



**Department of Public Health
Ethiopian Field Epidemiology and Laboratory Training
Program (EFELTP)**

Compiled Body of Works in Field Epidemiology

BY

Fekade Degu Woldekidan

March, 2018

Addis Ababa, Ethiopia

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

Compiled Body of Works in Field Epidemiology

BY

Fekade Degu Woldekidan

**Submitted to the St. Paul's Hospital Millenium Medical College, Department
of Public Health in partial fulfillment of the degree of Master of Public
Health in field Epidemiology**

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March, 2018

Addis Ababa, Ethiopia

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Student Name: **Fekade Degu Woldekidan**

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This body of work with thesis has been submitted for the examination with our approval as candidate's advisors.

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Abbreviations/Acronyms

AA	Addis Ababa	EPHI	Ethiopia Public Health Institute
AACA	Addis Ababa City Administration	EPI	Expanded Program on Immunization
AACALMIA	Addis Ababa City Administration Land Management Information Agency	ERC	Ethical Review Committee
AAHB	Addis Ababa Health Bureau	ERCA	Ethiopian Red Cross Association
AALRDA	Addis Ababa Land Resource and Development Agency	ETB	Ethiopian Birr
ABHC	Alem bank Health Center	Etc	etcetera
AIDS	Acquired Immunodeficiency Syndrome	FMHACA	Food, Medicine, and Health Administration and Control Authority
AMREF	African Medical and Research Foundation	FMoH	Federal Ministry of Health
ANC	Ante-Natal Care	GP	General Practitioner
AOR	Adjusted Odds Ratio	HAART	Highly Active Anti Retro viral Treatment
AR	Attack Rate	HC	Health Center
ART	Anti Retro viral Treatment	HDAs	Health Development Armies
ARTI	Acute Respiratory Tract Infection	HF	Health Facility
AU	African Union	HF's	Health Facilities
AWD	Acute Watery Diarrhea	HH	Households
BCG	Bacillus Calmette Guerin	HIV	Human Immunodeficiency Virus
BSc	Bachelor of Science	HO	Health Officer
CD	Compatible Disk	HP	Health Post
CDC	Center for Diseases prevention and control	IDSR	Integrated Diseases Surveillance and response
CDMA	Code Division Multiple Access	IHR	International Health Regulation
CFR	Case Fatality Rate	ILI	Influenza like Illness
CHWs	Community Health Workers	IMCI	Integrated Management of Child Illness
CI	Confidence Interval	IMR	Infant mortality Rate
CMR	Child Mortality Rate	INH	Isoniazid
COR	Crude Odds Ratio	IPT	Isoniazid Preventive Therapy
CPT	Cotri-moxazole Prophylaxis Treatment	IRB	Institution Review Board
CTC	Cholera Treatment Center	IUD	Intra Uterine Device
DM	Diabetic Mellitus	JSI/SEUHP	John Snow Inc's/ Strengthening Ethiopia Urban Health Program
DOTS	Directly Observed Treatment for Short course	KG	Kinder Garden
DRC	Democratic Republic of Congo	KK	Kolfe Keraniyo
EFETP	Ethiopia Field Epidemiology Training Program	KKSCHO	Kolfe Keraniyo Sub City Health Office
EFY	Ethiopian Fiscal Year	LR	Likelihood Ratio

EMoH	Ethiopian Ministry of Health	MAM	Moderate Acute Malnutrition
OPD	Out Patient Department	MR	Mortality Rate
OPV	Oral Polio Vaccine	MSF	Medicine Sans Frontlines Ethiopia
OTP	Outpatient Therapeutic Feeding Program	NGO	Non-governmental Organization
PCV	Pneumococcal Vaccine	NSL	Nifas Silk Lafto
PHEM	Public Health Emergency Management	SIAs	Supplementary Immunization Activities
PI	Principal Investigator	SNNP	Southern Nation Nationality and People
PITC	Provider Initiative Test and Counseling	SPHMMC	St Paul Hospital Millennium Medical College
PLHIV	People Living with HIV	SRS	Simple Random Sampling
PMTCT	Prevention of Mather to child Transmission	TB	Tuberculosis
PNC	Post Natal Care	TBAs	Traditional Birth Attendants
PPM	Public Private Mix	TB-HIV	Tuberculosis and Human Immunodeficiency Virus
PTB	Pulmonary Tuberculosis	TSF	Targeted Supplementary Feeding
RDH	Ras Desta Hospital	TT2	Tetanus Toxioid two doses
RDT	Rapid Diagnostic Test	TVET	Technical and Vocational Education Training
RHB	Regional health Bureau	UHEWs	Urban health extension workers
RRT	Rapid Response Team	UNECA	United Nations Economic Commission for Africa
Rx	Treatment	UNICEF	United Nations International Children Fund
SAM	Severe Acute Malnutrition	URTI	Upper Respiratory Tract Infections
SC	Sub City	VCT	Voluntary counseling and testing
SD	Standard Deviation	W9 HC	Woreda 9 Health Center
MCH	Maternal and Child Health	WDA	Women Development Army
MD	Medical Doctor	WHO	World Health Organization
MLHC	Mikili Land Health Center	WHO-AFRO	World Health Organization- Africa Regional Office
MPH	Master of Public health	WoHO	Woreda health office

CHAPTER-1: Outbreak Investigation

Cholera outbreak investigation (case-control study) in 4 woredas, Kolfe Keraniyo sub city, Addis Ababa, Ethiopia, 2016

Abstract

Introduction: An estimated 2.8 million and 87,000 cholera cases occur annually in endemic and non-endemic countries respectively. It remains a significant public health problem in many parts of the world where water supply, sanitation, food safety, and hygiene are inadequate. This problem occurred in the study woredas. The study aimed to determine the risk factor(s) associated with increased cholera transmission. **Methods:** The study conducted in 4 woredas from July-August 2016 using unmatched case-control study design with 1:2 cases to controls ratio. Cases selected from Mikililand Cholera treatment center and controls from general community in the same woreda to the cases by lottery method. Data collected using semi-structured questionnaire. Data checked for its consistency and completeness. Verbal consent obtained from respondents. Written letter of permission received from local authorities. Epi Info and statistical package for the social science softwares used for data entry and analysis. Each independent variable analyzed by bi-variable logistic regression. All independent variables analyzed by multivariable logistic regression to identify the strong risk factor/s for the cholera transmission in the study area. The association between risk factor/s for infection among cases and controls expressed as crude odds ratio and adjusted odds ratio with 95% confidence interval and $p < 0.05$.

Result: There were a total of 206 cases with an attack rate 0.2. Males accounted 113(55%) and females accounted 93(45%). Average ages of affected population 36.54 years with range 2-96 years. Consuming any type of raw meat with AOR 11.842; 95%CI, (4.10-34.25), $p < .001$; eating outside home at gathering with AOR 13.52; 95%CI(5.88-31.10), $p < 0.001$; those drinking local beverage (Tela) with AOR 3.93; 95%CI(1.45-10.65), $p < 0.007$; Irregular hand washing and not using soap before meal with AOR 5.23; 95%CI(1.20-22.80), $p < .028$; and visiting sick patients with AOR 19.34; 95%CI(6.87-54.48), $p < 0.001$ were identified risk factors for cholera disease.

Conclusion and recommendation: Cholera highly attacked males, 15-44 years age groups, and daily laborer populations. The risk factors for the occurrence of cholera disease were poor hygienic practice, exposure to uncooked foods and eating outside the home. Intensive community awareness by addressing all population groups and strengthening regulatory activities are the main area to work.

Key words: Cholera, Outbreak, Kolfe sub city, Addis Ababa

1.1 Introduction

Cholera is a rapidly spread and one of the three diseases requiring notification to the world health organization (WHO) as of revised 2005 international health regulation (IHR). About 1.4 billion people are at high risk for cholera in endemic countries. An estimated 2.8 million and 87,000 cholera cases occur annually in endemic and non-endemic countries respectively. In the same way every year about 91 000 and 2500 people die of cholera in endemic countries and in non-endemic countries respectively. This is only 5-10% world health organization estimated number [1]. Cholera remains a significant public health problem in many parts of the world. In 2015, 42 countries reported a total of 172,454 cases including 1304 deaths, resulting in an overall case fatality ratio (CFR) of 0.8%. Cases were reported from all regions, including 16 countries in Africa, 13 in Asia, 6 in Europe, 6 in the Americas, and 1 in Oceania. Afghanistan, the Democratic Republic of the Congo (DRC), Haiti, Kenya, and the United Republic of Tanzania accounted for 80% of all cases. Of cases reported globally, 41% were from Africa, 37% from Asia and 21% from Hispaniola. Imported cases were reported from 13 countries [2]. Sporadic cholera outbreaks can occur in any part of the world where water supply, sanitation, food safety, and hygiene are inadequate; and highly risky in over-crowded population and refugee camps in which poor sanitation, unsafe drinking-water, and increased person-to-person transmission [3].

A single laboratory confirmed cholera case is supposed to be an outbreak in the Ethiopia context based on the Ethiopia cholera and public health emergency management (PHEM) guidelines. The outbreak of cholera in Addis Ababa started on 8 June 2016 and the first index case was detected in private clinic by clinician and reported to the sub city health office by the clinic's surveillance focal person in woreda 9 within the kolfe keraniyo sub city. Simultaneously, the sub city health office PHEM officer reported it to regional health bureau and federal level within the same day.

Immediately after the reporting a case, investigation team from different discipline and institutions were deployed to establish the existence of an outbreak. In the first day, a male patient found age 35 years with the residential area kolfe sub city, woreda 06, and sub woreda 1 with specific area weira sefer and working in woreda 9 in the same sub city. A reported case was characterized by watery diarrhea, projectile vomiting, dryness of mouth, and sunken eyes. Stool sample was taken from the cased patient for laboratory confirmation whether the suspected case was cholera infection or not. The culture result confirmed it as v.cholera 01 sero-type on 9 June

2016 in the national laboratory, Ethiopia public health institution (EPHI). Immediately after the identification of the case, cholera outbreak taskforces were established in the sub city and downward to the woredas. Rapid response teams (RRT) were organized at each health facility level. Four sub task forces “committees” having different background were organized and given specific tasks in the response activities. The overall activities were led by Addis Ababa City Administration mayor and head of the health bureau with the respective sub cities and woredas authorities.

Based on the kolfe keraniyo sub city health office cholera outbreak line list, on 1st July 2016, the cumulative number of cases reported in the kolfe keraniyo sub city was 412 with the attack rate of 0.79 per 1000 person. Of the total cases 19.7% occurred among daily laborers, 22.3% were housewives and 5.8% among the unemployed. Two hundred thirty (55.8%) of all cases were males and 182 (44.2%) were females. Among the total reported cases 336 were confirmed either by culture or RDT and the rest 76 were suspected AWD cases. The majority (90.5%) of the cases were 15 years old and above and 2.7% were under five children. All the 15 woredas in the sub cities have reported an average of 27.5 (range 10-50) AWD cases. Forty-three percent of the reported cases were from four woredas including woreda 10, 3, 4, 1 in the order of high to low magnitude. Woreda 11 and 15 were relatively least reporting woredas in the sub city in June 2016. All the 15 woredas have reported cases. The cumulative attack rate (%) for the most affected woredas include: woreda 10 (0.171), woreda 1 (0.142) woreda 4 (0.124) and woreda 3 (0.076) [11]. The AWD case transmission is still going exponentially throughout the sub city in all woredas and affects many people. The major risk factor/factors that synergize the transmission of cholera not clearly identified. Risk factors implicated from initial assessments include drinking water from unprotected sources; exposure to river, spring, and holy water sites; Contamination water sources can be explained by the high level of open defecation due to lack of latrines, poor solid waste collection and disposal, poor food hygiene, and overcrowding. Therefore, the study needed to determine the risk factor(s) associated with increased cholera infection transmission in the community of the 4 woredas in the kolfe keraniyo sub city.

The public health interventions were still going on through various ways including community mobilization on the response of the outbreak; home to home community awareness creation on how to prevent and minimize the infection transmission; distributing water treatment chemicals to those living at highly suspected and crowded villages; disinfecting water source areas that

supposed to be contaminated with the infection; screening and treating each identified cases based on the protocol; disinfecting the houses, utilities and toilets of the cases; tracing each contacts with the cases; conducting intensive active search surveillance in the health facilities and community; and collecting samples from different sources for laboratory investigation. Even though the outbreak response efforts there, the disease transmission increased and attacked high number and different population groups and further expanded to other new areas. The source/s and risk factors for the continuous disease transmission was not clearly identified to mitigate the disease from the source. Therefore, this study conducted to determine if a case was more likely to have been exposed to a risk factor and source in the five days before onset of illness than a similar uninfected person in the community in the same woredas.

The study may help to the community to protect themselves from exposing for associated risk factor/factors that cause cholera. It also may help the cholera outbreak response task forces to response the disease prevention based on the findings accordingly. Additionally, it may help as a complement for additional epidemiological and microbiological investigations around new cholera infection sero-type, and for environmental analysis in the area of water and food sources as well potential contamination from hygiene and sanitation

1.2 Literature Review

Cholera is a rapidly spread and one of the three diseases requiring notification to the world health organization (WHO) as of revised 2005 international health regulation (IHR). About 1.4 billion people are at high risk for cholera in endemic countries. An estimated 2.8 million and 87,000 cholera cases occur annually in endemic and non-endemic countries respectively. In the same way every year from 2500 to 91 000 people died of cholera in the world. This is only 5-10% world health organization estimated number [1].

Cholera remains a significant public health problem in many parts of the world. In 2015, 42 countries reported a total of 172,454 cases including 1304 deaths, resulting in an overall case fatality ratio (CFR) of 0.8%. Cases were reported from all regions, including 16 countries in Africa, 13 in Asia, 6 in Europe, 6 in the Americas, and 1 in Oceania. Afghanistan, the Democratic Republic of the Congo (DRC), Haiti, Kenya, and the United Republic of Tanzania accounted for 80% of all cases. Of cases reported globally, 41% were from Africa, 37% from Asia and 21% from Hispaniola. Imported cases were reported from 13 countries [2].

Sporadic cholera outbreaks can occur in any part of the world where water supply, sanitation, food safety, and hygiene are inadequate; and highly risky in over-crowded population and refugee camps in which poor sanitation, unsafe drinking-water, and increased person-to-person transmission. Recently, the most cholera prevalent continents are Africa and Asia in the world. Parts of the Middle East and Sub-Saharan Africa are broadly affected by repeated cholera epidemics [3].

In Sub-Saharan Africa continent, the Central and western regions are highly affected by cholera outbreak yearly. Nigeria, DRC, Cameroon and Ghana collectively are responsible for the 96% and 99% of reported cholera cases in the region in 2014 and 2015 respectively. For example in 2014 among a total of 91,343 reported cholera cases: Nigeria accounts 35,996 cases, Ghana accounts 28,944 cases, DRC=19,306 cases and Cameroun = 3,355 cases in the order of their high magnitude among 18 countries in the regions. And in until 46 weeks of 2015, Democratic Republic of Congo (DRC) = 15,227 cases, 219 deaths with CFR of 1.4%; Nigeria = 5,172 cases, 184 deaths with CFR of 3.6%; Ghana= 687 cases, 10 deaths with CFR of 1.5%; and Cameroun= 89 cases, 5 deaths with CFR of 5.6% [4, 5].

Zimbabwe is one of the severely cholera affected countries in the southern region of Africa continent. The outbreak in this country was occurred in urban area with high (4.3%) case fatality rate (CFR). Shortage of clean water supply has been the main underlying cause but breakdown in health service delivery has also contributed to the magnitude and severity of the cholera outbreak in Zimbabwe [6].

In the first half of 2016 more than 75,000 cholera cases and 1,500 deaths with CFR of 2.0% were reported in 13 countries. The majority of the reported cholera cases were from eastern Africa under the sub-Sahara region. Three countries in eastern Africa region accounted for 87 per cent of the cases: Tanzania (28.5%, with CFR: 1.5%), Kenya (21.2%, with CFR: 1.5%) and DRC (16.0% with CFR: 1.4%) [7].

Frequent cholera outbreak has occurred here in the neighboring countries of Ethiopia particularly South Sudan and Kenya. In South Sudan, for example, there were four consecutive cholera outbreaks from 2006 to 2009. The main risk factors for the existence of cholera outbreak in the country were consuming foods outside home and traveling outside the residential village [8].

AWD outbreak is the continuous problem in the three regions of Ethiopia. As of week 20, 2016, a total of 1, 884 AWD cases and 19 deaths with CFR of 1.0% had been reported from three regions namely Oromiya, SNNP and Ethiopian Somali regions. This by individual region, Oromiya exhibited a total of 686 cases and 12 deaths with CFR=1.7%; SNNP reported a total of 405 cases and 2 deaths with CFR=1.2%; and Somali reported relatively high number (793) of cases and 2 deaths with CFR=0.3%. About 67.3% of the cases were 15 and above years old and 51.3% of them were male [9].

The good knowledge of cholera among community is very important for prevention and control. Poor food preservation methods, eating from road side food vendors were independent risk factors for the occurrence of cholera. Improvement in hygiene and sanitation conditions coupled with water infrastructural development is crucial to combating the cholera epidemic [10].

There are certain challenges in cholera outbreak, notification, reporting, and controlling activities. Among these challenges lack of clean water sources and supply; hygiene and sanitation services; poor health service delivery [3, 7]; inadequate laboratory and epidemiological surveillance systems; economic, social and political disincentives [1]; cross border involvement of nations [9, 11]; and humanitarian crisis and displaced people resulting from political instability, and ethnic tensions [8].

Consumption of vegetables and fruits has remained an unresolved risk factor in cholera outbreaks in Iran in recent years. In order to reduce the risk of cholera, sanitary standards for fruits and vegetables should be observed at all points from production to consumption, the population should be educated regarding hygienic food storage during outbreaks, and sanitary standards should be maintained when traveling during cholera outbreaks[14].

Risk factors like hand washing after latrine usage, drinking treated water, access to latrine (unsanitary latrines) and contact to a case and visiting someone with similar illness had shown statistically significant association with acute watery diarrhea/ cholera. Daily laborers were highly affected by the cholera disease than others because they were lived in mass in camps [15].

1.3 OBJECTIVES

1.3.1 General objective

To describe the demographic characteristics of cholera infected patients and to determine the risk factor(s) associated with increased infection transmission in the community of the study woredas, kolfe keraniyo sub city, Addis Ababa, 2016

1.3.2 Specific objectives

To describe the cholera case by person, place, and time in the study woredas of kolfe keraniyo sub city, 2016

To determine the risk factors associated with increased cholera infection in the study woredas of kolfe keraniyo sub city, 2016

1.4 Study method

1.4.1 Study area and period

This study was conducted in 4 woredas namely woreda 10, 12, 14, and 15 in the kolfe keraniyo sub city from 1st July to 31st August 2016. Using an unmatched case control study design, the study examined the differences in types of exposures between individuals who have AWD cases based on standard case definition or/and with rapid diagnostic test (RDT); and the healthy controls people who do not have AWD and not fulfill standard case definition of AWD in order to determine the risks associated with that exposure. The study was preceded prospectively started from 1st July 2016 by enrolling new cases in the Mikililand cholera treatment centers (CTC) as they are identified and the controls were chosen randomly from the communities around the cases living area.

The population size of the study woredas estimated to be 101,885 with male population 48,905 (48%) and female population 52,980 (52%), 24,422 (23.97%) less than 15 years of age, 7,295 (7.16%) under five years of age, and 17,127 (16.81%) 5-14 years of age as of 2007 population projection. The populations size of these woredas is nearly one fifth (19.03%) of the sub city total populations. There is only 1 public health center which used as AWD/cholera Treatment Center (CTC). In addition to the CTC, around 20 private and NGO health facilities which actively participated in screening and reporting suspected AWD cases in the study woredas. The study woredas defined by yellow color in the following figure.

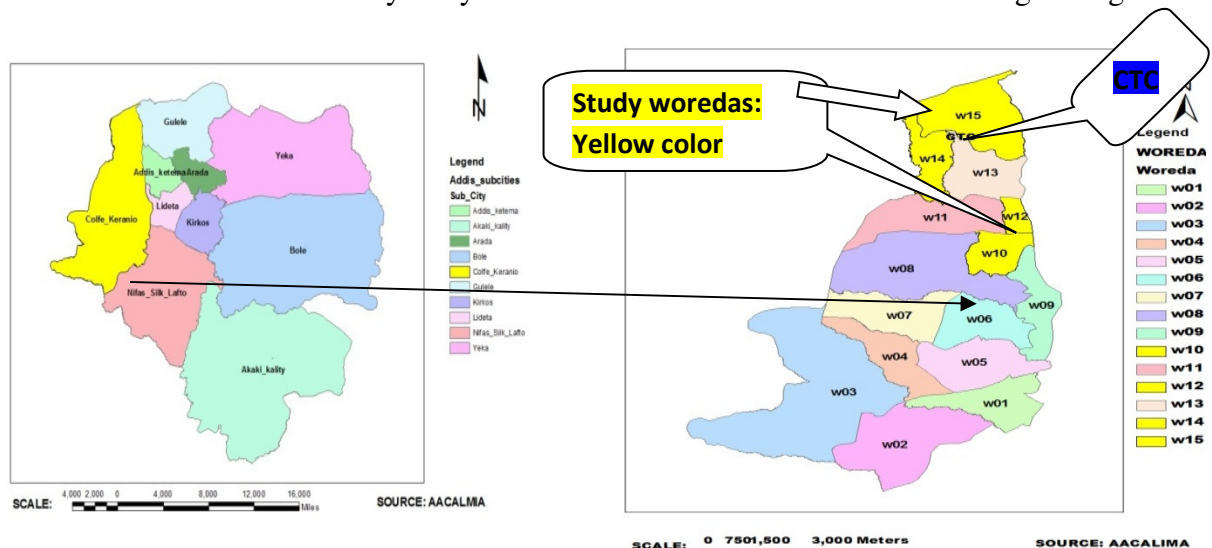


Fig 1: Map of Addis Ababa City Administration by sub cities and study woredas in the kolfe keraniyo sub city, 2017

1.4.2 Study design

Unmatched case-control study design with 1:2 cases to control ratio was used to determine the risk factor(s) associated with increased Cholera disease transmission in the community of the study woredas.

1.4.3 Population

1.4.3.1 Target population

The target populations were all people living in the kolfe keraniyo sub city during the study period.

1.4.3.2 Source population

The source populations for this study were the total population who live in the study woredas such as woreda 10, 12, 14 and 15.

1.4.3.3 Study population

The study populations were 150 sampled participants. The sampled participants included 50 new cases in Mikililand CTC and 100 controls in the selected woredas.

1.4.4 Case definition

Suspected case: A patient age 5 years or more who develops profuse watery diarrhea with or without vomiting.

Confirmed case: A patient age five years or more with clinical presentation of profuse watery diarrhea with or without vomiting and confirmed as presence of 01 or/and 0139 *Vibrio cholerae* sero-types by RDT or culture in the laboratory.

1.4.5 Sample size and Sampling procedure

1.4.5.1 Sample size determination

The sample size is calculated as unmatched case-control study to determine the sample size and power by using Epi info StatCalc. The least extreme Odds ratio (OR) 2.7; 95% CI (1.95, 3.89) obtained from previous study conducted in Iran about the association of consumption of vegetable and fruit in the last 3 days with cholera infection [14]. The hypothetical assumptions for the controls exposing to risk factors of the cholera infection assumed to be less relative to the cases. It also determined that statistically strong when the $p < 0.05$ with χ^2 and fisher exact test in logistic regression.

Assumptions: Least extreme Odds ratio to be detected= 2.7; Hypothetical proportion of exposed controls = 40%; Hypothetical proportion of exposed cases = 64.3%; Confidence level = 95%; Power = 80%; Number of cases = 50; Number of controls = 100; Total sample size = 150 (Kelsey et al).

1.4.5.2 Selection of cases

New cases were identified in the Mikililand CTC from all selected woredas such as woreda10, 12, 14, and 15 in the kolfe keraniyo sub city. The cases were newly confirmed of *Vibrio cholerae* with RDT/ culture; or a case that fulfilled the case definition of cholera without laboratory confirmation whose age with five years and above admitted to the Mikililand CTC. The cases were selected consecutively after having confirmation of their address from those selected woredas until the required sample (50) cases were obtained.

1.4.5.3 Selection of controls

To understand how rates of exposures to potential sources of infection differ between infected (cases) and uninfected (controls) persons, it is necessary to select controls from the general community in the selected woredas. Controls with age of 5 years and more were randomly selected from the community having not sign and symptom of cholera until the date of the interview but lives as neighborhood to the cases. To select controls, primarily cases were identified in the CTC. Following the identification of cases, the investigation team went to the residential area based on obtained address from the cased patient or his/her care giver to collect data from controls. Then starting the cased patient home, the random lottery method was used by toeing coins to select either right or left direction to recruit controls household. At the beginning immediately the following household to the case was selected and then after one control who fulfilled the criteria among the members was interviewed by obtaining informed verbal consent (or to parents if he/she was not mature enough to respond for the question). The second control was selected in the same way by leaving one household between controls. The same procedure was used for all participants until the required numbers of controls were obtained. To reduce recall bias especially younger children and aged people about possible source of exposure before five days, the investigation team repeatedly tried to patiently interview the candidates by mentioning different food and water sources that they might exposed earlier.

1.4.6 Exclusion criteria

Under five year children and persons who have had recently recovered from AWD/cholera were excluded from the study.

1.4.7 Study Variables

Dependent variables: diseased (cases) and not diseased (controls)

Independent variables: such as sex, age, marital status, educational status, occupation, residential area, date of onset, date of admission/hospitalization, and risk factors include: food source, water source both domestic and drinking, personal and environmental hygiene, sanitation, and contact history

1.4.8 Data collection method

Following the selection of participants and obtained their informed verbal consent, cases (or their care-giver where the case was too ill to speak) and control subjects were interviewed using the semi structured questionnaire. The questionnaire was adopted from Ethiopian Ministry of Health (EMoH) which was prepared as tool for AWD data collection. And the data were collected on some identifying information such as demographic characteristics, the date of onset and hospitalization, exposure to any risk factors for infection including water and food sources, hygiene and sanitation, travel history to the AWD affected area, and contact history with diarrhea or vomiting cases five days prior to onset of disease in order to develop hypothesis about the possible exposures, which was tested through this case control study. Stool samples were collected by laboratory technologist and tested by rapid diagnostic test (RDT) to isolate *Vibrio cholerae* in the stool. The data collection process took 2 months until collecting the minimum sample size which was 150. The data were collected by urban health extension workers having refreshed on infection prevention procedures prior to implementation and proper hand hygiene in the post implementation in order to minimize their own risk of infection when in close contact with patients and during community visits.

1.4.9 Data management

The principal investigator (PI) checked the daily collected data for its consistency, completeness, and clarity to keep the quality of data for the entire data collection period; supervised the data collectors both in the cholera treatment center (CTC) and in the community; and tallied daily compiled questionnaire. The questionnaire that was developed by English language for this data

collection was translated in to Amharic language to easily communicate with the interviewee and translated back to English language to make it fit for analysis.

1.4.10 Data analysis

Softwares such as Epi Info7^{AM} for data entry purpose, statistical package for the social science (SPSS) version 21, and Microsoft excel were used for data analysis. Descriptive statistics such as frequency was performed to describe the characteristics of demographic data for their frequency, central tendency and dispersion. Cross tabulation was used to check the presence of a minimum number of observations which is 5 in each cell before going to logistic regression statistical analysis. The association between risk factors for infection among cases and controls was analyzed using chi-square statistics or 2_sided Fisher's exact test and expressed as crude odds ratio (COR) and adjusted odds ratio (AOR) with 95% confidence interval (CI) and cut point p. value 0.05. Bi-variable analysis was used to determine the association of each independent variable to the infection with 95% confidence interval and the p. value < 0.05. Each independent variable having COR more than 1 with 95% CI and p. value 0.20 under bi-variable analysis were selected for multivariable logistic analysis to estimate the strength or statistical significance of the association between exposure and the infection. The selected variables were analyzed using multivariable logistic regression by backward likelihood ratio (LR) methods to determine which risk factor best explains the resulting infection; and the combination of risk factors associated with the odds of infection with AOR more than 1 with 95% CI and the p. value <0.05. The following outcomes were measured in the investigation corresponding to the objectives:

- I. The ratio of Odds of the exposure vs. Odds of the non exposure to a variety of potential source of infection in cases vs. controls
- II. The exposure or combination of exposures that best explain the resulting infection based on multivariable analysis of all exposures.

1.4.11 Operational definitions

Case: A case in this study was: - A patient age 5 years or more who develops profuse watery diarrhea with or without vomiting.

Control: A person age five years or more in whom no sign and symptom of cholera at the time of this data collection and he/she not recovered from the same infection.

Exposure: Any person exposing for any risk factors within the five days of proceeding to the data collection day.

1.4.12 Report the findings

The findings of the study interpreted and shared to local or woreda AWD outbreak response task forces, and the sub city health office to assist them in improving the same outbreak response interventions in the future.

1.4.13 Ethical considerations

Before preceding the data collection process, written letter of permission was obtained from kolfe keraniyo sub city health office to respecting woredas. Similarly permission was gained from woredas health offices to collect data for cases and controls from CTC and community respectively. Before interviewing both cases and controls, the purpose of the study was explained to all eligible subjects. They also were informed as they can reject the interviewer in case of inconvenience or objection, or mistrust happened. They also were reassured as the confidentiality of information obtained from them. And during the interviewing their verbal consent was obtained to participate in the study.

1.5 Result

I. Description of demographic characteristics of cholera affected patients in study woredas in the kolfe sub city, 2016

Acute watery diarrhea was identified on 8 June 2016 in kolfe keraniyo sub city in private clinic under the woreda 9. Subsequently Ethiopian Ministry of Health and Addis Ababa City Administration jointly declared as an occurrence of AWD/cholera outbreak in Addis Ababa, the Capital city of Ethiopia. The result of this study started with describing the AWD/cholera outbreak situation in the kolfe keraniyo sub city and particularly to the selected study woredas. The description of AWD as follow

There were a total of 206 cases with an attack rate (AR) (%) of 0.2. Among those cases males accounted 113 (55%) with AR of 0.23% and females accounted 93 (45%) with AR of 0.17%. The male populations were increasingly attacked by acute watery diarrhea infection than the female population except in woreda10 in the study area. This pattern of attack also observed in the kolfe keraniyo sub city as well Addis Ababa City Administration.

The total age distribution of affected population ranges from 2 to 96 years with an average age 36.54 years; males population with range of 3 to 96 years and with an average of 35.75 years; and females population with range of 2 to 76 years and with an average of 37.5 years. The most affected age group in the study woredas were the age between 15 and 44 years which accounted more than half or 57.3% of the all acute watery diarrhea cases. The pick age group in male population was the age group 25-34 years and 35-44 years in the female population.

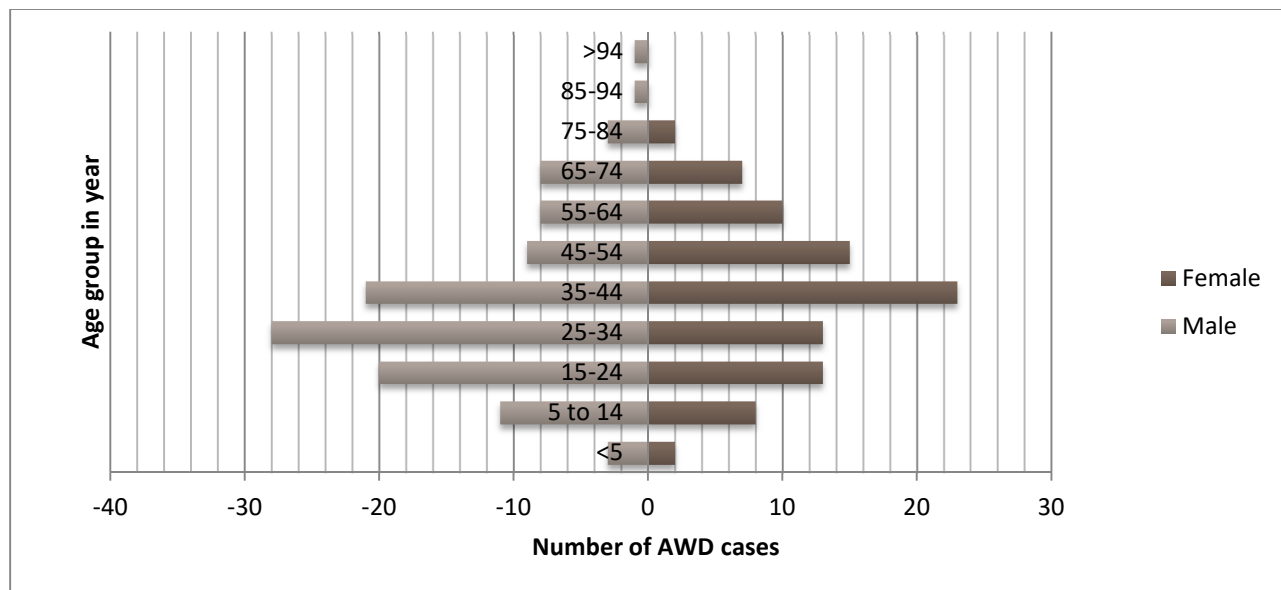


Fig 2: Population pyramid for AWD affected individuals in the study woreda of kolfe keraniyo sub city, Addis Ababa, 2016

According to the occupational status, daily laborer and people worked as private business were more affected by AWD/cholera disease and followed by house wife. Of the 206 cases, daily laborer accounted 56 (27.2%) and followed by private business 55 (26.7%). The following figure showed detail result.

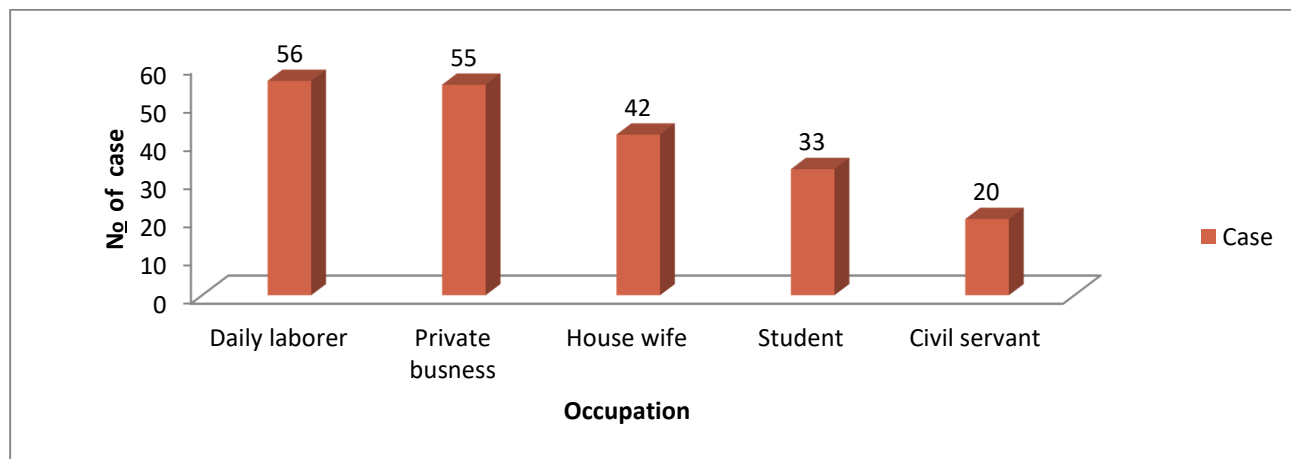


Fig 3: Occupational status of AWD/cholera affected population in the study woredas, kolfe keraniyo sub city, Addis Ababa, Ethiopia, 2016

The infected patients were admitted and rehydrated according to set management plans. Based on the management plan: Fifty (24.3%) patents were categorized in to severely dehydrated or as Plan C, 38 (18.4%) patients were moderately dehydrated or as plan B, and 118 (57.3%) patents were classified as mild dehydrated or as Plan A. The dehydration status of AWD affected male and female patients and their age groups in those woredas were described in the following table.

Table 1: The dehydration status of AWD affected patients by sex and age in the study woredas, 2016.

Age group	Dehydration status						Total
	Plan A		Plan B		Plan C		
	M	F	M	F	M	F	
0-4 years	2	1	0	1	1	0	5
5-14 years	8	6	2	0	1	2	19
15-44 years	43	27	11	10	15	12	118
≥ 45 years	14	17	8	6	8	11	64
Sub total	67	51	21	17	25	25	
Total	118		38		50		206

Woreda 10 and 12 were the 1st and 2nd in reporting the majority of the cases respectively. Eighty-nine cases were confirmed either by culture of RDT and 117 cases were suspected and linked to confirmed cases.

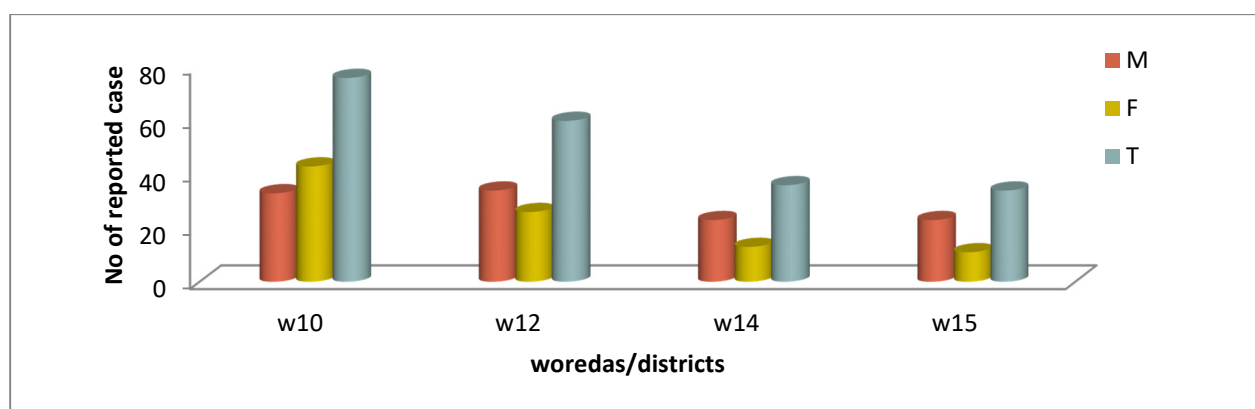


Fig 4: Cholera cases by sex in each study woreda in the kolfe keraniyo sub city, Addis Ababa, 2016

The highest and least attack rate was 2.67 per 1000 population and 1.20 per 1000 population, which was recorded in woreda 12 and 15 respectively. When we saw the disease by gender based attack rate in each woreda in the study area, males were highly attacked than females. The woreda that record high attack rate for male population was woreda 12 with an AR of 3.16 per 1000 population; and woreda 10 for female population with AR of 2.31 per 1000 population. Woreda 10 was the only woreda by recording high AR of cholera disease for female population in the study area.

Table 2: AR and CFR the disease by sex in each study woreda in the kolfe keraniyo sub city, Addis Ababa, Ethiopia, 2016

Name of woredas	Total population	Total population	Total number of reported cases (%)	AR/1000 population	CFR (%)
Woreda 10	male	14,273	33 (43.4)	2.31	
	female	15,463	43 (56.6)	2.78	
	total	29,736	76	2.55	
Woreda 12	male	10,766	34 (56.7)	3.16	
	female	11,964	26 (43.3)	2.17	
	total	22,430	60	2.67	1.67*
Woreda 14	male	10,273	23 (63.9)	2.24	
	female	11,130	13 (36.1)	1.17	
	total	21,403	36	1.68	2.78 **
Woreda 15	male	13,592	23 (67.6)	1.70	
	female	14,724	11 (32.4)	0.75	
	total	28,316	34	1.20	

*occurrence of death after the discharge from CTC; ** occurrence of death in the community

The outbreak reached peak on 19 June 2016 six days after isolating the first case in the four woredas mentioned earlier. Similar pattern was observed in July month. The case was started to seen on 13 June and end on 20 September 2016.

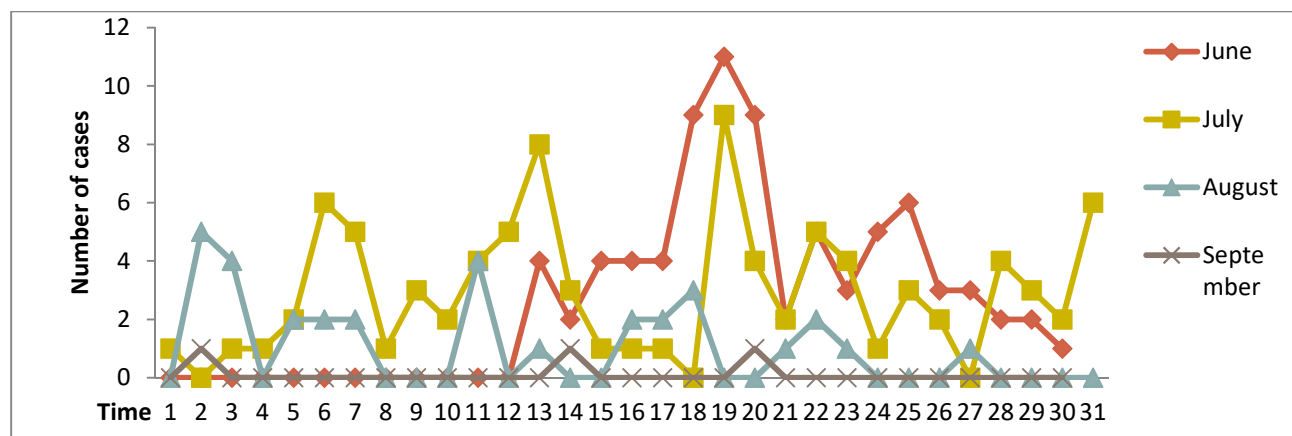


Fig 5: Daily reported acute watery diarrhea/cholera cases by months from June to September in the woreda 10, 12, 14, and 15, kolfe keraniyo sub city, Addis Ababa, Ethiopia, 2016.

Early case detection is one of the AWD cases prevention and control mechanisms. The maximum days between the onset of sign and symptom of the case and the patients seen at health facility were 7 days with an average of 1.06 days. In the same way, the maximum days stayed in CTC were 5 days with an average of 1.36 days.

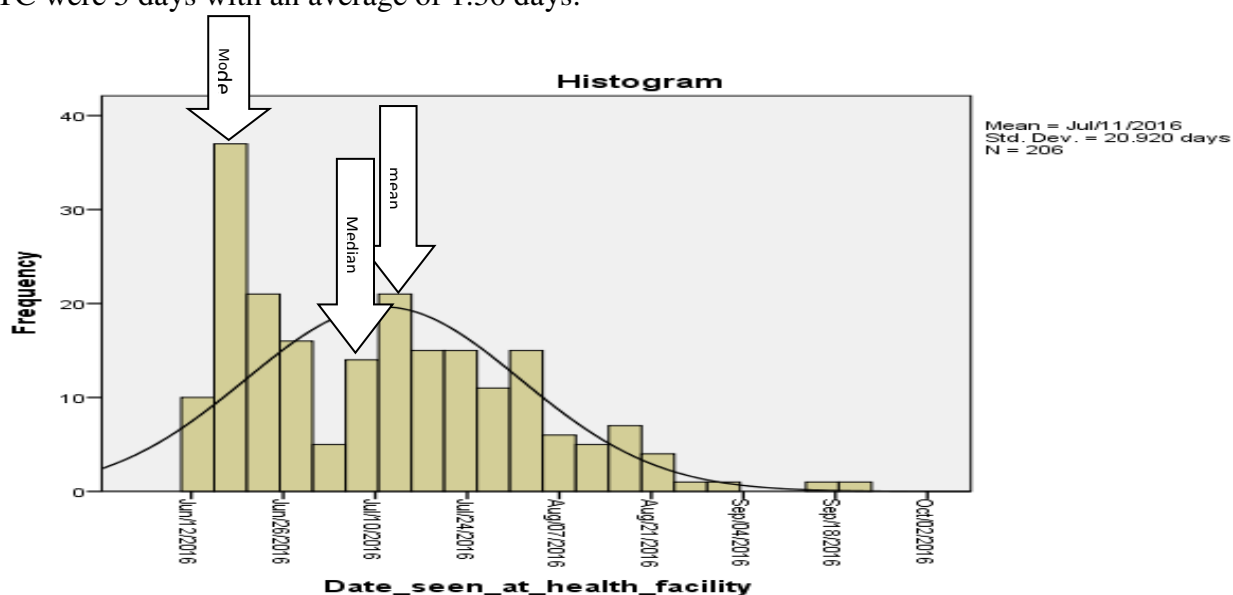


Fig 6: AWD outbreak curve in the four study woredas, kolfe keraniyo sub city, Addis Ababa, Ethiopia, 2016

II. Analytic epidemiology

There were a total of $n=150$ subjects (50 cases and 100 controls) interviewed for the possible risk factors associated with of transmission acute watery diarrhea infection in the four woredas of kolfe keraniyo sub city from 1 July to 31 August 2016. Among them 90 (60%) were females and 60 (40%) were males. The marital status of the interviewed subjects was described as 59 (39.3%) single (not married), 84 (56%) married, and 7 (4.6.7%) were widowed. Of the total interviewed subjects 26 (17.3%) were illiterate, 6 (4%) were able to read and write, 56 (38%) were educated primary school (grade 1-8), 37 (24.7%) were reached secondary school (grade 9-12), and 24 (16%) were reached college education.

The mean, age of the interviewed subjects' was 33.3year with SD ± 14.4 , range 84, max 90 and min 6. There were a numbers of questions which assessed the possible risk factors associated with AWD infection transmission in the area of water source , food and beverage source, hygiene and sanitation, and contact with diarrhea case or/and travel history to the AWD affected area.

