9(9)	32((15)	1
Knowledge about r/n TB/HIV	Yes	84(81)	187(90)	0.47(0.24-0.92),p=0.027
	No	20(19)	21(10)	1
Knowledge about transmission TB/HIV	Yes	86(83)	189(91)	0.48(0.24-0.96),p=0.038
	No	18(17)	19(9)	1
Chewing khat	Yes	30(29)	143(69)	1
	No	74(71)	65(31)	1.12(0.67-1.88),p=0.66
Alcohol intake	Yes	55(53)	69(33)	2.3(1.4-3.6),p=0.001

	No	49(47)	139(67)	1
Smoking status	Smoker	34(33)	46(22)	1.7(1.01-2.9),p=0.047
	Non smoker	70(67)	162(88)	1

Behavioral and Clinical related determinants

Low CD4 cell count (<200 cells/µl) and 200–500 cells/µl was significantly associated with TB infection. Compared to the respondent who had CD4 countgreaterthan500 cells/µl, those who had CD4count below200 cells/µl (COR 3.6; 95%CI(2.02-7.05) and200–500cell/mm3 (COR 2.1; 95%CI(1.2-3.9) were more likely to develop TB infection respectively. Those who were in WHO clinical stages three (COR 2.5; 95%CI (1.1-6.0) and four (COR 3.2; 95%CI (1.2-8.8) were more likely to develop TB infection than those in stage one. Those who had hemoglobin level of less than 10mg/dL, (COR 2.8; 95%CI (1.3-5.9) were more likely to develop TB infection than those who had 12.5mg/dL and above hemoglobin level. Having BMI less than 18.5kg/m(COR 3.4; 95% CI (2.05-5.6) was associated with TB infection. Those who missed to take HAART regularly (COR 5.1; 95% CI (3.1-8.6) were 5.1 times chances of acquiring TB infection compared to these who took regularly. and IPT (COR 0.30; 95% CI 0.18 to 0.50). Being on Isoniazid preventive therapy (IPT) (COR 0.29; 95% CI (0.18-0.49) and CPT (COR 0.49; 95% CI (0.3-0.8) had a protective effect against TB. However, baseline functional Status, history of pneumonia and diabetic mellitus were not a determinant for TB (Tables 3).

Table 28: Individual and Clinical related determinants of TB among HIV-positive adults in Addis Ababa public hospitals, Ethiopia, 2018

Variables		Case(N=104) n (%)	Control(N=208) n (%)	COR(95% CI),P-value
Missed to take HAART	Yes	67(65)	54(26)	5.1(3.1-8.6),p<0.0001
	No	37(35)	154(74)	1
Baseline CD4/ cell count	≤200 cells/µl	41(40)	39(19)	3.6(2.02-7.05),p<0.0001
	200–500 cells/µl	38(36)	79(38)	2.1(1.2-3.9),p=0.009
	≥500cells/µl	25(24)	90(43)	1
Baseline functional Status	Working	53(51)	98(47)	1
	Ambulatory	42(40)	87(42)	1.1(0.68-1.8),p=0.65
	Bedridden	9(9)	23(11)	1.4(0.59-3.2),p=0.45
Baseline WHO clinical stage	Stage1	6(6)	54(26)	1
	Stage2	20(19)	30(14)	1.4(0.7-2.6),p=0. 305
	Stage3	65(63)	82(40)	2.5(1.1-6.0),p=0.032
	Stage 4	13(12)	42(19)	3.2(1.2-8.8),p=0.020
CPT	Yes	66(64)	97(47)	0.49(0.3-0.8),p=0.005
	No	38(36)	111(53)	1
IPT	Yes	39(38)	138(66)	0.29(0.18-0.5),p<0.0001
	No	65(62)	70(34)	1
Baseline hemoglobin level	<10 mg/dL	18(17)	17(8)	2.8(1.3-5.9),p=0.008
	10–12 mg/dL	47(45)	88(42)	1.9(0.93-4.2),p=0.074
	≥12.5 mg/dL	39(38)	103(50)	1
Baseline BMI(kg/m)	<18.5	49(47)	43(21)	3.4(2.05-5.6),p<0.0001
	>18.5	55(53)	165(89)	1
Diabetic mellitus	Yes	15(14)	22(11)	1.4(0.7-2.8),p=0.32
	No	89(86)	186(89)	1
History of pneumonia	Yes	68(65)	108(52)	1.6(0.99-2.6),p=0.054
	No	38(35)	100(48)	1

