

SAINT PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE



Ethiopian Field Epidemiology and Laboratory Training Program (EFELTP)

Compiled body of work in field epidemiology with Thesis Report

By

Jemal Beksisa Shuramu

Submitted to Saint Paul's Hospital Millennium Medical College in partial fulfillment of the requirement for the Degree of Master of Public Health in Field Epidemiology

March 2018

Addis Ababa Ethiopia

Saint Paul's Hospital Millennium Medical College

Department of Public Health

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Advisor Tewodros Getinet

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SAINT PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE DEPARTMENT OF
PUBLIC HEALTH

Declaration

I, the undersigned, declared that this is my 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.

Name of the student: **-Jemal Beksisa Shuramu**

Signature_____

Date _____

Place _____

Date of Submission _____

Approval of Advisors

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Date _____

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LIST OF ACCRONYMS/ABBREVIATIONS

AACAHB	Addis Ababa City Administration Health Bureau
AACCR	Addis Ababa City Cancer Register
ADT	Androgen Deprivation Therapy
AFI	Acute Febrile Illness
AFP	Acute Flaccid Paralysis
AIDS	Acquire Immune Deficiency Syndrome
AJCC	American Joint Committee on Cancer
ANC	Ante Natal Care
AOR	Adjusted Odd Ratio
ART	Anti-Retroviral Therapy
ART	Attack Rate
ASIRs	Aga Standardized Incidence Rate
ASR	Aga Standardized Rate
AWD	Acute Watery Diarrhea
BCG	Bacilli Chalmette-Guerin
BMI	Body Mass Index
BPR	Business Process Reengineering
BSc	Bachelor of Science
CBN	Community Based Nutrition
CDC	Centers for Disease Control and prevention
CFR	Case Fatality Rate
CI	Confidence Interval
COR	Crude Odds Ratio
CTC	Cholera Treatment Center
DALYs	Disability-Adjusted Life Year
DNA	Deoxyribonucleic Acid
DRE	Digital Rectal Examination
DT	Doubling Time
EPHI	Ethiopian Public Health Institute
EPI	Expanded Program on Immunization

EPR	Emergency Preparedness and Response
FMOH	Federal Ministry of Health
GBD	Global Burden of Disease
GLOBOCAN	Global Burden of Cancer Study
HCT	HIV Counseling and Testing
HEW	Health Extension Workers
HMIS	Health Management and Information System
HIS	Health Information System
HIV	Human Immunodeficiency Virus
IDSR	Integrated Disease Surveillance and Response
IgM	Immunoglobulin M
IRS	Indoor Residual Spray
LLITNs	Long Lasting Insecticide Treated Net
MCH	Maternal and Child Health
MV	Measles Vaccinations
NGO	Non Governmental Organization
NPW	Non Pregnant Women
OPD	Out Patient Department
OPV	Oral Polio Vaccine
OR	Odd Ratio
OTP	Outpatient Therapeutic Program
PCSD	Prostate Cancer Specific Death
PHEM	Public Health Emergency Management
PITC	Provider Initiated Testing and Counseling
PLWHA	People Living With HIV/AIDS
PMTCT	Preventing Mother To Child Transmission
PNC	Post Natal Care
PSA	Prostate Specific Antigen
PSNP	Productive Safety Net Program
PTB	Pulmonary Tuberculosis
PW	Pregnant Women

RDT	Rapid Diagnostic Test
RHB	Regional Health Bureau
RR	Relative Risk
RRT	Rapid Response Team
SAM	Severe Acute Malnutrition
SARS	Severe Acute Respiratory Syndrome
SC	Stabilization Center
SD	Standard Deviation
SDI	Socio Demographic Index
SIAs	Supplementary Immunization Activities
SNNPR	South Nations Nationalities and Peoples Representatives
SPHMMC	Saint Paul's Hospital Millennium Medical College
SSA	Sub-Saharan Africa
TASH	Tikur Anbessa Specialized Hospital
TB	Tuberculosis
TNM	Tumor Node Metastasis
TSF	Targeted Supplementary Food
TVET	Technical and Vocational Education Training
VCT	Voluntary Counseling Test
WASH	Water Sanitation and Hygiene
WHO	World Health Organization
YLDs	Years Lived with Disability
YLLs	Years of Life Lost

EXECUTIVE SUMMERY

This document contains a two years Field Epidemiology and Laboratory Training Program outputs which is equivalent with thesis to be submitted to SPHMMC department of public health for partial fulfillment of master degree in Field Epidemiology. In addition to the outputs it also contains a thesis conducted for partial fulfillment of master of degree in Field Epidemiology. It includes reports of diseases outbreak investigations, public health surveillance data analysis, surveillance system evaluation, Health Profile Description, manuscripts, abstracts, Surveillance weekly Epidemiologic bulletin and public health research report (thesis). Accordingly the document is organized to eight chapters.

Chapter one contains diseases outbreak investigations. It is the only outbreak investigation with title of "Acute Watery Diarrhea outbreak investigations in woreda 8-13 districts of Yeka sub city" that I have conducted during my residency. The outbreak investigation was conducted using case control study design and it contains abstract, introduction, methods, discussions, conclusion, recommendations, acknowledgement and references separately.

Chapter two contains report of surveillance data analysis which was conducted on measles infection in Yeka sub city, Addis Ababa. In this data analysis five years surveillance data of measles (2010 to 2014) in Yeka sub city were used. Description and distribution of measles infection in the sub city with respect to place and person was performed. Incidence rate, trends and seasonality of measles infection were also determined. This report also contains abstract, introduction, methods, discussions, conclusion, recommendations, acknowledgement and references separately.

Similarly chapter three addresses surveillance system evaluation entitled "An Evaluation of typhoid fever surveillance system in Yeka Sub city". This chapter clearly presents the purpose and objectives of typhoid fever surveillance and its progress towards its objectives. Core and supportive activities of typhoid fever surveillance system in respect to case detection, registration, confirmation, reporting, epidemic preparedness & response, supervision, staff training, feedback and financial support were also described. The surveillance attributes: simplicity, flexibility, stability, acceptability, representativeness, timeliness and data quality were also assessed in the chapter.

Chapter four contains assessment of Yeka sub city health profile. In the chapter health and health related data of the sub city were evidently presented. Data generated from health profile has very crucial role in priority setting, resource allocation, identifying gap of health event and future planning. Prioritizing prominent health and health related problems of the community at any level is very vital for basic planning and appropriate public health interventions. Stake holders of health and health related issues will access evidence based information from this chapter.

Chapter five contains Scientific Manuscripts for Peer reviewed Journals. In his chapter, two manuscripts were presented. One of the manuscripts was prepared according to Indian Journal of public health. The manuscript having title of Yeka sub city measles surveillance data analysis's from 2010-2014, were prepared and sent to Indian Journal of public health for publication it is on the process to be published. The second manuscript were having title of acute watery diarrhea outbreak investigation in woreda 8-13 districts of Yeka sub city were prepared according to Ethiopian journal of health development author's guideline. In chapter six abstracts of outbreak investigations and surveillance data analysis were presented. The abstract entitled "Yeka sub city measles surveillance data analysis's from 2010-2014 were prepared and sent to 67 annual EIS conference TEPHINET, Organized by CDC FETP International Night 2018. But this abstract was not accepted to be presented on the conference.

Chapter seven includes Public Health Emergency weekly bulletins. Of many weekly bulletins that I have prepared during the field base attachment, I had included only two of them in this document. The weekly bulletins were communicated to different stakeholders through Yeka sub city public health emergency management offices.

Finally public health research (thesis) was described in chapter eight. The thesis title was survival and its determinants among prostate cancer patients diagnosed at Tikur Anbessa Specialized Hospital. This study was conducted on prostate cancer patients diagnosed from January 2012 to December 2016 by using retrospective cohort study design. This study tried to determine survival status and identifying different determinants of the survival.

CHAPTER I– OUTBREAK INVESTIGATION

1.1 ACUTE WATERY DIARRHEA OUTBREAK INVESTIGATION IN WOREDA 8-13 DISTRICTS OF YEKA SUBCITY, ADDIS ABABA, ETHIOPIA 2016

ABSTRACT

Background: Cholera remains a major public health threat of developing countries including Ethiopia where 2330 cases and 22 deaths were reported in 2016 according to World Health Organization. Yeka sub-city was reported the first Acute Watery Diarrhea (AWD) case in June 2016 and in July 2016 all woredas of the sub-city was affected, despite the response had started early. The information obtained from this study will help to control the outbreak and can be utilized to manage future similar outbreaks.