Bi-variable logistic analysis: There were eleven associated with cholera infection in the study woredas. Those independent variables were related with food and beverage exposure, behavioral factors, and contact with cholera infected patients. The bi-variable analysis indicated that consumption of raw and partially roasted meat, any type of fruit, vegetable salad, exposing for foods outside home such as at gathering and on street vender, drinking local beverages including Tela and Mewuded, irregular hand washing without soap before meal and after toilet, and contact with patients having diarrhea or/and vomiting independently had association with cholera infection in those woredas. Table3 demonstrated that as there were independent risk factors with COR more than 1; 95% CI, and less than 5% marginal error ($\alpha < 0.05$). Based on those questionnaires, the bi-variable logistic regression analysis result showed that there was no association between water sources both for drinking and domestic use with cholera disease in the study area.

Table 3: Identified crude risk factors for the cholera infection in the study woredas, kolfe keraniyo sub city, Addis Ababa, 2016.

Independent Variables	Catego ry	Case (%), n=50	Control (%), n=100	COR (95% CI)	P. value
consumed any type of raw meat	Yes	36(72)	21(21)	9.67	<.001
	No	14(28)	79(79)	(4.42-21.16)	*
consumed any type of partially roasted meat	Yes	22(44)	13(13)	5.258	<.001
	No	28(56)	87(87)	(2.35-11.78)	*
Ate any type of fruit	Yes	28(56)	25(25)	3.818	<.001
	No	22(44)	75(75)	(1.86-7.83)	*
Ate vegetable salad	Yes	37(74)	15(15)	16.128	<.001
	No	13 (26)	85(85)	(6.98-37.25)	*
Foods consumed outside home (at gathering)	Yes	38(76)	18(18)	14.43	<.001
	No	12(24)	82(82)	(6.32-32.93)	*
Foods consumed on street vender	Yes	6(12)	2(2)	6.682	.023
	No	44(88)	98(98)	(1.30-34.42)	*
Drunk local beverage (Tela)	Yes	20(40)	5(5)	12.67	<.001
	No	30(60)	95(95)	(4.39-36.65)	*
	Yes	8(16)	5(5)	3.619	.032
Drunk local beverage (Mewuded)	No	42(84)	95(95)	(1.12-11.72)	*
Irregular hand washing without soap before eating	Yes	40(80)	22(78)	14.18	<.001
	No	10(20)	78(78)	(6.13-32.82)	*

Irregular hand washing without soap after toilet	Yes	42(84)	28(28)	13.50	<.001
	No	8(16)	72(72)	(5.64-32.32)	*
Visiting sick patient	Yes	32(64)	18(18)	8.10	<.001
	No	18(36)	82(82)	(3.75-17.50)	*

*Reference category

Multi-variable logistic regression analysis: All independent variables having COR more than 1; 95% CI and p. value 0.20 were calculated both by Enter and backward likelihood ratio (LR) methods to estimate the strength or statistical significance of the association between exposure and the infection. Based on multi-variable logistic analysis, about 6 independent variables were identified which were strongly associated with the cholera disease. Variables those were significantly associated with the cholera disease in the study woredas were presented in the table 4. Among those risk factors: consumption of any type of raw meat with AOR 11.842; 95% CI, (4.10-34.25), p. value .000; eating at gathering outside the home with AOR 13.52; 95% CI, (5.88-31.10), p. value 0.000; and drinking local beverage such as ‘‘Tela’’ with AOR 3.933 (1.452-10.651), P. value .007 had strongly association with the cholera disease while consuming any type of fruits had protective effect from cholera disease. One hundred forty-nine (99.3%) interviewed cases and controls were used latrine for defecation; of which 46 (30.87%) were used private (for family member only) latrine and 103 (69.13%) were used communal latrine. There was no association between the use of private or/ and communal latrine with cholera infection transmission. Here the analysis showed that irregular hand washing and not use of soap before eating was significantly associated with cholera infection transmission with AOR 5.23; 95% CI, (1.20-22.80), p. value 0.028.

The designed questionnaire was tried to assess possible risk factors for the transmission of current acute watery diarrheal diseases related to any contact with diarrheal diseases, burial/ funeral ceremony with suspected diarrheal diseases, and any travel history to the cholera affected area in the last one week. Among 150 interviewed subjects (both cases and controls), 33 respondents had contact with diarrhea or vomiting in their home. Of which only 4 were from cases. Similarly, nine respondents had involved with funeral ceremony and travel history to cholera affected area; of which 3 and 2 respectively were cases. Fifty respondents visited patients

having diarrhea/ vomiting within the five days preceding this data collection, of which 32 were cases. The analysis showed that visiting any patient/s having diarrheal or/and vomiting diseases in the last one week had an association with cholera disease with AOR 19.34; 95% CI, (6.87-54.48), $p < .001$.

Table 4: Adjusted identified risk factors for the cholera infection in the study woredas, kolfe keraniyo sub city, Addis Ababa, 2016.

Variables	Response	Case (%), n=50	Control (%), n=100	AOR (95% CI)	P. value
Consumption of any type of raw meat	Yes	36(72)	21(21)	11.842	<.001
	No	14(28)	79(79)	(4.10-34.25)	*
Consumption of fruit	Yes	28(56)	25(25)	.443	.026
	No	22(44)	75(75)	(.217-.905)	*
Foods consumed outside home (at gathering)	Yes	38(76)	18(18)	13.52	<.001
	No	12(24)	82(82)	(5.88-31.10)	*
Drunk local beverage (Tela)	Yes	20(40)	5(5)	3.93	.007
	No	30(60)	95(95)	(1.45-10.65)	*
Irregular hand washing without soap before eating	Yes	40(80)	22(78)	5.23	.028
	No	10(20)	78(78)	(1.20-22.80)	*
	Yes	32(64)	18(18)	19.34	<.001
Visiting sick patient	No	18(36)	82(82)	(6.87-54.48)	*

*Reference category

1.6 Public health intervention

Immediately after the declaration of acute watery diarrhea/cholera outbreak in the city, the outbreak response task force and four committees with five groups were established at the sub city level aiming to awareness creation in the community; surveillance, case investigation and contact tracing activities, house hold disinfection and logistic supply. Subsequently, the task force stretched down to the all 15 woredas. Additionally, RRT in all public health facilities were established for those didn't have before and functioning already the existing one. Establishment of cholera treatment center in selected health centers and hospital, and preparation of cholera isolation rooms in each health centers were among the immediate public health actions. Three CTCs were equipped with cholera treatment logistics and were ready to admit and treat case patients for 24 hours in a day throughout the outbreak period. Three ambulances were standby one in ALERT hospital and two were in 2 CTC health centers to facilitate transportation of cases from community and other health institutions to CTC. All health professionals from all health centers and physicians from SPHMMC and ALERT hospitals actively participated on screening, diagnosis, IV fluid transfusion, antibiotic treatment, documentation, and reporting. Supporting staffs (especially cleaners and security/guards) were the back bone for the cholera outbreak response activity in all CTC. Environmental health professional also played significant roles by rearranging the CTC setup, mixing and diluting disinfectants according to the needs and by disinfecting and reassuring less risk environment around the CTC.

Besides these, urban health extension workers (UHEWs) and women development army (WDA) in each woreda collaborating with the establish committees played an important roles: in house to house health education on how to prevent cholera transmission; in distributing water treatment chemicals to the community; in identifying over flow /filled/ latrines and open defecation if any; in identifying and reporting suspected cases; in identifying areas with shortage of water supply; and high risk areas for the cholera infection transmissions.

Field epidemiology training program residents collaborating with sub city health office staffs worked on the area of active case search both in health institutions and community, contact tracing for each cases, case investigation, supporting the established team and reassuring the disinfection status of each case households and major risk areas.

Stockholders including FMOH, EPHI, AAHB, sub city and woreda sector offices had significant roles in coordinating, facilitating, supporting, and monitoring the overall response activities. Partners such as WHO, United Nations International Children Fund (UNICEF), Medicine Sans Frontlines (MSF) Ethiopia and John Snow Inc's/ Strengthening Ethiopia Urban Health Program (JSI/SEUHP) were also actively involved on the holistic outbreak response activities. Especially, MSF and GSI Ethiopia had played prominent activities through work force recruitment and by rearranging and standardizing the CTC, and by awareness creation in the community, as well in hygiene and sanitation.

In general, more than 24 thousand households were addressed home to home health education on cholera prevention. All 206 households and toilets of cases were disinfected with 5% chlorine solution immediately after the identification of the cases. A number of overflow /filled/ toilets were sucked and disposed and many pit latrines were constructed. Each contact of registered cases were traced and followed for consecutive five days.

1.7 Limitation of the study

- The main limitation of this study was information bias since it started a month after the occurrence of the outbreak of acute watery diarrhea in those woredas. It may reduce the validity of the study.
- The other limitation was recall bias especially younger children and aged people about possible source of exposure before five days. To minimize this kind of bias the investigation team tried to patiently interview the candidates by mentioning different food and water sources that they might exposed earlier.

1.8 Discussion

This study focused on identifying the most affected population groups and the main risk factors for the acute watery diarrhea/ cholera outbreak in those selected woredas. Based on this study finding, the male populations were increasingly attacked by acute watery diarrhea/cholera infection than the female population. This was in line with the case-control research study conducted in Afar region, Ethiopia, 2014 [15]. In contrary, other cross-sectional study conducted in Nigeria, 2016 showed that female population were more affected by cholera outbreak [16] and which also supported by other cholera outbreak investigation which was conducted in Central African Republic, 2011 [17]. The possible assumption for

this finding that males have more exposed for consumption of foods outside the home compared to females.

Age is one of the major concerns while talking acute watery diarrhea/cholera infection. This study showed that the most affected age group in the study woredas was the age between 15 and 44 years which accounted more than half or 57.3% of the all acute watery diarrhea/cholera cases in those study woredas. This was similar to the acute watery diarrhea/ cholera disease documented in the 3 regions of country such as Oromiya, SNNP, and Somali [10] but contrary to the previous study conducted on Meta analysis on the issue of global burden of cholera which showed that children less than five years of age were more vulnerable for cholera infection than any age groups [1]. The AWD/cholera affected age groups in this study were the major work force and who may have eaten outside the home, contact with working groups, and possibility of lacking water and soap for hand washing.

Acute watery diarrhea/ cholera infection is directly or indirectly associated with occupational status of the people. The finding in this study revealed that daily laborer and people worked as private business (involved in small scale business) were more affected by AWD/cholera disease. This was similar with study conducted in Afar region, Ethiopia, 2014 and. This is may be due to they may have access to eat contaminated foods outside home and poor hand washing facilities on their working area.

Consuming proper cooked meal and hygienic foods handling is one of the means of preventing acute watery diarrhea/ cholera infection among other measures. The analytic statistic in this study indicated that consumption of any type of raw meat was associated with AWD/cholera disease in the study woredas. This was probably due to lack of appropriate sanitation around meat processing area and cross contamination from butchers and other meat handlers.

The bivariate and multivariable analysis indicated as consumption of any type of foods outside the home and drinking local beverage (Tela) was as the risk factor for the acute watery diarrhea/ cholera disease. This study revealed that eating out side home (at gathering) had significant association with acute watery diarrhea/cholera disease in the study woredas which was in line with the study conducted in Juba county, South Sudan, 2014 [9]. This was may be due to the AWD outbreak season in the study woredas was summer and have many occasional gathering ceremonies and possibility of consuming contaminated foods and drinks.

Feaco-oral transmission is the main characteristic of acute watery diarrhea/ Cholera infection. One and the main acute watery diarrhea/cholera infection pretension mechanism is regular and proper hand washing with soap after toilet and before processing and eating foods. This study result indicated that irregular hand washing and not using soap before meal was significant association with the disease. The

odds of people those who didn't wash their hands regularly and not using soap were 5.23 time more likelihood developing acute watery diarrhea/ cholera disease compared with people who wash their hands regularly and with soap before meal. The study result was in line with the previous cross-sectional survey and case-control studies conducted in South Sudan [18] and Nigeria.

Contact with patients infected with acute watery diarrhea/cholera disease is another way of disease transmission from infected person to healthier one. This study revealed that visiting sick person with diarrhea or/ and vomiting within the five days duration had strong and significant association with the cholera disease occurrence. This may be due to lack of awareness of in the community on how to handle and visit the cholera infected patients. The case-control study conducted in Alborz Province, Iran, 2011 showed that as it had association with cholera infection but was weak association [14].

1.9 Conclusion

In the study woredas, male populations were more attacked by acute watery diarrhea/cholera disease than female population. This could be due to exposure for consumption of foods outside the home. The vulnerable age groups for the cholera infection/disease were between 15 and 44 years who were the major work force and may related contact with working groups. Daily laborers were more prone to exposing for acute watery diarrhea/cholera infection than other occupation. This was due to they may had access to eat contaminated foods outside home and poor hand washing facilities on their working area. Therefore, need addressing intensive awareness creation to those population groups.

People who ate any type of uncooked or raw meat and drunk local beverage (Tela) had probability of contracting acute watery diarrhea compared with none users. This was probably due to lack of appropriate hygiene and sanitation around meat and beverage handling and processing area and as well cross contamination from butchers and other food handlers. Here of, regular and continuous monitoring of the hygienic and sanitary condition of meat processing facilities from the source to the distribution site is mandatory to prevent similar problems in the future. It also need continuous medical checkup for those butchers and other food handlers

Poor and irregular hand washing practice and not soap/detergent using before food preparation and consumption was the major risk factor for the acute watery diarrhea/cholera disease. The other risk factor for this infection was visiting person/s sick with diarrhea or/and vomiting. This may be due to lack of awareness in the community on how to handle and visit the cholera infected patients. So that, extensive and tremendous health education to the community inclusively (male and female, young and adult) need strong work.

1.10 Recommendation

- Each woreda health office in the study area expected to work on increasing community awareness about possible communicable disease and their prevention methods through available means of communication and already existing structure.
- Urban health extension workers and the program modulators in the woreda and sub city health offices expected to address male population in the extension program and to expand the program to the working area in addition to strengthening the existing system to enhance required level of awareness in all community.
- The offices of food medicine health administrative and control authority (FM HACA) at all levels should regularly and intensively monitor the meat and meat product quality, meat processors medical status and hygienic condition, and hygienic and sanitary situation of meat processing facilities from the source to the end distributors.
- Finally, all communities, woreda administrators, and security offices should work together to prevent illegal meat and meat product processing and processors that may harm the health of the community, and they expected to develop collaborative strategy to eliminate such illegal activities from the woredas.

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Chapter-2: Surveillance Trend Analysis

Influenza like illness (ILI) Surveillance Trend Analysis in Kolfe sub-city from 2012 - 2015

Executive summary

Background: Influenza like illness is a contagious respiratory illness caused by flu viruses. The people having a flu often feel some or all of the following symptoms: fever, cough, sore throat, runny or stuffy nose, muscle/body aches, headaches, fatigue^{1, 2, 3}. Flu can affect human, domestic and wild animals and birds based on the causative microbes. Upper respiratory tract infection was the leading top ten causes of morbidity in Kolfe sub-city for the past four years and characterizes vast transmission pattern from year to year. Therefore, the aim of study was to assess the trends of influenza like illness in the Kolfe sub-city.

Method: All influenza like illness cases were collected from case-based report of 2012-2015 in the Kolfe sub-city. The collected data were cleaned and aggregated for analysis. The data was analyzed by person and time. The data was calculated for its frequency, proportion, ratio, and rate.

Result: One thousand-two-hundred-and-eighty-nine suspected influenza like illness were reported in Kolfe sub-city. Of which 526 (40.8%) were male and 763 (59.2%) were female. Among the total suspected influenza like illness 331 (25.7%) were diagnosed type A & B influenza virus in national laboratory. The male among those positive cases were 150 (45%) and the rest were female. The 15-44 years age groups 730 (56.6%) were more affected by the disease and followed by 5-14 years age groups 330 (25.6%). The female to male risk ratio was 1.44. Total positivity rate of tested influenza like illness was 25.7%. There were three peak seasons of the disease at 14th week of 2012, from 9th to 12th week of 2013 and at 42nd week of 2014. The transmission pattern of the disease was changed in 2014. **Conclusion and recommendation:** There were three missed outbreak features of influenza like illness from 2012 to 2014. It needs serious attention of Federal Ministry of Health and its partners in health promoting at school and work areas in addition to household level and close monitoring of transmission pattern of the disease.

Key words: Influenza like illness (ILI), trend, Kolfe sub-city

2.1 Introduction

2.1.1 Background

Description: Influenza like Illness (ILI) is also known as acute respiratory infection (ARI) and flu- like syndrome /symptoms is a medical diagnosis of possible influenza or other illness causing a set of common symptoms. It is a contagious respiratory illness caused by flu viruses. It can cause mild to severe illness and at a time can lead to death. People who have the flu often feel some or all of these symptoms: fever, cough, sore throat, runny or stuff nose, muscle /body aches, headaches, fatigue and the like^{1, 2, 3}.

Flu is unpredictable and how severe it is can vary widely from one season to the next depending on many things, include: how flu viruses are spreading, how much flu vaccine is available, when vaccine is available, how many people get vaccinated, and how well the flu vaccine is matched to flu viruses that are causing illness^{1, 2}.

Types and severity of influenza: There are different influenza types: seasonal, avian, swine flu, variant, pandemic and others. These different types of influenza had happened in different countries and regions in the world in the past decades. For example: Russian flu 1889-1890, Spanish flu from January 1918 to December 1920 was unusually deadly influenza pandemic and infected 500 millions of people across the world and resulted in death of 50 to 100 million (3-6% of the entire global population)^{Wikipedia, free encyclopedia}, Swine flu in China, bird flu in China⁴.

Transmission pattern: Flu can affect human, domestic and wild animals and birds based on the causative microbes of the flu. Flu can be transmitted from animals to animals, animals to birds, birds to birds ,and some types of flu may also from animal to human , from birds to human . Its mode of transmission could be close contact with infected animals or birds droplets from infected one to the other. Flu's transmission pattern can be locally (in the specific place), nationally (the whole country) and internationally (trans-boundary) as cluster/outbreak, epidemic and pandemic way respectively.

Impact of influenza: Influenza pandemic diseases can diminish countries economy resulting from blocking of goods exchange, restriction of tourisms flow and by hurting youth and labor forces at large. The social interaction between people will be weak and loose due to its communicability, severity and mode of trans-transmission. It also creates political instability by upraising internal and external pressure on the governors and political leaders¹¹.

Influenza like Illness (ILI) is one of the major problems of kolfe keraniyo sub-city population since last four years among other potential epidemic prone and public health importance diseases and conditions. It affects both genders and all age groups throughout the sub-city especially starting from 2012. Its distribution and severity is progressed year to year and is burden of health workers in different health institutions^{7,9}. Students and teachers absentees rose time to time from kinder garden (KG) to preparatory schools as of informal information of office of education in the sub city. It is also a challenge of private and government employees, and even a challenge of under-five children in their homes. So that it is the concern of public, health workers and government at large⁵.

Upper respiratory tract infection was the leading top ten causes of morbidity in the kolfe keraniyo sub-city for the past four years. It also more affects productive age group population that consequences decline in productivity. Influenza like illness is the syndrome of the respiratory tract. It is national and international concern. It characterizes fast and massive transmission pattern from year to year in the past mentioned years and potential for epidemic. These are significant information to study the trends of Influenza like Illness in the selected sub city.

2.2 Objective

2.2.1 Main Objective

To assess the trends of influenza like illness (ILI) in the Kolfe Keraniyo sub-city, Addis Ababa, Ethiopia, 2012 to 2015.

2.2.2 Specific objectives

To describe the trends of influenza like illness by epidemiological week in the kolfe keraniyo sub-city from 2012 to 2015

To find out if any seasonal change of the occurrence of influenza like illness in the study area within the mentioned years

To compare which population sub groups were more affected by influenza like illness within the study area from year 2012 to 2015.

To determine which influenza sub types were more circulated in the study area within the mentioned years

2.3 Method

2.3.1 Study area and period

The Influenza like illness (ILI) trend analysis covered from 2012 to 2015. Kolfe Keraniyo Sub-City is the largest in population and covers third wide geographic area among ten Sub-Cities established in the Addis Ababa City Administration. It is located at the western parts of Addis Ababa City Administration 9.6 kms away from the center of the city. The altitude of the sub-city ranges from 2,255 to 2,838 meters above sea level which has a range of 579 meters (9). At present, the sub-city is divided in to fifteen districts/ woredas/ with their defined administrative area and population, 103 sub woredas (ketena), 393 sefers, and 1385 blocks. It covers an area of 6,348.09 hectares (63,480.9 square kilo meters). Of which 1,334 square kilo meters covered with forest and included prominent feature Mount Jemo, Jemo River, and Repi Medhanealem Mount. It is one of the rapidly expanding sub-cities of Addis Ababa where intensive housing construction is taking place. It shares boundary with Addis Ketema Sub-City in north east, Lideta Sub-City in the east, Gulelle Sub-City in north, Nifas Silk Lafto (NSL) Sub-City in south and south east, and Oromiya national regional state in the west at large. Ring road crossing from general Wingate to Ayer Tena detaches Kolfe Keraniyo sub-city from neighboring sub-cities. Other three main asphalt roads which serve as junction to eastern, southern and western Ethiopia to the center cross in the sub-city (6, 10).

As of 2008 E.C projection the total population of the sub-city estimated as 524,200. Among the total population male=251616 (48%), female=272584 (52%), under five children accounts 37,533 (7.16%) and female in reproductive age group estimated to be 181,583 (34.46%). The population density of the sub-city ranges from 103.7/Hr to 716.5/Hr. The population of the sub city is diversified ethnic group and have religious back ground. Majority of the sub-city's population is migrants from different regional state and corner of the country and from other sub-cities in Addis Ababa (6, 10).

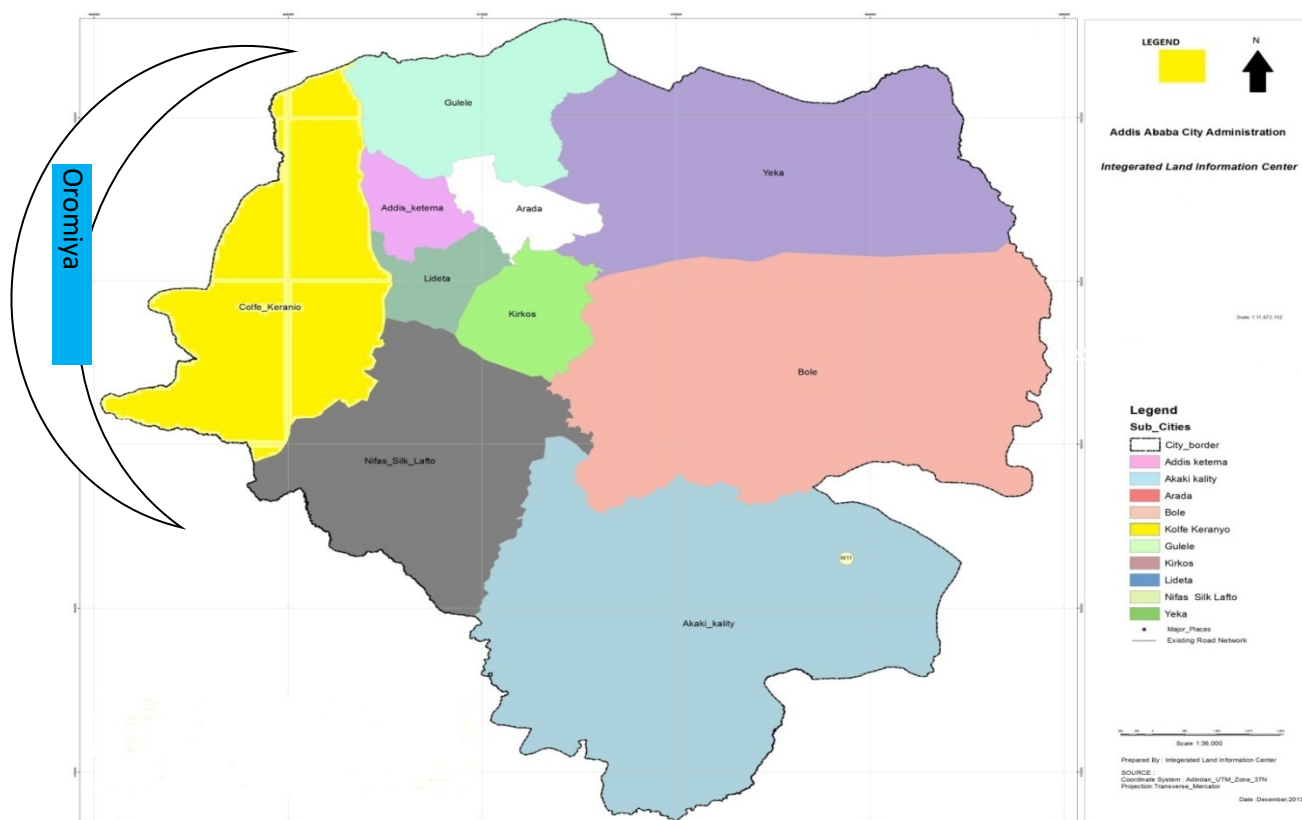


Fig 7: Map of Addis Ababa City Administration by sub cities

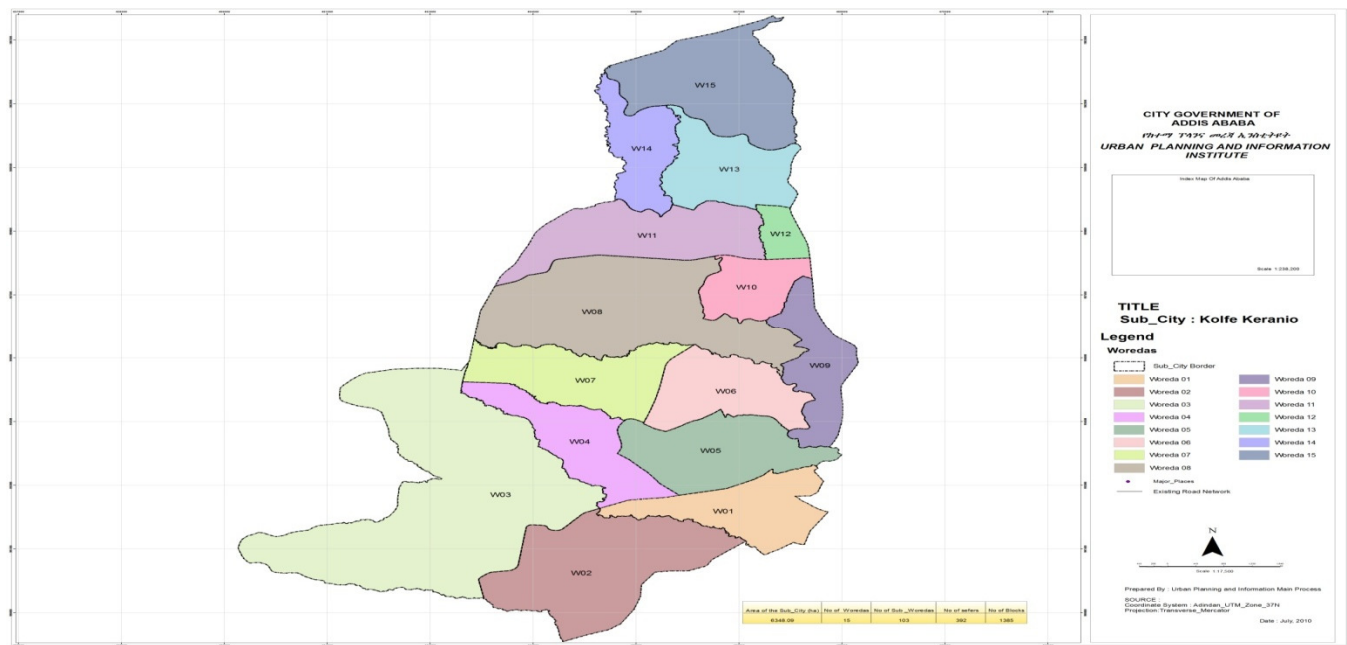


Fig 8: Map of the kolfe keraniyo sub city by woredas

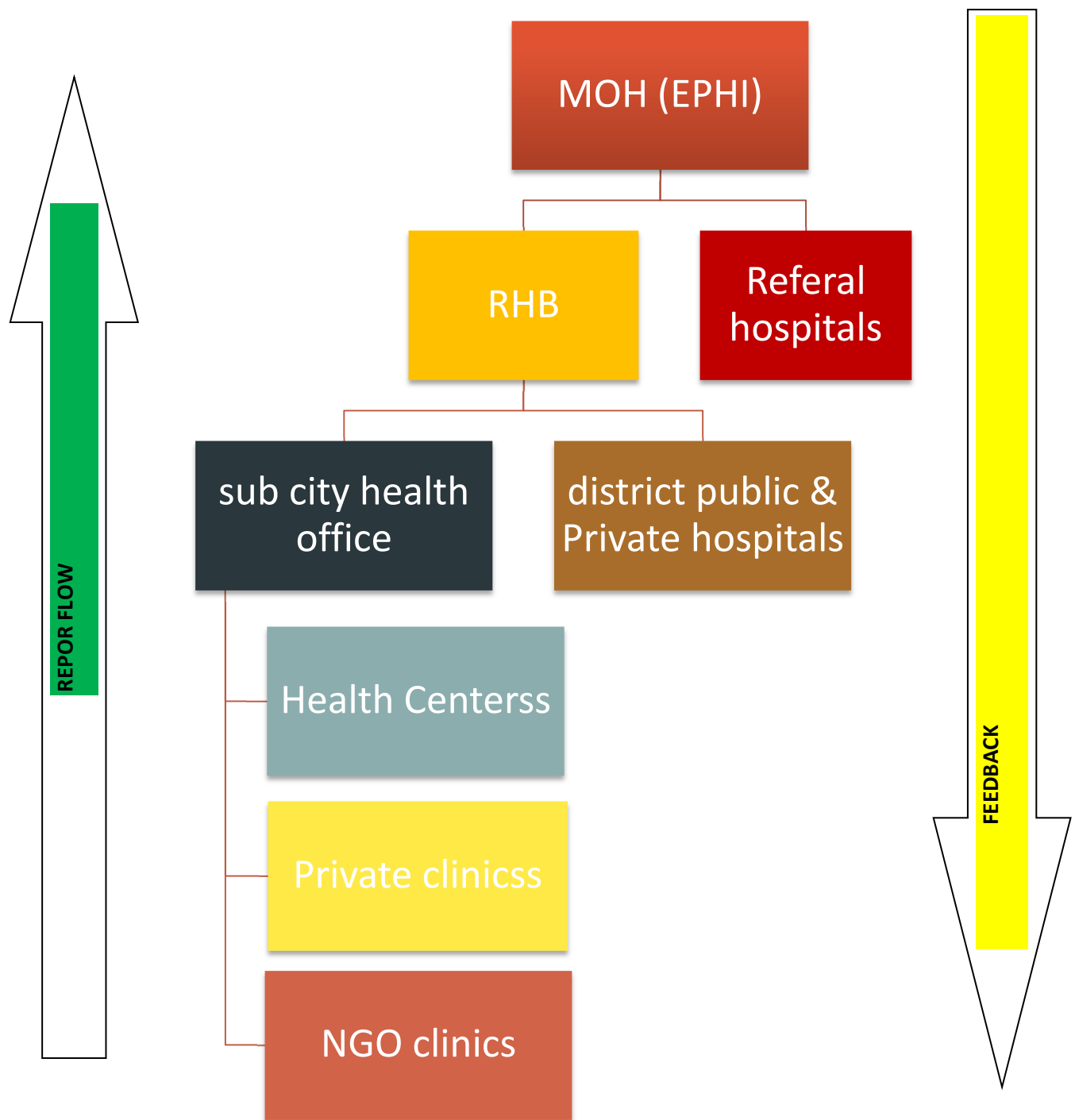


Fig 9: Surveillance report flow chart and feedback mechanism in the sub city as well in the country.

The surveillance system of the sub-city progressed from time to time and it incorporated 100 health institutions under its administration. Weekly surveillance report timeliness was above 80% and completeness approached to 90%. Two PHEM officers recruited in the sub-city health office and the process of enrollment for the woredas is ongoing. Except few primary clinics all health facilities sent their weekly IDSR report to the sub-city. The flow of weekly IDSR reporting started from health facilities every Monday to the sub-city and the sub-city sent aggregated summary data to the regional health bureau every Wednesday before 6:00 pm (6).

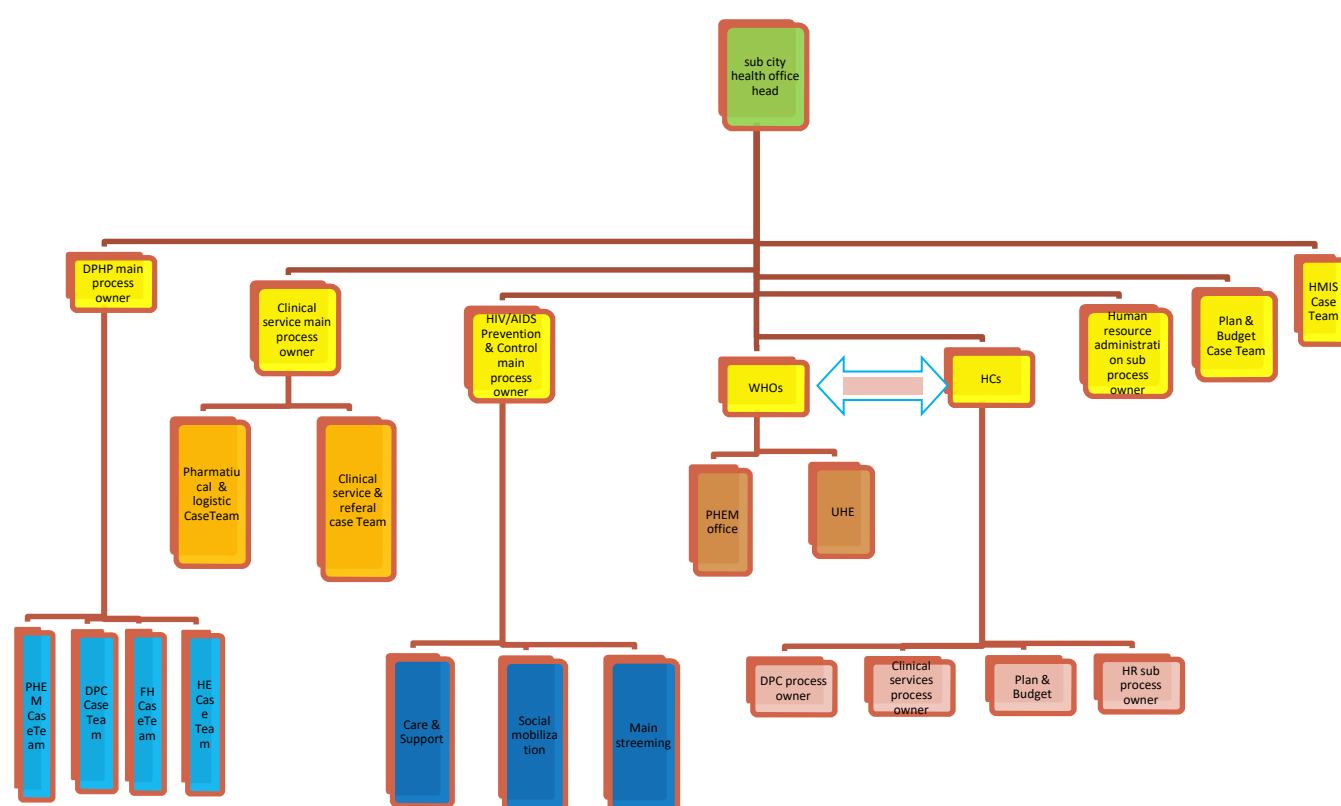


Fig 10: Organo gram of kolfe keraniyo sub city health system, 2015

Currently there are 11 functional public health centers and 1 Health post, 1 federal hospital, two general and two primary private hospitals, two NGO health centers, two NGO clinics, around 12 specialty clinics, one MCH center and nearly 60 private medium and primary clinics in the Kolfe Keraniyo sub-city. Ten out of the fifteen districts/ woredas have at least one public health center (10)

2.3.2 Study design

Facility based cross-sectional study design was used for the trend analysis of ILI cases in the kolfe health center, Addis Ababa.

2.3.3 Population and Sampling

2.3.3.1 Target population

All people living within Kolfe Keraniyo sub city administration, Addis Ababa, Ethiopia from 2012 to 2015

2.3.3.2 Source population

All people who attended kolfe health center for medical service from 2012 to 2015 in Kolfe Keraniyo sub city, Addis Ababa, Ethiopia.

2.3.3.3 Study population

All people who attended kolfe health center for medical service complaining respiratory tract infections from 2012 to 2015 in Kolfe Keraniyo sub city, Addis Ababa, Ethiopia.

2.3.3.4 Study subjects

All people with respiratory tract infection who met the WHO standard case definition of influenza like illness as adopted by Ethiopia Ministry of Health.

2.3.4 Case definition

Suspected case

A person with acute febrile respiratory illness (fever, cough, sore throat, shortness of breath, and difficulty in Breathing or chest pains) with the onset of 7 days or close contact with a person who is a confirmed case of the new influenza A (H1N1) virus infection.

Confirmed case

An individual with laboratory confirmed new influenza A (H1N1) virus infection by real-time RT-PCR

2.3.5 Inclusion criteria

All people attended kolfe health center with ILI suspected cases from Kolfe Keraniyo sub city were included in the study.

2.3.6 Exclusion criteria

All people with suspected ILI cases out of kolfe sub city were not included in the study. Those cases with missed information such as age and sex were also excluded.

2.3.7 Sample size determination

All (1298) suspected influenza like illness cases that registered in Kolfe health center from 2012 to 2015 were taken from case-based formats. Both sex and all age groups populations were included in this study. The primary study subjects were residents of kolfe keraniyo sub city.

2.3.8 Data collection and management

2.3.8.1 Data collection method

Following the selection of cases, data were collected using the structured questionnaire from kolfe health center and PHEM report of kolfe keraniyo sub city health office. Time taken for data collection was one week 12th to 18th May, 2016.

2.3.8.2 Data management

The collected data checked for its completeness, accuracy, clarity and consistency from the data collection to analysis period in order to maintain the quality of the data. Data out of study area and incomplete were removed from the analysis. I assured the quality of the data by carefully tallying for the completeness of each variable. Data kept appropriately in the personal computer to maintain confidentiality.

2.3.9 Data Analysis

The data analyzed by number, frequency distribution tables, proportion, and rate using Microsoft Excel software. During data analysis, tables and figures were the major tools to show ILI trend in the mentioned years. The collected data also were analyzed only by person and time. To analyze the data by place not convenient due to incomplete information or the information about the residential place of the cases that I found was not described in terms of specific kebele or woreda. The recorded addresses for all cases were kolfe keraniyo sub city.

2.3.10 Description of Variables

2.3.10.1 Dependent Variables

- Number of cases,
- proportion of cases,
- Ratio
- attack rate,
- positivity rate
- type of confirmed influenza

2.3.10.2 Independent variables

 Person:

- Sex
- Age

 Time

2.3.11 Ethical considerations

Written letter of permission was obtained from the college and kolfe sub city health office before conducting the study. The purpose of the study was explained to all authorities, PHEM officers and surveillance focal during the visit of health offices and health centers.

2.3.12 Dissemination of findings

The ILI trend analysis findings interpreted and shared to Kolfe health center, Kolfe Keraniyo Sub city health office, Addis Ababa City Administration Health bureau to take managerial decision. And the result also shared to St Paul Hospital Millennium Medical College Department of Public Health.

2.5 Result

From 2012 – 2015, a total of one thousand two hundred eighty-nine (1289) suspected influenza like illness cases were reported in the kolfe keraniyo sub city. Of which 526 (40.8%) were male and the rest 763 (59.2%) female. Among the total suspected influenza like illness sampled cases 331 (25.7%) were diagnosed as having types A & B influenza virus in national laboratory, EPHI. Out of those positive cases, 150 (45%) were male and 181 (55%) were female patients. All those cases were registered in the outpatient department. The trend of Influenza like illness in terms of epidemiological week in each year was displayed by the following line graph.

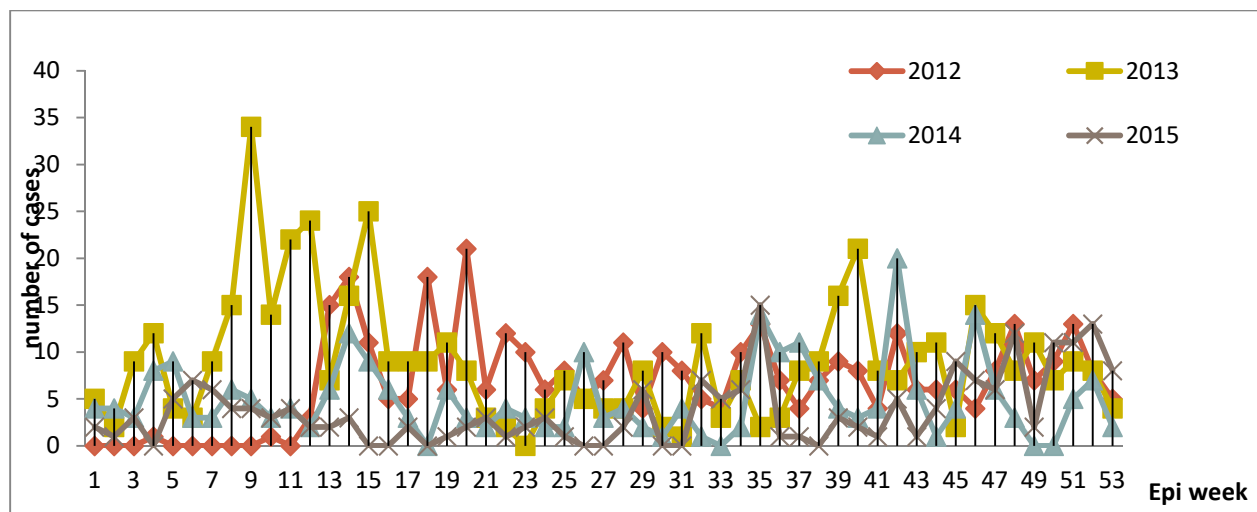


Fig 11: Suspected ILI cases by epidemiologic week in kolfe keraniyo Sub-City, 2012-2015

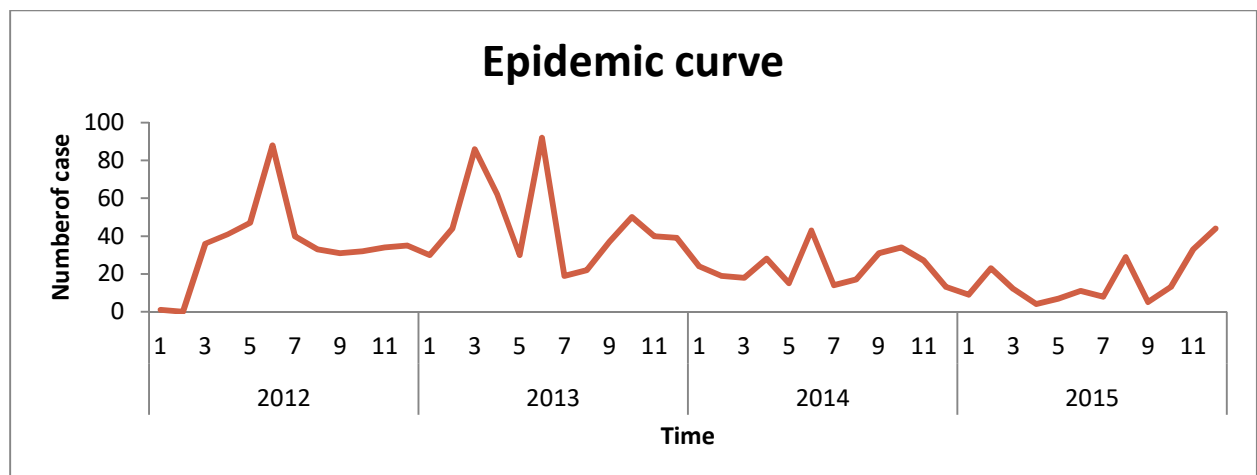


Fig 12: Epidemic curve on the ILI cases in Kolfe keraniyo Sub city, AA, 2012-2015

Table 5: Suspected ILI cases distribution by sex in kolfe keraniyo sub-city, 2012 to 2015

	2012		2013		2014		2015		Total	
Sex	Number	%	Number	%	Number	%	Number	%	Number	%
Male	177	49	195	41	81	31.4	73	37.8	527	40.8
Female	185	51	281	59	177	68.6	120	62.2	762	59.2
Total	362		476		258		193		1288	

The majority 730 (56.6%) of Influenza like illness case was occurred on 15-44 years age groups patients and followed by children 5-14 years age groups which accounted 330 (25.6%).

Table 6: Suspected influenza like illness (ILI) cases by age and sex in Kolfe Keraniyo Sub-City, 2012-2015

Age distribution						
Year	Sex	<5 Yrs	5-14 yrs	15-44yrs	>44yrs	Total
2012	Male	10	72	90	5	177
	Female	18	69	90	8	185
2013	Male	36	98	55	6	195
	Female	27	120	112	22	281
2014	Male	11	30	37	3	81
	Female	12	63	96	6	177
2015	Male	26	19	21	7	73
	Female	28	35	53	4	120
Total		168	330	734	61	1,289

Positivity rate: According to the national laboratory result feedback from EPHI, the four years total ILI positivity rate from tested samples was 25.7%. The test result for individual year showed that the positivity rate of the ILI sample was 27.3% in 2012, 27.7% in 2013, 28.4% in 2014, and 13% in 2015.