Multiple logistic regression analysis

Variables with a P-value <0.25 in bivariate analysis were again entered in to multivariate analysis phase to check out the presence of confounders, if any. On Multivariate analyses the independent risk factors with TB/HIV co-infection were: TB patients in the family, not having knowledge about transmission of TB/HIV, baseline BMI <18.5 kg/m2, CD4 count <200 cells/ µL, missed to take HIV medication, Alcohol consumption, IPT and baseline WHO clinical stage.

After adjusting other covariates, after adjustment for possible confounders, some variables remained in the multivariable model:The odds that measles disease was because of TB patient in the household (AOR 2.5; 95% CI (1.3-4.7) were more likely to develop TB. Patients whose base line CD4 cell count <200 cells/µL (AOR 3.7; 95% CI (1.4-3.9), baseline WHO clinical stage 3 (AOR 3.0; 95% CI (0.97-9.1) and stage 4 (AOR 3.7; 95% CI (1.01-13.0) and baseline BMI <18.5 kg/m (AOR 3.5; 95%CI (1.5-5.5) were more likely to develop TB infection. Those respondents who missed to take HAART regularly (AOR 6.2; 95% CI (3.2-12) had 6.2 fold chance of acquiring TB infection. Alcohol drunker (AOR 2.7; 95% CI (1.4-5.1) were 2.7 times more likely to develop TB than those who didn't drink. Not having knowledge about transmission of TB/HIV (AOR 0.23; 95% CI (0.08-0.39) increased the chance of acquiring TB infection by 77% and being vaccinated for IPT (AOR 0.27; 95% CI (0.14-0.51) was 27% protective against TB. However, knowledge about relationship between TB and HIV, Smoking, separate kitchen, electricity supply, marital status, level of education, occupation and contact history with the TB patients were not a determinant for TB (Table 4).

Table 29: Factors independently associated with TB infection among HIV-positive adults in Addis Ababa public hospitals, Ethiopia, 2018

Independent predictors		COR	p-value	AOR	p-value
TB patients in the	Yes	1.9(1.2-3.1)	0.007	2.5(1.3-4.7)	0.004
family	No	1		1	
Baseline BMI(kg/m)	<18.5	3.4(2.0-5.6)	<0.0001	3.5(1.5-5.5)	0.001
	>18.5	1		1	
Baseline CD4/ cell	≤200 cells/µl	3.65(2.02-7.05)	<0.0001	3.7(1.4-3.9)	0.005
count	200–500cells/µl	2.1(1.2-3.9)	0.009	1.5(0.71-3.2)	0.28
	≥500cells/µl	1		1	
Missed to take HAART	Yes	5.1(3.1-8.6)	<0.001	6.2(3.2-12)	<0.0001
	No	1		1	
Alcohol intake	Yes	2.3(1.4-3.6),	0.001	2.7(1.4-5.1)	0.001
	No	1		1	
Knowledge about	Yes	0.48(0.24-0.96),	0.038	0.23(0.08-0.39)	0.003
transmission of TB	No	1		1	
IPT	Yes	0.29(0.18-0.49)	<0.0001	0.27(0.14-0.51)	<0.0001
	No	1		1	
Baseline WHO clinical	Stage1	1		1	
stage	Stage2	1.4(0.7-2.6)	0.305	1.2(0.51-2.8)	0.67
	Stage3	2.5(1.1-6.0)	0.032	3.0(0.97-9.1)	0.05
	Stage 4	3.2(1.2-8.8)	0.020	3.6(1.01-13.0)	0.047