Objective: To identify factors associated with AWD infection and describing cases epidemiologically in woreda 8-13 districts of Yeka sub-city, Addis Ababa, 2016

Methods: health facility based case control study was conducted in woreda 8-13 districts of Yeka sub-city, Addis Ababa from July to August 5/2016 on 58 cases and 58 controls. National AWD case definition was used to select cases conveniently from Cholera Treatment Center. Controls were selected from community randomly. Principal investigator collected data using written questionnaires. Data was entered to EpiInfo version 7.1 and transferred to SPSSversion21software for analysis. Logistic regression analysis was performed and Variables with p-value of ≤ 0.05 were considered to be significantly associated with AWD infection.

Result: Male accounts 25(43.1%) among controls and 34(58.9%) among cases. The mean age of controls were 33.3(SD=13.7) and 38.3(SD=17.2) in cases. The age category 15-44 years accounts 85(73.3%) from total respondents and 40(69%) among cases. Water treatment before use (AOR=0.23, 95% CI=0.06-0.81), raw meat food item consumption in the past five days (AOR=13.9, 95% CI=3.04-63.8), eating food outside your home in the past five days (AOR=3.8, 95% CI=1.09-13.45) and regular hand washing with detergents after toilet (AOR=0.04, 95% CI=0.009-0.18) were significantly associated with AWD infection.

Conclusions: males and 15-44 year age category were the most affected group. Consumption of raw meat in the preceding 5 days of illness, eating outside, water treatment before use and regular hand washing after toilet were significantly associated factors. The district, sub-city and regional

health bureau should mobilize and educate the community on proper hand washing after latrine, not to consume raw foods like raw meat, not to eat out side and to treat water before use.

Key words: AWD, outbreak, Yeka sub city, Addis Ababa

1.1.1 INTRODUCTION

Back ground

Cholera is an infectious disease that present with acute watery diarrhea and caused by infection of the intestine with the gram-negative bacteria *Vibrio cholerae*, either type O1 or O139 sero-group. Both serotypes can cause cholera in epidemic form. It is one of the key indicators of social development and remains a challenge to countries where access to safe drinking water and adequate sanitation cannot be guaranteed. The typical presentation of cholera is a sudden onset of profuse painless watery stools, sometimes rice-water like, accompanied by vomiting. Dehydration appears within 12 to 24 hours. About 20% of those who are infected develop acute, watery diarrhea of which 10–20% of them develop severe dehydration that happen within the first 12 to 24 hours. For severe cases, patients may have cramps in the stomach, arms, or legs. The incubation period is usually 1 to 3 days but can range from several hours to 5 days. Symptoms usually last 2 to 3 days, although in some patients they can continue up to 5 days. The Case Fatality Rate (CFR) may reaches 30–50% without treatment and if there is appropriate treatment CFR is below 1%.

Infected persons whether they are symptomatic or not, can carry and transmit the germ during 1 to 4 weeks; a small number of individuals can remain healthy carriers for several months. Cholera is usually transmitted through feco-oral route by drinking-water that has been contaminated at its source or during transport, Food contaminated during or after preparation, Seafood taken from contaminated water and eaten raw, Fruit and vegetables irrigated with contaminated water, and then eaten raw and contact with Corpses of cholera patients. The greatest risk occurs in over-populated communities and refugee settings characterized by poor sanitation, unsafe drinking-water, and increased person-to-person transmission. As the incubation period of cholera is very short (2 hours to 5 days), the number of cases can rise extremely quickly (1).

Statement of the problem

Cholera remains a major public health threat in developing countries where safe water and sanitation facilities are inadequately available. The World Health Organization (WHO) estimates that annually, about 3 to 5 million people are affected worldwide by cholera and over 100,000 cases result in death. In 2011, 589 854-cholera cases including 7816 deaths were reported to WHO globally. Twenty-seven countries from the African continent reported 188 678 cases, including 4183 deaths (CFR, 2.22%). Compared with 2010(115 106 cases), the number of cases

reported from Africa increased by 65% and having highest case fatality rate. Cholera cases from Africa represented one third of the global total in 2011(2).

The risk factors for cholera include poverty, underdevelopment, population density, low education levels, travel to high-risk areas, consumption of leftover food, and consumption of unsafe fruits and vegetables (3). Other risk factors for cholera outbreaks are posed by sudden changes in sanitary behavior involving water and toilet use. Natural disasters such as floods can lead to the deterioration of sanitary conditions and inadequate health services. Sudden population movements and the need to find accommodation for refugees may likewise affect water and health resources. Climatic factors such as rainfall, water and sea surface temperatures, and the El Niño Southern Oscillation events have a significant impact on the incidence of cholera (4) . Epidemic regions are located near regional rivers and are characterized by sporadic outbreaks, which are likely to be initiated during episodes of prevailing warm air temperature with low river flows, creating favorable environmental conditions for growth of cholera bacteria. Heavy rainfall, through inundation or breakdown of sanitary infrastructure, accelerates interaction between contaminated water and human activities, resulting in an epidemic. This causal mechanism is markedly different from endemic cholera where tidal intrusion of seawater carrying bacteria from estuary to inland regions, results in outbreaks(5).

In East Africa, cholera epidemics have been closely associated with living near to large body of water or lake, lack of health facilities nearby, seasonal changes in rainfall (high rainfall), fishing community and were aggravated by the low socioeconomic status, inadequate healthcare systems and inadequate sanitary facilities. Some studies have shown that cholera cases occur in highly urbanized, densely populated areas close to water bodies, while others have shown a higher incidence in small, rural populations with high poverty levels, low urbanization, and lack of sanitation(6–8).

Study conducted in Ethiopia Afar region shows that AWD outbreak had happened in the region in 2009. Accordingly A total of 1076 cases and 48 deaths were registered during April 29 to May 16, 2009 in the three districts of Afar with an attack rate (AR) and case fatality rate (CFR) of 0.85% and 4.4% respectively. Males and the age category 15-44 years old constituted 531 (83.2%) and 499 (78.3%) of the cases respectively. Hand washing after latrine usage was protective of illness (crude OR = 0.13, p= 0.03), access to latrine (unsanitary latrine) [OR = 10.5, P-value= 0.001], contact with a case (OR = 200, P-value= 0.001) and visiting a place which has

similar illness (OR=33.6, P=0.001) had shown statistically significant association with being a case(9,10)

In Ethiopia Acute Watery Diarrhea cases have been reported from all ten sub-cities in Addis Ababa and other regions of the country in July 2016. The outbreak also continues to spread in other regions of the country and new affected woredas are reported in Amhara, Oromia, Dire Dawa and Southern Nation Nationalities and Peoples Representatives (SNNPR). Between 17 and 23 August (34th epidemiological week), a total of 2,330 new cases of AWD and 22 deaths with 0.9 per cent case fatality rate have been reported from 61 woredas and 10 sub-cities in Addis Ababa, Afar, Amhara, Somali, Oromia and SNNPR (11).

A single confirmed AWD case is considered as an outbreak in Ethiopia(12). The outbreak of AWD in Addis Ababa started in June 2016 and it was laboratory confirmed by culture. All the ten sub cities have reported cases. Yeka sub city was reported the first confirmed case on 10 June 2016. On July 13 all woredas of the sub city was affected and the cumulative number of cases reported was 233 with 2 death (CFR 0.8%). Despite the response like case management, health promotion on Water Sanitation and Hygiene (WASH) and surveillance interventions started, the number of cases was increased. The onset of the rainy season, large scale population movements in and out of Addis Ababa city, may increases the potential of further spread of the disease. The aim of this study was to determine the risk factors associated with AWD infection in Yeka sub city Addis Ababa, 2016 that helps to control the outbreak.

Significance of the Study

Investigation of any outbreak provides relevant information for taking immediate action and improving long-term disease prevention activities. The finding of this study can provide relevant information on risk factors and exposed groups to districts outbreak response team to control outbreak early. Also policy makers and Program implementers may use the output of this study as an input to manage future similar outbreak.