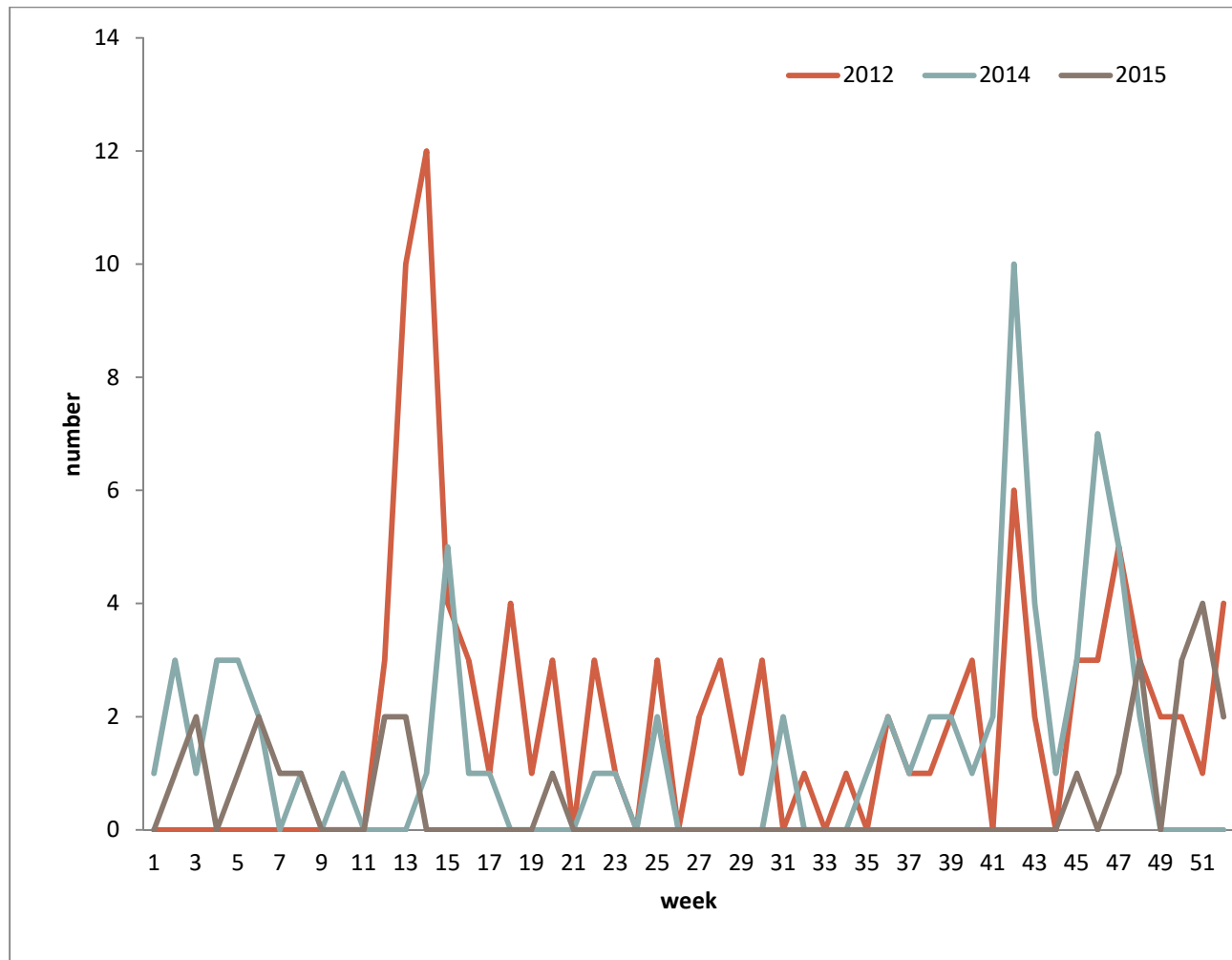


Fig 13: Positive test results of influenza by epidemiological week, in Kolfe Keraniyo Sub-City, 2012-2015

Table 7: Identified Influenza virus types in the Kolfe Keraniyo Sub-City, from 2012-2015

Year	Influenza type A virus		Influenza type B virus	
	No	%	No	%
2012	73	74	26	26
2013	75	57	57	43
2014	40	54	34	46
2015	17	65	9	35
Total	205	62	126	38

Source: ILI test result feedback, EPHI

Influenza virus type: There are three types of influenza viruses that is A, B and C. From the total 1,289 tested influenza like illness cases from 2012-2015, 331 were positive for different types of influenza viruses. Out of those positive influenza cases, 205 (62%) were influenza virus type A while the rest 126 (38%) were influenza virus type B. The type 'A' influenza virus was dominant and responsible for 74%, 57%, 54%, and 65% of the cases in the consecutive years (2012-2015).

Human influenza A and B viruses cause seasonal epidemic of diseases almost every winter. Influenza type C infections cause a mild respiratory illness and are not thought to cause epidemics. Influenza B viruses are not divided into sub types, but can be further broken down into lineages and strains.

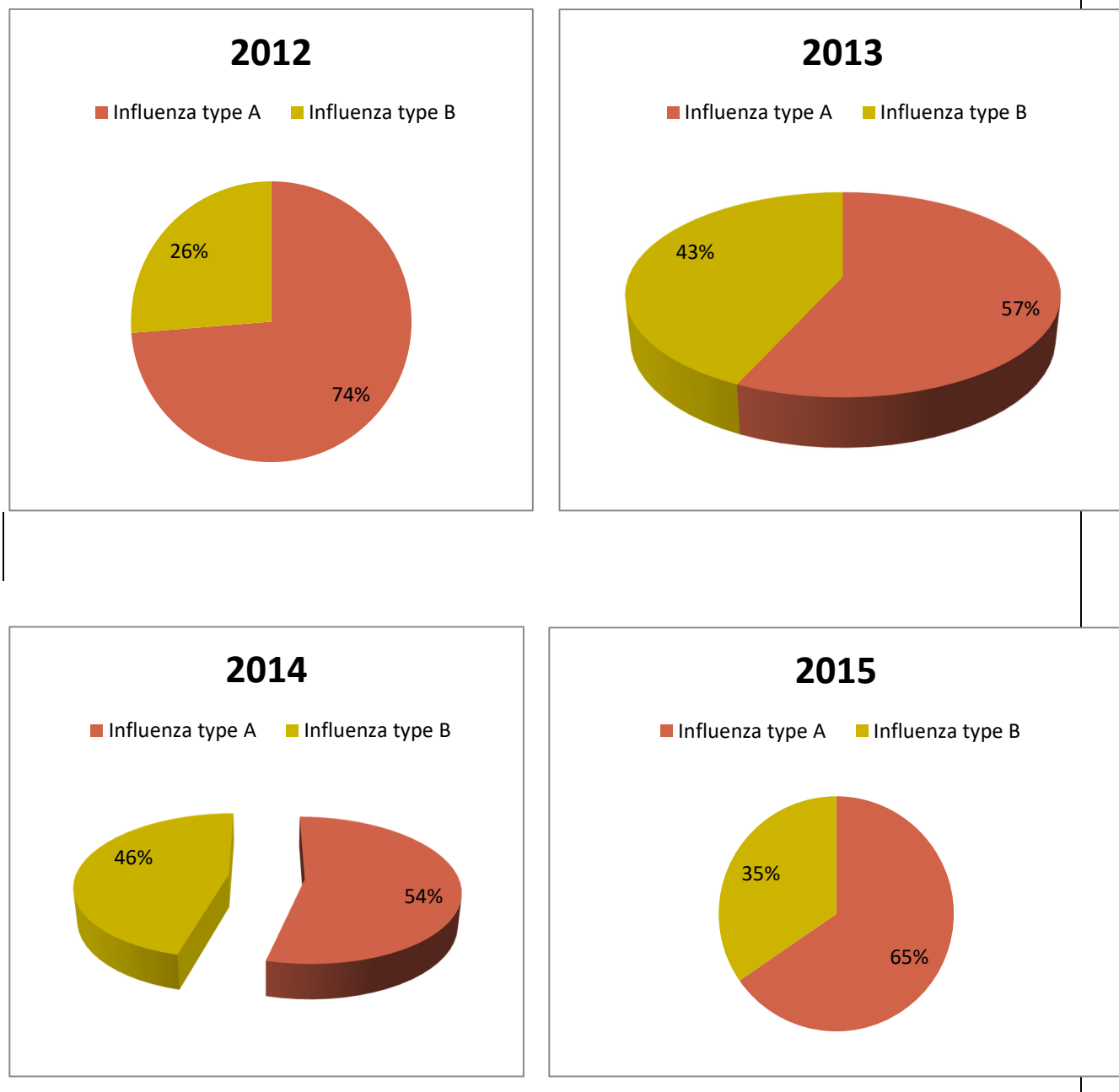


Fig 14: Identified influenza virus types in the KK Sc, in 2012-2015

During the analysis of influenza viruses in the study area the identified types were influenza type A and B but influenza type C was not identified in the laboratory examination.

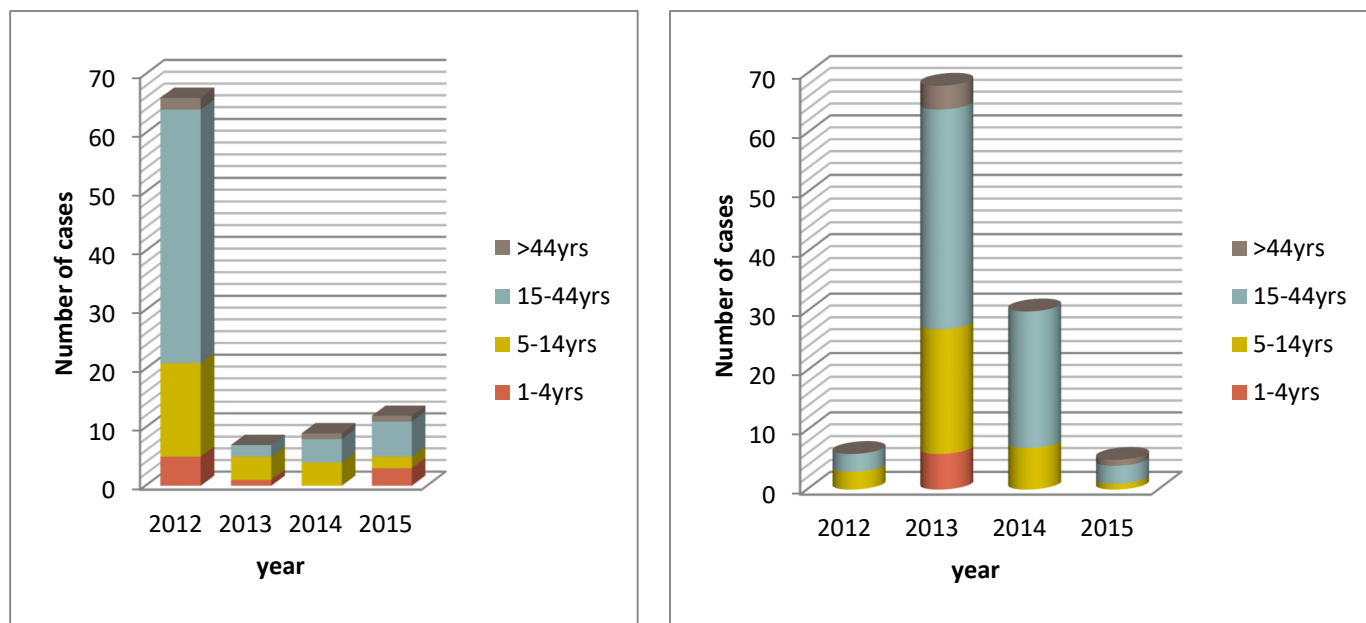


Fig 15: Distribution of Swine flu A (H1 N1) and seasonal flu A/H3 by age of the patient

2.6 Discussion

Trend: A total of 188,951 (18.5%) patients had complained of upper respiratory tract infection among 1,020,942 attendants for different medical care in the health facilities from 2012 to 2015. When we looked the health care attendants in each year, proportions of upper respiratory tract infection complaints accounted 16.10% in 2012, 18.05% in 2013, 19.06% in 2014, and 19.64% in 2015. According to the data, the proportion of upper respiratory tract infection cases elevated by 3.54% from year 2012 to 2015. ILI is one of the descriptions of upper respiratory tract infection. From a total of 188,951 OPD attendants for upper respiratory tract infections only 1289 samples were collected and tested in these study periods; which was 0.68% and could not be representative. The collected and tested samples were decline from 362 in 2012 to 199 in 2015 while upper respiratory tract infection complaints inclined from 31,767 in 2012 to 72,737 in 2015. So we can suggest that possibility of high number of influenza like illness (ILI) could be identified if the sample size was increased based on Upper respiratory tract infection complaints who attended health facilities in the mentioned years.

Seasonality: The influenza like illness was circulated in the Kolfe Keraniyo sub-city throughout the year in the last four consecutive years (2012-2015). Human influenza A and B viruses cause seasonal epidemic of diseases almost every winter. Influenza type C infections cause a mild respiratory illness and are not thought to cause epidemics (www.cdc.gov/flu/about/viruses/types.htm). The four years weekly reported sampled influenza like illness cases trend analysis showed that the cases reached peak at the seasons of late winter and early autumn (from epidemiological weeks 7-20), and at the late spring (week 38-43). The line graph indicated that the transmission pattern of the diseases in all four years were in the similar fashion, that was propagated transmission pattern. When we compared the four years ILI morbidity trend individually, in 2012, the index case was seen at the week 4 and started peak at week 13 and remained until week 20 then lowered by half and remained up and down fashion up to the end of the year. When we came to 2013, the cases showed two peaked seasons from week 7-15 and week 37-40 then continued in the similar way as 2012 but the magnitude of the case in 2013 was higher than 2012. In contrary, the peak season for both in 2014 and 2015 was between late summer and early spring.

Vulnerability: Influenza like illness (ILI) can affect all age group population but more dominant in children, elderly, immune-compromised population, and pregnant mothers according to doh_Duval_ Florida, USA; CDC, Atlanta and WHO influenza like illness (ILI) surveillance report. When we looked the age distribution of the victim for ILI in the kolfe keraniyo sub city, adults or 15-44 years age groups were more exposed to it and followed by children 5-14 years age groups. Old aged (>44 years) and young children (1-4 age groups) were less vulnerable than the mid age groups. It has slightly different characteristic by affecting age groups of people in study area from what we know from different sources in the world. In this regard we can suggest that the communicability of influenza like illness in work place and school was very high and possible source of ILI infection could be in these two work area.

The vulnerability of people to ILI in the sub city was somewhat shifted to productive age group population. This information showed us that the focus area for intervention of influenza like illness should be in school and work place.

The analysis of identified influenza virus types in terms of sex in Kolfe Keraniyo Sub-city showed type A influenza virus somewhat raised on males than females in 2012 and 2013, and lessened in 2014 and 2015 whereas females were more exposed to type B influenza virus than in males in the past four consecutive years. Those female population especially reproductive age groups were more dominant than others for the infection.

Virus type: Current sub types of influenza A viruses found in people are influenza A (H1N1) which has potential to pandemic (for example pandemic H1N1 2009) and influenza A (H3N2) viruses¹. National influenza laboratory (NIL) 2012 and 2013 annual ILI surveillance report at the three sentinel site indicated that among a total of 1,006 collected specimens 999 were tested at NIL by PCR, with 284 (28.4%) testing positive for Influenza; 93 (32.7%) for Flu B, 63 (22.2%) A/seasonal H3, and 128 (45.07%) were influenza A (H1N1) pdm 2009. From the total 1289 tested suspected influenza like illness cases within the study area from 2012-2015, 331 (25.5%) were positive either for influenza type A or type B viruses. Out of those positive influenza cases, 205 (62%) were influenza virus type A while the rest 126 (38%) were influenza virus type B. When we compared the number of diagnosed influenza viruses in each year, influenza virus type

A was more dominant than influenza virus type B. The proportion of influenza type A virus in each year include: 74%, 57%, 54%, and 65% in 2012, 2013, 2014, and 2015 respectively. Here, according to the data collected from the study area, influenza type A virus was climbed above national figure in the 2012 but below in 2013-2015. When we compared the number of diagnosed influenza viruses in each year, influenza virus type A was more dominant than influenza virus type B. Even though both types were circulated in the mentioned years, type A influenza virus specially H1N1 sub type had potential feature for epidemic.

2.7 Limitations of the study

Information bias: The recorded data didn't tell the specific residential woreda/district of the patients which affected the trend analysis of the diseases by the place.

2.8 Conclusion

Health facility attendants with complain of Influenza like illness (ILI) were increased from one year to the other (from 2012 to 2015). In the contrary, collected samples were decline and became as small as 199 (0.53%) from 72,737 complaints in the 2015. Samples were collected only from one health center which could not be representative to the whole population (for more than half million population) in the study area.

The four years weekly reported sampled influenza like illness cases trend analysis showed that two peak seasons such as late winter and early autumn (from epidemiological weeks 7-20), and at the late spring (week 38-43).

Based on the information obtained from the collected data, influenza like illness was serious challenge to the community of study area in the past four consecutive years especially to the age group 15-44 and 5-14 from high to low vulnerability. School and work place absentees were high specifically in the first semester of each year and which was increased from time to time and year to year. This can affect learning teaching process as well productivity at the working groups.

Type A influenza virus specially H1N1 sub type had potential feature for epidemic within the study period in the study area.

2.9 Recommendations

- EPHI / FMOH to expand influenza like illness (ILI) sentinel sites to address all eligible complaints in the appropriate place within the study sub city
- National influenza laboratory center to increase collecting and testing number of samples as proportion to ILI complains in all sentinel sites to investigate the status of the disease in the study area as well in the country.
- FMOH to design immunization program strategy to prevent and reduce influenza like illness (ILI) focusing on students and workers in the school and work place particularly at the end of Ethiopian summer season.
- All concerned bodies specifically sub city and woreda health offices to give due attention in health promotion & prevention activities of ILI and by reducing precipitation factors and to strengthen active search surveillance integrating with other health priority diseases in their respected catchment
- Finally but not least SPHMMC department of public health to design plan to conduct research focusing on influenza like illness in the particular mentioned sub city as well in the nationwide to identify possible risk factors.

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Chapter-3: Surveillance System Evaluation

Measles Surveillance System Evaluation in five woredas of Kofe Keraniyo sub city, Addis Ababa, Ethiopia, 2017

Executive Summary

Introduction: Measles is highly contagious, acute viral systemic infection caused by virus and transmitted via aerosol droplets or direct contacting with respiratory secretion. It has 2% to 7 % case fatality rate and even reaches 30% in humanitarian situation. Less than five children are the most affected population. Diarrhea, ear infections, and pneumonia are main complications of measles infection. Measles outbreak frequently exists in the different parts of a country. Presence of frequently reported Measles cases, absence of community based-surveillance, and data discrepancy between woreda and health centers are major reasons to study measles surveillance system evaluation.

Objective: To evaluate the Measles surveillance system performance in the five selected woredas of kolfe keraniyo sub city

Methods: The study conducted from 1-9 March 2017 in selected four health centers and five woredas in the Kolfe Keraniyo sub city. Which are selected conveniently based on the presence of frequently reported Measles cases in all the selected woredas. The data was collected both from health centers and woredas using CDC and WHO checklist. Letter of permission obtained from sub city health office before data collection in the study facilities. Frequency, rate and other measures analyzed with MS Excel 2007.

Result: A total of 9 health institutions were assessed. Thirteen measles cases were detected in the study area. Laboratory results were not existed. Report discrepancy between health centers and woredas was found. Detection and reporting were major component. Diseases trends/change not analyzed. Community based-surveillance was not started except one woreda. There were two measles outbreak but none of them were investigated. Supervision was there but not addressed the whole system. The feedback lacks constructiveness. Guideline and standard case definitions were found. No emergency preparedness plan at any study units. Some focal persons in the HCs were not trained and other not yet refreshed. Attributes such as usefulness, simplicity, flexibility and acceptability were not well done.

Conclusion and recommendation: The overall measles surveillance system in evaluated woredas and health centers was weak on the area of core components, emergency preparedness, and support components and in the surveillance attributes. Comprehensive stockholder collaboration is needed to achieve the mission of the WHO-AFRO and Ethiopian 2020 goal to eliminate measles infection.

3.1 Introduction

3.1.1 Background

Measles is highly contagious, acute viral systemic infection caused by virus with family paramyxovirus, genus Morbillivirus. Its transmission is via aerosol droplets or direct contacting with respiratory secretion from nose, mouth, and throat of infected individuals. The case fatality rate of Measles reaches two to seven percent even it exceeds 10 percent in developing countries in the outbreak and to 30 percent in certain humanitarian situation. Mortality is common in less than five years and under nourished children especially more common in 6-11 months age infants [1, 2, 3].

Measles can be a serious problem in all age group populations but too serious in children younger than five years of age and adults over than 20 years of age in developing measles complication. Ear infections, diarrhea and Pneumonia are the common measles complication. Encephalitis (swelling of the brain), and sub acute sclerosing panencephalitis (SSPE) also are severe measles complication in some people and need hospitalization [4]. Children who have not ever got measles vaccine, children with less sero-conversion rate for measles vaccine, and anyone with certain immunodeficiency are most high risk for contracting measles infection. Measles infection during pregnancy increases the likelihood of the occurrence of premature labor, miscarriage, and low birth weight in infant [5].

Annually, an estimated 267,000 measles cases and 114,900 to 146,000 [4, 6] deaths is reported resulting from measles complication in the world. The burden of Measles disease is high in different parts of Ethiopia including Addis Ababa. A number of outbreaks of measles disease were exhibited in different time in all regions of a country. There were a total of 4,395 measles cases were reported throughout the country in the first half of 2016. Oromiya, SNNP, and Ethiopian Somali were most affected regions by measles outbreak in 2016). Children less than five (53% of all cases) were the most affected age group population [7]. In Ethiopia, five percent of less than five mortalities are attributed to measles complication [8]. Surveillance is the ongoing, systematic collection, collation and analysis, interpretation, and dissemination of health and health related data to those who need to know, for use in relevant public health action. Data disseminated by health surveillance system can be used for immediate public health action, program planning and evaluation, and formulating research hypotheses. A well functioning disease surveillance system provides information for planning, implementation, monitoring and evaluation of public health intervention programmes [9].

Before 1998, Africa used multiple vertical surveillance system. Starting from 1998, in Sub Saharan African, WHO member states established Integrated Disease Surveillance (IDS) later, expanded to integrated disease surveillance and response (IDSR) as a regional strategy for strengthening national diseases surveillance systems in the African region. IDSR provides a framework for strengthening the surveillance, response, and laboratory core capacities [10, 11]. Ethiopia is one of the IDSR implemented country among WHO member states. Following the resolution of the 48th assembly of WHO-AFRO, 1998, Ethiopia adopted IDSR as the main strategy to strengthen national disease surveillance and response system. Subsequently, Ethiopia prepared a 5-year national plan of action for implementing from 2000-2004 focusing on 17 priority disease and then were raised to 23 until early of 2009 [12].

Public Health Emergency Management (PHEM) inaugurated in Ethiopia in 2009. It was established in the principle of multi-hazard approach and evolved from a traditional communicable diseases orientation to a more modern multi-hazard approach system. It covers the entire cycles of emergencies or disasters from risk assessment to recovery and rehabilitation. PHEM incorporates other eight natural and human made disasters, in addition to 21 emerging and reemerging diseases and conditions in the order of priority. Diseases and conditions under surveillance system are prioritized based on high epidemic potential, significance of public health importance, international requirement under IHR (2005), targeted for elimination and eradication, and availability of prevention and control measures [13].

Surveillance system evaluation is the process of periodic assessment of the relevance, effectiveness, and impact of the surveillance system based on the set standards aiming to ensure that problems of public health importance are being monitored efficiently and effectively. Which should addresses the assessment of system attributes, such as simplicity, flexibility, data quality, acceptability, sensitivity, predictive value positive, representativeness, timeliness, and stability [14].

Ethiopia adopted strategies and goals from WHO African Regional States and pushes important steps towards Measles control since 2002. The strategies include: improve routine immunization coverage (>80%); provide a second opportunity for measles vaccination through large scale supplementary immunization activities (SIAs) ($\geq 95\%$); intensify measles surveillance including laboratory confirmation; and improve case management through integrated management of childhood illness (IMCI) and Vitamin A supplementation. Despite the estimates of vaccination

coverage improves from 37% in 2000 to 80% in 2010, significant number of measles cases reported in Ethiopian [15, 16]. In the same way, kolfe keraniyo sub city has implemented Measles control strategies extensively. As of 2008 EFY, the vaccine coverage with routine immunization program reaches more than 90% in the sub city [17].

Involvement of all relevant parties is mandatory in the surveillance system to capture all suspected measles infection that has circulated in the community. Integration of all parties helps to ensure the representativeness as well as increases timeliness of the reporting to the higher level in the surveillance system. Sensitive case definition plays great roles in increasing in early case detection [18].

Weak surveillance system and poor response capacity leads any country to uncontrollable diseases outbreaks. In developing countries, there is often lacks prompt early case detection and inadequate response to outbreaks [19]. One of the major challenges for early detection and timely and adequately response, as well as instability of the system is lack of fund and technical support. Cultural attitude and less health seeking behavior of family regarding measles infection are present in the different parts of the Ethiopia. Recognition of post measles complications as resulting from measles infection by Health workers is weak when children and adults visit health institutions. These and other factors lead to under reporting of measles cases and deaths. Accumulation of unvaccinated children in the highly populated area, low nutritional status of the children, and increased migration movement combined with seasonality pattern can cause Measles outbreak [20]. The measles vaccine dropout rate in the 2016 health profile assessment in the neighboring woreda was more than the country target which was 14.4%. The possible reasons for high measles vaccine dropout rate were lack of provision of information to mothers and care givers about vaccines benefits, improper customer handling specially mothers and care givers, and vaccines stock out in the health institutions within the woreda [21]. The source of the surveillance data in the study woredas were health facilities. The collected raw data were reported to the next higher level without analysis and interpretation.

Presence of reported Measles case in all the selected woredas, absence of community surveillance, presence of risk areas and vulnerable population for measles infection, and data discrepancy between health facility and woredas both in PHEM and HMIS reports, and the high measles vaccine dropout rate are major problems in the study woredas. Therefore, the study conducted to evaluate the Measles surveillance system performance in the five selected woredas

and health centers in the kolfe keraniyo sub city. Weak early case detection and under reporting of measles cases are other problems. The specific attribute of measles surveillance not clearly identified. Core activities of the surveillance system are not fully implemented. The support functions of surveillance system at the grass root (community and health facility) level are not strong. Surveillance system evaluation was not done before and the status of public health surveillance system is not well known in these woredas and health centers.

3.1.2 Significance of the study

Measles infection is still the problem of community both for children and adults in those selected woredas even though the routine immunization coverage is greater than 90%. The measles vaccination dropout rate in the last year health profile assessment in the neighboring woreda was high (14.4%). Therefore, this study conducted to determine the status of core activities of the surveillance system, identify availability of support functions of surveillance system, describe the specific attributes, and identify areas for improvement. The finding also expected to help both PHEM and EPI program implementers to strengthen the measles surveillance activity and routine measles vaccination respectively.

3.3 Objective

3.3.1 General Objective

To evaluate the Measles surveillance system performance in the five selected woredas and health centers in the kolfe keraniyo sub city from 1 – 9 March 2017

3.3.2 Specific Objectives

To describe the core activities of the surveillance system such as case detection, reporting, analysis and response in the study area

To assess the preparedness of the woredas for epidemic responses activities

To identify the support functions surveillance system at health centers and woredas

To evaluate the attributes of the surveillance system for Measles infection at health center and woreda level

To provide recommendation to the woredas health offices and health centers based on the result of the evaluation

3.4 Methods and Materials

3.4.1 Study area and period

The study conducted in selected four health centers and five woreda health offices in the Kolfe Keraniyo sub city. The selected woredas to study include: woreda 6, 8, 9, 10, and 1; health centers include: woreda 6, keraniyo, woreda 9, and Mikili Land. Four of the five woredas have public health centers in their administrative area but woreda 10 has not. Averages of 8 (ranges from 4 to 13) all type health facilities distributed in each woreda. The selected woredas collectively have an estimate of 173,409 population with 83,236 (48%) male & 90,173 (52%) female, and <5 years population 12,416 (7.16%) as of 2007 Census projection for urban. There are a total of 40 health facilities expected to be in the surveillance system of which 33 private, 3 NGO, and 4 public in the study area. One PHEM officer and 40-45 urban health extension workers found per woreda in the study area. The locations of the woredas are marked by red color in the following figure. Four of the five woredas linked each other in boundary except woreda 15 which is found at the north peak. The study woredas estimated to cover one thirds of the sub city total catchment area.

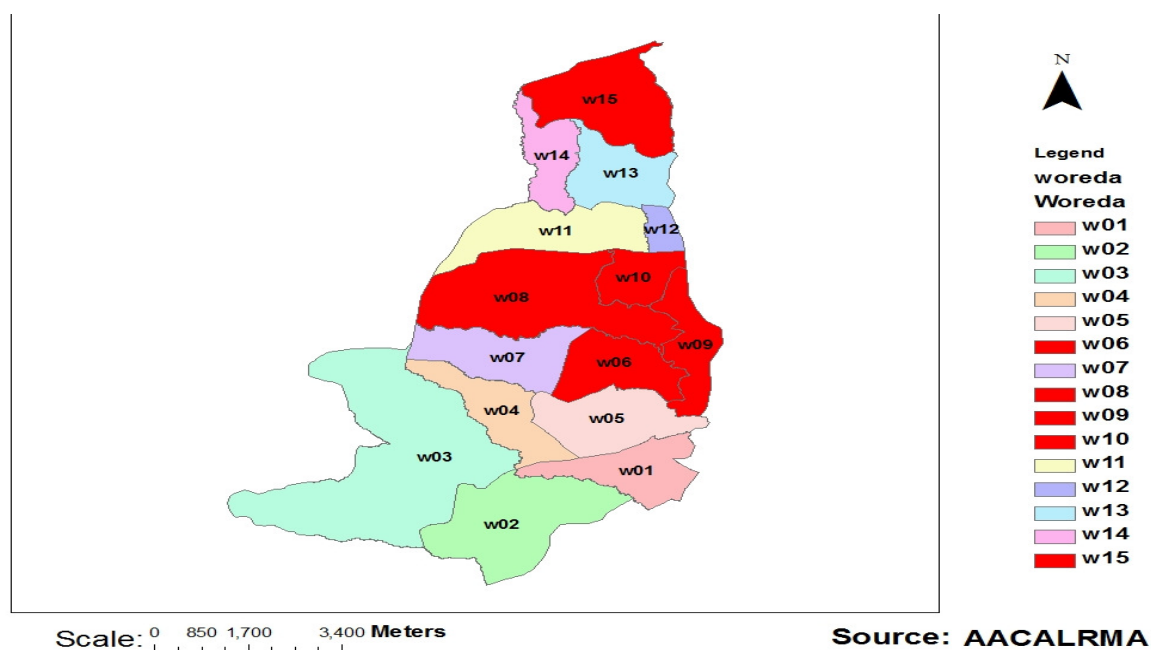


Fig 16: Diagram illustrates the map of Kolfe Keraniyo sub city administration by woreda, 2017

3.4.2 Study design

Woreda and health facility based cross-sectional descriptive study design was used to evaluate Measles surveillance system in the mentioned health centers and woredas under the kolfe keraniyo sub city.

3.4.3 Target population

The target populations were all people living in the kolfe keraniyo sub city.

3.4.4 Source population

The source populations for this study were all people living in the selected five woredas such as woreda 6, 8, 9, 10 and 15 in the kolfe keraniyo sub city.

3.4.5 Study unit

The study units are five woreda health offices such as woreda 6, 8, 9, 10, and 15, and four health centers such as woreda 6, keraniyo, woreda 9, and Mikili Land which are found in the kolfe keraniyo sub city.

3.4.6 Inclusion and exclusion criteria

3.4.6.1 Inclusion criteria

Public health center and health offices which are expected to implement full surveillance system as of the country need.

3.4.6.2 Exclusion criteria

Private and NGO health facilities are excluded since they involve partially in surveillance system such as in case detection and reporting activities. They almost all have not trained surveillance focal points due to high health workers attrition.

3.4.7 Sampling technique and procedure

Kolfe Keraniyo sub city has fifteen woredas and eleven public health centers which are currently implementing surveillance system. From these 15 woredas, five woredas and four health centers under them were selected purposively for this surveillance system evaluation discussing with the sub city PHEM Officers. These five woredas represented at least 33.3% of the total woredas of the kolfe keraniyo sub city. The selection criterion include presence of Measles case report in all

woredas, vulnerability of the woreda dwellers for measles infection, possible residential area for migrants from other towns and rural areas of regional states, and occurrence of high dropout rate in routine measles vaccination. All woreda health offices and public health centers under the selected woredas were part of study units.

3.4.8 Data collection tools and procedure

Data collection tools were adapted from CDC and WHO standard questionnaire developed for Measles surveillance system evaluation. Data collection process focused on Quantitative data and partial qualitative to supplement the quantitative one. The data were collected by principal investigator. The secondary data were collected from documents, registrations, case-based formats, line lists, and PHEM and HMIS reports both in woreda health offices and health centers. Using check list, woreda PHEM Officers, focal persons in the health centers and other responsible bodies were interviewed.

3.4.9 Data processing and analysis

Data cleaning process was given an emphasis during and after the data collection. The collected data were checked, tallied, and coded manually per each study unit. The data summarized in to the core functions, support function, and attributes of surveillance system. The qualitative data obtained from each study unit were summarized to supplement the quantitative data. The consistency and completeness of summery data were checked before entering into a computer. Descriptive statistical analysis was used to analyze for each core functions and support function for their expected performance in each woreda health offices and health center. Attributes in all study units were described and measured in terms of their intended use in the surveillance system. The Ethiopia Ministry of Health and WHO measles surveillance standards were used for comparison purpose. Microsoft office Excel 2007 was used as a tool to analyze the collected data. The final results of the study prepared and presented as narration, tables and figures.

3.4.10 Data quality control Measures

The secondary data collected from the health centers were cross checked with woreda PHEM report and HMIS report in the sub city. In the same way, the woreda PHEM data with sub city PHEM report. In addition to this, all collected data through questionnaire were also cross checked and conciliated with the actually observed data to ensure consistency and reliability.

3.4.11 Ethical consideration

Written letter of permission was obtained from the sub city health office to woredas and from woredas to their respective health center to conduct this study. There was no direct contact with individual or group of patients or community as a study subject so that no need of ethical clearance.

3.4.12 Dissemination of the study findings

The findings from this study prepared as hard and soft copies. The written report was shared to SPHMMC department of Epidemiology, Addis Ababa City Administration Health Bureau (AACAHB), Kolfe keraniyo sub city health office, and all visited woreda health offices.

3.4.13 Standard case definition of Measles

Suspected: - Any person with fever and maculopapular (non vesicular) generalized rash and one or more of the following symptoms: cough, coryza or conjunctivitis (red eyes); OR any person in whom a clinician suspects measles.

Confirmed:- A suspected case with laboratory confirmation (positive IgM antibody) or epidemiological link to confirmed cases in an epidemic situation.

Epidemiologically linked case: A case whose blood is not collected for laboratory investigation but has contact with another laboratory confirmed case and who is either a family member/school mate/neighbor/playmate or who has traveled to an area where a measles outbreak has been declared in the preceding 2weeks.

Community case definition: - Any person with fever and rash.

3.4.14 Operational definitions

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

Usefulness: Usefulness refers to how the information which is generated by the system customize for the intended objectives and presence of documented change in procedure and monitoring the diseases trend.

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

Simplicity: Simplicity refers to surveillance system structure, its understandability and ease of operation.

Data quality: The quality of data reflects the completeness and validity of the data recorded in the different formats that available in the surveillance system.

Timeliness: Timeliness refers to the time taken for communicating surveillance reporting to higher level, the ability of the system to trigger appropriate action in time.

Acceptability: Acceptability refers to the willingness of persons, institutions or organizations to participate in the existing surveillance system.

Sensitivity: Sensitivity refers to the ability of the system to detect cases and/or outbreaks through trends in the surveillance data.

Positive predictive value: Positive predictive value refers to cases that actually have the health condition in question among detected cases.

Representativeness: Representativeness refers to the extent to which the surveillance system accurately describes the occurrence of medical condition over time and their distribution in the community by place and person.

Stability: Stability refers to the existence of consistent and uninterrupted surveillance system in the study units.

3.5 Results

Functional and effective surveillance system helps for immediate public health action. It also provides information for planning, implementation, monitoring and evaluation of public health intervention programmes and formulating research hypotheses [9]. In the Ethiopia context each health institution at all level expected to do full surveillance system in the integrated manner. They also expected to perform the surveillance principal components such as case detection, confirmation, reporting, registration, analysis, and interpretation for appropriate public health response. These principal components of the surveillance system should be support with resource, training, supervision, and feedback. 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 inherent in certain public health informatics. The identified principal and support components, and system attributes described as follow:

Involved stakeholders:

Woreda health office heads, WoHO PHEM officers, medical directors, Disease prevention and control process owners, EPI focal person, and surveillance focal person were involved during information gathering.

Population under surveillance:

There are an estimate of 173,409 populations with 83,236 (48%) male & 90,173 (52%) female, and 12,416 (7.16%) less than five years population under the surveillance system in the selected five woredas.

Sites visited

A total of nine health institutions were assessed for this surveillance system evaluation. These include five woreda health offices and four health centers under those selected woredas in the kolfe keraniyo sub city. In woreda 6: one health office (HO) and one HC; in woreda 8: one HO and one HC; in woreda 9: one HO and one HC; in woreda 10: one HO; and in woreda 15: one HO and one HC.

Standard case definition of Measles:

Standard case definition for measles case was posted appropriately on a visualized place in all departments both in HO and HC.

The surveillance system in the study area was used an integrated surveillance system. The measles case surveillance report sent to the next higher level with other diseases under surveillance in the weekly based.

Case detection:

All assessed health centers tried to detect Measles cases based on standard case definition. But few health centers for example woreda 9 health center missed detecting 2 measles cases even if the records in IMNCI registration fulfilled the sign and symptoms of the measles standard case definition.

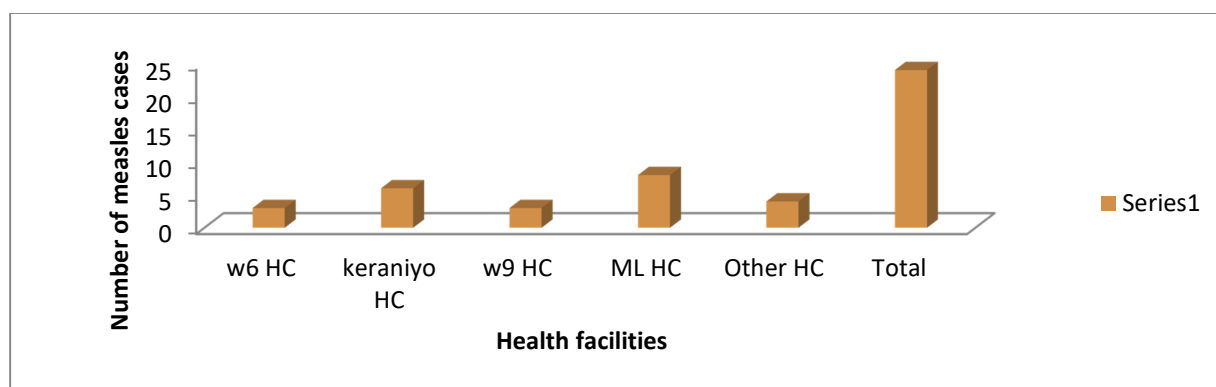


Fig 17: Number of detected measles cases from July 2016- March2017 by health facilities, in the 5 woredas, kolfe keraniyo sub city, Addis Ababa, Ethiopia

Case registration

Measles cases were registered on HMIS and IMNCI registration log books in the health centers. Registration specific for measles cases not available either in health center or woreda health offices. Rumor logbooks were not available in all visited woreda health offices.

Case confirmation

National Measles guideline supports to take 5 serum samples of suspected measles cases from each woreda/ health center per month with case-based form for confirmation in the accredited laboratory. Proportion of samples collected for laboratory confirmation by all woredas was 11 (46%) of 24 detected measles cases from July 2016 to March 2017. The rest 13 suspected measles cases not sent to the national laboratory for confirmation. The sent 11 measles cases were from woreda 10 and 15. The rest woredas and health centers were not took serum samples with case-based form for laboratory confirmation due to various reasons.

Reporting

The data source for the reporting system started at the health center level. Around 42 percent of detected measles cases particularly in keraniyo HC, woreda 9 HC and Mikililand HC were not reported to the woreda health offices as shown in the following table. There was discrepancy between the health centers and woredas measles cases report in the study woredas.

Table 8: Number of registered measles cases in HCs and reported to the WoHO in the study area, 2009 EFY (2016/2017)

Woredas	Detected measles cases in HC	Reported measles cases to WoHO	Unreported measles cases	Remarks
Woreda 6	3	2	1	
Woreda 8	6	1	5	
Woreda 9	3	1	2	
Woreda 15	8	5	3	
Woreda 10		4		4 cases From other HCs
Total	24	14	10	

Data Analysis

Surveillance data analysis expected at all level of surveillance system units. Only two woredas tried to analyze the surveillance data by time alone. Only 1 woreda used computer for analysis purpose. The rest 4 health centers were simply collect the data from registration and sent it to the woreda health office. In the same way, 3 woredas were received and compiling the data and sent it to the sub city without analysis. In general, surveillance analysis in the study area was not properly applied.

Community-based Surveillance

Community-based surveillance is basic and core area for effective surveillance system functioning. Each and individual cases could be identified in the community using women development army (WDA) and urban health extension workers (UHEWs). It covers almost 80 percent of all surveillance system. All woredas except woreda 15 in the study area were not practiced the weekly community-based surveillance until this data collection takes place. The eighty percent of the study woredas were not receiving weekly community-based surveillance either from WDA or UHEWs. In woreda 15, seventy-four (92.5%) of WDA in the woreda were sent weekly community-based surveillance report regularly to the WoHO through UHEWs.

Outbreak investigation

Outbreak investigation is a method for identifying and evaluating people who have been exposed to an infectious disease or affected by an unusual health event. The investigation provides relevant information for taking immediate action and improving long-term disease prevention activities. Here in the study area almost all woredas detected and reported measles cases. Particularly woreda 8 and 15 had more than 3 Measles cases per month which is an indication of an outbreak. But any of the cases were not investigated except reporting to EPHI with case-based form.

Epidemic preparedness and response

In the study area, 3 health centers at least form Rapid Response Team (RRT) with composition of health officers, nurses, lab technologist/ technician, pharmacist/druggist, surveillance focal, medical directors. Even though the RRT in 3 HCs place, none of the study units had any plan for the epidemic response and proposed any emergency budget. Neither the WoHO nor the HCS had not regular meeting pertaining to epidemic preparedness and response.

Supervision and Feedback

All visited woreda health offices and health centers were supervised by higher level at least once in 2009 EFY. Almost all visited health centers were given written feedback at least once concerning how to register cases, status of report timeliness and completeness from sub city PHEM officer but none of the visited woredas were given written feedback. In 2009 EFY, at least 11 serum samples were collected from suspected measles cases and sent to national laboratory from the study units but there was no written feedback to the reporting units about the result the collected samples.

Training

All 5 woredas have 1 PHEM officer and were trained on basic surveillance system and on detecting, reporting, registration/ documentation, analysis, interpretation. Where as in the visited health centers, only 2 (50%) surveillance focal person were trained on basic surveillance system 3-5 years back. They were not refreshed/ updated. The other 2 focal persons were given training focusing only on awareness creation on the diseases under the surveillance system. Any of the

surveillance focal persons in the health centers had not trained on detecting, reporting, registration/ documentation, analysis, interpretation.

Resource

All assessed institutions had National PHEM and Measles guidelines only in the form of soft copy except one HC which had both hard and soft copies. Standard case definitions were available in each study unit. Printed case-based and line list format were not available in more than half of WoHO and 1 health center for the last 6 months before assessment. There was also shortage of Test tubes for sample collection, case-based format pads in the HCs.

There was no telephone, computer and printer, internet or fax and incentives (for mobile card) in the woreda health office particularly to the surveillance system. The same resource scarcity was found in the health centers except telephone and in some health centers internet service both which were depended on electricity.

Description of the attributes of surveillance system

Usefulness:

A public health surveillance system is useful if it contributes to the prevention and control of public health problems and understanding of the implications of such public health problems. Based on these concept all visited health institutions perceived as the importance of surveillance to prevent and control public health problems. Even though, they perceived it is as an important program, they didn't detect measles outbreak early on time, they didn't analyze the trend of the measles cases, they didn't assess the effect of the prevention and control measures, and they didn't exchange the information smoothly. As mentioned earlier, there were only 14 out of the 24 suspected measles cases in the assessed health centers reported to the WoHO. There also were 6 and 8 suspected measles cases in woreda 8 and woreda 15 respectively but none of them were investigated and no proposed prevention and control measures that leads to improve the practice either in woredas or health centers. It is imagine that how much measles cases could be found in the community. Therefore, impossible to say the surveillance system in the assessed woredas and health centers is useful.

Simplicity:

The following measures might be considered in evaluating the simplicity of a system: amount and type of information necessary to establish a diagnosis, number and type of data sources, methods of transmitting case information and data, method of distributing reports, and amount of time spent operating the system. In the study units the data source for the surveillance system was the health facilities. The case definition of measles was posted in clearly visible place in each department of the health facilities and easily understandable. The methods of communication for measles reporting purpose in the woreda were both on telephone and with hardcopy and spent 2 to 5 hours to reach the next level. A long time was spent for feedback mechanism especially for laboratory results. There was no hardware or software machine to exchange information in simplest way to reduce the spent time.

