

Saint Paul's Hospital Millennium Medical College
Department of Public Health



Ethiopia Field Epidemiology Training Program (EFETP)
Compiled Body of Works in Field Epidemiology

By:
Helen Tesfayohannes Hagos

Submitted to the Department of Public Health of Saint Paul's Millennium Medical College in partial fulfilment for the degree of Master of Public Health in Field Epidemiology

March 2018
Addis Ababa

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March 2018

Addis Ababa

DEPARTMENT OF PUBLIC HEALTH GRADUATE STUDIES
FINAL BODY OF WORK WITH THESIS APPROVAL FORM

As members of the Board of Examiners of the final body of work with thesis open defence, we certify that we have read and evaluated the body of work with thesis prepared by **Helen Tesfayohannes** under thesis entitled “**Meta- analysis on the prevalence and associated factors of hypertension among adults in East Africa**” and recommendation for the *degree of Master of Public Health in Field Epidemiology*.

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

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

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Acronyms

AACAHB	Addis Ababa City Administration Health Bureau
AEFI	Adverse Event Following Immunization
ANC	Ante Natal Care
ART	Anti Retroviral Therapy
ARV	Anti Retro Viral
AURTI	Acute Upper Respiratory Infection
AWD	Acute Watery Diarrhea
BCG	BacilleCalmette-Guerin (vaccine for TB)
BMI	Body Mass Index
CDC	Center for Disease Control and Prevention
CEO	Chief Executive Officer
CHD	Coronary Heart Disease
CTC	Cholera Treatment Center
DALY	Disability Adjusted Life Years
DBP	Diastolic Blood Pressure
DM	Diabetes Mellitus
DPT	Diphtheria Pertussis Tetanus (vaccine)
DRC	Democratic Republic of Congo
E.C	Ethiopian Calendar
EDHS	Ethiopia Demographic Health Survey
eHMIS	electronic Health Management Information System
ePHEM	electronic Public Health Emergency Management
EPHI	Ethiopian Public Health Institute
EPI	Expanded Program of Immunization
HC	Health Center
HEP	Health Extension Program
HEW	Health Extension Worker
HMIS	Health Management Information System
IEC	Information Education and Communication
IGAD	Intergovernmental Authority on Development

IgM	Immunoglobulin M
IPD	Inpatient Department
LMIC	Low and Middle Income Countries
MDGs	Millennium Developmental Goals
mm Hg	millimeter of mercury
NCD	Non Communicable Diseases
OPD	Outpatient Department
OR	Odds Ratio
PCV	Pneumococcal Conjugate Vaccine
PHEM	Public Health Emergency Management
PHEMO	Public Health Emergency Management Officer
PITC	Provider Initiated HIV Testing and Counselling
PMTCT	Prevention of Mother To Child Transmission for HIV
PNC	Post Natal Care
RCS	Rapid Continent Survey
RRT	Rapid Response Team
SBP	Systolic Blood Pressure
SDGs	Sustainable Developmental Goals
SIA	Supplementary Immunization Activities
SOP	Standard Operating Procedure
SPHMMC	Saint Paul's Hospital Millennium Medical College
SSA	Sub Saharan Africa
USD	United States Dollar
UTI	Urinary Tract Infection
V.	Vibrio
VVM	Vaccine Vail Monitor
W	Wereda
WHO	World Health Organization

Executive summary

From November 2015- February 2018, I went to Saint Paul's Hospital Millennium Medical College to have Master of Public Health in field Epidemiology degree. My field base was in Bole Sub City Health office in Addis Ababa. During my stay, I did one outbreak investigation, one surveillance data analysis, one surveillance system evaluation, one Wereda health profile description, submission of three abstracts, coordinated one vaccination campaign and one research. We investigated Acute Watery Diarrhea outbreak in Bole sub city. I did four years surveillance data analysis on hypertension in Bole sub city. I evaluated Bole sub city health office's surveillance system. I described the health profile of one of the Weredas of Bole sub city. I submitted three abstracts for different conferences. I coordinated measles vaccination campaign and prepared a report. I did my thesis on Meta analysis of prevalence and risk factors of hypertension in East Africa.

We did Acute Watery Diarrhea outbreak investigation in Bole sub city. We conducted descriptive cross-sectional study and unmatched case-control study with 55cases and 110controls in Bole sub-city. We identified cases from Amoraw Cholera Treatment Center and controls from the community. Male patients accounted 65% of 717patients. The most affected age group was 25-44 accounting 73.8% of 717 patients. The sub-city's attack rate was 198/100,000 populations. The response rate for the case control study was 97%. Factors associated with AWD were eating raw meat with Adjusted Odds Ratio (AOR) of 39.6 (95% Confidence Interval [CI], 6.31-248.18); eating cold leftover food with AOR of 9.17(95% CI, 1.58-53.31); boiling drinking water 0.03 (95% CI, 0.001-0.39); and treatment of water with water guard 0.07 (95%CI, 0.01-0.82). The AWD outbreak has caused many people illness and missing days out of work. The risk factors of the cholera outbreak were eating raw meat and cold leftover food and the preventive factors were using boiled water and water guards for drinking water. We recommend educating the community on raw meat and cold leftover food consumption during the outbreak periods and utilization of water treatments like water guards and boiling would help in prevention and control of cholera outbreaks.

I conducted measles surveillance system evaluation in Bole sub-city from 2013-2016. A descriptive cross sectional study design was used. Two-hundred-forty-seven patients of measles

were reported in Bole sub-city from 2013- 2016. Epidemic preparedness plan and supervision was carried out in some Weredas and the sub-city. No written feedback and budget specifically allocated to carryout surveillance activities from sub-city to health facility levels. The completeness of the Bole sub-city surveillance report the last 12months was 89.5% while the timeliness was 72.2%. To improve the feedback mechanism, budget allocation, the timeliness surveillance activities and presence of epidemic preparedness plan and meet the standards of CDC guideline, stakeholders at all level must work together.

I did health profile of Bole sub city Wereda 9 administration from April 25-May 9, 2016. One Hospital, 1 Health Center and 9 clinics were available in the Wereda. To estimate the health coverage of the Wereda, data from Wereda 9 Goro Health Center was used from 2005-2007E.C. Except BCG vaccine all the vaccination coverage were above 100%. Acute Upper Respiratory Tract Infection was the leading cause of morbidity among all age groups & both sexes. Measles outbreak occurred in 2006E.C and there were 52 cases and 2 deaths. Twelve tracer drugs were available within three years but 10 were absent one time or another. Most of the health coverage indicators of Wereda 9 Goro Health Center were above 100% which shows underestimation of the catchment population. Data on safe drinking water and toilet services of the Wereda were not available. Data handling and quality control mechanisms should be improved in the Wereda and in the Health Center.

I prepared three abstracts for scientific conference submission. The abstracts were; Four years hypertension trend analysis in Bole sub city, 2013-2015, Measles surveillance system evaluation of Bole sub city administration, 2013-2017 and Factors associated with acute watery diarrhea outbreak in 2016 at Bole sub city, Addis Ababa, Ethiopia.

I investigated two building collapses in Bole sub city Wereda 10 that collapsed on April 27, 2016 and Feb 14, 2017. The probable causes of the collapses were use of sub standard materials and design modification. The problems could have been detected if there was a continuous follow up from the regulatory body. The total estimated loss due to the collapse was 8 million Birr. No one was injured or died. To prevent future similar incidences, the land authorities at different level should have strict follow up of buildings under construction.

I coordinated measles Supplemental Immunization Activity from March 3-12, 2017. The target population of the campaign were children aged 9-179 months in Bole sub city in 2017. Children from 9- 15 years of resided in Bole sub city vaccinated for measles during the measles campaign were 115,522. The post campaign Rapid Convenient Survey showed an overall sub city coverage of 95.3%.

I conducted a study on meta analysis of the prevalence and risk factors of hypertension in studies conducted in East Africa, 2011-2016. Data was extracted from quantitative facility or community based cross-sectional studies. PubMed, Medline, HINARI and Google scholar search engines were used. Non published literatures were included in the study to minimize publication bias. Data was extracted using Microsoft excel and analyzed using medcal and Review Manager 5.3. A total of 2,567 studies from PubMed, Medline, HINARI, Google Scholar search engines and from other records were searched and screened. We included 14 studies in this study. The pooled prevalence of hypertension in East Africa using DerSimonian Laird random effect was 25.37 % (17.67-33.76%). The prevalence among women was 26.7% (95%CI, 17.63-36.89%) and men was 24.87% (95%CI, 17.87-32.61%). The identified risk factors of hypertension with statistically significant pooled Odds Ratio were being obese/overweight 3.39 (95%CI, 2.17-5.29), excess alcohol consumption 1.27 (95%CI, 1.01-1.61), having family history of hypertension 1.94 (95%CI, 1.41-2.64), high waist circumference 2.99 (95%CI, 2.34-3.84) and having physical activity 0.62 (95%CI, 0.44-0.88).

Chapter I. Outbreak investigation

1.1 Factors associated with Acute Watery Diarrhea outbreak in 2016 at Bole sub city, Addis Ababa, Ethiopia

Executive summary

Background Cholera is acute watery diarrhea that can lead to dehydration and death within few hours. Cholera is transmitted through feco-oral route. The incubation period of cholera lasts from hours to five days. The basic management of cholera is fluid replacement based on dehydration status of the patient. Cholera, one of the immediately reportable disease epidemics occurred in Addis Ababa in the entire sub cities in 2016. This study helps decision makers within the health system to improve the health related problems and prevent the occurrence of the same cholera outbreak or minimize the severity in the future.

Objective To determine the magnitude and the risk factors of Acute Watery Diarrhea outbreak in 2016 in Bole sub city, Addis Ababa, Ethiopia.

Method Descriptive cross-sectional study was conducted to determine the magnitude of the outbreak. Unmatched case control study was conducted with 55 cases and 110 controls in Bole sub city to identify the associated factors. Cases were identified from Amoraw Cholera Treatment Center while the controls were selected from the community. Semi structured questionnaire was used to collect data. Data was entered on EpiInfo 7 and analyzed on SPSS 21. Bivariate analysis was carried out and P value less than 0.2 were taken in to multivariable analysis. Results with P value less than or equal to 0.05 were considered significant. Ethical clearance was not obtained since this study was part of the outbreak investigation process. Consent was obtained from every participant.

Result The response rate for the case control study was 97%. A total of 717 cases were reported in Bole sub city during the outbreak. Forty six percent were managed at Amoraw Cholera Treatment Center, 40.2% were treated at Dillre Cholera Treatment Center and the rest 13.8% were treated at other health facilities. Male patients accounted 65% of the cases. The most affected age group was 25-44 years accounting 73.8% of the cases. The sub city's attack rate was 198 per 100,000 populations. Risk factors for AWD were eating raw meat with Adjusted Odds Ratio (AOR) of 39.6 (95% Confidence Interval (CI) 6.31-248.18) and eating cold leftover food with AOR of 9.17 (95% CI 1.58-53.31). The preventive factors were boiling drinking water 0.03 (95% CI 0.00-0.39) and treatment of water with water guard 0.07 (95% CI 0.01-0.82).

Conclusion and recommendation The AWD outbreak has caused many people illness and missing days out of work. The risk factors of the cholera outbreak were eating raw meat and cold leftover food and the preventive factors were using boiled water and water guards for drinking water. We recommend educating the community on raw meat and cold leftover food consumption during the outbreak periods and utilization of water treatments like water guards and boiling would help in prevention and control of cholera outbreaks.

1.1.1 Introduction

1.1.1.1 Background

Cholera is acute watery diarrhea that can lead to dehydration and death within few hours. The etiology of cholera is *Vibrio cholerae* O1 and O139. The presentation of the disease varies from individual to individual, the reason is unknown but are said to be due to interpersonal difference in immunity, nutrition and blood type. Some of the infected people become asymptomatic while others present with life threatening conditions. ⁽¹⁾

Cholera is transmitted through feco-oral route. Once the bacteria are ingested, the bacteria that survived the acidity of the stomach will invade the intestinal cells. The bacteria produce enterotoxin during multiplication. This toxin will adhere to the intestinal cells and leads to excretion of fluid from the intestine. ⁽²⁾

The incubation period of cholera lasts from hours to five days. Patients with cholera present with sudden onset of painless rice-water like diarrhea that is mostly accompanied with vomiting. Loss of fluid leads to dehydration and shock. Nearly 75% of infected cases are asymptomatic, 20% present with other diarrheal like diseases, 2-5% present with profuse diarrhea, vomiting and severe dehydration. ⁽²⁾

The basic management of cholera is fluid replacement based on dehydration status of the patient. For severely dehydrated patients antibiotics are given after fluid therapy. If untreated the expected case fatality is up to 50% that is reduced to less than one percent if treatment is given. The purpose of responding to cholera outbreak is to minimize case fatality rate by proper patient management, mobilizing resources and improving access to care. The other objective is reduce the incidence by aggressively educating the community, carrying out sanitation campaigns and providing safe water supply. ⁽²⁾

The outbreak of cholera started on 9 June 2016 in Addis Ababa among solid waste handlers in Kolfe sub city. Then the outbreak spread all over Addis Ababa. This study assessed the magnitude and the associated risk factors of AWD outbreak in Bole sub city in 2016.

1.1.1.2 Statement of the problem

Cholera globally affects around 2.8 million people annually. ⁽³⁾ The incidence of cholera ranged from 0.5-4 per 1,000 population in Asia and Africa. ⁽⁴⁾ In sub Saharan countries, the incidence was 51.26 per 100,000 population. Ethiopia's yearly incidence rate of cholera, 2009-2011, was 20-50 cases per 100,000 population. ⁽⁵⁾ While in another study the incidence was 3.9-4.4 cases per 1,000 population. ⁽³⁾ In India only 17% of cholera cases were reported. ⁽⁶⁾ Similarly, in Western Kenya 46% alive patients and 5.9% of deaths due to cholera were not reported. Under reporting of cases and deaths of cholera were seen in these studies. ⁽⁷⁾

Cholera adversely affects the economy of a country by causing death and loss of missed days out of work due to illness. In the year 2007, 110,837 reported cases of cholera led to estimated loss of economy of 43.3million United States Dollar (USD) for life expectancy of 40years, 60million USD for life expectancy of 53years and 72.2million USD for life expectancy of 73years of age. ⁽⁸⁾

The risk factors identification of the cholera outbreak is mandatory to prevent the occurrence of cholera outbreak and reduce the incidence. Studies showed that the risk factors vary from place to place. Environmental variability⁽⁹⁻¹¹⁾, contact with river water and living along the riverside⁽¹¹⁻¹³⁾, treatment and storage of drinking water ^(7,14), eating leftover food⁽¹⁵⁾, movement of people, urbanization and overcrowding⁽¹⁶⁾ were some of the risk factors identified in previous studies.

Identification of the risk factors in local setting helps in preventing and controlling future outbreaks. This study was conducted as part of outbreak investigation and control of the Bole sub city in 2016. This study aimed to identify the magnitude and risk factors of cholera outbreak in Bole sub city in 2016.

1.1.1.3 Rationale of the study

The impact of cholera outbreak is significant in a country's health system and economy. This study investigated the outbreak and provides information on the risk factors of the outbreak. It helps decision makers within the health system from the facility level in the study area to the ministry to improve the health related problems and prevent the occurrence of the same cholera outbreak or minimize the severity in the future.

1.1.2 Literature review

1.1.2.1 Magnitude of cholera

Globally nearly one and half billion people are at risk of developing cholera in endemic countries. Annually 2.8million cases and 91,000 deaths occur in these countries. While in non-endemic countries, 87,000 people get cholera and 2,500 deaths occur annually. ⁽³⁾ In a study conducted in Africa and Asia in 2005, the incidence of cholera ranged from 0.5-4 cases per 1,000 populations annually. Children less than 5 years of age were the mostly affected age group with 1.2-8.8 per 1,000 populations. ⁽⁴⁾ A systematic review done from 2009-2011 showed that in Sub Saharan countries the incidence was 51.26 per 100,000 populations that was higher than the coastal Africa regions (26.75 per 100,000 population) and lower than Inland African regions (72.86 per 100,000 population). ⁽⁵⁾

In a study conducted in Africa, Western Pacific region and in Europe in 2008 using safe food International using food born and water born diseases database showed that 344 outbreaks were reported and 128 were from Africa, 118 from Western pacific and 98 were from Europe. Form the reported outbreaks, 126 were due to cholera. Out of the reported cholera outbreaks, Africa accounted 105 (83.3%) and western pacific region 21 (16.7%). Within those periods, a cholera outbreak that aroused from Zimbabwe spread to Botswana, Mozambique, Malawi, South Africa and Zambia that are the neighbouring countries of Zimbabwe. ⁽¹⁷⁾

A study conducted in Africa showed that Ethiopia's yearly incidence rate of cholera, 2009-2011, was 20-50 cases per 100,000 population. ⁽⁵⁾ The incidence was higher according to World Health Organization (WHO) 2012, that was 3.9-4.4 cases per 1,000 population. ⁽³⁾ Despite the above figures, underestimation and under reporting of the incidence of cholera is reported. A study conducted in India illustrated that within the years 1997-2006, the detected cases of cholera were 222,038. Only 37,783(17%) were reported to WHO. ⁽⁶⁾ Similarly, a study conducted in Western Kenya in 2008 showed that active case finding of cases increased the cases that were reported dead from 5.5 to 11.4% increase and 46% more surviving cases that were not reported to Ministry Of Health (MOH) district were found. ⁽⁷⁾

A study was conducted among WHO African regions to estimate the burden caused by cholera into economic cost. The finding showed that in 2005 there were 125,018 cases with the estimated economic loss of 39million USD for life expectancy of 40 years, 53.2million USD for life expectancy of 53 years and 64.2million USD for life expectancy of 73years. In 2006, 203,564 reported cases of cholera resulted in loss of 91.9million USD for life expectancy of 40years, 128.1million USD for life expectancy age of 53 and 156million USD for life expectancy of 73years of age. Similarly, in the year 2007, 110,837 reported cases of cholera led to estimated loss of economy of 43.3million USD for life expectancy of 40years, 60million USD for life expectancy of 53years and 72.2million USD for life expectancy of 73years of age. ⁽⁸⁾

1.1.2.2 Risk factors

Risk factors of cholera are overcrowding, inadequate water supply, poor quality of water, inadequate personal hygiene, poor hand washing facilities, poor sanitation, inadequate food safety and inadequate funeral services of cholera victims. ⁽²⁾

1.1.2.2.1 Environmental factors

Environmental conditions affect the incidence of cholera outbreak. A study conducted in Western Africa, 1975-2002, showed that cholera outbreak was associated with rainfall and climate variability. The oscillation of cholera outbreak and climate variability occurred at the same period. ⁽⁹⁾ Another study conducted at Zanzibar, temperature and rainfall increase was associated with increase in the number of cholera cases. ⁽¹⁰⁾ Major increase of cholera cases occurred during El Nino warm event in Burundi, Rwanda, Democratic Republic of Congo (DRC), Tanzania, Uganda and Kenya from year 1978-2008 and the cases decline in between the events. ⁽¹¹⁾

A study conducted in Ghana showed that high overcrowding, urbanization and living in the central part of the region was associated with high incidence of cholera. ⁽¹⁶⁾ Another study conducted in DRC from 2000-2005 showed that the source of the cholera outbreak in the area was the lakes. The movement of travelers and traders also has contributed to the transmission of the outbreak in the main cities. ⁽¹⁸⁾

In a study conducted in, 2000-2007, towns located in lakesides showed higher cholera epidemics. ⁽¹²⁾ Similarly, in a study conducted in Burundi, Rwanda, DRC, Tanzania, Uganda and Kenya showed that most of the cholera outbreaks were resided along the lakeside areas. ⁽¹¹⁾ In 1997 in Tanzania, cholera was significantly associated with people using river water for bathing. ⁽¹³⁾

1.1.2.2.2 Food and water related factors

In a matched case control study conducted in Ebeye Island, Republic of marshal islands with 53 case and 104 controls showed that storing water in water cooler with a tight fitting lead, drinking bottled water, boiled water, water with flavored powdered mixes were protective against cholera. ⁽¹⁴⁾ But availability of chlorine for water treatment and water storage in narrow mouthed container showed no association in a study conducted in Kenya. ⁽⁷⁾

A case control study conducted among refugees in Malawi showed that drinking river water, someone from the household visited the river were positively associated with the occurrence of the disease. In the same study, eating leftover food was a protective factor. ⁽¹⁵⁾

1.1.2.2.3 Other factors

Age matched case control study conducted in Western Kenya showed that antibiotics treatment at home, hospital admission, being treated at the governmental facilities, being educated by health professional about cholera were found to be protective. ⁽⁷⁾ In another study, there was no association between having cholera and eating outside home, washing hands before meal, by attending social gathering, eating leftover from social gathering. ⁽¹⁴⁾

1.1.3 Objectives

1.1.3.1 General objective

To investigate the magnitude and risk factors of Acute Watery Diarrhea outbreak in 2016 in Bole sub city, Addis Ababa, Ethiopia

1.1.3.2 Specific objectives

- To describe the magnitude of the Acute Watery Diarrhea outbreak in 2016 in Bole sub city, Addis Ababa, Ethiopia
- To identify the possible risk factors of Acute Watery Diarrhea outbreak in Bole sub city, Addis Ababa, Ethiopia

1.1.4 Methods

1.1.4.1 Study area

Addis Ababa is the capital city of Ethiopia. The city occupies 527 Km² surface area and bounded by Oromia region by north, south, east and west. There are 10 sub cities in the city administration and Bole sub city is one of the sub cities in the city. The sub city is bounded by Yeka sub city by north, Akaki sub city by south, Oromia region by east and Kirkos sub city by west. The sub city's total population in 2016 was 375,129. ⁽¹⁹⁾

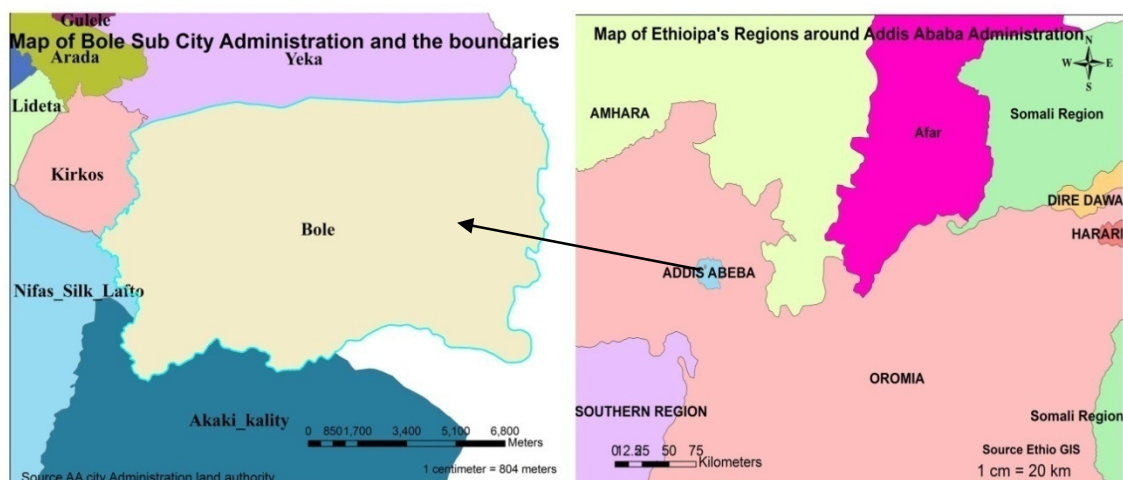


Figure 1.1 Map of Bole sub city on the left and Addis Ababa on the right

1.1.4.2 Study design

Descriptive cross-sectional study was conducted to determine the magnitude of the AWD outbreak. Unmatched case control study design was used with 1:2 case control ratio to identify the associated factors of AWD.

1.1.4.3 Population

1.1.4.3.1 Source population

The source population was all residents age five and above residing in Bole sub city within the study period.

1.1.4.3.2 Study population

People who fulfilled the criteria of eligibility, as listed below, of a case or control and that were included in the study.

1.1.4.3.3 Inclusion criteria

Case

A case of AWD was any person age greater than or equals to five years of age with presenting symptoms of acute watery diarrhea with or without vomiting with frequency of three or more diarrhea frequencies in 24 hours period.

Control

Control is any person with age greater than or equals to five years who did not fulfil the case definition, who lived in the same neighbourhood of the case in the past five days.

1.1.4.3.4 Exclusion criteria

Case

Cases of AWD that were not admitted at Amoraw Cholera Treatment Center (CTC) and did not reside at Bole sub city were excluded from the study.

Control

Controls that were not available during the study period were excluded from the study.

1.1.4.4 Sample size

Sample size was estimated using EpiInfo version 7 calculator, Fleiss with CC, 80% power, 95% confidence interval

1. Prevalence of sharing latrine three or more households' prevalence among cases was 67% and controls 51% in Kenya refugees making the sample size 121 cases and 241 controls using Fleiss with CC.
2. Prevalence of presence of soap among cases 61.3% and controls 87.1 in a study conducted in Kenya making the sample size 37 cases and 74 controls using Fleiss⁽²⁰⁾

3. Prevalence of observed faces on the ground among cases was 14.6% and controls 2.2% making the sample size of cases 46 and controls 91 using Kelsey in a study conducted in Kenya⁽²⁰⁾

The 3rd prevalence was used to estimate the sample size with 10% non-response rate. The final minimum sample size expected for the cases was 51 and controls was 101. Participants included in the study were 55 cases and 110 controls.

1.1.4.5 Sampling procedures

Cases were selected from patients who came to be treated for AWD in Amoraw CTC who fulfil the case definition within the study period. Cases were enrolled consecutively until the sample size was attained. Controls were selected from the same neighbourhood of the cases. First the house of the controls were selected from the neighborhood (people who lived in the houses of front and side of the cases up to the next road or turn about) randomly using lottery. Then the control to be interviewed were selected from the household by listing the names of the residents of the household who were available during the data collection period and randomly one was selected using lottery method. Participants who refused to participate in the study were considered as non respondents.

1.1.4.6 Data collection procedures

Line list was used to collect data on the overall socio-demographic characteristics of the patients treated in Bole sub city. A semi-structured questionnaire was used to collect the data of the case control study. The questionnaire had socio-demographic characteristics, clinical sign and symptoms and the risk factors. Two data collectors were trained on the purpose of the study and data collection instrument. Data was collected by the two data collectors and the principal investigator. Data was collected from the cases at Amoraw CTC and from the controls from the households they lived in.

1.1.4.7 Study Variables

The dependent variable was having AWD or not. The independent variables were age, sex, food consumed, ate leftover food, ate food outside home, types of beverages drunk, hand washing

practice, water used for drinking and domestic use, presence of toilet, solid waste disposal, visited a person with AWD, presence of AWD case in the household and attended a funeral.

1.1.4.8 Operational definitions

Suspected case of cholera is a patient aged 5 years or more develops acute watery diarrhea, with or without vomiting.

Confirmed case of cholera is a suspected case in which *Vibrio cholerae*O1 or O139 has been isolated from their stool.

Neighbor of the case is a person who lived next to the cases house front and side up to the road or turn about that separates it to the next block.

1.1.4.8 Data Analysis procedures

Descriptive statistics was done using Microsoft Excel 2007. Data was analyzed and presented by time, place and person. For the analytic part, data was entered and cleaned using EpiInfo version 7. Data was exported to Microsoft Excel 2007, then imported to SPSS version 21 for the analysis. Bi-variable logistic regression was done by testing the association of the independent variable with the dependent variable and calculated crude odds ratio. P-value less than or equal to 0.20 were included in the multivariable model. Multivariable logistic regression was done to calculate the adjusted odds ratio and variables with P value less than 0.05 were considered significant.

1.1.4.9 Data quality management

Training was given for two data collectors of the semi structured questionnaire and the line list. Data completeness of the semi- structured questionnaire was checked daily by data collectors and the principal investigator. The line list was cleaned daily by using Microsoft Excel 2007 filter command by identifying the outliers, variable with different value from the rest of the patients and rechecking. Data collection was supervised by the principal investigator.

1.1.4.10 Ethical consideration

Since this study was part of AWD outbreak control of Bole sub city Health Bureau ethical clearance was not obtained. Informed consent was obtained from each participants before proceeding with the data collection process. Code was given for each participants to keep confidentiality. Information on cholera sign and symptoms, method of transmission, treatment, prevention and control mechanisms was given for each participant.

1.1.5 Result

1.1.5.1 Outbreak report of Bole sub city

The first case in Bole sub city was reported on 12 June 2016 and the last case was on 12 September 2016. Overall cases of AWD in Bole sub city were 717. Two hundred twenty four (31.2%) were confirmed cases and 493 (68.8%) were suspected cases. Rapid Diagnostic Test (RDT) was used to confirm the cases. Two Cholera Treatment Center (CTC) were used to manage most of the cases in the sub city. These were Amoraw 328 (45.7%) and Dilfre CTC 288 (40.2%).

1.1.5.1.1 Description of AWD outbreak by person

The mean age of the patients was 32.9 years. From the reported cases male were 466 (65%). The mostly affected age category was 15-44 age category 529 (73.8%), followed by age greater and equal to 45 with 151 (21.1%) and 5-14 years with 37 (5.2%) patients.

Most of the patients were daily laborers 257 (35.8%), followed by housewives 105 (14.6%), private employees 77 (10.7%) and students 67 (9.3%). Source of water was household tap water for 694 (96.8%), communal tap water for 12 (1.7%) and spring for 11 (1.5%) of the patients.

All of the cases had watery diarrhea. Vomiting was present in 602 (84%) of the patients. Five hundred and fifty one (76.8%) presented with no dehydration, 25 (3.5%) with some dehydration and 41 (19.7%) with severe dehydration.

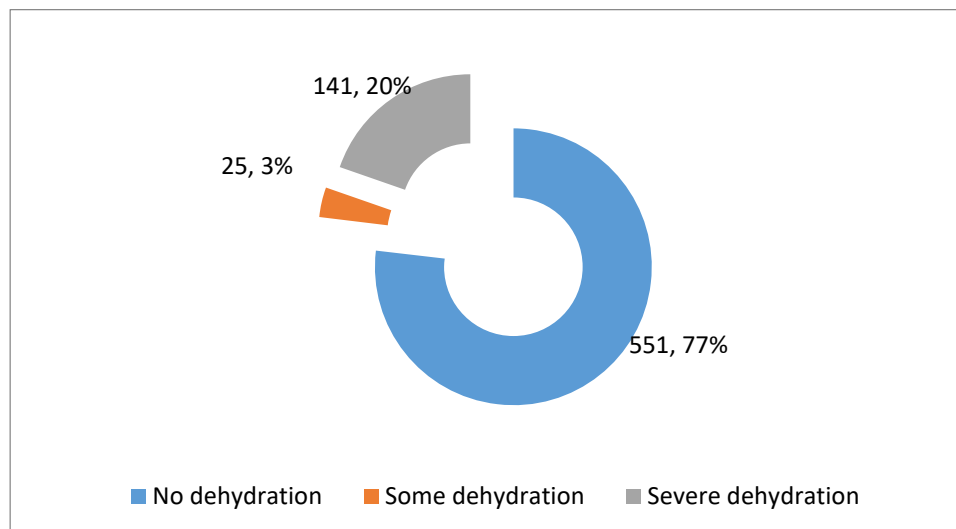


Figure1.2 Bole sub city AWD patients dehydration level, 2016

1.1.5.1.2 Description of AWD outbreak by place

The most affected Wereda was Wereda 10 with 161 patients which accounted 23.3% of Bole sub city report. The least affected Wereda was Wereda 2 with 8 (1%) patients. The highest attack rate was in Wereda 10 with 653/100,000 population and the lowest was Wereda 6 with 49/100,000 population. The total attack rate of the sub city was 198 per 100,000 population (Table 1).

Table 1.1 AWD patients of Bole sub city based on Wereda of residency, 2016

Bole Wereda	Number	Percentage	Population at risk	Attack rate/ 100,000
Street	1	0.1		
W01	34	4.7	30,997	110
W02	8	1.1	9,063	88
W03	38	5.3	34,938	109
W04	26	3.6	31,936	81
W05	13	1.8	22,254	58
W06	20	2.8	40,514	49
W07	93	13.0	23,455	397
W08	83	11.6	27,840	298
W09	87	12.1	27,840	313
W10	167	23.3	25,591	653
W11	17	2.4	8,926	190
W12	38	5.3	16,362	232
W13	74	10.3	35,493	208
W14	18	2.5	26,802	67
Grand Total	717	100	362,011	198

1.1.5.1.3 Description of AWD outbreak by time

The outbreak took four months. The highest date of onset reported was on 1 August 2016 with 20 cases as seen in the figure 3 below. The epidemiologic curve was increasing over time up to 1 August 2016 and declined after that. It had multiple pick points. The curve shows that the outbreak had multiple waves and taller pick points.

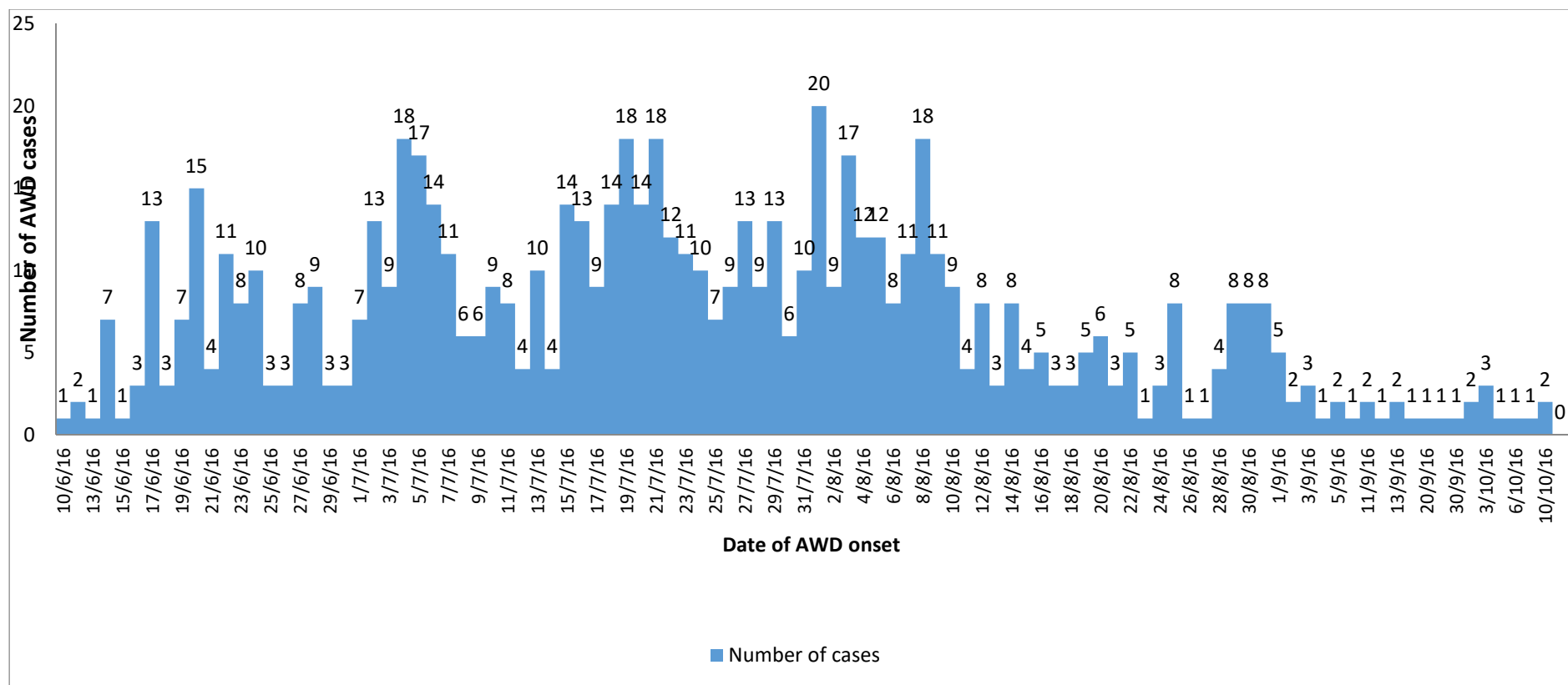


Figure 1.3 Bole sub city AWD patients date of onset, 2016

1.1.5.2 Findings of the cases control study

Out of 165 cases and controls 160 participated in the study giving response rate of 97%. Fifty five(34.4%) were cases and 105(65.6%) were controls. Male participants were 69 (43.1%) while female were 91(56.9%). The mean age of the participants was 28.7 with 7 the minimum age and 80 the maximum age. All of the participants resided in Bole sub city. The majority of the participants 44(27.5%)resided in Wereda 9, followed by Wereda 8 with 40(25%), Wereda 10 with 40 (25%), Wereda 7 with 30 (18.8%), Wereda 1 and Wereda 5 with 3(1.9%) participants. Forty three (26.7%) of the participants had vomiting, 55 (34.4%) had diarrhea and 41 (25.6%) had dehydration.

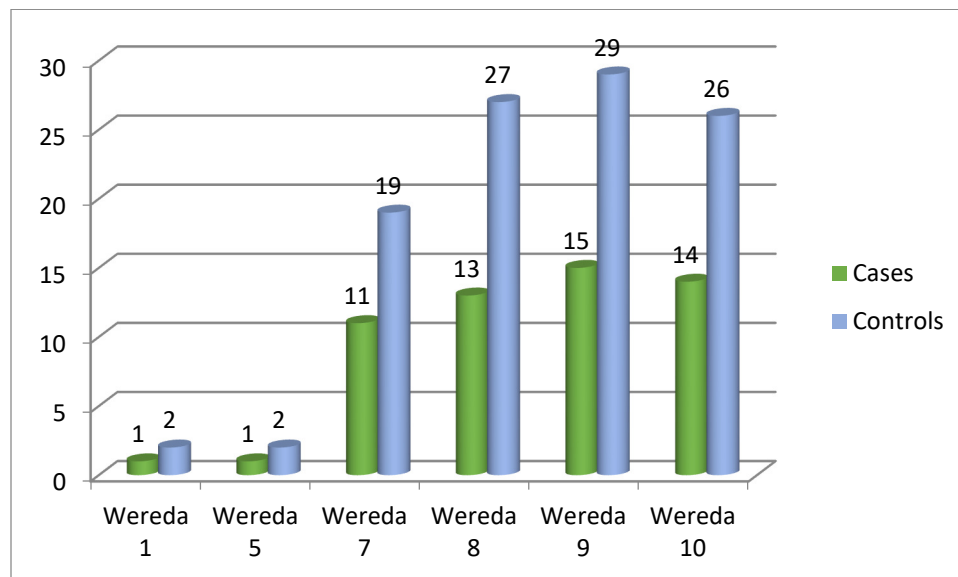


Figure 1.4Participants classification based on the place of residence Wereda in Bole sub city, 2016

Most of the participants were housewives 38(23.8%), followed by daily labourers 33(20.6%), student 21(13.1%) and merchants 19 (11.9%) as seen in the graph below.

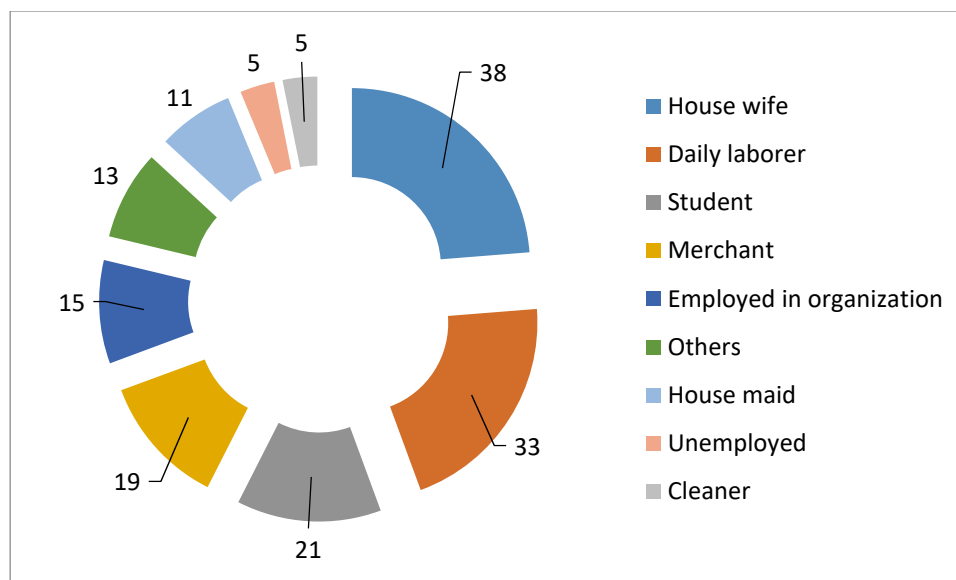


Figure 1.5 Participants occupational status in Bole sub city, 2016

Six (10.9%) of the cases and 10 (9.5%) of the controls drunk holy water the last 5 days of the data collection period. Thirty two (20%) of the participants ate fruits, 25 (15.6%) ate raw meat, 18 (1.3%) ate partially roasted meat, 24(15%) drunk milk and 2 (1.3%) ate fish within the last five days of data collection period. Among the cases 30(54.5%) and controls 25(23.8%) ate outside home before 5 days of showing symptoms for the cases and within the last five days of data collection for controls. The numbers of participants bought groceries from street shops were 57(35.6%), local markets were 99 (61.9%) and from private farm or garden were 2 (1.3%). From all the participants 55(34.4%) ate food outside home. Eighteen (14.4%) of the cases and 3(2.9%) of the controls are left over food within the last 5 days of start of illness for the cases and within the last 5 days of data collection for controls. Home beverages were used by 31(19.4%) of the participants.

Personal hygiene mechanisms were assessed in this study. Forty three (78.2%) of the cases and 86 (93.8%) of the controls reported that they wash their hands with soap and water regularly before eating food. Forty three (78.2%) of the cases and 95 (90.5%) of the controls reported that they washed their hands regularly with soap and water after using toilet. Latrine was available among 150 (93.8%) of the participants and 8 participants defecate openly and 2 used the rivers.

Four (7.3%) of the cases had a person with diarrhea and vomiting living in their household while there was not any in the control side. Twenty(12.5%) of the participants reported that they have visited a person with AWD the last five days. Three (5.5%) of the cases attended a funeral related to AWDwhile none of the controls attended any.