Discussion

This study showed that HIV-positive adults receiving IPT were less likely to develop TB, but base line CD4 cell count <200 cells/µL, baseline WHO clinical stage 3 and stage 4 and baseline BMI <18.5 kg/m2, TB patients in the family, not having knowledge about transmission of TB/HIV, missed to take HIV medication and alcohol consumption were independent determinants for increased TB occurrence

The results showed that, patients with CD4 T- lymphocytes count less than 200 cells/µl were about 3.7 times more likely to develop TB as compared with CD4 T-lymphocytes count more than 500 cells/µl. This finding was in line with another case control study conducted in North west Ethiopia which revealed that patients with CD4 T- lymphocytes count less than 200 cells/were 5 times more likely to contract TB than those who did have CD4 T-lymphocytes count more than 500 cells/µl(23). This is in fact that, as CD4+ lymphocyte count decreased the body defense mechanism will be overwhelmed by various opportunistic infections.

The current result also shows that, the association of patient's baseline WHO clinical stage with TB. Those patients in WHO clinical three and four were about 3.0 and 3.6 more likely to develop TB compared with those in WHO clinical stages I, respectively. This is a congruent finding from Amhara region which have been reported, patients in third and fourth WHO clinical stages were about 78% and 70% more likely to develop TB compared with those in WHO clinical stages I (34). This could be explained as once the patients get into late stages, the immunity protective capacity will be minimal which would make them prone to tuberculosis infection. A worth to mention as well is that TB is one of the AIDS defining criteria to categorize the patients in to the late WHO clinical staging which was also used as a criteria in HIV/AIDS clinics in Ethiopia.

In the present study, being vaccinated for IPT was 27% protective against TB, which is coincide with another case control study conducted in North west Ethiopia which stated that patients being vaccinated for IPT was 22% protective for TB(23)and meta-analysis study conducted on randomized controlled trials of Isoniazid prophylaxis for tuberculosis in HIV infected patients revealed that the risk of developing tuberculosis in the non-prophylactic group was 1.72 times higher than for the prophylactic group (35).

Another prominent factor associated withTB, substance use like alcohol consumption was the predictor of TB/HIV co-infection in HIV positive in the current study. Study subjects who consumed alcohol were 2.7 times more likely to develop TB. This finding was in line with another hospital based retrospective studies in Amhara region which revealed that alcohol drunker were 2.2 times more likely to develop TB(26). Alcohol can modulate the immune response. Long-term alcohol consumers have been shown to have impaired immunity (36).

In this study, respondents whose baseline BMI <18.5 kg/m2 were 3.5 times more likely to develop TB infection. This result is consistence with the study conducted in western Ethiopia, where having baseline BMI <18.5 kg/m2 were3.8 times more likely to develop TB (28). Another cross-sectional study done in North West Ethiopia revealed that, tuberculosis suspects who were underweight (BMI <18.5 kg/m) were sixteen times more likely to develop smear positive pulmonary tuberculosis than those who had normal weight (29). Previous research also indicated that low body mass index which explains under nutrition is significantly associated with TB infection (37). This might be due to the fact that under nutrition weakens the immunity level that increases the reactivation of latent tuberculosis infection.

Respondents who missed to take HAART had 6.2 fold chance of acquiring TB infection. This was in lined with another case control study done in Northwest Ethiopia, which showed that; HIV-positive adults receiving HAART (AOR 0.25; 95% CI 0.13 to 0.51) were less likely to develop TB. This may be due to a strong relation between increased HAART coverage and decreased viral load (38). Lowering of viral load was also linked with reduced occurrence of active TB (39).

Having knowledge about transmission of TB decreased the chance of acquiring TB infection by 23%, which is similar to previous study done in Eastern Ethiopia among pastoral community in the shinile (40) and cross-sectional study done in Burkina Faso ($p<0.001$) (32). The basic knowledge about the transmission means of TB has an important implication for TB control and prevention, in this it could reduce diagnosis and treatment delays as well as the spread of disease.