The current surveillance information flow in the study woredas missed core surveillance units such as UHEWs and community. These two units expected to cover around 80% of a total surveillance system.

The flow of the measles cases reporting and response system in the study woreda was shown in the following figure. Even though the structure is simple and straight forward, due to lack of technological resources, the surveillance system in the assessed health institutions looked complex.

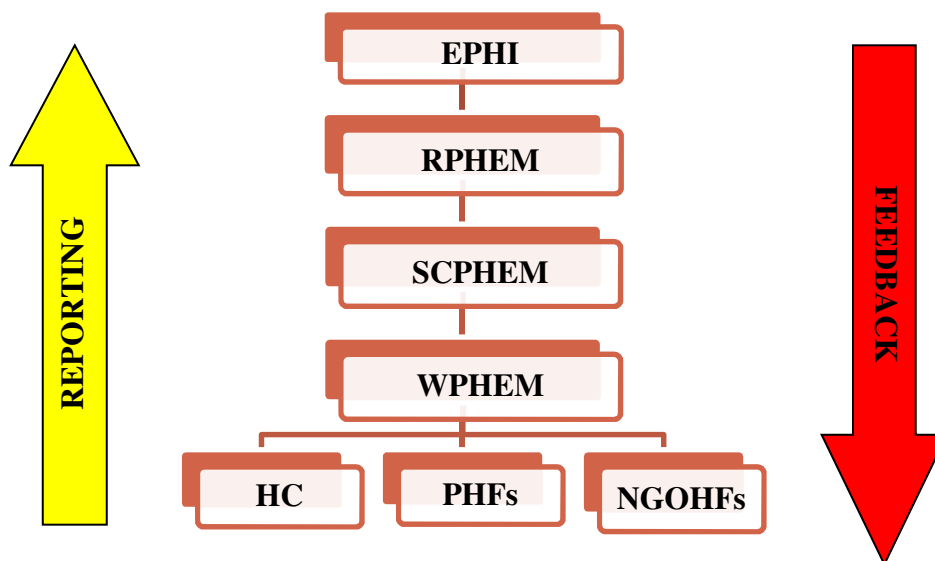


Fig 18: Flow chart for measles reporting and feedback system in the study area of kolfe keraniyo sub city, Addis Ababa, Ethiopia, 2017

Flexibility:

The newly implemented PHEM system made the reporting format more flexible to report other new cases in the provided blank space if occurred without difficulty. It is easy and allows integrating with other health systems. Current surveillance formats are easily understood by all health professionals. But it does not allow adding additional variables particularly on the weekly reporting formats.

Data quality:

Data quality was assessed in terms of completeness of variables and its validity in the case-based, line list, and weekly zero report formats. Missed variables on case-based formats were not seen at health center level but 70 to 80 percent of completed measles case-based formats did not tell the vaccination status of the cased patients (i.e. described by 9 or 99 which to represent unknown vaccination status). All recorded data were easily understood within the case-based formats. In the weekly surveillance zero report formats, nearly 60% of the formats were not clearly filled particularly for immediately reportable diseases rather they were filled with slashes

Acceptability:

Acceptability was measured by the willingness of individuals, community, and institutions in involving and participating in the surveillance system. The assessed health institutions/ organization were accepted surveillance system but on the part of active participation it was limited to the few personnel (to the surveillance focal person and health workers in adult and under five year's department in health centers and PHEM officers in the WoHO). Surveillance system acceptability at higher officials and leaders in the study area was remained low when it measured with their contribution to support, facilitating, and monitoring the system.

Sensitivity:

It was measured by the ability of the surveillance system to detect all Measles cases using provided standard case definitions and ability of communicating to the concerned body within the expected time, and ability of monitoring the trends/ changes of cases over time. To do this, every health workers at all level should know diseases under the surveillance , understand the importance of it, and adopt it as his/her day to day activity. Based on these concepts it is difficult to say the surveillance system is sensitive in the study area. Because there were detected suspected measles cases that were not reported and also were fulfilling the case definition of

measles cases that were recorded but not detected in some woredas during observation. There was no change monitoring practice. So that almost all visited woredas more or less experienced such problems. **Sensitivity** = $\frac{\text{No of cases detected by surveillance system}}{\text{Total number of cases found during evaluation}} \times 100 = \frac{14}{24} \times 100 = 58\%$. Laboratory results not available to calculate the sensitivity of the surveillance system based on confirmation.

Positive predictive value: To calculate PPV, laboratory results were not found in any of the visited woredas.

Representativeness:

Representativeness is viewed in terms of accessibility and distribution of health facilities in the community, ability of health workers to detect and capture all actual measles cases in all departments of the HFs, their reporting rate, presence of strong community centered surveillance. More or less all these factors can increase or decrease the representativeness of surveillance system. The assessment in the study area indicated that public health facilities were distributed in all woredas except woreda 10. The measles cases source was outpatient department of adult and under five years within the health centers. The surveillance system was mainly focused on facility based and lacks majority/ community based surveillance. Based on this fact, the representativeness of the surveillance system in the assessed health institutions was minimal.

Timeliness and completeness:

The data were assessed in terms of timeliness between surveillance steps and completeness of immediately and weekly report at woreda level. Average timeliness and completeness of weekly report for 4 assessed health centers was 95% and 100% respectively. Both indicators for weekly report from the woreda to sub city report were 100%. But for measles cases timeliness was below the standard (the minimum standard time to report the next level is 30 minutes; indicators is = 80%) i.e. it takes on average 2 to 5 hours to report the next level. Data analysis for timeliness and completeness is not yet practiced in the 40% of assessed woredas due to lack of computer.

Table 9: Timeliness and completeness of weekly and immediately reports of Measles at woreda level in kolfe keraniyo sub city, July 2016 to march 2017

Woredas	Weekly Report				Immediately Report(for Measles case)			
	No reported facilities	of	Timeliness (%)	Completeness (%)	No of detected measles cases	Reported on time	Lately reported case	Cases known by woreda
Woreda 6	10		90	100	3	1	1	1
Woreda 8	8		87.5	100	6	1	0	5
Woreda 9	12		92	100	3	0	1	2
Woreda 10	3		100	100	4	2	2	0
Woreda 15	5		80	100	8	5	0	3
Total	38		95	100	24	9	4	11

Stability:

The stability expressed in terms of the existence of consistent and uninterrupted surveillance system in the study units. The current established structure of PHEM system in the woreda is expected to strengthen the surveillance system by facilitating and supporting the surveillance system in early case detection, timely report, properly registration, trends/ change analysis over time and effective feedback activities. In the evaluated health institutions the surveillance data collecting, notifying and reporting activity relied only on the surveillance focal persons and PHEM officers. There was training gaps and weak refreshment activity for surveillance focal person in health centers which may restrict the participation of other health workers in the system. Managers both in health centers and WoHO had given less attention and weak priority for surveillance system in terms of participation, facilitation, supporting, and monitoring and evaluation activities. All these and related factors may loosen the stability of the surveillance system.

3.6 Discussion

Principal components: Case detection, case registration, case confirmation, reporting, data analysis, interpretation, and timely response are expected in each surveillance system units. Despite these activities are the key components for the national accelerated measles control strategy [2], in the visited woredas and health centers, it was not fully implemented. There was case detection, registration, reporting, and blood sample taking for laboratory investigation (even if the results not known) activities in some extent. But in the part of analysis, interpretation and timely response they were silent which is in line with the districts in Sidama zone, [19] and health centers in Dawro Zone, but contrary to districts in Dawro zone, SNNP, Ethiopia where analysis took place [20]. In other countries like Nigeria, similar set ups (health facilities and districts) perform data analysis and interpreted it for local outbreak investigation and response in addition to detecting, documentation and reporting to the next higher level [18, 21-23].

The epidemic preparedness emphasizes standard nationwide preparation at all levels of the system. And the national public health emergency management (PHEM) guideline emphasis to have achievable and operational epidemic preparedness plan to prevent, protect against, and respond to epidemics [13]. However, here in the assessed woredas there was any of the following components: epidemic preparedness plan, emergency budgetary fund, emergency drug stock, established emergency response task force, technical RRT; while in the health centers, at least had established RRT even if it was not actively perform its expected activities. This was resulted from either due to less acceptability to the surveillance system or lack of awareness about the importance of preparedness to the effective and timely response for the emergency.

Support components of surveillance system: To ensure effective surveillance system in place and to maintain its functionality, human development and capacity building, adequate resource allocation and distribution, supervision and constructive feedback are key indicators in the surveillance system. Capacity building in training in the woreda was good but weak in the HCs. Lack of resources starting from printed formats to computer, support and constructive feedback were the main problems of the surveillance system in the visited units.

Surveillance attributes: Attributes directly or indirectly determines the quality of surveillance system performance. Almost all surveillance attributes such as usefulness, simplicity, flexibility, sensitivity, and acceptability in all woreda and health center were weak compared to the health

facilities and districts found in Nigerian where attributes more or less are used properly in the surveillance system. Timely and complete cases report helps to appropriately and timely response and to quantify the magnitude and distribution of the cases as well. The timeliness and completeness of measles surveillance report was below the Ethiopian MoH and WHO standards (which for both indicators is $\geq 80\%$). The surveillance system in the study woredas lacked main part of surveillance data source which was community based-surveillance (from WDAs and UHEWs) except in one woreda. This was the reverse of the performance of the community based-surveillance in Amhara national regional state where more than 67% of suspected cases reported from those structures [24].

3.7 Limitation of the study

- This evaluation covered only for 9 months measles surveillance system performance in the assessed woredas and health centers since the woreda PHEM structure was newly established in the Addis Ababa. The result may not show the long term effect of the surveillance system in the assessed health facilities.
- The woreda PHEM officers trained for the basic surveillance 3-4 months, and for analysis a month earlier of this evaluation took place in the assessed woredas. This may not clearly describe the status of PHEM officers hired in those woredas (Timing of evaluation).

3.8 Challenges

- Lack of support from field supervisor
- Lack of electronic literatures previously done in the same topic in the study area as well in Addis Ababa
- Absence of any transportation facility during information collection and frequently support to the study units
- Inconvenience of office and office resources such as table and chairs, internet connection, etc.

3.9 Conclusion

The Measles surveillance system in evaluated woredas and health centers was weak on the principal components of surveillance such as reporting, registration, confirmation, analysis, interpretation, and response. The main area for surveillance system which is community-based surveillance was missed even though tendency of initiation existed in one woreda.

Emergency preparedness plan in the assessed woreda health offices and health centers was almost not exist even if informal RRT establishment was in health centers.

The support components of surveillance system including resource and feedback mechanisms was poor; and capacity building in health center was stagnant. Supervision was good but not addressed the whole surveillance components. In general, the surveillance system attributes in the study woredas were below their expected contribution. Thus, a focus on measles surveillance can help detect populations unreached by immunization systems and, by extension, program weaknesses, and reduces morbidity and mortality resulting from measles infection as well.

3.10 Recommendation

1. Addis Ababa Health Bureau / Kolfe keraniyo sub city health office should address training gaps particularly at the grass root (health center) level.
2. Health centers have to need motivation strategy for surveillance focal persons to improve core activities of the surveillance system.
3. Woredas should started community based surveillance as early as possible to make the surveillance system complete.
4. Woreda level PHEM officers should adhere and committed to analyze and utilize the collected data in local level and to strengthen the grass root level surveillance system.
5. Continuous and comprehensive supervision, constructive feedback mechanism and close support needs from the sub city to fill the gaps and to strengthen the lower level surveillance systems.
6. Surveillance system needs strong political will, thus, should be priority concern of leaders at local government structure (woreda health office and health facility level) on the area of epidemic preparedness, resource allocation, support, and monitoring and evaluation.

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Chapter-4: Health profile assessment

Health profile description report of woreda 13 in Kolfe sub city, Addis Ababa, 2016

Executive summary

Background: Health profile is a detail description of health and health related conditions. It has an advance of identifying road maps to the health and wellbeing to the communities and residential areas. It provides basic clue for informed decisions making, to collaborative planning, manpower enrollment, financial and other resource allocation with a firm emphasis on diseases prevention and health promotion. It gives significant information for health sectors, stakeholders, including NGOs, investors and community members in order to have clear and compiled health information about the woreda. Almost all woredas, in Addis Ababa have not summary data in detail about their catchment population. Woreda 13 in Kolfe sub city is among these woredas. So it needs to assess the health profile in the woreda 13, kolfe keraniyo sub city.

Method: Both the study area and population was woreda 13, kolfe keraniyo sub city. The study period covers 2007E.C (2014/2015). Sample woreda selected from 15 woredas in the sub city by simple random sampling method (Lottery Method). Health profile assessment was done using secondary data from documents, and primary data from interviewing key informants in different sector offices, and community representatives. Data collected by using health profile assessment tools having mixed method data collection approach (such as questionnaire & interview) having legal consent letter from 16-30, May 2016. The health profile data was analyzed by frequency, proportion, percentage, and ratio using Microsoft Excel software.

Result: The health coverage system was >100%, and health center to population ratio 1:28,482. The immunization coverage based on the woreda target was greater than 100 percent. But the dropout rates of penta1 to penta3= 365(12.4%), PCV1 to PCV3= 101 (3.4%), Rotarix1 to rotarix2= 311 (11%), penta1 to Measles =426 (14.4%). ANC fourth visit= 65%, deliveries assisted by a skilled health personal was 56%, FP acceptor rate in the woreda was 36.7%. TB detection= 96.5%, cure rate =88.5% and success rate=88.5%, TB-HIV service=89.7%, cotrimoxazole prophylaxis therapy=64.5%, ART=16%, INH uptake for newly enrolled HIV patients=26%, and VCT service=6% of the 2007 EFY target. **Conclusion:** The high measles dropout rate, low institutional delivery and the increased upper respiratory tract infection were major challenges. The service provision method and customer handling practice are key area to improve maternal health service. So it needs continuous monitoring and supportive supervision from sub city health office.

4.1 Introduction

4.1.1 Background

Health profile is a detail description of health and health related conditions, outbreaks/disasters, environmental sanitation, nutrition, human resources who serve in health system, finance and logistics, construction and maintenance, health facilities and programs, administration and good governance, planning, monitoring and evaluation.

Health profile assessment has an advance of identifying roadmaps to the health and wellbeing to the communities and residential areas. Health profile assessment findings help also policy makers to make accurate information based decision; planners to design righteous and workable programs; clinicians to prescribe and manage patients and clients based on available medication and logistics; authorities to allocate equivalent financial resource and recruit necessary human resource; and program managers to develop and avail necessary logistics on time and right place.

Health profile engages health care providers, health maintenance facilities, health related programs and activities, governing bodies, partners, and communities by providing a base for making informed decisions to collaborative planning, manpower, financial and other resource allocation with a firm emphasis on diseases prevention and health promotion, and strengthening health seeking behaviors and reducing health barriers and disparities in the community. Health profile findings assure prioritizing health and wellness related resources and manpower allocation for government, partners and community to determine the health of the community at most and planning the proper strategies and partnership to improve identified gaps based on health profile assessment.

Health profile is significant information for health sectors, stakeholders, including NGOs, investors and community members in order to have clear and compiled health information about the woreda as well as the nation at large. It is a fundamental for health planning, mobilizing health resources and manpower as well as designing appropriate public health interventions.

4.1.2 Statement of the problem

Health profile is one of the basic components to a county's health policy designing, planning and program implementation with structured and prioritized manner. Even though it is a core component of a health system, in our country, Ethiopia it found as less as expected particularly at the grass root (woreda) level. In Addis Ababa, there are around 117 woredas with their

population and administrative catchment area. But their health profile capturing system is weak. In general, health profile capturing system of the woreda 13 in kolfe keraniyo sub city, Addis Ababa had a significant gap which was difficult to make information based decision to officials and health care providers. So it needs to assess the health profile system of the woreda 13 in kolfe keraniyo sub city.

4.2 Objectives

4.2.1 General Objective

To assess the general health profile system of the woreda 13, Kolfe keraniyo sub city.

4.2.2 Specific Objectives

To describe the general health program status of the woreda

To identify major causes of health facility visit in the woreda

To identify major gaps related to health program in the woreda

4.3 Methods

4.3.1 Study setting and period

The data for this health profile description was obtained the 2007 EFY (2014/2015) report. Woreda_13 is one of largest in population and geographic area among fifteen woredas in Kolfe Keraniyo sub-city in Addis Ababa City Administration. The woreda is structured by twenty-two sector offices. It is found between 996,000-1002000 North and 466,000-472,000 East. It is characterized by heterogeneous type of topography with significant elevation range of 2,517-2,834 meters from sea level. The area of woreda 13 in kolfe keraniyo sub-city is 301 hectares (3,010,000 square meters) and covers 4.74% of the total sub-city land, and which is found in the northern part of the Sub-City Administration. There are 21 sector offices in the woreda headed by woreda executive administrative office. It is sub divided to number of former 27 (now 10) sub woredas/ketenas, 21 gott/sefers, 90 blocks and 13,500 households. There is huge condominium site called Mikili land condo with 4,863 households. It has 13 different health institutions starting from HP to HCs; 8 pharmacies and 9 drug dispensaries. There are 36 schools starting from KG to preparatory classes; 309 small scales to medium scale industries and enterprises; 5 government and private banks. It is bounded by woreda 11 and 12 in the south, ring road in the east, woreda 15 in north and woreda 14 in the west.

The total population of the woreda is 56,963 and among these, female account 31,470 (52.2%); male account 25,493 (47.8%); under five years children accounts 6,751 (11.85%); female in reproductive age group or /15-49 years/ accounts 15,159 (26.6%), and +60 years account 2,458 (4.3%) who is composed of different ethnic, religion and culture groups, educational background, and socio-economic status. The health coverage system of the woreda was more than 100% with health center to population ratio 1:28,

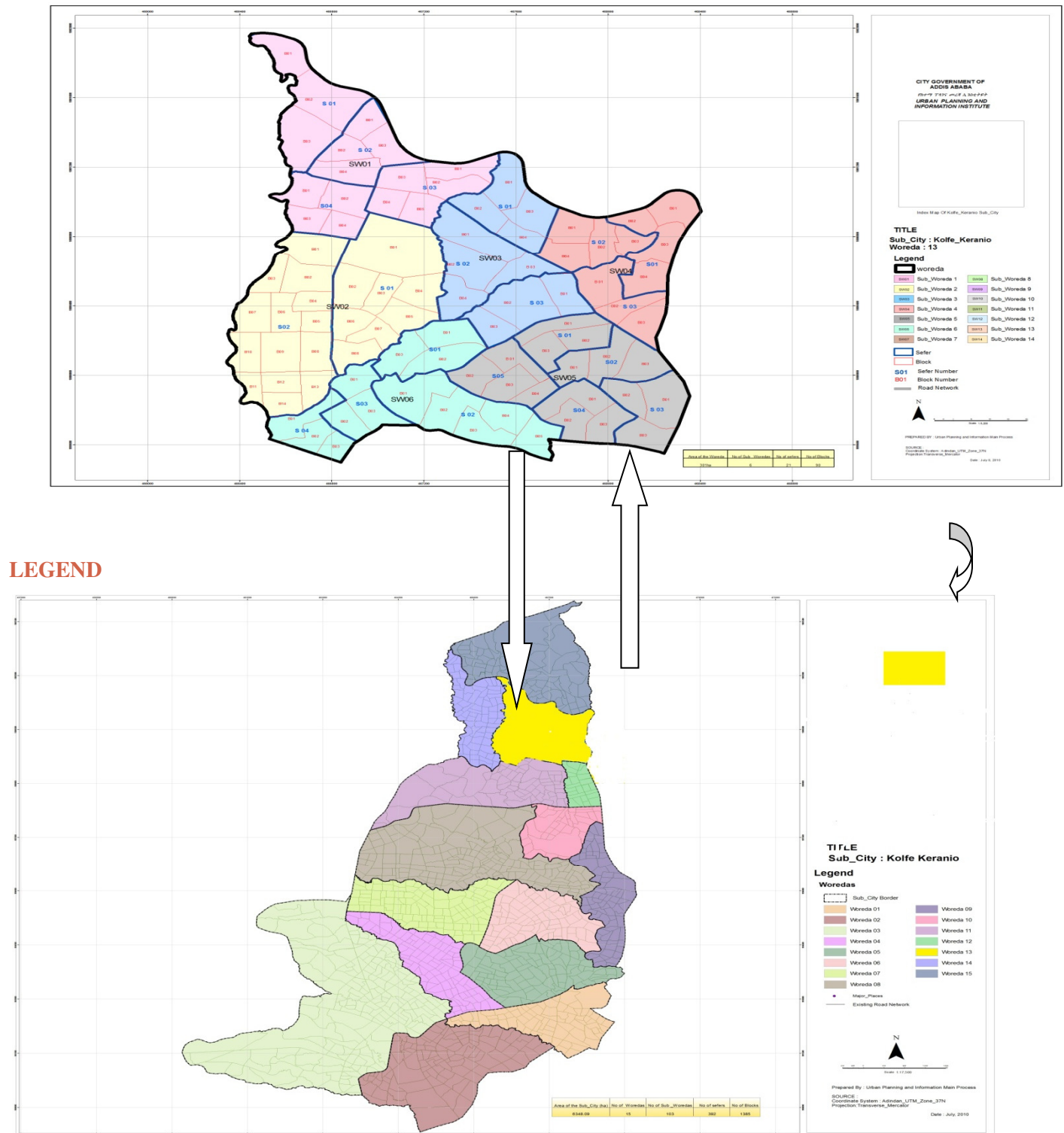


Fig 19: Sub-woredas and blocks of the study woreda in Kolfe Keraniyo Sub_City

4.3.2 Study design

Institution and community base descriptive study design used to the health profile assessment in the woreda.

4.3.3 Study population

The study population was the population of woreda 13 in the kolfe keraniyo sub city, Addis Ababa.

4.3.4 Sample size and sampling procedure

The sample size was pre determined. Sample woreda selected from 15 woredas in the sub city by simple random sampling method (Lottery Method).

4.3.5 Measurements

Number, proportion, percentage, ratio, rate

4.3.6 Variables

4.3.6.1 Dependent variables

Services outcome, performance, gaps, dependency

4.3.6.2 Independent variables

Age, Sex, religion, educational status, occupational status, immunization status, FP method and coverage, treatment outcome, and health service coverage, etc.

4.3.7 Data collection tools and procedures

4.3.7.1 Data collection tools

Structured questionnaire was used for health profile data collection which was adapted from Addis Ababa University.

4.3.7.2 Data collection procedure

We incorporated two procedures to collect health profile data. The first data collection procedure was done using secondary source from documents and reports at different offices using structured questionnaire; and the second data collection procedure was done directly from

key informants in different sector offices, and community representatives using semi-structured questionnaire to obtain primary data.

4.3.8 Data processing and analysis

4.3.8.1 Data processing

The collected data was tallied and categorized based on the variables. The summary data based on the variables were prepared for analysis.

4.3.8.2 Data analysis

The health profile data was analyzed by Microsoft excel window 2007. The data analyzed for its frequency, proportion, percentage, ratio, and rate. The analyzed data was described using tables and charts.

4.3.9 Data quality control

The collected data was checked for its completeness, relevancy, reliability and clarity. It was cleaned before and during analysis. The data were compiled from each sector offices after having permission. Before interviewing the key informant in the sector offices and community representatives, the principal investigator tried to check whether they were really representative or not.

4.3.10 Ethical consideration

The written letter of support and permission was sought from St. Paul Hospital Millennium Medical Collage and kolfe sub city health office to the respective sector offices and health centers before data collection process took place. Verbal consent was obtained from key informants before interviewing. The purpose and objective of the study was clearly explained to key informants and for each sector offices. The collected data was kept strictly confidential.

4.4 RESULT

Transportation, telecommunication, water and Electricity

Each sub woredas connected with each other and with the woreda by cobble stone and all weather asphalt roads. The woreda connected with other woredas and the sub-city head offices with main Asphalts and High Way Ring-Roads. The main transportation means of the woreda people is mini bus taxies and city bus. All sub woredas have access to telecommunication, pipe water supply, and electricity with some sort of interruptions. Water supply to the whole woreda is weekly based as of other neighboring woredas and stays 2-3 days to leave.

Population

According to urban health extension 2007 EFY woreda health profile, the total population of the woreda 13 was 56,963. Male population accounts 25,493 (45%) and female population accounts 31,470 (55%). The male to female population ratio of the woreda was 0.81:1. According to this data the male to female ratio is different from what sub-city/ regional population projection was, i.e. 0.92:1 (48%, 52% respectively). Around 102,997 populations were served in two Health centers in the woreda 13. Nearly half (44.7%) 46,032 population added from neighboring woredas in which health centers were not constructed.

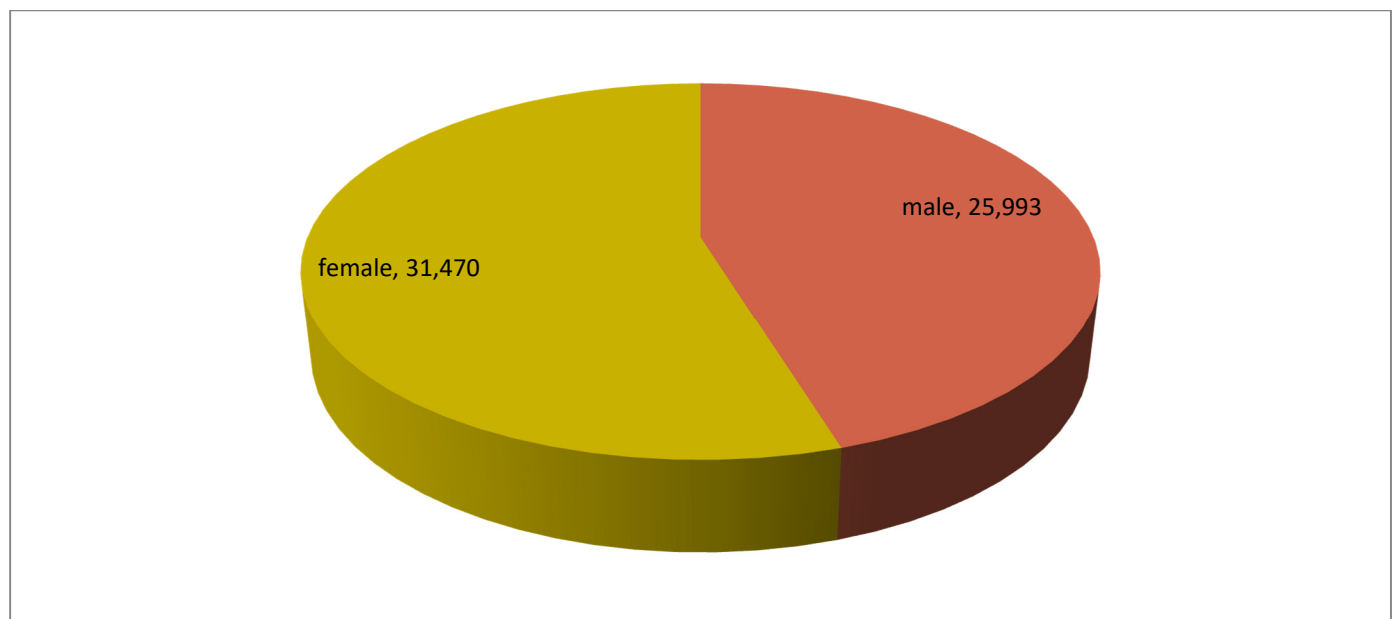
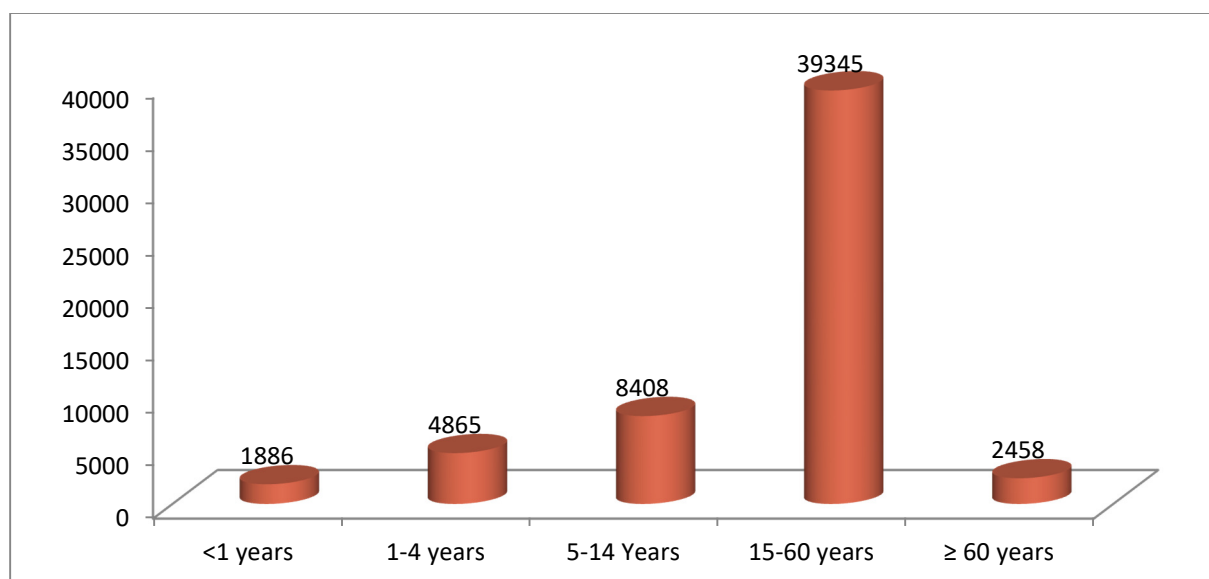


Fig 20: Population distribution by sex in w.13, KK Sc, 2014/2015



Source: woreda 13 UHEWs health profile, 2007 E.C

Fig 21: Population distribution by age group in the W.13, Kolfe keraniyo Sub-City, 2014/2015

When we saw the age distribution of the woreda population, 39,346 or more than half (69%) of the population was in the age group of 15-60 years followed by under 15 population who accounts 15,159 (26.6%). This indicates that there is relatively less dependent and high productive age group population in the woreda. The following table and figure shows population pyramid by age group distribution.

Religion

As known, Ethiopia is a country of diversified multi ethnic, religion and culture groups. Woreda 13 in kolfe keraniyo sub city is one of the residential areas of these diversified people. Available data showed that Ethiopian Orthodox is the dominant religion with the 39%, followed by Muslim religion which accounts around 34%, and Protestant represents 17.5%. Talking about ethnicity in this woreda is essential but recent data is not available to describe which ethnic group in the woreda is dominant.

Table 10: Population characteristic by religion in w.13, KK Sc, 2007 (2014/2015)

	Characteristics	Number	Percentage
Religion	Orthodox	22,231	39
	Muslim	19,312	33.9
	Protestant	9,981	17.5
	Catholic	1,282	2.3
	Others	161	0.28
	Others	3996	7
	Total	56,963	

Economic status/ occupational status

The main economic source of the population was small scales trade and other business. The small scale business includes restaurant, grosser, bar, coffee and tea, kiosk, wood and metal work, beauty and cosmetic salon, etc. The income status of the community depends on one's economic involvement in different work fields. When we come to the employment of the woreda population 4,013 people employed in government institutions, 6,908 people employed in private industries and enterprises , 9,864 people enjoyed with their private business, 12,688 are in education process and 6,947 are still jobless, and the rest of the woreda people are on the other field. Children and others unknown employment status account 16,543. The average income of the residents of the woreda is not known (data not available).

Table 11: Occupational status of people in w.13, Kolfe Keraniyo Sc, 2007 (2014/2015)

S. No	Employment	Number
1	Government Employer	4,013
2	Private Employer	6,908
3	Self employer	9,864
4	On education	12,688
5	Jobless =	6,947
6	Others	16,543

EDUCATIONAL STATUS

Education is the primary source of knowledge which has direct influence on health in the prevention of disease and risk reduction. The woreda has a total of 36 schools, including 6 governmental and 30 private schools. The legal age of schooling in the woreda is 4 years for stage one kinder garden and seven years for primary school. Based on the woreda education office data there are sixteen KG, sixteen primary and four secondary- preparatory schools in the woreda. There is neither higher education nor TVET School in the woreda but General Wingate and Kolfe TVET schools are nearby it. A total of 13,764 regular and 1,190 night students were followed their education with 6,976 male and 7,978 female students with only 0.24% drop out rate. The gross enrolment in KG 3193 (23.2%), primary school 8,466 (61.5%) and high and preparatory school 2105 (15.3%) was 97.2 % and 97.9 % in secondary school. The enrollment status indicates that both in students and teachers, the female magnitude greater than the male. All schools have water and electric supply. All schools in the woreda have functional health related clubs except KG schools. When we come to latrine status in the school, the private schools are better in both quality and comfort than government. The following tables and figures show distribution of students and teachers by gender and organization in the woreda.

Table 12: Distribution of students by sex and organization in w.13, kolfe keraniyo Sub city, 2015 /2016

Organization	Sex of students		Total
	Male	Female	
Government	2312	2803	5115
Private	5141	5065	10206
Total	7453	7868	15321

Table 13: Distribution of teachers by sex and organization in w.13, kolfe keraniyo Sub city, 2015/2016

Organization	Sex of teachers		Total
	Male	Female	
Government	88	155	243
Private	231	404	635
Total	319	559	878

Health

Health facilities

There are 13 different government and private health institutions starting from HP to HCs; 8 pharmacies and 9 drug dispensaries in the woreda with the total of 180 government and 75 private health workers from nurses to medical practitioners. Among these health facilities two health centers serve the woredas people as OPD, IPD in some extent, and services like Immunization, ART, TBL, TB-HIV, ANC, delivery, PNC and the like. One of the two health centers has long time experience in delivering health service and has currently exercised ORT for obstructed laboring women within the woreda and other bordering woredas and sub-cities collaborating with St Paul hospital. The health center to population ratio is 1:28,482 which is good achievement comparing with the set target (1:40,000) in the Addis Ababa city Administration. But the HCs have given services to neighboring woredas population in which health centers not available. Doctor to population, HO to population, nurses to population, Lab. Workers, Pharmacy workers, Environmental Health, UHEW ratio is 1:56,963, 1:2848 and 1:770, 1:2848, 1:3797, 1:28,482 1:2110 respectively. In addition to these health workers, there are 121 supportive staffs that are the back bone to the proper implementation of health delivery system in the health centers.

Table 14: Health facility distribution by type in the w.13, kolfe keraniyo sub city, 2015/2016

Organization	Type	Number
Public	HC	2
	HP	1
	Medium clinics	9
	Small clinic	1
Private	Pharmacy	8
	Drug stores	9

Human resource

Table 15: Woreda public health facilities human resource distributions by sex and profession in w13, kolfe keraniyo sub city, 2015/2016

	GP	HO	Nurses	Midwives	Lab. workers	Pharmacy workers	Env'tal Health	Anesthetist	HEW	Total
Male	1	10	25	6	8	6	2	1	0	59
Female	0	10	49	13	12	9	0	1	27	121
Total	1	20	74	19	20	15	2	2	27	180
Supportive staffs										121
Grand total										301

Table 16: Private health facilities human resource distributions in w. 13, kolfe keraniyo sub city, 2015/2016

Profession	GP	HO	Clinical Nurses	Midwives	Lab. Technician	Pharmacy technician	Environmental Health	Anesthetist	Nurses	HEW	Total
Private	2	7	20	1	12	33					75
Government	1	20	74	19	20	15	2	2	27		180
Total	3	27	94	20	32	48	2	2	27		255

Vital statistics

Table 17: Vital statistics of the woreda 13, kolfe keraniyo sub city, 2014/2015

Indicator	%
Child Mortality Rate	0.21
Crude Birth Rate	2.33
Maternal Mortality Rate	0
Contraceptive prevalence rate	50
Contraceptive acceptance rate	22
ANC rate (how many of the total expected pregnancies attended 1st ANC)	>100
Percentage of deliveries attended by skilled birth attendants	56
ANC rate (how many of the total expected pregnancies attended 4th ANC)	65
Percentage of deliveries attended by HEWs	0
Percentage of deliveries attended by TBA	NA
Average family size	4.1
Crude Birth Rate (per 1000)	20.3
Age dependency ratio (% working age population)	69
Age dependency ratio; old	4.4
Age dependency ratio in %; young	26.6

Child health

Improving child health is one of the national strategies which set a target for reduction of under five mortality rates from 101 to 68 per 1,000 live births and the infant mortality rate from 77 to 31 per 1,000 live births. Reducing the under-five mortality rate by two third between 1999 and 2015 is one of the target of MDGs. There are many national and sub national strategies designed by FMoH collaborating with international and national partners. Among these strategies some include expanded program on immunization (EPI), effective management of less than five diarrhea diseases and pneumonia, screening and management of malnutrition and etc.

In the achievement of the MDG target, EPI activity plays key roles in reducing less than five child mortality rate. Now a day, Ethiopia has experienced immunization activity intensively on ten antigens and vaccines throughout the country. These ten antigens and vaccines include BCG, OPV, penta-valent (DPT+ hep-B and Hib), PCV, Rotarix and Measles.

The immunization coverage of the woreda health centers showed that 3275 children had access to BCG, 2560 children to OPV 1, 2756 to OPV 3, 2954 to penta1, 2589 to penta3, 2821 to rotarix1, 2510 to rotarix2, 2991 to PCV1, 2890 to PCV3 and 2528 to Measles and fully vaccination. 2909 children were protected from tetanus at birth through their mothers who got two and more doses of tetanus Toxiod vaccine during and before pregnancy. Based on health centers catchment population, health centers in the woreda 13 was expected to provide vaccines for 2,400 children but they performed by more than 500.

The dropout rate of penta1 to penta3, PCV1 to PCV3, Rotarix1 to rotarix 2 , penta1 to Measles is 365 (12.4%), 101 (3.4%) 311 (11%) and 426 (14.4%) respectively. The WHO and FMOH accepted dropout rate of vaccinated children is $\leq 10\%$ but in this woreda some vaccine dropout rate (for example Measles dropout rate was 14.4%) exceeded the expected one.

EPI services

Table 18: Vaccination status in woreda 13, kolfe keraniyo sub city, 2014/2015

Type of Vaccine	Vaccination Status			Dropout rate	Remark
	1 st dose	2 nd dose	3 rd dose		
BCG	3275				
OPV	2560		2756	196(-7.7%)	
Penta-valent	2954		2589	365 (12.4%)	Penta-valent 1 to penta-valent 3
PCV	2991		2890	101(3.4%)	PCV1 to PCV3
Rotarix	2821	2510		311(11.0%)	Rotarix1 to Rotarix2
PAB		2909			
Measles		2528		426(14.4%)	Penta1 to measles

Source: health centers

Integrated management of neonatal and child illness (IMNCI) service

Table 19: The IMNCI services activity plan Vs performance in w.13, kolfe keraniyo sub city 2014/2015

	Plan	performance		Remark
		No	%	
Activities for under five children				
Number of live-born babies with birth weight less than 2,500g	0	176	11	
children screened for malnutrition	7375	13622	>100	
Total number of admission for severe malnutrition	1.4%	59	0.43	
Number of children recovered	85%	35	59	
Number of children defaulted	15%	24	41	
Number of children died	0	0	0	
<5 year children treated for diarrhea at public HF	8034 (6.8%)	2532	2.45	
<5 children year treated for pneumonia at public HF	6901 (6.7%)	1508	1.5	

As we know diarrheal and pneumonia diseases were the top leading cause of morbidity and mortality on under five children in a country up to recent years. Data in the health centers showed that percentage of diarrheal disease was 2.45% and pneumonia cases accounted 1.5% which were below the national (6.8%, 7%) and regional (6.8%, 6.7%) prevalence respectively. Those could be occurred as the result of after launching Rota and PCV routine vaccine.

Maternal Health

Table 20: Percentage of MCH (ANC, Delivery, PNC) activity in w.13, kolfe keraniyo sub city, 2014/2015

Indicator	Target and Eligible	Achievement		Remark
		Number	%	
Number of ANC Cases Registered		2932	>100	
Pregnant women received at least first antenatal care visit	2400	2932	100	
Pregnant women received antenatal care at least	92%	1915	65	

four visits

Number of pregnant women tested for HIV	100%	3051	>100
pregnant women eligible for HIV	3%	64	2.1
HIV positive pregnant women eligible for HAART	100%	64	100
pregnant women tested for syphilis	100%	2913	99
pregnant women provided at least TT2	100%	2909	99
Pregnant women provided iron foliate	100%	3086	>100
Post Natal Care visited	80%	2621	89.4
Number of children <5 year treated for diarrhea at public HF	8034	2532	31.5
Number of <5 year children treated for pneumonia at public health facilities	6901	1508	21.8
Deliveries conducted by skilled birth attendants	80%	1646	56
Number of live births	100%	1579	96
Number of still births	0	9	>100
Total obstetrics/Maternal/deaths	0	0	0
Total Newborn deaths		0	
Number of facilities reporting stock out of contraceptive commodities	0	0	0
comprehensive abortion care services		336	
Number of safe abortions performed	160	261	>100
Less than 18 years		18	7
Greater than or equal to 18 years		243	93
Number of post abortion/emergency care		75	22.3
Less than 18 years		14	18.7
Greater than or equal to 18 years		61	81.3
FP service for cases	100%	336	100

Strategic effort to reduce or eliminate maternal death focuses on assessment of risk mothers and risk factors, increasing access to skilled delivery care, strengthening referral network system, increasing number of ambulances with their full working time and strengthening reproductive health and family planning services.

Antenatal care service such as HIV and syphilis screening activity (100%, 99%), provision of TT2 (99%) and postnatal care visit (89.4%) performance was gone with as expected. There was

one stand by ambulance in the woreda which served for 24 hours and seven days in a week for its full working time. There also were 19 trained midwifery health workers in the health centers of woreda. Institutional as well as community maternal death was not recorded in the woreda, 2014/2015.

Family planning (FP)

Federal Ministry of health focuses on long term family planning method to improve maternal health, to prevent unwanted and unplanned pregnancies, to reduce frequency of visits to health facility and to minimize cost for repeated visit. Based on these and related conditions the health centers in the woreda and sub-city jointly set target provision of long term family planning methods to the one fourth of the eligible for the year. The total target for FP method was 16,618 (50%) of eligible. Among those 8,309 were for long term method. FP acceptor rate in the woreda was 36.7% and of which 30% were long term family planning method users. Percentage of post abortion FP service was 100% and it was one of the strong activities among other services in the woreda.

Table 21: Family planning (FP) activity by method and performance in w.13, kolfe keraniyo sub city, 2014/2015

Methods	plan	Achievement		Remark
		Number	%	
Total FP methods	16,618	5932	36.7	Plan= 50% of eligible Plan = 50% of total target
Short term methods	8,309	4139	70	
Oral contraceptives		1108	26.8	
Depo-Provera (Injectable)		2106	50.9	
Condom distribution		733	17.7	Individual plan not found
Others		192	4.6	
Long term methods	8,309	1793	21.6	Plan = 50% of total target
Implants		1283	71.6	Individual plan not found
IUCD		510	28.4	

Top ten causes of morbidity and mortality

Health centers have responsibility to admit patients for 24-72 hours and manage all out patient department visitors at their own level. In 2014/2015 a total of 88,653 cases had been managed in the outpatient department in two health centers in the woreda 13. Out of those cases 72,101 (81.3%) were ≥ 5 years and 16,552 (18.7%) were under 5. OPD visitors by gender includes 43,835 (49.4%) were male patients and 43,835 (50.6%) were female patients.

URTI was the leading morbidity both for adult and children as well as female and male population. UARI is significantly increased from year to year in the woreda as well as in the sub city at large.

Unspecified diseases, HTN and related diseases, and circulatory system diseases were 1st, 2nd and 3rd causes of admission in ≥ 5 patients. There was no death record in the health institution in the woreda.