Table 1.2 Risk factors of Acute Watery Diarrhea among participants at Bole sub city, 2016

Variable		COR	P value
Age			
	5-14	1	0.13
	15-44	0.14 (0.00-0.39)	
	45+	0.5 (0.07-3.52)	
Sex			
	Male	3.6 (1.8-7.2)	<0.001
	Female	1	
Ate vegetable salad the last 5 days			
	Yes	1.3 (0.44-3.88)	0.631
	No	1	
Ate fruit the last 5 days			
	Yes	0.7 (0.29-1.63)	0.407
	No	1	
Ate raw meat the last 5 days			
	Yes	22.67 (6.37-80.59)	<0.001
	No	1	
Ate partially roasted meat the last 5 days			
	Yes	1.62 (0.60-4.37)	0.343
	No	1	
Drunk milk the last 5 days			
	Yes	0.14 (0.03-0.63)	0.010
	No	1	
Ate food outside home			
	Yes	5.79 (1.47-22.8)	<0.001
	No	1	
Ate leftover cold food the last 5days			
	Yes	5.79(3.05-19.03)	0.012
	No	1	
Wash hands with soap regularly before eating			
	Yes	0.8 (0.35-1.78)	0.572
	No	1	

Variable		COR	P value
Have latrine			
	Yes	1.23 (0.31-4.99)	0.764
	No	1	
Wash hands with soap regularly after using toilet			
	Yes	0.38 (0.15-0.94)	0.036
	No	1	
Presence of AWD case in the household the last 5days			
Regular source of water for the house hold			
	Household tap water	1	0.174
	Communal tap water	1.05 (0.21-5.18)	0.954
	Spring	0.55 (0.12-2.30)	0.449
Regular source of water for drinking			
	House hold tap water	1	0.324
	Communal tap water	1.21 (0.36-4.09)	0.754
	Spring	0.61(0.20-1.87)	0.391
	Bottled water	1.13 (0.18-6.93)	0.899
Drunk homemade beverages the last 5 days			
	Yes	2.09 (0.94-4.63)	0.071
	No	1	
Treat water before drinking			
	Yes	0.17 (0.08-0.4)	<0.001
	No	1	
Filter			
	Yes	0.75 (0.14-4.02)	0.737
	No	1	
Boiling			
	Yes	0.15 (0.04-0.52)	<0.001
	No	1	
Water guard			
	Yes	0.26 (0.09-0.81)	0.009
	No	1	
Drink holy water			
	Yes	1.16 (0.4-3.39)	0.783
	No	1	

Bold P values are P values less than 0.20, # - OR couldn't be calculated because one of the cells had 0 value

Most of the participants 103 (64.4%) used communal tap water for regular domestic use, followed by household tap water 50 (31.3%) and spring water 7 (4.4%). For regular source of drinking waters 71 (67.6%) of the participants used communal tap water, 21(20%) used household tap water, 9(8.6%) used bottled water and 4(3.8%) used spring water.

Nine(16.4%) of the cases and 59(53.3%) of the controls treated their water before drinking. Thirty-two (20%) of the participants boiled, 28(17.5%) used water guards and 7 (4.4%) filtered their waters for drinking.

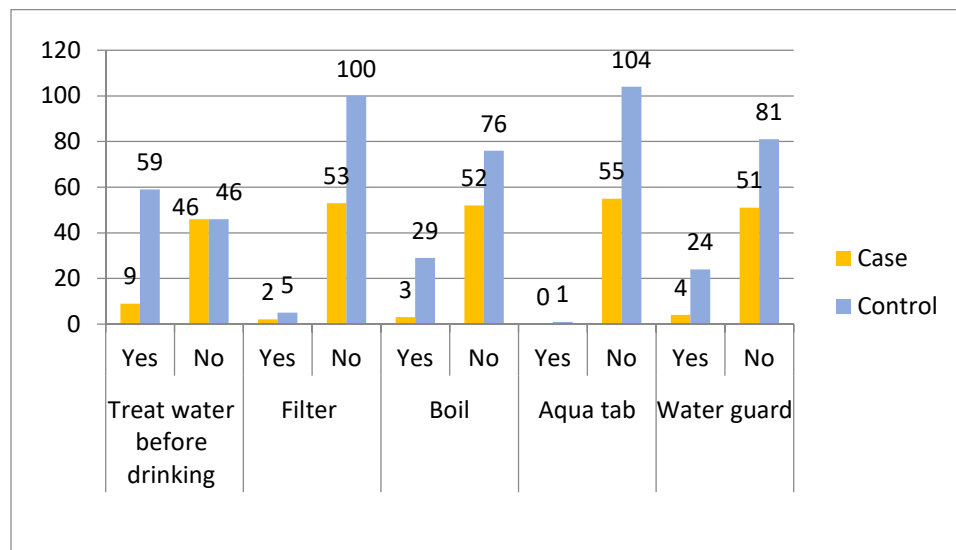


Figure 1.6 Treatment of water for drinking among participants, 2016

Variables that had p value of 0.20 and below were sex, hand washing practice after use of toilet, treated water for drinking, boiled water for drinking, used water guard to treat water, ate raw meat, ate food outside home, ate leftover food, drunk homemade beverages and drunk milk.

On multivariable analysis, significant association was detected in treatment of water by boiling and using water guard, eating raw meat, eating cold leftover food and drinking milk. In the case control study, eating raw meat and leftover food were risk factors and milk was preventive factor for AWD. Patients with AWD had odds of eating raw meat 39.6 times than those without AWD. Patients with AWD had the odds of eating leftover cold food 9.17 times than those without AWD. People that drunk milk products were 92% times less likely to develop AWD as compared to those who did not drink. People who boiled drinking water were 97% times less

likely to develop AWD as compared to those who did not boiled drinking water. People who treated drinking water with water guards were 93% times less likely to develop AWD as compared to those who did not treat with water guards. No significant association was detected with washing hands before eating and after eating or having a latrine or visiting a person with AWD.

Table 1.3 Exposure and outcome association among participants in Bole sub city, 2016

Variable	Adjusted odds ratio(95% confidence interval)	
Age	5-14	0.30 (0.02-4.12)
	15-44	0.61 (0.17-2.24)
	44+	1
Sex	Male	1.52 (0.50-4.12)
	Female	1
Treat water before drinking	Yes	4.93(0.52-46.75)
	No	1
Boil	Yes	0.03 (0.01-0.39)
	No	1
Water guard	Yes	0.07 (0.01-0.8)
	No	1
Ate raw meat the last 5 days	Yes	39.6 (6.31-248.18)
	No	1
Drunk milk the last 5 days	Yes	0.08 (0.01-0.67)
	No	1
Ate food outside home	Yes	0.94 (0.28-3.11)
	No	1
Ate leftover cold food the last five days	Yes	9.17 (1.58-53.31)
	No	1
Drunk homemade beverages the last five days	Yes	1.50 (0.49-4.58)
	No	1
Wash hands with soap after defecation	Yes	0.33 (0.10-1.08)
	No	1

Bold P values are P values less than 0.05

1.1.5.4 Prevention and control activities

To prevent and control the outbreak many activities were implemented. These activities include: contact tracing and follow up, disinfection of the patients households, provision of health education, proper liquid and solid waste management, patient management, social mobilization, logistic support for selected patients, distribution of water guard and provision of water supply were provided.

1.1.6 Discussion

Descriptive analysis was done to identify the magnitude of AWD outbreak at Bole sub city, 2016 and found that the attack rate of the outbreak was 198 per 100,000 population. Case control study was also conducted in AACAHB Bole sub city to identify the risk of AWD outbreak. The identified risk factors were eating raw meat and leftover cold food. The preventive factors were using boiled water, water guards for drinking water and use of milk products.

The most affected Wereda in the sub city was Wereda 10 with 653/100,000 population and the lowest Wereda 6 with 49 cases per 100,000 population. The sub city's attack rate was 198 people per 100,000 population. The incidence of cholera ranged from 0.5-4 per 1,000 in Asia and Africa annually. ⁽⁴⁾A study conducted in Nigeria has showed lower attack rate 47.8 cases per 100,000 population. ⁽²¹⁾Similarly, study conducted in sub Saharan countries, the incidence was 51.26 per 100,000 populations. ⁽⁵⁾ Another study in South African in 2008/2009 showed higher attack rate 330 cases per 100,000 population. ⁽²²⁾In the outbreaks of Bole sub city, Nigeria and South Africa, there was nearly similar duration of the outbreaks. ^(21, 22)In this study the epidemiologic curve showed that the outbreak had multiple picks while study conducted in Nigeria showed that the epidemiologic curve had only three picks. ⁽²¹⁾

In this study, risk factor for AWD was eating raw meat. Raw foods transmit cholera if contaminated with *V. cholerae*. ⁽²³⁾ Animal meat used for food consumption could be contaminated with *V. cholera* during meat handling, food preparation, storing and eating. The bacteria can survive in improperly cooked meat and cooked chicken meat for several days. ⁽²⁴⁾

Eating leftover cold food was a risk factor for AWD in this study. Eating leftover non refrigerated food was risk factor in a study conducted in Iran. ⁽²⁵⁾On the other hand, eating leftover from social gathering was not associated with AWD in a study conducted in Marshal Islands. ⁽¹⁴⁾

Drinking milk products was preventive for AWD in this study. Fermented milk prevents cholera due to its acidity. ⁽²⁾In this study milk consumption was not classified as fermented or not in the questionnaire. But a systematic review showed that *V. cholera* can survive in milk products for

more than two weeks even after refrigeration. ⁽²⁴⁾ Participants in this study might have reported fermented milk as they may have consumed milk.

Treatment of drinking water by boiling and using water guard was preventive for AWD in this study. In a matched case control study conducted in Ebeye Island, Republic of Marshall Islands with 53 cases and 104 controls showed that storing water in water cooler with a tight fitting lid, drinking bottled water, boiled water, water with flavoured powdered mixes were protective against cholera. Similarly, study conducted in Sierra Leone showed drinking non chlorinated water was a risk factor for cholera. ^(14,26) But availability of chlorine for water treatment and water storage in narrow mouthed container showed no association in a study conducted in Kenya. ⁽⁷⁾ In another study, there was no association between water treatment for drinking and cholera. ⁽²⁶⁾

No association was detected between washing hands before meal and after toilet use in this study. Similarly, washing hands before meal was not associated with having AWD in a study conducted in Marshall Islands. ⁽¹⁴⁾ Since hand washing practice was not observed, there might be social desirability bias. In another study, having soap for hand washing practices was strong protective factor. ⁽²⁷⁾ Having latrine was not associated with having AWD in this study. But a systematic review showed that scarcity of latrine in slum areas and camps was significantly associated with cholera outbreak occurrence. ⁽²⁸⁾

Eating raw vegetables and fruits were not associated with occurrence of AWD in this study. Fruits and vegetables can be contaminated by *V. cholera* polluted water and transmit the disease. Fruits that have acidity with PH less than 4.5, like lemon and orange, prevent the replication of the bacteria. But raw onions and garlic have a favourable environment for the bacterial replication. ⁽²⁴⁾

Even if the AR of AWD was similar to the other LMIC, it has caused many people morbidity and missing days from school and work. This might have affected the productivity of the patients that indirectly affects the economy of the sub city. A study conducted in WHO regions showed that cholera outbreaks had impacts on the economy of the country and the life expectancy of the

community.⁽⁸⁾ Preventing and early controlling of AWD outbreak prevent economic loss of the community, sub city, region and the country in general.

Many health professionals and non-health professionals were assigned to manage the patients, educate the community, disinfect the houses of the patients and to contact trace and do follow ups. These professionals missed their routine activity to undertake the outbreak prevention and control activities that indirectly affect other health services provided by health facilities. To manage the patients many medicine and medical supplies were used which could have been used to provide other services. Strengthening prevention and control activities of outbreaks might have reduced these burdens in the health facilities. This study has identified the magnitude and the associated factors of AWD outbreak in Bole sub city. This helps researchers to use this study as a base line in that specific location and carryout further studies by addressing this study limitation.

The outbreak took four months to control. This might be due to poor availability of latrine, solid waste management, access to clean water, poor personal hygiene and hand washing practices.⁽²⁾ Poor system of Public Health Emergency Management might have caused the inability to control the outbreak within short period of time. Since cholera is transmitted through feco- oral route, lack of the basic infrastructures like water and sanitation services and inter-sectoral collaboration of these sectors with the health sector might have also contributed. Strengthening the Public Health Emergency Management system and addressing the basic infrastructure problems might help in prevention and control of similar outbreaks in the future.

Limitation

Risk factors related to rainfall, living next to river, income and overcrowding risk factors were not included in the study. Participants that were absent during the data collection period in the selected household were not included in this study. The milk products were not classified as fermented or non-fermented.

1.1.7 Conclusion and Recommendations

1.1.7.1 Conclusion

The AWD outbreak has caused many patients illness and missing days out of school and work. These indirectly affect the economy of the individual, community, sub city, region and the country in general. The risk factors identified for Bole sub city during cholera outbreak of 2016 were eating raw meat and cold leftover food. The preventive factors were using boiled water, water guards for drinking water and use of milk products.

1.1.7.2 Recommendation

Sub city

Educating the community on raw meat and cold leftover food consumption during the outbreak periods and utilization of water treatments like water guards and boiling would help in prevention and control of cholera outbreaks. The sub city should supervise meat-selling places on the sanitation of the place, meat handling and distribution. The sub city must avail and distribute water guards to the community during outbreak period. Strengthening prevention, early detection and control mechanisms by the sub city would help controlling the outbreak within short period.

Addis Ababa City Administration Health Bureau

The health bureau must strengthening the Public Health Emergency Management activities and avail water guard during AWD outbreaks. The health bureau should strengthen the intersectoral collaboration between stakeholders like water and sanitation sectors and work on building the basic water and latrine infrastructures.

Ethiopia Public Health Institute

To prevent and control recurrent cholera outbreaks, addressing basic infrastructure issues like access to clean water and proper waste management should be considered. To address these issues inter-sectoral collaboration must be strengthened.

1.1.8 Acknowledgement

I would like to thank God for all His blessings. I am grateful for Dr. YosephWorku for his unreserved comment and support in the realization of this document. My appreciation extends to Bole sub city health office staffs for their valuable contribution in availing information that is needed. I would like to thank my data collectors and all the participants who were willing to be involved in the study.

1.1.9 Reference

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1.1.10 Annex

1.1.10.1 Questionnaire

This study is conducted by Addis Ababa Regional Health Bureau in collaboration with St. Paul Hospital Millennium Medical College for the ongoing response to AWD outbreak in AA. All the information that you will give will be handled confidentially and your name won't be mentioned.

Are you willing to participate in the study?

Yes _____

No _____

I.	General information		
	Code		
1.	Case	Control	
2.	Age in years		
3.	Sex	Male	Female
4.	Occupation		
5.	Region		
6.	Sub city		
7.	Wereda		
8.	Ketena		
9.	Phone number		
II.	Clinical information		
1.	Date of onset		
2.	Presenting symptoms		
	Vomiting	Diarrhea	
	Dehydration		
	Others specify _____		
3.	Where you hospitalized?	Yes	No
3.1	If yes, date of admission		
III.	Exposure		
1.	What was regular source of water for domestic use in the last five days?		
	House hold tap water	Communal tap water	
	River	Well	
	Borehole	Spring	
	Street vended water	Tank water(ROTO)	
	Bottled water	Others specify _____	
2.	Regular source of water for drinking water use in the last five days?		
	House hold tap water	Communal tap water	
	River	Well	
	Borehole	Spring	
	Street vended water	Tank water(ROTO)	
	Bottled water	Others specify _____	
3.	Did you treat the water before drinking?	Yes	No
3.1	If yes, how did you treat it?		
	Filter	Boiling	Aqua tab

	Water guard ☐	Bishangare ☐	Pure ☐
	Others, specify _____		
4.	Did you drink holy water in the last five days before illness?	Yes ☐	No ☐
	Where is the address?		
	What is the source of holy water site?		
	Spring ☐	Piped water ☐	Well ☐
	Others, specify _____		
IV.	Food and beverages		
1.	Did you eat any of the following before 5days prior to the onset of illness for case and the last 5 days for control?		
	Vegetable salad ☐	Fruits ☐	Raw meat ☐
	Partially roasted meat ☐	Fish ☐	Milk ☐
	Others, specify _____		
2.	Where did you get or buy food for your house hold?		
	Local market ☐	Private garden/farm ☐	
	Street shops ☐	supermarkets ☐	
	Others, specify _____		
3.	Did you eat food outside your home in the last five days?	Yes ☐	No ☐
3.1	If yes, where?		
	By street vendors ☐	Hotel ☐	At a gathering ☐
	Restaurant ☐	School/work cafeteria	
	Others, specify _____		
4.	Did you eat any cold left-over food in the last 3 days?	Yes ☐	No ☐
4.1	If yes, where is the source of the food?		
	Home ☐	Hotel ☐	Restaurant ☐
	University ☐	Others, specify _____	
5.	Did you drink any of the following locally made beverages in the last 5days?	Yes ☐	No ☐
	Shemeta ☐	Borde ☐	Beso ☐
	Kinito ☐	Others, specify _____	
V.	Hygiene and sanitation		
1.	Do you regularly wash your hands with soap before eating?	Yes ☐	No ☐
2.	Do you have latrine at your house?	Yes ☐	No ☐
2.1	If yes, what type?	Communal ☐	Private ☐
2.2	If no, where do you discharge human waste?		
	Open defecation ☐	In the river ☐	Bury in the soil ☐
	Others, specify _____		
3.	Do you wash your hands every time with soap after defecation?	Yes ☐	No ☐
4.	Where do you dispose your wastes?		

	Open pit	In the river	Open dumping
	Bury	Burn	At mobile containers by sanitarians
	Others, specify _____		
VI.	Other exposures		
1.	In the last one week did anyone in your household have diarrhea or vomiting?	Yes	No
2.	Did you visit anyone having diarrhea or vomiting?	Yes	No
3.	Did you attend a funeral within the last five days?	Yes	No
4.	Did you travel to a place affected with diarrhea and vomiting illness?	Yes	No
5.	If yes, where? (sub city, Wereda, ketene)		

Chapter – II: Surveillance Data Analysis Report

2.1 Four years hypertension trend analysis in Bole sub city, 2012-2015

Executive summary

Background

Hypertension is one of the Non-communicable diseases. The disease affects the human body by impairing the normal functions of the brain, heart, kidney and peripheral arteries. The criteria for a diagnosis of hypertension are average awake blood pressure $\geq 135/85$ mmHg and asleep blood pressure $\geq 120/75$ mmHg. These levels approximate a clinic blood pressure of 140/90 mmHg. It is projected that by 2025, out of 4 hypertensive cases 3 will be from low and middle income countries. This study is useful in showing the trend of hypertension in the sub city in the past 4 years.

Objective

To describe the trend of hypertension at Bole Sub city from 2012-2015

Methods and materials

Secondary data was collected from year 2012-2015 using semi structured questionnaire. The data was collected, analyzed and interpreted from April 24-June 13, 2016. Retrospective record review from eHMIS was undertaken. Data was entered on Microsoft Excel and data quality was checked then descriptive analysis was done.

Result

Bole sub city had a catchment population of 342,568 in 2011/2012, 349,712 in 2012/2013, 359,859 in 2013/2014 and 367,413 in 2014/015. The sub city is one of the well to do sub cities in Addis Ababa city administration. There were a total of 20,300 cases of hypertension and related diseases that were treated in the health facilities of bole sub city administration. Among these there were 1,237(6.1%), 3,202(17.3%), 4,049(19.9%) and 11,509(7%) case seen in the year 2012, 2013, 2014, and 2015 respectively. Within the four years period 8,868(43.7%) male cases and 11,433(56.3%) female cases came to get treatment for hypertension and related diseases.

Conclusion and recommendation

Trends of hypertension and related diseases from 2012-2015 reported in the HMIS in bole sub city showed that the incidence of hypertension cases increased throughout the years. The mostly affected sex was female and age group was age greater than 15 years and above. Other studies showed that the proportion of male and female cases vary between studies. Among the admitted cases of hypertension and related diseases 2.05% died. Male admission was higher than female admissions. There was poor completeness of data until 2015 since most of private health facilities did not start reporting before 2015. Attention should be given in prevention and control of hypertension since increase in the incidence of the cases has been seen. Data quality assurance and data handling mechanisms should be strengthened in the sub city.

2.1.1 Introduction

2.1.1.1 Background

Hypertension is high blood pressure that is caused by the force of blood pushing against the walls of arteries as it flows through them [1]. It is one of the Non Communicable Diseases (NCDs). The disease affects the human body by impairing the normal functions of the brain, heart, kidney and peripheral arteries. The criteria for a diagnosis of hypertension are average awake blood pressure $\geq 135/85$ mmHg and asleep blood pressure $\geq 120/75$ mmHg [2]. These levels approximate a clinic blood pressure of 140/90 mmHg. People who are overweight, high intake of table salt, low Calcium intake, excess alcohol consumption, psychosocial stress, low level of activity and family history of hypertension can contribute to the development of hypertension [2]. Multiple studies have shown an association between excess alcohol intake and development of hypertension [3-7]. On the other hand moderate alcohol intake appears to have a cardio protective effect even in patients with preexisting hypertension [8, 9].

Hypertension is a leading cause of cardiovascular disease worldwide [10]. The proportion of the global burden of disease attributable to hypertension has significantly increased. A study conducted in 2000 showed about nearly 1 billion adults which was 4.5% of the world's population had hypertension [11] and in 2010 another study showed 7 percent prevalence [12]. This makes hypertension the single most important cause of morbidity and mortality globally and highlights the urgent need of action to address the problem [13].

Previously hypertension was not common in low and middle income countries. It was mainly the disease of the rich but these days the disease is emerging in low and middle income countries too [14, 15]. This makes it difficult to control the disease since these countries are affected by infectious diseases also [15].

A study conducted in lower and middle income countries showed that globally hypertension affects about 32.3% of the population, with a range of 23.1- 37.8% in low income and middle income countries [16]. It is projected that by 2025, out of 4 hypertensive cases 3 will be from low and middle income countries. This increase might be due to globalization, economic improvement, and urbanization and improved life expectancy in these countries [17]. Due to

rapid epidemiological transitions, urbanization and changing life styles, there is raised incidence of NCD especially cardiovascular ailments in Sub Saharan African countries [18]. In these countries, there is an increase in obesity prevalence while epidemics of malnutrition are still there [19-21]. Global Burden of Disease studies estimated age-standardized death rates of 800 per 100,000 populations for NCDs in Ethiopia, of which higher death rates (approximately 450 per 100,000) were attributed to cardiovascular disease and diabetes, 150 per 100,000 attributed to cancer, and 100 per 100,000 to chronic obstructive pulmonary disease [22].

A community based study conducted in Oromia in 2014 showed that the prevalence of hypertension was 16.9% [23] while in a study conducted in the capital city Addis Ababa in 2009 it was 30.3% [24]. The burden of newly increasing number of NCD and the presence high prevalence of communicable diseases is making it difficult for Ethiopia to control these diseases and in distribution of resources. These double burden diseases are making Ethiopia to lag behind in economic development [25].

2.1.1.2 Rationale of the study

The prevalence of hypertension has increased the past couple of years globally including Ethiopia causing many morbidity and mortality. A study conducted in Addis Ababa Ethiopia from 2000-2009 showed that from all the deaths, 51% of deaths were attributed to NCDs', 42% to communicable diseases and 6% to injuries. The cause of death was ill-defined for 7% of deaths. These percentages exceeded 100% because multiple causes could be recorded for 1 death. Proportions of male and female deaths due to NCD and communicable diseases were similar, but more women than men died of both while injuries were responsible for 10% of male and 3% of female deaths. Among the NCDs' the leading cause of death was cardiovascular disease (24%); proportions for hypertension (12%) and stroke (11%) were similar and constituted most of the CVD deaths [26].

A systematic meta-analysis done in Ethiopia which included 9 studies showed that the prevalence of hypertension among Ethiopian population was estimated to be 19.6 % (95 % CI: 13.7 %, 25.5 %). Subgroup analyses indicated that the prevalence of hypertension is higher in the urban population (23.7 %) than rural and urban combined (14.7 %). The prevalence of hypertension among males (20.6 %) and females (19.2 %) was similar [27]. Another study done in Ethiopia with 9 surveysshowed that there was high prevalence of hypertension in people living in urban areas due to overweight, family history of hypertension, age, sex, sleeping for less than 5 hours, Oral contraceptive use, alcohol intake, physical inactivity, eating vegetable three or fewer days per week, high salt intake, obesity, higher education and vigorous recreational activities [28].

Hypertension can cause hypertensive crisis and in development of chronic diseases such as heart failure, coronary artery disease, renal disease and peripheral arterial disease.

This study will be useful in showing the trend of hypertension in the sub city in the past 4 years and be useful in making decision for public health action for Bole sub city health office and Addis Ababa Regional Health Bureau.

2.1.2 Objectives

2.1.2.1 General objective

To describe the four years trend of hypertension at Bole Sub city from 2012-2015

2.1.2.2 Specific objective

- To discuss the changes in the trend of hypertension in Bole sub city
- To identify the mostly affected groups among hypertensive cases in Bole sub city

2.1.3 Methods and materials

2.1.3.1 Setting

Addis Ababa is the capital city of Ethiopia. The city occupies 527 Km² surface area and bounded by Oromia region by north, south, east and west. There are 10 sub cities in the city administration and bole sub city is one of the sub cities in the city. The sub city is bounded by Yeka sub city by north, Akaki sub city by south, Oromia region by east and Kirkos sub city by west.

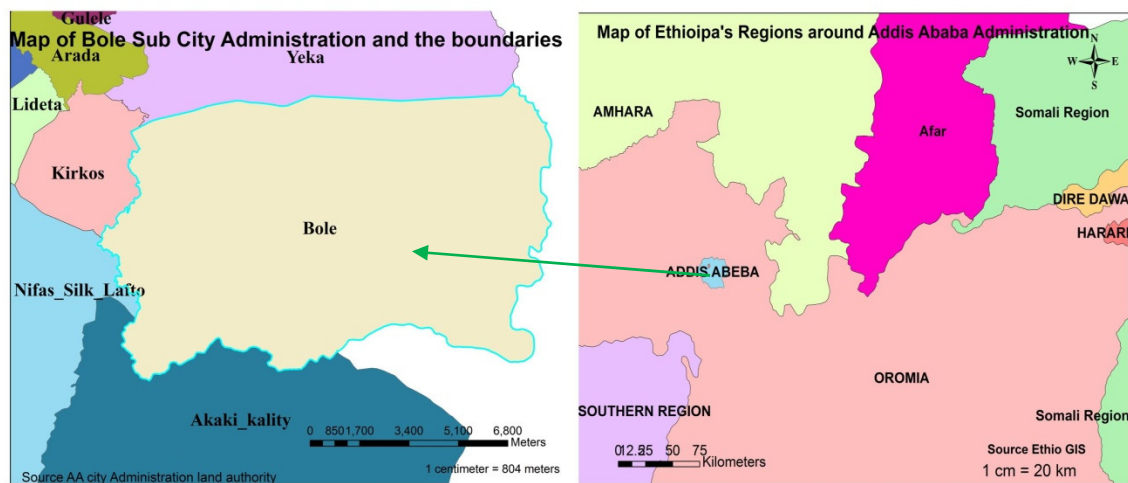


Figure 2.1 Map of Addis Ababa and Bole sub city administration

2.1.3.2 Data collection tool

Data was collected by using a semi-structured questionnaire from May 24-27, 2016 from Bole sub city health office. All the newly diagnosed hypertensive and related diseases cases from electronic Health management Information System (eHMIS) was counted and analyzed.

2.1.3.3 Study period

Secondary data was collected from the year 2012- 2015. This data was collected, analyzed and interpreted from April 24- Jun 13, 2016 G.C.

2.1.3.4 Study design

The study design used was retrospective record review.

3.5 Population

2.1.3.5.1 Source population

The source population was all cases who visited private and government health facilities that were found in Bole sub city during 2012-2015.

2.1.3.5.2 Study population

The study population was hypertensive cases who visited health facilities in Bole sub city from 2012-2015 and who were reported for Bole sub city health office as cases of hypertension and related diseases using HMIS were included in the study.

2.1.3.6 Data source

Secondary data was used to carry out the analysis. Four years monthly reports of disease classification hypertension and related diseases were reviewed from eHMIS software.

2.1.3.7 Data variables

The variables assessed were total admissions, total number of cases treated at the OPD, admission due to hypertension, number of hypertensive cases treated at the OPD, number of deaths, number of cases of hypertension based on their age and sex category. The cases are classified into new and repeat cases in the HMIS.

New cases- are cases who came for diagnosis or treatment of hypertension and related diseases for the first time in any health facility or hypertensive patients who came developing a new complication for the first time.

Repeat cases- are cases who previously came for diagnosis or treatment of hypertension and related diseases and now came for follow up visits.

2.1.3.8 Operational definitions

Hypertensive case is any person who presented to a health facility with BP greater or equal to 140/90mmHg excluding pregnancy related hypertension.

2.1.3.9 Quality assurance and control

Data quality was checked for validity, reliability, precision, integrity and timeliness of data quality standards. Since the study is done on health facility reports the validity of the study to represent the entire community is limited. To assure reliability the data was taken from HMIS

exported to Microsoft Excel and before analysis. The precision of the data is limited since it does not represent cases that did not come to health facility and that were not reported in the HMIS. Some outliers like reported cases less than 5 years were investigated and were found that the health facilities did not have the blood pressure cuff to measure under five years children so all data below 5 years were omitted to reduce simple errors and assure integrity and the data was timely.

The sub city had a quality assurance mechanism that is expected to be done monthly by selecting sample indicators by lottery method but this activity was performed irregularly.

2.1.3.10 Data analysis

Data was entered on Microsoft Excel. After cleaning of the data, findings were analyzed based on person and time and presented using tables and graphs.

2.1.3.11 Dissemination of result

After completion of the analysis, the report will be submitted and will be presented to the Bole sub city health office. The findings will be shared to St. Paul's Millennium Medical College, Addis Ababa City Administration Health Bureau (ACAHB) and Bole sub city health office through hard and soft copies.

2.1.3.12 Ethical consideration

A letter was given to Bole sub city health office from St. Paul Hospital Millennium Medical College to undertake the study. The study was done after getting an approval from Bole sub city health office to proceed with the study.

2.1.4 Result

Bole sub city had a catchment population of 342,568 in 2011/2012, 349,712 in 2012/2013, 359,859 in 2013/2014 and 367,413 in 2014/015 [29]. The sub city is one of the well to do sub cities in Addis Ababa city administration.

In the sub city in 2015 there were 11 private hospitals, 9 government health centers, 121 private clinics, 116 private pharmacies and drug stores, 4 health science colleges and 1 medical college [29].

Table 2.1.1 Bole sub city HMIS reported facilities 2012-2015, Addis Ababa, June 2016

No.	Facility	2012	2013	2014	2015
1.	Hospitals	*	*	*	11
2.	Health centers	9	9	9	9
3.	Clinics	*	*	*	65

**The number of health facilities wasn't indicted but it was reported as private for profit, nonprofit hospitals and clinics.*

Most of the private health facilities started reporting in 2014 and only in 2015 the reports of private health facilities were classified by their health facility names.

From 2012-2015 there were 20,300 cases of hypertension and related diseases that were treated in the health facilities of bole sub city administration. Among these there were 1,237(6.1%), 3,202(17.3%), 4,049(19.9%) and 11,509(56.77%) case seen in the year 2012, 2013, 2014, and 2015 respectively. Throughout the years, the number of cases treated in the health facilities has increased, especially in the year 2015 the cases nearly tripled from the previous year. Every year the number of female cases who came to the health facilities in Bole was higher than male cases. Within the four years period 8,868(43.7%) male cases and 11,433(56.3%) female cases came to get treatment for hypertension and related diseases. The detailed information can be seen below in the table.

Table 2.1.2 Bole sub city total OPD and IPD cases of hypertension and related diseases treated, 2012-2014

No.	Year	Age Group	Male	Female	Total	Cumulative
1.	2012	Age <=4	0	0	0	1237
		Age 5- 14	3	10	13	
		Age>=15	441	783	1224	
2.	2013	Age <=4	0	0	0	3505
		Age 5- 14	19	63	82	
		Age>=15	1376	2047	3423	
3.	2014	Age <=4	0	0	0	4049
		Age 5- 14	50	25	75	
		Age>=15	1622	2352	3974	
4.	2015	Age <=4	0	0	0	11509
		Age 5- 14	54	190	244	
		Age>=15	5303	5962	11265	
Total			8868	11432	20300	

2.1.4.1 OPD

From the year 2012- 2015 the proportion of hypertension and related cases treated at the OPD has increased throughout the four years as seen in the table below.

Table 2.1.3 Bole sub city proportion of hypertension and related cases treated at the OPD, 2012-2015

No.	Year	Total cases	OPD	New case of hypertension	% of cases treated for hypertension
1.	2012	114894		1,237	1.08
2.	2013	239226		3,505	1.47
3.	2014	295027		4,044	1.37
4.	2015	729772		11,172	1.53
Total		1378919		19958	1.45

From the year 2012- 2015 there were a total of new 19,958 hypertensive and related cases seen in the OPD. Among them 8,684(43.4%) were male and 11,274(56.5%) were female taking the higher proportion.

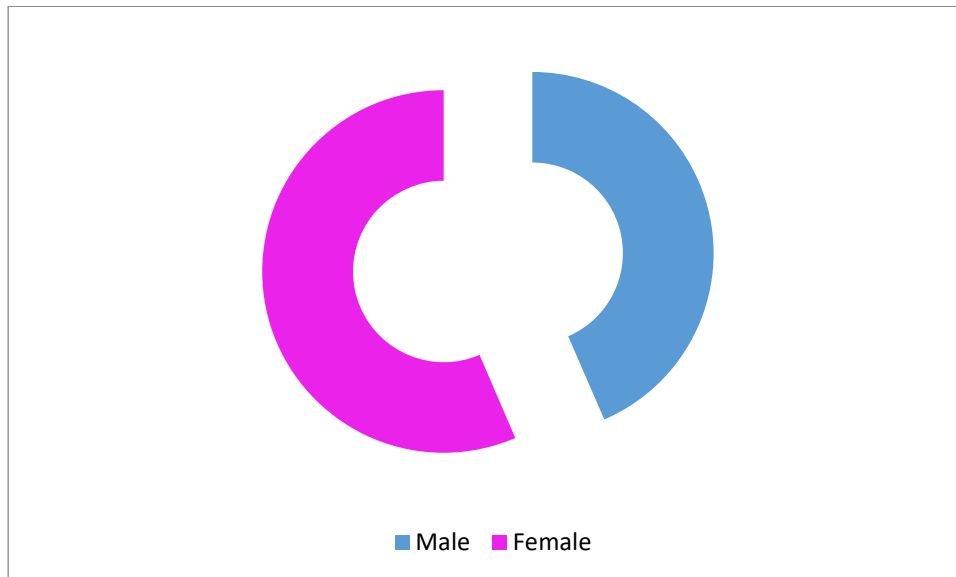


Figure 2.1.2 Number of hypertensive and related diseases treated at the OPD by sex at Bole sub city, 2012-2015, Addis Ababa, June 2016

The most affected age group within the four years period was the age group greater or equal to 15 years in both sexes and followed by the age group 5 to 14 years of age. There were reported cases of hypertension and related diseases below the age of 5 but were excluded during data quality assurance.

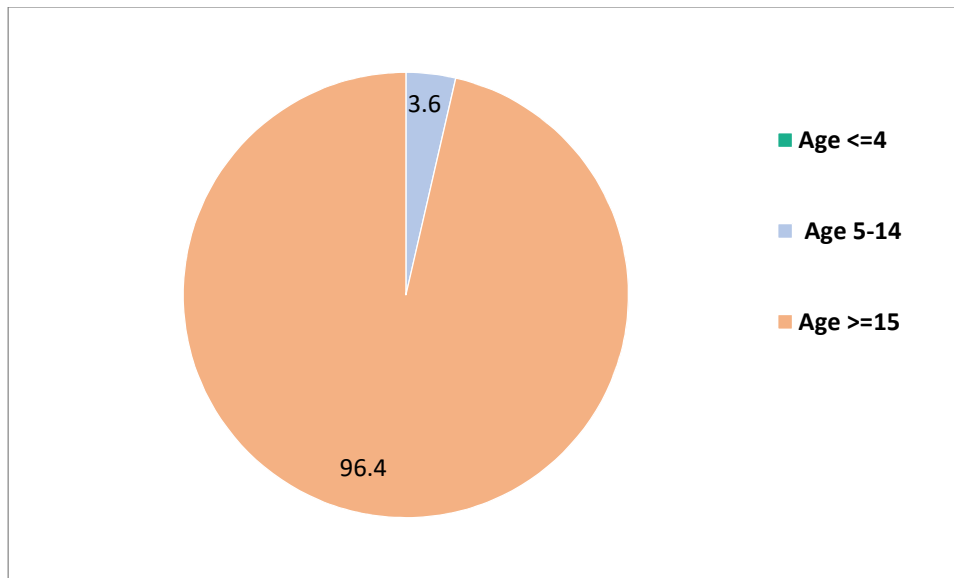


Figure 2.1.3 Proportion of cases of hypertension and related diseases by age groups in Bole sub city, 2012-2015

There was a continuous increase in newly diagnosed hypertensive and related disease cases as shown in the figure below. The increment was significant in the year 2015 than the previous three years. In both sexes the increment had similar rate and higher proportion was recorded among the females.

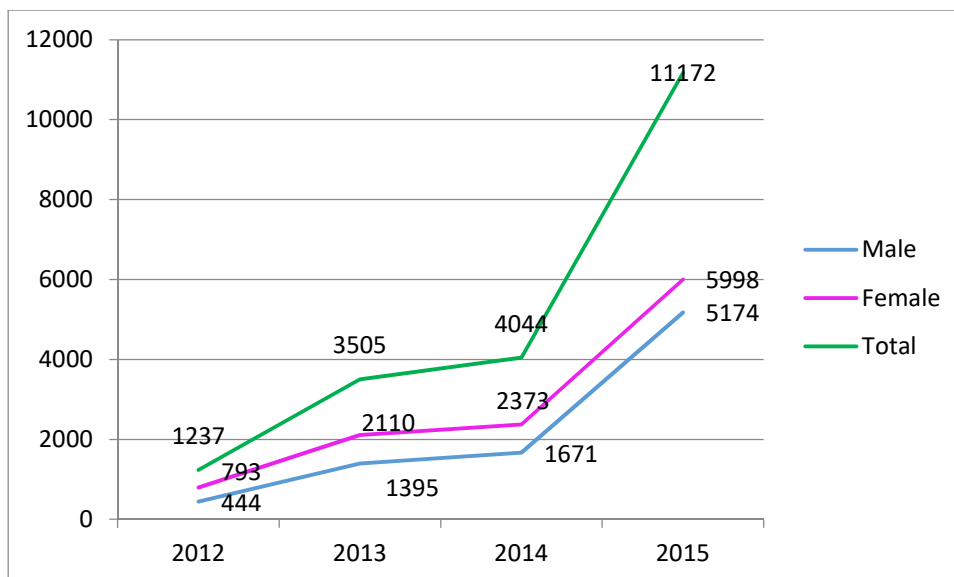


Figure 2.1.4 Trend of hypertensive and related diseases treated at the OPD, Bole sub city, 2012- 2015

The trend in the figure below shows that in bole sub city health facilities from 2012- 2015, the most affected age group by hypertension and related diseases was 15 or above years female cases followed by males within the same age group. The second mostly affected group was females within the age group 5 up to 14 followed by males with in that same age group.

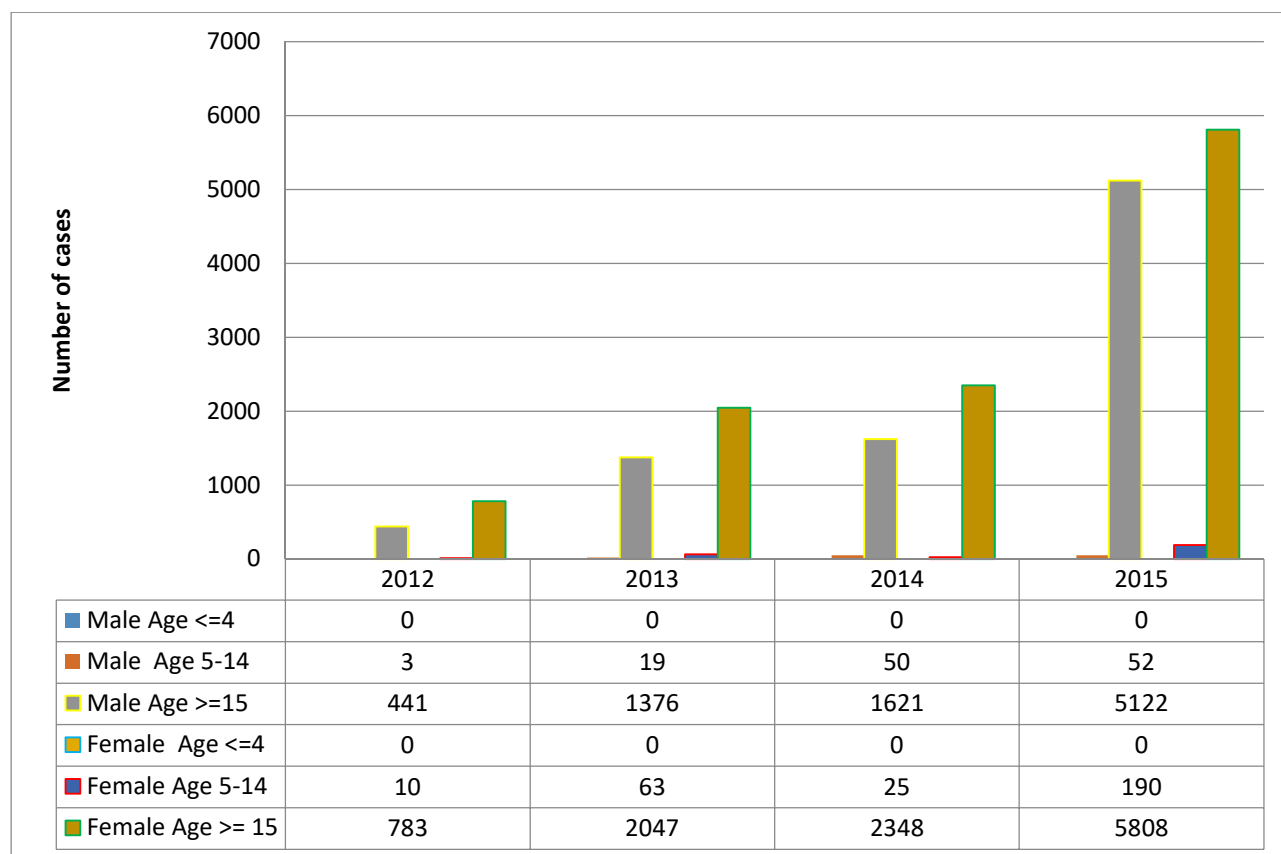


Figure 2.1.5 Bole sub city hypertensive and related diseases treated at the OPD by sex and age group, 2012-2015

Out of the reported cases of hypertension and related diseases in the four years period 6.2%, 17.6%, 20.3% and 56% were reported in the year 2012, 2013, 2014 and 2015 respectively. The majority of the reported cases, above half, were reported in the year 2015.