Respondents who lived with a TB patient in the household were 2.5 more likely to acquired TB. This study is in agreement with another cross-sectional a study done among prisoners of North Gondar zone and case control study in Amhara region, which revealed that people having TB

patients in the family were about 5 and 2.66 times more likely to contract TB respectively(23,33).

The results showed that there was no significant association between socio-demographic & socio-economic determinants and TB /HIV co-infection in multivariable logistic regression analysis. This was consistent with a previous retrospective study conducted at Metema Hospital which revealed that, multivariable logistic regression analysis was performed to identify socio-demographic predictors for HIV/TB co-infection among the study participants and there was no significant association between HIV/TB co-infection and the selected demographic determinants ($P > 0.05$) (27).

Limitations of this study

As a retrospective case–control approach, information bias related to substance use (chewing khat, smoking or alcohol consumption) was a problem, no temporal relationship could be established and the study design did not allow proof of causation. Design effect was not considered for sampling technique.

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Conclusion

The findings from the current study agree in many points with similar findings of previous publications. The study came up with that TB/HIV co-infection was associated with the majority of clinical variables and some social characteristics in multivariate logistic regression analysis. The results from this study showed that; base line CD4 cell count <200 cells/µL, baseline WHO clinical stage 3 & 4 and baseline BMI <18.5 kg/m2, TB patients in the family, not having knowledge about transmission of TB/HIV, missed to take HIV medication, not taking IPT and alcohol consumption were independent determinants for TB co-infection among adult HIV positives on ART.

Recommendation

HIV-infected adults with substance abuse (alcohol drunker) should be prioritized for TB screening. Expansion of HAART and IPT service are some of the best measures for reducing TB occurrence in HIV-infected adults in this study. A cohort study of HIV patients who are on HAART should be strengthened in order to estimate the effect of HAART on the development of TB and other opportunistic infections. Most of these factors can be intervened though health education, about preventive measures that enhance body immunity in order to reduce the susceptibility to opportunistic infections among HIV patients and supplementation of additional food(plump net) for those underweight HIV patients.

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Annex 5: English version of participant information sheet, consent and questionnaire
Participant information sheet

Title: Determinants of Tuberculosis in HIV-infected adults taking antiretroviral therapy (ART) among public Hospital in Addis Ababa, Ethiopia: A Case–Control Study

First of all, I would like to say thanks in advance to your cooperation and consent in participating in this study. More over; I were request you politely to read or listen attentively in order to provide relevant information about the study and if there is any confusable information or question which isn't clear regarding the study please don't hesitate to ask freely.

Introduction:TB is one of the top ten causes of illness, death, and disability worldwide and is the leading cause of death from a curable infectious disease**.** It is among the leading causes of death for people living with HIV (PLWHIV) which shares about twenty-five percent of all causes of the deaths.

Purpose of the study: To provide information about risk factors of TB among HIV adults on ART and to improve areas of health care services regarding the prevention and management of TB/HIV.

Objective: To identify determinants for tuberculosis (TB) among HIV-infected adults; taking ART.

Benefits for participants: There was no any financial incentive or other inducements in being participated in this study. However, this study provided a basic information or data for Addis Ababa city administration health office as well as for nationwide.

Risks: There was no risk to the study subjects being they are participated in the study.

Privacy: participants and their information were secured by using codes and not the patient's names throughout the study. Participant's privacy was ensured throughout the study by conducting the interview in separate room

Right: In this study, participants were informed about the right to decide voluntarily whether to participate in a study or not and they have the right stop or withdrawing at any time from the study.

Confidentiality: No personnel information havebeen disclosed to third party or will not appeared in any report from this study.

Assurance of Principal Investigator

I put my signature below to confirm you that I take over the responsibility for the scientific ethical and technical conduct of the research project and for provision of progress reports for all stakeholders of the research project.