1.1.2 OBJECTIVES

General Objective

To describe AWD cases epidemiologically and to identify factors associated with AWD infections in woreda 8-13 districts of Yeka sub city, Addis Ababa, Ethiopia, 2016

Specific Objective

- To describe AWD cases epidemiologically in terms of place, person and time in Woreda 8-13 of Yeka sub city, Addis Ababa, Ethiopia, 2016
- To determine factors associated with infection of AWD in Woreda 8-13 of Yeka sub city, Addis Ababa, Ethiopia, 2016

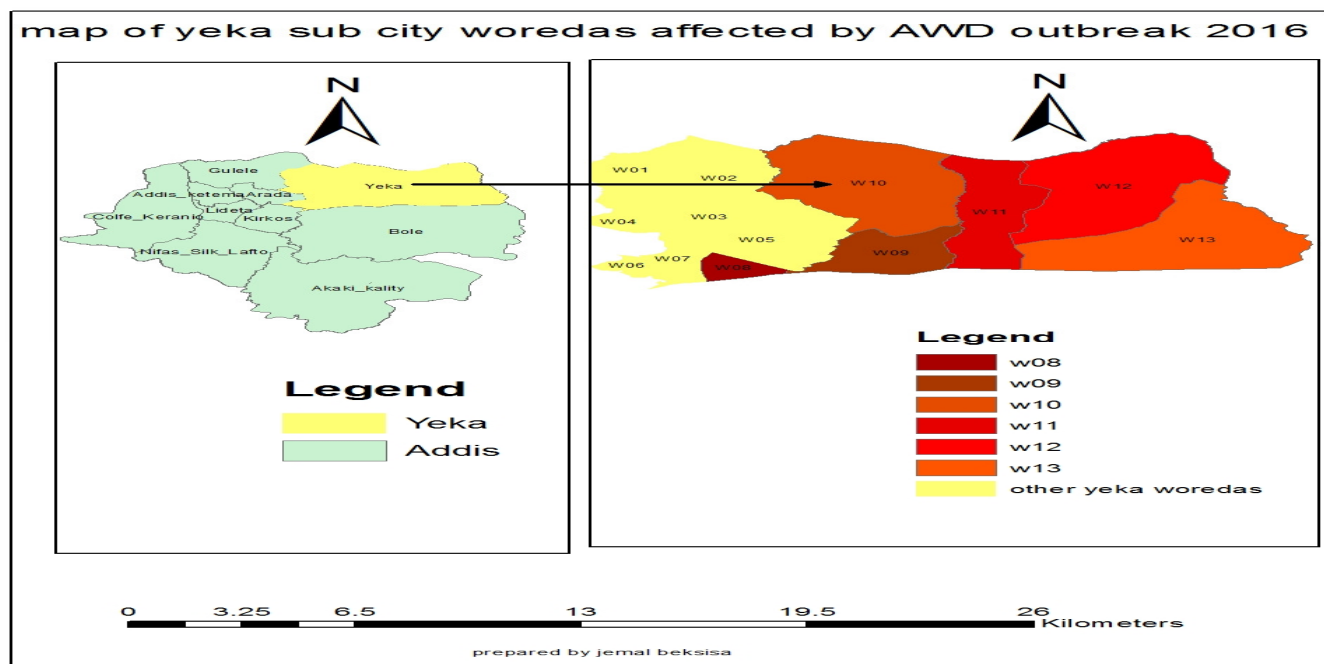
1.1.3 METHODS AND MATERIALS

Study Area and Period

The study was conducted in woreda 8-13 of Yeka sub city, Addis Ababa Ethiopia. Yeka sub city is one of the ten sub cities of Addis Ababa city Administration and located at northeastern part of the city. The sub city consists of 13 woredas/districts administratively and there are 13 health centers, 67 private clinics and 5 private hospitals. Based on the 2007 population census of Ethiopia Yeka sub city has estimated total population of 423316 by year of 2016 and the populations of woreda 8-13 districts were explained in the table below (table1). This study was conducted from July to August 5/2016.

Table 1 population of woreda 8-13 districts of Yeka sub city 2016

Name of districts	Total population
woreda 8	31715
woreda 9	42140
woreda 10	27179
woreda 11	34525
woreda 12	46048
woreda 13	38541



Map 1map of woreda 8-13 districts of Yeka sub city, 2016

Study Design

Health facility based case control study was undertaken to identify factors associated with AWD infection in woreda 8-13 districts of Yeka sub city, Addis Ababa, Ethiopia.

Source Population for cases: Source of population for cases were all AWD cases in woreda 8-13 districts of Yeka sub city.

Source Population for controls: Source of population for controls were all healthy individuals (free from AWD infection) living in woreda 8-13 districts of Yeka sub city.

Study Population for cases: All AWD cases in woreda 8-13 districts of Yeka sub city sought at Cholera Treatment Center (CTC) during the study period.

Study Population for controls: The study populations for controls were all healthy individuals (free from AWD infection) from district 8-13 of Yeka sub city and included in the study.

Inclusions and Exclusions Criteria: All laboratory (RDT) confirmed and admitted AWD cases were included as a case. All healthy individuals (free from AWD infection clinically) who are above five years of age were included as a control. Suspected AWD cases, age below five years and those who were unable to respond during interview due to severe illness were excluded from the study. Also controls who had recently recovered from AWD infection were excluded from the study.

Case Definition: Cases were defined according to WHO standard case definition as adopted by the Ethiopian Minister of Health(12).

Case: is a person/patient who has sign and symptoms of cholera infections which can be suspected or confirmed

Suspected case: Any person 5 years of age or more with profuse acute watery diarrhea and/ or vomiting

Confirmed case: A suspected case in which *Vibrio cholera* O1 or O139 has been isolated from their stool by RDT or culture test.

Acute Watery Diarrhea: is simplified community level case definition given to cholera and is defined as any person 5 years of age or more with profuse acute watery diarrhea and vomiting.

Controls: are persons living in the same districts/neighborhood of a case but who had not suffered cholera until the date of the interview.

Sample Size Determination

Sample size was calculated based on sample size calculation for unmatched case control study design using EpiInfo Statcalc by taking the following assumptions: 95% confidence interval, 80% power, odd ratio and proportion of exposed controls referred from the study conducted in Ethiopia Afar region as indicated in table below (table 2). The ratios of cases to controls were one to one (1:1) and the final total sample size was 116 of 58 cases and 58 controls by considering larger sample size.

Table 2 sample size determination for AWD outbreak investigation study in Yeka sub city, 2016

Associated risk factors	Proportion of exposure among control	Odd ratio	Calculated number of sample size
Using water treatment chemical before use	34.7	0.27 (p- 0.05)	116
Hand washing with detergent after latrine	95.6	0.13 (p- 0.03)	86

Sampling Procedure: All new laboratory confirmed AWD cases fulfilling the eligibility criteria were selected from CTC conveniently. Controls who did not meet AWD standard case definition without conducting laboratory confirmation were selected randomly from the community. First house hold neighbor to the cases home were selected conveniently. Then one control was selected from family members of the selected household randomly.

Data Collection: Following the selection of respondents and receipt of informed verbal consent, cases and control subjects were assessed using the structured questionnaire. The questionnaire has certain variables related to socio-demographic information, water exposure, food exposure, environmental sanitation and personal hygiene information was collected by Principal investigator.

Data Quality Control: Data was collected using structured questionnaires that are prepared in English language and converted to Amharic during interviewing by principal investigator. Completeness and consistency of collected data was checked during data collection daily by principal investigator.

Data Analysis: Data was entered to EPI info version 7.1 and transferred to SPSS version 21 software for analysis. Univariate descriptive analysis like frequency, percentages and graphs were performed for qualitative variables and appropriate numerical summary measures (mean) were used for quantitative variables like age. The associations between risk factors and infection

among cases and controls were analyzed using logistic regression and expressed as Crude Odds Ratios (COR) with 95% Confidence Intervals (CI) during Bivariate analysis. Variables whose p-value were ≤ 0.2 and other variables that are considered to be important were included in multivariable analysis. Finally those significantly associated risk factors with AWD infection at $P < 0.05$ were explained with Adjusted Odd Ratio (AOR) and CI.