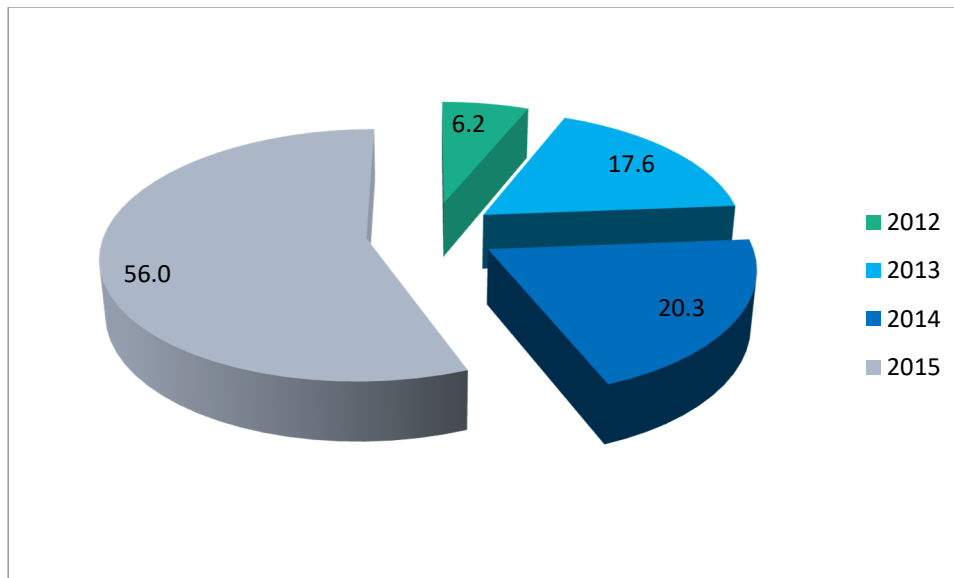


Figure 2.1.6 Bole sub city hypertensive and related diseases proportions from 2012-2015

2.1.4.2 IPD

There were 342 admitted cases of hypertension and related diseases reported at Bole sub city from 2014-2015. Among those admitted and received treatment, 184(53.8%) were males and 158(46.2%) were females. The proportion of admitted cases of males was higher than females unlike the other proportions.

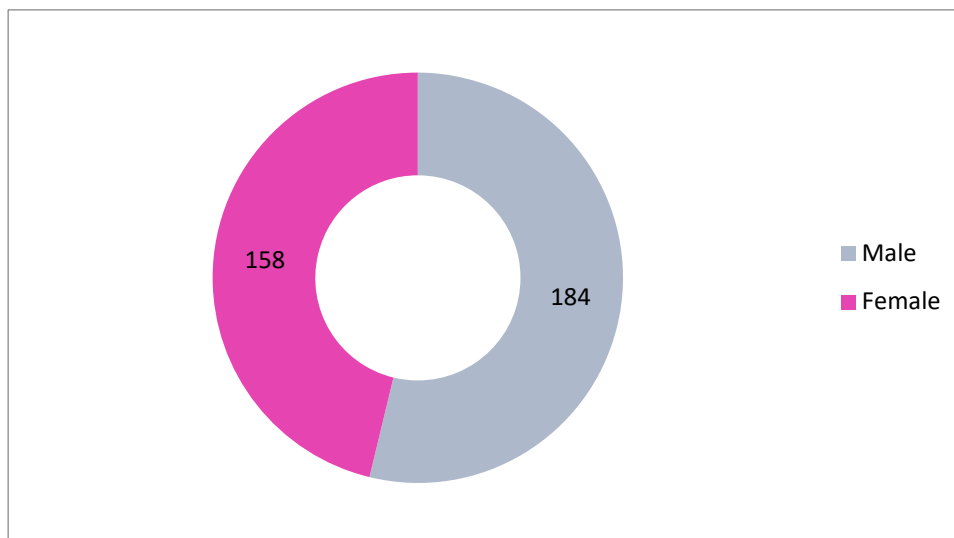


Figure 2.1.7 Admitted cases of hypertension and related diseases who were alive and dead at Bole sub city, 2014-2015

In 2014 there were 5 admitted cases of hypertension and related diseases and in 2015 there were 342 cases. All the 342 cases were admitted and treated. No admission data was found from the year 2011-2013.

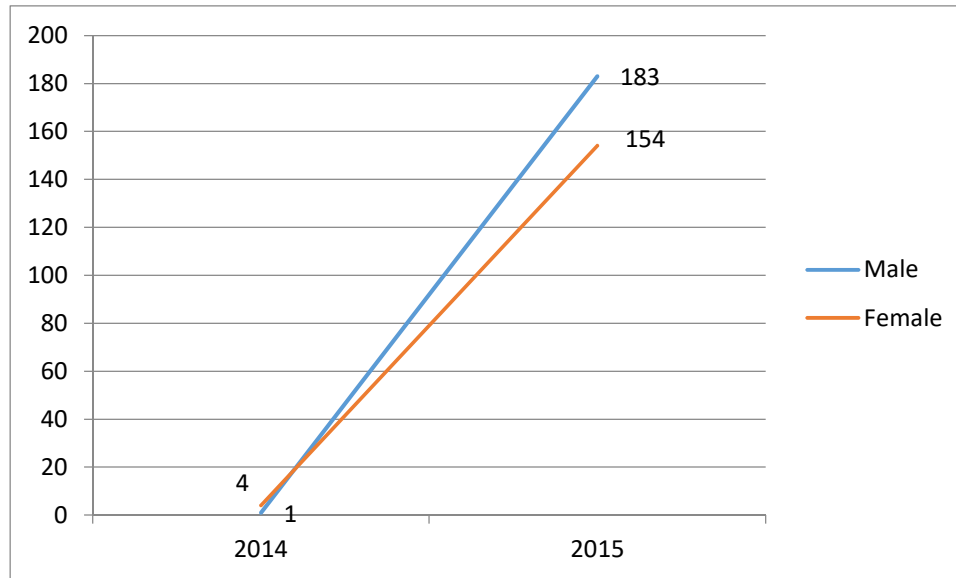


Figure 2.1.8 Trend analysis of hypertension and related diseases cases and deaths in Bole sub city, 2014-2015

Among the admitted cases, patients who were treated and discharged alive were 335(97.9%). Of those 333(99.4%) were within the age group of 15 years and above and 2(0.6%) were within the age group of 5 up to 14 years.

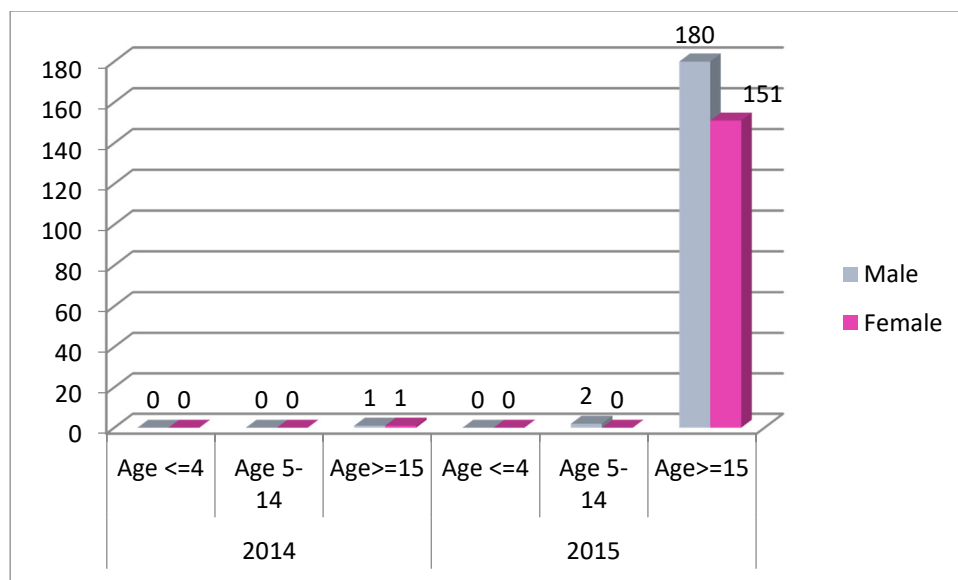


Figure 2.1.9 Bole sub city trend of hypertensive and related diseases cases who received inpatient care, 2014-2015

From the year 2014-2015, there were 342 admitted cases of hypertension and related disease which makes 2.05% hospitalization rate. Within the two years period there were 7 deaths making the case fatality rate 0.045% or 4.5 deaths per 10,000 population. Six of the deaths occurred in females in the age group 15 years and above and a death occurred in male 15 years and above as showed in the figure below.

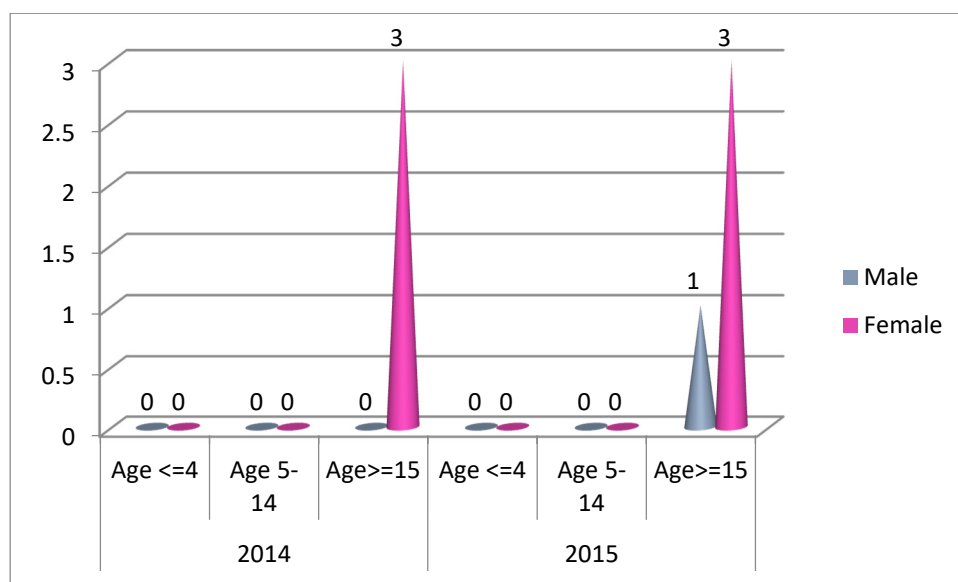


Figure 2.1.10 Cases admitted to inpatient and who died because of hypertension at Bole sub city, 2014-2015

2.1.5 Discussion

Trends of hypertension and related diseases from 2012-2015 reported in the HMIS in Bole sub city showed that the trend of hypertension cases increased throughout the years. Especially in the year 2015 there was a significant increment nearly tripling of cases compared to the previous year. These might be due to increase in the incidence of hypertension and related diseases or due to increase in the number of reporting private facilities or due to increase in the accessibility of health facilities in the sub city or due to population increment. A meta- analysis of nine studies in Ethiopia showed that the prevalence of hypertension was 23.5% in the urban population of Ethiopia [27]. A study conducted in Addis Ababa in the 10 sub cities showed that the highest prevalence was recorded in Lideta sub city 37%, then followed by Bole 35.7% and the least was in Yeka 13.2% [29].

The mostly affected sex was female and age group was age greater than 15 years and above. A systematic review conducted in Ethiopia showed that the prevalence of hypertension among males was 20.6% while in females it was 19.2% [27]. Another systematic review of nine studies showed 5 studies indicated the prevalence of hypertension was higher in males than females. The highest prevalence was reported in Addis Ababa with prevalence of 31.5% males and 28.9% in females [28]. Age group 18 years and above were associated with being mostly affected by hypertension [28, 30].

Among the admitted cases of hypertension and related diseases 2.05% died which is lower than case fatality rate of 42.9% of Nigeria [31]. Male admission was higher than female admissions. Similarly male admission was higher in as a hospital-based study conducted in Nigeria [31].

No admission data was found from 2012-2013. This might be due to no private health facility reported in that period and admission service was not available at the government health centers.

Limitation

The trend analysis was done based on health facility report so this report doesn't include asymptomatic cases and cases who did not come to health facility for treatment. The other limitation of the study is health facilities that provided services but did not report HMIS report to the sub city were not included in the study.

Because secondary data was used quality of the data is questioned. Misclassification of new and repeat cases can occur since data collection is done by different professionals who might or might not be trained for HMIS disease classification and reporting. A person who developed a complication due to hypertension could be reported twice since new case definition includes cases that develop a new complication.

The age disaggregation of HMIS disease classification doesn't have sub categorization for adults so results were presented as a gross form with age category greater than or equal to 15 years.

The HMIS lets a person with illness to be reported by only one disease classification so if a person comes with two illnesses, only one of the major cause that makes the patient to seek health care service will be reported. This might lead to under reporting of cases.

2.1.6 Conclusion and recommendation

2.1.6.1 Conclusion

There was a continuous increase in the number of cases of hypertension and related diseases at Bole sub city from 2012-2015. This causes an alarm to focus not only in communicable diseases but also on NCDs. Females had greater percentage of hypertension and related diseases than males and age groups greater and equal to 15 years were the most affected age groups. Most of the cases were treated at the OPD level and some were treated at IPD since 2014.

2.1.6.2 Recommendation

Attention should be given by the health sector to prevent and control hypertension and related diseases by educating the community on the causes, sign and symptoms, prevention and control mechanisms using health extension workers, media, brochures' and etc...To assess the trend of hypertension and recognize the severity or the burden of the disease a reliable data source is needed. To assess the actual trend of the disease community based assessment should be undertaken. To identify asymptomatic and pre hypertensive cases in the community, regular screening mechanisms should be in place.

To improve data representativeness of the health facilities in bole sub city completeness should be improved and data quality check mechanisms should be in place and implemented regularly.

2.1.7 Acknowledgement

I would like to thank God for all His blessings. I am grateful for Bole sub city health office staffs for their valuable contribution in availing information that is needed. My appreciation extends to Dr. YosephWorku for his unreserved comment and support in the realization of this document. Also I would like to thank MesafintAlebachew my field mentor for his comments and support.

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2.1.9 Annex

2.1.9.1 Study tool

Addis Ababa city administration

1. What is the city administration's surface area? _____
2. The city administration is bounded by _____ by north,
_____ by south,
_____ by west and
_____ by east.
3. How many sub cities are there? _____

Bole sub city

1. What is the sub city's surface area? _____
2. The sub city is bounded by _____ by north,
_____ by south,
_____ by west and
_____ by east.
3. What is the altitude of the sub city? _____
4. What is the total number of the population living in the sub city? _____

Table3. Number of types of health facilities by their ownership in Bole sub city, 2016

No.	Type of health facility	Government	Private	Federal	Army	Police	NGO
1.	Clinics						
2.	Pharmacies and drug stores						
3.	Health center						
4.	Hospital						
5.	Public health lab						
6.	Health science college						
7.	Medical college						

Table4. Number of Hospitals, clinics, health centers started reported through HMIS in Bole sub city, 2012-2015

No.	Facility	2013	2014	2015
1.	Hospitals			
2.	Health centers			
3.	Clinics			

Table5. Monthly distribution of hypertensive and related cases in the OPD Bole Sub city, 2012-2015

Month	Male						Female					
	< 5years		5-14 years		>= 15 years		< 5years		5-14 years		>= 15 years	
	Case	Death	Case	Death	Case	Death	Case	Death	Case	Death	Case	Death
January												
February												
March												
April												
May												
June												
July												
August												
September												
October												
November												
December												

**Table6. Monthly distribution of hypertensive and related cases in the IPD Bole Sub city,
2012-2015**

Month	Male						Female					
	< 5years		5-14 years		>= 15 years		< 5years		5-14 years		>= 15 years	
	Case	Death	Case	Death	Case	Death	Case	Death	Case	Death	Case	Death
January												
February												
March												
April												
May												
June												
July												
August												
September												
October												
November												
December												

Table7. Total number of OPD visits in Bole sub city, 2012-2015

Month	Male						Female					
	< 5years		5-14 years		>= 15 years		< 5years		5-14 years		>= 15 years	
	Case	Death	Case	Death	Case	Death	Case	Death	Case	Death	Case	Death
January												
February												
March												
April												
May												
June												
July												
August												
September												
October												
November												
December												

Table8. Total number of IPD visits in Bole sub city, 2012-2015

Month	Male						Female					
	< 5years		5-14 years		>= 15 years		< 5years		5-14 years		>= 15 years	
	Case	Death	Case	Death	Case	Death	Case	Death	Case	Death	Case	Death
January												
February												
March												
April												
May												
June												
July												
August												
September												
October												
November												
December												

Chapter – III: Evaluation of Surveillance System

3.1 Measles surveillance system evaluation of bole sub city administration, 2013-2017

Executive summary

Background Surveillance is ongoing systematic collection of data, analysis, interpretation and dissemination of results for decision making. The aim of surveillance evaluation is to check health events are monitored effectively and efficiently. Measles is one of the priority diseases in the Ethiopian surveillance system. Measles is responsible for 367 deaths daily and every hour 15 deaths related to measles occur around the globe. This study has identified the challenges of measles surveillance system in Bole sub city by assessing the core and supporting functions and the attributes of the surveillance system. Findings of this study will help researchers and decision makers by providing information on the surveillance system of Bole sub city.

Objective To evaluate the measles surveillance system of Bole sub city from 2013-2017.

Methods A descriptive cross sectional study design was used. Twenty six participants working at the health facility, Wereda, sub city, Addis Ababa City Administration Health Bureau and World Health Organization were included in this study. World Health Organization communicable disease surveillance and response systems guide to monitoring and evaluating and updated Center for Disease Control and Prevention guide were used for the evaluation. Letter was obtained from St Paul's Hospital Millennium Medical College to proceed with the data collection. Informed consent was obtained from every participant. Data was collected using semi-structured questionnaire. Data was entered and analyzed on EpiInfo version 7. Descriptive analysis was undertaken. Open ended questions were summarized and presented using numbers and percentages.

Result Twenty-one reportable diseases were followed under the Public Health Emergency Management system. One of the reportable disease was measles that was reported immediately. There were 247 patients of measles in Bole sub city from 2013- 2016. All surveillance focal persons responded that they would report to the next level if they encountered person with measles. To confirm priority diseases, samples were sent to regional laboratory and Ethiopia Public Health Institute. Data was analyzed by time, place and person at the sub city level weekly and 3 (75%) of the Weredas. There was epidemic preparedness plan in the sub city, in public health facilities and it was present in 2 (50%) of the Weredas. There was no written feedback from the Addis Ababa City Administration Health Bureau to the sub city, from the sub city to the Wereda and from the Weredas to the health facilities. Measles case management guideline was present in the sub city, all the Weredas and health facilities. Surveillance training plan was available at the sub city level but only in one (25%) of the Weredas. Supervision was carried out in the 3 (75%) Weredas and the sub city. No budget was specifically allocated to carryout surveillance activities at the sub city, Wereda or at the health facility levels. The completeness of the Bole sub city the last 12 months was 89.5% while the timeliness was 72.2%. Participants rated the surveillance system usefulness 85.1%, simplicity 81.5%, flexibility 78.5%, sensitivity to detect outbreaks 77.7%, acceptability 87.7% and reliability 89.2%.

Conclusions and recommendations The backup mechanism for the report was poor. Strengthening electronic Public Health Emergency Management implementation would solve this problem. There was no formal assigned budget and necessary materials to undertake surveillance activities. The Wereda, sub city, Addis Ababa City Administration and Ethiopian Public Health Institute should work together to solve the budget problem. The completeness of the sub city weekly report was above the expected standard and the timeliness was below the expected standards. The sub city must make an effort to enhance the timeliness of the report.

3.1.1 Introduction

3.1.1.1 Background

Surveillance is ongoing systematic collection of data, analysis, interpretation and dissemination of results for decision making. Surveillance can be classified into passive, active and sentinel surveillance. Passive surveillance is when data comes following the formal structure. Active surveillance is health department initiated surveillance activity usually limited to specific diseases. Sentinel surveillance is a prearranged sample of health professionals willing to report all the cases of certain diseases (1).

“Evaluation is the periodic assessment of the relevance, effectiveness and impact of activities in the light of the objectives of the surveillance and response systems” (2). The aim of surveillance evaluation is to check health events are monitored effectively and efficiently. Evaluations should be done periodically. The evaluation report must include recommendations to improve the quality, efficiency and usefulness. The evaluation focuses on how well the system is functioning to achieve its goals (3).

Measles is a viral infection that is transmitted from person to person through respiratory secretions or aerosols. The disease affects any person and causes death and disability. (4, 5). Globally, 134,200 deaths were reported in 2015 due to measles. Nearly 20 million deaths related to measles were averted due to measles vaccination from 2000-2015. Ninety five percent of reported cases of measles are in low-income countries and countries with poor health infrastructure (5). In Ethiopia measles incidence was 7.2 cases per 100,000 populations and 243 measles outbreaks were reported in the year 2013 (6).

To prevent and control the disease five strategies are developed and are being implemented. These are strengthening the routine immunization, provide second opportunity for by supplementary immunization activity, improve case management and intensify measles surveillance (4). There was no study done to evaluate measles surveillance in Bole sub city. This study aimed to evaluate measles surveillance system of Bole sub city administration by assessing the core, supporting functions and attributes of the surveillance system.

3.1.1.2 Rationale

Surveillance system evaluation helps in assessment of the objectives of the surveillance system are met, document changes in the performance of the system, provides information to revise surveillance objectives, to allocate resources in planning process, gives justification for the systems successes and failures and states recommendation to advance the system (3). This study has identified the challenges of measles surveillance system in Bole sub city by assessing the core and supporting functions and the attributes of the surveillance system. It will strengthen the surveillance system by indicating the status of Bole sub city administration surveillance system, identified the problems and recommend solutions. Findings of this study informs decision makers on the surveillance system of Bole sub city.

3.1.2 Literature review

3.1.2.1 Surveillance system evaluation

Surveillance is a systematic ongoing data collection, analysis, interpretation and dissemination of information. Surveillance changes data to information to make decisions on planning, implementation and evaluation of programs (1,7). The surveillance system success depends on the steadiness of the characteristics of the surveillance system. These characteristics are the core and supportive functions and the attributes of the surveillance system (2, 3).

The core functions of the surveillance system are case detection, case registration, case confirmation, case reporting, data analysis and interpretation, epidemic preparedness, response, control and feedback. Case detection is identification of cases or outbreak using formal and informal structures. After cases are identified, the cases are expected to be registered in a standardized register. The cases must be confirmed using laboratory tests or epidemiologically. The registered case will be reported from the lower level to the highest level using different mechanisms of reporting. The data obtained must be analyzed and interpreted to provide information for decision making. To prevent and control outbreaks, epidemic preparedness plan and availing resources to respond to outbreaks must be carried out. The ability of the surveillance system to respond to and control outbreaks must be assessed. To implement follow up of activities feedbacks must be given at every surveillance point (1, 2).

The supportive function of surveillance system that facilitates the core functions starts with the assessment of presence of standards and guidelines. Trainings must be provided for the professionals working within the surveillance system. Supervision of the surveillance units will help in identifying surveillance activities implementation and follow up. To report surveillance activities and provide feedbacks the appropriate media of communication must be selected. Human, financial and logistics resources must be planned and availed to undertake surveillance activities. Plan versus achievement of surveillance activities must be monitored and evaluated to improve the system. Inter-sectoral collaboration and coordination must be there to implement activities (1, 2).

The attributes of surveillance system are completeness of the report, timeliness of the report, usefulness, simplicity, acceptability, flexibility, sensitivity, specificity, positive predictive value and representativeness of the surveillance system (1, 2). The completeness and timeliness of the report must be above 80% (7). Completeness of the report is percentage of facilities that reported to the next level timely compared with the expected number of reporting health facilities while timeliness of the report is percentage of health facilities that reported timely as compared to the expected number of reporting health facilities. The usefulness of the surveillance system must be assessed, meaning the usefulness of the collected data for early warning and program monitoring. Simplicity of the surveillance system must be identified by explaining the systems easiness information flow and implementation. Acceptability of the implemented system should be assessed by examining the system's acceptance among the surveillance staffs and the acceptance and utilization of the data derived from the system. Flexibility of the surveillance system must be determined by investigating the ability of the system to accept changes. The sensitivity, positive predictive value and representativeness of the surveillance system must be assessed by identifying the system's ability to detect the true positives, to detect the true positives from the reported positives and the representativeness of the reported cases distributed in the general population, respectively (1, 2).

3.1.2.2 Ethiopia's surveillance system

Public health is continually challenged by recurrent and unexpected diseases outbreaks and is facing the challenges of managing health consequences of natural and human made disaster, emergencies, crisis and conflicts. To address these problems Ethiopia uses Public Health Emergency Management (PHEM) approach. PHEM is the process of anticipating, preventing, preventing, preparing for, detecting, responding to, controlling and recovering from consequences of Public health threats in order that health and economic impacts are minimized. This core process is comprised of four sub processes: Public Health Emergency preparedness, early warning, response and recovery (7).

The major Public Health risks identified in Ethiopia health system according to their priority from higher to lower are epidemic of communicable diseases, drought conditions with malnutrition, food contamination, flood, pandemic influenza, disease that affect people during

conflicts and in displaced population, accidents including chemical spills, earthquake, volcanic eruptions and bioterrorism. Measles is one of the prioritized communicable diseases followed by the surveillance system (7).

3.1.2.3 Measles

Measles is a viral infection that is transmitted from person to person through respiratory secretions or aerosols. The disease affects any person and causes death and disability globally. Patients with measles present with maculo-papular rash, fever, coryza, conjunctivitis and in severe cases, they present with pneumonia, diarrhea, croup, otitis media, blindness, and acute encephalitis. Measles does not have anti-viral treatment, rather supportive to facilitate healing process (4, 5).

Even if there is a vaccine to prevent measles, globally 134,200 deaths were reported in 2015 due to measles. Everyday 367 deaths and every hour 15 deaths related to measles occur around the globe. Nearly 20 million deaths related to measles were averted due to measles vaccination from 2000-2015. Annual death was reduced from 651,600 in 2000 to 134,200 deaths in 2015. Ninety five percent of reported cases of measles are in low-income countries and countries with poor health infrastructure (5). In Ethiopia measles incidence was 7.2 cases per 100,000 populations and 243 measles outbreaks were reported in the year 2013 (6). According to WHO report of 2015, the total suspected cases of measles were 6137, 6.52 measles incidence per 100,000 population in 2013. In 2014 number of suspected cases increased to 16,028, confirmed cases 14,100 and incidence of 14.61 per 100,000 population (8).

This study evaluated the measles surveillance system of Bole sub city, Addis Ababa, Ethiopia. The system was evaluated by assessing the core functions, supportive functions and the attributes of the surveillance system. It identified the strengths and the challenges of the surveillance system of Bole sub city.

3.1.3 Objectives

3.1.3.1 General objective

To evaluate the measles surveillance system of Bole sub city from 2013-2017

3.1.3.2 Specific objectives

- To assess the attributes of the measles surveillance system of Bole sub city,2013-2017
- To describe the functions of measles surveillance system of Bole sub city, 2013-2017

3.1.4 Methods

3.1.4.1 Study area

Addis Ababa is the capital city of Ethiopia. The city is bounded by Oromia region in North, South, East and West. The total estimated area is 540Km². The city's topography is between 2,200 and 2,500 meters above sea level (9). According to Census 2007 the total population of the city was 2,738,248 in 2007. With 2.1% growth rate in 2017 the total population of Addis Ababa is estimated to be 3,370,778 (10). Addis Ababa city administration has 10 sub cities and Bole sub city is one of them. Bole sub city is bounded by Yeka sub city by North, Akaki sub city by South, Oromia region by East and Kirkos sub city by West. The total population of the sub city is estimated to be 387,153 in 2017 (11).

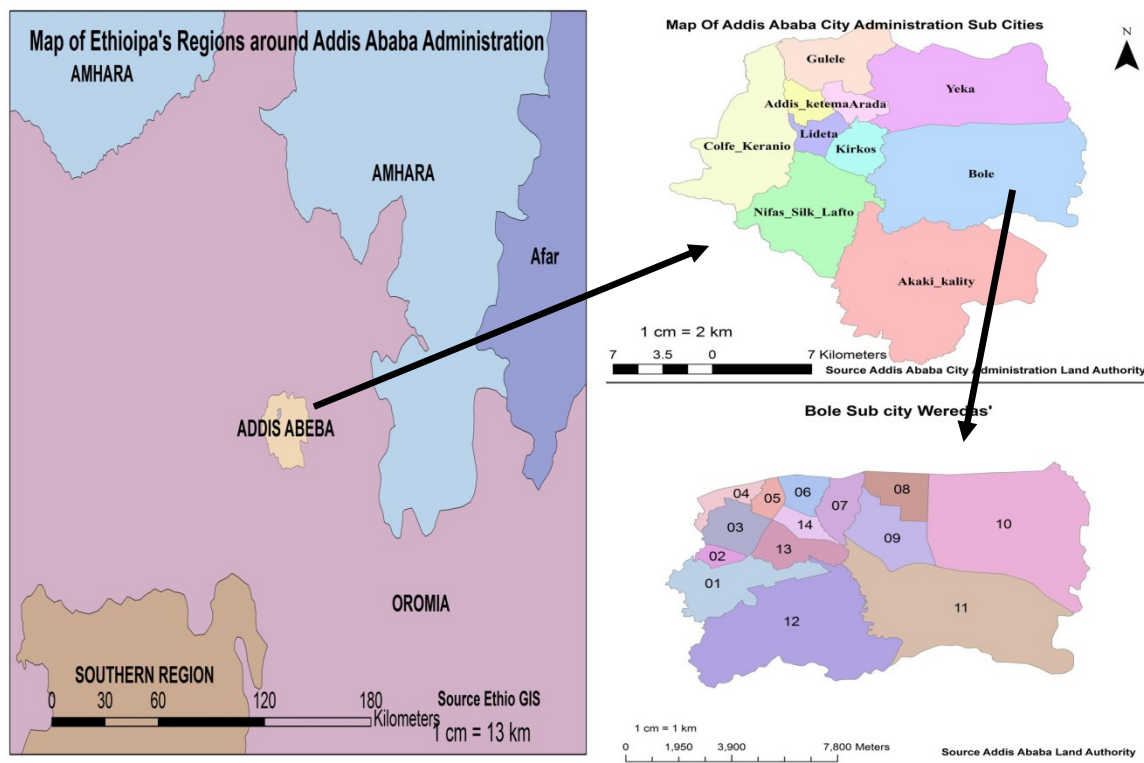


Figure 3.1 Map of Near Addis Ababa Ethiopia's Region, map of Addis Ababa Sub cities, map of Bole Sub city Weredas from left to right top and right bottom respectively

3.1.4.2 Study design

A descriptive cross sectional study design was used.

3.1.4.3 Sample size

The number of participants that were included in the study were 26.

3.1.4.4 Sampling procedure

The study was conducted in Bole sub city. In Bole sub city there are 14 Weredas. From the 14 Weredas 4 Weredas was selected randomly. Within those selected Weredas. In each Wereda 1 Public Health Emergency Management Officer (PHEMO) was interviewed. There are 9 public health centers, 11 private hospitals and 132 private clinics in the sub city. Three health centers, 2 hospitals and 2 clinics were selected randomly. From each selected health center and hospital one surveillance focal person and two health professionals working in the OPD were selected. One surveillance focal person and one health professional was selected from every selected private clinic. One PHEMO of Bole sub city was interviewed. From AACAHB 1 PHEMO and 1 Expanded Program of Immunization (EPI) officer from World Health Organization (WHO) were included in the study.

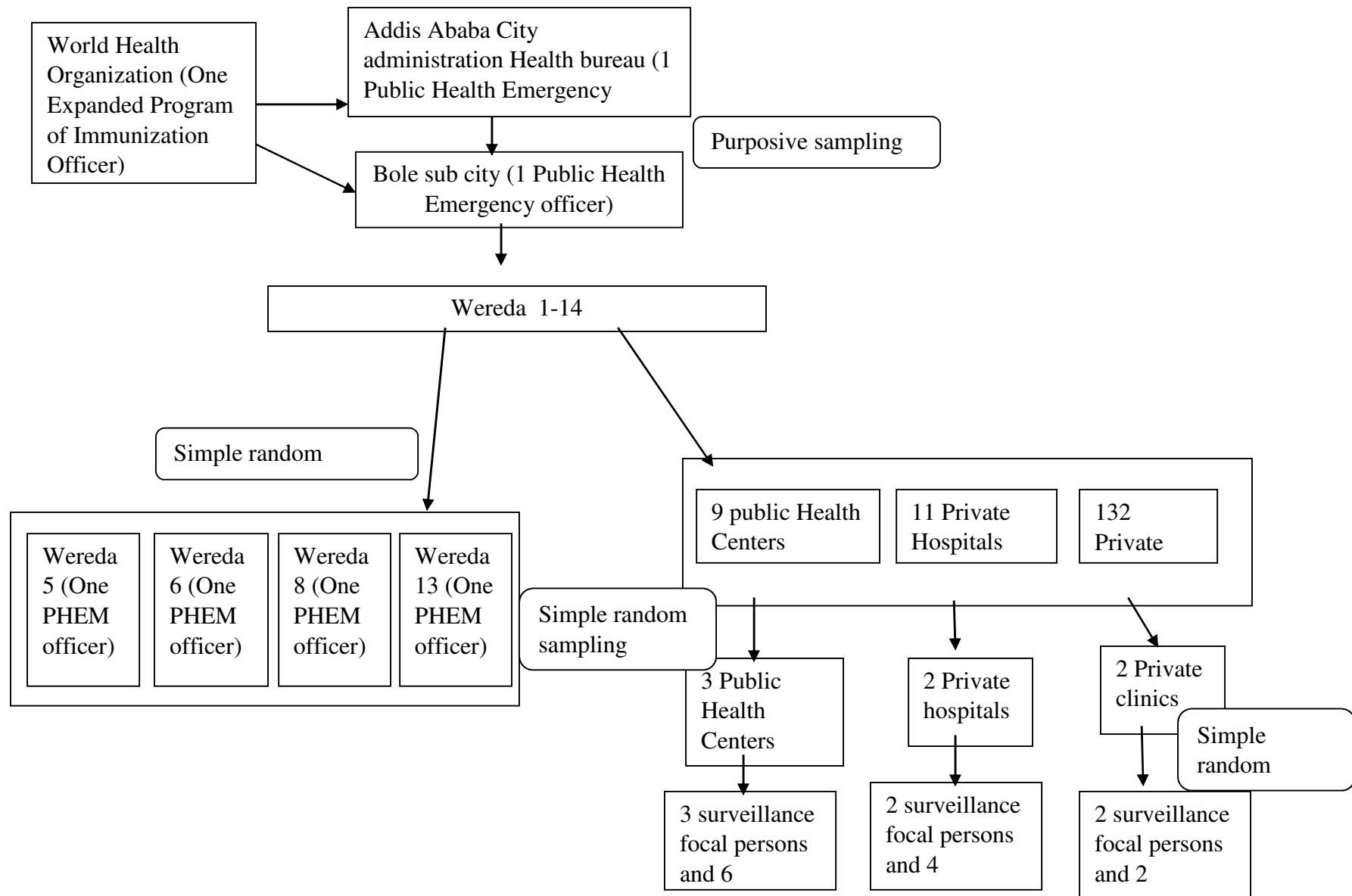


Figure 3.2 Surveillance evaluation sampling procedure, Bole sub city, 2017

3.1.4.5 Data collection procedure

Updated guideline for evaluating Public Health Surveillance Systems of CDC(3,12) and WHO communicable disease surveillance and response systems guide to monitoring and evaluating(2) were used to evaluate the measles surveillance of Bole sub city administration. Records were reviewed and key informant were interviewed.

3.1.4.6 Operational definitions

Suspected case- Any person with fever and macula-papular (non-vesicular) generalized rash and cough, coryza or conjunctivitis (red eyes) OR any person in whom a clinician suspects measles.

Confirmed case- A suspected case with laboratory confirmation (positive IgM antibody) or epidemiologically linked to confirmed cases in an outbreak.

Epidemiologically linked- A suspected measles case that has not had a specimen taken for serologic confirmation and is linked (in place, person and time) to a laboratory confirmed case.

3.1.4.7 Data analysis procedure

Data was entered and analyzed on EpiInfo version 7. Descriptive analysis was undertaken. Open ended questions were summarized and presented using number and percentages. Attributes of surveillance were rated by the participants from 1 (the minimum score) to 5 (maximum score). The scores were converted into percentages 1 as 20%, 2 as 40%, 3 as 60%, 4 as 80% and 5 as 100% based on WHO guideline. (2) The means of the percentages were calculated and presented.

3.1.4.8 Data quality management

Completeness of the questionnaires were assessed daily. Data was double entered by different data encoders. Inconsistencies were checked by reviewing the questionnaire.

3.1.4.9 Ethical consideration

Letter was obtained from St Paul's Hospital Millennium Medical College (SPHMM) to proceed with the data collection. Informed consent was obtained from every participant. The questionnaires were coded and any information that can identify the participants was kept confidential.

3.1.4.10 Method of assessment

The surveillance system was evaluated by assessing the surveillance system core functions, supporting functions and attributes. These are listed below. The health professionals working in the health service system rated most of the surveillance attributes (usefulness, simplicity, flexibility, sensitivity, acceptability and reliability) from 1-5 scores. The scores given were changed into percentages based on 1 represents 20%, 2 represents 40%, 3 represents 60%, 4 represents 80% and 5 represents 100% (2). The average of the percentages represented each attribute.

Core functions

Case detection

"Case detection is the process of identification of cases and outbreaks" (11). This can be from private, government, Non Governmental Organizations or community structures. To detect cases case definitions, rumour verification are the key components (2).

Case registration

"Case registration is the process of recording cases identified" (2). To register the identified cases a standard register is needed (2). This study assessed if facilities have standardized registers and are filled correctly.

Case confirmation

"Case or outbreak confirmation refers to the epidemiological and laboratory capacity for confirmation" (2). Capacity to confirm priority diseases within the facility laboratory or referral laboratory and proportion of outbreaks that were confirmed by laboratory investigation were assessed in this study.

Reporting

Reporting is the process of data movement starting from data point of registration throughout the surveillance system (2). In this study case based reporting rate and timely notification of epidemics were assessed.

Data analysis and interpretation

To provide information for decision makers, data should be analyzed and interpreted. Alert and epidemic thresholds must be known by the health professionals working in surveillance system (2). The presence of threshold level of measles and the knowledge of the health professionals working in the surveillance system about the threshold were investigated in this study.

Epidemic preparedness

Epidemic preparedness is the level of preparedness of the facilities to respond and control a health event. Epidemic preparedness of the surveillance system was assessed by assessing the presence of epidemic preparedness plan, fund for emergency response, shortage of drugs and supplies during the most recent outbreak, presence of Information Education Communication (IEC) materials, epidemic preparedness committee and presence of Rapid Response Team (RRT).

Response and control

The use of Public Health surveillance system is to provide epidemic information to respond and control epidemics timely (2). The outbreak response and availability of emergency kits were assessed in this study.

Feedback

The surveillance system needs a feedback mechanism to improve performance. This study has investigated the presence of regular feedback mechanisms and proportion of feedbacks disseminated.

Supporting functions

Training

Training is provision of capacity building trainings for health professionals working in the surveillance system (2). This study identified the proportion of surveillance units with available surveillance training modules, training plan, proportion of surveillance focal persons trained on Surveillance or PHEM and proportion of surveillance focal persons that took refresher training the last 2 year.

Standard guidelines

To undertake the overall activities of surveillance and monitor the implementation standard guidelines are needed (2). This study has identified the availability of standard guidelines for priority diseases, standard case management protocol, lab Scope Of Practices (SOP) for collection of samples, packing and sample referral of epidemic prone pathogens and shortage of reporting formats.

Supervision

Supportive supervision helps to follow the whole activities of surveillance (2). The study determined the proportion of the supervisory visits that went according to plan.

Communication

To transmit feedbacks to the surveillance units appropriate way of communication should be selected. In this study the communication methods of the surveillance system was identified.

Resources

Resources are the engine to implement surveillance activities. Identification of the resource need, mobilizing the resources and appropriate use is necessary (2). This study assessed the budget allocation, availability of computers and man-power to implement surveillance activities.

Attributes

Timeliness

The number of lives and resources lost due to epidemics depends on the timeliness of the report (2). This study reviewed the timeliness of submission of surveillance reports, notification and response of suspected outbreaks.

Completeness

Completeness of the reporting site is regardless of the timeliness of the health facility, the report is submitted by the health facility. It includes zero reporting of immediately or weekly reporting diseases. Completeness of case reporting is the match between the actual number of cases seen and the reported cases. Completeness of the surveillance data is the match between the expected number of priority diseases and the reported diseases (2). Completeness of the reporting site and completeness of the case reporting was determined by this study.

Usefulness

The main purpose of surveillance data is to detect epidemics early and to respond accordingly (2). The usefulness the surveillance system in case detection, planning, priority setting and intervention was determined in this study.

Simplicity

Simplicity is the surveillance system structure easiness in implementation of surveillance activities. It includes information flow from point of generation throughout the surveillance system (2). It was rated by health professionals working in the surveillance system by considering the data collection, compilation, reporting, analysis and utilization of the surveillance information in this study.

Flexibility

Flexibility of the surveillance system is the easiness of the system to modify the reporting data frequency and addition of diseases (2). This was rated by health professionals working in the surveillance system by considering the ability of the surveillance system to adapt to changing needs.

Sensitivity

Sensitivity is the ability of the surveillance system to detect the true positives (2). This was rated by health professionals working in the surveillance health system by taking account to the ability of the surveillance system to detect outbreaks.

Acceptability

Acceptability is the willingness of the health professionals working in the surveillance system to implement and use data generated by the system (2). This was rated by health professionals working in the surveillance system.

Reliability

Reliability is the degree to which results obtained from the surveillance system and could be repeated (2). This was rated by health professionals working within the surveillance system.

3.1.5 Result

3.1.5.1 Public health importance of health related event under surveillance

3.1.5.1.1 Disease of health importance

There are 21 diseases under surveillance that are identified at the national level and being followed and are listed below. Maternal Death was added as the 21st event to follow in the year 2014. The diseases under surveillance are expected to be reported immediately or weekly.