Teferi Yidenek (PI)

Signature: _____ Date: _____

Note: If you have any questions about this study, you should feel free to ask now or at any time throughout the study by contacting:

PI Address: Teferi Yidenek, St. Paul's Hospital Millennium Medical College, School of Public Health, Addis Ababa, Ethiopia.

Email:teferiyidenek@gmail.com, Tel: +251912157441

Informed consent:

I, (Full Name) ……...……

Here by voluntarily authorize the researcher to interview me and consent to him in order to obtain information that is relevant to his research topic on "Determinants of Tuberculosis in HIV-infected adults taking antiretroviral therapy (ART) among public Hospital in Addis Ababa, Ethiopia, 2017: A Case–Control Study". I understand that as a participant, my privacy was maintained and the information obtained in this research was used in a manner that protects with guaranteed confidentiality, respect and personal rights.

I am aware that participating in this study is voluntary and I haven't obligated to answer every question asked for me and that I may withdraw my consent at any time without disadvantage to myself or others. I am informed that information collected in this study was strictly confidential and for this study only.

Signature of Participant …… Date……..

Signature of data collector……. Date……

Questionnaires

Respondent's status 0.Case 1.Control

Section 1: Socio-demographic and socio- economic determinants

S/N	Question	Alternatives
1.1	Address	Region_____ Woreda _____
1.2	Sex	1.Male 2.Female
1.3	Age	_____Year
1.4	Marital Status	1.Single 2.Married 3.Divorced 4.Widowed
1.5	What is your monthly income?	1. <30USD 2. .>30USD
1.6	Occupation	1. Farmer 2.House wife 3.Student 4.Unemployed 5. Daily laborer 6.Merchant 7. Government 8.Others(specify)
1.7	Level of Education	1. Illiterate 2.Read & write 3. Elementary 4.Secondary 5. College and above
1.8	Where is your residency?	1. Urban 2.Rural

Section 2: Social and environmental determinants

2.1	Was there anyone living in your home infected with TB?	1. Yes 2.No
2.2	Have you a contact history with the TB patients?	1. Yes 2.No

2.3	How many family members residing with you?	**1.**<4 people **2**.>4 people
2.4	Have you imprisoned with chronically coughing person in same cell?	1. Yes 2.No
2.5	What it looks like the house condition?	1. ventilated 2. Not ventilated
2.6	Walls of your house made of?	1. Mud 2.Cement 3. Other _____
2.7	The floor of your house is made of?	1.Mud 2.Cement 3.Other _____
2.8	Do you have a separate kitchen?	1. Yes 2.No
2.9	Is there electricity supply in your house?	1. Yes 2.No

Section 3: Behavioral related determinants

3.1	Do you know TB/HIV disease?	1. Yes 2.No
3.2	Tell me what you know about TB/HIV?	_____
3.3	Are TB/HIV preventable disease?	1. Yes 2.No
3.4	Do you think there is a relationship between TB and HIV?	1. Yes 2.No
3.5	Do you Chew 'khat'?	1. Yes 2.No
3.6	Do you drink alcohol?	1. Yes 2.No
3.7	Do you smoke cigarettes?	1. Yes 2.No