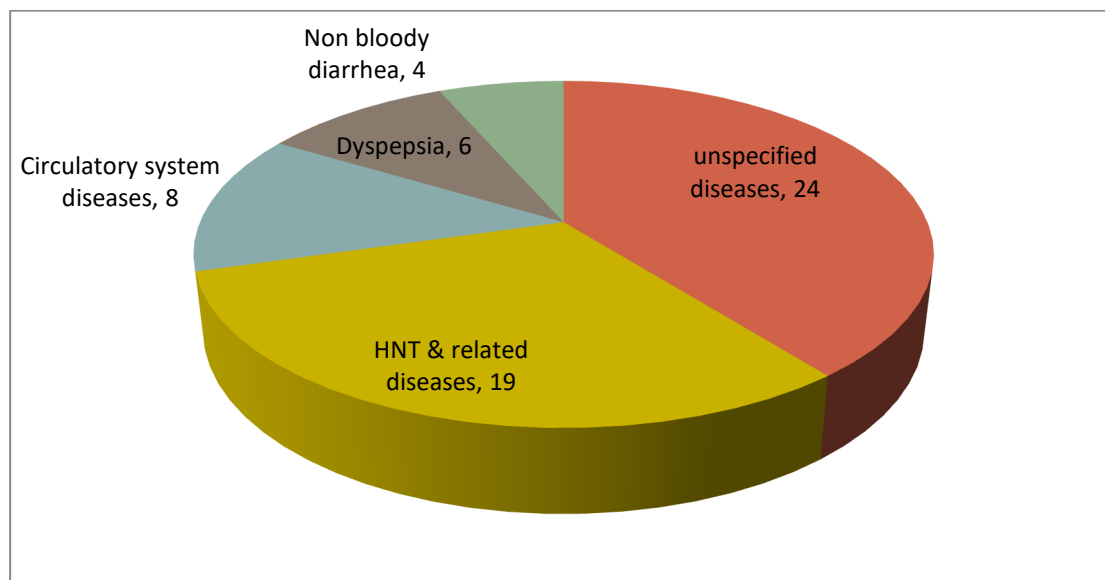


Fig 22: Top five causes of admissions in w.13, kolfe keraniyo sub city, 2007 E.C (2014/2015)

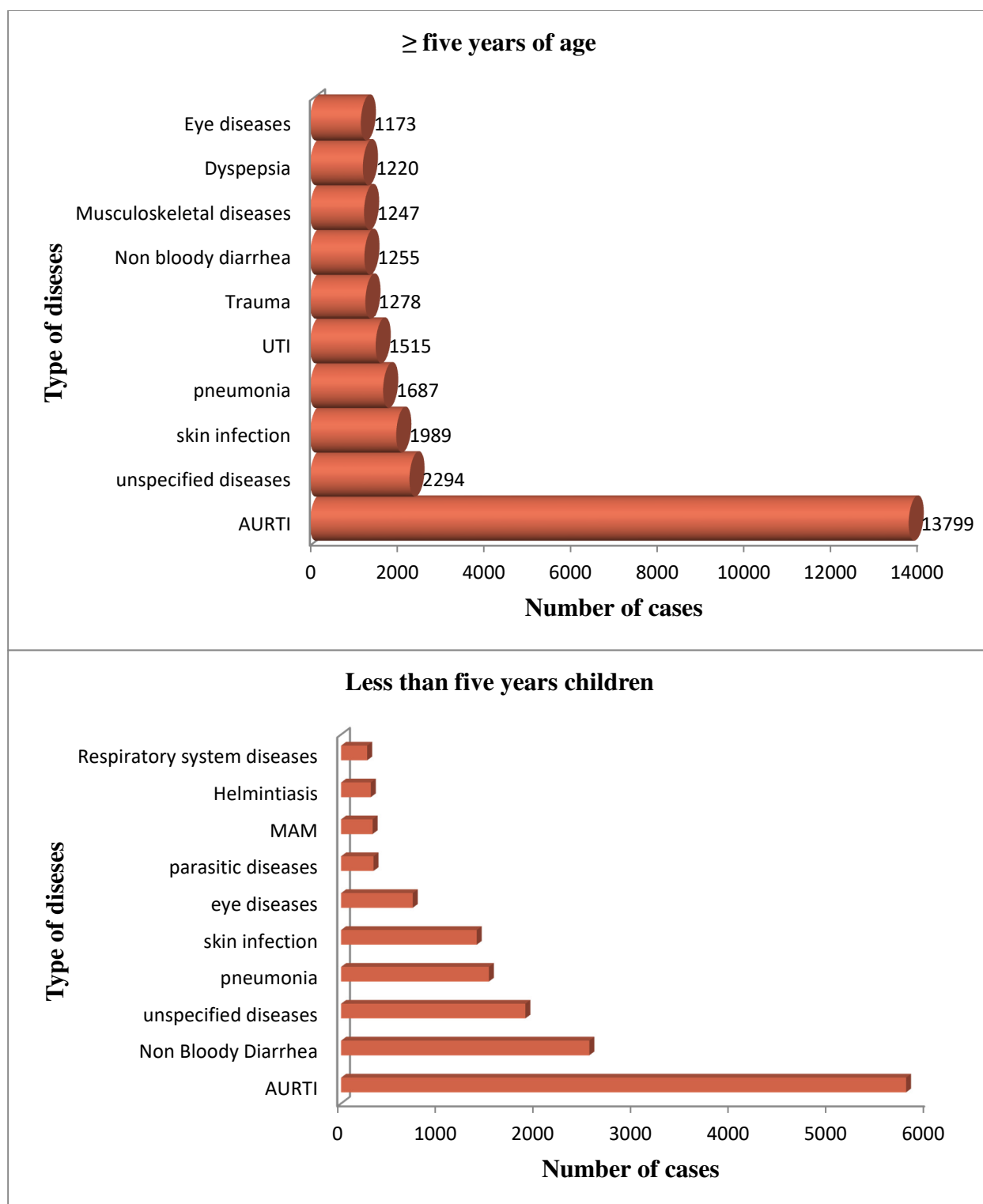


Fig 23: Top ten leading causes of OPD visit (morbidity) by age in w.13, kolfe keraniyo sub city, 2007 E.C (2014/2015)

TBL and TB-HIV:

Tuberculosis is contagious infectious disease and can infect large number of people at a time. Different findings indicated that two third of developing countries' population exposed to TB infection. Currently MDR TB case is a serious challenge in the world wide especially in under the Sahara region. Our country Ethiopia is among top ten TB burden countries in Africa. Data showed in the woreda that still there is significant number of TB cases circulating in the community. Among 223 detected all forms of TB cases 34 of them were re-infected and were risk for developing MDR TB. Detection, cure and success rate of TB was 96.5%, 88.5% and 88.5% respectively.

Effective screening and management of TB-HIV co-infection cases is basic strategy to reduce TB mortality rate. Proportion of TB patients screened for HIV was 89.7% and initiation of cotrimoxazole prophylaxis therapy and antiretroviral treatment for TB-HIV co-infected patients was 64.5 and 16% respectively in the health Centers under the woreda. It was below the target of sub-City, region and federal ministry of health.

Table 22: TB, TB-HIV and leprosy program activity in w.13, kolfe keraniyo sub city, 2007 EFY (2014/2015)

Activity	Target	Achievement		Remark
	%(number)	Number	%	
All forms of TB detection rate	231(100)	223	96.5	*This data covers not only the woreda population but it includes health centers catchment population
Bacteriological positive TB DR	111(75)	70	63	
Cure rate	46(75)	54	88.5	
Treatment success rate	≥55% (≥ 90)	54	88.5	
All form TB treatment completion rate	≥201(≥90)	196	88	
Defaulter rate	<5%	3	1.3	
Death on TB Rx	<5%	9	4	
TB treatment failure	2(3.4)	1	0.44	
Leprosy detection rate	6(100)	0	0	

Leprosy treatment completion rate	1 (100)	1	100
TB patients screened for HIV	223(100)	200	89.7
TB patients tested positive for HIV	33 (15)	31	94
TB-HIV co-infected Patients initiated CPT	31 (100)	20	64.5
HAART for TB-HIV co-infected Patients	31 (100)	5	16
PTB negative among all TB cases		43	
EPTB negative among all TB cases		87	
Retreatment TB cases among all TB cases		34	

Source: Health centers TB registration

*health centers catchment area beyond the woreda catchment (administration) area

HIV/AIDS

The woreda had low achievement in INH preventive therapy for newly enrolled HIV patients (26%) as well as in HIV testing and counseling program which was 6% of the target plan for the year 2007 EFY. INH preventive therapy reduces the risk of acquiring active tuberculosis at least by 50 to 60 percent if it is provided as early as possible. The other big issue is HIV testing and counseling program which was 6% of the target plan for the year 2007 EFY. ***Negligibility of HIV screening may result in abrupt epidemic so that it needs serious attention.***

Table 23: The status of HIV/AIDS by age in w.13, kolfe keraniyo sub city, 2007EFY (2014/2015)

Activities	total	Adult	Pediatric	Remark
Total HIV tested	3613	3559	54	
VCT	0	0	0	
PITC	562	508	54	
PMTCT	3051	3051	---	

Tested positive for HIV	38	36	2	Plan not found for all indicators
Newly enrolled in pre ART	72	67	4	
Ever enrolled	4309	NA	NA	
Pre ART	2105	NA	NA	
Ever started	2012	1910	103	
Currently on ART	1474	1410	64	
IPT initiation for newly enrolled HIV/AIDS patients	19	19	0	

Essential drugs

There were no shortage/ out stock of essential drugs in the health centers of the woreda. In addition to health budget, health care financing system in the health centers made easy the process of essential drugs purchasing procedure and reduces the essential drugs gaps. Out of a total of 1,575,366.48 EBR allocated budget, 1,305,251.24 EBR (83%) was utilized for medication and other medical supplies.

Nutrition

There were a total of 59 severely malnourished (SAM) children enrolled as Outpatient therapeutic program (OTP) in the two health centers. Among those admitted children 35 (59%) were recovered and the rest 41% were defaulted. No death record due to severe malnutrition in the woreda.

Disaster situation in the woreda

There was no record of any natural or manmade disaster and feature of an outbreak/ epidemic in the woreda in 2014/2015.

Community Health Services

Health Services Integration with community is vital to diseases prevention and health promotion as well as services expansion and quality assurance. To facilitate this integration, organizing women development army and strengthening 1 to 5 networking system is a key factor in

government health policy. Urban health extension workers have tremendous role in the community both in health service integration and awareness creation within the community. There are 27 UHEWs and 3 supervisors, and around 2400 model households who were networked by 1 to 5 in to 400. They introduced 15 health packages already designed by Addis Ababa City Administration for urban dwellers to the community. Urban health extension workers have responsibility to educate and demonstrate the residents of the woreda about these health packages thoroughly. Some of the major activities of UHEWs are: provision of health education about prevention of communicable and non communicable diseases, how to manage solid and liquid wastes; how to handle personal, household and surrounding hygiene; assisting and facilitating mothers and care givers to take their children to the health institutions for vaccination; assisting and facilitating pregnant mothers to attend and get ANC, delivery and PNC service in the health facilities; screening and referring malnourished and any health conditions to the health facility; training model households and networking them to other community members; collecting and recording the health profile of the community and the like.

Environmental Health and Sanitation

Solid waste management

Clean environment is vital to reduce diseases causing pathogens and to improve the health of the community. Addis Ababa City Administration efforts setting strong objectives to expand free waste, clean and green woredas and sub woreda in the city. Woreda 13 solid waste management office tried to accomplish the objective of the City Administration by fulfilling human resources, availing solid waste containers and managing waste disposal activities. There were around 47 road cleaner, 80 and more members of (in 8 groups) household solid waste collectors and 13 management officers assigned in the woreda. The woreda solid waste management office designed one group of household solid waste collectors to serve 900 to 1000 households at least two times per week using more than 32 waste containers. But when we saw the real situation of the woreda, there were only 18 waste containers which were disproportion to the households and only two combiners in the sub city to load and reload the waste from the container sites. According to the office information, the woreda waste disposal activity was delay 2 to 3 weeks until loading and reloading. The delayed waste disposal activity made delayed solid waste collection from households, which may facilitate to accumulate harmful pathogenic micro organism and created offensive bad odors around the area of solid waste containers.

Liquid waste management and housing situation

There was no woreda reflective tangible data about liquid waste management in the woreda but the following table showed us that some households with liquid waste management and housing condition.

There were still open defecation habit in the in some households in the woreda. Those households 7 in number (source: solid waste management office, w.13) were owned by kebele and had no latrine nearby them and unable to construct by themselves otherwise construction permission given to them by Sub_City land resource management office. It needs the woreda 13 executive office attention to execute and construct communal latrine for those households.

Table 24: Liquid waste management and housing situation in w.13, KK Sc, 2007 EFY (2014/2015)

	satisfactory	Not satisfactory	Total	Remark
Private latrine	8457	1334	6311	
Communal latrine	1551	2145	3996	
Households who have private bathing room	4865	5896	10761	
Households who have communal bathing room	954	2664	3618	
Households with liquid waste disposal	7443	2818	10259	
Households with solid waste disposal	11696	913	12409	
Households having light	12004	1239	13243	
Households having ventilation	12172	1086	13258	
Number of households used Open field defecation			7	

Challenges:

- Absence of some essential information such as: Safe drinking water, electricity, telecommunication, and road coverage specific to the woreda.
- Discrepancy of catchment population between woreda and health centers

Major gaps:**Low percentage of pregnant women for fourth ANC visit relative to first visit (65%) or registry**

- Low level of deliveries assisted by skilled health personnel (56%)
- Increment of vaccine dropout rate e.g. penta3, measles, fully vaccinated
- Low achievement of modern family planning service
- Weak TB-HIV activities
- Data discrepancy between health centers annual report, HMIS and Woreda information
- Lack of organized and standardized warehouse for data in the woreda
- URTI was the leading cause (morbidity) of adult and children as well as female and men population.
- Deposition of long time or delayed disposal of solid waste in the woreda

Conclusion:

Among a total population 36.5% had jobs and earn their income. 12.2% of the woreda population was jobless. 4.3% were old age dependency and 26.6% were young age dependency. The overall economic dependency was 43.1% which is high in the woreda. So that it might need number of small scale enterprises to overcome the woreda economic dependency and to alleviate consequences resulting from this problem.

The woreda health coverage system is >100% based on Ethiopia federal ministry of health standard, and health center to population ratio 1:28,482. The immunization coverage based on the woreda target was greater than 100 percent. The dropout rates of penta1 to penta3 was 365 (12.4%), Rotarix1 to rotarix2 was 311 (11%), and penta1 to Measles 426 (14.4%). The maximum expected measles or fully immunized children dropout rate is $\leq 10\%$. Here, the result in the above mentioned immunization program showed as it has gap. So that children still at high risk acquiring infectious diseases like Measles infection. That might be due to lack of provision of information to mothers and care givers about vaccines benefits, or improper handling of customers specially mothers and care givers, or due to vaccines stock out in the health institutions within the woreda.

Antenatal care attendants coverage at least one visit was >100% in 2007E.C (2014/2015), that was good performance. Proportion of ANC for fourth visit was 65% of the first visit. It was low compared to the sub city target (92%) for the year. The percentage of deliveries assisted by a skilled health personnel was 56% which was below the target of the sub city (100%), regional and national (>80%). Still birth accounts 9 among institutional deliveries. It could result from either poor service provision for pregnant mothers during first ANC visit, and labor and delivery, or due to lack of birth preparedness counseling plan in ANC follow up, or weak referral linkage between health centers and community i.e. loose integration of HEP to Health facilities. ANC fourth visit, skilled attendant delivery and still birth measure the quality of maternal health. The service provision method and customer handling practice are key area to improve maternal health service. So it needs continuous monitoring and supportive supervision from the sub city.

Upper respiratory tract infection was the leading ten top causes of adult and children as well as female and men population. URTI was series challenge to entire populations in the woreda which also was the leading cause of morbidity in the sub city. Delayed collection and disposal as well as long time accumulation of solid waste within the community may also the main precipitating factors to URTI. An emerging new infectious pathogen or re-emergence of existing infectious pathogen could be the possible source of this problem. It needs further research to identify the root cause if the problem.

Tuberculosis detection rate, cure rate and success rate in the woreda were more or less good. Proportion of TB patients screened for HIV was 89.7%, and it was below the regional target (100%). And initiation of cotri-moxazole prophylaxis therapy was 65% and antiretroviral treatment as well 16% for TB-HIV co-infected patients. The woreda had low achievement in INH uptake for newly enrolled HIV patients (which was 26%) as well as in HIV testing and counseling program which was 6% of the 2007 EFY target. TB-HIV activities in general, indicated as a weak performance in the woreda.

Recommendation:

- I strongly recommend primarily health centers to assess ANC, Delivery, EPI, FP, TB and ART service provision protocol, customer handling practice, ways of communication with customers to minimize the identified gaps in each service provision area.
- I recommend Health centers and woreda health office to set collaborative strategy to strengthen HEP to achieve targeted goals within the community.
- URTI was the leading cause of morbidity and it became strong challenge and increased year to year in the woreda as well as in the Sub-City so that it needs respect sector offices attention to closely monitor the pattern of transmission to set minimizing strategy.
- May I recommend sub-city health office to strengthen continuous and regular supportive supervision to both woreda health office and health centers
- I recommend health sector managers and program officers to cross check the reliability and validity of available data from different reporting sources.
- I also recommend all sector offices in the woreda except education and capacity building offices and all health centers to capture, compile, organize, and document all necessary data/ information about the woreda in the database.
- Long term deposition of solid or liquid waste may facilitate the growth of unwanted and pathogenic microorganisms in the area and/or may create toxic substance which may cause dangerous health problem in the community. And it can precipitate the existing illness like respiratory tract infection. I also recommend the woreda and Sub-city administrative heads to assign additional solid waste loaders that facilitate effective solid waste managing system and as same time to reduce the risk factors of community health.

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Chapter-5: Abstract for Scientific presentation

5.1 Influenza like illness (ILI) Surveillance Trend Analysis in Kolfe sub-city from 2012 – 2015

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Executive summary

Background: Influenza like Illness is a contagious respiratory illness caused by flu viruses. The People having a flu often feel some or all of the following symptoms: fever, cough, sore throat, runny or stuff nose, muscle /body aches, headaches, fatigue^{1, 2, 3}. Flu can affect human, domestic and wild animals and birds based on the causative microbes. Upper respiratory tract infection was the leading top ten causes of morbidity in kolfe sub-city for the past four years and characterizes vast transmission pattern from year to year. Therefore, the aim of study was to assess the trends of influenza like illness in the Kolfe sub-city. **Method:** All influenza like illness cases were collected from case-based report of 2012-2015 in the kolfe sub-city. The collected data were cleaned and aggregated for analysis. The data was analyzed by person and time. The data was calculated for its frequency, proportion, ratio, and rate.

Result: One thousand-two-hundred-and-eighty-nine suspected influenza like illness were reported in kolfe sub city. Of which 526 (40.8%) were male and 763 (59.2%) were female. Among the total suspected influenza like illness 331 (25.7%) were diagnosed type A & B influenza virus in national laboratory. The male among those positive cases were 150 (45%) and the rest were female. The 15-44 years age groups 730 (56.6%) were more affected by the disease and followed by 5-14 years age groups 330 (25.6%). The female to male risk ratio was 1.44. Total positivity rate of tested influenza like illness was 25.7%. There were three peak seasons of the disease at 14th week of 2012, from 9th to 12th week of 2013 and at 42nd week of 2014. The transmission pattern of the disease was changed in 2014. **Conclusion and recommendation:** There were three missed outbreak features of influenza like illness from 2012 to 2014. It needs serious attention of Federal Ministry of Health and its partners in health promoting at school and work areas in addition to household level and close monitoring of transmission pattern of the disease.

Key words: Surveillance, Influenza like illness (ILI), kolfe keraniyo sub city, Addis Ababa

Chapter-6: Assessment of disaster situation

**Assessment of immediate environmental health for Shelter
in Koshe Rubbish Landslide disaster survivors, Kolfe
Keraniyo Sub-city, Addis Ababa**

Summary Report

Introduction: Inadequate solid waste management is major environmental problem to the dwellers of woreda 01 of Kolfe Keraniyo Sub city where the waste disposal activity takes place. A total of 90 households were destroyed with their household properties, 115 lives lost, 129 were injured, and 186 households with 521 family sizes were immediately evacuated from the disaster site. The main purpose of the assessment is to identify the possible environmental health gaps within and around the temporary shelter of the Koshe rubbish slide disaster survivors in woreda 1, kolfe keraniyo sub city. **Methods:** The assessment study was conducted from 17th -18th March, 2017 in the temporary shelter of the Koshe rubbish slide survivors in woreda 1, Kolfe keraniyo sub-city. Data collected by interviewing the relevant local government authorities who had directly involvement in disaster management activity, key informants representing the shelter residents, and worker of social associations, and by observing the actual conditions of the shelter after having letter of permission using standard structured tools adapted from CDC. Verbal consent was obtained from respondents before interview and informed them as their response is confidential especially for key informants and social workers.

RESULTS: A total of 186 households with 521family size with an average of 65 persons per tents were lived in temporary shelter. There was very short distance (approximately 1meter) between shelters and (less than 30cm) between beds. The tents were not water proofed. No separate tents for males and females. Foods were prepared on and off sites and the supplied foods lack variability. Adequate, safe, and clean water was available. A total of eight toilets were found but no supply of soft tissue paper and adequate number of receptacles in the rest/ toilet. Medical services were given on the site. The compound of the shelter was occupied by sawdust, tatters, and other remnants and, no free and adequate area for recreation purpose. Community sewage system of the area was open and passed in front of the shelter which had offensive and unwanted odder. **Conclusion & Recommendation:** The overall environment of the temporary shelter for the evacuee people of Koshe landslide was not adequate and clean except for water supply. The concerned body should give an attention to the nutritional status of the residents, adequate and separate shelter for males and females. It is important to clean the surrounding environment to the shelter rather than bleaching chemical disinfectants.

Key terms: Disaster, Environment, Koshe, Temporary shelter, Kolfe sub-city, Addis Ababa

6.1 Introduction

6.1.1 Background

Disaster is a serious disruption of the functioning of a community or a society causing widespread human, material, economic, or environmental losses which exceed the ability of the affected community or society to cope using its own resources. It is the combined result of hazards, vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk [1, 2, 3]. There are two main types of disasters: natural and technological. Natural disasters occur outside the control of humans, whereas technological disasters are breakdowns in human-made systems [3].

Landslide is a natural disaster involves the breakup of intact land and downhill flow of the breakup rock, mud, artificial landfill, and anything caught in the path and characterized by mass movement. Landslide can be occurred by **Geological causes**: weak materials, weathered materials, fissured materials, etc; **Morphological causes**: Tectonic or volcanic uplift, Glacial rebound, Deposition loading slope or its crest, Vegetation removal, etc; **Physical Cause**: Intense rainfall, rapid snow melt, flooding, thaw and freeze weather, Shrink and swell weather, earthquake, volcanic eruption- are triggers; and **Human causes**: excavation of slope or its toe, deforestation, irrigation, mining, artificial vibration, and water leakage from utilities[4]. Establishment of settlement and increased agricultural activities have greatly contributed to the occurrence of landslides [5].

There are mainly two forces affecting landslides: Driving Force (DF) which causes the slope to move, and Resistant Force (RF) which stabilize and prevent movements. Factors speeding Driving Forces include: over steepened slope, adding water to the slope, heavy rain fall and/or rapid snowmelt, and loading extra materials at the top of slope. Factors strengthening Resistant Forces include: Removing excess water from slope, adding buttress at the base of the slope, and building retaining walls. Working in these two forces, either facilitates the movement or prevents/mitigates the landslide occurrences [6]. The force of gravity—which acts to move material downhill—is usually depends on two things: 1) the internal strength of the material, and 2) the friction of the material on the slope. Landslides usually occurred when the force of gravity become greater than either friction or the internal strength of the rock, soil, or sediment [7]. Presence of water to material on a slope can make landslides more common. It increases the

weight to the slope as it seeps into the ground and also decreases the strength of the material which can make it less able to withstand the force of gravity [8].

6.1.2 Statement of the problem

A sudden landslide (Shenzhen landslide) at the hillside of the industrial park killed 10 people, disappeared 75 citizens, and covered a large number of buildings in the Guangming district, China, on December 20, 2015 [9]. Massive landslide killed at least 40 people and 104 people were missed in Sri Lanka on 17th May, 2016 [10]. Landslide triggered by Heavy rains killed 18 people, completely buried 15 houses, and damaged many others. The landslide disaster affected 421 households with 3,480 persons, and approximately 5 acres (1 acre = 4000square meter) of land on 24 June 2012 in the Bududa District, Uganda [11]. It damaged several houses amounting to millions of rands, and the loss of a life at Quarry Heights Road, Durban, KwaZulu-Natal, South Africa in November 2011[12]. In the time frame of a week Rwanda, Uganda and Ethiopia had lost a total of 120 people, and destroyed numerous homes and farming areas due to landslides in 2016 alone. The cause of the landslides was harsh rainfall and while weak infrastructure was main reason to the deaths occurrence [13].

Addis Ababa, the capital of Ethiopia is the largest as well as the dominant political, economic, cultural, and historical city of the country. It is sub divided in to 10 sub-cities and 117 Woredas. The population of the city is 3,035,135. It is a home town of AU, Diplomats, and other international organizations. It is center for modern economic and social activities. The Mayor of the Capital has designed numbers of strategies to foster the development of the City. However, its development specially regarding to waste management is too slow to meet the demands of the rapidly increasing population. Inadequate solid waste management is major environmental problem in Addis Ababa City Administration particularly to the dwellers of woreda 01 of Kolfe Keraniyo Sub city where the waste disposal activity takes place. Woreda 01is one of the highly risk for health and health related disaster among 15 woredas found in the kolfe keraniyo sub city. It is the area of current Municipal solid waste disposal site.

The rapid population growth is also resulting in a rise of urban waste generation. This implies that the current waste collection and disposal capacity of the city could not match with the growing population and generation of waste. These environmental problems also have socio-economic consequences. Poor environmental quality of cities can deprive citizens of a good

quality of life as it affects their health and consequently, adversely affect productivity and economic development.

The city has traditional solid waste management system within the city. It lacks a well-engineered and operated sanitary land fill that complies with the environment and human health protection. The current solid waste disposal facility, which is located 13km away from the center in South West direction of the city, is merely an open air dumpsite. The landfill called 'Repi' has been in use for more than forty years. The only factors that then considered in selecting the solid waste disposal site were hauling distance and the availability of the land. There was no evaluation of the underlying soil structure and topography, climatological conditions, surface water hydrology or the geologic and hydro-geologic conditions of the area. For these reasons, the dumping site is causing environmental, health and social problems to the people living around the site.

In 2015 alone, 376 natural disasters occurred worldwide, compared to 380 for the 2005-2014 average. Asia was the first continent in experiencing 44.4% natural disaster, followed by the Americas (25.5%), Africa (16.5%), Europe (7.2%) and Oceania (6.4%). In terms of human vicinity; 22,765 deaths and 110.3m victims were exhibited. In 2015, low income and lower-middle income countries accounted 67.6% of global disaster mortality report. Globally estimated number of US\$ 70.3 billion economic lost due to natural disaster [14].

Landslide has occurred in different parts of the world in different times. It destroyed several thousands of homes and infrastructures; damaged properties estimated as millions of dollars; displaced and killed thousands of people.

High steep slopes, dam area, mountainous area, mining areas, loading and excavation sites, deep valley, roads those carry high loads, and so on are prone to landslides. The composition of weak materials; deposition of water and other compounds; shrink and swell weathered materials; deposition of loading slope; excavation of slope; artificial vibration nearby the site; and water leakage from utilities from those households living in the site are some of the possible risk factors of landslides. In the other hand, steepness of the slope, absence of waste management system such as: sewage system to remove excess water, buttress at the base of slope, and retaining wall may facilitate the landslide to speed.

The vulnerable groups such as community living with short distance with the slope (presence of dwellers near to the slope) and batch of scavengers at the top and base of the slope increases the

magnitude of victims during the landslide disaster. The Sudden and atrocious the so called “Koshe rubbish slide” disaster that occurred on 11th March, 2017 at 7:30pm is experienced the typical example of the above mentioned characteristics.

6.1.3 Significance of the study

Inadequate and slow recovery and reconstruction of survivors have further deepened the pain and left families with uncertainty. Lack of basic services like electricity, water, sanitation, education, and health is serious challenge to survivors at the post-disaster situation. Psychological aftermaths are other tangible impacts of disaster which always cannot be quantified [15].

Safety and security of children, women, and girls is a major concern as they are living in camps and shared rooms. Cross contamination of food due to mass preparation and consumption, and communicable diseases resulting from poor hygiene and sanitation, and inadequate ventilation also are the second disaster in the shelter and camps since survivors have varying level of knowledge and behavioral backgrounds [16, 17].

This study will have a significant input for the decision makers and stakeholders involved in the disaster management to prepare them and to provide information based response; to design appropriate strategy in risk reduction and mitigation in the community. The study finding can be used for kolfe keraniyo sub city worda 1 administration, kolfe keraniyo sub city administrations; other stakeholder who need to use it. It also encourages other researchers to carry out in depth research in this particular area.

6.2 Objective

6.2.1 General objective

The main purpose of the assessment is to identify the possible environmental health gaps within and around the temporary shelter of the Koshe rubbish slide disaster survivors in woreda 1, kolfe keraniyo sub city, Addis Ababa, 2017.

6.2.2 Specific Objective

To determine safe food source and handling process in the temporary shelter

To assess the presence of adequate and safe water for drinking and other utility in the shelter

To identify possible pests or vectors in the temporary shelter

To assess the availability of hygiene and sanitation facilities in the temporary shelter

6.3 Method

6.3.1 Study area and period

The study was conducted in the temporary shelter of the Koshe rubbish slide survivors in woreda 1, Kolfe keraniyo sub-city from 17-18 March, 2017. Woreda 1 is the most risky woreda among fifteen woredas of the kolfe keraniyo sub city even in the Capital. This woreda shares boundary with woredas 2, 4, and 5 from west, west north, and north respectively within the kolfe keraniyo sub city, Nifas Silk Lafto sub city in the east and south at large. The woreda has sub divided in to 8 sub woredas /Ketenas/. The atrocious rubbish slide occurred in sub woreda 8 as of Addis Ababa Land Resource and Development Agency (AALRDA) but currently and locally called sub woreda 4 Tibia 7. The particular Koshe rubbish slide site is located in 8.97633 latitude and 38.71431 longitudes. An estimated area which is covered by Koshe solid waste dump site is 1,000,000m². As of 2016/2017, The Woreda has a total population of 29,484 of which 48% are males and 52% are female (based on 2007 population census estimation).

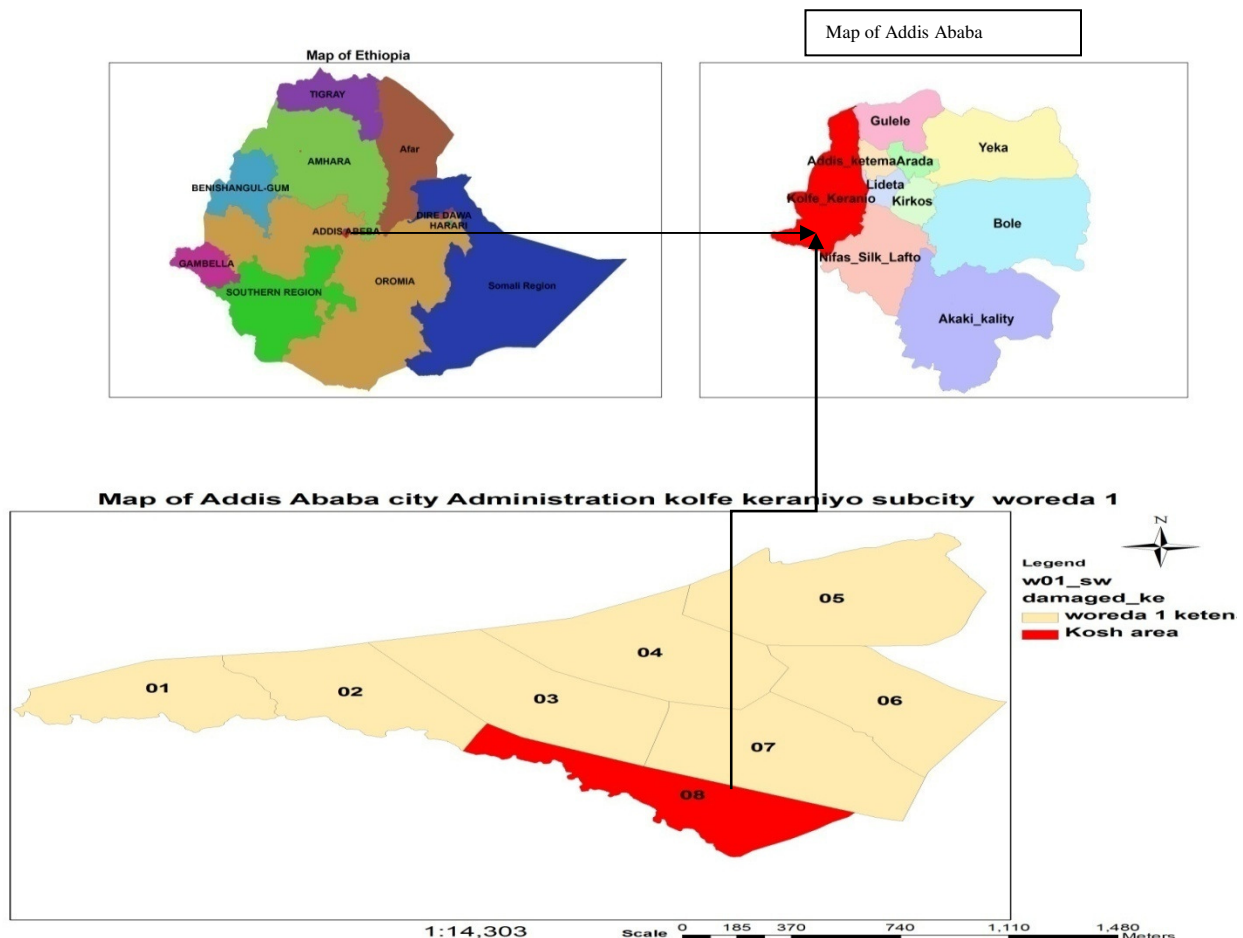


Fig 24: Map of woreda 1 per sub woredas/ ketenas in the kolfe keraniyo sub city, 2017

6.3.2 Data collection tool and procedures

6.3.2.1 Data collection tools

Checklist was used to collect data which was adapted from Center for diseases prevention and control (CDC) available in the form of ‘environmental health assessment for shelter condition form during disaster’. , key informant interview, and observation

6.3.2.2 Data collection procedures

Data was collected by interviewing the relevant bodies among established disaster management task forces in the woreda, the representatives of the evacuee people within the shelter, and different volunteers working in that shelter using guiding checklist. In addition to the interviewing the concerned bodies, observation took place focusing on food, water access, hygiene and sanitation practices, sewage and waste disposal system, sleeping area, childcare area, and medical care using checklist. I tried to observe food handling and preparation methods; availability of clean drinking water and its source; shelter condition such as whether they were ventilated or not, the roofs and walls were water proofed or not, the floors were concrete based or not, availability of electric light, presence of recommended distance between shelters/ tents; presence and availability of separated shelters/ tents for women and men as well pregnant and lactating mothers; availability of separated toilets both for both male and female and its quality; availability of hygiene and sanitation facilities includes: hand washing practice before feeding and after toilet, washing facilities for clothes and other utilities, showering for male and female; cleanness of mattress and blankets in the shelters/ tents; cleanness of surrounding environment of the shelter/tents (refuse disposal and sewage management); In addition, I also observed some scenarios such as ‘infants and children feeding , defecating, fecal disposal, and diaper changing and the related practices of caretakers; and availability of medical care service within the shelter.

6.3.3 Data source

The main sources of data were the kolfe keraniyo sub city police department, the woreda 1 health office staffs, the emergency clinic staffs of woreda 1 health center, the labor and social affairs offices of woreda 1 and kolfe keraniyo sub city, FMHACA of the woreda1and kolfe keraniyo sub city, and key informants in the woreda.

6.3.4 Dissemination of study

Written report (both hard and soft copies) shared to the woreda 1 administration of kolfe keraniyo sub city, kolfe keraniyo sub city health office, Addis Ababa city administration health Bureau, St' Paul hospital millennium medical college, department of Public Health.

6.3.5 Operational definition

Evacuee people	People who leave the usual residential area due to disaster
Environment	The internal and external situations of the temporary shelter including the surroundings
Hygiene	Safe food handling practice and personal cleaning practices and habits
Sanitation	Cleanness of the tents and surrounding environment; solid and liquid waste management system

6.3.6 Ethical consideration

Letter of permission was requested from kolfe keraniyo sub city health Office to collect data from different sector offices which involved in the disaster and were part of disaster management task force. Verbal consent of the key informants was requested before data collecting. The data was strictly confidential.

6.4 Results

6.4.1 The disaster and its consequence

It was March 11, 2017 the place where Koshe, in the woreda 01, kolfe keraniyo sub city, Addis Ababa City Administration, Ethiopia at the time 7:30 pm (01:30 local time). Families, neighbors, and friends gathered in their home to pass favorable time as usual. Children played within their compound feeling happiness having got their parents, caregivers, elder brothers and sisters who separated from their children for different purpose for a day. Some parents started to prepare foods for their children and for themselves; others started planning to their future separately or in group; students prepared to do their homework and study to attain their future vision. Electric power switched off Suddenly, Unexpected disaster (event) occurred at the north part of the rubbish dump site (locally called Koshe) in the woreda 01, kolfe keraniyo sub city, Addis Ababa City Administration, Ethiopia. It was incident for all city dwellers at night (01:30 local time) Death report toll 115 on the Koshe garbage dump slide. Among those 109 of them identified as whom they are and the rest 6 were still not recognized according to kolfe keraniyo sub city police command information. Of those deaths, male account 41 (35.65%) and while 74 (64.35%)

were female, and children less than 5 years were 13 (11.3%), five to 14 years were 24 (20.9%) and more than two third 78 (67.8%) were age 15 years and above. The age of the victims' range from 4 days of life to 59 years.

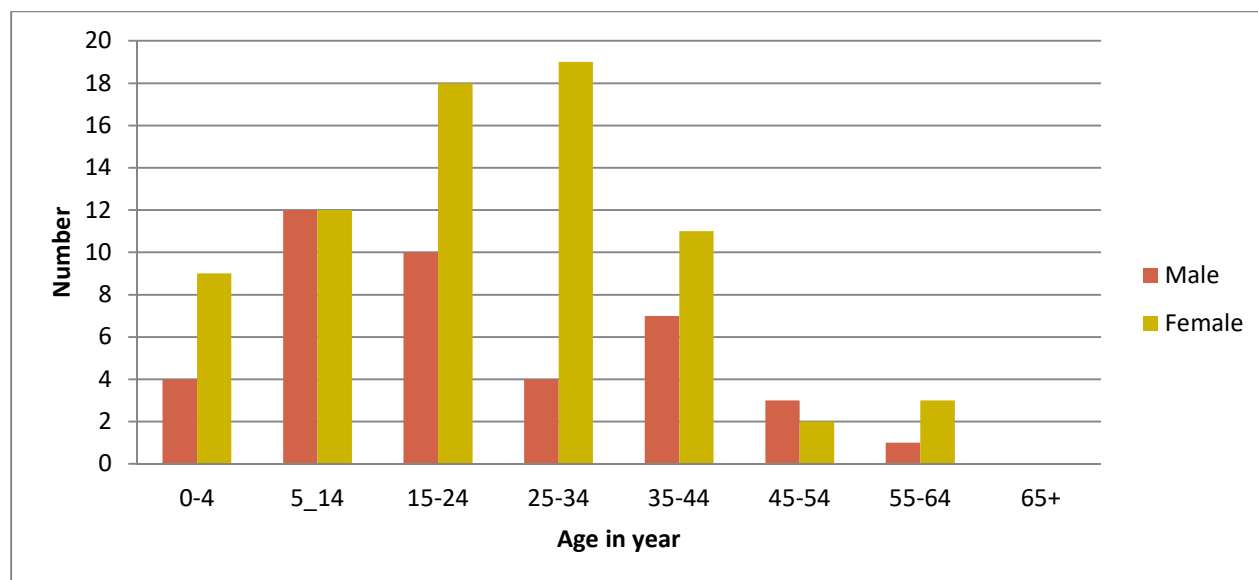


Fig 25: Age and sex distribution of deaths at Koshe rubbish slide on 11th March, 2017

Based on the information from kolfe keraniyo sub city police department, one hundred twenty-nine (129) people were exposed to simple to severe injury but records were found only for 22 people in Alert hospital and Woreda 1 health center.

Rescue activity continued until 24th March, 2017 to discover dead body of the victims inside the garbage damp slide. Rescue activity led by Addis Ababa Fire and Emergency Prevention and Control Authority. Amazing involvement of the Ethiopia Red Cross Association and community specially youths in rescue activity was there. Addis Ababa Police commission, kolfe keraniyo police command, and had played great roles in the coordination and collaboration, and by ensuring the security the area. More than 1000 rescue workers from governmental and nongovernmental organizations and 123 community youths were participated to save lives, to discover dead bodies, and in keeping security activity around the disaster site. The final dead body discovered on 23rd March, 2017. Twenty ambulances were involved in transporting injured people and dead bodies to the hospitals. The slide rubbish was reloaded to the center of the waste dump site to reduce land fill from rescue area and to facilitate dead body discovery activities

using more than 110 different machineries like loaders, bulldozers, excavators, and trucks day and night starting from half an hour of after the disaster happening.

In this disaster a total of 90 households were destroyed with their household properties. Out of 90 households, 54 HHs were occupants and 7 HHs were scavengers who lived on the top slope of the rubbish dump. Different habitants like cows, sheep, and other animals and infrastructure like water system and electric and telecommunication line and pole were damaged. In this disaster a total of an estimated 12,297,647 EBR economy was lost. This represents only to the victims' households and their properties cost.



Fig 26: photo illustration of disaster situation and rescue activity at Koshe rubbish slide site, kolfe keraniyo sub city, Addis Ababa, Ethiopia, 13th March 2017.

A total of 186 households with a total of 521 family size were immediately evacuated from the disaster site; out of those, 90 HHs were evacuated because of their houses were damaged/destroyed and the rest 96 HHs were because of their houses were at risk. The other 120 households planned gradually to leave their residences since they are at high risk for similar or other disasters such as flood and associate disasters. There are still estimate of 150 to 200 households around the area which are at high risk for flood, fire, and chemical explosion.

6.4.2 Temporary Shelter/ Tents Situation

There were a total of 8 shelters which were building base, steel sheet base and tent type. An average of 65 persons per tent has been lived. The floors of all shelters were cemented and easy to clean. The roofs of the shelters were sealed but the tent type shelters were not water proofed and difficult to be there during raining. All shelters had appropriate lighting system both at day time from sun light and at night from electricity. There was a very short distance between shelters especially to those tent types as shown on the following figure. Therefore, cross ventilation (free air movement) of the shelters was poor.

6.4.2.1 SLEEPING AREA:

Within one tent having 58.52 m², there were 18 to 20 mattress and more than 30 people slept in it. The distance between mattresses at the side not more than 20cm and 0.6m from head to toe. This type of mattresses placement and sleeping condition creates contact between people and their sleeping beds may expose to introduction of pests and leads to an abrupt communicable diseases outbreak. The other observed situation in the shelter was that males and females from different households were slept in the same tent. Except for lactating mothers, there were no separate tents for males and females as well to the children.



Fig 27: Planted tents in the temporary shelter, woreda 1, kolfe sub city, Addis Ababa, 2017

6.4.2.2 Disinfection status of temporary tents

The tents and clothes of the resident were disinfected once until this assessment took place with diazin chemical to protect rodents and pests by veterinarians' staffs of the sub city urban agriculture office. Plan was there to disinfect the temporary shelter twice a week.

6.4.3 Food source and supply:

Before and during the assessment time, foods were prepared on and off sites. Some social society and Ethiopian Red Cross Association members prepared foods and served to evacuee people on site which was easy to monitor safe food handling practices and the source of the foods. In the other hand, already prepared foods were brought from different civil societies and served to evacuee people on site which was difficult to monitor safe food handling practices and the source of it. Appropriate kitchen was not available in the temporary shelters until the assessment taken place.

Concerning to food adequacy, people get food at least 4 times a day for breakfast, lunch, snack, and dinner. In addition to this children have got carbohydrate content foods between meals. But the food supply lacks item diversity such as fruits, vegetables, high protein content foods, and the likes.

6.4.4 Water access:

There was adequate water supply for drinking, for hand washing, for dish washing, for cloth washing, and for showering purposes. Excess amount of bottled water was available which was funded by different water bottling companies and fairly distributed to the evacuee people for drinking purpose. In addition to this, there was communal tap water in the shelter without interruption. Additionally 20, 000 Liter volume of fiber glass tanker was planted as reservation in case shortage of bottled and tap water will happen. Water treatment chemicals were available in the medical care service department in the shelter. Therefore, safe source and adequate supply of water was documented in the temporary shelter.

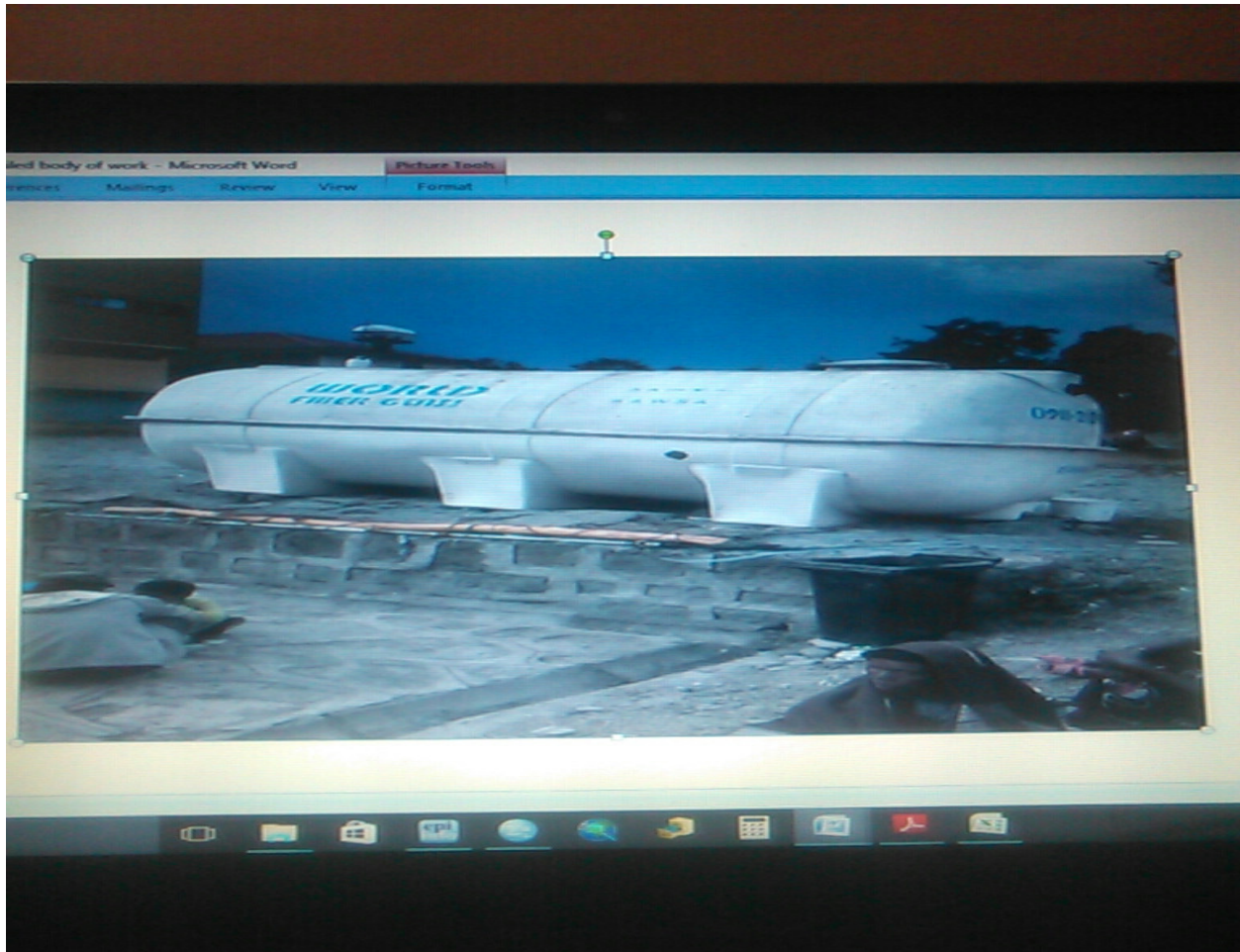


Fig 28: planted fiber glass water tanker for alternative water supply in the temporary shelter, woreda 1, kolfe sub city, 2017.