Immediately reportable diseases take 2 hours to get to the federal level from the community or health post or health facility. Immediately reportable disease must be reported from the community or health post or health facility to Wereda within 30 minutes. Then the Wereda must report to the zone or sub city within 30 minutes. The zone or the sub city must report to the regional health bureau within 30 minutes. The regional health bureau must report to the federal level within 30 minutes. The Federal Ministry of health must report to World Health Organization within 24 hours of detection.

Immediately reportable diseases

1. Acute Flaccid Paralysis (AFP) or Polio
2. Anthrax
3. Avian human influenza
4. Cholera
5. Drancuncunliasis or Guinea worm
6. Measles
7. Neonatal Tetanus
8. Pandemic influenza A
9. Rabies
10. Small pox
11. SARS
12. Viral Hemorrhagic Fever
13. Yellow fever
14. Maternal Death

From the compiled diseases of weekly reportable disease starting from Monday to Sunday from the health facilities report to the Wereda until Monday midday. The Wereda reports to the zone or sub city until Tuesday midday. The Zone or the sub city reports to the Regional health Bureau until Wednesday midday. The Regional Health Bureau reports to Ethiopia Public Health Institute (EPHI) until Thursday midday. EPHI reports to the stakeholders until Friday midday. The weekly and immediately diseases under surveillance are;

Weekly reportable diseases

15. Dysentery

16. Malaria

17. Meningococcal Meningitis

18. Relapsing fever

19. Severe Acute malnutrition

20. Typhoid fever

21. Typhus

The immediately reportable diseases are included on the weekly reportable diseases format.

3.1.5.1.2 Description of the selected disease

From January 2013- December 2016, there were 247measles cases. One hundred eleven (44.9%) were age less than 5 years, 76 (30.8%) were age 5-14 years and 60 (24.3%) were age greater or equals to 15 years. One hundred and forty two (57.5%) of the cases had results of measles IgM positive.

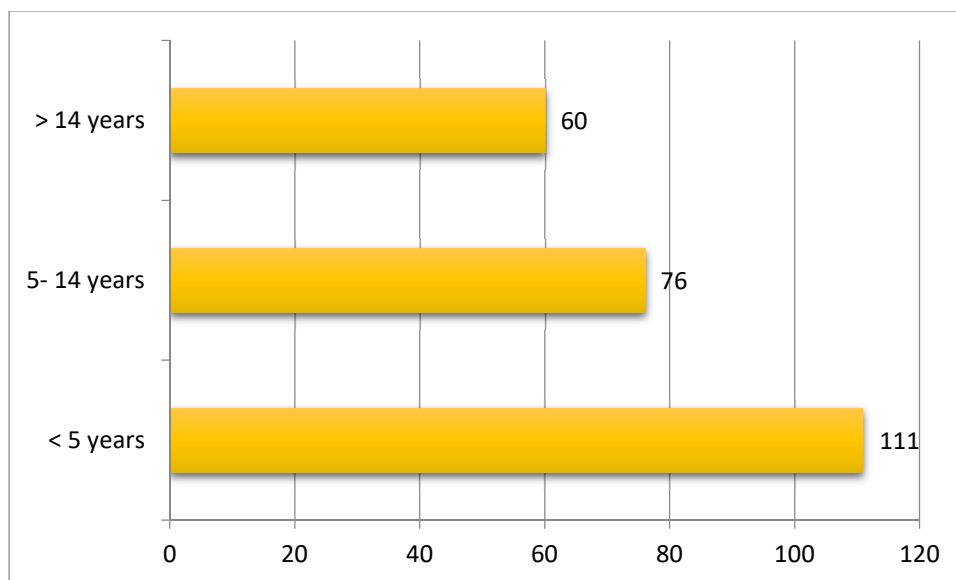


Figure 3.3 Measles patients age category classification in Bole sub city, 2013-2016

Measles cases in Bole sub city in the year 2013 were 81, in 2014 were 89, in 2015 were 51 and in the year 2016 were 26 as seen in the figure 4 below.

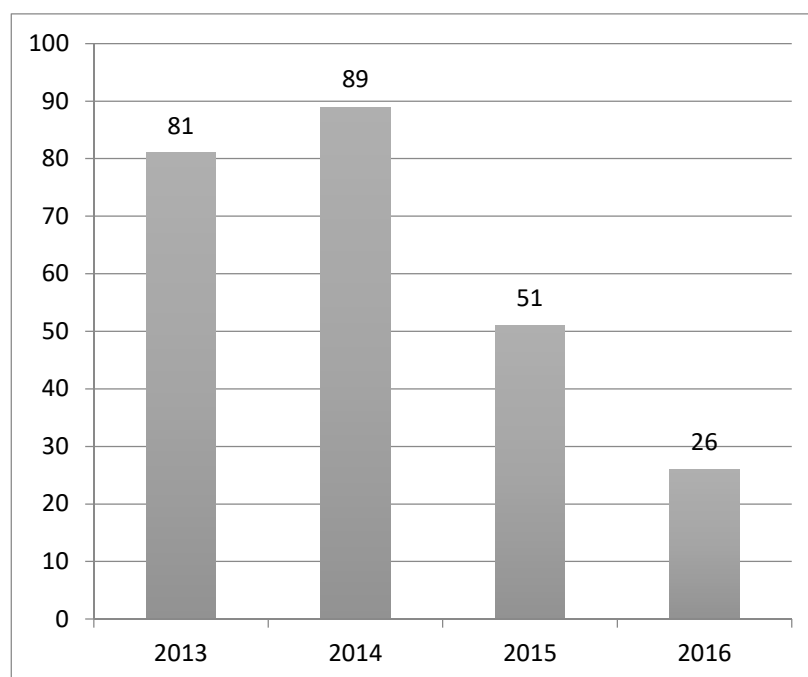


Figure 3.4 Measles cases in Bole sub city, 2013-2016

3.1.5.2 Surveillance strategy and coordination

Surveillance and response plan was present in the sub city level, 2(50%) of the Weredas, 2(67%) of the health centers and no private health facility had a plan. AACAHB planned to evaluate the

performance of the Sub cities 4 times on the past 12 months and evaluation was done twice (50%). The sub city had no plan to evaluate the performance of the Weredas the last 12 months. Because the structure of the Wereda level was implemented within the last 12 months and some Weredas did not assign focal person for some months during the last 12months. All the private and public owned facilities had assigned surveillance focal persons. One health center and one hospital had two surveillance focal persons. Two Weredas (50%) planned to evaluate the surveillance system of health facilities the last 12months period. The plan versus achievement of the evaluation was 100% in two of the Weredas. One PHEM officer and 2 PHEM officers were present in each Wereda and at the sub city, respectively. Except one Wereda that had 4 review meetings the past 12months, none of the Weredas or the sub city carried out review meetings. Even if the PHEM guideline has the list of the roles and responsibilities of PHEM officer, none of them reported that they have roles and responsibilities that was listed.

3.1.5.3 Networking and partnership

The sub city had networking and partnership with other sectors including water, sanitation and animals health. Half of the Weredas reported that they have networking and partnership with these sectors. There was cross boarder communication during the last 12months during the outbreak period in the sub city and in 3 (75%) Weredas. Standard case definition was present in all the Weredas and the sub city. The sub city had no informal mechanism to capture unusual public health events. A documented list of reference laboratory for confirmation of epidemic prone diseases was present in one (25%) private and one (33%) public health facility.

3.1.5.4 Core functions

Case detection

All surveillance focal persons responded that they would report to the next level if they encountered person with measles. Clinicians working at the OPD also reported that they report to the concerned body when they encountered a patient with measles except one (8.3%) who said that he would treat and send the person home.

Case registration

HMIS register was used in the OPDs of all the health facilities and the registers were filled correctly.

Case confirmation

To confirm priority diseases, samples were sent to regional laboratory and EPHI. All the surveillance focal persons responded that they send samples of priority diseases for further investigation to regional lab and EPHI. There was no reported outbreak of measles the last 12 months in the sub city.

Reporting

The proportion of the Weredas that recorded the cases of measles on the line list were 50%. Three health facilities reported measles the last 12 months. Case based and line list was filled for three (75%) in the health facilities.

Data analysis and interpretation

Data was analyzed by time, place and person at the sub city level weekly and in 3 (75%) of the Weredas. All the public health facilities and 3 (75%) of private facilities analyzed surveillance data. PHEM officers working at the sub city, in the Wereda and surveillance focal persons in public health facilities responded that the threshold of measles outbreak is the occurrence of five or more suspected cases in one month or three confirmed cases on one month. Two of surveillance focal persons working at private facilities gave the same answer while two responded that they do not know the answer. Among clinicians working at the OPD 3 (25%) did not know the threshold of measles outbreak.

Epidemic preparedness

There was epidemic preparedness plan in the sub city, in public health facilities and it was present in 2 (50%) of the Weredas. The plan was present only in one (25%) of the private health facilities. From previous experience of outbreaks, there were funds for emergency response but it was not adequate. The Weredas, the sub city and public health facilities had IEC materials for surveillance activities. Two (50%) of the private health facilities did not have IEC materials. Epidemic preparedness committee was present in the sub city, in all Weredas except one and in

all the public health facilities. However, they only meet during outbreak periods. RRT was absent in two of the Weredas and all private health facilities.

Epidemic response and control

Measles and cholera outbreak has occurred the last 12 months in Addis Ababa. Both of the outbreaks were investigated within 24 hours of detection. Cholera outbreak was present the last 12 months in Bole sub city. The first case was investigated within 3hours of report.

There was no medicine and medical supply at stock for emergencies at AACHB. At the sub city level medicine and medical supplies for emergencies were reported to be available in the public health facilities.

Feedback

There was no written feedback from the higher level to the lower level, meaning no written feedback was given for the sub city from AACAHB, for the Weredas from the sub city, for the health facilities from the Wereda.

Standards and guidelines

National PHEM guideline was present in the sub city and Weredas except one Wereda. Measles case management guideline was present in the sub city, in all the Weredas and in the health facilities. Shortage of reporting formats was present at the sub city level but no shortage was reported at the Wereda level. All the health facility laboratories had Standard Operating Procedure (SOP) for sample collection, packaging and specimen referral for epidemic prone diseases. No shortage of laboratory reporting format was reported during the last 6 months in the health facilities.

3.1.5.5 Supportive functions

Training

Surveillance training plan was available at the sub city level but not in the Weredas except one. All the PHEM officers were trained for PHEM at sub city and Wereda level.

Supervision and communication

Supervision was carried out in the 3 (75%) Weredas and the sub city. Two of the Weredas supervision versus achievement was 50% and the other Wereda performed 75%. The sub city reports to the regional health bureau through mail and telephone. All the Weredas use telephone to send report while one Wereda reported through hard copy. All of the health facilities use telephone to report cases. Two (67%) of the public health facilities and 3 (75%) of private health facilities use hard copy as a reporting mechanism. Electronic Public Health Emergency Management (ePHEM) was implemented 5 years back as part of Health Management Information System (HMIS). The software was not used in any of the PHEM structures.

Resource

No budget was specifically allocated to carryout surveillance activities at the sub city, Wereda or at the health facility levels. The sub city had computer for PHEM activities while none of the Weredas had any. In the public health facilities only 1 (33%) and in private health facilities 3 (75%) had computer to undertake surveillance activities.

3.1.5.6 Attributes of the surveillance system

Completeness

The completeness of the report formats for the sub city was 70%. For the Wereda the completeness was 100% for two of the Weredas and 90% for the other two. The average completeness of the report formats were 100% in public health facilities and 75% for private health facilities. The completeness of facilities in Bole sub city was 89.5% with average number of facilities expected to report 120. See figure 5.

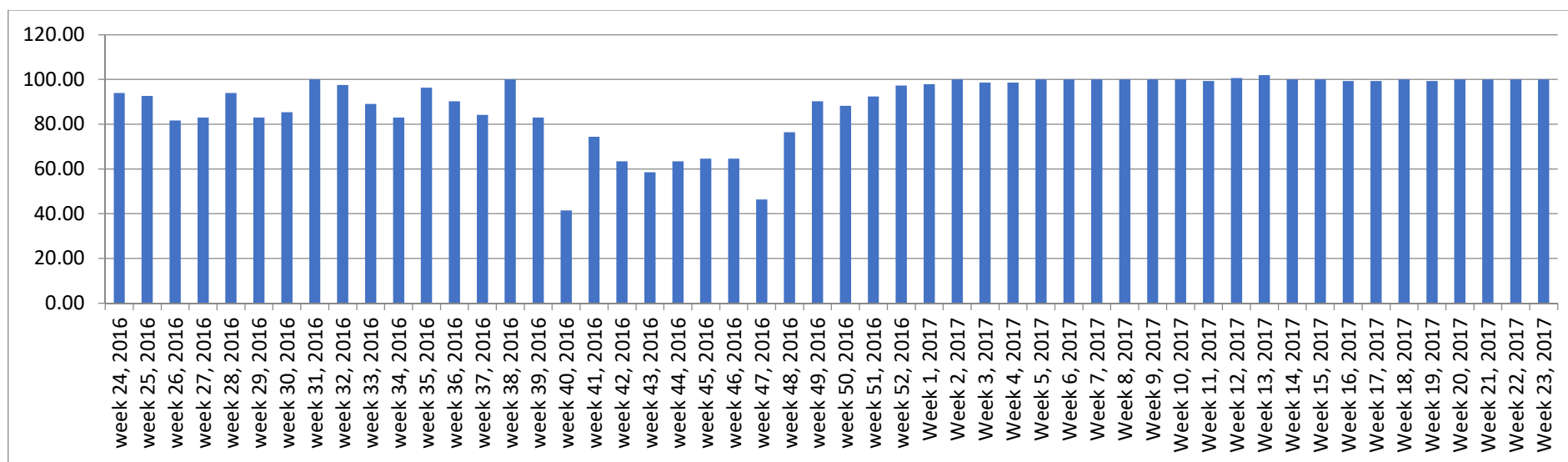


Figure 3.5Weekly report completeness percentage of Bole Sub city from week 24, 2016- week 23, 2017,Addis Ababa

Timeliness

The timeliness of facilities in bole sub city were 72.2%. In some weeks the all the health facilities reported late. In some weeks all the facilities reported timely. See figure 6.

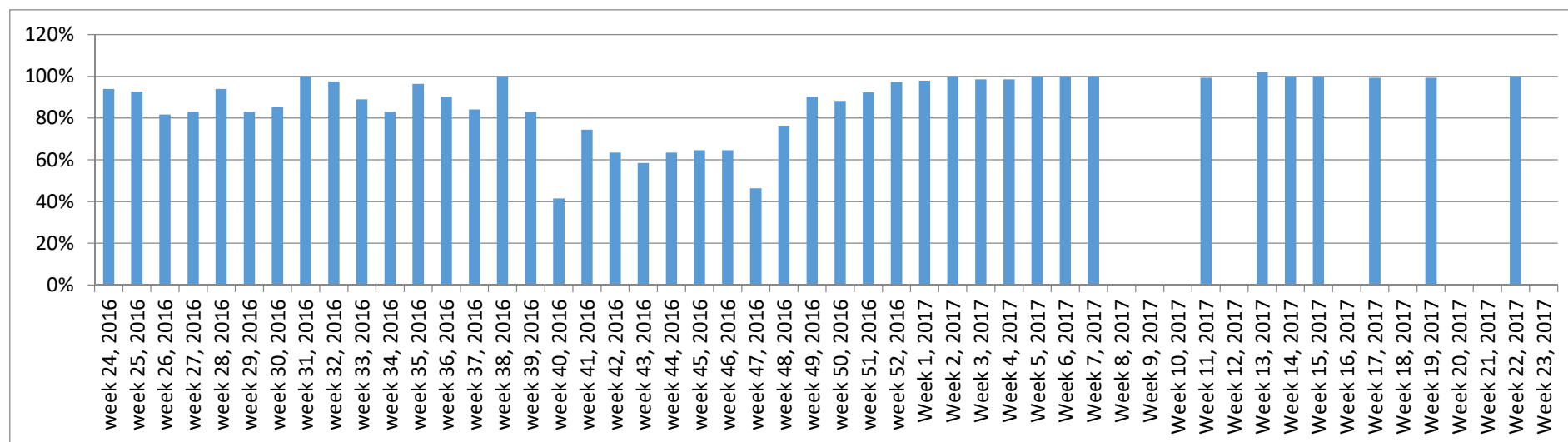


Figure3.6 Weekly report timeliness percentage of Bole Sub city from week 24, 2016- week 23, 2017, Addis Ababa

Usefulness

All the participants responded that the surveillance system could detect diseases, injuries, or adverse or protective exposures of public importance in a timely way to permit accurate diagnosis or identification, prevention or treatment, and handling of contacts when appropriate. Twenty-four participants (96.1%) replied that the system had the ability for estimation of the magnitude of morbidity and mortality of health related event. All the participants responded that the system could detect trends that signal changes in occurrence of health event including outbreaks or epidemics. All the participants responded that the surveillance system permits the assessment of the effect of prevention and control programs and leads to clinical, behavioural, social, policy, environmental practices or stimulates research. The overall usefulness of the surveillance system rated by participants in case detection, planning, priority setting and intervention was 85.1%.

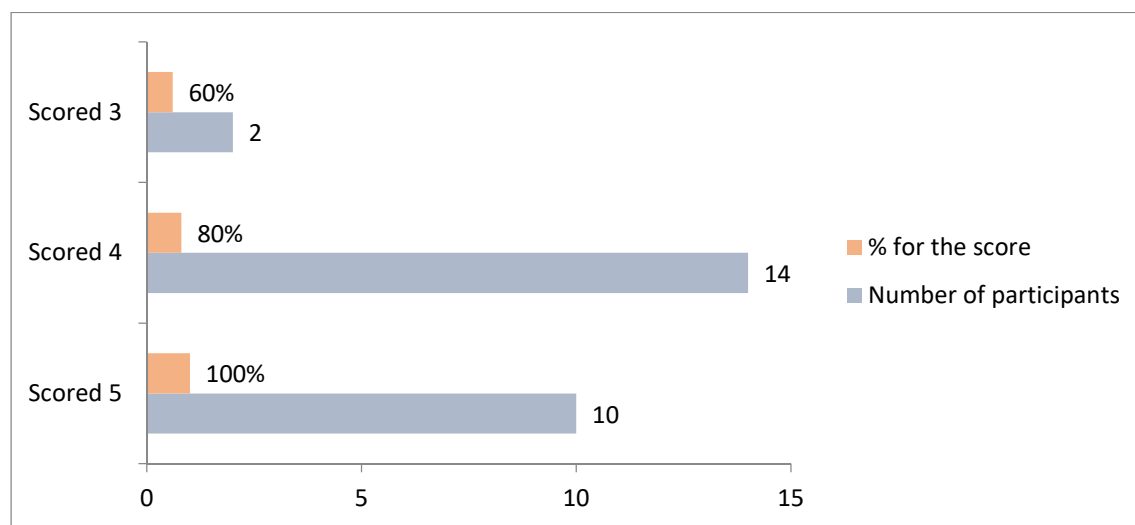


Figure 3.7 Surveillance system usefulness score given by participants in Bole sub city, 2017

Simplicity

Twenty-four (96.1%) of the participants responded that the surveillance system needs special or follow-up laboratory test to confirm cases. All the participants responded that the surveillance system needs investigation of the case including telephone contact or home visit by public health personnel to collect detailed information. To collect and interpret data, all the participants responded that special training is a requirement. The simplicity of the surveillance system in

data collection, compilation, reporting, analysis and utilization by implementers and users of the system was rated by participants 81.5%.

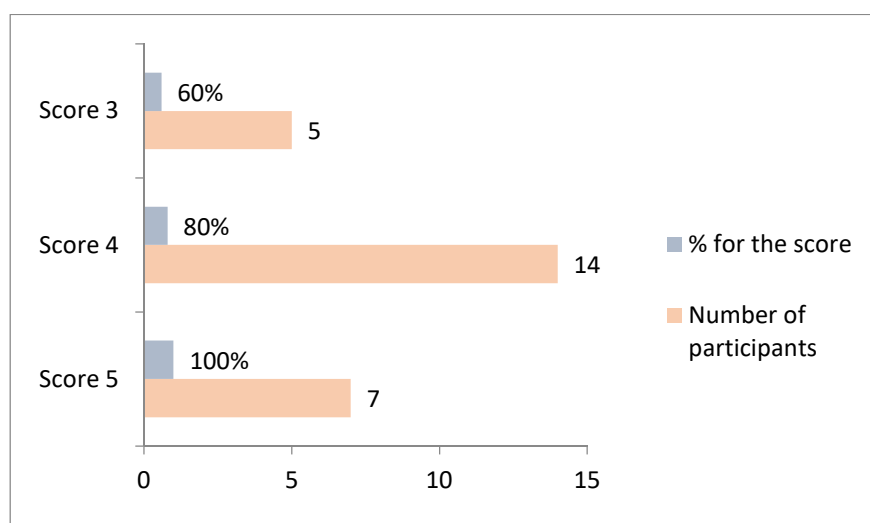


Figure 3.8 Surveillance system simplicity score given by participants in Bole sub city, 2017

Flexibility

The ability of the surveillance system to adapt to changing needs as perceived by the national health managers and evaluators was rated by participants with 78.5% flexibility.

Sensitivity

The sensitivity of the surveillance system to detect outbreaks was 77.7% based on the raters results. Nine raters gave 60%, 11 raters gave 80% and 6 raters gave 100% sensitivity.

Acceptability

The acceptability of the surveillance system by users and implementers was 87.7%. Three raters gave 60%, 10 raters gave 80% and 13 raters gave 100% acceptability.

Reliability

The reliability of the surveillance data or reports by implementers and users of the system was 89.2%. One participant gave 40%, 11 participants gave 80 % and 14 participants gave 100% reliability.

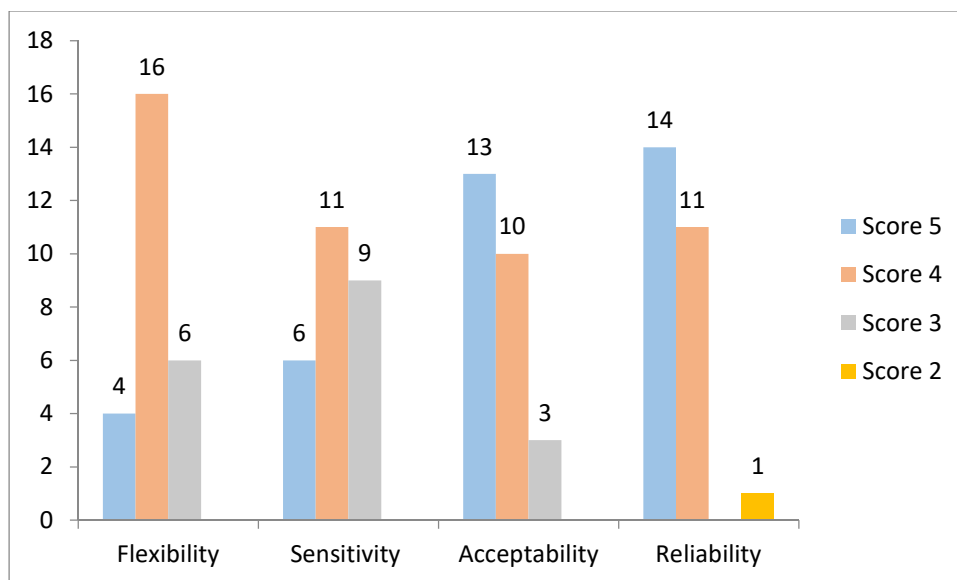


Figure 3.9 Surveillance system flexibility, sensitivity, acceptability and reliability scores rated by participants in Bole sub city, 2017

3.1.6 Discussion

To evaluate the surveillance system of Bole sub city, interview were carried out among PHEM officers and clinicians working in private and public health facilities. The surveillance system was evaluated by assessing the attributes, core and supporting functions of the surveillance system.

In Ethiopia, there are 21 priority diseases that are followed through the surveillance system. Immediately reportable diseases, from the lowest level of reporting unit to the federal level within 2 hours of report. These diseases are 14. Weekly reportable disease are 7. The diseases are reported weekly and reach to the federal level until Thursday midday. According to International Health Regulation 2005, countries are expected to report diseases that have a potential to become cross boarder and threaten people's lives worldwide to WHO. So as the international community could help responding and controlling these life-threatening conditions (13).

Assigned person who coordinated the surveillance activity was present at every Wereda and health facility. This helps in carrying out surveillance activities and strengthens the PHEM system. Most of the PHEM officers reported that their roles and responsibilities were not clearly listed, even if the list is available in the PHEM guideline (7).

The sub city had networking and partnership with the neighbouring sub cities during the previous outbreak. For successful and comprehensive surveillance system, networking and partnership play important roles (2). No informal mechanism was in place to capture unusual events in the sub city. Informal ways of investigating rumours including media scanning, community members and new scientific finding can help in strengthening the surveillance system (7). Most of the health professionals working at the OPD reported that they would report to the concerned body if they got measles case but one clinician reported that he would treat and send the patient home. This might result in underreporting of cases. All of the focal persons knew the threshold of measles in this study and this might help in improvement of case detection.

RRT was absent in 2 Weredas. Even in the rest of the Weredas the RRT becomes functional only during outbreak seasons. Part of epidemic preparedness is establishment of RRT and training the RRT. The RRT team investigates and follows the daily activities of the outbreak investigation (7). Without these teams, it would be difficult to investigate and monitor the outbreak investigation.

Reports from the health facilities to the Wereda and from Wereda to sub city were sent through phone and hard copies. The sub city reports to the AACAHB through telephone and sometimes through email. ePHEM was implemented 5 years back as part of HMIS. The software was not used in any of the PHEM structures. These might lead to poor data management and no backup system. Written feedback was not available in the sub city, Wereda and health facilities. Written feedbacks help to make follow-ups easier, otherwise might be forgotten. SOP for laboratory sample collection and transport was available in every facility. Laboratory investigations aims at properly diagnosing the diseases and reduce errors (7). Availability of SOP will help in achieving these goals.

No formal budget was allocated for PHEM activities at the sub city, wereda and health facility levels. All of the Wereda PHEM officers did not have computer to carry out their daily activities. Unavailability of the necessary equipments might compromise the quality of the surveillance system. It shows that emphasis was not given to equip the focal points at each level with necessary materials. During the last outbreak of cholera, shortage of budget led many professionals not being paid for their time of work during the outbreak. In the AACAHB, no medicine and medical supplies were available for emergencies. These might lead to unorganized and poor timing of outbreak response that would cause loss of many lives.

Completeness of Bole sub city PHEM report from week 24, 2016 – week 23, 2017 was 89.5%. The standard minimum expected completeness of the report is 80% (7). Timeliness of the report of Bole sub city PHEM report from week 24, 2016- week 23, 2017 was 72.2% that is below the target 80% (7). Delay on the timeliness of a report can lead to delay in reporting an outbreak and delay in the response.

Poor implementation of PHEM activities would lead to economical and human lives losses in a country by different outbreaks. Strengthening outbreak early prevention and control activities would prevent the effect of outbreak impacts on a community and on a country at large. Strong PHEM system would predict the occurrence of an outbreak, detect outbreak early, implement prevention activities timely, carryout control activities and work on recovery.

Limitation

The estimated sample size was not based on a formula and selection of the number of facilities did not consider the number of the health facilities that makes the generalizability of this study results limited.

3.1.7 Conclusions

Some Weredas did not have a plan to evaluate health facilities. At every level of the PHEM structure there were assigned focal persons to carryout PHEM activities. But they did not show their roles and responsibilities when they were asked. The sub city had networking and partnership with other sub cities and sectors. However, there was no informal mechanism to trace potential outbreaks.

Not all clinicians knew that measles cases need to be notified to the next level. There was assigned laboratory professional to carryout laboratory investigations for the diseases under surveillance in the health facilities. Some Weredas did not have RRT to investigate outbreaks. Reports were sent to the higher level through telephone, hardcopy and sometimes through email. The backup mechanism for the report was poor. Supervisions were carried out in the sub city and in some Weredas but written feedbacks were not available at any level. There was no formal assigned budget and necessary materials to undertake surveillance activities. The completeness of the sub city weekly report was above the expected standard and the timeliness was below the expected standard.

3.1.8 Recommendations and Actions taken

Wereda level

The Weredas must prepare evaluation plan and implement it accordingly. Roles and responsibilities of PHEMO must be known by every PHEMO. Trainings on PHEM priority diseases should be given to health professionals working in the health facilities. Weredas with no RRT must establish the teams. The weekly and the case based report formats should be kept in organized way. Written feedbacks should be given after supervisory visits. The Wereda administration should provide a separate budget to undertake PHEM activities. The importance of having evaluation plan, organized report, establishment of RRT and written feedbacks were discussed. PHEMOs were informed on the presence of the list of roles and responsibilities on PHEM guideline.

Sub city level

Informal ways of capturing surveillance report should be established. The PHEMO should support Wereda PHEMO in provision of trainings for health professionals working at the health facility about priority diseases. The weekly and the case based report formats should be kept in organized way. Written feedbacks should be given after supervisory visits. The sub city must support the Wereda in assigning budget PHEM activities. The sub city health office needs to have a separate budget for PHEM activities. Ways to improve the timeliness of the sub city report must be identified and implemented. Informal ways of capturing surveillance report, provision of support for the Wereda's PHEMOs to provide training for health workers working at the health facilities, proper report format handling, provision of written feedbacks after supervision, budget allocation for PHEM activities and report timeliness were discussed with the sub city PHEM team.

AACAHB level

Strengthening the already existing ePHEM would help in availability of PHEM data at all levels of PHEM with good backup mechanism. Written feedbacks should be given after each supervisory visits. Budget and resource related problems at the Wereda and sub city levels should be followed up by the bureau and resources must be mobilized to solve the problems.

The importance of strengthening ePHEM system, provision of written feedbacks and resource scarcity and mobilization were discussed with the bureau.

EPHI level

EPHI could share experiences of other regions that are currently implementing the ePHEM correctly without interruption to AACAHB. Resource problems that could not be addressed by the AACAHB must be identified and the ministry could mobilize resources and address these issues.

3.1.9 Acknowledgement

First of all, I would like to thank God for all His blessings. Secondly, I am grateful for my advisor Dr. YosephWorku for his valuable comments and suggestions. Lastly, I am thankful for all the participants of this study and Bole sub city health office for volunteering to participate in this study and providing all the information that I need.

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3.1.11 Annex

3.1.11.1 Questionnaire for AACAHB, WHO, sub city, wereda and health facility

No.	Component of surveillance	Indicator	Indicator definition	Question	Level
1	Surveillance strategy and coordination	Plan of action for communicable disease surveillance systems	Presence of surveillance and response plan	Q1. Is there surveillance and response plan? (Check for documentation) 1 Present 2 Absent	Sub city, wereda and health facility level
		Performance of routine surveillance system evaluation	Whether evaluations are conducted according to plan	Q2. Is there a plan to evaluate performance of Weredas/Sub city/ Regional surveillance activities in the last 12months? 1 Yes 2 No Q3. How many planed evaluations were there in the past 12 months?____ How many were carried out according to plan?_____	Regional health bureau, sub city, Wereda
2		Presence of a surveillance	Presence of a surveillance	Q4. Is there a focal person assigned to carryout surveillance	Sub city, wereda and

		coordinating body	coordinating body at each level	activity? If yes, how many?_____(number)	health facility level
		Scheduled surveillance coordination meetings	Proportion of scheduled surveillance or PHEM coordination meetings held	Q5. How many planned surveillance review meetings were planned in the last 12 months? _____ Q6. How many of the planned meetings were carried out? ____	Sub city, Wereda
		Laboratory representation in the surveillance coordinating body	Regular coordination body includes laboratory personnel	Q7. Did the review meeting include lab personnel? 1 Yes 2 No	Sub city, Wereda
		Existence of documented roles & responsibilities	Roles and responsibilities are well documented at each level of surveillance system	Q8. Is there a document with roles and responsibilities of the surveillance foal person? 1 Present 2 Absent	Sub city, Wereda

3	Networking and partnership	Intersectoral collaboration, networking and partnership	Existence of intersectoral collaboration, networking and partnerships with other sectors (water and sanitation, agriculture, animal health, etc)	Q9. Is there collaboration, networking and partnership with water, sanitation, agriculture, animal health... sectors? 1 Present 2 Absent	Sub city, Wereda
		Functional laboratory networks	Existence of functional laboratory networks established	Q10. Is there a lab facility that you will send samples to for further investigation? 1 Yes 2 No	Health facilities
		Capacity for sharing outbreak related information between neighboring Weredas or sub cities	Existence of cross-border Communications during outbreaks	Q11. Was there cross boarder communication of outbreaks during the last 12 months? 1 Present 2 Absent	Sub city, Wereda
		Health facilities with standard case definitions	Proportion of health facilities with standard case definitions for diseases to	Q12. Is there a standard case definition for diseases in the facility? 1 Yes	Sub city, Wereda

			be reported regularly in the surveillance system	2 No	
		Mechanism for outbreak detection within the health facility	Existence of surveillance systems for the detection of outbreaks in health facility settings	Q13. If you encounter a patient with measles while working in the Out Patient Department, what will you do?(let the physician answer and circle one of the questions listed below) 1 Report to the next level 2 Treat and send the patient home 3 Other, specify_____	Health facility
		Existence of event based surveillance	Existence of a mechanism to capture unusual or public health events from non routine sources in the health system (e.g. from the community, media or other informal sources)	Q14. Do you any mechanism to capture unusual public health events outside the structured surveillance system from the community, media or informal sources? 1 Yes 2 No If yes, specify_____	Sub city, Wereda
4	Core functions, case	Availability of registers	Proportion of health facilities with standardized	Q15. Is there HMIS register in the Out Patient department and In	Health facility

	registration		registers	Patient Department? 1 Yes 2 No	
		Correct filling of registers	Proportion of HF with correctly filled registers	Q16. Are the registers filled correctly?(Observe) 1 Yes 2 No	Health facilities
		Existence of rumor log	Existence of rumor log or database for registration of suspected public health events from informal sources	Q17. Is there a rumor registration book? (Observe) 1 Present 2 Absent	Health facilities
5	Core functions, case confirmation	Confirmation of priority diseases	Capacity to confirm selected priority diseases either within the laboratory or at a reference laboratory	Q18. Is there a lab within the health facilities or at a reference laboratory for selected priority diseases? 1 Present 2 Absent	Sub city
		Knowledge of where to refer samples appropriately	Presence of a documented list of reference laboratories for confirmation of	Q19. Is there a documented list of reference laboratories for confirmation of epidemic prone diseases?	Health facilities

			epidemic-prone diseases	1 Present 2 Absent	
6		Laboratory confirmation of outbreaks	Proportion of outbreaks that are laboratory confirmed	Q20. How many suspected outbreaks of measles where there in the past 3 years____ Q21. How many of the suspected measles outbreak were lab confirmed? ____ %_____	Sub city
7	Core functions, reporting	Case-based reporting rate	Proportion of cases of diseases targeted for elimination/eradication line listed or reported using case-based reporting forms in the past 12 months	Q22. How many number of measles cases were reported in the past 12 months? (check the report)_____ Q23. How many of them are written down on the line list?(check the line list)_____	Sub city, Wereda and health facilities
		Timely notification of epidemics	Proportion of measles epidemics (above epidemic threshold) detected in previous 12 months that were notified to the next	Q24. How many measles outbreaks were detected in the past 12 months?_____ Q25. How many of them were notified to the next level within	Sub city, Wereda and health facilities

			higher level within 2 days of detection	2days of detection?_____	
8	Core functions, data analysis and interpretation	Routine analysis of data by surveillance units	Proportion of health facilities with evidence of data analysis by time, place and person for selected indicator diseases (epidemic-prone, vaccine preventable, Others of public health	Q26. Data analyzed by time, place, person? 1 Yes 2 No	Sub city, Wereda and health facilities
9		Pre-defined epidemic threshold values	Presence of predefined action thresholds for selected indicator diseases (epidemic-prone, Vaccine preventable, others of public health importance)	Q27. Is there a predefined action threshold for prioritized diseases? 1 Yes 2 No	National guideline
		Surveillance units having epidemic threshold values	Proportion of surveillance units with defined epidemic threshold values for priority diseases	Q28. What is the threshold level for measles?(let the focal person answer the question and circle the answer after wards) 1 Five or more cases suspected cases in one month or three	Sub city, Wereda, health facilities

				confirmed cases in one month 2 Others, specify_____	
				3 I don't know	
10		Capacity for routine laboratory data analysis and interpretation	Evidence of routine laboratory data analysis and interpretation	Q29. Is there a data analysis based on time, place and person on routine lab investigations? 1 Present 2 Absent	Health facilities
11	Core functions, epidemic preparedness	Epidemic preparedness plan	Presence of epidemic preparedness plans	Q30. Is there an epidemic preparedness plan in the facility? 1 Present 2 Absent	Sub city, wereda and health facility
		Emergency funds	Existence of funds for emergency response	Q.31 Based on previous emergencies, where there emergency response funds? 1 Present 2 Absent	Sub city, Wereda and health facility
		Adequacy/availability of supplies	Proportion of public health units that experienced shortage	Q32 Did the facility experienced shortage of drugs and supplies during the most recent outbreak?	Health facilities

		and drugs for outbreak management and control	of drugs and supplies for the most recent outbreak (define the time frame e.g. 3, 6, 12 months)	1 Yes 2 No	
		Availability of IEC materials for surveillance and response	Proportion of surveillance units with IEC materials/activities	Q33. Does the facility has IEC materials for surveillance activities? 1 Yes 2 No	Sub city, Wereda and health facilities
		Epidemic preparedness committee	Presence of a functional Epidemic preparedness committee	Q34. Is there functional epidemic preparedness committee in the facility? 1 Present 2 Absent	Sub city, Wereda and health facilities
		Rapid response teams (RRT)	Presence of RRT	Q35 Is there RRT in the facility? 1 Present 2 Absent	Sub city, Wereda and health facilities

	Core function, response and control	Capacity for outbreak response	Proportion of outbreaks responded to in the previous 12 months	Q36. How many outbreaks were there the past 12 months?_____ Q37. How many of the outbreaks were investigated within 3hours?_____	AACAHB and Sub city
		Availability of rapid response kits	Availability of rapid response/ emergency kits at various levels	Q38. Do you currently have medicine and supplies for emergency situations? 1 Yes 2 No	AACAHB and Sub city
12	Core functions, feed back	Existence of regular feedback	Presence of a feedback mechanism	Q39. Is written feedback from the higher level present in the facility? 1 Present 2 Absent	Sub city, Wereda and health facilities
		Feedback disseminated	Proportion of feedback reports/bulletins disseminated	Q40. How many number of supervisions were carried out in the past 12 months?____ Q41. How many feedback were given to the facilities?_____ (check documentation)	Sub city and Wereda

13	Standards and guidelines	Surveillance Standards and guidelines	Availability of surveillance standards and guidelines for priority diseases	Q42. Is there national PHEM guideline in the facility? 1 Present 2 Absent	Sub city and Wereda
		Standard case management protocols	Proportion of surveillance units with standard case management protocols or guidelines for case management of measles	Q43. Is there measles case management guideline in the facility? 1 Yes 2 No	Sub city and Wereda
		Guidelines for specimen collection, packaging and referral	Proportion of laboratory units with SOPs for collection, packaging and referral of specimens of targeted epidemic prone pathogens	Q44. Is there lab SOP for sample collection, packaging and referral specimen for epidemic prone diseases? 1 Yes 2 No	Health facilities
		Availability of reporting forms at HF/District levels	Proportion of HF/Districts that were not short of reporting forms ¹ in the previous 6 months	Q45. Was there any shortage of reporting format in the facility the past 6months? 1 Yes 2 No	Sub city, Wereda and health facility
14	Training	Availability of training	Proportion of surveillance units with surveillance	Q46. Is there surveillance training module in the facility?	Sub city, Wereda and

		manuals/ modules for surveillance	training manuals/modules	1 Yes 2 No	health facility
		Availability of surveillance training Plan	Proportion of surveillance units with a training plan for surveillance	Q47. Is there surveillance training plan? 1 Yes 2 No	Sub city and Wereda
		Staff trained on surveillance/ PHEM	Proportion of surveillance staff/HCWs trained in surveillance or PHEM	Q48. Is the focal person trained for in the facility? 1 Yes 2 No	Sub city and Wereda
		Staff receiving Refresher courses on surveillance	Proportion of health staff that have received at least one refresher course on surveillance in the previous 2 years	Q49. Did the focal person received refresher training in the past 2 years at least once?(If trained PHEM training before 2 years) 1 Yes 2 No	Sub city and Wereda
15	Supervision and communication	Supervisions conducted	Proportion of supervisions conducted according to plan	Q50. How many supervisions were planned this year?_____ How many of the planned were implemented according to	Sub city and Wereda

				plan?_____	
		Availability of communication facilities	Proportion of surveillance units with functional communication facilities for immediate, weekly, and monthly reporting	Q51. What is the way of communication in the facility to the next level? Circle that is appropriate 1 Telephone 2 Email 3 Hard copy 4 Fax 5 Others, specify_____	Sub city, Wereda and health facilities
16	Supportive functions, resource	Availability of budget line for surveillance activities	Evidence of a budget line for Surveillance activities (reporting forms, feedback bulletins, communication, supervision, training, etc)	Q52. Is there budget allocated for surveillance activities? 1 Yes 2 No	Sub city, Wereda and health facilities
		Availability of functioning computers	Proportion of surveillance units with functional computers for surveillance purposes	Q53. Is there a computer to do surveillance activities? 1 Yes 2 No	Sub city, Wereda and health facilities