Section 4: Clinical and laboratory profile of study participants

4.1	Do you have a cough for the last few days back?	1. Yes 2.No

4.2	For how long have you been coughing?	_____
4.3	Currently, what kind of symptoms (complaints) do you have?	1. Chest pain 2. Difficulty of breathing 3. Fever 4. Weight loss 5. Night sweating 6. Loss of appetite 7. Malaise 8. Fatigue 9. Others(specify) _____
4.4	ART Status	1. Pre- ART 2. ART
4.5	Do you take a highly active antiretroviral therapy (HAART)?	1. Yes 2.No
4.6	Have you ever missed to take your HIV medication?	1. Yes 2.No
4.7	Base line CD4 cell count (cells/µL)	1. ≤200 2. 200–500 3. ≥500
4.8	Drug Adherence	1. Poor 2. Fair 3. Good
4.9	Base line functional Status of the patient	1. Working 2. Ambulatory 3. Bedridden
4.10	Base line WHO clinical stage of HIV	**1.**Stage1 **2.**Stage 2 **3.**Stage 3 **4.**Stage 4
4.11	Do you receive Cotrimoxazole preventive therapy (CPT)?	1. Yes 2.No
4.12	Do you receive Isoniazid preventive therapy (IPT)?	1. Yes 2.No
4.13	Have you ever missed to take your TB medication?	1. Yes 2.No
4.14	BMI	1. >18.5 2. <18.5
4.15	Base line hemoglobin level	1. <10 2. 10–12 3. ≥12.5
4.16	History of Diabetes mellitus	1. Yes 2.No
4.17	History of pneumonia	1. Yes 2.No

Amharic version of participant information sheet, consent and questionnaire

የመጠይቅመለያቁጥር _____

ቀን _____

በቅዱስጳውሎስሚሊኒየምሜድካልኮሌጅየማህበረሰብጤናክፍልበቲቢ ተጎጂ የሆኑትን የኤች አይቪ / ኤድስ ህመምተኞች ለቲቢበሽታየሚያጋልጡችግሮችንልማጥናትየትዘጋጀመጠይቅ

የሚሰጥአጠባበቅስምምነት

ጤናይስጥልኝእኔ _____ እባላሁ

በቅዱስጳውሎስሚሊኒየምሜድካልኮሌጅየማህበረሰብጤናፊልድኢፒድዮሞሎጅየሁለተኛድግሪተማሪነኝ ፡፡የዚህጥናትአላማበዚህአካባቢ በቲቢ ተጎጂ የሆኑትን የኤችአይቪ / ኤድስ ህመምተኞችለቲቢበሽታየሚያጋልጡመንስኤዎችችግበተመለከተጥናትእያካሄድንነውበዚሁጥናትምእን ድትሳተፉበትህትናእንጠይቃለን፡፡ይህምጥናት በቲቢ ተጎጂ የሆኑትን የኤችአይቪ / ኤድስ ህመምተኞችየቲቢበሽታንለመከላከልይጠቅማል፡፡ያለእርስዎስምምነትምንምአይነትመረጃለሌላእንደማ ይባክንአረጋግጣለሁ፡፡በዚህጥናትለመሳተፍፈቃደኛከሆኑጥያቄዎቹንከአጠቃላይነጥብበመነሳትእጅምራ ለሁትክክለኛውንመረጃመስጠትችግሩንለማሻሻልእንደሚረዳለማሳሰብእወዳለሁ፡፡ጥናቱበቅዱስጳውሎስ ሚሊኒየምሜድካልኮሌጅተቀባይነትንያገኘነውበጥናቱለመሳተፍፈቃደኛነዎት?