6.4.5 Hygiene and Sanitation

6.4.5.1 Sanitation

In the temporary shelter, there were a total of 8 toilets. Six toilets were served for adults and 2 toilets were for children. Toilets which served for adults had wider holes and it was risk for children unless they were kept by parents and caregivers. It enables easily entering plastic water containers which simultaneously obstacle the liquid waste sewage system and removal activities, and reduces quality of service. Four shower rooms were available 2 shower rooms for males and 2 for females. Each toilets and shower rooms had barriers which kept the privacy of people while they serving. Toilets and shower rooms were cleaned 3 times a day by residents of the shelter. There is only 1septic tank served to 8 toilets and 4 shower rooms in the shelter. It was

easily filled up within three days of removal due to excess liquid waste sewage from bath and rest rooms. But I observed that there was no supply of soft tissue paper and adequate number of receptacles in the rest/ toilet rooms.

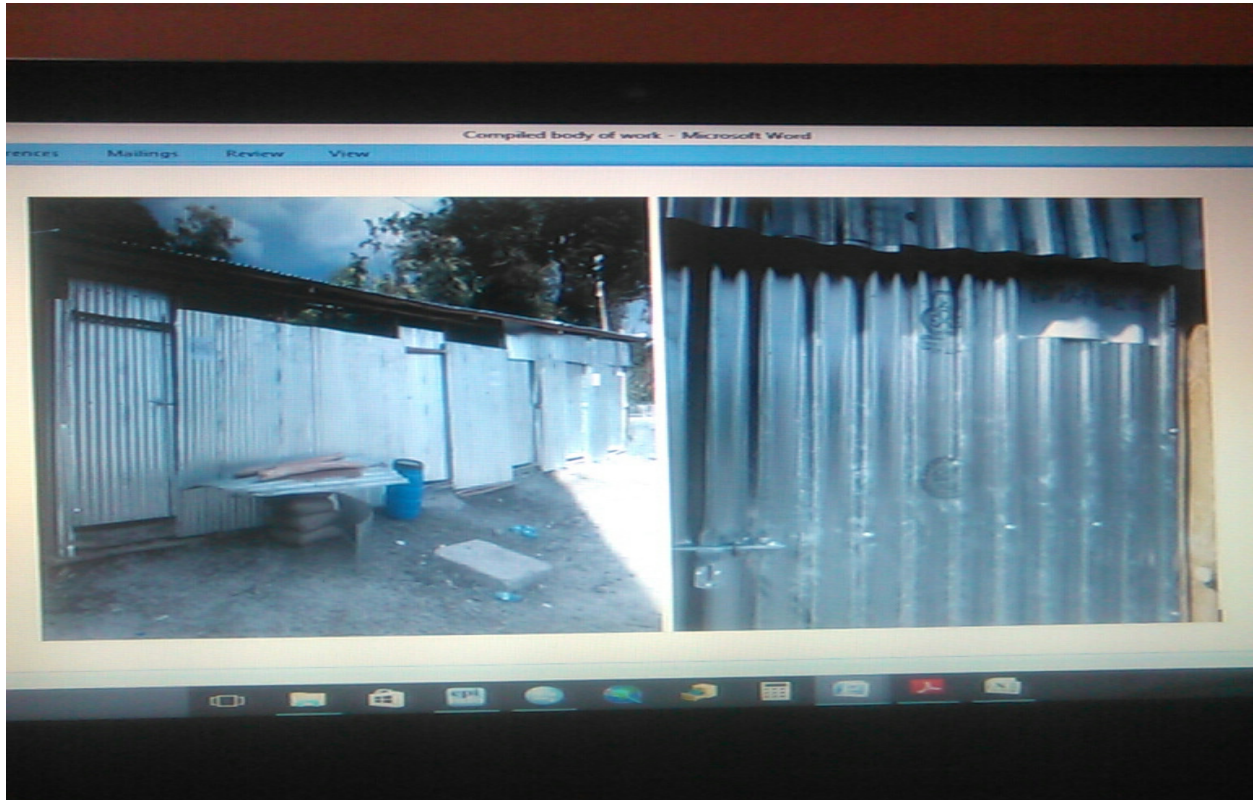


Fig 29: Photo illustration of steel sheet cover toilet & shower rooms in the temporary shelter, woreda 1, kolfe keraniyo sub city, Addis Ababa, March 2017

There were 7 pipes and 6 Jeri cans with 0.05 chlorine solutions and soap for hand washing and more than 6 plastic dishes with 0.05% chlorine solutions for domestic use. Other 14 washing basins with adequate water supply were prepared to wash the clothes. One to two Soaps were distributed to each household for a week based on the family size after 3 days of evacuation but it was not enough to families with many children (as response of evacuee representatives). I observed that as having gaps in soap distribution and as complaints was so true.

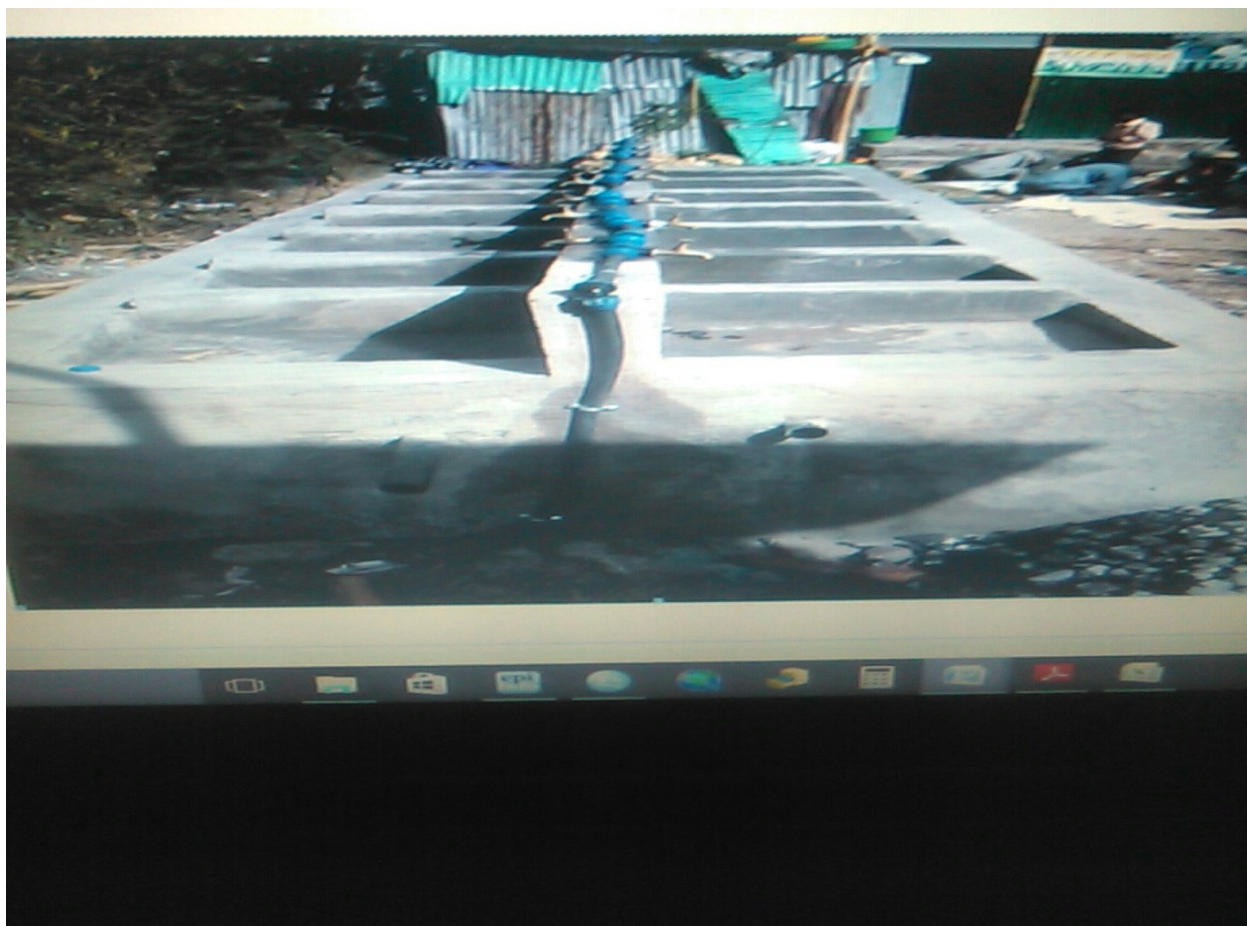


Fig 30: Facilities for hand and cloth washing in the temporary shelter, woreda of kolfe sub city, Addis Ababa, 2017

There were more than 30 volunteers participated in coordinating hygiene and sanitation practices around toilet, shower rooms, tents, and surrounding environment. Two volunteers were assigned for each shelter in two shifts to educate the shelter residents to wash their hand before meal, facilitate and support them in the hygiene practices.

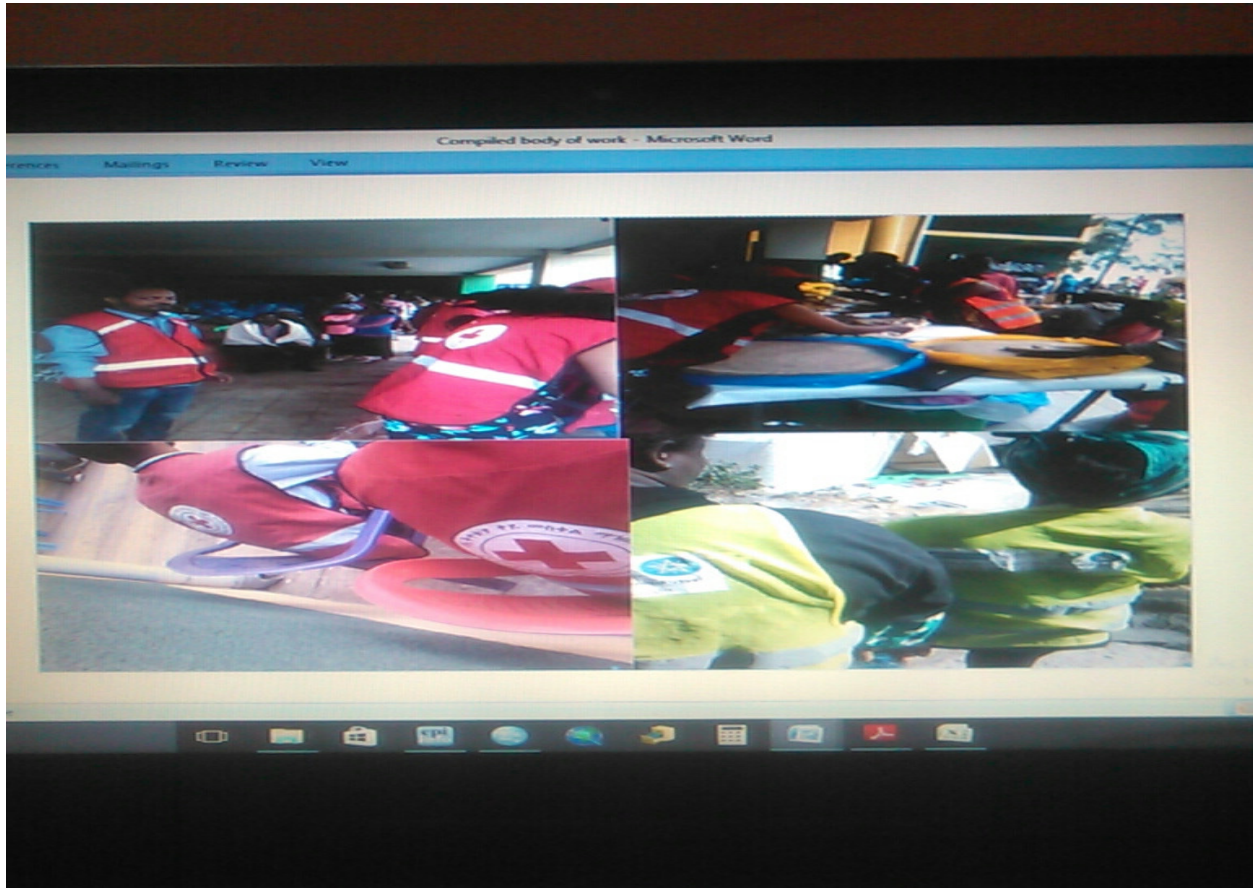


Fig 31: Photo illustrated the volunteers serving social activity in the temporary shelter, woreda 1 of Kolfe sub-city, AA, 2017

7.4.5.2 Solid Waste Management System

There were huge and different type solid wastes in the temporary shelter which was generated within the shelter and from the community and organizations. Only few numbers of dry waste collection receptacle and one container were available within the shelter compound. Dry waste was collected and stored in primary container three times a day. And the stored dry waste was removed every 3 day in a week. The waste management committee tried to mobilize the residents to separate and dispose the dry waste in to the primary container to make the environment clean. But the containers were limited and not proportional to the day to day generated dry wastes. It was a challenge both for coordinators and 521 shelter residents.



Fig 32: Photo illustration of solid waste disposal system out of the container in temporary shelter, woreda1, kolfe Sub-city, 2017

7.4.6 Environmental situation

The total area of the shelter compound was estimated to be 1000m². The surrounding compound of the shelter had been covered with iron sheet fence. There was no free and adequate area for recreation purpose. There were no facilities to dry the washed cloths of the residents of the shelter. It had sawdust and other remnants and tatters which harbors dust particles. It was difficult to the evacuee people especially to the children while playing there and to volunteer workers for their day to day activity. During windy time the dust smog the entire compound which affect people including beds and clothing within the tents. It was also susceptible to pests and rodents breeding site.

The community sewage system of the area was open and passed through the shelter which had offensive and unwanted smell. Social workers and visitors walked through it and carried particles while entering the compound. It was serious challenges to the shelter residents particularly children and people with upper respiratory tract infections. The surrounding environment of the temporary shelter was narrow as compare to the evacuated people and it was not clean as well. It was occupied by household materials of the evacuee people. The storage system for household materials was not existed but it was dropped up on an open environment. The situation was in dangerous condition for materials damaging and for rodents breeding.

7.4.7 Health / Medical Services

Temporary clinic were established both in the temporary shelter and nearby the disaster site. Health professionals were assigned for both clinics. The health team was composed of physicians and other relevant health professionals. Clinical assessment and laboratory investigation activities were performed on the site. Referral system and ambulance service was there. Nutritional screening assessment for children, lactating and pregnant mothers were took place. People with chronic diseases and follow up were identified from the shelter residents and facilitated to continue their follow up and medication. Communicable and other diseases were properly registered and monitored day to day. There was standby investigation team in both sites.

7.5 Discussion

FOOD: Food supply to the displaced people during humanitarian situation is the major concern to the disaster management stockholders as well as to the government. Adequate and nutritious foods supply should be provided to people who in need especially for at high risk population such as children, lactating, and pregnant mothers, chronically ill people and elderly. High risk populations have needed additional foods in between meal. And the foods should contain recommended protein, carbohydrate, fat, minerals and vitamins [16]. Before and during the assessment period, people were supplied foods at least three times a day from different community members and social organizations. Kids and children were given snack after schooling. But they were given similar food types from day to day. When we saw the available foods supply at the site, it lacks Item diversity and it was mainly focused to carbohydrate content foods and partially to fiber content foods. For instance, the people who lived in the shelter lacked high protein and fat content foods as well minerals and vitamins in their food supply. Unfortunately, there were no any identified SAM cases except some MAM cases. In the other hand, World Health Organization (WHO) recommended that as all food types better to prepare and serve onsite to reduce contamination and to monitor the sources of the foods. Some social organizations started to prepare and serve foods onsite. But majority of supplied foods were prepared elsewhere and served onsite. This was very challenging in monitoring safe food handling process and its source except the packed foods types.

Safe and clean drinking water as well supplying adequate water to the displaced people for their day to day use is crucial during humanitarian condition. World health organization suggests that

every individual needs at least 15litre of water per day [16, 17]. In the temporary shelter, there was adequate bottled water supply donated by different local mineral water production industries. Additionally, water treatment chemicals were ready in case shortage of bottled water for drinking is exists. Uninterrupted communal tap water supply was there. And besides this, fiber glass tanker having a capacity of containing 20,000litre water planted in nearby the shelter for reserve purpose. Addis Ababa Water and Sewage Authority south west branch played great role collaboration with local Authorities. Therefore, water supply and accessibility in the temporary shelter was adequate and nearly similar to the WHO and SPHERE project recommendation even if it was not measured with standard materials. Even though adequate, safe and clean water supply is there, efforts needed to maintain its continuity.

Establishment of effective strategy for vector and rodent control activity keeps from physical damage to the property of human and simultaneously protects the source of pests' breeding site. These also indirectly protect the occurrence of communicable diseases which have possibility of an outbreak originate from pests. Distracting and cleaning vector breeding site and disinfection activities are among the strategies. In the temporary shelter, there was an effort to disinfect sleeping beds and clothing with chemicals twice a week. Chemical may has long term effect on the health of human especially children. In the other way, the surrounding environment of the shelter was occupied by different household materials and tatters which facilitate vector breeding.

When thinking the environment hygiene and sanitation are major and critical components. Hygiene includes food hygiene, personal hygiene and household utility hygiene. Hand washing and showering are types of personal hygiene. Keeping personal hygiene particularly regular and proper hand washing can prevent from acquiring number of diseases. In the temporary shelter, there were 25 pipe nocks for hand washing purpose. There was also jury cans containing 0.05% chlorine solution and soap. But the habits of hand washing practice almost for the half of the shelter residents were less. So it needs guidance and continues health education to bring effective behavioral change.

Solid and liquid waste management system; availability proportional latrine to the population and its utilization determine the presence of safe and clean environment and they always go with attitudes and knowledge of the community. World health organization (WHO) and Center for diseases prevention and control (CDC) recommended that as latrine to population ratio is 1:20.

The available latrines both for adults and children in the temporary shelter were 8 in number. Total residents within the shelter were more than five hundred. The constructed hygiene and sanitation facilities should consider special population groups but it lacks such consideration. The available latrines were inadequate compared to WHO and CDC standards. Based on these organization standards other additional 18 latrines will need.

7.6 Challenges

1. Temporary shelters /tents/ could not prevent rain and wind
2. An excess deposition of variety of cloths which were brought from the community within the shelter particularly near to the feeding area.
3. The usual habit of the residents in personal and environmental hygiene was challengeable to bring behavioral change with health education.
4. Authorities in some situation were not co-cooperative to give permission to collect data from relevant bodies especially at the early period of the disaster.
5. The attitude of some local authorities in the benefits of information for action and uses of provision of relevant data for further improvement was minimal. Due to this reason they tried to give incoherent data which may distort the actual situation.

7.7 Conclusions

Foods which supplied to the temporary shelter residents was not enough and lacks variability in contents and at the same time its quality during preparation was questionable.

Accessibility and supply of water to the residents both for drinking and other utilities was at the acceptable level. The water supply qualified the WHO's recommendation in quality and amount.

The sleeping condition of the shelter residents had not appropriate space between individuals and between households. The situation created close contact between residents which was risk for introduction to pests and diseases communicability. Direct and frequently disinfecting the sleeping beds, cloths, and the tents with chemicals may create long term effect in the health people.

Hygiene and sanitation condition particularly concerning to quality and sufficiency of latrine in the temporary shelter was not enough. The sanitation of the surrounding environment to the shelter was not good and it may facilitate the vectors to breed. Meanwhile suffocated environment may block the movement of free air inside the shelter.

7.8 Recommendations

1. Adequate foods with variable nutritional content should be supplied to the residents. The concerned body should give an attention to the nutritional status of the residents particularly to those eligible populations.
2. Even though, water supply in amount and quality in the temporary shelter was good, it needs effort to maintain the system in place to the future.
3. I recommend the woreda health office to implement clean the surrounding environment to the shelter rather than bleaching chemical disinfectants.
4. I also recommend the kolfe keraniyo sub city and woreda Labor & Social Offices to find better sites as well to accelerate the rehabilitation program.
5. Local authorities in the woreda should look for constructing additional latrines proportional to the residents and focusing disabled population groups.

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Chapter-7: Epidemiologic Research Thesis

Utilization status of Isoniazid preventive therapy and associated factors among newly enrolled HIV/AIDS patients attending public health facilities in Addis Ababa, Ethiopia

Abstract

Background: Isoniazid preventive therapy augments anti-retroviral treatment and prevents development of latent TB infection in HIV patients. According to Addis Ababa health bureau report, the current Isoniazid preventive therapy utilization early in time among newly enrolled PLHIV in Addis Ababa is low. In addition, factors contributing to low utilization of Isoniazid preventive therapy are not well known. Therefore, the aim of this study was to assess utilization status of Isoniazid preventive therapy and associated factors among newly enrolled PLHIV in public health facilities of Addis Ababa. **Methods:** A facility based cross-sectional study was conducted supplemented with qualitative study from November 13 to December 8, 2017 in Addis Ababa. The data collected at the exit of ART clinic after having consent of study participants. Pearson's chi-square test was used to check the distribution and multi-logistic regression with 95%CI at $p < 0.05$ used to analyze the associated factors.

Result: Eighty-four (22%) were received Isoniazid preventive therapy within three months of enrollment among 382 drug receiver. Majority 492(97.6%) were screened for TB at enrollment and 299(59.3%) hadn't TB symptom initially. The WHO HIV clinical stage IV patients and currently not in union with their partners had positive association to receive Isoniazid drug within three months of enrollment [AOR2.99; CI(1.476, 6.079) $p < 0.002$] and [AOR7.12; CI(1.46, 34.707) $p = 0.15$] respectively, being getting HIV care services at health center and presence of TB symptom at enrollment had negative association (AOR.148; CI(.074, .294) $p < .001$) and (AOR.447; CI(.24, .83) $p = 0.011$) respectively. Fear of drug resistance and toxicity, drug stock out, and weak M&E were supplementary qualitative results for barriers to low Isoniazid drug utilization among PLHIV. **Conclusion and recommendation:** Utilization status of Isoniazid preventive therapy among PLHIV in public health facilities of Addis Ababa was not good. Presence of TB symptom at the beginning and Enrollment at health center were contributing factors for low Isoniazid preventive therapy utilization in addition to other supplementary factors. Advanced TB screening for PLHIV and strengthening peripheral health care system are the key area to work.

Key words: TB, HIV, IPT utilization status, public health facility, Addis Ababa

7.1 Introduction

7.1.1 Back ground

Isoniazid preventive therapy augments anti-retroviral treatment, prevent development of latent tuberculosis infection to disease, and significantly reduce incidence of tuberculosis in the People Living with HIV. Tuberculosis (TB) is contagious and airborne disease caused by the bacillus mycobacterium tuberculosis [1]. As of World Health Organization (WHO) estimates, one-third of the population in the world has latent infection with Mycobacterium tuberculosis [2]. In 2015, there were an estimated 10.4 million new notifiable TB cases and 1.8 million deaths in the globe. Of which, 1.2 million (11.5%) cases and 400,000 (11%) of the deaths were from People living with HIV (PLHIV [1, 3]. The global burden of TB mainly lay down in the 22 countries and about 50% of prevalence occurs in 5 countries of South East Asia, namely, India, Indonesia, Bangladesh, Thailand, and Myanmar [4]. It is known by high mortality and amongst top 10 causes of death worldwide and leads HIV and malaria [1], ranking alongside HIV/AIDS by deadly list [5].

Tuberculosis is the major opportunistic infection and causes of death for HIV infected patients especially countries with constrained economy and poor settings particularly in Africa, Asia, and South America [6, 7]. Human Immunodeficiency Virus infection (HIV) is the highest risk factor for changing the latent TB infection in to the disease stage or developing new TB infection. The risk of developing TB infection with PLHIV is as high as 37 times greater compared to the none-HIV infection [8]. TB is responsible for the 30% of HIV related death in the Horn of Africa (Uganda) [9]. In high HIV prevalent countries like Ethiopia, TB infection is highly increased even though well established implementation of TB direct observed treatment short-course (DOTS) program [10]. Ethiopia is one of the known twenty-two high TB burden countries in the world and found the 3rd and 9th stages in the Africa and in the world respectively [11]. It is the major cause of death and hospital admission in the country [12, 13]. According to Addis Ababa Health Bureau TB-HIV report, the incidence of TB and low utilization of Isoniazid preventive therapy among PLHIV has continued as a problem in the capital City. Meanwhile, high number of TB-HIV and DOTS implementing health facilities, the incidence of TB in the City is still very high in HIV infected patients and is a challenge for stretched objectives of reducing HIV/AIDS associated morbidity and mortality.

7.1.2 Statement of the study

The utilization status of Isoniazid preventive therapy among people living with HIV in the Capital of Ethiopia is a challenging problem in the implementation of integrated TB-HIV program. As of 2008 Ethiopian fiscal year (EFY) Addis Ababa Health Bureau annual TB/HIV report, only 15% of HIV patients were provided Isoniazid preventive therapy among 7,134 newly registered PLHIV. It was significantly decreased by more than half (55.9%) compared with similar report a year before at which the IPT up take was 34% [14]. The problem is contrary to the objectives of the program at large. The root cause of this reduction and low uptake of IPT utilization on newly enrolled HIV patients in the City is not clearly understood.

Studies in other African countries revealed that there are a number of reasons that may hinder IPT utilization among PLHIV. Among these reasons: less accessibility of TB preventive treatment [3]; adverse reaction for INH drug and patients' forgetting to take it [6]; Insufficient information to patients on the use of INH [8], limitation of regular patient screening [15, 16], limitation of operational guideline and algorithm [16, 17]; reluctance and negative perception on the part of policy makers and program implementers, competing priorities for resource allocation, insufficient TB/HIV supply management, shortage of INH, perceiving fear of INH resistance TB [17]; provision of insufficient information about IPT (poor adherence) [18]; patients' interruption of their treatment before completion [19].

Though, the studies in the other African countries suggested the above mentioned reasons as the barriers for IPT utilization that it is not clear whether these problems infer the Ethiopia status or not. Few studies, here in the city, tried to assess the IPT utilization and focused to associate it with the demographic characteristics on general HIV positive patients as well. They also tried to quantify the status of IPT as low [10, 12] and as no association to the demographic characteristics of HIV patients [20, 21]. But they did not answer the underline cause or the associated factors related to the program system, the perception of the patients on IPT use, the availability of logistics and drug stock, and the attitudes of the health care workers on the program, and so on. Beside this, the studies did not incorporate the primary health facilities where majority of HIV patients have been served.

People living with HIV have still developed active tuberculosis while they follow chronic care services and on the HAART in Addis Ababa [14]. This implies that there are certain problems which have hinder the effectiveness of IPT utilization on HIV/AIDS programs in the public

health facilities. Therefore, the aim of this study was to assess the utilization status of IPT and factors associated with it among newly enrolled PLHIV attending public health facilities in Addis Ababa, Ethiopia.

7.1.3 Significance of the study

The author believed that this study assessed the general IPT uptake status among newly enrolled HIV/AIDS patients and revealed the basic associated factors /barriers/ to its utilization in the public health facilities in the City. The findings founded from this study provided some clues to TB/HIV program managers and service implementers about the status of IPT utilization among newly enrolled HIV/AIDS patients and the key areas where the stakeholders need to focus addressing to maximize and improve the IPT utilization status. The researcher believed also that the finding of this research gives the researchers additional information to further in depth study on the related issue on HIV/AIDS patients.

7.2. Literature Review

7.2.1 Overview of Isoniazid preventive therapy utilization

Tuberculosis (TB) is contagious and airborne disease caused by bacillus mycobacterium tuberculosis. In 2015, it was one of the top 10 causes of death worldwide and was responsible for more deaths than HIV and malaria. In the same year, there were an estimated 10.4 million new (incident) TB cases worldwide; of which 11% were accounted People living with HIV. Similarly, 1.8 million people died from TB and 0.4 million were among people with HIV. The case fatality ratio varied from 5% to more than 20% [1].

Based on the World Health Organization (WHO) estimates, one-third of the world's population has latent TB infection with *Mycobacterium tuberculosis*. The risk of reactivation of latent TB infection is greatly increased in individuals with immune suppression, like HIV infection. The greatest burden of latent TB infection is found in Southeast Asia (prevalence, 46%), the Western Pacific region (32%), Africa (31%), and the Eastern Mediterranean region (27%), the Americas (15%), and the Europe (14%). In sub-Saharan Africa, one-third to one-half of HIV-infected individuals is co-infected with *M. tuberculosis* [2].

TB is the leading cause of death among all infectious diseases and WHO reported that in 2010 there were 1.1 million deaths among HIV negative people and 0.35 million deaths from HIV associated tuberculosis. The global burden of TB mainly lies in the 22 high burden countries and about 50% of prevalence occurs in 5 countries of South East Asia, namely, India, Indonesia, Bangladesh, and Thailand, Myanmar [4].

The spread of HIV in the past few decades in sub-Saharan Africa has been accompanied by a major increase in the number of new cases of tuberculosis. In 2010, 22.6% deaths exhibited for TB-HIV co-infection among an estimated 1.68 million people dying of Tuberculosis. The proportion of TB-HIV co-infection is highest in African countries and accounted for 82% of TB cases among people living with HIV [19].

TB is one of the major causes of morbidity and mortality in the Horn of Africa. The TB disease is one of the major health problems in different regional states of Ethiopia. According to the previous study, the TB disease is in the top ten causes of outpatient visit, hospital admission and deaths in the Somali Regional State (SRS) in 2008 [6]. The country is one of the top three in Africa [6] and ranked 9th among the 22 countries in the glob with a high-burden of TB in 2010 [6, 7].

Latent TB and HIV infections have contributed to the increment of TB incidence in countries with dual burden infections. Isoniazid preventive therapy decreases the incidence of new active tuberculosis and latent TB infection on HIV/AIDS patients. So that, high level of IPT uptake on HIV/AIDS patients during early enrollment has benefited in reducing TB incidence and its associated morbidity and mortality [8].

Human Immunodeficiency Virus infection (HIV) is the highest risk factor for changing the latent TB infection in to disease stage or developing new TB infection. The risk of developing TB infection with PLHIV is as high as 37 times greater compared to the non HIV infection [10].

Tuberculosis is the major opportunistic infection and causes of death for HIV infected patients especially countries with in constrained economy and poor settings particularly in Africa, Asia, and South America [8, 9]. In high HIV prevalent countries like Ethiopia, TB infection is highly increased even though well established implementation of TB direct observed treatment short course (DOTS) program [11]. Co-infection of tuberculosis and HIV increases mortality rate of HIV patients [18].

There are certain activities (which collectively called 3Is) to reduce the burden of tuberculosis (TB) infection among PLHIV. These include: intensified TB case-finding (ICF), Isoniazid (INH) preventive therapy (IPT) and infection control in health-care and congregate settings (IC) [19].

One of the critical issues in selecting eligible patients for IPT is screening and ruling out for active tuberculosis. Unless and otherwise patients carefully screened they may treated with single INH drug and resulted in drug resistant TB. Screening PLHIV those who are eligible to IPT is diagnostic and symptom based as of WHO TB screening tools, not as complicated issue and not necessarily required highly qualified specialty especially in resource constrained settings. So screening is a precondition for delivery of IPT to PLHIV [20].

Counseling HIV infected patients before initiation of IPT concerning the patients' understanding about the rationale of IPT, potential INH side effects, regular attendance to follow up clinics, and freedom to take INH publicly increases the patients' adherence level to IPT [22].

Previous studies recommended that PLHIV without active TB infection should receive IPT for a minimum of six months as part of comprehensive chronic HIV care package [13]. The study conducted in Botswana, revealed that provision of IPT to PLHIV for more than 36 months, is

highly beneficial in reducing and preventing from developing active tuberculosis in high TB prevalence area and high likelihood of transmission [21]. Isoniazid preventive therapy is effective, safe, and feasible disease prevention plan (scheme) and it should be addressed to all PLHIV including children and pregnant women. It has the effect of lowering the incidence of TB on PLHIV. Isoniazid Preventive Therapy with daily 300mg regimen for consecutive 6 months duration has an association with reduction of the development of active TB by 50% in all PLHIV [14] and nearly 60% in children age less than 15 years [21].

7.2.2 Factors associated with Isoniazid preventive therapy utilization

There are a number of reasons that may hinder IPT utilization among PLHIV. Of these: Factors that may contribute to low coverage include the need to screen for active TB, the use of TSTs where this is policy, weak health care systems, lack of treatment literacy, the reluctance of a national TB control program to use a first-line TB drug as preventive therapy, and the stigma associated with such use. If chest radiography is part of the screening process, it adds to the costs, and it may be a barrier to starting preventive therapy, particularly if there are no radiographic facilities on site [2]. Fear of isolation and discrimination, lack of recognition of symptoms and the stigma of association with HIV; feeling socially neglected and isolation within the family are main barriers for the effective IPT utilization [4]. Factors related to INH drug adverse effects that lead PLHIV to discontinue taking their Isoniazid preventive therapy include gastrointestinal disturbances, hepatotoxicity, pruritus, seizures, headache and arthralgia. Lack of coordination between the TB and HIV programs, and lack of supervision were another contributing factor for prolonged delays in initiating IPT for PLHIV and to decrease the use of IPT [8].

The previous study revealed also that lack of regular up date for health care workers to screen HIV patients and put them on IPT, and insufficient awareness creation for patients by health care workers (doctors) are determinant factors for the implementation of Isoniazid preventive therapy to peoples living with HIV [10]. The other study described that the patients' HIV Clinical stages (stage III and stage IV), previous history of TB illness among patients, and limitation of regular screening for all PLHIV were an observed factors that inhibits IPT uptake [13]. The slow IPT utilization coverage and implementation had been linked with concern of development of

Isoniazid related resistance, drug side effects, providers' attitude on its effectiveness, failure to consistently use TB screening algorithms and shortage of drug supplies [14].

lack of experience, knowledge, and clarity on the benefits of IPT and existing guidelines by health workers; absence of an established system to monitor and evaluate the implementation of collaborative TB/HIV activities in resource constrained countries are factors that hinder utilization of IPT scale up [15]. Side effect, forgetfulness, perceived long duration of treatment, and being away from residential area in the patient side, and lack of advice by doctors and other health workers about how to use and benefit of IPT were major reasons for interruption or not completion of the full course of INH dose [16]. The reasons non-adherent patients' interruption of their treatment before completion is feeling better, long duration of treatment, side effect, and difficulty to access to health facility [17].

Socio-demographic characteristics:

- Sex
- Age
- Educational status
- Occupational status

Factors associated with the system:

- Need of chest Radiography
- Monitoring & evaluation system
- Stock of INH drug
- Availability of

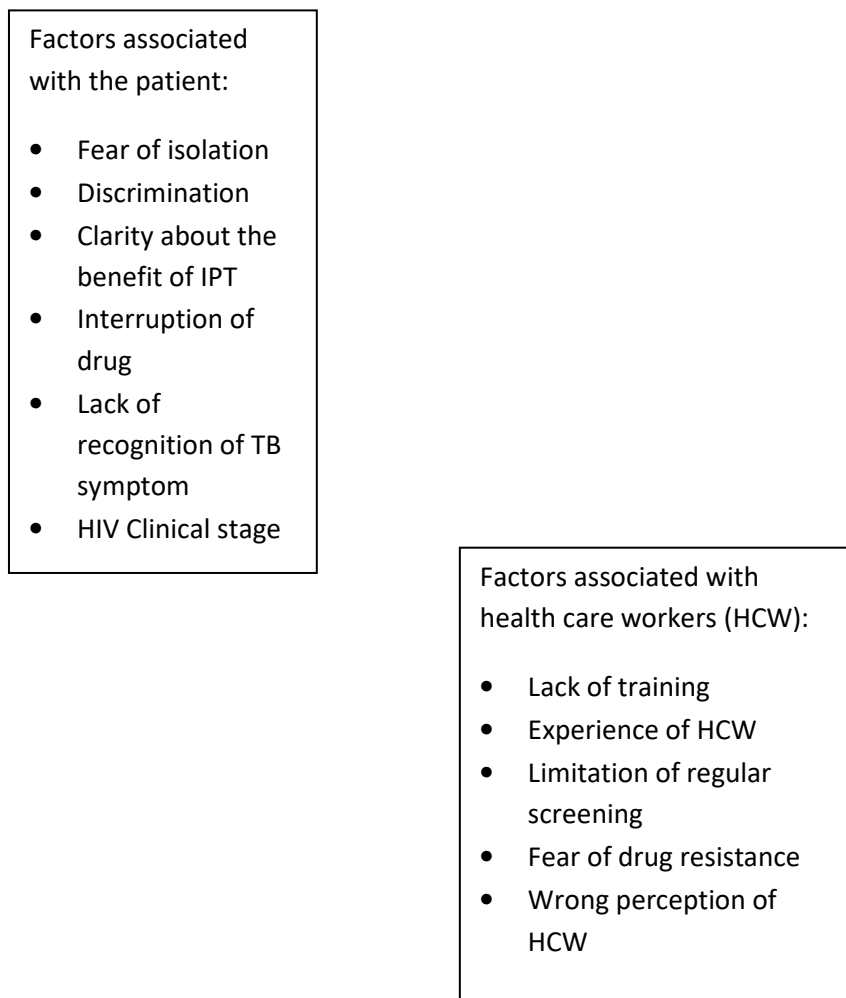


Fig 33: Conceptual frame work of utilization status of Isoniazid preventive therapy [2, 4, 6, 8, 14, 15, 16, 17, and 18].

7.3. Objectives

7.3.1 General Objective:

To assess utilization status of Isoniazid preventive therapy and associated factors among newly enrolled HIV/AIDS patients in public health facilities in Addis Ababa, Ethiopia, 2017.

7.3.2 Specific Objectives:

- To assess utilization status of Isoniazid preventive therapy among newly enrolled HIV/AIDS patients
- To identify factors associated with utilization of Isoniazid preventive therapy among newly enrolled HIV/AIDS patients

7.4. Methods and materials

7.4.1 Study area and period

The study conducted from 13th November to 8th December 2017 in the twelve health facilities in the three sub cities namely Arada, Kirkos, and Kolfe keraniyo in Addis Ababa. Addis Ababa is the largest city and the capital of Ethiopia. It is the dominant political, economic, cultural, and

historical city of the country. The City was chartered in 1886 by Emperor Minilik II. The City covers a total of 527 km² (203 sq miles) land capital. The city found at the coordinates of 8° 49' 55.929" and 9° 5' 53.853" North altitudes and between 38° 38' 16.555" and 38° 54' 19.547" East longitudes. The elevation of the Capital is 2,355m (7,726 ft). It is a home town of African Union (AU), foundation of United Nations Economic Commission for Africa (UNECA), Diplomats, and other international organizations. It is center relatively for modern economic and social activities in the country [23]. The City is sub divided in to 10 sub-cities and 117 Woredas. The population of the City as 2009 EFY projection is 2,914,406 with annual growth rate of 2.1% as of 2007 census [24].

The health system is structured hierarchically from regional health bureau to health facilities. Currently there are around eight-six public health facilities which have provided TB/HIV services in the City and going to sought to increase this number. Of which 11 are hospitals and the rest are health centers. As of 10 years my experience; supervision, support, feedback, and capacity building for program implementers has been provided by higher level and the reporting and other activities related with service provision has been performed by the lower level.

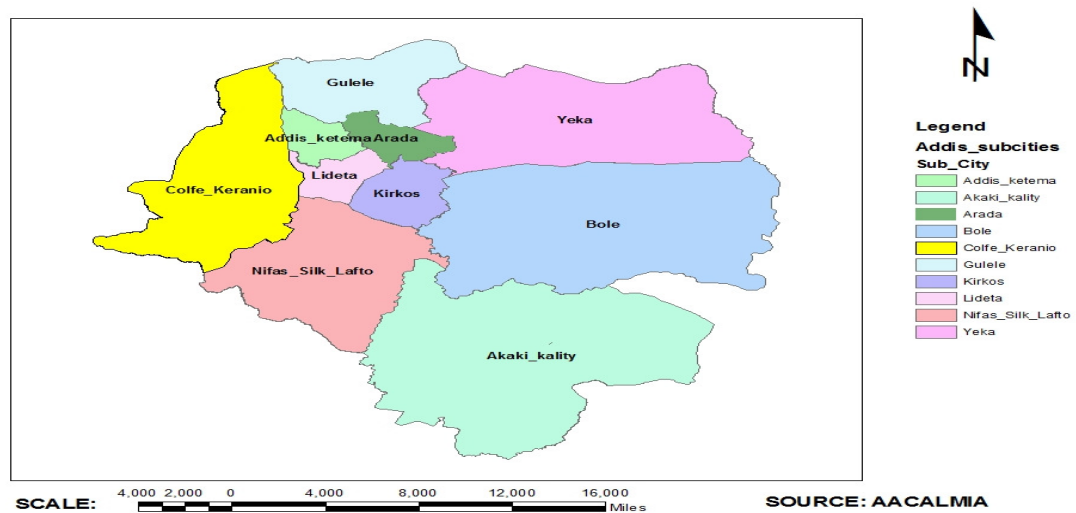


Fig 34: Diagram illustrates the map of Addis Ababa by sub city administration, 2017

7.4.2 Study design

A facility based cross-sectional study design was used supplemented with qualitative study.

7.4.3 Population

7.4.3.1 Target population

The target populations were all HIV/AIDS patients enrolled for chronic HIV care services in all health facilities in Addis Ababa.

7.4.3.2 Source population

The Source populations were included all HIV/AIDS patients enrolled for chronic HIV care services in all health facilities in the study area in Addis Ababa.

7.4.3.3 Study population

The study populations were those all HIV/AIDS newly enrolled in the sampled public health facilities and were directly participated in this study in the study area.

7.4.4 Inclusion and exclusion criteria

7.4.4.1 Inclusion criteria

All children and adults with HIV/AIDS newly enrolled to chronic HIV care services (both on Pre-ART and on ART service) before six months of the data collection period, without active TB, currently not on anti TB treatment, and previously not treated for drug resistant TB.

7.4.4.2 Exclusion criteria

- All children and adults with HIV/AIDS newly enrolled to chronic HIV care services (both on Pre-ART and on ART service) before six months from the data collection period and at the same time having had known active tuberculosis and already on anti-TB treatment, and treated for drug resistant TB
- All children and adults with HIV/AIDS newly enrolled to chronic HIV care services for less than six months from the data collection period.

7.4.5 Sampling

7.4.5.1 Sample size determination

The sample size was calculated using the formula a single population proportion by assuming 5% margin of error and 95% confidence interval (CI) ($\alpha=0.05$) for each objective.

1. The calculated sample size for IPT utilization proportion $P=0.287$ [19] was:-

$$n = \frac{\left(Z \frac{\alpha}{2}\right)^2 P(1-P)}{d^2} = \frac{Z^2 P(1-P)}{d^2} = \frac{(1.96)^2 0.287 \times 0.713}{(0.05)^2} = 314$$

2. The calculated sample size for initiation IPT alone prior to HAART [8] was:-

$$n = \frac{\left(Z \frac{\alpha}{2}\right)^2 P(1-P)}{d^2} = \frac{Z^2 P(1-P)}{d^2} = \frac{(1.96)^2 0.79 \times 0.21}{(0.05)^2} = 255$$

3. The calculated sample size for adverse effect related to INH treatment [8] was:-

$$n = \frac{\left(Z \frac{\alpha}{2}\right)^2 P(1-P)}{d^2} = \frac{Z^2 P(1-P)}{d^2} = \frac{(1.96)^2 0.012 \times 0.988}{(0.05)^2} = 18$$

4. The calculated sample size for WHO clinical staging [14] was:-

$$n = \frac{\left(Z \frac{\alpha}{2}\right)^2 P(1-P)}{d^2} = \frac{Z^2 P(1-P)}{d^2} = \frac{(1.96)^2 0.8214 \times 0.1786}{(0.05)^2} = 225$$

Where: n = the required sample size

z = the value of the standard normal curve score corresponding to the given confidence interval = 1.96

P = proportion of each variable which was found on previous study.

d = margin of error (type one error) = 5%.