Variables: Dependent variable is AWD Infection status

Independent Variables are age, sex, districts and occupations, water source for domestic and drinking, water treatment, holly water exposure, raw meat consumption, vegetables and fruits exposure, eating outside, hand washing habit and latrine access

Ethical Consideration

Addis Ababa City Administration Health Bureau (AACAHB) wrote first official letter of co-operation to Yeka Sub city health office and permission to conduct the study was obtained from health office. During the visit to both cases and controls, the purpose of the study explained to all eligible subjects and their verbal consent obtained by principal investigator. Also respondents were introduced that their confidentiality is respected and they have told that the right to stop or not to answer to the question if they need. Variables were not containing the name of the study subjects (cases) which will address concern of the study subject privacy.

Dissemination of the Result

The findings of this study will be interpreted and shared with the outbreak responders to assist in improving the outbreak response interventions and to prevent AWD outbreak in future. The result of the study will be communicated to SPHMMC Department of Public Health and Yeka Sub city Health Office. In addition, it will be presented on different conference and seminars.

1.1.4 RESULT

Description of Socio Demographic Characteristics of Respondents

A total of 116 respondents' (58 cases and 58 controls) were recruited. Male sex accounts 57(50.9%) of total respondents, 25(43.1%) among controls and 34(58.9%) among cases. The minimum and maximum ages were 6 and 80 respectively with mean age of 35.85(SD-15.7) years. The mean age among controls and cases were 33.3(SD-13.7) and 38.3(SD-17.2) respectively. The age category 15-44 years accounts 85(73.3%) of total respondents, 45(77%) of controls and 40(69%) of cases. From total respondents house wives occupation accounts 26 (22.4%) followed by 20 (17.2%) daily laborers. The highest proportion of occupations were daily laborers 15(25.9%) among cases and house wives 13(22.4%) among controls (table 3).

Table 3socio demographic characteristics of respondents by study group at 8-13 districts of Yeka sub city, 2016.

Socio demographic variables		AWD status		
		control	Case	total
sex	male	25(43.1%)	34(58.9%)	57(50.9%)
	female	33(56.9%)	24(41.1)	55(49.1%)
age categories	5-14 year	1(1.7%)	1(1.7%)	2(1.7%)
	15-44 year	45(77.6%)	40(69%)	85(73.3%)
	above 45	12(20.7%)	17(29.3%)	29(25%)
occupation	civil servant	11(19%)	6(10.7%)	17(14.7%)
	daily laborer	5(8.6%)	15(25.9%)	20(17.2%)
	house wife	13(22.4%)	13(22.4%)	26(22.4%)
	merchant	11(19%)	10(17.2%)	21(18.1%)
	retire	6(10.3%)	8(13.8%)	14(12.1%)
	other	12(20.7%)	6(10.3%)	18(15.5%)
district name	woreda 8	9(15.5%)	9(15.5%)	18(15.5%)
	woreda 9	5(8.6%)	5(8.6%)	10(8.6%)
	woreda 10	10(17.2%)	11(19%)	21(18.1%)
	woreda 11	7(12.1%)	7(12.1%)	14(12.1%)
	woreda 12	13(22.4%)	12(20.7%)	25(21.6%)
	woreda 13	14(24.1%)	14(24.1%)	28(24.1%)

About 28(24.1%) of the study participant were from districts of woreda 13 followed by 25(21.6%) in woreda 12. Woreda 13 and 12 districts account about 14(24.1%) and 12(20.7%) of

cases respectively (table3). Woreda 10 district were the most affected wereda with highest attack rate 4 (figure1)

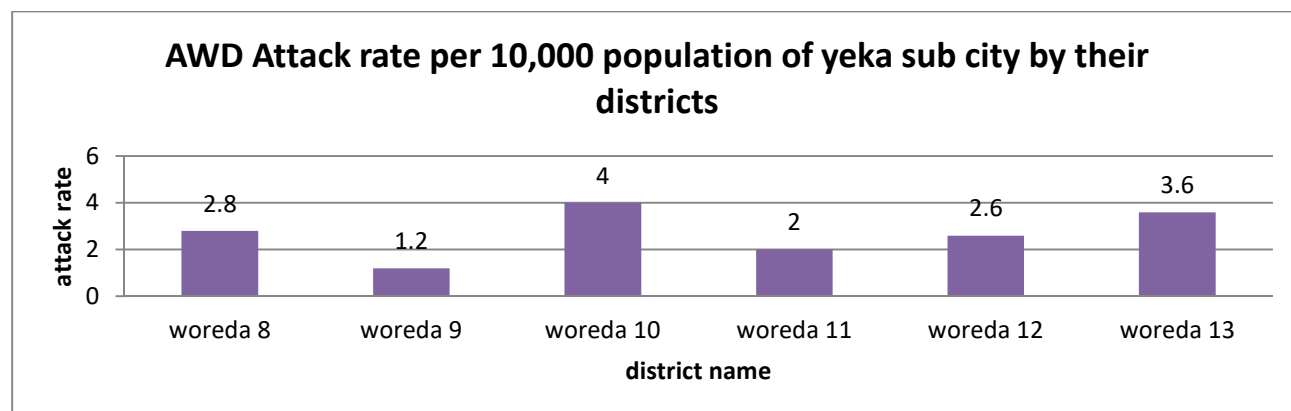


Figure 1AWD attack rate by districts name of Yeka sub city, July 2016

Date of onset of illness for recruited cases ranges from July 17 to August 3/2016. Three peaks of outbreak were seen during this period on July 20, 26 and On August 1/2016 with 6 cases reported on each day (figure 2). The epidemic curve graph below shows that there are multiple peaks that happened in different incubation period, which give a clue of propagated source of infection in this outbreak.

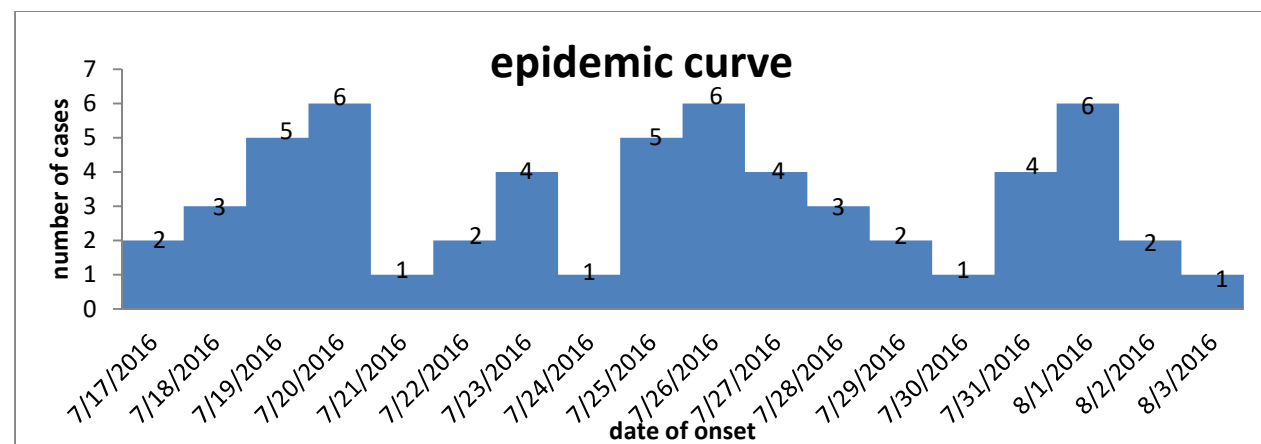


Figure 2Epidemic curve for AWD outbreak in woreda 8-13 districts of Yeka sub city from July 17 to August 4/2016.

Description of Water, Food and Beverage Exposure patterns of Respondents

Common piped water was used by 82 (70.7%) and 80(72.2%) of respondents for drinking and domestic purposes respectively. it was used for drinking purpose by 46(80%) cases and 37(63.7%) of controls. Water treatment before use were performed by 53(45.7%) of respondents, 39(67.2%) of controls and 14(24.1%) of cases. About 86(74.1%) of respondents, 45(77.6%) of cases and 41(70.7%) of controls buy their food from local market. Eating food outside to their home in the past five days were performed by 63(54.3%) of respondents, 43(74.1%) of cases and 20(34.1%) of controls while, Raw meat and vegetable or fruit were eaten by 34(29.3%) and 38(32.8%) of respondents respectively. Half of cases 29(50%) and 5(8.6%) of controls ate raw meat in the past five days before onset of illness (table 4).