1. **አዎ._____ መልሱአወከሆነወደሚቀጥለውጥያቄእለፍ/ፊ**

2. **የለም _____ መልሱየለምከሆነበማመስገንጥያቄውንአቋርጥ/ጭ**

የጥያቄውንፈቃደኝነትያረጋገጠውመረጃሰብሳቢ

የመረጃሰብሳቢስም _____መጠየቁየተደረገበትቀን _____ፊርማ _____

በተቆጣጣጪስለመረጋገጡስም _____መጠየቁየተደረገበትቀን _____ ፊርማ _____

በጥናቱባለቤትለመረጋገጡስም _____ቀን _____ፊርማ _____

1. **ክፍልአንድ፡ማህበራዊዳይሞግራፊካዊባህርያት**

ተ.ቁ	ጥያቄዎች	አማራጭመልስ
1.1	አድራሻ	ክልል_____ ወረዳ_____
1.2	ፆታ	1. ወንድ 2.ሴት
1.3	እድሜ	_____አመት
1.4	የጋብቻ ሁኔታ	1.ያላገባ 2.ያገባ 3.የፋታ/ች4.በህይወትየሌለ/ች
1.5	የወር ገቢዎ ምንያህልነው?	1. <30USD 2. .>30USD
1.6	የስራሁኔታ?	1. ገበሬ 2.የቤትእመቤት 3.ተማሪ 4.ስራአጥ 5. የእለት ተእለት ሰራተኛ 6.ነጋዴ 7.መንግሥትሰራተኛ 8.ሌሎች / ይግለጹ_____
1.7	የትምህርት ደረጃ	1. ያልተማረ 2.ማንበብእናመፃፍ 3.አንደኛ ደረጃ 4.ሁለተኛደረጃ 5.ኮሌጅ እና ከዚያ በላይ
1.8	የመኖሪያ ቦታዎ የት ነው?	1. ከተማ 2.ገጠር

2. ክፍልሁለት፡ማህበራዊና አካባቢያዊ ተፅእኖዎች

2.1	በርስዎ ቤት በቲቢ የተያዘሰው ይኖር ይሆን?	1.አዎ 2.አይደለም

2.2	ከቲቢ ሕመም ተኛች ጋርየመገናኘት ታሪክአለዎት?	1.አዎ 2.አይደለም
2.3	ከቤተሰብ አባላት ጋር ምን ያህል ቤተሰቦች ይኖራሉ?	1.<5 ሰዎች 2.>5 ሰዎች
2.4	የቆየሳልካለው ሰውጋርበአንድክፍልውስጥ ታስረውያውቃሉ?	1.አዎ 2.አይደለም
2.5	የቤቱ ሁኔታ ምን ይመስላል?	1- አየር የተሞላ 2- ያለተሞላ
2.6	የቤታችሁ ግድግዳ ከምን የተሠራ ነውን?	1. ጭቃ 2.ሲሚንቶ 3. ሌላ _____
2.7	የቤታችሁ ወለል የተሠራው ከምን ነው?	1. ጭቃ 2.ሲሚንቶ 3.ሌሎች _____
2.8	የተለየ ምግብማብሰያ ቤት አለዎት?	1. አዎ 2.አይደለም
2.9	በቤትዎ ውስጥ የኤሌክትሪክ አቅርቦት አለ?	1. አዎ 2.አይደለም

3. ክፍል ሶስት፡ስለቲቢ እና ስለኤች አይቪ እውቀት

3.1	ስለ ቲቢ, ኤች አይቪ / ኤድስ በሽታ ግንዛቤአለዎት?	1.አዎ 2.አይደለም
3.2	ቲቢ, ኤች አይቪ / ኤድስ በሽታ መከላከል የሚችል በሽታ ነው?	1. አዎ 2.አይኖርም
3.3	ስለ ቲቢ, ኤች አይቪ / ኤድስ የሚያውቁትን ምን እንደሆነ ይንገሩን?	_____
3.4	በቲቢ እና በኤች አይቪ መካከል ግንኙነት አለ ብለው ያስባሉ?	1. አዎ 2.አይኖርም

3.5	ጫት ይቅማሉ?	1. አዎ 2.አይደለም
3.6	አልኮል ይጠጣሉ?	1. አዎ 2.አይደለም
3.7	ሲጋራ ያጨሳሉ?	1. አዎ 2.አይደለም