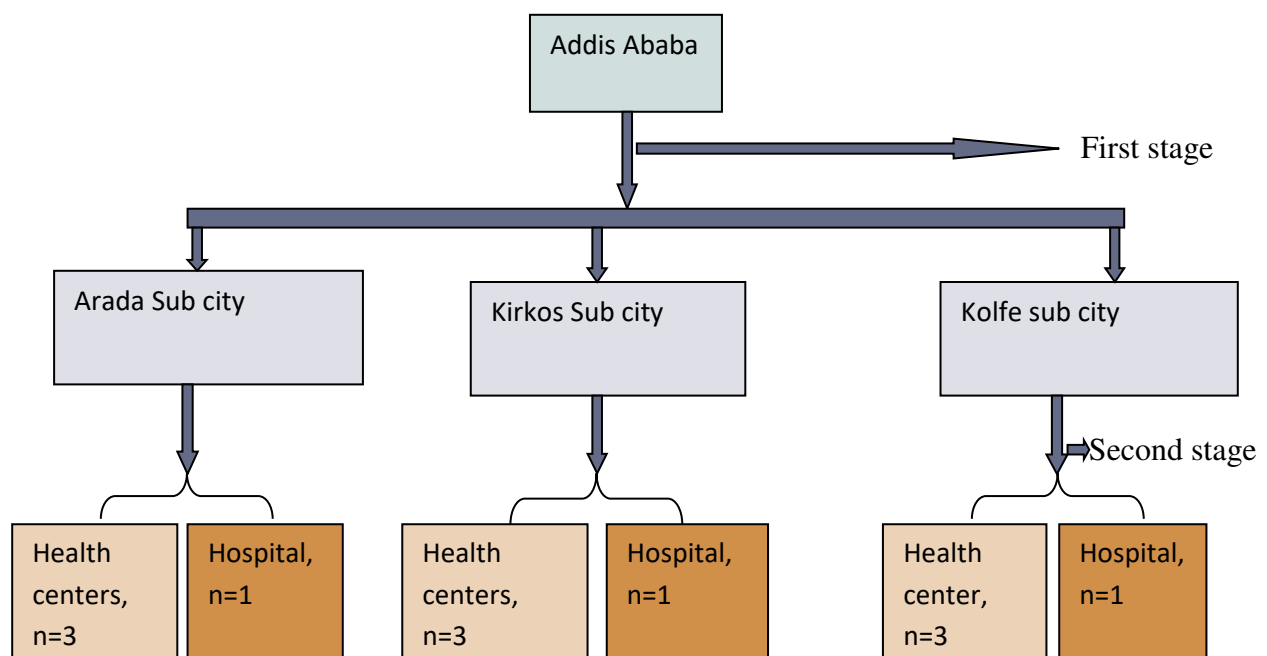
The highest sample (314) was taken from calculated sample sizes. To maximize the power of the study and to reduce design effect resulting from multi-stage sampling technique, the actual sample size was multiplied by 1.5 & considered 10% non-response rate. The final sample size became 506 for quantitative study. The sample size for qualitative study was purposely decided to be 16 from one-third sampled health facilities. Sixteen key informants 4 from each health facility representing to the management system, the TB-HIV service provider, the logistic system, and the adherence support groups were added.

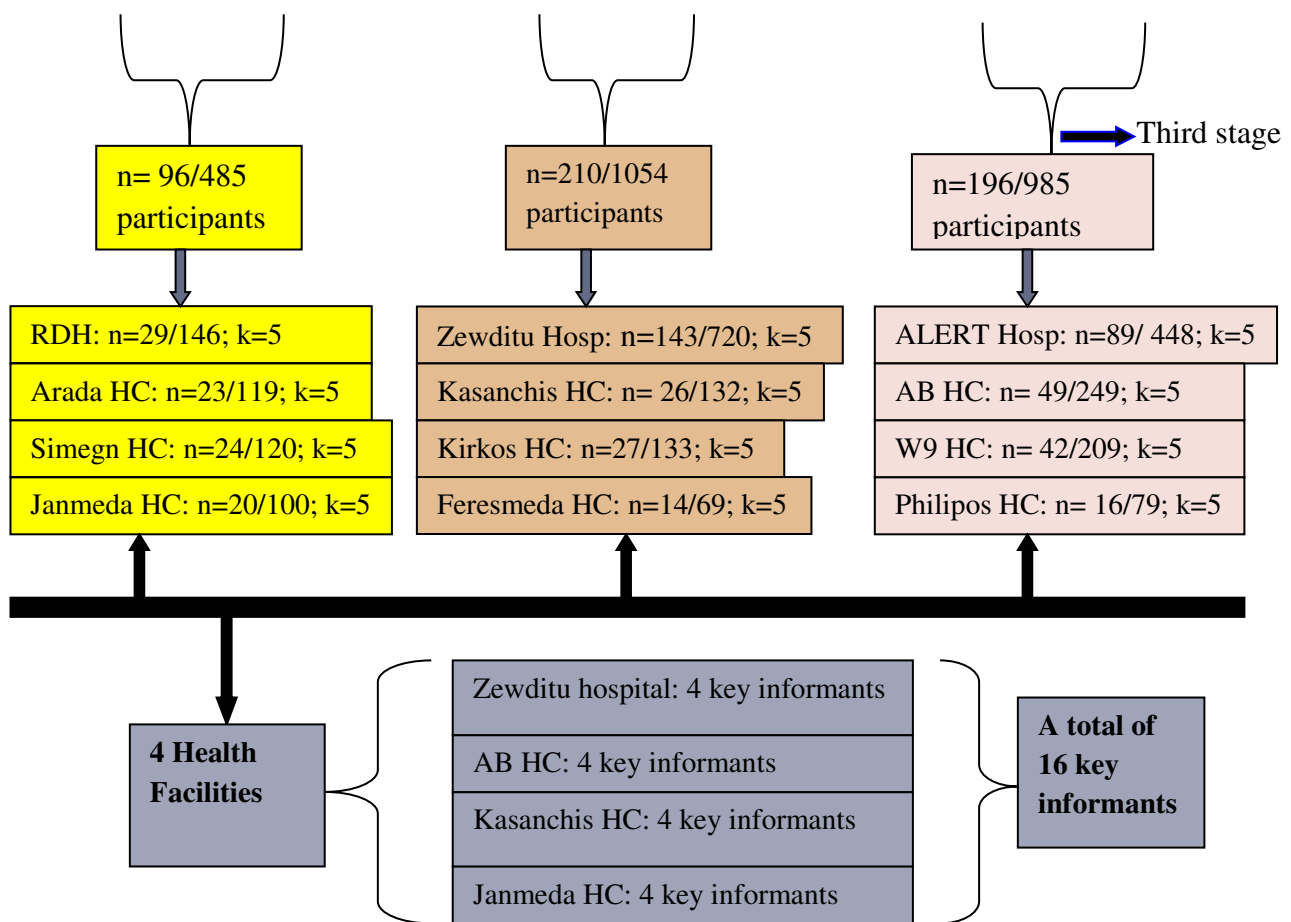
7.4.5. 2 sampling technique

A multistage sampling technique was used to obtain the final sample size. There were a total of 86 TB/HIV services implementing public health facilities in Addis Ababa (75 health centers and 11 hospitals). The three stages went through to obtain the final sample size. Stage one: three sub

cities namely Arada, Kirkos, and Kolfe keraniyo were selected using lottery method among other ten sub cities found in Addis Ababa. Stage two: 9 health centers and 3 hospitals were selected using the same methods among 28 TB-HIV implementing government health facilities found in the selected sub cities. Here hospitals were selected purposely by assuming they have served for general PLHIV in the city. Stage three: 506 sample participants were selected among 2,524 PLHIV newly enrolled in chronic care service from 01 Hamle 2007 EFY to 30 Sene 2009 EFY within the selected health facilities using SRS method. As indicated in the following figure, the sample participants in each health facility were proportional to the number of enrolled PLHIV in the specified time frame.

One-third (4) of TB-HIV service implementing government health facilities were selected among 12 sampled HFs by lottery method to interview key informants. Cost and time visibility was considered while selecting those health facilities. Based on the plan a total of 16 key informants (four from each sampled HF representing to the management system, TB-HIV service provider, the logistic system, and adherence support groups in each selected HF) were interviewed using semi-structured questionnaire.





K= constant value to select the k^{th} patient with SRS technique in each health facility

Fig 35: The sampling frame of the study in each stage in the Addis Ababa, 2017

7.4.6 Study variables

7.4.6.1 Dependent variables

Utilization status of Isoniazid preventive therapy (strong or weak) among PLHIV

7.4.6.2 Independent variables

Demographic characteristics included: sex, age, residential area, marital status, educational status, and occupational status; IPT utilization status; factors determining TB screening, IPT and HAART initiation status included: date of knowing HIV status, date of HAART initiation, WHO clinical stage of HIV during enrollment, date of TB screening, presence of sign and symptom of TB during initial screening, date ruled out absence of active TB, days between initial TB

screening and INH initiation, reasons for not initiating INH following immediately after ruling out absence of active TB, provision of clarification before initiating INH, completion of recommended doses of INH; and accessibility of manpower and logistics included: availability of INH stock in the chronic care service unit without interruption, availability of trained adherence counselors for a full working hours in the health unit, availability of TB-HIV trained health workers in the ART clinic, and availability of National TB-HIV guideline/manual/protocol/ TB screening algorithm in the ART unit.

7.4.7 Data collection tools and procedures

For interviewing the study participants (people living with HIV), the structured questionnaire was used. The questionnaire was developed from previous studies in different international journals and ensured it as a standard. The questionnaire translated in to local language (Amharic language) before administering to interview and local language interviewer assigned to easily communicate with the interviewee. The questionnaire was tested in five percent of the sample on similar patients other than sampled health facilities within the selected sub cities before collecting the actual data whether it was workable or not and founded it well workable.

The study participants (PLHIV) were interviewed at the exit of ART clinic after having verbal and written consent. The data collectors collected information from each participant following to introducing themselves and explaining the objective of the study until the required sample was obtained. Each data collector filled a minimum of ten questionnaires per day. Only one data collector was assigned to one health institution to minimize customers' confusion and discomfort within the ART service unit. Supervisors closely supervised the data collectors and the data collection process, checked filled questionnaires for their completeness on the site and compiled and submitted them to principal investigator (PI) on daily base. The PI supervised the data collectors and supervisors daily on the data collection site. The PI checked each questionnaire and tallied based on the variables.

The key informants representing to the management system, ART clinic (TB-HIV service provider), logistic system (ART pharmacy), and the adherence supporter groups were interviewed using semi-structured questionnaire and tape recorder. The principal investigator arranged the key informants and interviewed them in the logical way based on the questionnaire. One rapporteur appointed to write the responses of the key informants and supported with tape

recorder. Three key informants were interviewed in a day and took 6 days to complete interviewing all key informants.

7.4.8 Data processing and analysis

Data processing:

Quantitative data: Data cleaning was given an emphasis during and after the data collection period. Each collected data was checked for its consistency and completeness. Then, the collected data was translated in to English language for processing. The data was coded, tallied, and organized manually before entering in to the computer. The organized data was entered in to designed template (form) in Epi Info soft ware. Then the data was again checked for its missing variables and completed supporting with the line listing within the soft ware. The completed data was exported and stored in the data storage file.

Qualitative data: The collected data was carefully categorized in to similar responses based on the questionnaire by the principal investigator. The recorded data was transcribed word by word and cross checked with the written response data that obtained from a particular key informant. The missed data during write up was included. Finally, the categorized data was summarized in to the more similar response data and prepared for analysis.

Data analysis

The stored data was imported in to statistical package for social science (SPSS) soft ware version 21. Data analysis was performed using SPSS soft ware. The demographic characteristics and other variables related to the patients' clinical status and HIV care service provision were analyzed for their frequency and percentage separately. Additionally, the central tendency and dispersion was analyzed for the age of the study participants.

Here, each variable was tested for its independence and evenly distribution using Pearson's chi-square test to cells which had five and more expected counts and Fisher exact test or Likelihood ratio tests to cells which had expected count less than five with asymptotic 95% confidence level under the crosstab. All independent variables were analyzed separately using binary logistic regression with 95% confidence level weather each variable had an association to the dependent

variable (utilization status of IPT) or not. All the independent variables that had the p value <.20 were collectively analyzed by multi covariate binary logistic regression method to identify the independent variables that had the strong association to the IPT utilization status among PLHIV.

7.4.9 Data management

The supervisors checked the collected data before the data collectors leave the data collection sites. Each supervisor took responsibility for the completeness and quality of data in each study unit. They oversaw the entire data collection procedures starting from introduction to the departing process of the study participants. The principal investigator (PI) checked and cleaned the daily collected data for its consistency, completeness, and clarity for the entire data collection period. The data was coded, tallied and organized at daily base. The Amharic version questionnaire was translated back to English for the convenience of analysis.

7.4.10 Data quality assurance

The data collection tool was valid since it was adapted from similar studies both at national and international level. It was carefully translated in to local (Amharic) language before administering. The data collectors and supervisors were selected based on their ability to speak, listen and write both English and Amharic language to participate in the data collection process. The nominees were from ART clinics other than sampled health facilities. Both the data collectors and supervisors were Degree holder in health and had additional training particularly on TB-HIV program and had experience working in ART clinic. Data collectors were trained for two days on what to collect, how to collect, when, where, and why they collect the data. Similarly, supervisors were trained on how to supervise the data collectors, how to cross check the collected data, how to monitor the data completeness and consistency, when to compile the collected data, to whom he/she submit the compiled data in addition to the above enquiries. The training was provided by experienced person. The principal investigator facilitated the training process step by step.

7.4.11 Operational definitions

Early in time: The first three months of IPT receiving time of the PLHIV from their HIV care enrollment.

Good IPT utilization status: The PLHIV, who were screened for tuberculosis at the initial HIV care visit, unlikely ruled out active TB, and not previously treated for drug resistant TB; were

received IPT within three months from their HIV care enrollment, and completed the recommended daily single dose of 300mg Isoniazid preventive therapy within 7 months of initiation.

Not good IPT utilization status: The PLHIV, who didn't fulfill the conditions mentioned under the "good IPT utilization status".

Completed: The newly enrolled PLHIV completed the recommended daily single dose of 300mg Isoniazid drug within 7 months of initiation.

Incomplete: The newly enrolled PLHIV, who didn't complete the recommended daily single dose of 300mg Isoniazid drug within 7 months of initiation.

Latently: The IPT receiving time of the PLHIV after three months of their HIV care enrollment.

Public health facilities: The health facilities that have served the general public in the city and owned by government.

Newly enrolled: Any person who had been tested and confirmed with a positive HIV status and had been newly registered to Pre-ART care and/or ART service.

7.4.12 Ethical consideration

The study was conducted following the approval of Institution Review Board (IRB) of SPHMMC and ethical research committee (ERC) of regional health bureau after having written letter of permission from Addis Ababa health bureau and local health institutions at the data collection sites. Each study participant was clearly informed the aim of the study and the benefits he/she will have from the study. And clarification provided for every study participant as he/she has the right to accept or refuse to interview if he/she came to any question he/she didn't want to answer. They also were assured that as there will be no risks of being involved in this study and if any potential risk they have it will be appropriately managed. The parents or care givers were interviewed having had permission for those less than 15 years study participants. Verbal and written consent obtained from direct participants and parents of the children before administering interview. The collected data was kept strictly confidential by using code for every participant.

7.5. Results

7.5.1 Demographic characteristic of respondents

Five hundred-and-four (99.6%) study participants were involved in this study from the planned 506 samples in public health facilities of Addis Ababa. Among those respondents 209(41.5%) were male and 295(58.5%) were female. The mean age of the respondents was 40.64 years with

the SD $\pm$ 10.11years. The majority 487(96.6%) of study participants were resident of Addis Ababa and nearly half or 248 (49.2%) of the study participants were currently in union (married). Around one-fifth of the study participants had not formal education and 78 (15.5%) were joined tertiary education. Majority 293(58.1%) of the study participants were employed in government and private organizations and 93(19%) were self employed in trade

Demographic characteristics of the study participants by sex in the public health facilities of Addis Ababa, Ethiopia, 2017

Age group	Sex		
	Male: n=209(%)	Female: n=293(%)	Total: n=504(%)
$\leq$ 25 year	4 (2)	23(7.4)	27 (24)
26-50 years	154 (8)	245 (83)	399 (9)
> 50 years	51 (5.4)	27 (79.1)	78 (15.5)
Total	209 (100)	295 (100)	504 100.0)
Residential area			
In Addis Ababa	200 (95.7)	286 (97.0)	486 (96.4)
Other regions	9 (4.3)	9 (3.0)	18 (3.6)
	209 (100.0)	295 (100.0)	504 (100.0)
Marital status			
Currently in union	142(68.0)	106(35.9)	248(49.0)
Single	31(13.8)	59(20.0)	90(18.0)
Currently not in union	38 (18.2)	130(44.1)	168(33.0)
Total	209(100.0)	295(100.0)	504(100.0)
Educational background			
No formal education	29(13.9)	79(26.8)	106 (21.0)
Primary	66(31.6)	95(32.2)	161 (32.0)
Secondary	71(34.0)	86(29.2)	159 (31.5)

College & above	43(20.4)	35(11.9)	78 (15.5)
Total	209(100.0)	295(100.0)	504(100.0)
Occupational status			
Employed	155(52.9)	138(46.8)	293(58.1)
Trader	25(12.0)	11(3.7)	36(7.1)
Unemployed	20(9.6)	62(21.0)	82(16.3)
Other jobs	9(4.3)	84(28.5)	93 (18.5)
Total	209(100.0)	295(100.0)	504(100.0)

7.5.2 Isoniazid preventive therapy utilization

Nearly three-fourth or 383(76.0%) study participants received Isoniazid preventive therapy while 121 were yet not received. However, only 84(21.9%) study participants received the drug early in time (within three months of their HIV care enrollment) among 383 IPT receivers. The rest four-fifth 299 (78.1%) of the IPT receivers were took the drug lately (after three months of their HIV care enrollment).

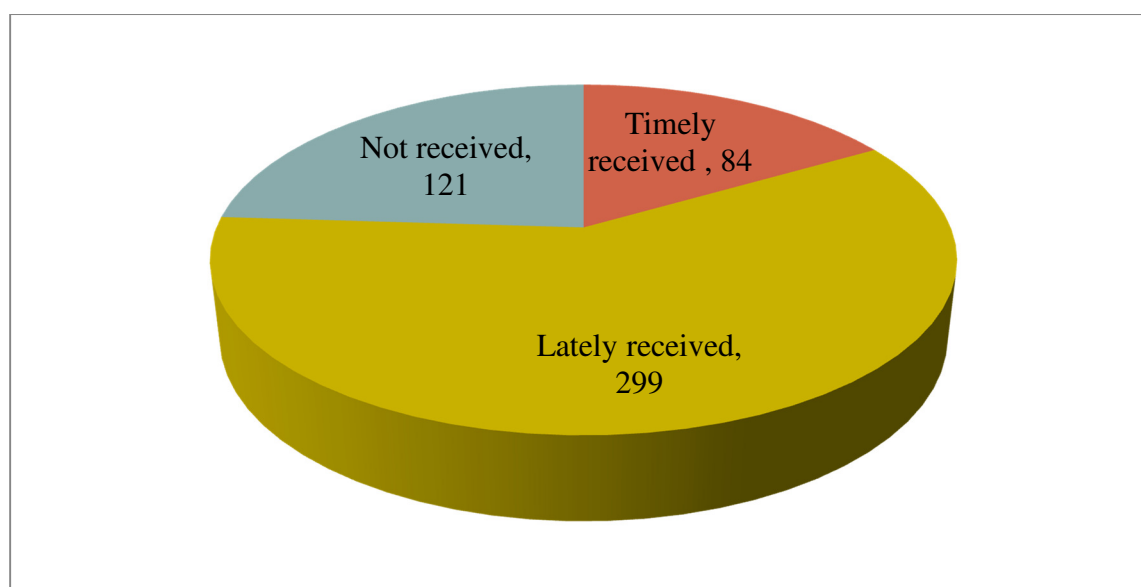


Fig 36: Time based IPT utilization status of the study participants in public health facilities

Around 312(62%) of study participants were HIV clinical stage I and II during their HIV care enrollment. Of which only 251(88.3%) were received Isoniazid preventive therapy. Four hundred-and-twelve (81.7%) respondents started their anti-retroviral (ART) drug immediately following to their HIV care enrollment while 92 were started lately. Four hundred and eighty-eight (96.8%) of the study participants were screened for TB during enrollment while the rest sixteen were not. The study participants screened for TB at every their HIV care visit were 393(78%), 100 were screened intermittently, and eleven were not screened at all. Two hundred and six (40.9%) study participants had have one or more sign and symptom of TB at initial visit while 298(59.1%) had not. Out of those none TB symptomatic patients 224(75.2%) were received IPT; of which only 57(25.4%) received the drug in recommended time or within three months of their HIV care enrollment. Among IPT receivers 167(74.6%) were took the drug lately. Nearly nine tenth or 463(91.9%) study participants were given clarification about their TB status during initial HIV care visit.

From the total study participants 403(80%) were given information about the importance of IPT use; of which 356(88.3%) from IPT receiver and 47 (11.7%) from none IPT receiver. From all 383 IPT received interviewed study participants, 365(95.3%) used recommended daily 300 mg single dose of Isoniazid for six consecutive months, but eighteen interrupted taking the drug before completion. Among eighteen drug interrupted study participants ten were due to drug intolerance, 3 were due to wrong perception, the other three were due to lost to follow up, and the rest two were due to other reasons.

Among 420 both lately IPT receiver and none receiver, 322(72.9%) didn't know what the reason was to delay or not to receive IPT at the recommended time (within three months of HIV care enrollment), but 98 (17.1%) gave their different assumption.

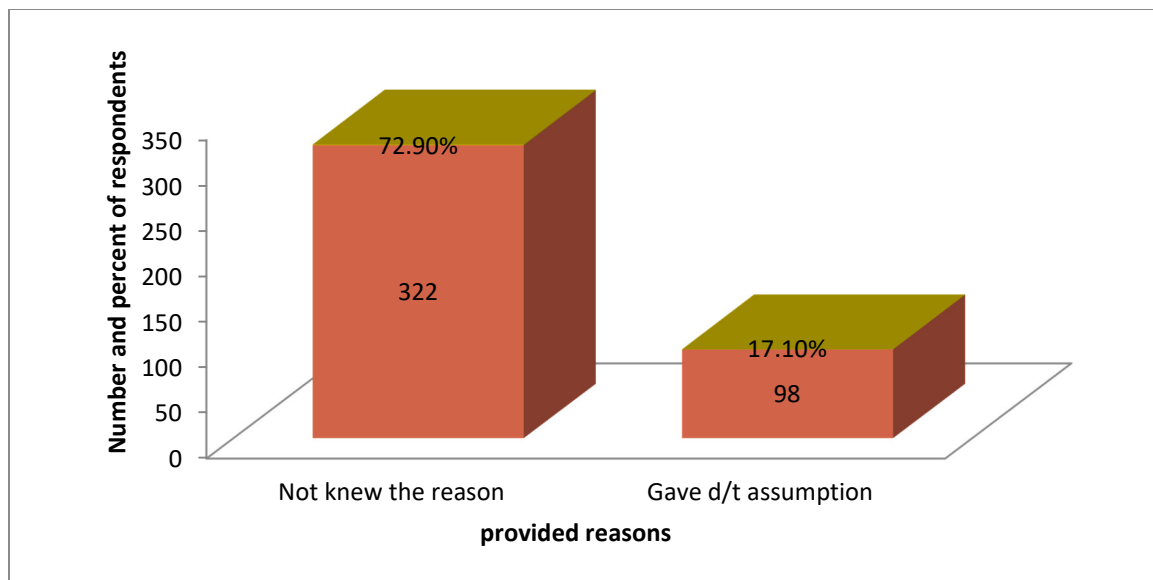


Fig 37: Reasons for the delay or/and not to receive IPT among both lately IPT receiver and none receiver study participants in public health facilities of Addis Ababa, 2017

7.5.3 Factors associated with IPT utilization status

The crude statistics analysis of predictors showed that some variables had an association with Isoniazid preventive therapy utilization status. Age group and marital status indicated an association with IPT utilization status among variables under the demographic characteristic. The age group ≤ 25 years and 26-50 years had less likely to have strong IPT utilization status compared with the age groups > 50 years with COR .137; CI (.041,.459) $p=.001$ and COR .322; CI (.125,.826) $p .018$ respectively. For every increased age group, there was probability of good level of IPT utilization status. Similarly, PLHIV currently not in union with their relatives had an association with strong IPT utilization status (COR 1.8; CI (1.014, 3.195) $p .045$).

Table 25: The crude odds ratio of demographic characteristics of the study participants, Addis Ababa, 2017

Independent Variables	Category	Status; n=504 (%)		COR	95% CI (EB)		Sign
		Good	Not good		Lower	Upper	
Sex	Male	32(15.3)	177(84.7)	.845	.522	1.367	.492
	Female	52(17.6)	243(82.4)				
Age group	1-25 years	9(23.3)	18(66.7)	.137	.041	.459	.001
	26-50 years	70(17.5)	329(82.5)	.322	.125	.826	.018

	>50 years	5(6.4)	73(93.6)				*
	Currently in union	47(18.9)	202(81.1)				*
Marital status	Single	18(20.2)	71(79.8)	.918	.500	1.684	.782
	Currently not in union	19(11.4)	147(88.6)	1.800	1.014	3.195	.045
	No formal education	12(11.1)	96(88.9)	1.455	.616	3.435	.393
Educational background	1 ⁰ education	32(19.9)	129(80.1)	.733	.354	1.516	.402
	2 ⁰ education	28(17.8)	129(82.2)	.838	.400	1.753	.638
	3 ⁰ education	12(15.4)	66(84.6)				*
	Employed	48(16.4)	245(83.6)				*
Occupational status	Trade	8(22.2)	28(77.8)	.686	.29	1.595	.381
	Unemployed	15(18.3)	67(81.7)	.875	.462	1.659	.683
	Others	13(14)	80(86)	1.206	.621	2.339	.580

* Reference category

Variables related to service provision at health facilities and the patient status at initial HIV care enrolment and during follow up visits were analyzed whether they had an association or not to the dependent variable. The HIV enrollment time, HIV clinical stage, ART starting time, clarification to the patients about their TB status at the initial visit, frequency of TB screening during follow up visits, and the service provision health facilities had crude association with the dependent variable. The people living with HIV enrolled in to HIV care before one year were 7.76 times to have strong IPT utilization status than whom enrolled between last 6 months to one year duration with CI (3.019, 19.948) $p < .001$. The WHO clinical stage III & IV had more likely to have strong IPT utilization status with respect to WHO clinical stage I with COR 2.04; CI (1.079, 3.858) $p .028$ and COR 7.825; CI (1.802, 33.975) $p .006$ respectively.

Table 26: The crude odds ratio of IPT utilization among PLHIV in public health facilities of, Addis Ababa, 2017

Independent Variables	Category	Status; n=504 (%)		COR	95% CI (EB)		P value
		Good	Not good		Lower	Upper	
	6 mon. to 1yr	11(57.9)	8(42.1)				*
HIV enrollment	Before 1yr	73(15.1)	412(84.9)	7.760	3.019	19.948	.000

Time							
	Stage I	31(23.1)	103(76.9)				*
HIV clinical stage	Stage II	33(18.8)	143(81.2)	1.304	.751	2.275	.345
	Stage III	18(12.9)	122(87.1)	2.040	1.079	3.858	.028
	Stage IV	2(3.7)	52(96.3)	7.825	1.802	33.975	.006
ART starting time	Lately	61(14.8)	351(85.2)	.521	.302	.899	.019
	Immediately	23(25)	69(75)				*
TB symptom at enrollment	No	57(19.1)	241(80.9)				*
	Yes	27(13.1)	179(86.9)	1.568	.954	2.578	.076
Clarification of TB status @ begin	No	2(4.7)	41(95.3)	4.435	1..052	18.706	.043
	Yes	82(17.8)	379(82.2)				*
Frequency of TB screening during follow up visits	Not at all	0(0)	11(100)	2E ⁹	.000	—	.999
	Some times	28(28)	72(72)	.427	.254	.719	.001
	Always	56(14.2)	337(85.8)				*
Clarification about IPT benefit	No	13(12.9)	88(87.1)	1.448	.766	2.735	.250
	Yes	71(17.6)	332(82.4)				*
Service provider	HC	69(26.6)	190(73.4)	.180	.099	.324	.000
HF type	Hospital	15(6.1)	230(93.9)				*

* Reference category

The adjusted odds ratio showed that the PLHIV currently not in union with their partners, and having WHO clinical stage IV had positive association with good IPT utilization, while the presence of TB symptom at the HIV care enrollment and being getting HIV care services in health center had negative association. As shown on table 5 below, the PLHIV currently not in union with their partners were more likely in good Isoniazid preventive therapy utilization status [AOR 2.996; CI (1.476, 6.079) p .002]. The PLHIV being getting HIV care services in public health centers were 14.8% times at risk to be in not good status with CI (.074, .294) p<.001.

Table 27: Adjusted odds ratio of some independent variables to the IPT utilization status among PLHIV, Addis Ababa

Independent Variables	Category	Status; n=504		COR	95% CI		AOR	95% CI	
		Good	Not good		Lower	Upper		Lower	Upper
Marital status	Currently in union	47(18.9)	202(81.1)						
	Single	18(20.2)	71(79.8)	.918	.500	1.684	1.627	.743	3.566
	Currently not in union	19(11.4)	147(88.6)	1.800	1.014	3.195	2.996	1.476	6.079
HIV clinical stage	Stage I	31(23.1)	103(76.9)						
	Stage II	33(18.8)	143(81.2)	1.304	.751	2.275	.71	.353	1.425
	Stage III	18(12.9)	122(87.1)	2.040	1.079	3.858	1.49	.678	3.276
	Stage IV	2(3.7)	52(96.3)	7.825	1.802	33.975	7.12	1.460	34.707
TB symptom at enrollment	No	57(19.1)	241(80.9)						
	Yes	27(13.1)	179(86.9)	1.568	.954	2.578	.447	.240	.832
HF type	Health center	69(26.6)	190(73.4)	.180	.099	.324	.148	.074	.294
	Hospital	15(6.1)	230(93.9)						

* Reference category

7.5.4 Qualitative findings

Sixteen key informants from different groups working in the HIV/AIDS program under the four health facilities were participated in this study. Of sixteen study participants fourteen were females and two were males. The average age of the key informants was 33.3 years and range 25 years (24 to 49 years). Among those key informants ten were degree holders, three were diploma holders, and the rest three had certificate.

They were asked five questions to explain the utilization status of IPT and associate factors among PLHIV using semi-structured questionnaire. Their summary response was as follow:

Eleven out of 16 respondents agreed that the status of TB-HIV co-infection in their respective health facility is still going on even if some sort of reduction probability has there. Five respondents mentioned it that as it has been improved from previous trend. However, all participants agreed that the linkage between these two programs has shown progression from time to time.

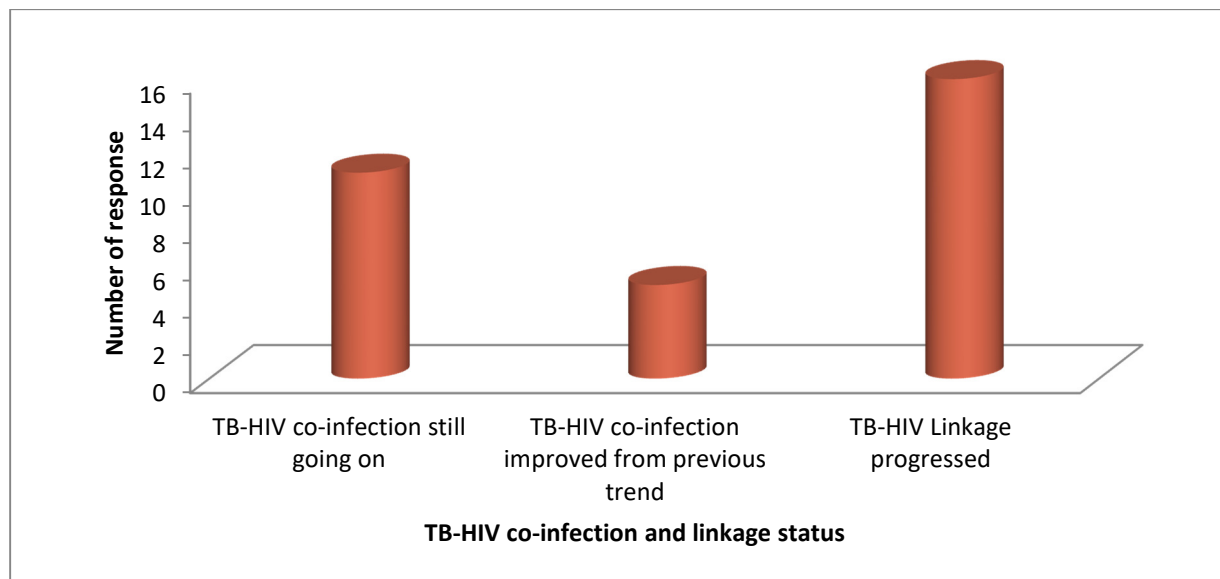


Fig 38: Qualitative findings about TB-HIV co-infection status and linkage in public health facilities, Addis Ababa, 2017

All 16 participants responded for the ‘question perception of participants about the necessity of Isoniazid preventive therapy for PLHIV’ that Isoniazid preventive therapy is essential and necessary to protect TB disease and to improve the immune status of people living with HIV.

They were asked: how do you evaluate the preparation and readiness of the stakeholders in your health facility to provide IPT for those eligible people living with HIV? Fourteen (87.5%) out of 16 participants replied that stakeholders at the health facilities level are ready and integrated each other to provide IPT for those eligible PLHIV. They also concluded that the loose integration exist with the drug supplier especially with PFSA and coordination at health bureau and health offices level concerning to IPT implementation program.

Two participants: one 25 years old male participant from health center representing the leadership group and the other 35 years old female participant from hospital representing the adherence support group responded for this question that *“readiness and preparation of health workers at ART clinic still remain weak by pointing out different reasons to not to provide Isoniazid preventive therapy for the patients. They included that some PLHIV complain as they have exposed to pill burden and refused to take IPT due to weak counseling service”*.

How do you describe the strength and weakness of the following systems /groups/ in contributing to scale up IPT coverage to the PLHIV? For this question all participants shared that as the INH and pyridoxine supply interruption is frequent and lacks continuity.

All 16 participants agreed that TB screening report at each patient visit at health facility level was good but decision to rule out the absence of active TB and to provide IPT for those eligible PLHIV at the right time was weak. Nearly two third (62.5%) of key informants remarked that each stakeholder at the health facility level tried to accomplish its duty accordingly. They added their assumption that interruption of INH and absence of pyridoxine is the main reasons for the weakness to scale up Isoniazid coverage at the right time.

Four participants: - One 27 years female participant from logistic group, a 28 and 49 years female participants from care provider group and a 35 years female participant from adherence group underlined that *“lack of confident from health workers during screening to rule out absence of active TB and fearing development of drug resistance TB*

are the prominent reasons in addition to shortage and interruption of INH and pyridoxine drugs. Half of them quoted the main reasons for the weakness of IPT scale up coverage that the negligence and negative attitude of health workers to screen and rule out the absence of active TB at appropriate time and to prescribe INH for those eligible PLHIV as well''.

They also were asked “what are the major bottle necks/ barriers that block the coverage and retard the required result of Isoniazid preventive therapy on people living with HIV?” Thirteen participants answered that lack of INH continuity; eight (50%) participants responded that the absence of pyridoxine drug, four (25%) participants said poor awareness among patients; three participants added poor understanding of health workers about IPT; other three participants responded as negligence, negative attitude and fear of INH drug outcome.

A 28 years female participant from care provider group responded that *“absence/limitation of additional TB screening materials (e.g. Chest X-ray) in public health facilities is the basic barrier to rule out the presence or absence of active TB during HIV care enrollment”.*

Another a 27 years male participant from logistic group said *“weak relationship between health care workers and HIV patients and absence of up to dated training for health workers in the HIV/AIDS care service department were major barriers”.*

7.6 Discussion

This study revealed that prevalence of Isoniazid preventive therapy among PLHIV in public health facilities in Addis Ababa was 76%. This is nearly similar with the high IPT implementing countries like Malawi in which the IPT prevalence in 2015 was 79% ^[3] and better achievement than other TB burden countries like Indonesia in which the prevalence of IPT among newly enrolled PLHIV in 2015 was 2% ^[3]. This study also showed high achievement compared with the previous study in North Ethiopia' in which the coverage was 20% ^[26]. Possible reason for the deference of this result could be better expansion of health facilities in the Addis Ababa. However, prevalence of early IPT users among PLHIV based on expert's recommended time frame was 16.7% which is nearly similar with 2013 national TB-HIV sentinel surveillance report conducted by EPHI/CDC at which it was 18.2% ^[11] and the report of Addis Ababa health bureau TB-HIV report (15%) ^[12]. But which is less than by half from previous cross-sectional study conducted in Nigeria at which it was 30% ^[10] and is slightly below from 2013

This study found out that TB screening for people living with HIV during HIV care enrollment and the patients' understandings about the importance of IPT use from both IPT receivers and none receivers was high. Almost all interviewed key informants agreed on this result. However, the IPT receiving status at the recommended time was not good i.e. nearly one for every five patients. And it was directly related with the confidence of health care provider in deciding unlikely to rule out active TB. This directly showed that the high level TB screening activity for HIV/AIDS patients in health institution was either for the formality of the program without benefit of the HIV patients or due to frequent INH drug stock out to provide Isoniazid preventive therapy at the right time.

The study detected also that the highest almost nearly 95.3% Isoniazid preventive therapy completion rate among people living with HIV. It was more likely resulted from strong adherence counseling to the patient before and during IPT receiving period about the importance of the drug. It showed a better achievement compared with many previous studies in Rio-de Janeiro, Brazil' at which it was 85% ^[8], in Addis Ababa it was 86.5%. ^[16], in Zimbabwe it was 81% ^[27], in Thailand it was 75% ^[28], in Swaziland it was 89.4% ^[29].

The study unveiled from the qualitative result that INH drug stock out and absence of pyridoxine; weak monitoring and evaluation from program managers; and lack of confidence unlikely to rule out active TB were the major barriers to scale up and early initiation of Isoniazid preventive therapy for PLHIV. These findings are revealed in the previous studies on the title ‘opinion of implementation of IPT for people living with HIV worldwide [15] and in North Ethiopia [26]. Both studies described that perceived fears of resistance to INH and fear of toxicity of INH, reluctance and negative perception of program managers, shortage of INH, lack of monitoring and evaluation system, and lack of training were as the major barriers. However, this result was contrary to the study conducted in Jimma, Ethiopia on the title ‘perceived barriers to implementation of IPT for PLHIV in resource constrained country’ in which the poor patient adherence was as a major barrier [30].

The service provision health facility had an association with the Isoniazid preventive therapy. Among the study participants those who got HIV care service in health center were less likely to receive IPT in the recommended time than from receiving in hospitals. However, I didn’t get literatures from web site media to discuss this result since almost all studies related to Isoniazid preventive therapy utilization have been conducted in hospitals but didn’t tell the primary health care system. As my suggestion the health centers may lack the additional aid materials to screen TB at the early stage of HIV care enrollment. The low level of confidence of the health care workers in the health centers another issue for the occurrence of this gap.

7.7 Limitation of the study

During data collection period the patients’ recall bias for their long term HIV care services and IPT status was identified in some extent. The effect of that bias was incomplete response from the study participants. However, the data collector team patiently reminded the patients to recall their back IPT status and HIV care service history. Additionally, to minimize the bias, the patients’ HIV care service registration book was observed to those study participants whom unable to remind their back IPT and HIV history.

7.8. Conclusion

The utilization status of Isoniazid preventive therapy among people living with HIV in public health facilities of Addis Ababa was not good. The Isoniazid preventive therapy coverage at the recommended time (within three months of HIV care enrollment) was low despite the prevalence is high. Those PLHIV currently not in union with their partners, WHO HIV clinical stage 4, presence of TB symptom at the enrollment, and having HIV care service in health centers were associated with IPT utilization. However, tuberculosis screening at the beginning and follow up visit of the patients was high, it lacks decision. Weak integration, frequently drug stock out, lack of confidence, and loose monitoring & evaluation were major barriers of IPT utilization status in Addis Ababa. There was no significant problem in the patient side on the Isoniazid preventive therapy utilization.

7.9. Recommendation

- Needs the commitment of program managers at Addis Ababa Regional Health Bureau level to look IPT as the basic TB infection control package on PLHIV and to coordinate drug importers and distributors to avail uninterrupted drug supply all the time.
- Health care workers in the HIV care unit need continuous, up to dated and evidence based capacity building about IPT implementation
- Addis Ababa Regional Health Bureau needs to consider integrating initial TB screening for all PLHIV with regional laboratory for Gin X-pert diagnosis.
- Addis Ababa Regional Health Bureau and sub city health offices have to strengthen the Isoniazid preventive therapy implementation for PLHIV specially at the primary health care system and regular and consistent monitoring and evaluation of IPT program

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ANNEXES

Annexes 1- Survey questionnaire for Cholera outbreak investigation

Part A: General information

1. Code-----
2. Case ☐ Control ☐
3. Age (in years): -----
4. Sex: Male ☐ Female ☐
5. Occupation-----
6. Educational status: 1.Illiterate ☐ 2.Read & write☐ 3. Primary education
(1- 8)☐ 4. Secondary education (9-12)☐ 5. College education☐
7. Marital status: 1.singe☐ 2. Married☐ 3. Divorced☐ 4. Separated ☐
5. Widowed ☐
8. Residential Address Sub city_____ Woreda _____ Ketene_____ House No _____
Telephone No_____

Clinical Information (for cases)

1. Date of onset (dd/mm/yyyy) -----
2. Presenting symptoms
Watery Diarrhoea☐ Vomiting ☐ Dehydration☐ Others (specify)-----
3. Hospitalized? Yes ☐ No ☐
4. Date of hospitalization (dd/mm/yyyy) -----

Part B: Exposures

Water

1. What is your regular source of water for domestic use in the last 5days?

Household Tap water ☐ Communal tap water ☐ River ☐ Well ☐

Borehole ☐ Spring ☐ Street vended water ☐

Tanker water (Roto) ☐ Bottled water ☐

others(specify)_____

2. What is your regular source of drinking water within the last five days?

Household Tap water ☐ Communal tap water ☐ River ☐

Well ☐ Borehole ☐ Spring ☐ Street vended water ☐

Tanker water (Roto) ☐ Bottled water ☐

Others (specify)_____

3. Did you treat the water before drinking? Yes ☐ No ☐

4. If yes, how did you treat it? Filter ☐ Boiling ☐ Aqua tab ☐

water guard ☐ Bishangari ☐ Pure ☐

Other (specify)_____

5. Did you drink water from a holy water site in the last five days? Yes ☐ No ☐

6. If yes, what is the source of the holy water site? Tap water ☐ spring ☐

Well ☐ others sources (specify)_____

Food and Beverages

7. Did you eat any of the following in the last 5 days?

Vegetable salad ☐ Fruits ☐ Raw meat ☐ partially roasted meat ☐

Fish ☐ Milk ☐ others (specify) -----

8. Where did you get (or buy) food for your household?

Local market ☐ Private garden/farm ☐ Street shops ☐

Supermarkets ☐ Others (specify) -----

9. Did you eat food outside your home in the last 5 days? Yes ☐ No ☐

10. If yes, where? Sold by street vendors ☐ Hotel ☐ Restaurant ☐

At a gathering ☐ School/work cafeteria ☐

Others (specify)-----

11. Did you eat any cold left-over food in the last 3 days? Yes ☐ No ☐

12. If yes, where is the source of the food? Home ☐ Hotel ☐

Restaurant ☐ University ☐ Others (specify)-----

13. Did you drink any of the following locally-made beverages in the last 3 days?

Yes ☐ No ☐

14. If yes, which one of the following? Shameta ☐ Mewuded ☐ Borde ☐

Besso ☐ others (specify) -----

Hygiene and sanitation

15. Do you regularly wash your hands with soap before eating?

Yes ☐ No ☐

16. Is there a latrine in your home? Yes ☐ No ☐

17. If yes, Communal or private? Communal ☐ Private ☐

18. If No to Q.15, where do you discharge human waste (faeces)?

Open defecation ☐ In the river ☐ bury in the soil ☐

Others (specify) _____

19. Did you wash your hands every time with soap after defecation? Yes ☐ No ☐

20. Where do you dispose of your refuse? Open dumping ☐ Open pit ☐

In the river ☐ Bury ☐ Burn ☐ Others (specify) _____

Other exposures

21. In the last one week, did anyone in your household have diarrhea or vomiting?

Yes ☐ No ☐

22. Did you visit anyone having diarrhea or vomiting Yes ☐ No ☐

23. Did you attend a funeral within the last five days? Yes ☐ No ☐

24. Did you travel to a place affected with diarrhea and vomiting illness?

Yes ☐ No ☐

25. If Yes, where? _____ (Name of Kebele/Ketena,
Woredas,)

Annexes 2: Questionnaire Influenza like Illness (ILI) data collection case based tool

General information:

Reporting health facility_____ EPID number_____

Date 1st seen at health facility_____ date of symptom onset__/__/__

Admission Information:

Outpatient ☐ Inpatient ☐ Referred ☐

Source of Information:

Patient yes ☐ No ☐ Proxy Yes ☐ No ☐ if proxy, relation to contact... Yes ☐
No ☐

Patient detail:

Patient full name..._____

Age: year_____ month _____

Sex: male ☐ female ☐

Occupation_____

Address: Region_____ sub-city_____ woreda_____ kebele/gott_____

Sign & symptoms: body temp _____ °C Axillaries ☐ Oral ☐ Rectal ☐

Sudden onset of fever >38 °C yes ☐ No ☐ Cough: Yes ☐ No ☐

Sore throat: Yes ☐ No ☐

Vaccine & treatment:

Did patient receive an influenza vaccine in the last 12 months? Yes ☐ No ☐

How was vaccination history obtained? Patient recall ☐ Parent recall ☐ medical
record ☐

Antiviral, Antibiotic and Antipyretic

Has the patient receive any antiviral drugs in the last 14 days? Yes ☐ No ☐

if Yes, date given__/__/__

Has the patient receive any antibiotic drugs in the last 14 days? Yes ☐ No ☐

if Yes, date given__/__/__

Has the patient receive any antipyretic drugs in the last 14 days? Yes ☐ No ☐

if Yes, date given__/__/__

Travel & exposure history within 7 days:

Has the patient had close contact with a person with severe acute respiratory infection (SARI) symptoms? Yes ☐ No ☐

Has the patient had close contact with or handled sick or dead poultry? Yes ☐ No ☐

Has the patient resided in or visited an area where there are unusual deaths of poultry or wild birds? Yes ☐ No ☐

Laboratory information

Type of specimen : throat swap ☐ Nasopharyngeal swap ☐

Date of specimen collection ____/____/____

Was the sample tested? Yes ☐ No ☐ Date of sample tested ____/____/____

What type of testing done? Real Time PCR ☐ Viral Isolation ☐

Immuno-fluorescent Assay (IFA) ☐

Is RNA sep amplified? Yes ☐ No ☐

Result of test: Influenza positive ☐ Influenza negative ☐

Indeterminate ☐

☐ If positive, which type is it? Influenza A ☐ Influenza B ☐

If type influenza A positive, was influenza sub typing performed? Yes ☐ No ☐

If yes, result was positive for which sub type? Seasonal A/H1 ☐ swine A ☐

swine H1 (pandemic H1N1) ☐ seasonal A/H3 ☐ A/H5a ☐ A/H5b ☐

Name of sample collector _____ Sig. _____

Annexes 3 Woreda (intermediate level) data collection tools for surveillance evaluation

Identifiers _____	District _____
Assessment team _____	Date region/province _____
Interviewer _____	Country _____
Respondent _____	Surveillance system _____

PART ONE: General Surveillance system

I. Availability of a National Surveillance Manual

1. Did you have National Measles guide line? ☐ Yes ☐ No ☐ NA
 2. Did you have standard case definition for Measles diseases? ☐ Yes ☐ No ☐ NA
 3. Is the standard case definition posted on the appropriate place? ☐ Yes ☐ No
 4. Do all professionals have awareness about the standard case definition? ☐ Yes ☐ No
 5. If answer for Q2 is No, what is the reason/s for the absence of the case definition? _____
-

6. Did you have case based reporting formats for Measles diseases? ☐ Yes ☐ No ☐ NA
 7. Is the guide line support for specimen collection, handling and transportation to the next level?
☐ Yes ☐ No ☐ NA
 9. Is a specimen collected from every identified Measles cases? ☐ Yes ☐ No ☐ NA
 10. Which sample type needed to collect for measles cases examination?
a) Stool b) whole blood c) CSF d) serum e) Throat swap f) others (specify) _____
 11. What is the recommended temperature for measles sample storage?
a) < zero °C b) 4-8°C c) 9-15°C d) above 15°C e) others (specify) _____
 12. List materials that needed for measles sample collection _____
-

13. Which time is best appropriate for sample collection to suspected measles cases?
a) Before the appearance of rash
b) At any time after the development of rash

c) Up to 28 day after the appearance of rash

d) Between at onset of rash appearance and disappearance

14. Is there a limit to the number of Measles cases that can be sampled on a monthly basis? ☐ Yes

☐ No ☐ NA

15. If yes, what is that number? _____

16. How are laboratory specimens collected in this health center? (Please describe) _____

a. Who are responsible for specimen collection? _____

b. How frequently are these staffs trained on specimen collection, documentation, storage, and transportation methods? _____

17. How are laboratory specimens labeled and packaged in the health center? (Please describe) _____

18. How are laboratory specimens shipped/ transported to the confirmatory laboratory? (Please describe)

19. When does the specimen is transported to the confirmatory laboratory after collected? _____

20. Does the site have printed standard specimen collection forms and in use? ☐ Yes ☐ No ☐ NA

21. Does the site have written standard operating procedures (SOP) for specimen collection, transportation, and storage and in use? ☐ Yes ☐ No ☐ NA

22. From whom/where did you get the standard specimen collection form? _____

23. Please indicate which of the following items are included on the specimen collection form:

a. Unique identifier ☐ Yes ☐ No ☐ Not Applicable

b. Health center name ☐ Yes ☐ No ☐ Not Applicable

c. Person collecting specimen ☐ Yes ☐ No ☐ Not Applicable

d. Age or date of birth ☐ Yes ☐ No ☐ Not Applicable

e. Sex ☐ Yes ☐ No ☐ Not Applicable

f. Date of symptom onset ☐ Yes ☐ No ☐ Not Applicable

- g. Date of health facility arrival? ☐ Yes ☐ No ☐ Not Applicable
- h. Date of specimen collection ☐ Yes ☐ No ☐ Not Applicable
- i. Type of specimen collected ☐ Yes ☐ No ☐ Not Applicable
- j. Vaccination status? ☐ Yes ☐ No ☐ Not Applicable
- k. Other (please describe) _____
24. Are specimen collection materials readily available? ☐ Yes ☐ No ☐ Not Applicable
25. If yes, for how many specimens materials are routinely available? _____
26. For how long are specimens stored before being sent for testing? _____
27. Is there a system in place for monitoring the temperature of the samples in storage? ☐ Yes ☐ No
28. If yes, please describe that system _____
29. Are total numbers of specimens collected and tested ☐ Yes ☐ No ☐ Not Applicable
30. Are laboratory results reported back to clinicians? ☐ Yes ☐ No ☐ Not Applicable
31. If yes, how often are laboratory results received at the site/reported to clinicians?
32. What is the typical lag time between specimen collection & reporting of results to clinicians?