Table 4 water, food and beverage exposure patterns of respondents in the past five days by study group at woreda 8-13 districts of Yeka sub city, 2016

water exposure related variables	AWD status		
	control	case	total
Water source for domestic use			
Household piped	17(29.3%)	7(12.1%)	24(20.7%)
Common piped	37(63.8%)	45(77.6%)	82(70.7%)
Non piped water	4(6.9%)	6(10.3%)	10(8.6%)
Water source for drinking			
Household piped	13(22.4%)	5(8.8%)	18(15.7%)
Common piped	37(63.8%)	46(80.7%)	80(72.2%)
Non piped water	8(13.8%)	6(10.5%)	14(12.2%)
Water treatment before use in past 5days			
Yes	39(67.2%)	14(24.1%)	53(45.7%)
No	19(32.8%)	44(75.9%)	63(54.3%)
If yes, how you treat water			
Filter	1(2.6%)	0	1(1.9%)
Boiling	3(7.7%)	5(35.7%)	8(15.1%)
Aqua tab	14(35.9%)	2(14.3%)	16(30.2%)
Water guard	21(53.8%)	7(50%)	28(52.8%)
Holy water exposure			
Yes	8(13.8%)	6(10.8%)	14(12.1%)
No	50(86.2%)	52(89.7%)	102(87.9%)
Where did you get/buy food			
Local market	41(70.7%)	45(77.6%)	86(74.1%)
Supermarket	17(29.3%)	13(22.4%)	30(25.9%)
Eating food outside in the past 5 days			
Yes	20(34.5%)	43(74.1%)	63(54.3%)
No	38(65.5%)	15(25.9%)	53(45.7%)
If yes where you eat			
Hotel	8(40%)	11(25.6%)	19(30.2%)
Restaurant	6(30%)	19(44.2%)	25(39.7%)
Cafeteria	4(20%)	5(11.6%)	9(14.3%)
Street vendor	2(10%)	8(18.6%)	10(15.9%)
Food item eaten in the past five days			
Vegetables and fruits	19(32.8%)	19(32.8%)	38(32.8%)
Raw meat	5(8.6%)	29(50%)	34(29.3%)
Other	34(58.2%)	10(17.2%)	44(37.9%)
Eating cold/leftover food in Past 5 days			
Yes	0	2(3.4%)	2(1.7%)
No	58(100%)	56(96.6%)	114(98.3%)
Drink locally soft drink in past 5 days			
Yes	1(1.7%)	5(8.6%)	6(5.2%)
No	57(98.3%)	53(91.4%)	110(94.8%)

Description of Environmental Sanitations and Hygiene of Respondents

Environmental sanitation and personal hygiene of respondents are shown in Table 6. Majority 112(96.6%) of the respondents, 56(96.6%) of cases and 56(96.6%) of controls have latrine access. About 61(73%) and 31(27.7%) of this latrine were common and private respectively. Three fourth 87(75%) of respondents, 39(67.2%) of cases and 48(82.8%) of controls answered that they wash their hands with soap before meal. Half 57(50.9%) of respondents, 12(21.4%) of cases and 45(80.4%) of controls wash their hands with detergents after toilet. Only 5 (8.6%) of cases have contact history with known AWD infection in the past five days (table 5).

Table 5 Environmental sanitation and hygiene of respondents by study group at woreda 8-13 districts of Yeka sub city, 2016

sanitation and hygiene related variables		AWD status		
		control	case	total
latrine access	yes	56(96.6%)	56(96.6%)	112(96.6%)
	no	2(3.4%)	2(3.4%)	4(3.4%)
is your latrine communal or private	common	36(64.3%)	45(80.4%)	61(72.3%)
	private	20(35.7%)	11(19.6%)	31(27.7%)
regular hand wash with detergent before meal	yes	48(82.8%)	39(67.2%)	87(75%)
	no	10(17.2%)	19(32.8%)	29(25%)
regular hand wash with detergent after toilet	yes	45(80.4%)	12(21.4%)	57(50.9%)
	no	11(19.6%)	44(78.6%)	55(49.1%)
how you dispose your domestic solid waste	open dump	4(6.9%)	5(8.6%)	9(7.8%)
	open pit	2(3.4%)	1(1.7%)	3(2.6%)
	by collector	52(89.7%)	52(89.7%)	104(89.7%)
contact history with known AWD in past five days	yes	0	5(8.6%)	5(4.3%)
	no	58(100%)	53(91.4%)	111(95.7%)

Factors Associated with AWD infection

Predictors of AWD infection are presented in table 6 below. Those variables with P-value ≤ 0.2 on Bivariate analysis and some important variables were entered to the multivariate Analysis. Multivariate logistic regression was done to identify their associations with AWD infection after adjusted for socio-demographic and other related variables. Then those variables with P-value ≤ 0.05 on multivariate analysis were considered as associated factors for AWD infections (table 6)

Table 6 risk factors associated with AWD infection at woreda 8-13 districts of Yeka sub city, 2016.

Variables	Controls N (%)	Cases N (%)	Crude OR (95% CI)	Adjusted OR (95 CI)
sex			p-0.096	p-0.98
male	25(43.1%)	34(58.9%)	1.87(0.89, 3.9)	0.98(0.25, 3.74)
female	33(56.9%)	24(41.1)	1	1
water treatment before use			p-0.001	p-0.02
yes	39(67.2%)	14(24.1%)	0.15(0.07, 0.35)	0.23(0.06,0.81)*
no	19(32.8%)	44(75.9%)	1	1
food item eaten in the past 5 days			p-0.001	p-0.002
vegetable and fruit	19(32.8%)	19(32.8%)	3.4(1.3, 8.78)	1.72(0.4, 6.75)
raw meat	5(8.6%)	29(50%)	19.7(6.04, 64.3)	13.9(3, 63.87)*
other	34(58.2%)	10(17.2%)	1	1
eating food outside in the past 5days			p-0.001	p-0.035
yes	20(34.5%)	43(74.1%)	5.44(2.4, 12.1)	3.8(1.09, 13.45)*
no	38(65.5%)	15(25.9%)	1	1
latrine type			p-0.06	p-0.612
common	36(64.3%)	45(80.4%)	2.2(0.96, 5.3)	0.71(0.19, 2.66)
private	20(35.7%)	11(19.6%)	1	1
regular hand washing before meal			p-0.057	p-0.91
yes	48(82.8%)	39(67.2%)	0.42(0.17, 1.02)	0.90(0.29, 3.0)
no	10(17.2%)	19(32.8%)	1	1
regular hand washing after toilet			p-0.001	p-0.040
yes	45(80.4%)	12(21.4%)	0.06(0.02, 0.16)	0.04(0.009,0.18)*
no	11(19.6%)	44(78.6%)	1	1

*significant at level of $p < 0.05$

Accordingly, water treatment before use (AOR=0.23, 95% CI=0.06-0.81), raw meat food item consumption in the past five days (AOR=13.9, 95% CI=3.04-63.8), eating food outside your home in the past five days (AOR=3.8, 95% CI=1.09-13.45) and regular hand washing with detergents after toilet (AOR=0.04, 95% CI=0.009-0.18) was significantly associated with AWD infection.

1.1.5 DISCUSSION

This study revealed that AWD infection outbreak that happened in woreda 8-13 districts of Yeka sub city had affected males (58.9%) than females and 15-44 age categories (69%). This may be due to that they are adults who are taking responsibility of their homes and moving outside for works which may increase their exposure to the disease through consumption of food from poor hygiene area. Also this idea is supported with highest proportion of occupation among cases were daily laborers (25%) who works mostly moving from place to place and living in low socio-economic status. This result is similar with the study conducted in Ethiopia Afar region that states about 82% of males, 78.3% of 15-44 year age category and most of the respondents were daily laborers(9). Also study conducted in Malawi shows that (95%) of cases were male and Patients' age ranged from 7 to 70 years with 93% in 15-44 age category(7). The attack rate of the districts of the sub city is variable with high attack rate happening in woreda 10 and 13 districts. Small attack rate was happened in woreda 9. The difference could happen due to difference in population size, socio-economic status, environmental sanitation and difference to response activities at district levels. The epidemic curve graph shows that there are multiple peaks that happened in different incubation period, which give a clue of propagated source of infection in this outbreak. This may be happen due to that there might be multiple possible source of infection and delayed identification of it resulting in favoring the transmission of the disease.