ክፍል4፡የጥናቱተሳታፊዎች ክሊኒካዊ እና ላቦራቶሪ መግለጫ

4.1	ባለፉት ጥቂት ቀናት ውስጥ ሳል ነበረዎት?	1. አዎ 2.አይደለም
4.2	ለምን ያህል ጊዜ ሲያስለዎት ነበር?	_____
4.3	በአሁኑ ጊዜ, ምን አይነት የበሽታ ምልክቶች (ቅሬታዎች) አሉዎት?	1. የደረት ህመም 2.የመተንፈስ ችግር 3. ትኩሳት 4.ክብደት መቀነስ 5.ሌሊትላብ 6. የምግብፍላጎትማጣት 7.የህመምስሜት 8. ድካም 9. ሌሎች (ለይተውተመርጡ) _____
4.4	የኤ.አር.ቲ ሁኔታ	1. ቅድመ-ህክምና/የኤ.አር.ቲ 2.ኤ.አር.ቲ
4.5	ከፍተኛ የሆነ የበሽታ መከላከያ ህክምና (ሀርት) ይወሰዳሉ?	1. አዎ 2.አይደለም
4.6	የኤች አይቪ መድሃኒትዎን ሳይወስዱ የቀሩበት ቀን ይኖራል?	1. አዎ 2.አይደለም
4.7	ሲ.ዲ. 4 / የቫይራልሎድ / የሴል ቆጠራ ኤችአይቪ / በኤች አይ ቪ ምርመራ ወቅት	1. ≤200 2.200—500 3. ≥500
4.8	የመድሃኒት አጠቃቀም	1. ደካማ 2.መጠነኛ 3.መልካም

4.9	አሁን ያለው የታማሚው ሁኔታ	1.ስራላይ 2.መንቀሳቀስ የሚችል 3.አልጋ ላይ የተኛ
3.10	ኤች.አይ.ቪ መድሃኒት ሲጀመር የኤች.አይ.ቪየሂደት ደረጃ	1.ደረጃ 1 2.ደረጃ 2 3.ደረጃ 3 4.ደረጃ 4
4.11	ኮትሪምክዛዞል ለበሽታ የመከላከያ ህክምና (CPT) ይቀበላሉ?	1. አዎ 2.አይደለም
4.12	Isoniazid Preventive Therapy (IPT) ይቀበላሉ?	1. አዎ 2.አይደለም
4.13	የቲቢ መድሃኒትዎን ለመውሰድ አቋርጠው ያውቃሉ?	1. አዎ 2. አይደለም
4.14	ቢ.ኤም.አይ	1. >18.5 2. <18.5
4.15	የሂሞግሎቢን መጠን	1. <10 2. 10—12 3. ≥12.5
4.16	የስኳር ህመምአለብዎት?	1. አዎ 2.አይደለም
4.17	የኒሞኒያ ህመምአለብዎት?	1. አዎ 2.አይደለም

DEPARTMENT OF PUBLIC HEALTH

APPROVAL SHEET (by advisors and program coordinator)

This is to certify that the body of work with thesis entitled "_____" submitted in partial fulfillment for the requirements of for the degree of Master of Public Health in Field Epidemiology of the graduate program of the Department of Public Health, Saint Paul's Hospital Millennium Medical College, is a record of original research carried out by _____, Id. No _____ under my supervision and no part of the body of work with thesis has been submitted for any other degree or diploma.

The assistance and help received during the course of this investigation have been duly acknowledged. Therefore, we recommend that it to be accepted as fulfilling the body of work with thesis requirements.

Name of Primary advisor

Signature

Date

Name of Co-advisor

Signature

Date

Name of FETP Coordinator

Signature

Date

DEPARTMENT OF PUBLIC HEALTH GRADUATE STUDIES

FINAL THESIS APPROVAL FORM

As members of the Board of Examiners of the final body of work with thesis open defense, we certify that we have read and evaluated the body of work with thesis prepared by Teferi Yidenek under the title "Determinants of Tuberculosis in HIV-infected adults taking antiretroviral therapy (ART) among public Hospital in Addis Ababa, Ethiopia: A Case–Control Study and recommencement for the degree of Master of Public Health in Field Epidemiology.

_____

_____

_____

Name of the Chairperson_____

Signature_____

Date_____

Name of Primary Advisor_____

Signature_____

Date_____

Name of Co-advisor_____

Signature_____

Date_____

Name of Internal Examiner_____

Signature_____

Date_____

Name of External Examiner_____

Signature_____

Date_____

Final approval and acceptance of the body work with thesis is contingent upon the submission of the final both hard and soft copies of the body work with thesis to the department of public health.