17	Quality outputs of surveillance, timeliness	Timeliness of submission of surveillance reports	Proportion of surveillance units that submitted surveillance reports (immediate, weekly, monthly) to the next higher level on time	Q54. How many facilities reported timely in the last Fiscal year?_____	Sub city and Wereda
		Timeliness of notification of suspected outbreaks	Proportion of outbreaks (with observed no. of cases > threshold values) notified to the next higher level within 48 h of detection	Q55. How many facilities were expected to report timely in the last Fiscal year?_____	
		Timeliness of response to suspected outbreaks	Proportion of suspected outbreaks that were verified within 48 h of detection	Q56. How many health facilities reported cases above the threshold level within 48hours of detection the past 12 months?_____	
				Q57. How many suspected outbreaks were there the past 12 months?_____	
				Q58. How many of the suspected outbreaks were verified within 48hours of detection?_____	Sub city and Wereda
18	Quality/outputs of surveillance system	Completeness of reporting	Proportion of total expected surveillance reports received, regardless of the timeliness of	Q59. How many health facilities are expected to report regardless of the time of submission the past 12 months?_____	AACAHB, WHO, Sub city and Wereda

			submission	Q60. How many of the expected to report facilities reported regardless of time of submission the past 12months?_____	
		Completeness of data reported	Proportion of surveillance reports/registers with no missing required information	Q61. How much of the proportion of the surveillance reports/registers with no missing required information? (Take 10 randomly selected reports or 2 registers and check the completeness). _____ %	AACAHB, WHO, Sub city, Wereda and health facilities
		Usefulness of surveillance data	Rating of the usefulness of the Surveillance system (for case detection, planning, priority setting and interventions)	Q62. Does the surveillance system detect diseases, injuries, or adverse or protective exposures of public importance in a timely way to permit accurate diagnosis or identification, prevention or treatment, and handling of contacts when appropriate? A. Yes B. No	AACAHB, WHO, Sub city and Wereda
				Q63. Does the surveillance system	

				provide estimates of the magnitude of morbidity and mortality related to the health-related event under surveillance, including the identification of factors associated with the event? A. Yes B. No	
				Q64. Does the surveillance system detect trends that signal changes in the occurrence of disease, injury, or adverse or protective exposure, including detection of epidemics (or outbreaks)? A. Yes B. No	
				Q65. Does the surveillance system permit assessment of the effect of prevention and control programs? A. Yes B. No	
				Q66. Does the surveillance system leads to improved clinical, behavioral, social, policy, or environmental practices? Or	

				stimulates research intended to lead to prevention or control? A. Yes B. No	
				Q67. How much do you rate the current usefulness of the surveillance system in case detection, planning, priority setting and intervention? 1 2 3 4 5	
		Simplicity of the surveillance system	Rating of the simplicity of the Surveillance system (in terms of data collection, compilation, reporting, analysis and utilization) by implementers and users of the systems	Q68. Does the surveillance system needs a special or follow-up laboratory tests to confirm the case? A. Yes B. No	AACAHB, WHO, Sub city and Wereda
				Q69. Does the surveillance system needs investigation of the case, including telephone contact or a home visit by public health personnel to collect detailed information? A. Yes B. No	

				Q70. Does the surveillance system needs integration of related systems whereby special training is required to collect and/or interpret data? A. Yes B. No	
				Q71. How much do you rate the current simplicity of the surveillance system in data collection, compilation, reporting, analysis and utilization by implementers and users of the system? 1 2 3 4 5	
		Flexibility/ adaptability of the surveillance system	Rating of the ability of the surveillance system to adapt to changing needs, as perceived by the national health managers and evaluators	Q72. How much do you rate the ability of the surveillance system to adapt to changing needs, as perceived by the national health managers and evaluators? 1 2 3 4 5	AACAHB, WHO, Sub city and Wereda
		Sensitivity of outbreak	Rating of the sensitivity of the surveillance system to	Q73. How much do you rate the sensitivity of the surveillance	AACAHB, WHO, Sub

		detection	detect outbreaks	system to detect outbreaks? 1 2 3 4 5	city and Wereda
		Acceptability of the surveillance system	Rating of the acceptability of the surveillance system by users and implementers	Q74. How much do you rate the acceptability of the surveillance system by users and implementers? 1 2 3 4 5	AACAHB, WHO, Sub city and Wereda
		Reliability of surveillance data reports	Rating of the reliability of the surveillance data/ reports by implementers and users of the system	Q75. How much do you rate the reliability of the surveillance data or reports by implementers and users of the system? 1 2 3 4 5	AACAHB, WHO, Sub city and Wereda

3.1.11.2 Questionnaire for Addis Ababa City Administration Health Bureau

Answer the following questions

1. Was there a plan to evaluate performance of Weredas/Sub city/ Regional surveillance activities in the last 12months?
A. Yes B. No
2. If yes, how many planed evaluations were there in the past 12 months?(in number)_____
3. How many were carried out according t the plan?_____
4. How many outbreaks were there in the past 12 months?_____
5. How many were investigated within_____ hours?_____
6. D you currently have medicine and supplies in your stock for emergency situations?
A. Yes B. No
7. How many of health facilities are expected to report in the last 12months?_____
8. How many of the expected facilities reported regardless of time of submission the past 12months?_____
9. How much of the proportion of the surveillance reports/registers with no missing required information? (Take 10 randomly selected reports or 2 registers and check the completeness)_____%

Please rate the appropriate score for each question 1- being the lowest and 5 being the highest and circle the appropriate answer

No.	Question		Scores
1.	Usefulness	Does the surveillance system detect diseases, injuries, or adverse or protective exposures of public importance in a timely way to permit accurate diagnosis or identification, prevention or treatment, and handling of contacts when appropriate?	A. Yes B. No
		Does the surveillance system provide estimates of the magnitude of morbidity and mortality related to the health-related event under surveillance, including the identification of factors associated with the event?	A. Yes B. No
		Does the surveillance system detect trends that signal changes in the occurrence of disease, injury, or adverse or protective exposure, including detection of epidemics (or outbreaks)?	A. Yes B. No
		Does the surveillance system permit assessment of the effect of prevention and control programs?	A.Yes B.No
		Does the surveillance system leads to improved clinical, behavioral, social, policy, or environmental practices? Or stimulates research intended to lead to prevention or control?	A. Yes B. No
		How much do you rate the current usefulness of the surveillance system in case detection, planning, priority setting and intervention?	1 2 3 4 5
2.	Simplicity	Does the surveillance system needs a special or follow-up laboratory tests to confirm the case?	A.Yes B.No

		Does the surveillance system needs investigation of the case, including telephone contact or a home visit by public health personnel to collect detailed information?	A.Yes B.No
		Does the surveillance system needs integration of related systems whereby special training is required to collect and/or interpret data?	A.Yes B. No
		How much do you rate the current simplicity of the surveillance system in data collection, compilation, reporting, analysis and utilization by implementers and users of the system?	1 2 3 4 5
3.	Flexibility	How much do you rate the ability of the surveillance system to adapt to changing needs, as perceived by the national health managers and evaluators?	1 2 3 4 5
4.	Sensitivity	How much do you rate the sensitivity of the surveillance system to detect outbreaks?	1 2 3 4 5
5.	Acceptability	How much do you rate the acceptability of the surveillance system by users and implementers?	1 2 3 4 5
6.	Reliability	How much do you rate the reliability of the surveillance data or reports by implementers and users of the system?	1 2 3 4 5

3.1.11.3 Questionnaire for sub city

Answer the following questions

1. Is there surveillance and response plan? (Check for documentation)
A. Present B. Absent
2. Is there a plan to evaluate performance of Weredas activities in the last 12months?
A. Yes B. No
3. How many planed evaluations were there in the past 12 months?_____
4. How many were carried out according to plan?_____
5. Is there a focal person assigned to carryout surveillance activity?
A. Yes B. No
6. If yes, how many?(Number)_____
7. How many planned surveillance review meetings were planned in the last 12 months?

8. How many of the planned meetings were carried out? _____
9. Did the review meeting include lab personnel?
A. Yes B. No
10. Is there a document with roles and responsibilities of the surveillance foal person?
A. Present B. Absent
11. Is there collaboration, networking and partnership with water, sanitation, agriculture, animal health... sectors?
A. Present B. Absent
12. Was there cross boarder communication of outbreaks during the last 12 months?
A. Present B. Absent
13. Is there a standard case definition for diseases in the facility?
A. Yes B. No
14. Do you any mechanism to capture unusual public health events outside the structured surveillance system from the community, media or informal sources?
A. Yes B. No
15. If yes Q14, specify _____

16. Is there a lab within the health facilities or at a reference laboratory for selected priority diseases?
- A. Present B. Absent
17. How many suspected outbreaks of measles were there in the past 3 years_____
18. How many of the suspected measles outbreak were lab confirmed? _____
19. How many number of measles cases were reported in the past 12 months? (check the report)_____
20. How many of them are written down on the line list?(check the line list)_____
21. How many measles outbreaks were detected in the past 12 months?_____
22. How many of them were notified to the next level within 2days of detection?_____
23. Data analyzed by time, place, person?
- A. Yes B. No
24. What is the threshold level for measles?(let the focal person answer the question and circle the answer after wards)
- 24.1Five or more cases suspected cases in one month or three confirmed cases in one month
- 24.2Others, specify_____
- 24.3I don't know
25. Is there an epidemic preparedness plan in the facility?
- A. Present B. Absent
26. Based on previous emergencies, where there emergency response funds?
- A. Present B. Absent
27. Does the facility has IEC materials for surveillance activities?
- A. Present B. Absent
28. Is there functional epidemic preparedness committee in the facility?
- A. Present B. Absent
29. Is there RRT in the facility?
- A. Present B. Absent
30. How many outbreaks were there the past 12 months?_____
31. How many of the outbreaks were investigated within 3hours?_____

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46. Is there budget allocated for surveillance activities?
 A. Yes B. No
47. Is there a computer to do surveillance activities?
 A. Yes B. No
48. How many facilities reported timely in the last Fiscal year?_____
49. How many facilities were expected to report timely in the last Fiscal year?_____
50. How many health facilities reported cases above the threshold level within 48hours of detection the past 12 months?_____
51. How many suspected outbreaks were there the past 12 months?_____
52. How many of the suspected outbreaks were verified within 48hours of detection?_____
53. How many health facilities are expected to report regardless of the time of submission the past 12 months?_____
54. How many of the expected to report facilities reported regardless of time of submission the past 12months?_____
55. How much of the proportion of the surveillance reports/registers with no missing required information? (Take 10 randomly selected reports or 2 registers and check the completeness)._____%

Please rate the appropriate score for each question 1- being the lowest and 5 being the highest and circle the appropriate answer

No.	Question		Scores
1.	Usefulness	Does the surveillance system detect diseases, injuries, or adverse or protective exposures of public importance in a timely way to permit accurate diagnosis or identification, prevention or treatment, and handling of contacts when appropriate?	A. Yes B. No
		Does the surveillance system provide estimates of the magnitude of morbidity and mortality related to the health-related event under surveillance, including the identification of factors associated with the event?	A. Yes B. No
		Does the surveillance system detect trends that signal changes in the occurrence of disease, injury, or adverse or protective exposure, including detection of epidemics (or outbreaks)?	A. Yes B. No
		Does the surveillance system permit assessment of the effect of prevention and control programs?	A. Yes B. No
		Does the surveillance system leads to improved clinical, behavioral, social, policy, or environmental practices? Or stimulates research intended to lead to prevention or control?	A. Yes B. No
		How much do you rate the current usefulness of the surveillance system in case detection, planning, priority setting and intervention?	
			1 2 3 4 5
2.	Simplicity	Does the surveillance system needs a special or follow-up laboratory tests to confirm the case?	A. Yes B. No
		Does the surveillance system needs investigation of the case, including telephone contact or a home visit	A. Yes B. No

		by public health personnel to collect detailed information?	
		Does the surveillance system needs integration of related systems whereby special training is required to collect and/or interpret data?	A. Yes B. No
		How much do you rate the current simplicity of the surveillance system in data collection, compilation, reporting, analysis and utilization by implementers and users of the system?	1 2 3 4 5
3.	Flexibility	How much do you rate the ability of the surveillance system to adapt to changing needs, as perceived by the national health managers and evaluators?	1 2 3 4 5
4.	Sensitivity	How much do you rate the sensitivity of the surveillance system to detect outbreaks?	1 2 3 4 5
5.	Acceptability	How much do you rate the acceptability of the surveillance system by users and implementers?	1 2 3 4 5
6.	Reliability	How much do you rate the reliability of the surveillance data or reports by implementers and users of the system?	1 2 3 4 5

Answer the following questions

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30. Is there measles case management guideline in the facility?
A. Yes B. No
31. Was there any shortage of reporting format in the facility the past 6months?
A. Yes B. No
32. Is there surveillance training module in the facility?
A. Yes B. No
33. Is there surveillance training plan?
A. Yes B. No
34. Is the focal person trained for PHEM in the facility?
A. Yes B. No
35. Did the focal person received refresher training in the past 2 years at least once?(If trained PHEM training before 2 years)
A. Yes B. No
36. How many supervisions were planned this year?_____
37. How many of the planned were implemented according to plan?_____
38. What is the way of communication in the facility to the next level? Circle that is appropriate
- 38.1 Telephone
- 38.2 Email
- 38.3 Hard copy
- 38.4 Fax
- 38.5 Others specify _____
39. Is there budget allocated for surveillance activities?
A. Yes B. No
40. Is there a computer to do surveillance activities?
A. Yes B. No
41. How many facilities reported timely in the last Fiscal year?_____
42. How many facilities were expected to report timely in the last Fiscal year?_____
43. How many health facilities reported cases above the threshold level within 48hours of detection the past 12 months?_____
44. How many suspected outbreaks were there the past 12 months?_____

45. How many of the suspected outbreaks were verified within 48hours of detection?_____
46. How many health facilities are expected to report regardless of the time of submission the past 12 months?_____
47. How many of the expected to report facilities reported regardless of time of submission the past 12months?_____
48. How much of the proportion of the surveillance reports/registers with no missing required information? (Take 10 randomly selected reports or 2 registers and check the completeness)._____%

Please rate the appropriate score for each question 1- being the lowest and 5 being the highest and circle the appropriate answer

No.	Question		Scores
1.	Usefulness	Does the surveillance system detect diseases, injuries, or adverse or protective exposures of public importance in a timely way to permit accurate diagnosis or identification, prevention or treatment, and handling of contacts when appropriate?	A. Yes B. No
		Does the surveillance system provide estimates of the magnitude of morbidity and mortality related to the health-related event under surveillance, including the identification of factors associated with the event?	A. Yes B. No
		Does the surveillance system detect trends that signal changes in the occurrence of disease, injury, or adverse or protective exposure, including detection of epidemics (or outbreaks)?	A. Yes B. No
		Does the surveillance system permit assessment of the effect of prevention and control programs?	A. Yes B. No
		Does the surveillance system leads to improved clinical, behavioral, social, policy, or environmental practices? Or stimulates research intended to lead to prevention or control?	A. Yes B. No
		How much do you rate the current usefulness of the surveillance system in case detection, planning, priority setting and intervention?	1 2 3 4 5
2.	Simplicity	Does the surveillance system needs a special or follow-up laboratory tests to confirm the case?	A. Yes B. No

		Does the surveillance system needs investigation of the case, including telephone contact or a home visit by public health personnel to collect detailed information?	A. Yes B. No
		Does the surveillance system needs integration of related systems whereby special training is required to collect and/or interpret data?	A. Yes B. No
		How much do you rate the current simplicity of the surveillance system in data collection, compilation, reporting, analysis and utilization by implementers and users of the system?	1 2 3 4 5
3.	Flexibility	How much do you rate the ability of the surveillance system to adapt to changing needs, as perceived by the national health managers and evaluators?	1 2 3 4 5
4.	Sensitivity	How much do you rate the sensitivity of the surveillance system to detect outbreaks?	1 2 3 4 5
5.	Acceptability	How much do you rate the acceptability of the surveillance system by users and implementers?	1 2 3 4 5
6.	Reliability	How much do you rate the reliability of the surveillance data or reports by implementers and users of the system?	1 2 3 4 5

Answer the following questions

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B. No

15.1 Five or more cases suspected cases in one month or three confirmed cases in one month

15.3 I don't know

B. Absent

B. Absent

B. Absent

B. No

B. No

B. Absent

B. Absent

B. Absent

B. No

B. No

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A. Yes

B. No

27. What is the way of communication in the facility to the next level? Circle that is appropriate

27.1 Telephone

27.2 Email

27.3 Hard copy

27.4 Fax

27.5 Others, specify _____

28. Is there budget allocated for surveillance activities?

A. Yes

B. No

29. Is there a computer to do surveillance activities?

A. Yes

B. No

30. How much of the proportion of the surveillance reports/registers with no missing required information? (Take 10 randomly selected reports or 2 registers and check the completeness)._____%

Please rate the appropriate score for each question 1- being the lowest and 5 being the highest and circle the appropriate answer

No.	Question		Scores
1.	Usefulness	Does the surveillance system detect diseases, injuries, or adverse or protective exposures of public importance in a timely way to permit accurate diagnosis or identification, prevention or treatment, and handling of contacts when appropriate?	A. Yes B. No
		Does the surveillance system provide estimates of the magnitude of morbidity and mortality related to the health-related event under surveillance, including the identification of factors associated with the event?	A. Yes B. No
		Does the surveillance system detect trends that signal changes in the occurrence of disease, injury, or adverse or protective exposure, including detection of epidemics (or outbreaks)?	A. Yes B. No
		Does the surveillance system permit assessment of the effect of prevention and control programs?	A. Yes B. No
		Does the surveillance system leads to improved clinical, behavioral, social, policy, or environmental practices? Or stimulates research intended to lead to prevention or control?	A. Yes B. No
		How much do you rate the current usefulness of the surveillance system in case detection, planning, priority setting and intervention?	1 2 3 4 5
2.	Simplicity	Does the surveillance system needs a special or follow-up laboratory tests to confirm the case?	A. Yes B. No

		Does the surveillance system needs investigation of the case, including telephone contact or a home visit by public health personnel to collect detailed information?	A. Yes B. No
		Does the surveillance system needs integration of related systems whereby special training is required to collect and/or interpret data?	A. Yes B. No
		How much do you rate the current simplicity of the surveillance system in data collection, compilation, reporting, analysis and utilization by implementers and users of the system?	1 2 3 4 5
3.	Flexibility	How much do you rate the ability of the surveillance system to adapt to changing needs, as perceived by the national health managers and evaluators?	1 2 3 4 5
4.	Sensitivity	How much do you rate the sensitivity of the surveillance system to detect outbreaks?	1 2 3 4 5
5.	Acceptability	How much do you rate the acceptability of the surveillance system by users and implementers?	1 2 3 4 5
6.	Reliability	How much do you rate the reliability of the surveillance data or reports by implementers and users of the system?	1 2 3 4 5

3.1.11.6 WHO EPI officer

Please rate the appropriate score for each question 1- being the lowest and 5 being the highest and circle the appropriate answer

No.	Question		Scores
1.	Usefulness	Does the surveillance system detect diseases, injuries, or adverse or protective exposures of public importance in a timely way to permit accurate diagnosis or identification, prevention or treatment, and handling of contacts when appropriate?	A. Yes B. No
		Does the surveillance system provide estimates of the magnitude of morbidity and mortality related to the health-related event under surveillance, including the identification of factors associated with the event?	A. Yes B. No
		Does the surveillance system detect trends that signal changes in the occurrence of disease, injury, or adverse or protective exposure, including detection of epidemics (or outbreaks)?	A. Yes B. No
		Does the surveillance system permit assessment of the effect of prevention and control programs?	A. Yes B. No
		Does the surveillance system leads to improved clinical, behavioral, social, policy, or environmental practices? Or stimulates research intended to lead to prevention or control?	A. Yes B. No
		How much do you rate the current usefulness of the surveillance system in case detection, planning, priority setting and intervention?	1 2 3 4 5

2.	Simplicity	Does the surveillance system needs a special or follow-up laboratory tests to confirm the case?	A. Yes B. No
		Does the surveillance system needs investigation of the case, including telephone contact or a home visit by public health personnel to collect detailed information?	A. Yes B. No
		Does the surveillance system needs integration of related systems whereby special training is required to collect and/or interpret data?	A. Yes B. No
		How much do you rate the current simplicity of the surveillance system in data collection, compilation, reporting, analysis and utilization by implementers and users of the system?	1 2 3 4 5
3.	Flexibility	How much do you rate the ability of the surveillance system to adapt to changing needs, as perceived by the national health managers and evaluators?	1 2 3 4 5
4.	Sensitivity	How much do you rate the sensitivity of the surveillance system to detect outbreaks?	1 2 3 4 5
5.	Acceptability	How much do you rate the acceptability of the surveillance system by users and implementers?	1 2 3 4 5
6.	Reliability	How much do you rate the reliability of the surveillance data or reports by implementers and users of the system?	1 2 3 4 5

3.1.11.7 Questionnaire for health professionals working in the selected facilities

Answer the following questions

1. If you encounter a patient with measles while working in the Out Patient Department, what will you do?(let the physician answer and circle one of the questions listed below)
 - 1.1 Report to the next level
 - 1.2 Treat and send the patient home
 - 1.3 Others, specify_____
2. What is the threshold level for measles?(let the focal person answer the question and circle the answer after wards)
 - 2.1 Five or more cases suspected cases in one month or three confirmed cases in one month
 - 2.2 Others, specify_____
 - 2.3 I don't know

Please rate the appropriate score for each question 1- being the lowest and 5 being the highest and circle the appropriate answer

No.	Question		Scores
1.	Usefulness	Does the surveillance system detect diseases, injuries, or adverse or protective exposures of public importance in a timely way to permit accurate diagnosis or identification, prevention or treatment, and handling of contacts when appropriate?	A. Yes B. No
		Does the surveillance system provide estimates of the magnitude of morbidity and mortality related to the health-related event under surveillance, including the identification of factors associated with the event?	A. Yes B. No
		Does the surveillance system detect trends that signal changes in the occurrence of disease, injury, or adverse or protective exposure, including detection of epidemics (or outbreaks)?	A. Yes B. No
		Does the surveillance system permit assessment of the effect of prevention and control programs?	A. Yes B. No
		Does the surveillance system leads to improved clinical, behavioral, social, policy, or environmental practices? Or stimulates research intended to lead to prevention or control?	A. Yes B. No
		How much do you rate the current usefulness of the surveillance system in case detection, planning, priority setting and intervention?	1 2 3 4 5
2.	Simplicity	Does the surveillance system needs a special or follow-up laboratory tests to confirm the case?	A. Yes B. No

		Does the surveillance system needs investigation of the case, including telephone contact or a home visit by public health personnel to collect detailed information?	A. Yes B. No
		Does the surveillance system needs integration of related systems whereby special training is required to collect and/or interpret data?	A. Yes B. No
		How much do you rate the current simplicity of the surveillance system in data collection, compilation, reporting, analysis and utilization by implementers and users of the system?	1 2 3 4 5
3.	Flexibility	How much do you rate the ability of the surveillance system to adapt to changing needs, as perceived by the national health managers and evaluators?	1 2 3 4 5
4.	Sensitivity	How much do you rate the sensitivity of the surveillance system to detect outbreaks?	1 2 3 4 5
5.	Acceptability	How much do you rate the acceptability of the surveillance system by users and implementers?	1 2 3 4 5
6.	Reliability	How much do you rate the reliability of the surveillance data or reports by implementers and users of the system?	1 2 3 4 5

Chapter – IV: Health Profile Description

4.1 Bole sub city Wereda 9 administration health profile assessment

Executive summary

Background

Health profile of a city represents the overall health status of the catchment population. Identifying Wereda's health problem can help decision makers in improving the identified health problem. There has not been any health profile done at bole sub city Wereda 9 administration. This health profile aims to assess the health profile of Bole sub city Wereda 9 administration.

Objective

To describe the health and health related profile of Bole sub city Wereda 9 administration.

Methods and materials

The assessment was done from April 25-May 9, 2016 at Bole sub city Wereda 9 administration by using retrospective literature review. Semi structured questionnaire was developed. Secondary data was collected from the Wereda's report and by interviewing the Wereda's different sector staffs. Data was analyzed using Ms Excel.

Result

Wereda 9 is bounded to Wereda 8 by north, Wereda 11 by south, Wereda 7 and 13 by west and Wereda 10 by east. The Wereda has a surface area of 12,928.3m². According to Census done by HEWs' in the Wereda in 2006 E.C there were a total of 29,151 people living in the Wereda with female accounting 15,699 (53.9%) and male 13,452 (46.1%) of the population. Making the sex ratio, for every 86 men there were 100 female populations which is lower compared to EDHS 2011, 95 males per 100 females. On 2008 E.C, the estimated population was 30,388. There were 1 Hospital, 1 HC and 9 clinics in the Wereda. To estimate the health coverage data from W 9 Goro HC was used from 2005-2007 E.C. First ANC, 4th ANC follow ups were above 100% which was due to underestimation of the catchment population. Number of women who delivered in the HC were one third of women who came for their 1st ANC visit. Except BCG all the vaccination coverage were above 100%. AURTI was the leading cause of morbidity among all age groups & both sexes. In 2006 E.C there was measles outbreak, there were 52 cases and 2 deaths. In 2007 E.C there were 56 HIV positive cases who were currently on ART. Twelve tracer drugs were available within three years but 10 were absent one time or another.

Conclusion and recommendation

Most of the health coverage indicators of W 9 Goro HC were above 100% which shows underestimation of the catchment population. Data on safe drinking water and toilet services of the Wereda were not available. Data handling and quality control mechanisms should be improved in the Wereda and in the HC.

4.1 Introduction

4.1.1.1 Background

City health profile aims to reveal the city's health related problems by bringing together wide range of health information and inform the public, policy makers and politicians. City health profiles are expected to provide the evidence and credibility for serious efforts to promote health at a local level. They are meant to be the basis for setting priorities for health and be an integral part of local decision-making and the strategic planning process. The purpose of the health profiles is not to only to write a report but also to speak on the behalf of the community to improve health. Health profiles inform strategies to improve health. They must provide information for plans. They are therefore not an end by themselves rather an essential component in the cycle of improving health and thus moving closer to the reality of a healthy city (1). It's a tool for every participant in a healthy city network and provides a lively, scientifically based account of health in the city. It can stimulate public interest and political commitment. It can also identify targets for the future and monitor progress towards them (2).

Health profile of a city, Sub city or Wereda indicates the overall health status of the community living in that specific area. Health profile consists of the socio demographic characteristics, access to health service, health service coverage, top ten causes of morbidity and mortality of the community. In doing so the health profile will indicate the health needs of the community for public health action.

Globally, the Millennium Development Goals (MDGs) have been implemented from 1990-2015 with eight goals. The health related goals were three consisting; reduce child mortality, improve maternal health and prevention of communicable diseases. After the years ended, Sustainable Developmental Goals (SDGs) were developed. The SDGs have 17 goals and 169 targets. The document is a continuation of the MDG. The goal which focuses on health is Goal 3 which sees health comprehensively. "Ensure healthy lives and promote well-being for all at all ages". Within this goal, there are 13 targets (3).

In Ethiopia the health system is composed of three tier system. These are primary, secondary and tertiary level of health care where each levels with a catchment population of 60,000 -100,000, 1

– 1.5 million and 3.5 – 5 million, respectively. The primary level health care is composed of primary hospital, health centers and health posts (4).

Disease prevention, health promotion and curative health services are tightly intertwined with other sectors. Health profile of a City, Sub city or Wereda lists health and health related problems and identifies possible solution. This helps the City, Sub city or Wereda to allocate resources, plan interventions and monitor the overall activities of the Wereda.

Ethiopia has achieved MDG goal 3 by reducing child mortality by two third. According to Ethiopia Demographic Health Survey 2011 Child mortality was 88 deaths per 1,000 live births. The regional variation was significant, 169 deaths per 1,000 in BenshangulGumuz and 53 deaths per 1,000 in Addis Ababa. Unlike child mortality reduction, maternal mortality ratio has not shown a significant change. Ethiopia planned to reduce maternal mortality by 75% but this was not successful in the past years. To achieve the above stated goals and achieve the five year transformational plan, FMOH has identified five pillars of strategy: excellence in health service delivery, excellence in quality of assurance, excellence in leadership and governance and excellence in health system capacity (4).

Every City, Sub city and Wereda needs health profile which identifies the health and health related problems. The health profile needs to be updated based on the current situations and interventions should be planned. In Bole Sub city Wereda 9 there has not been any health profile done so this study is one of its kind.

4.1.1.2 Rationale of the study

This study will help Bole sub city and Wereda 9 administration to identify the Wereda's health and health related problems in the Wereda. It will also help them to plan interventions based on the findings that in turn will benefit residents of Bole sub city Wereda 9 administration residents. There has not been any health profile done in Bole Sub city Wereda 9 administration before so this study is the first in its kind and aimed to highlight the community's health needs by explaining the main health and health related indicators, identifying problems and suggest interventions for the concerned body.

4.1.2Objective

4.1.2.1 General objective

To describe the health and health related profile of Bole sub city Wereda 9 administration, Addis Ababa, Ethiopia, 2016

4.1.2.2 Specific objective

- To explain health and health related information relevant to the Bole Wereda 9 administration
- To identify health and health related problems of the Bole sub city Wereda 9 administration

4.1.3 Methods and materials

4.1.3.1 Study area

This study was conducted in Addis Ababa, Ethiopia. Addis Ababa has 10 sub cities. Of the ten sub cities Bole sub city is one of them. In Bole sub city there are 14 Weredas. This study was conducted in Bole sub city Wereda 9 administration.

4.1.3.2 Study period

Data was collected from April 25-May 9, 2016. Data was entered and summarized from May 10-June 7, 2016.

4.1.3.3 Study design

The study design used was retrospective record review.

4.1.3.4 Study units

The study units were wereda offices like health, education, sanitation, construction and design, human resource, vital statistics, food and medicine authority offices, CEO and the health facilities.

4.1.3.5 Data collection method

Semi structured questionnaire was developed which consisted of open and close ended questions. Secondary data was collected by interviewing staffs working in different sectors of the Wereda and by reviewing reports.

4.1.3.6 Data analysis

Data was entered and analyzed using MS Excel. Data was presented using graphs and tables.

4.1.3.7 Data quality control

Data was checked for consistency with in the months and years. Out layers were double checked by reviewing registers.

4.1.3.8 Data dissemination

The report will be presented for the Wereda, HC and Bole sub city health office. The report will also be submitted to St Paul's Hospital Millennium Medical College, Addis Ababa Regional Health Bureau, Bole sub city health office, Bole sub city Wereda 9 administration and Wereda 9 Goro Health Center in soft and hard copies.

4.1.4 Result and discussion

Addis Ababa, meaning new flower, was established in 1886. The site was chosen by Empress Taytu Betul during Emperor Menilik II regime. The city is situated in 527Km² area. The city administration has 10 sub cities. The city is surrounded by Oromia region (5).

Bole sub has 14 Weredas'. It is situated in the eastern part of Addis Ababa, bounded by south Akaki, by west Kirkos and Nifas silk, by north Yeka and by east Oromia region. In the sub city the altitude ranged from 2120 to 2408 meters above sea level which has a range of 288 meters (6).

Wereda 9 is bounded to Wereda 8 by north, Wereda 11 by south, Wereda 7 and 13 by west and Wereda 10 by east. The Wereda has a surface area of 12,928.3m². The wereda has 9 sub weredas' and 28 blocks. It is administered by Chief Executive Officer (CEO) of the wereda and peoples counsel.

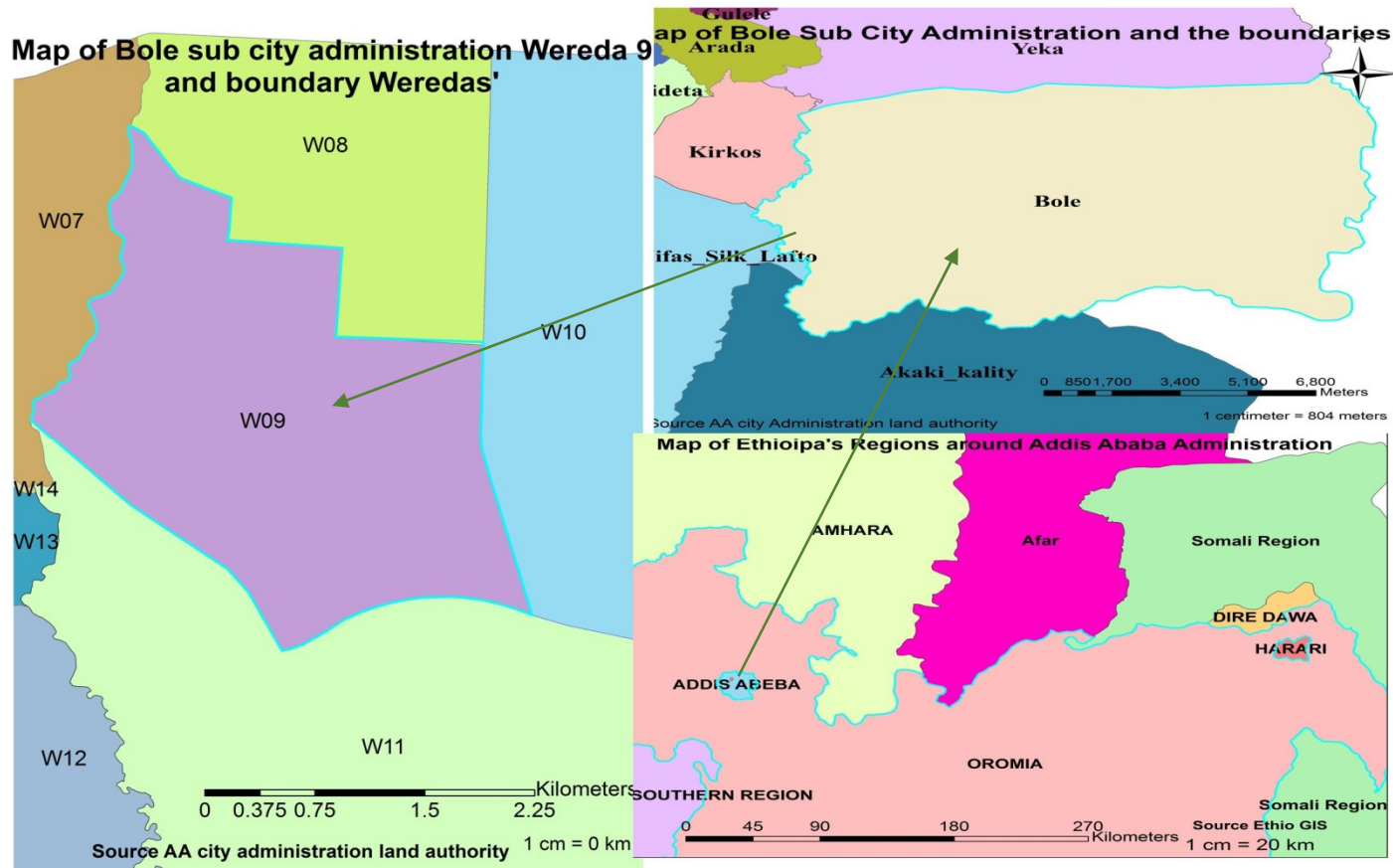


Figure 4.1 Map of Bole sub city, AA city administration and Ethiopia from left to right, 2008E.C

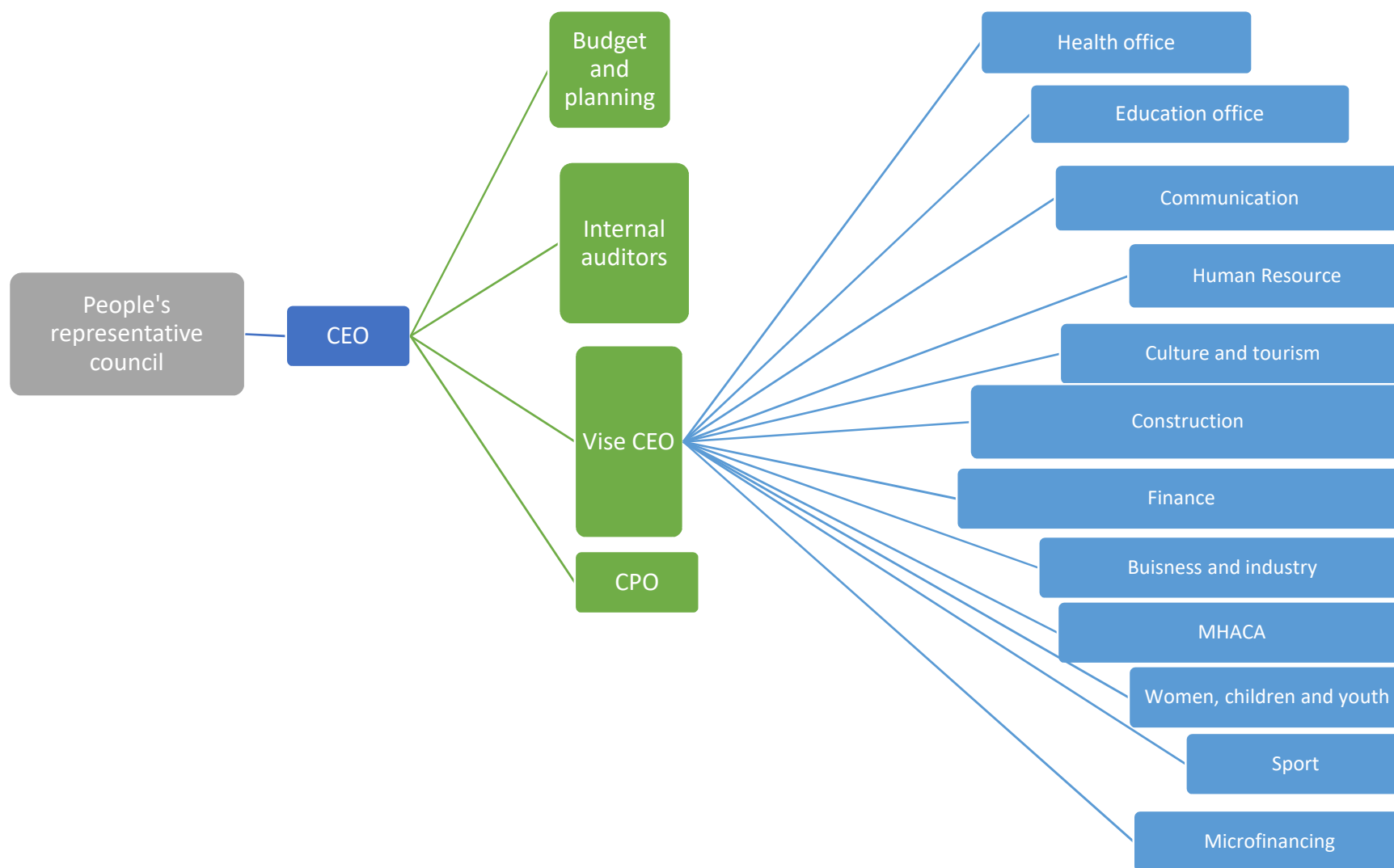
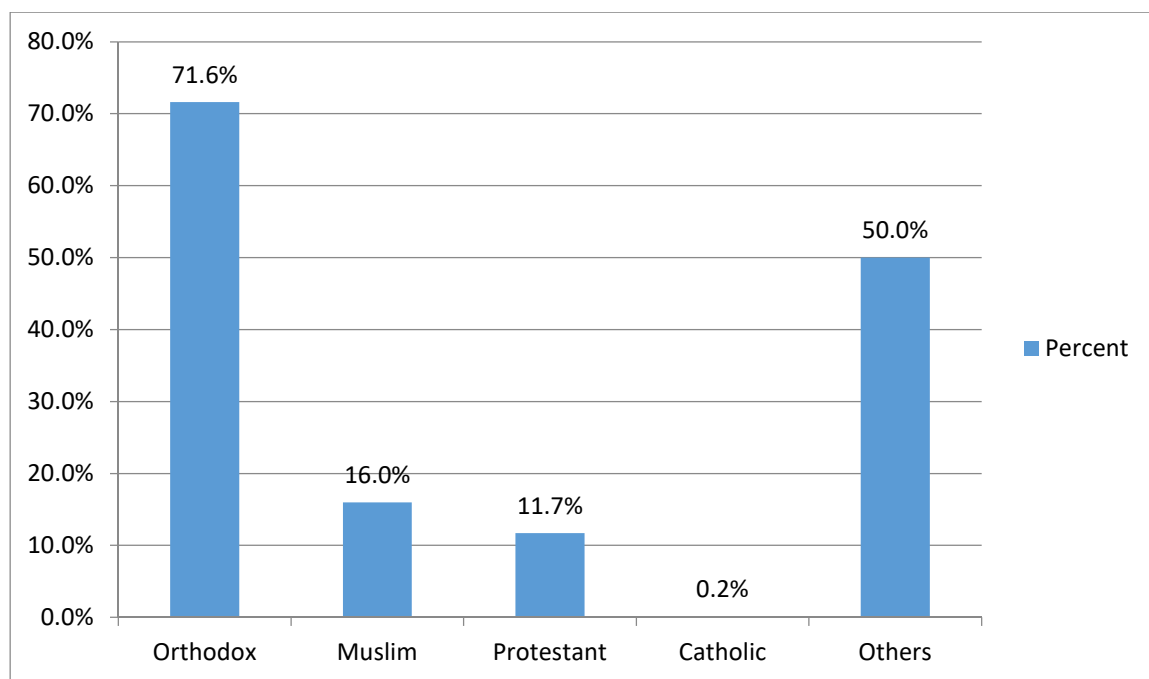


Figure 4.2 Organogram of the Bole sub city Wereda 9 administration, 2008E.C

4.1.4.1 Socio demographic characteristics

According to Census done by HEWs' in the Wereda in 2006E.C there were a total of 29,151 people living in the Wereda with female accounting 15,699(53.9%) and male 13,452(46.1%) of the population. Making the sex ratio, for every 86 men there were 100 female populations which is lower compared to EDHS 2011, 95 males per 100 females. According to Census 2007G.C the population of Addis Ababa has 2.1% population growth rate which makes the estimated residents in the wereda in 2008E.C 30,388 (7,8,9).

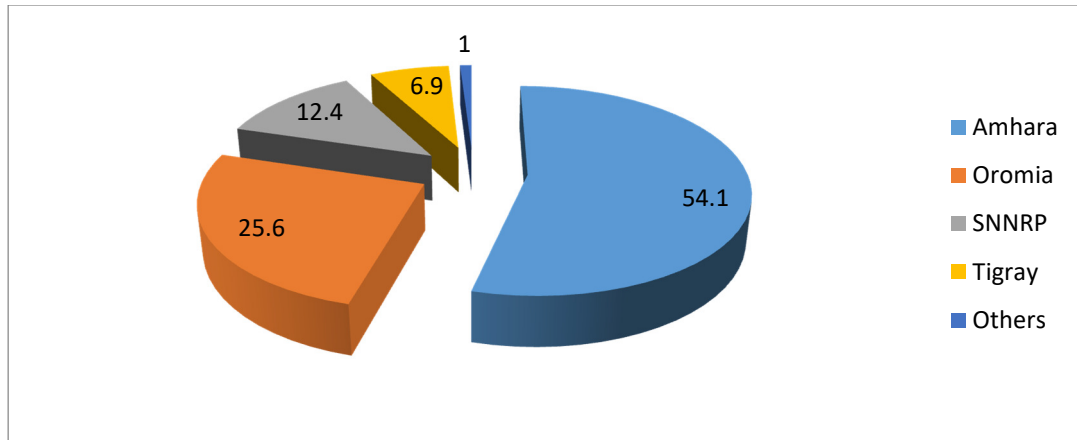
The religion Orthodox is the most dominant religion in the wereda(71.6%) followed by Muslim(16%), Protestant(11.7%), Catholic(0.2%) and others accounting 0.5% which is similar in with the religion distribution order result of EDHS2011, Orthodox 47.5%, Muslim 27.5%, protestant 22%, catholic 1.1%, traditional 0.8% and others 0.1% (7).