Our study also tried to identify an association with AWD infections and factors related with variables of water exposure, raw food items consumption, environmental or personal hygiene and socio demographic data. Accordingly all most all respondents of both cases and controls uses piped water may be communal and private and there were only 3% of respondents who were used non piped water in the last five days preceding time of data collections. In addition to this using non piped water didn't show association in our study as the study conducted in Kenya shows association(6). Water treatment before use was significantly associated with AWD infections with (AOR=0.23, 95% CI= 0.06 to 0.81) and those who treat water before use were 77% less likely to have AWD infections than those who did not treat the water. This is similar with the study conducted in Ethiopia Afar region showing that there is an association of water treatment before drink and AWD infection with p-value of 0.03. Even though, most of the rivers that are around the city of Addis Ababa were confirmed with laboratory to have cholera, tap water (piped water) were not confirmed with laboratory to support these evidence. Since majority of the respondents

uses piped water the association may be due to that water contamination may happen at home during storage and use even though it is piped water.

Raw meat food consumption in the last five days preceding to onset of illness was significantly associated with AWD infection with (AOR=13.9, 95% CI =3.04 to 63.8). Those who ate raw meat in the last five days preceding to onset of illness were 13.9 times more likely to have AWD infections than those who did not ate raw meat. Contamination of meat might be happened exogenously during processing, cooking, storage or consumption. Also washing of the meat products with contaminated water or storing in contaminated materials may cause cross contamination. So eating raw meat without proper cooking to kill bacteria may increase risk of infection. This is supported with the study that shows association of AWD infection with raw food consumption like raw or undercooked fish and sea food(3,13). However, other studies have showed that eating raw food like vegetables and fruit showed an association with cholera infection and our study didn't show it(3). Also eating outside the home or from hotels and others in the past five days was significantly associated with AWD infection (AOR=3.8, CI=1.09 to 13.45). Those who ate outside to their home in the last five days preceding to onset of illness were 3.8 times more likely to have AWD infection than those who did not ate outside.

The other risk factor that was significantly associated with AWD infection was the habit of regular hand washing after toilet (AOR =0.04, 95% CI 0.009 to 0.18). Those respondents who regularly wash their hands with detergents after toilet were 99.96% less likely to have AWD infection than those who do not wash their hands regularly with detergents after toilet. These implies that the odd ratio was very small that majority of respondents or cases did not wash their hands with soap regularly and those who wash their hands irregularly and without soap were not considered. This result is similar with the study conducted in Ethiopia Afar region AWD outbreak investigation in 2009 which shows association with p-value 0.03(9). Consumption of vegetables and fruit shows significant association in bivariate analysis and become insignificant during multivariable analysis.

1.1.6 STRENGTH AND LIMITATIONS OF THE STUDY

The comparative nature of the study was helpful to compare groups with appropriate sample size for both groups. Using of laboratory confirmation for AWD case diagnosis decreased the subjectivity of diagnosis that decreases bias. The study is not properly supported with environmental investigations to identify possible source of AWD infection and to take control measures. It was conducted during the outbreak and had not been designed in advance; hence, the data might have not been collected comprehensively. Controls were ascertained clinically without laboratory investigation and asymptomatic cases may be included as controls. Also attack rate and epidemic curve were performed only for incident cases that are sampled for case control study only.

1.1.7 CONCLUSIONS AND RECOMMENDATIONS

This study revealed that AWD infection outbreak happened in woreda 8-13 districts of Yeka sub city had more affected males and 15-44 year age category. Water treatment before use, consumption of raw meat in the past 5 days, eating food outside in the past five days and regular hand washing with detergent after toilet were significantly associated with AWD infection. The controls of any outbreak require collaboration of different sectors. The district health office, sub city health office and AACAHB should mobilize the whole community on WASH proper hand washing after latrine, before meal and other environmental sanitations activities. They should mobilize and educate the whole community not to consume raw foods like raw meat and not to eat food outside. The community should treat water before domestic use or before drink to decrease cross contamination. The regional health bureau and Yeka sub city health office need to conduct environmental laboratory investigation and should communicate the result early to concerned body (response team) to take intervention.

1.1.8 PUBLIC HEALTH INTERVENTION /RESPONSE TAKEN

Starting from the first AWD case identified in Addis Ababa, Yeka Sub City health office has prepared for possible cases management and outbreak control. Extensive public health interventions involving different actors in the sub-city, wereda and partners facilitated in the management and control of the outbreak.

Case management: All 13 health centers, 67 private clinics and 5 private hospitals in the sub city had established isolation site and Oral Rehydration Point (ORP) for non-severe case treatment while CTC were established in Sara-Ampol health facility and Menelik hospital.

Surveillance: Active and passive surveillance was carried out to identify possible cases and their contacts using the existing community network system and health facilities in the sub city as well as through communication with neighboring districts. All facilities were participated in case identification and report daily. In addition, the surveillance team of the sub city had performed registering cases with line list, reporting cases, conducting detail case investigation to identify possible risk of infection, suggest the sample for laboratory investigation and take intervention early. Accordingly, repeated sample from food different hotels, slaughterhouse, holy water, rivers and piped water at home were taken for culture and other quality tests.

WASH: Generally, the WASH team of the sub-city and corresponding districts of wereda 8-13 had performed the following activities.

Identify communities with no latrine/open defecation and promoting construction of new latrines

Identify full and leaking latrine and dislodging it in collaboration with AACSWA office

Health promotion on treating water through distributing water treating chemicals to households

Identifying communities using inadequate and unsafe water then providing them safe water

Performing disinfection of the household and cases at CTC for infection prevention

Inspection of restaurants, street vendors, butchering houses and slaughter areas and health promotion, disinfection and temporarily suspending have been done in collaboration with Sub-city health office, wereda health office, and Food Medicine Healthcare Administration and Control Authority (FMHACA) and health extensions workers.

In collaboration with church leaders and priests at holly water site, hygiene promotion, treatment of holly water and containers as well as temporarily closure of holly water has been done.

Promoting household and personal hygiene and sanitation with health extension workers and surveillance officers through street hand washing, distributing, T-shirt and banners with support of stakeholders has done.

1.1.8 REFERENCES

1. Health E. Guideline on CHOLERA OUTBREAK MANAGEMENT Ethiopia.
2. Repub- D. Weekly epidemiological record Relevé épidémiologique hebdomadaire. 2012;(31):289–304.
3. Moradi G, Rasouli MA, Mohammadi P, Elahi E, Barati H. A cholera outbreak in Alborz Province , Iran : a matched case- control study. 2011;1–6.
4. Jutla A, Whitcombe E, Hasan N, Haley B, Akanda A, Huq A, et al. Environmental Factors Influencing Epidemic Cholera. 2013;89(3):597–607.
5. Xu M, Cao C, Wang D, Kan B. Identifying Environmental Risk Factors of Cholera in a Coastal Area with Geospatial Technologies. 2015;354–70.
6. Stoltzfus JD, Carter JY, Akpinar-elci M, Matu M, Kimotho V, Giganti MJ, et al. Interaction between climatic , environmental , and demographic factors on cholera outbreaks in Kenya. 2014;1–9.
7. Khonje A, Metcalf CA, Mlozowa DD, Akesson A, Corbet T. Cholera outbreak in districts around Lake Chilwa , Malawi : Lessons learned. 2012;24(June):29–33.
8. Access O. High case fatality cholera outbreak in Western Kenya, August 2010. 2013;8688(August 2010):1–7.
9. Beyene BB, Tumato M, Abera B, Maskai O, Luce R. Epidemiology of Acute Watery Diarrhea Outbreak and Challenges of Control — Afar , Ethiopia , 2009 Epidemiology of Acute Watery Diarrhea Outbreak and Challenges of Control — Afar , Ethiopia , 2009. 2016;(October 2014).
10. Bwire G, Munier A, Ouedraogo I, Heyerdahl L, Komakech H, Kagirita A, et al. Epidemiology of cholera outbreaks and socio- economic characteristics of the communities in the fishing villages of Uganda : 2011-2015. 2017;2011–5.
11. WHO, UN, 2016, AWD Affects Ten Sub-cities in Addis Ababa. :330.
12. Public Health Emergency Management. FMOH, Addis Ababa, 2012;
13. Rabbani GH, Iii WBG. Food as a Vehicle of Transmission of Cholera. 1999;17(1):1–9.