33. Are total numbers of positive and negative specimens reported to a surveillance focal point? ☐ Yes
☐ No ☐ Not Applicable
34. If yes, how often are these results reported (e.g. weekly/monthly/quarter, etc)? _____
35. Have you faced any outbreaks of Measles? ☐ Yes ☐ No ☐ Not Applicable
36. Did you have line list for reporting Measles outbreaks? ☐ Yes ☐ No ☐ Not Applicable

II. Case Detection and Registration

1. Do all suspected measles cases detected on time? ☐ Yes ☐ No
2. Is there measles cases registration log book in your facility? ☐ Yes ☐ No ☐ Not applicable
3. Is there standard rumor registration log book in place? ☐ Yes ☐ No ☐ Not applicable

III. COMMUNICATION:

Presence of recommended reporting forms in the woreda at all times over the past 6 months:

4. Is the Regional health bureau/ sub city health office responsible for providing surveillance forms to the health facilities? Yes ☐ No ☐ Unknown ☐
5. If yes, have you lacked appropriate surveillance forms at any time during the last 6 months?

Yes ☐ No ☐ Unknown ☐

6. What are the reporting entities for the surveillance system?

a. Public health facilities b. NGO health facilities c. Military health facilities

d. Private health facilities e. Others_____

7. Was there any reported measles cases in the past 1 month? Yes ☐ No ☐

8. If yes, for Q#7, with in what time is the report received after detection of the diseases?

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

9. Percent of health facilities that have means for reporting to next level by e-mail, telephone, fax or radio_____

10. How do you report weekly, monthly and other information to higher level? a. Mail b. Fax

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

11. Do you have regular contact address of sub city PHEM officers? Yes ☐ No ☐

12. How frequently are you communicating with the sub city PHEM officers on emergencies and other daily activities? ☐Daily ☐Weekly ☐Every 2 wks ☐Monthly ☐Quarterly ☐Every 6 month

☐Yearly ☐Others-----

13 Did you have address of HC/HP PHEM focal persons? Yes ☐ No ☐ NA☐

14 How frequently are you communicating with the HC/HP PHEM focal persons on emergencies and other daily activities? ☐Daily ☐Weekly ☐Every 2 wks ☐Monthly ☐Quarterly ☐Every 6 month

☐Yearly ☐Others-----

15 Did you have case based reporting formats for last 6 months? Yes ☐ No ☐ NA☐

16 Was there guideline for specimen collection, handling and transportation to the next level? Yes ☐

No ☐ NA☐

17. Did you have line list for reporting outbreaks? Yes ☐ No ☐ NA☐

18. Did you face shortage of surveillance reporting and recording formats? Yes ☐ No ☐

If yes, list them please_____

19. When are you expected to send weekly report to the sub city/ woreda PHEM unit?

☐Monday ☐Tuesday ☐Wednesday ☐Thursday ☐Friday ☐Saturday ☐Sunday ☐I don't know

20. When are you expected to receive weekly surveillance report from health facilities?

☐Monday ☐Tuesday ☐Wednesday ☐Thursday ☐Friday ☐Saturday ☐Sunday

☐I don't know

21. How is the woreda communicating the health facilities' PHEM focal in case measles diseases? ☐by

e-mail ☐by phone ☐by fax ☐ through regular weekly report ☐others

22. Did you send summary or short report to the administrative /program leaders or other responsible organs on planning, prevention and control activities addressing important issues at community level that have arisen through the surveillance system? Yes ☐ No ☐

23. If answer for Q #24 is yes, to whom did you send? _____

24. Did you face any problems on communicating and reporting? Yes ☐ No ☐

Please, list them _____

25. Please, mention the alternative solutions that you take to tackle the problems you listed on the above?

26. Does the woreda has assigned surveillance officer for PHEM activities and working on? ☐ Yes

☐ No

27. If the answer for Q#26 is No, who is responsible for PHEM activities? _____

28. If yes for Q#26, did he/she trained on basic surveillance system? ☐ Yes ☐ No

29. If the answer for Q#26 is yes, a) when _____ b) Topic of the training _____ c)

For how long _____

30. Did you conduct any onsite training / orientation about surveillance system for the health facility's PHEM focal persons in the last 6 months? Yes ☐ No ☐

31. Was the data compiled and kept appropriately? Yes ☐ No ☐

32. Did computer available in your office? Yes ☐ No ☐

33. Did you have computer on your department (particularly for PHEM unit)? Yes ☐ No ☐

34. What is the data entry and compilation method? ☐ manual ☐ computer ☐ other please, mention-----

35. Did you have computer skill on ☐ MS word ☐ MS excel ☐ MS power point ☐ Epi-info

36. Did you analyze the data collected from surveillance system? Yes ☐ No ☐

37. If the answer for Q #36 is yes, did you described data by, ☐ time ☐ place ☐ person

38. Did you have denominators for data analysis? ☐ total population ☐ male ☐ female ☐ under five

39. How frequent your surveillance data analysis. ☐ Weekly ☐ Every two week ☐ Monthly ☐ Quarterly
☐ Every 6 month ☐ Annually ☐ No regular time

40. Did you communicate the results of your analysis to the higher level PHEM officers? Yes ☐ No ☐

41. Did you communicate the results of your analysis to the lower level PHEM focal persons?

Yes ☐ No ☐

42. If answer for Q 36 is No, what is the reason? ☐Lack of knowledge ☐Shortage of time
☐Less attention ☐Shortage of materials ☐Analysis is not familiar ☐ workload ☐Other-----

43. How reporting system can be improved? _____

IV. Epidemic preparedness

44. Do you have plan for epidemic preparedness and response? Yes ☐ No ☐

45. Do you have emergency stocks of drugs and supplies? Yes ☐ No ☐

46. If answer for Q #44 is No, how did you control epidemics?

47. Had you experienced shortage of drugs, vaccines and supplies in 2008 EFY? Yes ☐ No ☐

48. Was woreda epidemic management committee established? Yes ☐ No ☐

49. Did the epidemic management committee have regularly scheduled meeting time? Yes ☐ No ☐,
observe the documented minute_____

50. Was Woreda /HF Rapid response team established? Yes ☐ No ☐. If Yes, list team composition

51. Did the Rapid response team have regularly scheduled meeting time with minute during epidemics?
Yes ☐ No ☐, observe the documented minute_____

52. Were personal protective equipment available in your office? Yes ☐ No ☐. If No, why _____

53. Did you have case management protocol for epidemic prone diseases? Yes ☐ No ☐

54. Did your PHEM have multi sectoral emergency preparedness and response task force committee?
Yes ☐ No ☐

55. In what frequency did the task force meet during outbreaks? _____

56. Were partners working together with your office on emergencies? Yes ☐ No ☐

57. If answer for Q #56 is yes, what type of supports did they give to your office? _____

58. Was there a planned budget for epidemic response? Yes ☐ No ☐

59. Had you a car assigned for emergencies situation (PHEM)? Yes ☐ No ☐ Not functional ☐

60. If answer for Q 58 is NO, how did you address emergencies? _____

61. Had you faced any Challenges on epidemic response and preparedness in 2015/ 2016? Yes ☐ No ☐

62. If answer for Q 61 is yes,

a) List the challenges_____

b) What measures did you take to tackle the challenges? _____

V. Outbreak investigation

63. Was there any Measles outbreak in your locality in 2015/ 2016? Yes ☐ No ☐

64. Had you investigated any Measles outbreak in 2015/ 2016? Yes ☐ No ☐

65. Did you have Measles outbreak investigation check list? Yes ☐ No ☐

66. If answer for Q 65 is No, how did you know possible factors for the outbreak? _____

67. Where did you send specimens for laboratory confirmation? ☐ Regional laboratory

☐ Hospital ☐ EPHI ☐ Health center ☐ Contracted private laboratory ☐ Other_____

68. Who was responsible to investigate an outbreak? ☐ Rapid response team ☐ HEWs

☐ Staffs of woreda HO ☐ Experts organized randomly ☐ Health facility staffs ☐ Other_____

69. If answer for Q 65 is yes, how many out breaks did you investigated in 2015/ 2016? _____

S. No	Name of out break	Place (sub woreda)	Total #of cases	No of deaths			Start date of the out break			Investi gation date	Remar k
				M	F	<5	M	F	<5		
1											
2											
3											
4											

70. Had you faced any challenge in outbreak investigation in 2015/ 2016? Yes ☐ No ☐

76. If answer for Q #70 is yes,

a) List the challenges_____

b) List the alternatives that you took to tackle the challenges. _____

VI. Responses

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

Yes ☐ No ☐ Unknown ☐ Not applicable ☐

78. Does the district responded within 48 hours of notification of most recently reported outbreak (from written reports)

Yes ☐ No ☐ Unknown ☐ Not applicable ☐

79. Does the district achieved an acceptable case fatality rate for most recent outbreak (Observe from outbreak report) Yes ☐ No ☐ Unknown ☐ Not applicable ☐

80. Has epidemic management committee evaluated their preparedness and response activities during the past one year? Yes ☐ No ☐ Unknown ☐ Not applicable ☐
(Observe written report to confirm)

VII. Supervision and Feedback

81. Do you have supervision plan to supervise health institutions under your woreda? Yes ☐ No ☐

82. If answer for Q#81 is No, how did you supervise? _____

83. If answer for Q# 81 is yes, did you supervise the health facilities according to your plan in 2015/2016? Yes ☐ No ☐

84. If answer for Q# 81 is No, what was the reason? _____

85. If answer for Q# 81 is yes, how many times did you supervise each health facilities in 2015/2016? Health center _____ other health facilities _____

86. Do you have supervision checklist? Yes ☐ No ☐

87. If answer for Q# 86 is No, how did you supervise the health facilities?

88. Did you send written feedback of your supervision to the health facilities commenting/indicating their strong and weak sides? Yes ☐ No ☐ (observe)

89. If answer for Q# 89 is No, why _____

90. If answer for Q#89 is yes, for how many health facilities did you send a feedback in 2015/2016? HC----- and other health facilities-----

91. Had you reviewed about surveillance practice by higher level supervision? Yes ☐ No ☐
92. Had you received feedback from higher level supervisors in 2015/ 2016? Yes ☐ No ☐
93. If answer for Q 92 is yes how many feedbacks did you received in 2015/2016? _____
94. Had you faced any challenge on supervision and feedback in 2015/ 2016? Yes ☐ No ☐
95. If answer for Q 94 is yes
- a) List the challenges _____
- b) List the measures that you took to tackle the challenges _____

VIII. Training

96. Have you been trained in Basic disease surveillance? Yes ☐ No ☐ NA ☐
97. If yes, specify when, where, how long, by whom?
- _____
98. What percent of your personnel in the district/HF have been trained in surveillance and epidemic management? _____

IX. Resources

99. Percent of sites that have:

Logistics

- a. Electricity _____
- b. Motor cycles _____
- c. Vehicles _____

Data management

- a. Stationery _____
- b. Calculator _____
- c. Computer _____
- d. Printer _____
- e. Statistical package _____

100. Communication

- a. Telephone service
- b. Fax
- c. Radio
- d. Computers that have modems

101. Information education and communication materials

- a. Posters
- b. Megaphone

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

X. Satisfaction with surveillance system

102. Are you satisfied with the surveillance system?

Yes ☐ No ☐ Unknown ☐ NA ☐ If No, how can the surveillance system be improved?

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

PART-TWO Describe Each System Attributes:

I. IS THE SURVEILLANCE SYSTEM USEFUL?

1. To detect outbreaks early on time to permit accurate diagnosis? ☐ Yes ☐ No
2. To estimate the magnitude of morbidity and mortality? ☐ Yes ☐ No
3. To assess the effect of prevention and control programs? ☐ Yes ☐ No
4. To allocate funds for the surveillance system management ☐ Yes ☐ No
5. To estimate research intended to lead to prevention and control? ☐ Yes ☐ No

II. Simplicity:

1. Is the measles case definition easy for case detection by all level health professionals? ☐ Yes ☐ No
2. Does the surveillance system allow all levels of professionals to fill data? ☐ Yes ☐ No
3. Does the surveillance system help to record and report data on time? ☐ Yes ☐ No
4. Does the surveillance system have necessary information for investigation? ☐ Yes ☐ No
5. Does the surveillance system allow updating data on the cases? ☐ Yes ☐ No
6. How long does it take to fill the reporting format? ☐ <5 min ☐ 5 to 10 min ☐ 10 to 15 min ☐ >15 min
7. How long does it take to have laboratory confirmation? -----

III. Flexibility

1. Can the current reporting formats be used for other newly occurring health event (disease) without much difficulty? ☐ Yes ☐ No
2. Did you think that any change in the existing procedure of case detection and reporting formats will be difficult to implement? ☐ Yes ☐ No, Add your explanation -----
3. Is the system easy to add new variables? ☐ Yes ☐ No
4. Is the surveillance system easy to integrate with other systems? ☐ Yes ☐ No
5. Is the surveillance system easy to add new disease on report? ☐ Yes ☐ No

IV. Data quality

1. Are all reported forms Complete? ☐ Yes ☐ No
2. If answer for Q1 is No, how many unfilled spaces are in 2015/ 2016 report? -----
3. Percentage of unknown or blank responses to variables from the total reported measles cases in 2015/ 2016 _____
4. Percent of reports which are complete (that is with no blank or unknown responses) from the total reports measles cases _____
5. Is the recorded data clear to read and understandable? ☐ Yes ☐ No
6. If answer for Q5 is No, how many records are not clear/are difficult to understand in 2015/ 2016 report? _____
7. Percent of records which are difficult to read/ understand _____

V. Acceptability

1. Do you accept the priority diseases/events surveillance system? ☐ Yes ☐ No
2. Do higher officials in your office accept and support the measles surveillance system? ☐ Yes ☐ No
3. Do you think the reporting agents accept and well engaged in measles surveillance activities? ☐ Yes ☐ No
4. If yes, how many are active participants (of the expected)? -----
6. If No, what is the reason for their poor participation in the surveillance activity?
 - A) Lack of understanding of the relevance of the data to be collected
 - B) No feedback / or recognition given by the higher bodies for their contribution

C) Reporting formats are difficult to understand

D) Report formats are time consuming

E) Other: -----

7. Are all reporting sites used the standard case definition to identify measles cases? ☐ Yes ☐ No

VI. Representativeness

1. What is the health service coverage of the district? _____%

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

3. Did the surveillance system incorporate all health facilities and other sites expected to report? ☐ Yes ☐ No

4. Do you think the populations under surveillance have good health seeking behavior? Yes ☐ No ☐

5. Do you think that children and adult communities are equally benefited in surveillance system? Yes ☐ No ☐

6. If answer for Q 5 is no, who do you think is well benefited by the surveillance system? Children ☐ Adults ☐ Both ☐. Why _____

VII. Timeliness

1. Are all reporting sites/ health facilities reported on time in 2015/ 2016? ☐ Yes ☐ No

2. Average number of reporting sites that reported on time. -----

3. Did you report immediately and weekly aggregated report on time to the next higher level? ☐ Yes ☐ No (Check the evidence) _____

4. Did you provide feedback to the reporting sites those not reported on time? ☐ Yes ☐ No

VIII. Completeness

1. Were all expected sites or health facilities reported weekly measles case zero report in 2015/2016? ☐ Yes ☐ No

2. Were all surveillance data completed in the reporting formats? ☐ Yes ☐ No

3. Average numbers of health facilities that send measles case zero report in each week in 2015/2016 ----

4. If the answer for Q#2 is No, what was/ were the reason/s? _____

IX. Stability

1. Was any new restructuring affected the procedures and activities of the surveillance system? ☐ Yes

☐ No

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

3. Was there any time /condition in which the surveillance system is not fully operating? ☐ Yes ☐ No

4. If the answer for Q3 is yes, explain why? _____

5. What mechanism do you suggest to fully operating the surveillance system? _____

X. Sensitivity

1. Does the Measles standard case definition able to pick all cases? ☐ Yes ☐ No

2. How many suspected Measles cases detected in your woreda /site in 2015/2016? _____

3. What proportion of suspected Measles cases confirmed by National accredited laboratory?

4. How many of those detected measles cases epidemiologically linked with lab confirmed case?

Annexes 4: Data collection tool for health profile assessment

1. Historical

- Wereda Name _____
- Any other historical aspect about the Wereda
- Number of ketens _____
- Sectors offices, where they found
- Main supporting organizations

2. Geographical coordinate

- Latitude
- Longitude
- Annual Rain Fall (average)
- Climatic zone _____ (%) _____ (%) _____ (%)
- Wereda boundaries

North _____ South _____ East _____ West _____

- Map of the subcity
- Culture
- Main transport and how they connected each weredas, kebeles and with the capital city of the zone
- Telephone, mobile and internet
- Electric city

3. Demographic Data

❖ Population

S. No	Sub-woredas/Ketenas	Sex		Total
		Male	Female	
1				
2				
3				

4				
5				
6				
7				
8				
9				
10				

Population distribution

Se.No	Description	Total Population	%	Remark
1	Male			
2	Female			
3	Under 1 year			
4	Under 5 year			
5	5-15 year			
6	15 -49			
7	6-59 month age group			
8	24-59 month age group			
9	Pregnant women			
10	Non pregnant on reproductive age			

4. Population pyramid

Population data by age and sex

Sex	Age									Total
	<1	1-4	5-14	15-24	25-34	35-44	45-54	55-64	>64	
Male										
Female										
Total										

Population characteristics

Characteristics		Number	Percentage
Ethnicity	Oromo		
	Amhara		
	Tigrie		
	Guraghe		
	Wolayta		
	Others		
Religion	Orthodox		
	Muslim		
	Protestant		
	Catholic		
	Others		
Occupation	House Wife		
	Student		
	Gov't employment		
	Merchant		
	Others		
Water Source	Pipe		
	River		

	Wale		
	Others		

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

Main income sources

- ✓ Livestock
- ✓ Tourism
- ✓ Trade
- ✓ Other business

Household income source

- ✚ Government Employer_____ (#)
- ✚ Private Employer_____ (#)
- ✚ Daily Laborer_____ (#)
- ✚ Different business_____ (#)
- ✚ Jobless _____ (#)
- ✚ Average Income_____

6. EDUCATIONAL STATUS

Characteristics		Frequency		Percentage
		Gov't	Private & others	
Educational institution	K.G			
	Primarily School 1-8			
	Secondary 9-10			
	Preparatory			
	College/ University			
	TVET			
School health	Number of schools with Water supply			

	Schools with functional latrine	Male			
		Female			
	Schools with HIV/other Health clubs				

School Enrolment	Sex			
	Male		Female	
	Frequency	Percentage	Frequency	Percentage
Illiterate				
KG				
1_8				
9_12				
TVET				
Collage/University				
School Age Children (target)				
School dropout year 2007 EFY				

o Universities _____ No of student _____

o High School _____ No of students _____

o Primary schools _____ No of students _____

o Drop out.....% compare with the previous year% and means of drop out

o Enrolment compare with the previous year

Teachers distribution						
	Government		Private			Remark
	Male	Female	Male	Female	Total	
Master & above						
Degree						
Diploma						
Certificate						
Supportive staffs						

7. Water coverage

Characteristics	Frequency	Percentage
Total safe water coverage		
Main source of water supply		
1. _____		
2. _____		
3. _____		
4. _____		
Kebeles getting safe water		
Population getting safe water		
Daily water consumption per day per person		

Other Facilities

Characteristics	Frequency	Percentage
Transport		
Accessibility (main roads)		
Type of road		
How many ketenas have access to transportation		
Flow of transportation per day		
Telecommunication		
How many people have access to fixed telephone		
How many people have access to mobile phone (coverage)		
Post Office		
Bank		
Power supply		
How many house hold get power supply		

8. Disaster situation in the woreda

- Was there any disaster (natural or manmade) in the woreda in the last one year? Yes , No
- Is there any recent disease outbreak/other public health emergency? Yes , No
- If yes, number of cases_____ and number of deaths_____

9. Vital Statics and Health Indicators

- Number of still birth in 2007 EFY_____
- Infant Mortality Rate (IMR) _____ (total <1 yr deaths in 2007 EFY _____)
- Child Mortality Rate_____ (total <1-4 yr deaths in 2007EFY _____)
- Crude Birth Rate_____
- Crude Death Rate_____ (total deaths 2007 EFY _____)
- Maternal Mortality Rate_____ (2007 EFY total maternal deaths_____)
- Contraceptive prevalence rate_____
- Contraceptive acceptance rate _____
- ANC rate (how many of the total expected pregnancies attended 1st ANC) _____
- ANC rate (how many of the total expected pregnancies attended 4th ANC) _____

- Percentage of deliveries attended by skilled birth attendants_____
- Percentage of deliveries attended by UHEWs_____
- Percentage of deliveries attended by TBAs _____
- Average family size_____

10. Immunization Coverage

Type of Vaccine	Vaccination Status			
	Zero dose	1 st dose	2 nd dose	3 rd dose
BCG				
OPV				
Pentavalent				
Measles				
PCV				
TT2				
Rotarix				

11. Health facilities.

S.No	Type of Health facility		Number		HF: Population Ratio	Total Number of beds	Remark
			Governme ntal	Non-governmental			
1	Hospitals						
2	HC						
3	HP						
4	Dxic laboratory						
5	Clinics	Higher					
6		Medium					

7		Small					
9	Pharmacy						
10	Drug store						

Human resource distributions

Se.No	Profession	Number		Total	HP:population Ratio	Remark
		Male	Female			
1	Specialist					
2	GP					
3	HO					
4	Nurse BSC					
5	Clinical nurses					
6	Ophthalmic nurse					
7	Public nurse					
8	Ophthalmic nurse					
9	Midwife BSC					
10	Midwife diploma					
11	Lab. Technology					
12	Lab. Technician					
13	Pharmacist					
14	Pharmacy technician					
15	Environmental HO					
16	X-ray technician					
17	Anesthetist					
18	Health assistance					
19	HEW					
Total						
Supp staff						

12. Top causes of morbidity and mortality

Top ten leading causes of OPD visit (morbidity)

	Adult	Pediatrics/ < 5 years
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Top ten causes of admissions (Morbidity)

S.No	Adult	Pediatrics/ < 5 years
1		
2		
3		
4		
5		

6		
7		
8		
9		
10		

Top ten causes of deaths (mortality)

	Adult	Pediatrics/ < 5 years
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

13. Health budget allocation Government

- Total budget allocated for the woreda _____
- Total budget allocated for health _____ (____ %)

Funds from NGO

➤ Total _____ (purpose/programs)_____

14. Community Health Services Status of services provided by community health workers namely:

- ❖ No. of TBAs/TTBA_____ and their responsibility_____
- ❖ No. of CHWs/CHPs_____ and their _____
- ❖ Others_____

15. Status of Primary Health Care Components – with focus on the eight PHC elements and MDG

- (Immunization, MCH, Essential drugs, Food and Nutrition, Education, Illness and injury, Water and Sanitation, Vector and reservoir)

➤ MCH (Delivery, ANC, PNC)

S. No	Indicator	Total Number
1	Number of ANC Cases Registered	
2	Number of pregnant women provided at least TT2	
3	PNC cases visited	
4	Number of children <5 year treated for diarrhea at public HF	
5	Number of children <5 year treated for pneumonia at public health facilities	
6	Number of facilities reporting stock out of contraceptive commodities	
7	Total deliveries conducted by skilled attendants	
8	Number of live births	
9	Number of still births	
10	Total obstetrics/Maternal/deaths	
11	Total Newborn deaths	

➤ **Family Planning Methods**

Methods	Frequency	Percentage
Oral Contraceptive		
IUD		
Implant		
Injection		
Condom		

- **Is their EPI (outreach service?)** Yes , No
- **Was Conduct cold chain or vaccine management supportive supervision** Yes , No
- **If yes, do you have checklist?** Yes , No

Environmental Health and Sanitation

- Latrine coverage_____ & utilization rate_____

Type of Latrine	Frequency	Percentage
Open field		
Pit Latrine		
Ventilated Pit Latrine		
Others		

Solid waste management

- Is their solid waste container? Yes , No
- Is their solid waste container loader? Yes , No
- If yes, frequency of solid waste collection_____

Is there Liquid waste management? yes , No

others_____

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

16. Endemic diseases Malaria:

- Total cases/yr _____ deaths/yr _____, <5yr cases _____ deaths _____
- Malaria supplies (Coartem, RDT, etc) shortage _____
- Other issues _____

TB/Leprosy:

Total TB cases in the year 2007EFY _____

- PTB negative _____
- PTB positive _____
- Extra PTB _____
- TB detection rate _____
- TB Rx completion rate _____
- TB cure rate _____
- TB Rx success rate _____
- TB defaulter _____
- Death on TB Rx _____

Total TB patients screened for HIV _____ (% _____)

Total TB patients tested positive for HIV _____

Total number of TB-HIV co-infected Patients initiate CPT _____

Total number of TB-HIV co-infected Patients initiate HAART _____

Total Leprosy cases _____

Leprosy detection rate _____

Rx completion rate _____

HIV/AIDS

➔ Total people screened for HIV (last one year) _____

- VCT _____ PITC _____ PMTCT _____

➔ Total PLWHA _____

- On ART _____ on Pre-ART _____
- Other HIV prevention activities _____

Nutrition

- ❖ Total Out Patient Therapeutic Program (OTP) sites _____, total admissions to OTP/yr _____

☐ Total SC sites, _____, Newly opened/yr _____, total admissions to SC/yr _____

➔ Is there TSF (targeted supplementary feeding) program in the woreda _____

☐ CBN program _____ PSNP _____ other _____

17. Essential drugs (shortage)

- _____
- _____
- _____
- _____
- _____

18. Epidemic prone diseases

What do you think the main problems of the district are?

➔ Discussion of the highlights and the main findings of the health profile assessment and description

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

Annexes 5: Rapid environmental health assessment tool for shelters conditions during Koshe rubbish landslide disasters

I. ASSESSING AGENCY DATA

¹Agency /Organization Name _____

²Assessor Name/Title _____

³Phone _____ - _____ - _____

⁴Email or Other Contact _____

II. FACILITY TYPE, NAME AND CENSUS DATA

⁵Shelter Type ☐ Community/Recovery ☐ Special Needs ☐ Other _____ ⁶ARC Facility ☐ Yes ☐ No ☐ Unk/NA ⁷ARC Code _____

⁸Date Shelter Opened ____/____/____ (mm/dd/yr) ⁹Date Assessed ____/____/____ (mm/dd/yr) ¹⁰Time Assessed ____:____ ☐ am ☐ pm

¹¹Reason for Assessment ☐ Preoperational ☐ Initial ☐ Routine ☐ Other _____

¹²Location Name and Description _____

¹³Street Address _____

¹⁴City / County _____ ¹⁵State ____ ¹⁶Zip Code _____ ¹⁷Latitude/Longitude _____/_____

¹⁸Facility Contact / Title _____ ¹⁹Facility Type ☐ School ☐ Arena/Convention center ☐ Other _____

²⁰Phone _____ - _____ - _____ ²¹Fax _____ - _____ - _____ ²²E-mail or Other Contact _____

²³Current Census _____ ²⁴Estimated Capacity _____ ²⁵Number of Residents _____ ²⁶Number of Staff / Volunteers _____

III. FACILITY

²⁷Structural damage ☐ Yes ☐ No ☐ Unk/NA

²⁸Security / law enforcement available ☐ Yes ☐ No ☐ Unk/NA

²⁹Water system operational ☐ Yes ☐ No ☐ Unk/NA

³⁰Hot water available ☐ Yes ☐ No ☐ Unk/NA

³¹HVAC system operational ☐ Yes ☐ No ☐ Unk/NA

³²Adequate ventilation ☐ Yes ☐ No ☐ Unk/NA

³³Adequate space per person ☐ Yes ☐ No ☐ Unk/NA

VIII. SOLID WASTE GENERATED

⁶⁶Adequate number of collection receptacles ☐ Yes ☐ No ☐ Unk/NA

⁶⁷Appropriate separation ☐ Yes ☐ No ☐ Unk/NA

⁶⁸Appropriate disposal ☐ Yes ☐ No ☐ Unk/NA

⁶⁹Appropriate storage ☐ Yes ☐ No ☐ Unk/NA

⁷⁰Timely removal ☐ Yes ☐ No ☐ Unk/NA

⁷¹Types ☐ Solid ☐ Hazardous ☐ Medical ☐ Unk/NA

IX. CHILDCARE AREA

³⁴ Free of injury /occupational hazards ☐ Yes ☐ No ☐ Unk/NA ³⁵ Free of pest / vector issues ☐ Yes ☐ No ☐ Unk/NA ³⁶ Acceptable level of cleanliness ☐ Yes ☐ No ☐ Unk/NA ³⁷ Electrical grid system operational ☐ Yes ☐ No ☐ Unk/NA ³⁸ Generator in use, ³⁹ If yes, Type_____ ☐ Yes ☐ No ☐ Unk/NA ⁴⁰ Indoor temperature _____ °F ☐ Unk/NA	⁷² Clean diaper-changing facilities ☐ Yes ☐ No ☐ Unk/NA ⁷³ Hand-washing facilities available ☐ Yes ☐ No ☐ Unk/NA ⁷⁴ Adequate toy hygiene ☐ Yes ☐ No ☐ Unk/NA ⁷⁵ Safe toys ☐ Yes ☐ No ☐ Unk/NA ⁷⁶ Clean food/bottle preparation area ☐ Yes ☐ No ☐ Unk/NA ⁷⁷ Adequate child/caregiver ratio ☐ Yes ☐ No ☐ Unk/NA ⁷⁸ Acceptable level of cleanliness ☐ Yes ☐ No ☐ Unk/NA
IV. FOOD	
⁴¹ Preparation on site ☐ Yes ☐ No ☐ Unk/NA ⁴² Served on site ☐ Yes ☐ No ☐ Unk/NA ⁴³ Safe food source ☐ Yes ☐ No ☐ Unk/NA ⁴⁴ Adequate supply ☐ Yes ☐ No ☐ Unk/NA ⁴⁵ Appropriate storage ☐ Yes ☐ No ☐ Unk/NA ⁴⁶ Appropriate temperatures ☐ Yes ☐ No ☐ Unk/NA ⁴⁷ Hand-washing facilities available ☐ Yes ☐ No ☐ Unk/NA ⁴⁸ Safe food handling ☐ Yes ☐ No ☐ Unk/NA ⁴⁹ Dishwashing facilities available ☐ Yes ☐ No ☐ Unk/NA ⁵⁰ Clean kitchen area ☐ Yes ☐ No ☐ Unk/NA	X. SLEEPING AREA ⁷⁹ Adequate number of cots/beds/mats ☐ Yes ☐ No ☐ Unk/NA ⁸⁰ Adequate supply of bedding ☐ Yes ☐ No ☐ Unk/NA ⁸¹ Bedding changed regularly ☐ Yes ☐ No ☐ Unk/NA ⁸² Adequate spacing ☐ Yes ☐ No ☐ Unk/NA ⁸³ Acceptable level of cleanliness ☐ Yes ☐ No ☐ Unk/NA
XI. COMPANION ANIMALS	
	⁸⁴ Companion animals present ☐ Yes ☐ No ☐ Unk/NA ⁸⁵ Animal care available ☐ Yes ☐ No ☐ Unk/NA ⁸⁶ Designated animal area ☐ Yes ☐ No ☐ Unk/NA ⁸⁷ Acceptable level of cleanliness ☐ Yes ☐ No ☐ Unk/NA
V. DRINKING WATER AND ICE	
⁵¹ Adequate water supply ☐ Yes ☐ No ☐ Unk/NA ⁵² Adequate ice supply ☐ Yes ☐ No ☐ Unk/NA ⁵³ Safe water source ☐ Yes ☐ No ☐ Unk/NA ⁵⁴ Safe ice source ☐ Yes ☐ No ☐ Unk/NA	XII. OTHER CONSIDERATIONS ⁸⁸ Handicap accessibility ☐ Yes ☐ No ☐ Unk/NA ⁸⁹ Designated smoking areas ☐ Yes ☐ No ☐ Unk/NA ⁹⁰ Immediate Needs Identified: ☐ Yes ☐ No ☐ Unk/NA
VI. HEALTH / MEDICAL	
XIII. COMMENTS (List Critical Needs on Immediate Needs Sheet)	

⁵⁵ Reported outbreaks, unusual illness / injuries	☐ Yes ☐ No ☐ Unk/NA	
⁵⁶ Medical care services on site	☐ Yes ☐ No ☐ Unk/NA	
⁵⁷ Counseling services available	☐ Yes ☐ No ☐ Unk/NA	
VII. SANITATION		
⁵⁸ Adequate laundry services	☐ Yes ☐ No ☐ Unk/NA	
⁵⁹ Adequate number of toilets	☐ Yes ☐ No ☐ Unk/NA	
⁶⁰ Adequate number of showers	☐ Yes ☐ No ☐ Unk/NA	
⁶¹ Adequate number of hand-washing stations	☐ Yes ☐ No ☐ Unk/NA	
⁶² Hand-washing supplies available	☐ Yes ☐ No ☐ Unk/NA	
⁶³ Toilet supplies available	☐ Yes ☐ No ☐ Unk/NA	
⁶⁴ Acceptable level of cleanliness	☐ Yes ☐ No ☐ Unk/NA	
⁶⁵ Sewage system type	☐ Community ☐ On site ☐ Portable ☐ Unk/NA	

Annexes 6: Questionnaire for Utilization status of Isoniazid Preventive Therapy and Associated Factors among newly enrolled HIV/AIDS Patients

Consent form

Introduction: Hello! My name is _____ and I am the second degree student in SPHMMC. I am conducting research on the topic of “Utilization Status of Isoniazid Preventive Therapy and Associated Factors among Newly Enrolled HIV/AIDS Patients Attending in Public Health Facilities, Addis Ababa, Ethiopia”.

Purpose of the study: To assess the utilization status of Isoniazid preventive therapy and associated factors among newly enrolled PLHIV to provide evidence based information.

Procedure: As part of the study we would first like to ask some questions about your personal details. Then we will interview you the service that you have got from HIV Care unit in this health facility and the information you have about TB and TB-HIV as well.

Duration of interview: The interview will take 15 to 20 minutes to complete.

Benefits: This information will help the government and other stakeholders to plan problems reduction and service improvement strategies in HIV Care service units. Similarly, PLHIV will be benefitted from proper TB screening service and IPT use to preventing the development of TB disease.

Risks: We assure you that there will no risks of being involved in this study.

Right to accept or refuse: Participation in this study is voluntarily. If you come to any question you don't want to answer, just let me know and I will go on to the next question; or you can stop the interview at any time. Are you voluntary now? I would very much appreciate your participation in this study. However, I hope you will participate and respond to all the interviewed questions in the study since your views are important.

Confidentiality: Any participant's identifier will not be written on the questionnaire. Whatever information you provide will be kept strictly confidential, and will not be shared with anyone other than members of the study team. At this time, do you want to ask me anything about the study please? May I begin the interview now?

Signature of interviewer: _____ Date: _____

Here, I assure by giving verbal and written consent participation in this study having clear explanation and understanding about the purpose and benefits of the study; assurance of absence of risk involving in the study and having believed well keeping confidential for any information

that I have being provided. Therefore, I approved with my signature as I am voluntary participating in the study. Signature of participant _____ Date: _____

Questionnaires for study participants

S. N ^o	Questionnaire	Possible responses
Part I. Socio- demographic characteristics of the patients		
1	Code of the respondent	_____
2	Sex	1= Male 2= Female
3	Age	Age (Year): _____
4	Address	Sub city _____ District _____ H. N ^o _____
5	Marital status	1= Married 2= single 3 = divorced 4= widowed 5=Separated
6	Educational status:	1= illiterate 2 = read & write 3= primary (grade 1-8) 4= secondary (grade 9-12) 5= Higher education (college)
7	Occupation:	1= Government employee 2= Private employee 3= Self employed 4= Trader 5=Student 6= Daily laborer 7= unemployed 8=housewife 9=NGO 10= other (specify)
Part II. Questionnaire focusing to Tb screening, HIV clinical stage, IPT and HAART initiation, and patient-provider relationship		
1.	When did you know your HIV status?	1) Since a month 2) One to six months ago 3) Six to one year ago 4) Before one year (Refer patient intake form)
2	In which WHO's HIV clinical stage you were when you enrolled in to chronic care service in the health facility?	1) Stage I 2) stage II 3) stage III 4) stage IV (Refer patient intake form)
3	When did you start Anti-HIV treatment (HAART)?	1) Immediately after HIV care enrollment 2) After completion of IPT 3) Concurrently with IPT 4) not yet started

4	Have you been screened for TB at your HIV care enrollment?	1) Yes 2) No
5	Had you have some or all of the following signs and symptoms such as cough, weight loss, night sweating, loss of appetite, and fatigue during initial follow up visit?	1) Yes 2) No
6	Have you ever treated for drug resistant TB	1) Yes 2) No
7	Did your care provider disclose you the presence or absence of the signs and symptoms of TB at the beginning?	1) Yes 2) No
8	Did you receive the INH medication immediately after disclosing you the absence of active TB in you?	1) Yes 2) No
9	If you have been ruled out for absence of active Tuberculosis at the initial visit, when did you start receiving IPT?	1) Within a 3 months 2) Between 3 to 6 months 3) Between six months to one year 4) after one year 5) Not yet started
10	If your answer for Q7 is No, what was/were basic reason/s which holds you from receiving IPT?	1) HIV clinical stage 2) Pill burden 3) Previous TB history 4) Absence of INH 5) Absence of pyridoxine 6) Presence of TB symptom 7) Fear of drug side effect 8) Refusal 9) other 10) I don't know the reasons
11	Have you had given information about the benefit and procedures of IPT use by your care provider in the ART clinic?	1) Yes 2) No
12	Did you take the recommended dose of a single tablet (300mg) of INH daily for six month duration without interruption?	1) Yes 2) No
13	For how long you receive the Isoniazid preventive therapy?	1) For lease than a month 2) For three months 3) For consecutive six months 4) For more

		than six months 5) Interrupted before completion without specific time
14	How frequent did your care provider screen you about TB in your subsequent follow up visit since your HIV care enrollment?	1) At every visit 2) Sometimes 3) No, at all
15	If your answer for Q11 is No, what is the reason behind?	1) Pill burden 2) Drug intolerance 3) Drug shortage 4) Believe of less drug effectiveness 5) Forgetfulness 6) Due to lost to follow up
16	Where was your initial HIV care enrollment?	1. Health center 2. Hospitals 3. Others

Thank you!

Questionnaires for key informants

S. N ^o	Questionnaire	Possible responses
Part I. Socio- demographic characteristics of the patients		
1	Code of the respondent	_____
2	Sex	1= Male 2= Female
3	Age	Age (Year): _____
4	Address	Sub city: _____ HF: _____
5	Marital status	1) Married 2) single 3) divorced 4) widowed 5) Separated
6	Profession:	_____
7	Responsibility:	1= Administration 2= Logistics 3= Clinician 4= Adherent supporter
Part II. Questionnaire focusing on the status of TB-HIV co-infection, attitudes of the interviewees about use of IPT, logistics system, and major barriers that hinder IPT utilization		
1	How do explain the status of TB-HIV co-infection in this health facility?	1. _____ 2. _____ 3. _____
2	How do you perceive the necessity of IPT for eligible PLHIV?	1. _____ 2. _____
3	How do you evaluate the preparation and readiness of the stakeholders to provide IPT for those eligible PLHIV?	1. _____ 2. _____ 3. _____
4	How do you describe the strength and weakness of the following systems /groups/ in contributing to scale up IPT coverage on the PLHIV?	1. Management system: _____ _____ _____ 2. Logistic system: _____ _____

		3. Clinician: 4. Adherence supporter:
5	What are the major bottle necks/ barriers that block the coverage and retard the required result of IPT on PLHIV?	1. 2. 3. 4. 5.

Thank you

Biography

The author is called Fekade Degu Woldekidan and was born on 21st November, 1978 in Guragie Zone, Southern Ethiopia. I attended my primary education and high school at Koter Gedira Elementary School and Pawi, Ayer Tena, and Addis Ketema Secondary School, respectively. Then I joined Haramaya University in 2005 and graduated with BSc. in Nursing in 2007.

After graduation I worked as Junior Nurse Professional in Deneba Health Center, North Shoa, Amhara National Regional State from October, 2007 to August, 2009 and as Disease Prevention and Control Officer in the department of Health Promotion and Disease Prevention Process at Kolfe Keraniyo Sub-City Health Office until October, 2015. Then I joined St. Paul's Hospital Millennium Medical College in November, 2015 for a postgraduate studies in Field Epidemiology Training Program.