Source Wereda 9 census report 2006E.C

Figure 4.3 Religion distribution among Bole sub city Wereda 9 residents, 2006E.C

Most of the residents of the wereda were Amhara in Ethnicity followed by Oromia, SNNRP, Tigray and others, 54.1%, 25.6%, 12.4%, 6.9% and 1% respectively.



Source Wereda 9 census report 2006E.C

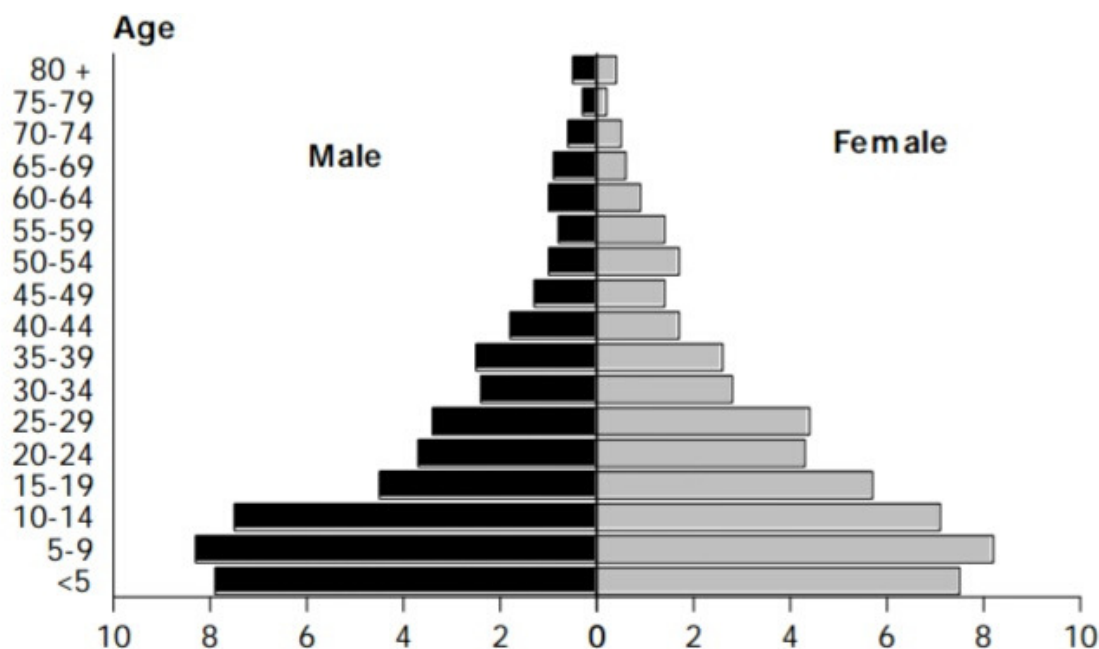
Figure 4.4 Ethnicity distribution among Bole sub city Wereda 9 residents, 2006E.C

Based on the wereda's census report of 2006E.C and CSA 2007 report the population distribution age group is listed in the table below table 1.

Table 4.1 Population distribution of Bole sub city Wereda 9 residents based on Wereda census 2006E.C report and EDHS 2011 estimates, 2008E.C

No.	Description	Percentage	Population	Remark
1.	Total population	100	29,151	Based on Wereda census 2006E.C
2.	Male	46.1	13452	Based on Wereda census 2006E.C
3.	Female	53.9	15699	Based on Wereda census 2006E.C
4.	Population growth rate	2.1	30,388	2008E.C expected population based on Ethiopia census 2007G.C
5.	6-59 months age group	6.36	1933	>>
6.	24-59 months age group	6	1823	>>
7.	Under one years	2.2	669	>>
8.	Under three years	5.6	1702	>>
9.	Under five years	7.1	2158	>>
10.	Women 15-49 age group	34.6	10514	>>
11.	<15 years	26.3	7992	>>
12.	15-24 age group	28.9	8782	>>
13.	15-59 age group	71	21575	>>
14.	Pregnant women	2.33	708	>>
15.	Non pregnant women in reproductive age group	34.64	10526	>>

There was no data found in drinking water, waste disposal and toilet facility coverage in the Wereda.



Source EDHS 2011

Figure 4.5 Population pyramid of Bole sub city W 9 Administration, 2011G.C

As seen from the above figure, the population pyramid of the Wereda is the same as most of the developing countries which is triangular. There was high fertility and high under 15 years population which decreases as the age increases (9).

4.1.4.2 Infrastructure

4.1.4.2.1 Road

The Wereda has 2Kms of Asphalt, 35Kms of Coble stone and 5Kms of hard surface road. The way to the health center was hard surface and it gave the ambulances a hard time. Once there was an incident of an ambulance flipped because of the road problem.

The wereda house holds didn't have a proper liquid waste disposal mechanism and the wastes were let to drain in the middle of the road which was damaging the roads.

4.1.4.2.2 Education

In the wereda there are 26 KG schools, 13 primary schools and 2 secondary schools as shown in the table below. Private schools account 87.8% and government schools 12.2% of schools found in the Wereda.

Table 4.2 Number of private and government owned school types in Bole sub city Wereda 9, 2008E.C

No.	School type	Private	Government	Total
1.	KG	23	3	26
2.	Primary	11	2	13
3.	Secondary	2	0	2
4.	Tertiary	0	0	0
Total		36	5	41

4.1.4.2.3 Health facilities

In the Wereda there were 7 medium and 2 lower private owned clinics, one government owned health center, one private owned hospital and 9 private owned pharmacies. There was no public health lab, health science college and medical college in the wereda. There were 4 holy water sites and one traditional healer in the wereda.

Table 4.3 Number of types of health facilities by their ownership in the Bole sub city Wereda 9 administration, 2008E.C

No.	Type of health facility	Government	Private	Federal	Army	Police	NGO
1.	Clinics	0	9	0	0	0	0
2.	Pharmacies and drug stores	0	9	0	0	0	0
3.	Health center	1	0	0	0	0	0
4.	Hospital	0	1	0	0	0	0
5.	Public health lab	0	0	0	0	0	0
6.	Health science college	0	0	0	0	0	0
7.	Medical college	0	0	0	0	0	0
Total		1	19	0	0	0	0

Source W 9 Goro HC HSTP 2015

4.1.4.3 Human Resource for health

Health professionals work in the wereda in the clinics, health center, hospital, pharmacies and in the wereda health office. There were 207 clinicians and 102 admin staffs working in the health facilities. Overall, there were 134 employees working in the public health facilities and 175 employees working in private health facilities.

Table 4.4. Number of health professionals working in the public and private sectors in Bole sub city Wereda 9, 2008E.C

No.	Type	Public	Private	Total
1.	Specialists	0	4	4
2.	General practitioners	0	3	3
3.	Public Health Officers	8	8	16
4.	Pharmacists	4	6	10
5.	Druggists	4	8	12
6.	Laboratory technologists	3	4	7
7.	Laboratory technicians	3	17	20
8.	Clinical nurse BSc	6	19	25
9.	Clinical nurse diploma	31	46	77
10.	Midwife BSc	3	4	7
11.	Midwife Diploma	6	3	9
12.	Health Extension Professional	13	0	13
13.	Environmental health professional	1	0	1
14.	Other health professionals	0	3	3
15.	Administration	52	50	102
Total		134	175	309

4.1.4.4 Health service provision

Even if there were many health facilities providing health service for Wereda 9 community only the public health care service provider which was Wereda 9 Goro health center data was used to summarize the health provision for the community since data on the other service providers found were incomplete.

4.1.4.5 Wereda 9 Goro health center

The health center is found in Bole sub city wereda 9 administrations. It was established on Genbot 2004E.C. The health center provided health services for Wereda 9 and Wereda 11 residents with estimated catchment population of 37,045 in 2007E.C. for both Weredas'. The health center provides curative and preventive health services. It is administered technically by Bole sub city health office and administratively by the board of directors. The members of board of directors had seven members with Wereda 9 CEO as a chair person, Health centers head as a secretary, Wereda health office head as a member, Wereda finance head as a member, Wereda women and child office head as a member, representative from the community as a member and health center's staff representative as a member. The board is expected to meet every month but they meet irregularly. All health services reports go directly to the sub city skipping the Wereda health office. The Wereda health office was only expected to handle political issues and had poor capacity in terms of skilled man power to supervise and support the health center.

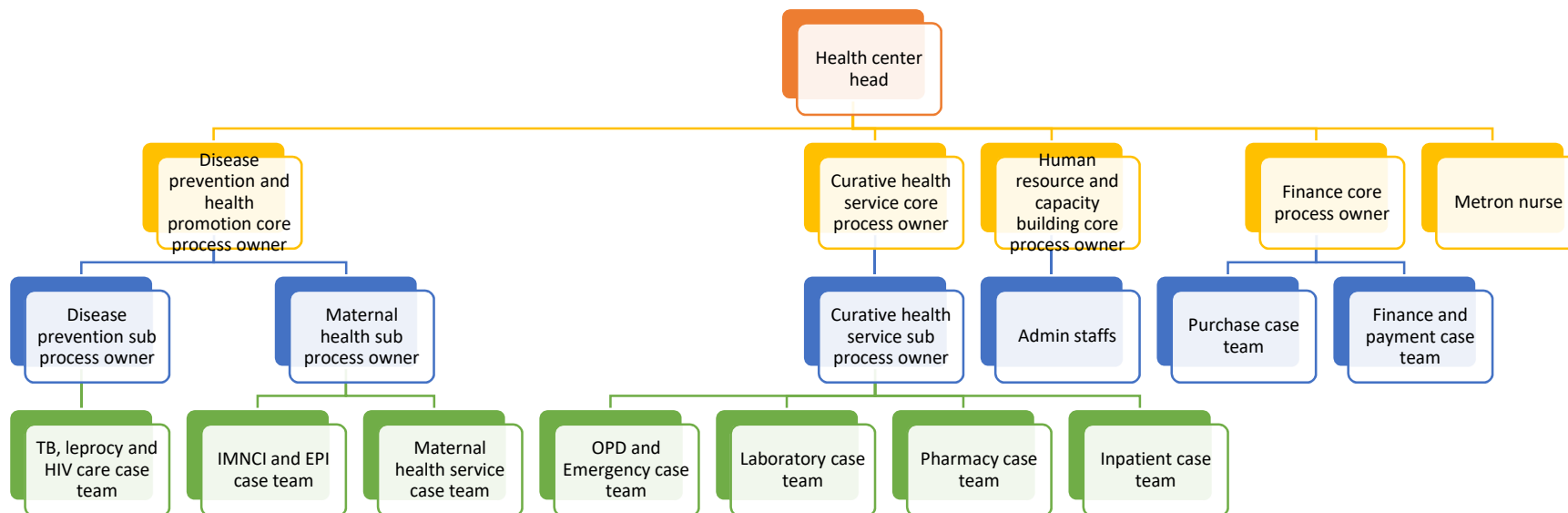


Figure4.6 Bole sub city Wereda 9 Goro HC Organogram

4.1.4.5.1 Maternal and child health services

Maternal and child health indicators indicate the overall health status of the community. As shown in the table below most of the indicators are above has greater that 100% performance. This was because the catchment population was under estimated. All the mothers who came for ANC for their first visit got iron supplementation, VDRL screening and TT vaccination except in the year 2006E.C there was less number of mothers who relieved VDRL test due to shortage of the reagent. In 2007E.C, some of the indicators showed a light decrement this might be due to the opening of a private hospital near the health center (10). The findings were similar with the sub city report except the first ANC visit coverage that was 63% in 2006E.C (6).

The utilization of family planning program was 41% in 2005 then increased to 91% in 2006E.C and dropped down to 57.4% in the year 2007E.C (10).The sharp decrement in the year 2007 might be due to the new opening of health facilities in the catchment area. In 2006E.C the family planning coverage in the Bole sub city was 63% that was significantly different from the HC's report in 2006E.C but nearly similar with the 2007 E.C report (6).

Table 4.5 Maternal and child health service coverage of Wereda 9 Goro HC, 2005-2007 E.C

No.	Service type	2005 E.C			2006 E.C			2007 E.C		
		Plan	Achievement	%	Plan	Achievement	%	Plan	Achievement	%
1.	1 st ANC coverage	768	1225	159.5	1200	1719	145%	1640	1688	102.9%
2.	4 th ANC coverage	640	177	27.6%	900	1264	140%	1476	1443	82%
3.	VDRL screening	768	1225	159.5	1200	1061	88.4	1640	1688	102.9%
4.	TT for pregnant	768	1225	159.5	1200	1719	143	1640	1688	102.9%
5.	Iron supplementation	768	1225	159.5	1200	1719	143	1640	1688	102.9%
6.	Skilled delivery	596	319	53.5%	780	627	802%	863	563	65%
7.	Post natal care	508	308	60.6%	780	705	90%	863	517	59%
8.	PMTCT service provided	768	1225	159.5%	1200	1563	130%	1640	1688	102.9%
9.	Positive mothers	60	17	28%	24	25	104%	26	24	92.3%
10.	Prophylaxis/ ART	60	17	28%	24	25	104%	26	24	92.3%
11.	Family planning coverage	9345	3860	41%	6276	5733	91%	6762	3883	57.4%
12.	Maternal deaths	*	*	*	*	*	*	*	*	*
13.	Infant deaths	*	*	*	*	*	*	*	*	*
14.	Under five years deaths	*	*	*	*	*	*	*	*	*

• No data was found

Source W 9 Goro HC 2015

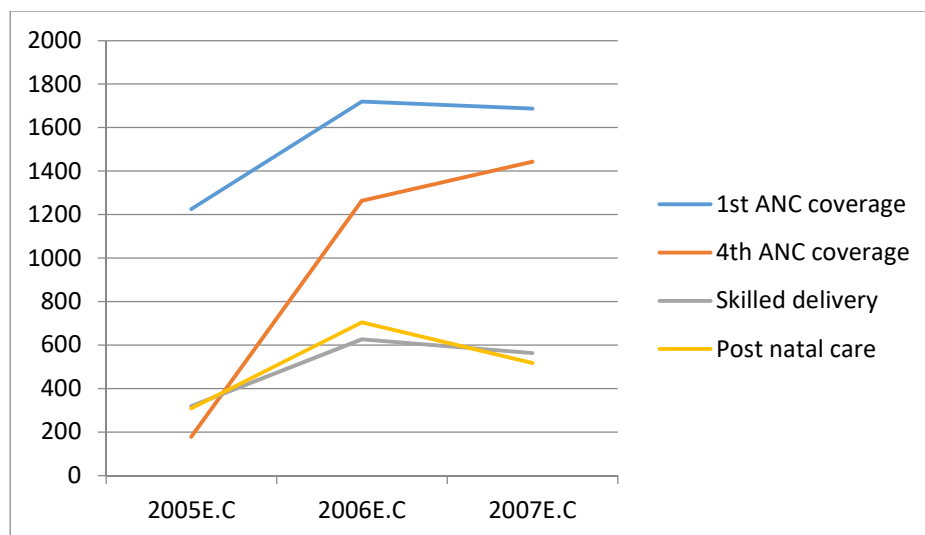


Figure4.7 ANC 1st, 4th, delivery and PNC of Wereda 9 Goro Health Center, 2005-2007E.C

The number of mother who seek the service of ANC first decreased radically by fourth ANC visit and during delivery during the three years period as shown in the figure above. Numbers of mothers who delivered in the health center and utilized PNC service were almost the same with in the years. The number of women who delivered in the health center was nearly one third of mothers who had 1st ANC follow-up from 2005-2007E.C (10). Unlike the Bole sub city report of 2005 and 2006E.C. showed that the number of mothers who delivered in health institutions were above 100% (6). This might be due to that the sub city had many private health facilities that provide obstetric services and the customers might come to the sub city to get services.

As shown in the table 4.5 all mothers who came for first ANC visit were tested for HIV except in the year 2006E.C due to shortage of HIV test kits. All who were positive were put on ARV prophylaxis or treatment.

Data on infant mortality and maternal mortality could not be found at the vital registration office since they only registered people who came to seek their service and there was no active surveillance system.

4.1.4.5.2 Expanded Program of Immunization

As shown in the table below all the immunization indicators were below 100% but improved in the year 2006 and 2007E.C (10). The number of infants who were vaccinated with measles should be equal to the number of infants who were fully immunized but in the first two years fully immunized infants number were greater than measles vaccinated infants. This might be due to data entry error.

The Bole sub city report of 2006E.C also showed that the immunization coverage indicators were all above 100% as that of the W 9 Goro HC report (6).

Table 4.6 Immunization coverage of the Wereda 9 Goro HC , 2003-2007E.C

N o.	Service type	2005 E.C			2006 E.C			2007 E.C		
		Plan	Achievement	%	Plan	Achievement	%	Plan	Achievement	%
1.	BCG	768	705	91.7%	871	1127	129%	1238	1106	89%
2.	PCV3	704	701	99.5%	826	1324	160%	911	1358	149%
3.	Penta 3	704	701	99.5%	826	1274	154%	911	1356	148.8%
4.	Measles	704	352	50%	834	1073	128.7%	911	1213	133%
5.	Fully immunized	704	622	88%	832	1224	144%	911	1213	133%

Source W 9 Goro HC HSTP 2015

4.1.4.5.3 Top ten causes of morbidity

The top five diseases of Wereda 9 Goro Health center are Acute Upper Respiratory Tract Infection in both sexes and among ages less than five and greater than five. The detailed information is listed below in the table.

Table 4.7 Top ten causes of morbidity and mortality among men in the adult OPD in the W 9 Goro HC, 2005-2007E.C

No .	Disease	2005			Disease	2006			Disease	2007		
		Case	Death	Total		Case	Death	Total		Case	Death	Total
1.	AURTI	860	0	860	AURTI	1868	0	1868	AURTI	1863	0	1863
2.	AFI	679	0	679	Trauma	979	0	979	Trauma	919	0	919
3.	Other or unspecified infectious and parasitic disease	535	0	535	AFI	616	0	616	AFI	830	0	830
4.	Trauma	497	0	497	Diarrhea non bloody	591	0	591	Diarrhea non bloody	599	0	599
5.	Dyspepsia	357	0	357	Helmentiasis	514	0	514	Infection of the skin and subcutaneous tissue	472	0	472
6.	UTI	307	0	307	Dyspepsia	505	0	505	Dyspepsia	467	0	467
7.	Infection of the skin and subcutaneous tissue	261	0	261	Typhoid fever	477	0	477	Disease of the musculoskeletal tissue	378	0	378
8.	Pneumonia	248	0	248	UTI	467	0	467	Helmentiasis	355	0	355
9.	Other or unspecified disease	235	0	235	Infection of the skin & subcutaneous tissue	347	0	347	Urinary tract infection	341	0	341
10.	Anemia	217	0	217	Disease of musculoskeletal tissue & connective tissue	306	0	306	Other or unspecified diseases	337	0	337

Table 4.8 Top ten causes of morbidity and mortality among women in the adult OPD in the W 9 Goro HC, 2005-2007E.C

No .	Disease	2005			Disease	2006			Disease	2007		
		Case	Death	Total		Case	Death	Total		Case	Death	Total
1.	AURTI	1157	0	1157	AURTI	2124	0	2124	AURTI	2743	0	2743
2.	UTI	885	0	885	UTI	1369	0	1369	AFI	1125	0	1125
3.	Dyspepsia	648	0	648	Dyspepsia	1026	0	1026	Dyspepsia	1111	0	1111
4.	AFI	636	0	636	Diarrhea non bloody	620	0	620	UTI	1053	0	1053
5.	Other or unspecified infection and parasitic diseases	582	0	582	Helmentiasis	585	0	585	Other or unspecified diseases	797	0	797
6.	Other obstetric condition	388	0	388	AFI	539	0	539	Diarrhea non bloody	697	0	697
7.	Disease of MSS and connective tissue	345	0	345	Typhoid fever	530	0	530	Infection of the skin and subcutaneous tissue	667	0	667
8.	Pneumonia	326	0	326	Infection of the skin & subcutaneous tissue	443	0	443	Disease of the musculoskeletal tissue	572	0	572
9.	Infection of the skin & subcutaneous tissue	267	0	267	Trauma	433	0	433	Helmentiasis	415	0	415
10.	Trauma	257	0	257	Disease of the musculoskeletal & connective tissue	394	0	394	Other or unspecified disease of the eye and adnexa	313	0	313

Table 4.9 Top ten causes of morbidity and mortality among under five male children in the OPD in the W 9 Goro HC, 2005-2007E.C

No.	Disease	2005			Disease	2006			Disease	2007		
		Case	Death	Total		Case	Death	Total		Case	Death	Total
1.	AURTI	1031	0	1031	AURTI	1726	0	1726	AURTI	1708	0	1708
2.	Diarrhea non bloody	606	0	606	Diarrhea non bloody	758	0	758	Diarrhea non bloody	881	0	881
3.	Other or unspecified diseases	225	0	225	Infection of the skin & subcutaneous tissue	246	0	246	Infection of the skin & subcutaneous tissue	369	0	369
4.	Other or unspecified disease of the eye and adnexa	110	0	110	Other or unspecified disease of the eye & adnexa	163	0	163	Other or unspecified disease of the eye & adnexa	200	0	200
5.	Infection of the skin and subcutaneous tissue	103	0	103	Pneumonia	75	0	75	Pneumonia	140	0	140
6.	Pneumonia	59	0	59	Other or unspecified diseases	73	0	73	Other or unspecified disease	97	0	97
7.	AFI	52	0	52	Helmentiasis	72	0	72	Trauma	85	0	85
8.	Other or unspecified infection & parasitic disease	49	0	49	Trauma	69	0	69	Other or unspecific infection & parasitic disease	61	0	61
9.	Otitis	49	0	49	Otitis	67	0	67	Otitis	55	0	55
10.	Other or unspecified disease of the skin & subcutaneous tissue	40	0	40	Other or unspecified skin and subcutaneous tissue disease	57	0	57	Diarrhea with blood	49	0	49

Table 4.10 Top ten causes of morbidity and mortality among under five female children in the OPD in the W 9 Goro HC, 2005-2007E.C

N o.	Disease	2005			Disease	2006			Disease	2007		
		Case	Deat h	Tota l		Case	Death	Total		Case	Deat h	Total
1.	AURTI	384	0	384	AURTI	1390	0	1390	AURTI	1552	0	1552
2.	Diarrhea non bloody	177	0	177	Diarrhea non bloody	663	0	663	Diarrhea non bloody	685	0	685
3.	Infection of the skin and subcutaneous tissue	49	0	49	Infection of the skin and subcutaneous tissue	194	0	194	Infection of the skin & subcutaneous tissue	315	0	315
4.	AFI	46	0	46	Other or unspecified disease of the eye & adnexa	114	0	114	Other or unspecified disease of the eye and adnexa	37	0	37
5.	Other or unspecified infectious & parasitic disease	44	0	44	Other or unspecified disease	107	0	107	Other or unspecified disease	140	0	140
6.	Other or unspecified disease of the eye and adnexa	44	0	44	AFI	62	0	62	Pneumonia	106	0	106
7.	Other or unspecified disease	26	0	26	Otitis	57	0	57	Otitis	57	0	57
8.	Pneumonia	23	0	23	Pneumonia	53	0	53	Other or unspecified skin & subcutaneous tissue disease	37	0	37
9.	Trauma	13	0	13	Helmentiasis	41	0	41	Diarrhea with blood	35	0	35
10.	Otitis	12	0	12	Trauma	37	0	37	AFI	35	0	35

Table 4.11 OPD and IPD coverage of Wereda 9 Goro HC, 2005 -2007 E.C

No	Service	2005			2006			2007		
		Plan	Achievement	%	Plan	Achievement	%	Plan	Achievement	%
1	Inpatient service	60	33	55%	110	107	98%	110	58	52.7%
2	Outpatient service	24166	26750	110.6%	24312	20931	86%	25192	19360	76.6%

Utilization of OPD service had decreased in the year 2006 and 2007E.C compared to 2005E.C this was because the opening of new clinics and hospital in the Wereda. In 2006E.C, there were many admissions compared to the previous and the followed year this was because there was measles outbreak in the year 2006E.C and many were admitted and treated.

4.1.4.5.4 Surveillance of immediately and weekly reportable diseases

Surveillance is a systematic ongoing process of data collection, analysis, interpretation and dissemination of results for public health action. Ethiopia is following 13 immediately reportable diseases and 7 weekly reportable diseases with a total of 20 diseases (11). Since 2008E.C Maternal death was added to the immediately reportable diseases and making the reportable diseases 21.

Wereda 9 Goro health center started reporting weekly and immediately reportable diseases since 2005E.C but the data was available since Tikmit 2006E.C and there was interruption of report on Yekatit 2006E.C for 3 weeks and on Ginbot 2006E.C for a week. The data analyzed here was used from the IDSR report but when compared with HMIS report it had major discrepancies.

Immediately and weekly reportable diseases

Table 4.12 Weekly reportable diseases of the Wereda 9 Goro HC, 2005- 2007 E.C

No.	Disease	2006		2007	
		Case	Death	Case	Death
1.	Plasmodium falciparum	5	0	16	0
2.	Plasmodium vivax	26	0	26	0
3.	Typhoid fever	742	0	582	0
4.	Epidemic typhus	981	0	563	0
5.	Relapsing fever	0	0	1	0
6.	Dysentery	163	0	248	0
7.	Sever acute malnutrition	0	0	0	0
8.	Meningitis	0	0	0	0

Table 4.13 Immediately reportable diseases of the Wereda 9 Goro HC, 2005-2007E.C

No.	Disease	2006		2007	
		Case	Death	Case	Death
1.	AFP	1	0	0	0
2.	Measles	65	0	19	0
3.	NNT	0	0	0	0
4.	Cholera	0	0	0	0
5.	SARS	0	0	0	0
6.	Pandemic influenza	0	0	0	0
7.	Avian Influenza	0	0	0	0
8.	Small pox	0	0	0	0
9.	Yellow fever	0	0	0	0
10.	Guine worm	0	0	0	0
11.	VHF	0	0	0	0
12.	Antrax	0	0	0	0
13.	Rabies	0	0	0	0

As shown in the figure below the number of cases of plasmodium falcipurum and vivax hasn't exceeded from 7 cases each within a month in 2006 and 2007E.C.

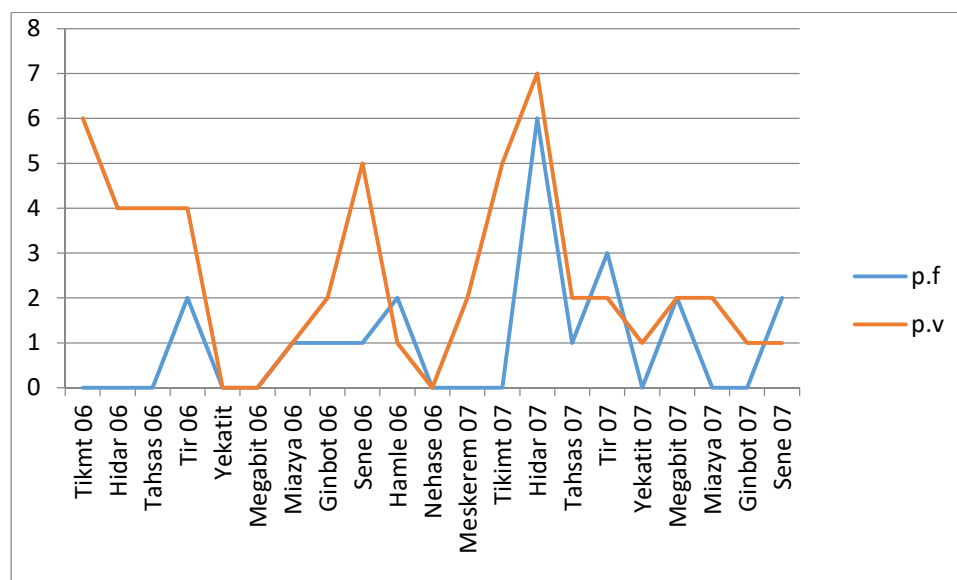


Figure 4.8 Plasmodium falcipurum and vivax cases in W 9 Goro HC, 2006-2007E.C

4.1.4.5.4.1 Outbreaks

Starting from 29/06/06- 9/7/06E.C there was measles outbreak in Bole sub city in the catchment population of W 9 Goro HC. There were 52 cases affected by measles and 2 cases were dead, making the case fatality rate 3.8%. Out of the total 52 cases 29 were male and 23 were female. Ten cases were treated at the OPD and 42 were treated at the IPD. Twenty three cases were from the age group 0-4 years, 17 cases were within the age group 5-14 years and 12 cases were above 15years of age. The residence of cases were 26 were from W 9, 13 were from W 11, 1 was from W 12 and 12 cases place residence wasn't registered. Cases who had history of vaccination for measles were 19, 7 vaccination status was unknown and 26 were unvaccinated.

4.1.4.6 HIV care

Because of HIV test kit shortage in the year 2006 and 2007E.C PITC and VCT services were not adequately given for the clients seeking the services. ART service started in the health center in 2006E.C. Within two years the number of clients who were put on ART for the first time were 48 and total number of clients who were given ARV drugs were 111.

Table 4.14 Number of clients who received HIV care in the Wereda 9 Goro HC, 2005-2007 E.C

N o.	Service provided	2005			2006			2007		
		Plan	Achieve ment	%	Plan	Achieve ment	%	Plan	Achieve ment	%
1.	PITC	7920	5763	73%	7920	1056	13%	7920	150	3%
2.	VCT	2640	1316	50%	2640	605	23%	2640	50	1.8%
3.	Ever started ART	0	0	0	160	46	29	160	48	30
4.	Currently on ART	0	0	0	200	72	36	200	111	56

4.1.4.7 Availability of tracer drugs

From all the 22 list of tracer drugs only 12 were available in the 3 consecutive years as shown below. In the year 2006E.C 11 tracer drugs, in 2006E.C 10 tracer drugs and 2007E.C 12 tracer drugs were available without an interruption throughout the year. The rest of the 10 tracer drugs were interrupted from few days to many months in the fiscal year.

Table 4.15 Availability of tracer drugs in the Wereda 9 Goro HC, 2005-2007E.C

Tracer Drugs	2005	2006	2007
	Percent	Percent	Percent
Amoxicillin 500mg/250 mg Caps/suspension	100	100	100
Arthmeter + Lumfanthrine 20mg+120mg tab	42	42	33
Ciprofloxacin 500mg tablet	100	100	100
Co-trimoxazole tablet/suspension	100	100	100
Mebendazole /Albendazole tab/susp.	100	100	100
Metronidazole capsule/suspension	50	50	65
RHZE-150mg+75mg+400mg+275mg-tablet	67	83	75
TDF/ZDV+3TC+EFV/NVP adult	100	100	100
Ferrous sulphate + folic acid	50	50	83
Tetracycline eye ointment	58	50	83
Tetanus toxoid vaccine (TT)	83.3	92	92
Pentavalent vaccine (DTP+HepB+Hib)	100	100	100
Magnesium Sulphate injection	75	0	0
Oxytocin 10units/ml injection	100	100	100
ORS±Zinc sulphate tablet/syrup	92	75	100
Hydralazine injection	100	100	100
Adrenaline (Epinephrine) injection	100	92	100
Aminiphyllin injection	100	100	100
Glucose 40%	91.6	75	92
Dextrose in normal saline/Ringer lactate	83.3	91.7	83.3
Lidocaine (1% or 2% injectable)	75	66.7	58
Paracetamol 125mg syrup/500mg tablet	100	100	100

4.1.4.8 Budget allocation

As shown in the table below, budget allocated for the Wereda has increase throughout the years. But percentage of budget allocated for the Wereda health programs was higher in the year 2004 and 2005E.C.

Table 4.16 Budget allocation for administration and health in the Wereda, 2004-2008E.C

No.	Budget	2004	2005	2006	2007	2008
1.	Allocated for over all administration of Wereda 9	4,000,078	5,127,196	7,483,943	9,938,119	13,119,634
2.	Allocated for Wereda 9 health office and food and medicine regulatory	382,982	515,43	607,210	713,837	1,061,095
3.	Percentage of budget allocated for health In the wereda	9.6%	10%	8.1%	7.2%	8.1%
4.	Allocated for Goro health center	-	3,349,069	3,746,063	4,749,901	5,958,346
5.	Retained by the health center	-		1,294,999	955,851	-
6.	Utilized by the health center	-			718,691	-

4.1.4.9 HEP

After the implementation of HEP there have been many changes in the Wereda. These were increase in ANC utilization, skilled delivery, PNC and increased vaccination coverage as seen in the W 9 Goro HC reports. There were 1,470 Health Development army, 49 Women Development Army and 185 one to five networked women in the Wereda in 2008E.C.The Wereda was included in Open Defecation Free initiative but the Wereda was not declared free.

4.1.4.10 Limitation

The data used to estimate the health coverage of the wereda was used only from wereda 9 Goro health center due to unavailability of data from other private clinics. The health center provided services for Wereda 9 and 11 residents and used as a cumulative since there was no split data for wereda 9 residents.

4.1.5 Conclusions

The wereda's sex ratio was lower than 100%. Most of the residents were followers of Orthodox religion followed by Muslim, catholic, Protestants and others. Even if most of the Wereda's roads were covered by asphalt, cobble stone, some parts were hard surface roads. The road that took to the health center was hard surface and it was making it hard for the ambulances to get to the health center. The wereda lacked proper liquid waste management and wastes from the households were allowed to drain in the middle of the road. The vital registration office of the wereda didn't have the total number of population, the number of births and deaths in every year. The office only had numbers of deaths and births who came to get certificates.

In the wereda there were private owned clinics, a hospital, pharmacies and government owned health center. There were different health professionals working in these facilities and in wereda health office also. The Wereda 9 Goro Health Center was governed by the bole sub city health office technically and by the board of directors administratively. But not always were the board members meeting according to the schedule monthly to solve the health center's problems.

Mothers who came for the first time to utilize ANC service didn't continue their follow-ups until their 4th visit and each year 120-455 mothers dropped out within the years 2005-2007E.C. From mothers who came for their 1st ANC visit and finally delivered in the health center, every year there were 906-1125 mothers who dropped out. Due to shortage of HIV test kits PITC and VCT services were interrupted in 2006 and 2007E.C. PMTCT service was interrupted in 2006E.C due to the same reason. All mothers who came for their 1st ANC visits were given TT vaccination and supplemented iron. But, syphilis screening was interrupted in the year 2006E.C due to shortage of reagent. There was data discrepancy between weekly and immediately reportable disease on HMIS and IDS report. The data used here was the IDS report. Out of 23 tracer drugs 10 were available from 2005-2007E.C throughout the years but the rest 13 tracer drugs were out of stock one time or another.

4.1.6 Recommendations

Addis Ababa Regional health bureau needs to modify the man power structure of the Wereda health offices and equip the staff to be able to support the health facilities. The wereda health office needs to be functional in supporting and supervising the private and government owned health facilities. The board members of the Health Center should meet regularly and solve the health center's problems. Liquid wastes of the wereda households should be controlled by the wereda.

The under estimation of the catchment population of the Wereda 9 Goro Health Center had resulted a false above 100% coverage of the health services. So the catchment population should be updated after the next national census. Vital statistics office of the Wereda should get the next census result and should start working on active surveillance system and strengthen passive surveillance system.

The health center should figure out a mechanism to retain mothers who come to the health center for 1st ANC visit and provide all of them 4th ANC follow up, delivery and PNC services. HIV test kits reagents and tracer drugs should be availed timely by the health center and by PFSA. Since most of the top ten diseases of the health center were communicable diseases, prevention mechanisms should be strengthened.

Data concerning the health of Wereda 9 residents should be available in the Wereda 9 health office, including private health facilities and public health facilities. The health center needs to develop a mechanism to separate reports of Wereda 9 and Wereda 11 service acceptors and report accordingly. The health center needs to work on improvement of data quality of both the HMIS and IDS reports.

4.1.7 Acknowledgement

I would like to thank God for all His blessings. I am grateful for Bole sub city health office, Wereda 9 and Goro HC staffs for their valuable contribution in availing information that was needed. My appreciation extends to my advisor Dr. YosephWorku for his unreserved comments and support in the realization of this document. And last but not least I would like to thank my field mentor MesafintAlebachew for his valuable comments.

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4.1.8 Annex

4.1.8.1 List of health facilities in Wereda 9 administration

4.1.8.1.1 List of clinics in the Wereda 9 administration, 2008E.C

No.	Clinic name	Level	Phone number
1.	Kidiste Mariam	Medium	0911740529
2.	Bole Kotebe	Medium	0116188815
3.	Sefera	Medium	0911447147
4.	Getnet no 2	Medium	0913480811
5.	Semit international	Medium	0911572905
6.	Florence	Medium	0911108741
7.	Efrata	Medium	-
8.	Medhanialem	Lower	0910224746
9.	Besufkad	Lower	-

4.1.8.1.2 List of pharmacies and drug stores in Wereda 9 administration, 2016

No.	Pharmacy or drug store name	Phone number
1.	Tedious	0913480811
2.	Natanim	0911367261
3.	Semit	0118601678
4.	Goro	0911696656
5.	KT	-
6.	Abenezer	0923315271
7.	Hiwan	0948245171
8.	Yegna	0912418279
9.	Konjit	0937809506

4.1.8.1.3 List of Hospital and health center in Wereda 9 administration, 2008E.C

No.	Health facility	Ownership	Phone number
1.	Yerer Hospital	Private	
2.	Wereda 9 Goro health center	Government	0118691049

4.1.8.1.4 List of traditional healing places in Wereda 9, 2008E.C

No.	Traditional clinic name	Phone number
1.	Ethiopia Filstem	-

4.1.8.1.5 List of Holy water sites in Wereda 9, 2008E.C

No.	Holy water site name	Phone number
1.	St. Michael	-
2.	Medhanialem	-
3.	St Mariam	-
4.	St Gebreal	-

4.1.8.2 Wereda 9 Health Profile Questionnaire

Addis Ababa city administration

4. What is the city administration's surface area? _____
5. The city administration is bounded by _____ by north,
_____ by south,
_____ by west and
_____ by east.
6. How many sub cities are there? _____
7. When was the city established? _____
8. Why is it called Addis Ababa? _____

Bole sub city

5. What is the sub city's surface area? _____
6. The sub city is bounded by _____ by north,
_____ by south,
_____ by west and
_____ by east.
7. What is the altitude of the sub city? _____
8. What is the total number of the population living in the sub city? _____

Bole sub city Wereda 9 administration

Geographic location

1. What is the Wereda's surface area? _____
2. The Wereda is bounded by _____ by north,
_____ by south,
_____ by west and
_____ by east.

Climate condition

1. What are the seasons of the Wereda?

2. What is the altitude of the Wereda? _____

Political and administrative structure

1. How many sub Wereda's are there with in the Wereda? _____
2. How many sefers are there in the Wereda? _____
3. How many blocks are there in the Wereda? _____

4. Who is the power organ of the Wereda? _____
5. Organogram of the Wereda
6. Map of the Wereda

Socio demographic characteristics

Population characteristics

1. How many people does the wereda estimated to have?
2. How many of them are male? _____
3. How many of them are female? _____
4. What is the total population of Bole sub city? _____
5. Which sub Wereda is densely populated? _____
6. Which sub Wereda is sparsely populated? _____

Table1. Age and sex distribution of wereda 9 administration residents in 2008E.C

No.	Description	Perc enta ge	Population	Remark
1.	Total population			
2.	Male			
3.	Female			
4.	Population growth rate			
5.	6-59 months age group			
6.	24-59 months age group			
7.	Under one years			
8.	Under three years			
9.	Under five years			
10.	Women 15-49 age group			
11.	<15 years			

12.	15-24 age group			
13.	15-59 age group			
14.	Pregnant women			
15.	Non pregnant women in reproductive age group			

Religion

1. What proportion of population in the Wereda are
 - a. Orthodox _____
 - b. Catholic _____
 - c. Protestant _____
 - d. Muslim _____
 - e. Traditional _____
 - f. Others, Specify with proportion _____

Ethnicity

1. What proportion of population in the Wereda have the listed below ethnicity
 - a. Afar _____
 - b. Amhara _____
 - c. Guragie _____
 - d. Nuwer _____
 - e. Oromo _____
 - f. Sidamo _____
 - g. Somali _____
 - h. Tigray _____
 - i. Welaita _____
 - j. Other, specify _____

Housing condition

1. What type of housing does the residents live in? _____
2. What percentages of the residents live in each type of housing?

3. Is there a condominium site in the Wereda?
Yes ☐ No ☐
4. If yes, how many? _____
5. If yes to question number 3, what is the totals surface area of the sites? _____

Water supply

1. What is the main source of water in the community and what are the percentages?
 - a. Piped water in the compound _____
 - b. Piped water in the public tap _____
 - c. Bore hole _____
 - d. Well _____
 - e. Spring _____
 - f. Surface water _____
 - g. Others, specify _____

Toilet facility

1. What kind of toilet facility do the community in the Wereda use and what are the percentages?
 - a. Flush or pour flush toilet _____
 - b. Pit latrine _____
 - c. Bucket toilet _____
 - d. Composting toilet _____
 - e. Field _____
 - f. Other, specify _____
2. Is there open defecation free initiative in the wereda? _____
3. If yes, is the Wereda declared defecation free wereda? _____

Road

1. How many KM are covered with these types of roads?
 - a. Asphalt _____
 - b. Coble stone _____
 - c. Hard surface _____

Education

Table2. Number of private and government owned school types in the Wereda, 2016

No.	School type	Private	Government
1.	KG		
2.	Primary		
3.	Secondary		
4.	Tertiary		

Health facility availability

Table3. Number of types of health facilities by their ownership in the Wereda, 2016

No.	Type of health facility	Government	Private	Federal	Army	Police	NGO
1.	Clinics						
2.	Pharmacies and drug stores						
3.	Health center						
4.	Hospital						
5.	Public health lab						
6.	Health science college						
7.	Medical college						

Table4. List of clinics in the Wereda, 2016

No.	Clinic name	Phone number
1.		
2.		
3.		
4.		
5.		
6.		
7.		

Table5. List of pharmacies and drug stores in the Wereda, 2016

No.	Pharmacy name	Phone number
1.		
2.		
3.		
4.		
5.		
6.		
7.		

Table6. Number of health professionals working in the public and private sectors in the Wereda, 2016

No.	Type	Public	Private	Total
1.	Specialists			
2.	General practitioners			
3.	Public Health Officers			
4.	Pharmacists			
5.	Druggists			
6.	Laboratory technologists			
7.	Laboratory technicians			
8.	Clinical nurse BSc			
9.	Clinical nurse diploma			
10.	Midwife BSc			
11.	Midwife Diploma			
12.	Health Extension Professional			
13.	Environmental health professional			
14.	Administration			

Table7. List of traditional healing places in the Wereda, 2016

No.	Traditional clinic name	Phone number
1.		
2.		
3.		
4.		
5.		
6.		
7.		