1. 1.10 ANNEX

Annex 1 Questionnaire for AWD outbreak investigation in Yeka sub city district 8-13 Addis Ababa, 2016

Part A General information

1 serial no/code.....

2 case ☐ control ☐

3 Age (in years).....

4 Sex: Male ☐ Female ☐

5 Occupation

6 Residential Address.....

7 Sub-city.....

8 Telephone number.....

Clinical Information (for Case)

Date of onset (dd/mm/yyyy).....

Presenting Symptoms

Watery Diarrhea ☐ Vomiting ☐ Dehydration ☐ Others
(specify).....

Hospitalized yes No ☐ ☐

4 Date of hospitalization(dd/mm/yy).....

Part B Exposures

Water

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

Household tap water ☐ communal tap wa ☐ ☐ ☐ l ☐ b ☐ le
 spring ☐ street vender water ☐ tanker water (☐) bottled ☐ water
 other.....

2 what is your regular source of drinking water with in the last 5 days?

Household tap water ☐ communal tap wa ☐ ☐ ☐ l ☐ b ☐ le
 spring ☐ street vender water ☐ tanker water (☐) bottled ☐ water
 other.....

3 did you treat the water before drinking? ☐ ☐ o

4 if yes how did you treat it? Fil ☐ boi ☐ aq ☐ b wa ☐ ard
 Bishangare ☐ pr ☐ other.....

5 did you drink water from a holy water site in the last 5 days? ☐ ☐

6 if yes what is the source of the holy water? Spri ☐ piped v ☐

Well ☐ others.....

Food and beverages

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

Vegetable salad ☐ fru ☐ raw n ☐ partially roaste ☐ at

Fish ☐ mi ☐ others.....

8 where did you get or buy food for your house hold?

Local marke ☐ private garden/far ☐ street ☐ super ☐ et

Others (specify).....

9 did you eat food outside your home in the last 5 days? ☐ ☐

10 if yes where? Sold by street vendo ☐ ho ☐ resta ☐ at a g ☐ ing

School/work cafeter ☐ others(specify).....

11 did you eat any cold left over food in the last 5 days? ☐ ☐

12 if yes where is the source of the food? Home ☐ h ☐ resta ☐

University ☐

others(specific).....

13 did you drink any of the following locally made beverages in the last 5 days? Sha ☐

Borde ☐ bes ☐

others(specify).....

Hygiene and sanitation

14 do you regularly wash your hands with soap before eating? ☐ ☐

15 do you have latrine? yes ☐ no ☐

16 if yes wich one? Communa ☐ pri ☐

17 if no to Q 15, where do you discharge human waste (faeces)? Open defica ☐

In the rive ☐ bury in the ☐

others(specify).....

18 did you wash your hand regularly with soap after defication? ☐ ☐

19 where do you dispose of your refuse? Open dumpi ☐ opei ☐

In the river ☐ bury ☐ burn ☐

others(specify).....

Other exposures

20 in the last 5 days did any one in your household have diarrhea or vomiting ?

Yes ☐ ☐

21 did you visit any one having diarrhea or vomiting? ☐ ☐

22 did you attend a funeral with in the last 5 days? Y ☐ ☐

23 did you travel to a place affected with diarrhea and vomiting illness? ☐ ☐

24 if yes where?(name of kebele/ketene, wereda)

CHAPTER II- SURVEILLANCE DATA ANALYSIS

2.1 YEKA SUB CITY MEASLES SURVEILLANCE DATA ANALYSIS OF 2010 TO 2014- ADDIS ABABA, ETHIOPIA 2016

ABSTRACT

Background-Measles is an acute, contagious and vaccine preventable viral disease caused by measles virus. It causes morbidity and mortality among children worldwide especially in developing countries like Ethiopia. This study attempts to describe the epidemiology of Yeka sub city measles cases reported in between 2010 to 2014, and ultimately contribute to design a better intervention and control programme.

Methods-We conducted descriptive cross sectional study on measles surveillance data of 2010-2014. We used National Measles guideline for case definitions and classification. Selected variables from measles surveillance database were analyzed using SPSS version 21 and Microsoft excel.

Result-A total of 337 cases were reported in 2010-2014 and about 34.1% were reported from woreda 5. Male accounts 54% and 37.3% of cases were in 1-4 years age group. Higher cumulative incidence of 21.9 per 100,000 populations per year was reported in 2014. About 11.9% of cases were not vaccinated and 42.5% with unknown vaccination status. The sub cities measles vaccine coverage was 85% and 77% while numbers of cases were 59 and 93 in 2010 and 2014 respectively. The highest number of cases reported during March 16.6% and May 14.2%.

Conclusion- The cumulative incidence of measles cases were increased during 2010-2014. The age group 1-4 years and male were mostly affected group. Measles immunization coverage was low and higher transmissions of measles were seen during dry windy seasons of winter and autumn. Sub city health office should improve measles immunization coverage and further investigation is needed for seasonal transmission and causes for mostly affected groups.

Key words: Measles epidemiology, IgM antibody, surveillance data, Yeka sub city, Addis Ababa.

2.1.1 INTRODUCTION

Background

Measles is an acute, highly contagious viral disease caused by measles virus and transmitted from person to person by respiratory droplets. The incubation period is approximately 10–12 days from exposure to the onset of rash and has Prodromal symptoms like fever, malaise, cough, coryza (runny nose), and conjunctivitis during this period. Measles can be transmitted from four days before start of rash to four days after rash disappeared. The risk factors for measles virus infection include infants who lose passive antibody before the age of routine immunization, children with vitamin A deficiency and immunodeficiency. Complications and case fatality are common in young children below 5 years of age, malnutrition (vitamin A deficiency), and inadequate vaccination. The case fatality from measles is estimated to be 3 – 5% in developing countries but may reach more than 10% in outbreaks especially when it is compounded by malnutrition. In certain high-risk populations, case-fatality rates may reach 30% in infants aged less than 1 year of age.¹

Statement of the problem

Prior to the availability of measles vaccine, measles infected over 90% of children before they reached 15 years of age with 20 million estimated cases per year globally. These infections were estimated to cause 2.6 million deaths and between 15,000 to 60,000 cases of blindness annually worldwide and the majority (85%) in Africa and Asia. From 2000-2013 there was decrease of death by 75% and cases by 72% globally^{2, 3} Improving measles vaccination coverage and reducing measles-related deaths is a global imperative, particularly as it relates to the United Nation's Millennium Development Goal 4 (MDG). In 2006, the African Region adopted a goal to achieve 90% measles mortality reduction by 2010 with strategies of improving routine vaccination coverage, providing measles vaccination through supplementary immunization activities (SIAs) and establishing measles surveillance.^{4,5}

Ethiopia initially introduced measles vaccination programs in 1980 as part of the Expanded Program on Immunization (EPI) and, in 2002 has launched SIA program that has targeted children aged six months to 14 years.^{6,7} Also measles is prioritized diseases that is under surveillance of the country and every suspected measles cases are reported immediately, using the case based report form. Laboratory investigation for identification and confirmation is performed at Ethiopian national laboratory center.⁸

However, between 2008 and 2010 an increase in measles outbreaks occurred in many African Nations including Ethiopia.⁹ Ethiopia has experienced numerous measles outbreaks and increasing morbidity affecting different regions. Between 2005 and 2009 a total of 17521 cases and 127 deaths were reported from Ethiopia.¹⁰ About 26.9% were not vaccinated and 35.3% with unknown vaccination status during this period. In 2013 and 2014, 243 and 302 measles outbreak had reported in the country with increased affected woredas from 192 to 249 respectively.¹¹ Similarly, measles positivity rate has increased for the last two years reaching 35% and 53% in 2013 and 2014 respectively.

Since measles is a vaccine preventable disease, measles surveillance data analysis is use full to describe measles epidemiologically and to guide intervention and vaccination activities. Nevertheless, there are little studies, which assess the epidemiology of measles in the country and particularly in the study area, there is no such studies conducted before. Therefore, this study attempts to describe the epidemiology of Yeka sub city measles cases reported in between 2010 to 2014.

Significance of the Study

The finding of this study can provide policy makers and NGOs with relevant information for future planning and interventions. The output of this study may also be used by program implementers as an input towards supporting and promoting surveillance program in their district and it may be used as a baseline data for those who are interested in carrying out further investigation. Also it may be used for health policy implementers in such way that to identify the community at risk and measles vaccine status (potency) and based on that to take intervention.