Table8. List of Holy water sites in the Wereda, 2016

No.	Holy water site name	Phone number
1.		
2.		
3.		
4.		
5.		
6.		
7.		

Public health service provision

- Is there a health center in the wereda? _____
- If yes, does the health center provide services for one wereda or provide services for other catchment weredas? _____
- What kind of services does the health center provide? _____
- Who manages, administer and supervise the health center? _____
- Organogram of the health center? _____

Maternal and child health service

Table9. Maternal and child health service coverage of the Wereda, 2003-2007 E.C

No.	Service type	2003 E.C		2004 E.C		2005 E.C		2006 E.C		2007 E.C	
		number	%	number	%	number	%	number	%	number	%
1.	1 st ANC coverage										
2.	4 th ANC coverage										
3.	VDRL screening										
4.	TT for pregnant										
5.	Iron supplementation										
6.	Skilled delivery										
7.	Post natal care										
8.	PMTCT service provided										
9.	Positive mothers										
10.	Prophylaxis/ ART										
11.	Family planning coverage										
12.	Maternal deaths										
13.	Infant deaths										
14.	Under five years deaths										

Expanded Program of Immunization

Table10. Immunization coverage of the Wereda, 2003-2007E.C

No.	Service type	2003 E.C		2004 E.C		2005 E.C		2006 E.C		2007 E.C	
		number	%	number	%	number	%	number	%	number	%
1.	BCG										
2.	PCV 3										
3.	Penta 3										
4.	Measles										
5.	Fully immunized										

Top ten causes of morbidity in the adult OPD

Table11. Top ten causes of morbidity and mortality among men in the adult OPD in the Wereda, 2003-2007

No .	Disease	2003			2004			2005			2006			2007		
		Case	Death	Total	Case	Deat h	Total	Case	Death	Total	Case	Deat h	Total	Case	Deat h	Total
1.																
2.																
3.																
4.																
5.																
6.																
7.																
8.																
9.																
10.																

Table12. Top ten causes of morbidity and mortality among women in the adult OPD in the Wereda, 2003-2007

No ·	Disease	2003			2004			2005			2006			2007		
		Case	Death	Total	Case	Deat h	Total	Case	Death	Total	Case	Deat h	Total	Case	Deat h	Total
1.																
2.																
3.																
4.																
5.																
6.																
7.																
8.																
9.																
10.																

Top ten causes of mortality and morbidity among under five years children in the OPD

Table13. Top ten causes of morbidity and mortality among boys at under five OPD in the Wereda, 2003-2007

No ·	Disease	2003			2004			2005			2006			2007		
		Case	Death	Total	Case	Deat h	Total	Case	Death	Total	Case	Deat h	Total	Case	Deat h	Total
1.																
2.																
3.																
4.																
5.																
6.																
7.																
8.																
9.																
10.																

Table14. Top ten causes of morbidity and mortality among girls at under five years OPD in the Wereda, 2003-2007

No .	Disease	2003			2004			2005			2006			2007		
		Case	Death	Total	Case	Deat h	Total	Case	Death	Total	Case	Deat h	Total	Case	Deat h	Total
1.																
2.																
3.																
4.																
5.																
6.																
7.																
8.																
9.																
10.																

Immediately and weekly reportable diseases

Table15. Weekly reportable diseases of the Wereda, 2003- 2007 E.C

No.	Disease	2003		2004		2005		2006		2007	
		Case	Death	Case	Death	Case	Death	Case	Death	Case	Death
1.	Malaria										
2.	Typhoid fever										
3.	Epidemic typhus										
4.	Relapsing fever										
5.	Dysentery										
6.	Sever acute malnutrition										
7.	Meningitis										

Table16. Immediately reportable diseases of the Wereda, 2003-2007E.C

No.	Disease	2003		2004		2005		2006		2007	
		Case	Death	Case	Death	Case	Death	Case	Death	Case	Death
1.	AFP										
2.	Measles										
3.	NNT										
4.	Cholera										
5.	SARS										
6.	Pandemic influenza										
7.	Avian Influenza										
8.	Small pox										
9.	Yellow fever										
10.	Guine worm										
11.	VHF										
12.	Antrax										
13.	Rabies										

1. Where there any emergency outbreak or disaster in the wereda?_____
2. If yes, what was the cause?_____
3. How many people were affected?_____

4. What was the intervention taken? _____
5. For how long did it take to control the emergency? _____

HIV care

Table17. Number of clients who received HIV care in the Wereda, 2003-2007 E.C

N o.	Service provided	2003		2004		2005		2006		2007	
		Numbe r	Achieve ment %	Num ber	Achieve ment %	Num ber	Achieve ment %	Num ber	Achieve ment %	Num ber	Achieveme nt %
1.	PITC										
2.	VCT										
3.	Ever enrolled in HIV care										
4.	Ever started ART										
5.	Currently on ART										

Availability of tracer drugs

Table18. Availability of tracer drugs in the Wereda, 2003-2007E.C

Tracer Drugs by Facility	2003	2004	2005	2006	2007
Amoxicillin 500mg/250 mg Caps/suspension					
Arthmeter + Lumfanthrine 20mg+120mg tab					
Ciprofloxacin 500mg tablet					
Co-trimoxazole tablet/suspension					
Mebendazole /Albendazole tab/susp.					
Metronidazole capsule/suspension					
RHZE-150mg+75mg+400mg+275mg-tablet					
TDF/ZDV+3TC+EFV/NVP adult					
Ferrous sulphate + folic acid					
Tetracycline eye ointment					
Tetanus toxoid vaccine (TT)					
Pentavalent vaccine (DTP+HepB+Hib)					
Magnesium Sulphate injection					
Oxytocin 10units/ml injection					
ORS±Zinc sulphate tablet/syrup					
Hydralazine injection					
Adrenaline (Epinephrine) injection					

Aminiphyllin injection					
Glucose 40%					
Dextrose in normal saline/Ringer lactate					
Lidocaine (1% or 2% injectable)					
Paracetamol 125mg syrup/500mg tablet					

Budget allocation

Table19. Budget allocation for administration and health in the Wereda, 2004-2008E.C

No.	Budget	2004	2005	2006	2007	2008
1.	Allocated for over all administration of Wereda 9					
2.	Allocated for Wereda 9 health office and food and medicine regulatory					
3.	Percentage of budget allocated for health In the wereda					
4.	Allocated for Goro health center					
5.	Retained by the health center					
6.	Utilized by the health center					

HEP

1. What things did improve because of HEP in the past 3 years?

2. Is there health development army in the wereda? _____

3. If yes, how many are they? _____

4. How many 1 to 5 links are there in the wereda? _____

Chapter – V: Abstracts for Scientific Presentation

5.1 Four years hypertension trend analysis-Bole sub city, Addis Ababa, Ethiopia, 2012-2015

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Background: Hypertension is the raise of blood pressure greater or equal to 140/90mmHg and affects the human body by impairing the normal functions of the brain, heart, kidney and peripheral arteries. The disease is showing increment around the world especially in low and middle-income countries. This study assessed the four years trend of hypertension in Bole sub city, Addis Ababa, Ethiopia.

Methods: Secondary data was collected from years 2012-2015 using semi structured questionnaire. Retrospective record review from electronic Health Management Information System (eHMIS) was undertaken. The study population was hypertensive patients who visited health facilities in Bole sub city and reported in eHMIS. Data was entered, cleaned and Microsoft Excel version 2007 was used to do a descriptive analysis.

Result: Hypertensive and related diseases accounts 1.45% of patients that came at the Out Patient Department during the four years period. Among the reported patients 6.1%, 17.3%, 19.9% and 56.7% were in the year 2012, 2013, 2014 and 2015 respectively. Within the four years period 43.7% male cases and 56.3% female cases came to get treatment for hypertension and related diseases. Among the admitted cases of hypertension and related diseases, the hospitalization proportion was 2.05% and the case fatality rate was 4.5 deaths per 10,000 patients. Male admission (53.8%) was higher than female admissions (46.2%).

Conclusion: Trends of hypertension and related diseases from 2012-2015 reported in the HMIS in Bole sub city showed that hypertension trend has increased over the years. The mostly affected sex was female. Male admission was higher than female admissions.

Recommendation: Prevention and control activities of hypertension require due attention since the trend of hypertension has shown increment. Further studies on identifying the burden and risk factors of hypertension are required in this area.

Key words: Hypertension, Trend, Bole sub city, Addis Ababa, Ethiopia

5.2 Associated factors of Acute Watery Diarrhea Outbreak in Bole sub-city, Addis Ababa, Ethiopia, 2016

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Background Cholera is Acute Watery Diarrhea (AWD) that can lead to dehydration and death within few hours. Cholera outbreak occurred in Addis Ababa in all of the sub-cities in 2016. We investigated the outbreak to determine the risk factors and recommend prevention measures of AWD outbreak, 2016, Bole sub-city, Addis Ababa, Ethiopia.

Methods We conducted descriptive cross-sectional study and unmatched case-control study with 55 cases and 110 controls in Bole sub-city. A case of AWD was any person age ≥ 5 years with AWD with or without vomiting with three or more diarrhea frequency in 24-hours. We identified cases from Amoraw Cholera Treatment Center and controls from the community. We used semi-structured questionnaire to collect data. We entered data on EpiInfo-7 and analyzed using SPSS-21. Bivariate analysis with $P \leq 0.2$ were taken into multivariable analysis. P value ≤ 0.05 were considered significant.

Results Male patients accounted 65% of 717 patients. The most affected age group was 25-44 accounting 73.8% of 717 patients. The sub-city's attack rate was 198/100,000 populations. The response rate for the case control study was 97%. Factors associated with AWD were eating raw meat with Adjusted Odds Ratio (AOR) of 39.6 (95% Confidence Interval [CI], 6.31-248.18); eating cold leftover food with AOR of 9.17 (95% CI, 1.58-53.31); boiling drinking water 0.03 (95% CI, 0.001-0.39); and treatment of water with water guard 0.07 (95% CI, 0.01-0.82).

Conclusions The AWD outbreak has caused many people illness and missing days out of work. The risk factors of the cholera outbreak were eating raw meat and cold leftover food and the preventive factors were using boiled water and water guards for drinking water. We recommend educating the community on raw meat and cold leftover food consumption during the outbreak periods and utilization of water treatments like water guards and boiling would help in prevention and control of cholera outbreaks.

Key words: Cholera, infectious disease outbreaks, risk factors, Ethiopia

5.3 Measles surveillance system evaluation Bole sub-city, Addis Ababa, Ethiopia, 2013-2016

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Background Surveillance system evaluation is assessment of the importance, effectiveness and the long term effect of surveillance activities based on the set objectives. Measles is one of the leading causes of morbidity among children and included under reportable diseases in the Ethiopian surveillance system. Findings of this study informs decision makers and researchers on the surveillance system of Bole sub-city. The study aimed to evaluate measles surveillance system of Bole sub city from 2013-2016.

Methods A descriptive cross sectional study design was used. Twenty six participants working at the health facility, Wereda, sub city, Addis Ababa City Administration Health Bureau and World Health Organization(WHO) were included in this study. WHO and Center for Disease Control and Prevention(CDC) surveillance system evaluation guides were used. The attributes were scored by participants' from 1-5 indicating percentages 1(20%), 2(40%), 3(60%), 4(80%) and 5(100%). Data was entered and analyzed on EpiInfo-7.

Results Two-hundred-forty-seven patients of measles were reported in Bole sub-city from 2013-2016. Epidemic preparedness plan was present in the sub city, in public health facilities and in 2(50%) of the Weredas. Supervision was carried out in the 3(75%) Weredas and the sub-city. No written feedback was available in every surveillance unit. No budget was specifically allocated to carryout surveillance activities from sub-city to health facility levels. The completeness of the Bole sub-city surveillance report the last 12 months was 89.5% while the timeliness was 72.2%. Participants rated the surveillance system usefulness 85.1%, simplicity 81.5%, flexibility 78.5%, sensitivity to detect outbreaks 77.7%, acceptability 87.7% and reliability 89.2%.

Conclusions No formal budget was assigned to carryout surveillance activities that can potentially compromise quality. To improve the feedback mechanism, budget allocation, the timeliness surveillance activities and presence of epidemic preparedness plan and meet the standards of CDC guideline, stakeholders at all level must work together.

Key words: Public health surveillance, evaluation, program evaluation, Ethiopia

Chapter – VI: Narrative Summary of Disaster Situation

6.1 Bole sub city Wereda 10 building collapse on April 27, 2016 and February 14, 2017 report

Abstract

Background

Building is defined as any human-made structure used or intended for supporting or sheltering any use or continuous occupancy, or an act of construction. Buildings serve several needs of the society, primarily as shelter from weather and as general living space, to provide privacy, to store belongings and to comfortably live and work. For a building to stand by itself all the structural members of the building must be firm. The building should be stable to maintain its shape or to retain under load, to resist sliding,

Objective

To elaborate the causes of Bole Sub city Wereda 10 building collapse on April 27, 2016 and February 14, 2017

Methods and materials

In Bole sub city Wereda 10 administration a private building collapsed on April 27, 2016 and February 14, 2017. The site of the building that collapsed was the study area and the study was conducted from April 28, 2016 - June 3, 2017. Data was collected by using unstructured questionnaire and used to collect primary and secondary data using interview from the Bole sub city land authority, neighbours and the guards.

Result

The cause of the April 27, 2016 building collapse was use of substandard materials. The building was under construction. Yet the ground floor and the first floor were occupied. The building started functioning without receiving legal permit. The cause for the other building collapse, February 14, 2017, was design modifications that lead to overloading of the building. The building was under construction and no one occupied the building. In both of the buildings poor follow up contributed to the problems. The total estimated loss due to the collapse was 8 million Birr. No one was injured or died.

Conclusion and recommendation

The collapse of two buildings in Bole sub city W 10 cause were design modification, use of poor quality materials and poor follow up. No death or physical injury occurred during the collapse. The estimated money lost was 8 million Birr. To prevent future similar incidences, the land authorities at different level should have strict follow up of buildings. The legislation should be modified by increasing the punishment for buildings constructions that endangers public safety.

6.1.1 Introduction

6.1.1.1 Background

Building is defined as any human-made structure used or intended for supporting or sheltering any use or continuous occupancy, or an act of construction (1). Buildings serve several needs of the society – primarily as shelter from weather and as general living space, to provide privacy, to store belongings and to comfortably live and work. A building as a shelter represents a physical division of the human habitat (a place of comfort and safety) and the outside (a place that at times may be harsh and harmful). It is a space that is necessary for protection from natural environment and constructed for a specific use (2).

Building failure is defined as loss of building and its functions. It can be categorized into two; physical and performance failure. Physical failure of a building is when a building losses its functions structurally. While performance-building failure is failure of a building functions due to below the expected standard functions (3).

Ethiopia's economy in building construction is growing rapidly with 37% annually. Addis Ababa city is expanding at a rate of 3.3% annually. Many constructions housing and infrastructures buildings are increasing in number. Many of the constructions are centered in Addis Ababa, the study assessed the estimated loss and the cause of failure of a building resided in Addis Ababa, Bole sub city Wereda 10 that collapsed on April 27, 2016.

Many lives are lost and infrastructures destroyed due to collapse of buildings globally. Two hundred and eighty three deaths occurred in Nigeria due to building collapse from 1990-2009 (5). In Bangladesh 1,110 deaths occurred as a result of garment building failure on April 2013. On June 1995 in South Korea a building collapse lead to a loss of cost damage of \$216 million (6).

The causes of building collapse can be structural failure, faulty design, poor workmanship, using substandard materials, due to surrounding building development, illegal conversion, inexperience contractor or building usage (6). Inadequate preliminary work, foundation problems, poor concrete mix ratio, improper walling, lack of approved structural design, poor building material

specification, ineffective supervision and climate were the most common causes of building failure in another study conducted in Nigeria (7).

Building collapse can be prevented by strict using quality building materials, working with competent professionals, using the right design, proper maintenance, passing and signing national building code and provide trainings for professionals (7,8).

Many buildings constructions are being carried out these days in Addis Ababa city. These buildings are built for dwelling and other purposes. On April 27, 2016 a building collapsed in bole sub city Wereda 10 administration. This study identified the cause of building failure and provided information on the cause and prevention mechanisms of future similar events.

6.1.1.2 Rationale of the study

Globally there has been many building collapses due to many reasons. This study aimed to assess the causes of the building collapse on April 27, 2016 and February 14, 2017 at bole sub city W 10 administration and determine the potential live lost and resources lost during the incidence. This study helped in providing information to prevent future similar events.

6.1.2 Literature review

6.1.2.1 Building collapse magnitude

Globally building collapse is causing injuries, life losses and economic loss. A systematic review conducted in Nigeria from 1990- 2009 showed that death due to building collapse reported was 283 among affected 453 people. The causes of building collapse were high-rise of the buildings and nature of the soil (5). In another study conducted in Nigeria from 2000-2010 showed that there were several building collapses which led to 145 deaths, 250 injuries and several properties worth millions of Naira destroyed (9). A five storey department store in Seoul, South Korea collapsed on June 29th 1995 causing 937 people injured and with total cost damage of \$216 million (6). Eight storey building housing garment factory collapsed in Savar Darkar, Bangladesh on 24th April, 2013 causing at least 1,110 deaths (6).

6.1.2.2 Causes of building collapse

A study conducted in Lagos Nigeria in 2013 showed that building collapse was highly associated with non enforcement of building code, conversion of building code, utilizing substandard materials, poor workmanship, quackery, profit maximization, greedy client, insufficient planning, dearth of skilled labor, inadequate supervision and hasty construction (10).

Another study in Cameroon showed that the causes of building failure were soil investigation & foundation (25%), detailing (20%), structural design (18%), concrete processing (17%), degradation due to environment (10%) and poor quality materials (10%). In addition the other causes were poor materials and workmanship, lack of equipment in the construction industry, absence of professional supervision of site works, inadequate design, faulty construction methodology, illegal conversion of building, change of use of buildings, financial pressures, the use of quacks or of non-professionals in building construction, lack of quality control check, fire disaster, poor management and maintenance in buildings, reinforcement steel corrosion and erosion (11).

A study conducted in Malaysia, Nigeria, Singapore and Thailand shows that the causes of building collapse are structural failure 36%, faulty design 16.3%, poor workmanship 12.8%,

using substandard materials 11.6%, due to surrounding building development 2.2%, illegal conversion 7%, inexperience contractor 5.8% and building usage 8.1% (6).

For a building to stand by itself all the structural members of the building must be firm. The building should be stable to maintain its shape or to retain under load, to resist sliding, overturning, partial or complete collapse. Thus to ensure stability, loads must be balanced by reactions, and the moments due to loads must be balanced by the moments due to reactions.

Building that can't resist load applied to it may show distress or lead to collapse. The possibility of collapse should always be considered. The collapse may cause loss of property or lives (12).

The commonest cause of building failure is due to structural failure. This may occur by not specifying the right amount and kind of materials or by not availing the materials during the construction. Because of building failures specially after the completion and its occupied if not lives lost, financial investments are wasted. So precautions should be undertaken to avoid structural failures (12).

6.1.2.3 Prevention of future incidence

In a systematic review conducted in Nigeria recommended that policy review in building bureaucratic procedures, by creating awareness in the community on emergency management, assigning qualified professionals for supervision and making responsible faulty design and physical development can prevent future incidences (5). Another study stated building collapse could be prevented by strict using quality building materials, working with competent professionals, using the right design, proper maintenance, passing and signing national building code (8).

6.1.3 Objectives

6.1.3.1 General objective

To elaborate the causes of Bole Sub city Wereda 10 building collapse on April 27, 2016 and February 14, 2017.

6.1.3.2 Specific objectives

- To determine the causes of the building collapses at Bole sub city W 10 on April 27, 2016 and February 14, 2017
- To estimate the extent of loss in terms of life and property of the building collapse at Bole sub city W 10 on April 27, 2016 and February 14, 2017

6.1.4 Methods and materials

6.1.4.1 Study area

Bole sub city is one of the 10 sub cities of Addis Ababa city administration. The sub city has 14 Weredas. The building that collapsed is situated in Bole sub city Wereda 10 administration. The Wereda has an estimated population of 28,156 in 2017 (13). The Wereda is bounded by south to Wereda 11, by west to Wereda 8 and 9, by north to Yeka sub city and by east to Oromia region.

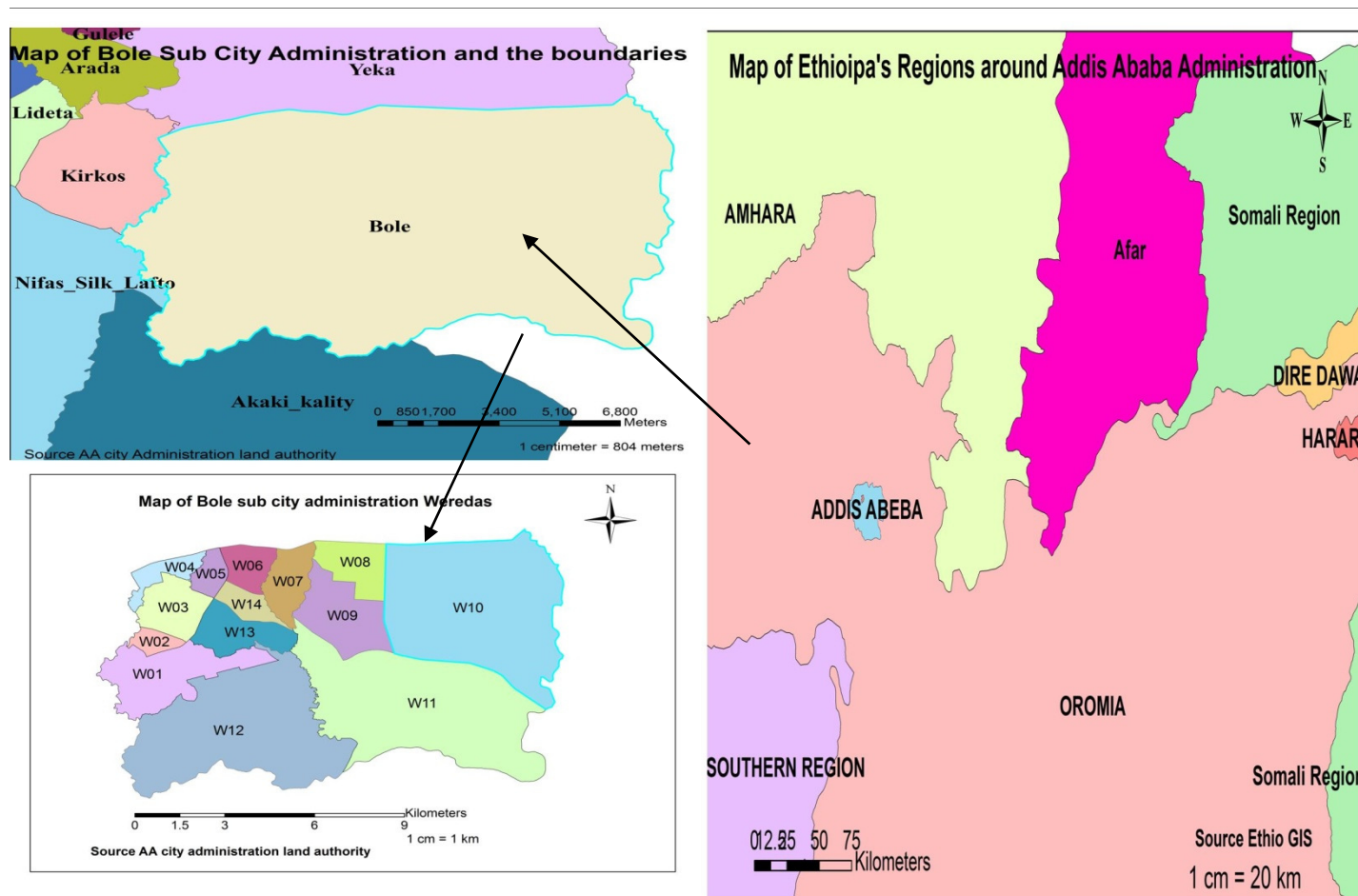


Figure 6.1 Map of Bole sub city Wereda 10 Administration, Addis Ababa, Ethiopia

6.1.4.2 Study period

The study was conducted from April 2016 – June 2017.

6.1.4.3 Study design

The study design used was case series using interview method.

6.1.4.4 Study units

Addis Ababa building monitoring and evaluation and Bole sub city land authority officials, the guards, neighbours residing in that area were the study units.

6.1.4.5 Data collection

Data was collected by using unstructured questionnaire using interview method.

6.1.4.6 Data variables

The data variables were building collapse, the building age, number of dead people, number of injured people, cost of the building, presence of legal permit, added extra floors, soil examination before construction, loading capacity of the building, depth of the foundation, design approval before construction, presence of structural drawing and presence of bills of quantities.

6.1.4.7 Data dissemination

The report will be presented for the Bole sub city land authority, Bole sub city health office and Wereda 10 health office. The report will be submitted to St Paul's Hospital and Addis Ababa Regional Health Bureau.

6.1.5 Result

Two buildings collapsed in Addis Ababa administration Bole sub city Wereda 10. The first building collapsed on April 27, 2016. The second building collapsed on February 14, 2017.

The first building is situated near Semit Soft drink factory. The area of the place was 600m². The building construction started in the year 2009. The building was a five storey building. It only lacked finishing of the above two floors. The height of the building was 18 meters. The ground floor was occupied by two banks. The first floor was occupied by church. From the second floor up to the fourth floor it was a vacant space. The building started making a cracking noise 2am 18-19/08/08. The cracking noise was heard by one of the bank guards. The guard woke the other bank guards and evacuated before the building collapsed totally that was 6:50am in the morning.

The estimated cost of the building was 5 million Birr. The building had legal permit for construction and the design was approved before implementation. The design was approved by a qualified person. Structural drawing of the building was present. There was no added floor during the construction. The nature of the soil was not examined before the start of the building. But no legal permit was provided to occupy and use the building. The possible cause of the building collapse was poor workmanship and substandard material use. No one was injured during the collapse.



Figure 6.2 Bole sub city Wereda 10 five storey building that collapsed on April 27, 2016

Another building collapsed at Bole sub city Wereda 10 which was located 1km away from the previously collapsed building. It is situated near SemitYetebaberut oil station. The building had an area of 250 m². The building started construction on 2010. The building collapsed on 14 February 2017 morning at 5:45am. Behind the building there were two room houses. A husband and a wife with their two kids lived there. Luckily, the building did not fall in to the houses but blocked the way out and no one was injured during the collapse. No one occupied any of the floors.

The total estimated budget for the building was 3 million Birr. The building had a legal permit for two storey building but the owner modified the design and made it into three storey building. The owner does not have legal permit for the extra floor. The building was overloaded. The nature of the building soil was examined before the construction started. The metal capacity was not tested. There was poor supervisory follow-ups. The absence of a strong punishment for design modification lets the owners to modify designs with minimal punishment.



Figure 6.3 Bole sub city Wereda 10 three storey building that collapsed on 14 February, 2017

No one was injured during the two building collapses but had it occur after the buildings were finished; there could have been many injuries and death. In the sub city, there was no previously reported collapsed buildings before, other than the two. There are two public health centers and one private hospital in 2kms radius of the two buildings.

6.1.6 Discussion

In-depth interview was carried out to investigate the causes of the two building collapses in Addis Ababa Bole sub city Wereda 10. The causes of the collapse were design modification and use of poor quality materials. The problem could have been detected if there was good follow up. The estimated money lost was 8 million Birr and no one was injured or died during the collapse.

Use of poor quality materials and use of substandard material were the causes of a five story building collapse in Bole sub city W 10 on April 27, 2016. In study conducted in Chennai Metropolitan Development Authority from 2014- 2015, there were 194 reports of building regulation violations. Among the violations 62% were totally unauthorized, 28% were unauthorized, 7% deviation from the regulation and 3 % were others. The study was conducted after a twelve story building collapsed and caused 48 construction workers death. To get water and electricity supply, there is a legal support to have legal permit if the building could start functioning (14). The causes for modification of designs illegally were population growth, inadequate space, land, poor building management, difficulties in obtaining permits, commercialization of facilities and inadequate knowledge of the regulations. These modifications can disturb the stability and diminish the quality of the building. It can cause injury and health hazards in the occupants of the building (15).

Design modification and poor follow up were the cause of three storey building collapse of Bole sub city Wereda 10 building that collapsed on Feb 14 2017. Another study showed that conversion of buildings and lack of follow up were the causes for building collapse (11). Illegal conversion of buildings was responsible for 7% building failures (6). Study conducted in Nigeria in 2013 reported that to maximization of profit one of the issue related to building collapse (10). According to the Ethiopian proclamation 2009 Article 53 number 2, any owner of a building who has problems related to design, use of poor quality material, uses building without legal permit or constructs building that endangers public safety will be punished with imprisonment from five years to ten years and from 20,000-50,000 (16). This punishment is not comparable to the damages and the lives that will be lost due to the building collapse.

The total estimated loss of money from the two buildings collapse was 8million Birr in this study but the estimated loss is not inclusive of materials inside the buildings. In another study conducted in Nigeria from 2000-2010 showed that several building collapses which lead to loss of several properties worth millions of Naire (9). In South Korea a five storey department store in Seoul collapsed and caused total cost damage of damage of \$216 million (6).

No one was injured or dead during the building collapse in this study. In study conducted in Nigeria from 2000-2010 showed that several building collapsed led to 145 deaths and 250 injuries (9).A five storey department store in Seoul, South Korea collapsed and caused 937 people to get injured (6).Eight storey building hosing garment factory collapsed in SavarDarkar, Bangladishand caused at least 1,110 deaths (6).

Limitation

The participants psychological injury was not estimated in this study. The estimated loss of money did not include materials inside the building.

6.1.7 Conclusion and Recommendation

6.1.7.1 Conclusion

The collapse of two buildings in Bole sub city W 10 cause were design modification, use of poor quality materials and poor follow up. No death or physical injury occurred during the collapse. The estimated money lost was 8 million Birr.

6.1.7.2 Recommendation

To prevent future similar incidences, the land authorities at different level should have strict follow up of buildings. The construction proclamation of Ethiopia puts little punishment for someone who modify design and use of poor quality materials (17). The legislation should be modified by increasing the punishment. The water and electricity authorities should put a requirement of certification for the construction to start functioning before providing their services.

6.1.8 Acknowledgement

I would like to thank God for all His blessings. I am very grateful to have my advisor Dr. YosephWorku by my side to carryout this study. My appreciation extends to Bole sub city land authority office staffs, Addis Ababa City Administration building construction inspection and follow up office and all the participants for their willingness to participate in this study.

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6.1.10 Annex :

6.1.10.1 Questionnaire

Disaster questionnaire to be filled on field investigation

My name is Helen Tesfayohannes. I am a student at St Paul's Millennium Medical College. I am conducting a study on the building collapse which occurred around summit area. This study's objective is to assess the health related risk of the building collapse, prevent and recommend interventions to avoid the same incidences in the future. Your name won't be disclosed in the study. So are you willing to participate in the study?

Yes _____

No _____

Date of Interview	
Name of Interviewer	
Name of Respondent/s	
Contact Detail of Respondent (Optional)	
Starting time	
End time	

1. Area of the place _____
2. When was the building started _____
3. Current status of the building _____
4. Height of building _____
5. Expected date of completion _____
6. Date of collapse? _____
7. Exact time of collapse _____
8. Number of dead people _____
9. Number of injured people _____
10. How many rooms were there? _____
11. Who use to occupy the down stares? _____
12. Who used to occupy 1st floor? _____

13. Who used to occupy the 2nd floor? _____
14. Who used to occupy the 3rd floor? _____
15. Who used to occupy the 4th floor? _____

Disaster questionnaire to be filled by construction office

1. What was the cause of the building failure?
 - a. Structural failure
 - b. Faulty design
 - c. Poor workmanship
 - d. Substandard materials
 - e. Due to surrounding building development
 - f. Illegal conversion
 - g. Inexperience contractor
 - h. Building over usage
 - i. Others, specify _____
2. What was the total estimated cost of the building? _____
3. Was it build after having the legal permit? _____
4. How many of the buildings in Bole sub city have legal permits in percentage?

5. Did the owner add any extra floors? _____
6. Was the nature of the soil examined before the start of the construction? _____
7. Probable loading capacity of the building? _____
8. Was it over loaded? _____
9. How many meters depth was the foundation? _____
10. Was it adequate? _____
11. Was the design approved before implementation? _____
12. If yes, was it given by a qualified person? _____
13. Is the structural drawing present? _____
14. Were bills of quantities prepared? _____
15. Is there any method of follow-up of old buildings? _____

16. How many building failed in the past five years at Bole sub city?_____

17. What _____ were _____ the _____ causes?

Construction safety related issues

1. Are the safety rules and regulations being addressed for constructions, if any

2. Are there fire or emergency exit plans and guides

3. Did the building had emergency exits? _____

4. Were there nearby health facilities?_____

5. If yes, in how many meter radius?

Disaster risk assessment

1. Estimated number of casualty had it happened at working hour_____

2. Estimated number of casualty had it happened after it was completed and functional_____

3. How many nearby health facilities and other facilities available for such kind of emergencies? _____

4. Readiness of the system to handle such emergencies and casualty?

Chapter VII Other additional report

7.1 Bole sub city measles Supplementary Immunization Activity report, 2017

7.1.1 Background

Measles is caused by Morbillivirus. The disease is transmitted from person to person through contact with respiratory secretion or aerosols. Patients with the disease present with fever, macula-papular rash, cough, coryza and conjunctivitis. Some of the complications of measles include pneumonia, diarrhea, croup, otitis media, blindness, acute encephalitis, malnutrition and sub acute sclerosing panencephalitis. A systematic review conducted among WHO regions showed that the overall case fatality was 3.56(0-40%), Ethiopia's was 27% in 1981. According to EDHS 2016, Ethiopia's measles vaccination coverage was 54.3%, Afar with the lowest coverage (30.1%) and Addis Ababa with the highest (93.1%). Globally, deaths due to measles averted by measles vaccination was 71% from 2000-2011.

Four strategies are set to control measles. These are strengthen routine immunization of $\geq 90\%$ of children aged 9 to 11 months, provide second opportunity by National and Sub national Supplementary Immunization Activities, intensify measles surveillance and improve case management. Mass vaccination activities are one of measles control strategies. These activities support the routine vaccination by improving measles vaccine coverage.

7.1.2 Objective

To vaccinate at least 95% of all children aged 9-179 months in Bole sub city in SIA, 2017

7.1.3 Implementation

7.1.3.1 Micro planning

Addis Ababa City Administration Health Bureau (AACAHB) and Bole sub city health office carried out the planning process in collaboration. According to Measles Supplementary Immunization Activity (SIA) field guide, the estimated eligible population of the sub city is estimated in the table below.

Table 7.1 Number of eligible under 15 years children in Bole sub city, 2017

No.	Total population	Estimated <15 years percentage	Estimated <15 years children
1.	387,153	42.8%	165,702

Based on the performance of the 2016 polio campaign, the total population and the target population was projected as seen in the table below.

Table 7.2 Bole sub city measles campaign micro plan, March 2017

No.	Sub city	9-59months children	60-179 months children	Total targeted children
1.	Bole sub city	49,045	138,303	187,348

7.1.3.2 Period

The measles campaign took a total of eight days, from March 3- 12, 2017. The actual planned days of campaign were 7 days and 2 days were added at the end.

7.1.3.3 Target population

The target population was all children from 9 months up to 15 years old excluding children who celebrated their 15 years birthday.

7.1.3.4 Vaccination places

The vaccine was given in all governmental health centers, 9 health centers, found at Bole sub city during the campaign period. Mobile and fixed vaccination posts were also giving measles vaccination service in every Wereda.

7.1.3.5 Hard-to-reach areas

Prior to the campaign hard to reach areas were identified. These areas were Weregenu at Wereda 12, Arapsa at Wereda 11, Yeka bole, Endode and Chefe at Wereda 10.

7.1.3.6 Vaccinator teams, supervisors and coordinators

To carry out the measles campaign, there were 93 teams, 23 supervisors and 56 Wereda coordinators and 13 sub city coordinators in Bole sub city. Each team had two vaccinators (health professional from the catchment health center), one recorder (health extension worker) and one crowd controller (health development army member). The supervisors were from the Bole sub city health office, Wereda health offices and health centers.

Table 7.3 Number of measles vaccination campaign participants in Bole sub city, March 2017

No.	Participants	Number
1.	Teams	93
2.	Supervisors	23
3.	Coordinators	68
4.	Criers	465

7.1.3.7 Cold chain

The vaccines, diluents and medical supplies were available prior to the start of the campaign. There was no shortage of vaccines and medical supplies seen during this campaign. Supervisors were changing ice packs as frequently as necessary for the teams.

7.1.3.8 Social mobilization

Social mobilization activities started 3 days earlier from the start of the campaign. Posters were available by Addis Ababa Regional Health Bureau. There were 465 town criers. A car with loud speakers was advertising the campaign for 4 days during the campaign days.

7.1.3.9 Training

One-day training was given for vaccinators and crowd controllers. In one room, there were 84 participants.

7.1.3.10 Injection safety and waste management

Vaccinators were trained to give injection safely and what could happen if safety wasn't in place. Supervisors were oriented to observe vaccinators injection handling. At each health centers janitors were appointed to handle the wastes. All wastes were collected from every post every day and were burnt daily. Supervisors and coordinators supervised waste management daily.

7.1.3.11 Monitoring process

Pre campaign assessment was done at each health center. Observation checklist was filled throughout the campaign. Post campaign Rapid convenient survey(RCS) was done. The result showed that the overall coverage of measles vaccine was 95.3%. Weredas that did not perform above 95% were Wereda 3, 6 and 12 as seen in the table below.

Table 7.4 Post campaign Rapid Convenient Survey result of Bole sub city, March 2017

No.	Wereda	RCS coverage
1.	Wereda 1	96
2.	Wereda 2	98.2
3.	Wereda 3	91
4.	Wereda 4	95
5.	Wereda 5	88
6.	Wereda 6	94.3
7.	Wereda 7	96
8.	Wereda 8	99
9.	Wereda 9	96.8
10.	Wereda 10	95.2
11.	Wereda 11	98
12.	Wereda 12	94
13.	Wereda 13	97
14.	Wereda 14	95.7
Bole sub city		95.3

7.1.4 Result

Children from 9- 15 years of resided in Bole sub city vaccinated for measles during the measles campaign were 115,522(61.7%). The coverage does not truly represent the coverage of measles since the plan was ambitious. The post campaign RCS showed greater coverage with overall sub city coverage of 95.3%. The highest coverage was achieved by Wereda 2(109%) and the lowest by Wereda 1 (44.3%) as shown in the table below. Highest performance was achieved on Day 4 because most of the children who were eligible were found in schools at one place.

Table 7.5 Number of children vaccinated for measles by Wereda during the campaign at Bole sub city, March 2017

Wereda	Daily plan	Day1	Day2	Day3	Day4	Day5	Day6	Day7	Day8	Day9	Total		
											Performance	Plan	%
1	1464	665	824	624	1338	619	247	222	0	0	4539	10248	44.3
2	569	643	312	105	827	919	786	615	56	80	4343	3983	109.0
3	749	164	343	292	1190	736	303	142	60	111	3341	5243	63.7
4	1107	1559	631	452	1206	294	207	571	0	0	4920	7749	63.5
5	856	917	703	597	958	375	119	118	0	0	3787	5992	63.2
6	1061	1045	642	458	1436	349	133	55	0	0	4118	7427	55.4
7	2285	2042	1918	934	2343	910	317	334	0	0	8798	15995	55.0
8	1921	1685	902	860	2421	2271	803	650	69	164	9825	13447	73.1
9	3488	1603	1979	1685	4173	3061	927	849	97	38	14412	24416	59.0
10	5231	3840	4108	4275	4119	3302	1680	663	71	79	22137	36617	60.5
11	1292	1108	859	1029	1488	455	292	227	0	0	5458	9044	60.3
12	2798	1826	1326	1977	2282	2529	919	420	30	98	11407	19586	58.2
13	2560	1800	1538	1714	2884	1669	722	628	43	90	11088	17920	61.9
14	1383	1124	869	556	1854	1475	937	442	62	30	7349	9681	75.9
Bole	26764	20021	16954	15558	28519	18964	8392	5936	488	690	115522	187348	61.7

The highest number of children vaccinated was reported by Goro Health Center (19,870) and lowest was reported by 17/20 Health Center (8,882). The highest coverage was reported by Dilfre Health Center 67% and lowest was from Bulbula Health center with 58.2%. This coverage was underestimated because the plan was an ambitious plan. The RCS showed that the overall coverage of the vaccination was good.

Table 7.6 Number of children vaccinated for measles by Wereda during the campaign at Bole sub city, March 2017

No	Wereda	Performance	Health Center	Performance	Plan	Performance in %
1.	1	4,539	17/20 HC	8,882	14,231	62.4
2.	2	4,343				
3.	3	3,341	17 HC	12,048	18,984	63.5
4.	4	4,920				
5.	5	3,787				
6.	6	4,118	Dilfre HC	11,467	17,108	67.0
7.	14	7,349				
8.	7	8,798	Amoraw HC	18,623	29,442	63.2
9.	8	9,825				
10.	9	14,412	Goro HC	19,870	33,460	59.4
11.	11	5,458				
12.	10	10,672	Semit HC	10,672	18,305	58.3
13.	10	11,465	Meri HC	11,465	18,312	62.6
14	12	11,407	Bulbula HC	11,407	19,586	58.2
15.	13	11,088	Gerji HC	11,088	17,920	61.9
Total		115,522			187,348	61.7

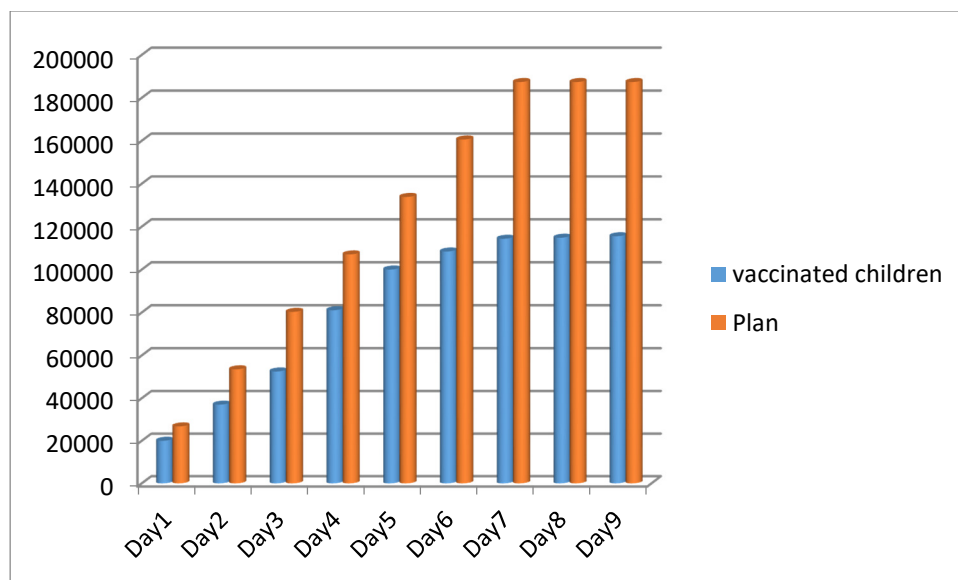


Figure 7.1 Bole sub city measles vaccinated children during the campaign, March 2017

From the total children that received measles vaccine, 115,151(99.7) were previously vaccinated while 371(0.3%) took for the first time.

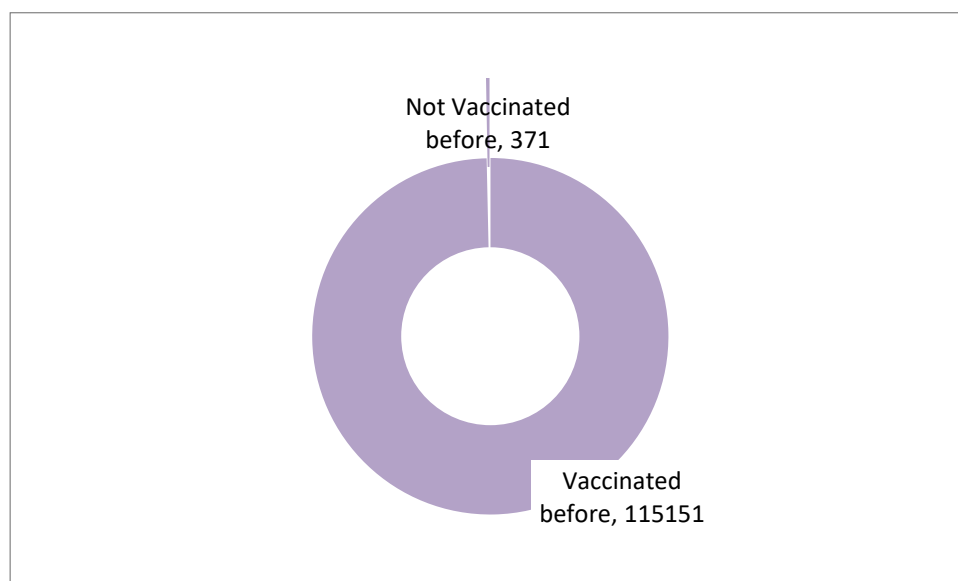


Figure 7.2 Number of children vaccinated for measles during measles campaign, March 2017

Among children that were vaccinated for measles for the first time 32.1% were from 9-11 months, 15.9% were 12-59months, 32.1% were 59-119 months and 19.9% were 120-179 months old.

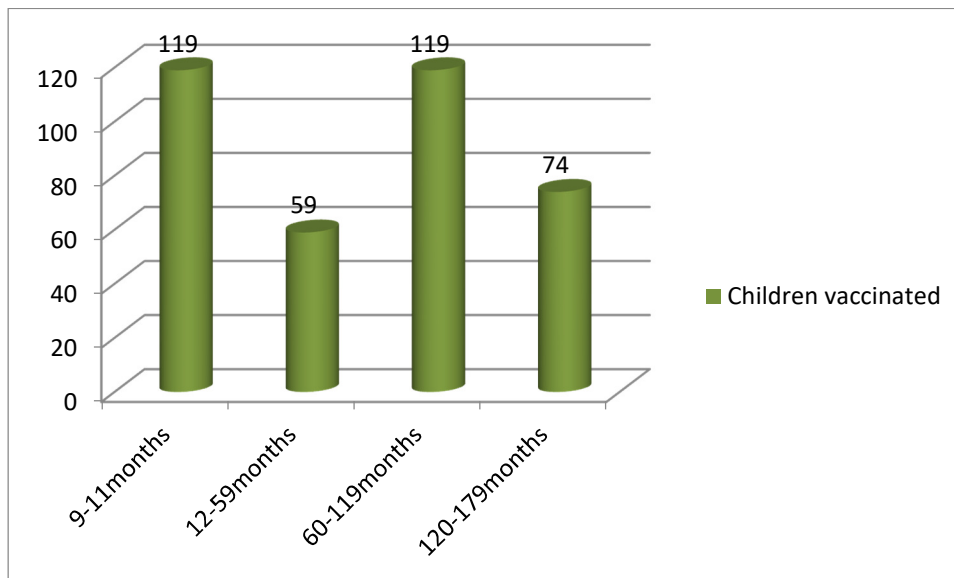


Figure 7.3 Number of children vaccinated for measles for the first time in Bole sub city, March 2017

Among the total vaccinated children (115,522); 3,507(3.04%) were from 9-11 months, 43,568(37.71%) were from 12-59 months, 35,185(30.46%) were from 60- 119 months and 33262(28.79%) were from 120-179 months old.

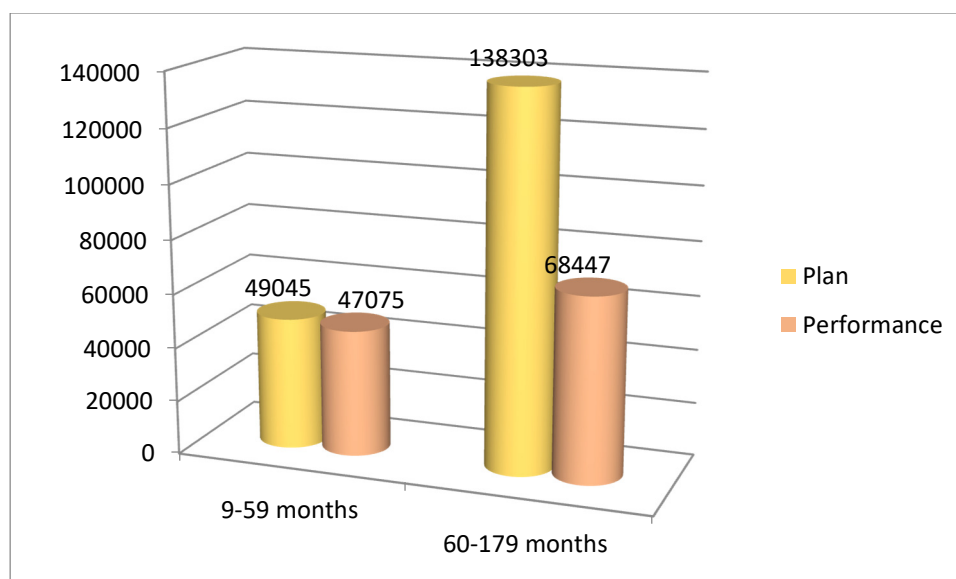


Figure 7.4 Number of children vaccinated for measles during measles campaign by age group, March 2017

Forty seven thousand seventy five (95.98%) of children age 9-59 months old and 68,447(49.49%) of children age 60-179 months were vaccinated for measles during the campaign.

7.1.4 Adverse Event Following Immunization (AEFI)

The reported cases of AEFI during the measles campaign were six. One developed rash, one developed anaphylaxis and three became dizzy. Two were given adrenalin and four were observed. One was asthmatic patient, one had previous history of allergy to milk and the rest four no previous illness or allergy was identified. Five children with AEFI were above the age of five while one was between 1-5 years age category.

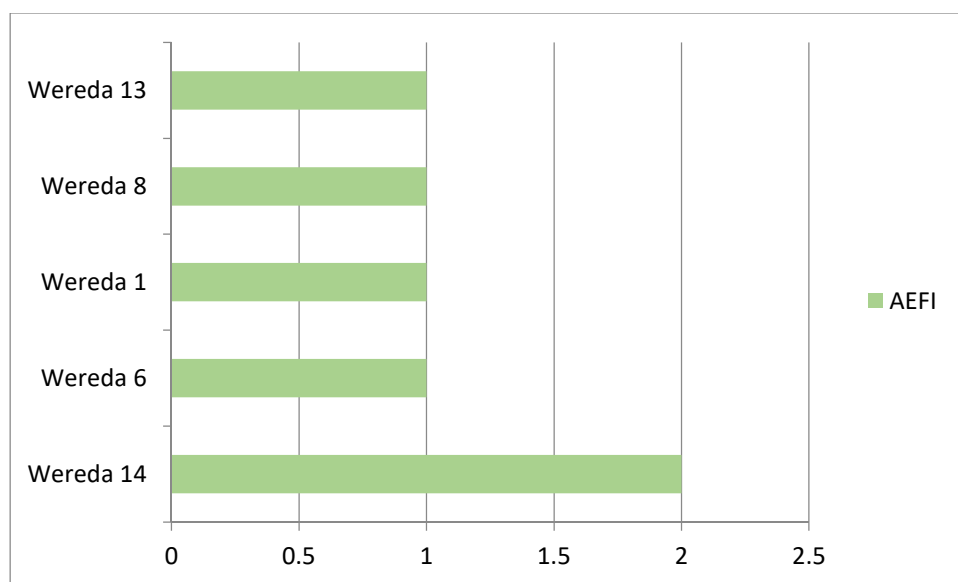


Figure 7.5 Reported AEFI in Bole sub city during measles campaign by Wereda, March 2017

7.1.5 Vaccine utilization

The total vaccine with dilutant received were 17,963 vials of those 11,568 vials were used, 6,395 vials were returned and no vial had Vaccine Vial Monitor (VVM) problem. One vial of vaccine with dialutant is expected to vaccinate 10 children. But in some cases the doses were more than 10. Due to this the wastage rate was negative in some cases. The total wastage rate was 0.14%.

7.1.6 Strengths and major challenges

7.1.6.1 Strengths

- Daily campaign meetings was carried out
- The Weredas', health centers and the teams were ranked daily
- The supervisors and the teams were highly motivated
- The Bole sub city health office head commitment to lead and organize the campaign
- The vaccines and medical supplies were available adequately prior to the campaign days
- AARHB staffs supported closely throughout the campaign days

7.1.6.2 Major challenges

- There was shortage of transportation in some health centers
- The target was overestimated which made the coverage low
- The campaign started on Friday so it was hard to get the children during the weekend and also to screen children who were vaccinated after the weekdays
- During the first days of the campaign schools and the community were not aware of the campaign that showed poor pre-campaign social mobilization

7.1.7 Reference

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7.1.8 Annex

7.1.8.1 Bole sub city measles campaign report of March 2017

Region/City Administration: A.A				Zone: Bole sub city										Date: March 2-13, 2017										
Wor eda	Target population			No. vaccinated for Measles										Vaccine wastage rate for Measles					# of AEFI					
	9-59 mont hs	60 -179 months	Total	9-11 months		12- 59 months		60 - 119 months		120 - 179 months		Total vaccin ated for measle s	Cove rage(%)	# of Measles vials received	#of measles vials used	# of measles vials unused due to VVM	# of vials returned unused & in good condition	Wastage Rate(%)	1	2	3	4	5	6
				Vaccinated Before	Not vaccinated Before	Vaccinated Before	Not vaccinated Before	Vaccinated Before	Not vaccinated Before	Vaccinated Before	Not vaccinated Before													
	A	B	C	D	E	H	I	J	K	L	M	N	O	P	Q	R	S	T						
1	2683	7565	10248	110	3	1542	31	1413	51	1346	43	4539	44.3	877	467	0	410	2.81	0	0	0	0	0	1
2	1043	2940	3983	58	1	1078	0	1627	1	1577	1	4343	109.0	703	446	0	257	2.62	0	0	0	0	0	0
3	1373	3870	5243	143	21	1638	0	943	0	596	0	3341	63.7	519	327	0	192	-2.17	0	0	0	0	0	0
4	2029	5720	7749	41	0	1491	0	1951	0	1437	0	4920	63.5	758	492	0	266	0.00	0	0	0	0	0	0
5	1569	4423	5992	45	0	1235	0	1320	0	1187	0	3787	63.2	488	382	0	106	0.86	0	0	0	0	0	0
6	1944	5483	7427	94	0	1159	7	1190	5	1656	7	4118	55.4	735	412	0	323	0.05	0	1	0	0	0	0
7	4187	11808	15995	374	12	3390	0	2575	8	2422	17	8798	55.0	1462	880	0	582	0.02	0	0	0	0	0	0
8	3520	9927	13447	232	0	3025	0	3319	0	3249	0	9825	73.1	1481	986	0	495	0.35	0	0	0	0	0	1
9	6392	18024	24416	551	3	5205	3	4154	33	4460	3	14412	59.0	2238	1424	0	814	-1.21	0	0	0	0	0	0
10S	4792	13513	18305	427	21	4415	11	3266	10	2521	1	10672	58.3	1699	1071	0	628	0.35	0	0	0	0	0	0
10M	4794	13518	18312	237	13	5979	0	2606	9	2620	1	11465	62.6	1663	1154	0	509	0.65	0	0	0	0	0	0
11	2368	6676	9044	243	2	2255	0	1455	0	1503	0	5458	60.3	828	545	0	283	-0.15	0	0	0	0	0	0
12	5127	14459	19586	419	2	4876	0	3088	0	3022	0	11407	58.2	1975	1144	0	831	0.29	0	0	0	0	0	0
13	4691	13229	17920	290	15	3776	7	3560	2	3437	1	11088	61.9	1397	1097	0	300	-1.08	0	0	0	0	0	1
14	2534	7147	9681	124	26	2445	0	2599	0	2155	0	7349	75.9	1140	741	0	399	0.82	0	0	1	0	0	1
Tota l	49045	138303	187348	3388	119	43509	59	35066	119	33188	74	115522	61.7	17963	11568	0	6395	0.14	0	1	1	0	0	4

Chapter VIII. Thesis report

8.1 Meta- analysis on the prevalence and associated factors of hypertension among adults in East Africa

Abstract

Background Hypertension is one of the Non Communicable Diseases. The disease affects the human body by impairing the normal functions of the brain, heart, kidney and peripheral arteries. In 2010 globally, hypertension was one of the leading risk factor for global burden diseases with 9.4 million deaths and 7% of global Disability Adjusted Life Years followed by high Body Mass Index and high plasma glucose. In East African countries the prevalence of hypertension ranges from 10.3- 30%. There is a need of a point estimate indicating the East Africa prevalence and the risk factors of hypertension.

Objective: The objective of this study was to pool the prevalence and associated factors among studies conducted in East Africa, 2011-2016.

Methods: Data was extracted from quantitative facility or community based cross-sectional studies. The participants age was greater than 15 years of age, any sex and non-pregnant. Systolic blood pressure of ≥ 140 mm Hg or diastolic blood pressure of ≥ 90 mmHg studies were included in this study. The studies included in the study were published or unpublished articles from the year 2011-2016. PubMed, Medline, HINARI and Google scholar search engines were used. Non published literatures were included in the study to minimize publication bias. Data was reviewed by two independent reviewers and third reviewer was involved in case of controversies. Data was extracted using Microsoft excel and analyzed using medcal and Review Manager 5.3. Summary of the findings were presented using forest plots and tables. Statistical heterogeneity was assessed using I^2 . We used random effect model.

Result A total of 2,567 studies from PubMed, Medline, HINARI, Google Scholar search engines and from other records were searched and screened. We included 14 studies in this study. The pooled prevalence of hypertension in East Africa using DerSimonian Laird random effect was 25.37 % (17.67-33.76%). The prevalence among women was 26.7% (95%CI, 17.63-36.89%) and men was 24.87% (95%CI, 17.87-32.61%). The identified risk factors of hypertension with statistically significant pooled Odds Ratio were being obese/overweight 3.39 (95%CI, 2.17-5.29), excess alcohol consumption 1.27 (95%CI, 1.01-1.61), having family history of hypertension 1.94 (95%CI, 1.41-2.64), high waist circumference 2.99 (95%CI, 2.34-3.84) and having physical activity 0.62 (95%CI, 0.44-0.88).

Conclusion Hypertension affected one in four adult population in East Africa. The identified risk factors of hypertension were being obese/overweight, having family history of hypertension and high waist circumference. With the estimated prevalence of hypertension, the capacity of health facilities to provide accessible and quality hypertension management should be assessed and improved including staff capacity and presence of facilities to manage patients within the health facilities. Further studies are needed in identification of the risk factors of hypertension in this area.

8.1.1 Introduction

8.1.1.1 Background

Hypertension is the raise of Systolic Blood Pressure (SBP) greater than or equal to 140 millimeter of mercury (mm Hg) or a Diastolic Blood Pressure (DBP) of greater than or equal to 90 mm Hg. The level of hypertension is classified in to stage I with SBP of 140-59 mm Hg and DBP of 90-99 mm Hg. Stage II hypertension is SBP of ≥ 160 and DBP of ≥ 100 mm Hg and isolated systolic hypertension where the SBP is ≥ 140 mm Hg and DBP of < 90 mm Hg. ⁽¹⁾

Hypertension is one of the Non Communicable Diseases (NCD) that affects the human body by impairing the normal functions of the brain, heart, kidney and peripheral arteries by narrowing down arterial walls. Heart disease is the commonest cause of death among hypertensive patients. Hypertension affects the brain by causing brain infarction and hemorrhage. It affect the renal system by injuring the kidneys and causing end stage renal disease and it causes damage to the peripheral arteries of the lower extremities causes a threat for the future cardiovascular diseases. ⁽¹⁾

The treatment options for hypertension are pharmacologic and non-pharmacologic treatments. Pharmacologic treatments aim in controlling the hypertension using medications. The non pharmacologic treatments focus on the reduction of blood pressure using life style modifications. The life style modifications include reduction of salt intake, weight reduction in obese patients, alcohol limitation, regular physical exercise and consume healthy dietary intake. Both treatment options aim improve the lives of hypertensive patients by reducing and controlling of blood pressure and prevent end organ damage. ⁽¹⁾

East Africa countries consists of 9 countries; Tanzania, Kenya, Uganda, Ethiopia, Somalia, Djibouti, Eritrea, Rwanda and Burundi. ⁽²⁾From East Africa countries Intergovernmental Authority on Development (IGAD) defined greater horn of Africa as countries including Djibouti, Eritrea, Ethiopia, Kenya, Somalia, South Sudan, Sudan and Uganda excluding three countries and adding Sudan. The area of these countries is 5.2 million km² and estimated to have a population of 230 million. The economy of these countries is based on agriculture that account the 80% of the employment of the total population. Most of these countries are the world's least developed countries. ⁽³⁾

8.1.1.2 Statement of the problem

Deaths due to NCD rose from below 8million in the year 1990 to 34.5 million in 2010. These accounted two third of the recorded deaths.⁽⁴⁾In 2010 globally, hypertension was one of the leading risk factor for global burden diseases with 9.4 million deaths. It accounted 7% of global Disability Adjusted Life Years (DALYs) followed by high Body Mass Index (BMI) and high plasma glucose.⁽⁵⁾

The global loss due to cardiovascular diseases is estimated to increase through time. The global loss due to cardiovascular diseases was 863 billion United States Dollar (USD) in the year 2010. It is estimated to rise to 1,044 billion in the year 2030. Fifty five percent of the loss is due to direct health care cost while 45% is productivity loss due to missing days out of work, disability and death. ⁽⁶⁾

The number of people that are affected by hypertension is increasing globally. In the year 2000, there were 972 million adult population who had hypertension.⁽⁷⁾ One billion and three hundred ninety million people had hypertension in 2010⁽⁸⁾ and it is estimated that 1.56 billion people will have hypertension in the year 2025.⁽⁷⁾ The prevalence increased in Low and Middle-Income Countries (LMIC) while it decreased in high-income countries within the years of 2000-2010. ⁽⁸⁾ In Africa, the prevalence was 30.8% in the year 2010 and estimated to affect 216.8 million people by the year 2030.⁽⁹⁾ The prevalence varies from country to country, by age category and place of residence. ^(10, 11) The increment of the prevalence of hypertension in developing countries could be due to urbanization, ageing population, change in dietary habits and social stress.⁽¹²⁾ The prevalence of hypertension among women was higher in some studies ^(10, 13) while the prevalence was higher among men participants' in another.⁽¹⁴⁾

The risk factors of hypertension are many. These include tobacco smoking^(15, 16) alcohol drinking ⁽¹⁷⁾, less consumption of fruits and vegetables leading to low potassium level ⁽¹⁸⁾, older age group ^{(15),(19)}, high Body Mass Index (BMI)⁽¹⁹⁻²¹⁾ and moderate activity. ⁽²¹⁾

To estimate the burden of hypertension disease in East Africa, identify the risk factors and plan intervention, there is a need of an aggregated finding from the East African countries. Many

studies on the prevalence and the associated factors of hypertension were done in East Africa. ^(10, 11, 22) These studies used cross sectional study designs and others with systematic review and meta analysis study designs were conducted in SSA countries. ^(11, 22) Studies that aggregate and present a point estimate of the prevalence and risk factors of hypertension are needed.

8.1.1.3 Significance of the study

This study will help decision makers by providing information on the magnitude and factors associated with hypertension in the East Africa. It will indirectly benefit the community by showing the prevalence so as interventions could be implemented based on the identified prevalence and associated factors of hypertension. It will identify and recommend further area of research in this area.

8.1.2 Literature review

Globally, 1.39 billion people had hypertension; 1.04 billion were from low and middle income countries while 349 million were from high-income countries in 2010.⁽⁸⁾ In the year 2000, 972 million (26.4% of adult population) had hypertension. By 2025 the number is estimated to reach 1.56 billion that is 29.2% of adult population.⁽⁷⁾ A study conducted in 2014 showed that the prevalence was 52.9% among 50 years and older population with nearly similar prevalence within countries.⁽¹⁰⁾

The prevalence of hypertension in both genders were nearly similar; 26.6% for men and 26.1% for women in 2000. It was estimated that the prevalence would reach 29.0% for men and 29.5% for women in 2025.⁽⁷⁾ The prevalence of hypertension in women was higher than men in studies conducted in India, China, Ghana, Mexico, Russia, and South Africa.⁽¹⁰⁾ Similarly, the prevalence was higher in women in studies conducted in Kenya, South Africa, China, India, Pakistan, Argentina, Chile, Peru and Uruguay.⁽¹³⁾ On the contrary, in a study conducted in France, male hypertension prevalence (47%) was higher than women prevalence (35%).⁽¹⁴⁾

Hypertension prevalence in developing countries is increasing. A study conducted in middle and low-income countries showed that the overall prevalence of hypertension was 32.3%. Middle income countries hypertension prevalence was 37.8% and low-income countries was 23.1%.⁽²⁴⁾ Another study compared hypertension prevalence among high, middle and low-income countries. In that study, the overall prevalence of hypertension was 31.1% in 2010. The prevalence was 28.5% in high-income countries while it was 31.5% in low and middle-income countries. The prevalence has decreased by 2.6% in high-income countries and increased by 7.7% in low and middle-income countries compared to the year 2000 prevalence.⁽⁸⁾ The increment of the prevalence of hypertension in developing countries could be due to urbanization, ageing population, change in dietary habits and social stress.⁽¹²⁾

The prevalence of hypertension in Africa varied based on the year, area of study and the age of participants. In Africa, the prevalence of hypertension was 19.7% in the year 1990, 27.4% in the year 2000 and 30.8% in the year 2010. The prevalence was estimated to affect 216.8 million

people in the year 2030.⁽⁹⁾ A study conducted in Africa showed that hypertension prevalence was 55.2% among elderly people greater than 50 years of age. Urban settings had higher prevalence.⁽²⁵⁾ Another study determined the prevalence of hypertension in SSA countries as 16.2% that ranged from 10.6% in Ethiopia and 26.9% in Ghana. Seventy five million people were estimated to have hypertension in 2008 while 125.5 million people were estimated to live with hypertension in 2030.⁽²²⁾ In 2012, the prevalence of hypertension was 19.3% in rural Nigeria, 21.3% in rural Kenya, 23.7% in Urban Tanzania and 38% in urban Namibia.⁽¹⁰⁾ A study conducted in SSA showed that hypertension prevalence was different among studies that ranged from 15%-70% based on age differences and the pooled prevalence was 30% from the year 2000-2013.⁽¹¹⁾

The risk factors of hypertension include tobacco smoking^(15, 16) alcohol drinking ⁽¹⁷⁾, less consumption of fruits and vegetables leading to low potassium level⁽¹⁸⁾, older age group^(15, 19), high BMI⁽¹⁹⁻²¹⁾ and moderate activity.⁽²¹⁾ Hypertension was significantly associated with people with older age, smoking, who took extra salt intake and had central obesity among participants in Bangladesh in 2012.⁽¹⁵⁾ Study conducted in Pelotas showed that higher family income, non white, increase in age, family history of hypertension and higher BMI were associated with presence of hypertension.⁽²³⁾ Similarly, age, BMI, Diabetes Mellitus (DM), Coronary Heart Disease (CHD), family history of hypertension and being male were the associated risk factors of hypertension in a study conducted in Afyonkarahisar.⁽²⁰⁾ A study conducted in Southern Brail showed that hypertension was associated with male gender, older age, overweight, obesity, Asian ethnicity and self-report diabetes.⁽¹⁹⁾ Another study in Kenya showed that being widow, having high wealth index, obesity and moderate physical activity were associated with hypertension. ⁽²¹⁾

Different studies show that the prevalence of hypertension is different in different contexts and due to many reasons. The risk factors of hypertension differ from study to study. Identification of the risk factors will help in designing focused interventions. This study aimed to identify the pooled prevalence of hypertension in East Africa and explore the risk factors.

8.1.3 Objectives

8.1.3.1 General objective

To pool the estimates of the prevalence and associated factors of hypertension from studies conducted in East Africa, 2011-2016.

8.1.3.2 Specific objectives

- To aggregate the prevalence of hypertension from studies conducted in East Africa, 2011-2016
- To identify factors associated with hypertension from studies conducted in East Africa, 2011-2016

8.1.4 Methods

The protocol of this study was done using The Cochrane Public Health Group Guide for developing a Cochrane protocol.⁽²⁶⁾

8.1.4.1 Criteria's for considering studies for this review

Table 8.1. Inclusion and exclusion criteria of the studies

Inclusion criteria	Exclusion criteria
Facility and community based studies	Studies with study participants with pregnant hypertensive cases
Studies from Tanzania, Kenya, Uganda, Ethiopia, Somalia, Djibouti, Eritrea, Rwanda and Burundi	Studies other than English language
Participants age greater than 15 years of age	Poor quality studies based on Downs and Black score system ⁽²⁷⁾ with scores less than the mean score
Any sex	
Systolic blood pressure of ≥ 140 mm Hg or diastolic blood pressure of ≥ 90 mmHg studies	
Cross-sectional studies	
Full text studies	
Published and non-published studies	
Studies from 2011-2016 years	

8.1.4.2 Search methods

PubMed, Medline, HINARI and Google scholar search engines were used. Non-published literatures were included in the study by assessing government documents, reports and technical documentation from WHO library database and Google. Same inclusion and exclusion criteria were used to select non-published literatures as that of published articles. Key words like

“hypertension”, “Africa, Eastern”, “Prevalence” and “risk factors” were used to identify the studies.

8.1.4.3 Data collection and analysis

8.1.4.3.1 Selection of studies

The Principal Investigator (H.T) selected the titles and abstracts. Unrelated titles were excluded and full text papers were included in the study. Two independent reviewers (H.T and Z.T) reviewed the selected studies and third reviewer (A.M) was involved during controversies. We kept the records of the reasons of exclusion of the studies. PRISMA flow diagram was used to show the process of selection of the studies. Inter Rater Reliability among the two reviewers was calculated using Cohen’s kappa and agreement between the two reviewers was assessed. No agreement was considered for result with 0-0.2, minimal agreement 0.21-0.39, weak agreement 0.40-0.59, moderate agreement 0.60-0.79, strong agreement 0.80-0.90, almost perfect agreement above 0.90 Cohen’s kappa scores.⁽²⁸⁾ This helped in showing the agreement between the raters or the reviewers. Reference was managed using Endnote X5. Multiple reports of the same study were merged.

8.1.4.3.2 Data extraction and management

Once the studies were selected by the reviewers, data was extracted for synthesis. Data extraction form was developed and was pretested by two data extractors. The extraction form included year of publication, survey, age, sampling methods, study design, response rate, sample size, hypertension definition based on blood pressure, number of blood pressure measurements, and type of measuring device, prevalence and the associated factors. The data extraction form was pretested. Based on the findings of the pretest, the form was modified. For the actual data collection, two independent extractors (H.T and Z.T) extracted the data and third data extractor (A. M) was involved in case of controversies. The filled form is annexed in this study and was used in the synthesize data. All potential confounders that might divert the outcome were included in the extraction form.

In case of multiple measures of similar findings, one measure was chosen by selecting the paper with most complete data. To avoid double synthesis of a study, the selected article titles were

reviewed twice by two reviewers. Consistency of the data extracted was checked and in case of inconsistency the articles were reviewed again.

8.1.4.3.3 Data analysis and interpretation

We entered data on Microsoft Excel 2007 and analyzed it using medcal and Review Manager 5.3. The unit of analysis was at article level. We presented a table containing all the relevant information on the selected paper. We assessed methodological heterogeneity during study selection and statistical heterogeneity using I^2 . Summary of the findings is presented using forest plot. The prevalence of hypertension was presented using pooled proportions and the risk factors were presented with pooled odds ratio and Confidence Interval (CI). We used random effect model, DerSimonian Laird with 95% CI.

8.1.4.3.4 Dealing with missing data

We excluded articles on specific variables analysis when there were missing values on that specific variable.

8.1.4.3.5 Assessment of reporting biases

To investigate publication bias funnel plot was used. When the plot was symmetric about the mean effect size then we considered that there was no publication bias since the sampling error was at random.

8.1.4.3.6 Data quality

The quality of the studies were assessed using the Downs and Black score system.⁽²⁷⁾ Study scores below the mean were considered as studies with poor quality and were excluded from the analysis. Two data extractors with MPH were trained on the study objective and data extraction for a day. The reviewers were the principal investigator and another reviewer with Master of Public Health Degree. The inter rater reliability of the two data reviewers was assessed using Cohen's kappa. The agreement between the two raters was weak 0.56 ($p=0.004$).

8.1.4.3.7 Subgroup analysis

Subgroup analysis for prevalence was carried out for the countries and male/female.

8.1.4.3.8 Ethical clearance

Before proceeding with the data collection, ethical clearance was obtained from Saint Paul's Hospital Millennium Medical College Department of Public Health.

8.1.5 Result

8.1.5.1 Study selection

A total of 2,562 studies from PubMed (241), HINARI (1,688), Medline (530) and Google scholar (103) search engines. Five studies were added from other records making it 2,567 studies. Two thousand and one hundred thirty seven studies were excluded because of unavailability of free full text (1,304), year of publication (446), languages other than English (27) and age of the participants (359) as seen in Figure 1. Full text 431 articles titles, abstracts and sometimes the full contents of the articles were reviewed and 396 were excluded for the reasons of topics not being related (233), the design (28), study area (80), pregnant study population(8), age (8) and duplicates (49). The final number of studies included in this study were 14.

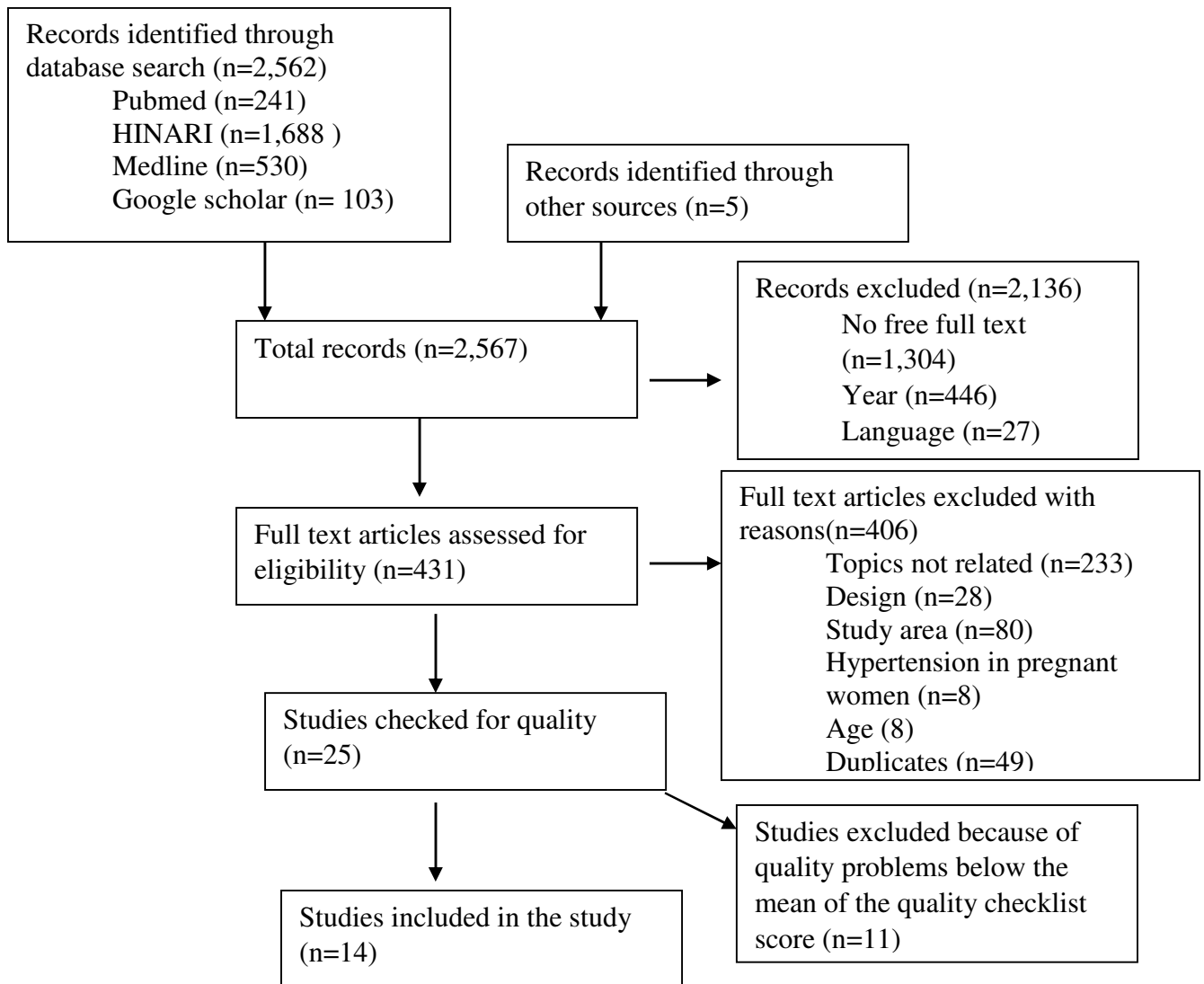


Figure 8.1 PRISMA flow chart of the studies selected in East Africa, 2017

8.1.5.2 Selected studies characteristics

Fourteen studies from Uganda (5), Ethiopia (4), Tanzania (4) and Kenya (2) were included in the study with a total of 23,120 study participants. The sample size ranged from 396-4142. The ages of participants were 15 years or more. The overall prevalence of hypertension was 25.4%. All were cross sectional studies.

Table 8.2. Characteristics of 14 selected studies conducted in East Africa, 2011-2016

Study	Country	Number of participants	Age	Hypertension prevalence (%)	Study setting (community based/facility based/school)
Abebeet al 2015	Ethiopia	2200	≥ 35	27.9	Community
Bonsa et al 2014	Ethiopia	396	15-70	16.9	Community
Guwatudaet al 2015	Uganda and Tanzania	629	≥ 18	25.9	Community and school
Heleloet al 2014	Ethiopia	518	> 31	22.4	Community
Kaymiet al 2015	Uganda	3685	18-40	15.0	Community
Kotwaniet al 2013	Uganda	2252	≥ 18	15.7	Community
Kagarukiet al 2014	Tanzania	671	≥ 18	26.2	Facility
Nuwaha et al 2013	Uganda	4142	≥ 18	23.2	Community
Olacket al 2015	Kenya	1528	35-64	27.4	Community
Joshi et al 2014	Kenya	2061	≥ 18	12.6	Community
Mandhaet al 2015	Tanzania	561	≥ 25	21.4	Community
Mayegaet al 2012	Uganda	1616	35-60	20.47	Community
Angawet al 2015	Ethiopia	629	≥ 18	27.3	Facility
Dewrhustet al 2013	Tanzania	2232	≥ 70	69.9	Community
Total		23,120	≥ 18	25.4	

Systematic review findings

The prevalence of hypertension in four studies conducted in Ethiopia were 16.9% (age 15-70 years), 22.4% (age ≥ 31 years), 27.3% (age ≥ 18 years), 27.9% (age ≥ 35 years) with a study population of age ≥ 35 years.⁽²⁹⁻³²⁾ Five studies conducted in Uganda were included. The prevalence of hypertension in these studies were 19.70% (age ≥ 18 years), 15.0% (age 18-40 years), 15.7% (age ≥ 18 years), 23.2% (age ≥ 18 years) and 20.47% (age 35-60 years).⁽³³⁻³⁷⁾ Four studies from Tanzania were included in the study. The prevalence of hypertension in these studies

were 21.4% (age ≥ 25 years), 26.2% (age ≥ 18 years), 43.1% (age ≥ 18 years) and 69.9% (age ≥ 70 years).^(33, 38-40) Two studies from Kenya were included in the study with hypertension prevalence of 12.6% (age ≥ 18 years) and 27.4% (age 35- 64 years).^(21, 41) Eleven of the studies were community based ^(21, 29, 30, 32, 34-38, 40), two were facility^(31, 39) and one was community and school based. ⁽³³⁾

Six studies reported that being obese or overweight was a risk factor for hypertension.^(21, 30, 31, 34, 37, 41) Having family history of hypertension was one of the risk factors of hypertension in two studies.^(30, 31) Smoking was reported as a risk factor for hypertension in two studies.^(32, 33) Having high waist circumference was one of the risk factors of hypertension in two studies.^(29, 41) In a study, alcohol, low physical activity and being female were the risk factors of hypertension.^(30, 32, 37)

Meta-analysis findings

8.1.5.3 Prevalence of hypertension

The pooled prevalence of hypertension in East Africa among 14 studies using DerSimonian Laird random effect was 25.37 % (95%CI, 17.67-33.76%) pooled prevalence. The pooled prevalence of hypertension in the five studies of Uganda was 18.61% (95%CI, 14.88-22.64%), in four studies of Tanzania 39.69% (95%CI, 14.26- 68.58%), in four studies of Ethiopia 23.77% (95%CI, 19.26-28.60%) and in two studies of Kenya 19.46% (95%CI, 7.29-35.69%). The prevalence of hypertension among women was 26.7% (95%CI, 17.63-36.89%). The prevalence of hypertension among male participants was 24.87% (95%CI, 17.87-32.61%). (See below figure 8.2, 8.3 and 8.4)

Study	Sample size	Proportion (%)	95% CI	Weight (%)	
				Fixed	Random
Abebe et al 2015	2141	27.93	26.04-29.88	9.03	7.17
Angaw et al 2015	629	27.34	23.89- 31.01	2.65	7.11
Bonsa et al 2014	396	16.92	13.36- 20.98	1.67	7.06
Helelo et al 2014	518	22.39	18.87- 26.23	2.19	7.09
Kaymi et al 2015	3685	14.52	13.40- 15.70	15.53	7.18
Kotwani et al 2013	2252	15.72	14.24- 17.29	9.49	7.17
Kagaruki et al 2014	668	26.20	22.90- 29.71	2.82	7.11
Nuwaha et al 2013	4142	23.20	21.92- 24.52	17.46	7.18
Olack et al 2015	1528	27.36	25.13-29.67	6.44	7.16
Joshi et al 2014	2045	12.62	11.21-14.13	8.62	7.17
Mandha et al 2015	561	21.39	18.07- 25.02	2.37	7.10
Mayega et al 2012	1656	20.47	18.55- 22.50	6.98	7.16
Dewrhust et al 2013	2223	69.86	67.90- 71.76	9.37	7.17
Guwatude et al 2015	1272	36.87	34.21- 39.60	5.36	7.15
Total (fixed effects)	23716	25.03	24.50 -25.59	100.0	100.0
Total (random effects)	23716	25.27	17.67- 33.76	100.0	100.0

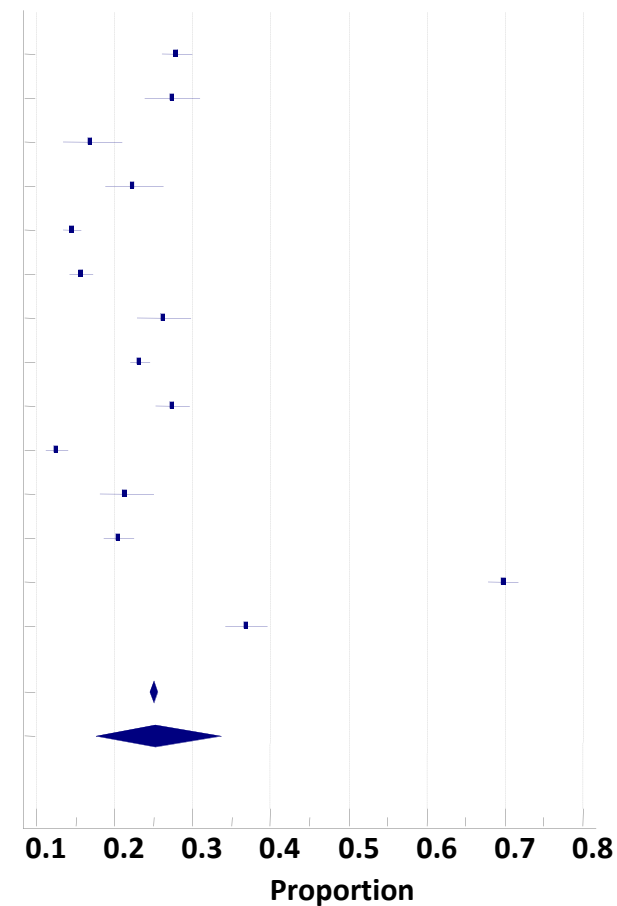


Figure 8.2 The prevalence of hypertension in East African countries, 2011-2016

Note: ■ - effect estimate (prevalence)

— 95% CI of the estimates

◆ Pooled effect estimate