2.1.2 OBJECTIVE

General Objective

To assess epidemiology of measles cases in Yeka sub city from the year 2010 through 2014.

Specific Objective

To describe measles cases in terms of person and place

To see temporal trends of measles cases from 2010 to 2014

2.1.3 METHODS AND MATERIALS

Study Area and Period

The study was conducted in Yeka sub city, Addis Ababa Ethiopia. Yeka sub city is one of the ten sub cities of Addis Ababa city Administration and located at northeastern part of the city. The estimated total population was 423316 by year of 2015/16. The sub city consists of 13 weredas administratively. Data was collected from April 26 to April 30 2016 and the study period was from April to June 2016.

Study Design: Descriptive cross sectional study was undertaken on the Yeka sub city measles surveillance data of the period 2010 to 2014.

Source Population: The source population for this study was the total population of the sub city during the period 2010 to 2014.

Study Population: All suspected measles cases reported to the sub city during 2010 to 2014 were our study population.

Source of Data: Secondary data of measles from 2010 to 2014 was obtained from case based report of PHEM department of Yeka sub city and from feedback report given to Addis Ababa health bureau by Ethiopian Public Health Institute (EPHI).

Data Collection: Soft copy of measles surveillance data of the sub city during the period 2010 to 2014 was obtained from measles surveillance data base of the AACAHB PHEM office and sub city PHEM office. Data from variables like age, sex, date of specimen collection/date of report, reporting wereda/health facility, number of measles vaccine doses, type of reporting form, final classification of cases and presence of outbreaks were edited as needed.

Case definitions: The national Public Health Emergency Management and WHO measles guidelines were used for the case definitions and the final classification of cases by the laboratory as it was kept in the data base. According to the Federal ministry of health of Ethiopia-Public health emergency management, measles is one of the immediately reportable diseases under surveillance. Suspected cases and deaths of having fever with rash illness will be filled with case-based reporting form, serum sample collected and sent to Central virology laboratory (EPHI) to test IGM antibody. Line listing reporting form was also used during an outbreak for reporting of suspected measles cases/deaths.

Suspected case: Any person with fever and maculo-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 epidemic. All suspected cases of measles are finally classified based on the adequacy of the blood specimen collected, and sample taken or not in to the following categories;

Laboratory confirmed: A suspected measles case that is investigated, including the collection of an adequate blood specimen (5 ml), and has serological confirmation of recent measles virus infection (IgM positive).

Epidemiologically linked: A suspected measles case that has not had a blood specimen taken for serologic confirmation, but is linked to a laboratory confirmed case (definitive serologic evidence of recent measles virus infection). Linked is interpreted as being in the same geographic area (place) during the infectious period (time) of a laboratory-confirmed case (person), that is, in the same district within 30 days.

Discarded: A suspected measles case that has been completely investigated, including the collection of adequate blood specimen (5 ml), but lacks serologic evidence of recent measles virus infection (that is, IgM negative).

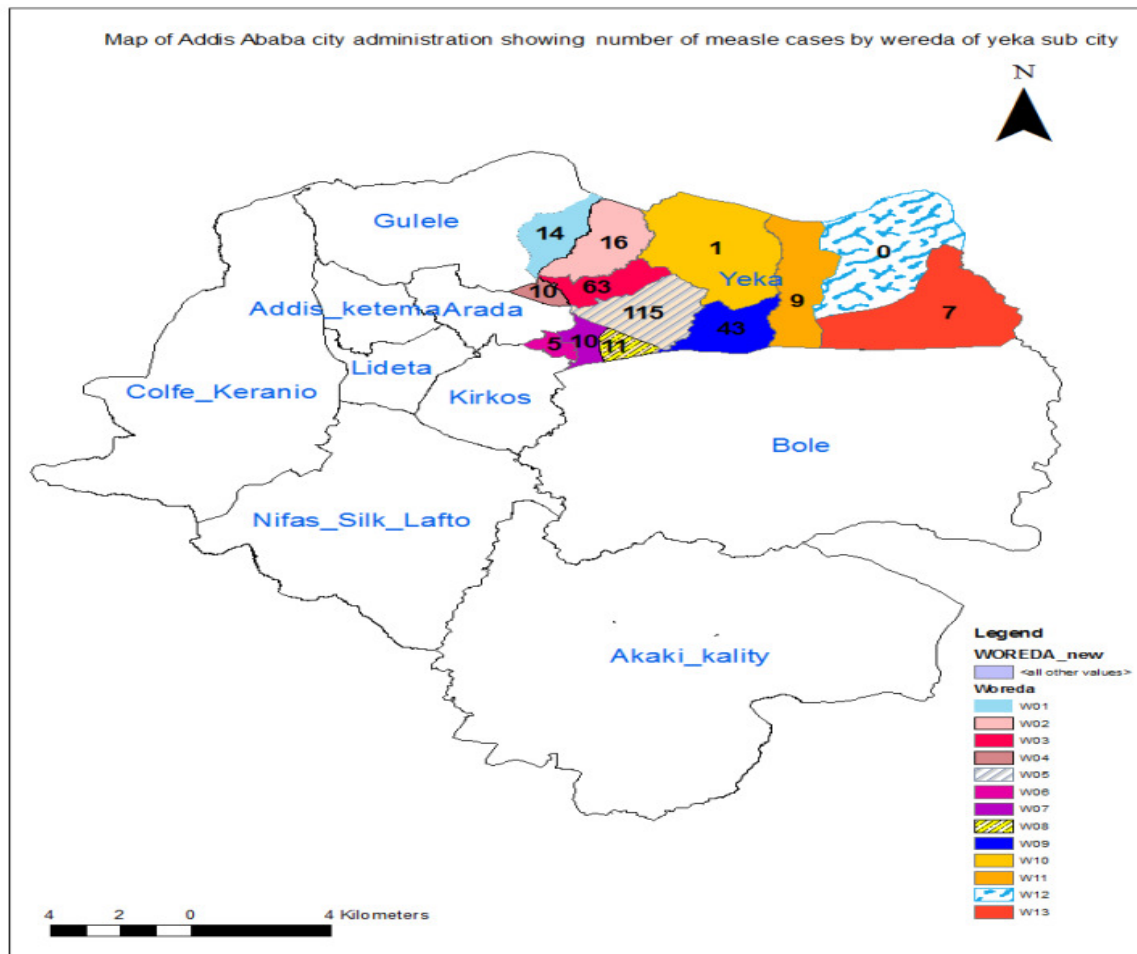
Clinical / Compatible: A suspected measles case that has not had a blood specimen taken for serologic confirmation, and cannot be epidemiologically linked to a laboratory-confirmed case.

Data Analysis: The collected data was checked for completeness, cleaning, coding and recoding was done when needed. Univariate descriptive analysis like frequency, percentages and graphs were performed for qualitative variables and mean was done for quantitative variables by using SPSS 21 software. Also Microsoft excels and Arc GIS soft ware's were used when needed. The results were presented by using tables, graphs and texts.

Ethical Consideration: The study had ethical clearance from SPHMMC and Addis Ababa city health bureau. After approval of proposal by SPHMMC Department of Public Health, Official letter of co-operation was written to Yeka Sub city health office and permission was obtained from health office. The variables from the data base will not contain the name of the study subjects (cases) which will address concern of the study subject confidentiality and it will not transferred to the third body without the owner's consent.

Dissemination of the Result: The result of the study will be presented to SPHMMC Department of Public Health. It will be communicated to Yeka Sub city Health Office, Addis Ababa City Administration Health Bureau (AACAHB) PHEM department and to other stake holders. In

addition it will be presented on different conference, seminars. Finally an attempt will be made to publish the paper in reputable journal



Map 2Background map of Yeka sub city showing measles case distribution by woreda in 2015/16.

2.1.4 RESULTS

About 337 measles suspected cases were reported throughout the sub city in 2010 to 2014 and all cases were reported with case based report format. There were no outbreaks and measles death report during this period. About 182 (54%) of cases were males while 155(46%) were females. The median age was 6 years old and the age ranges from 5 month up to 33 years. The age group 1-4 years constituted 123 (37.27 %) of suspected measles cases reported over the five years period and the least were under one year age group 15 (4.5%) (Figure3).

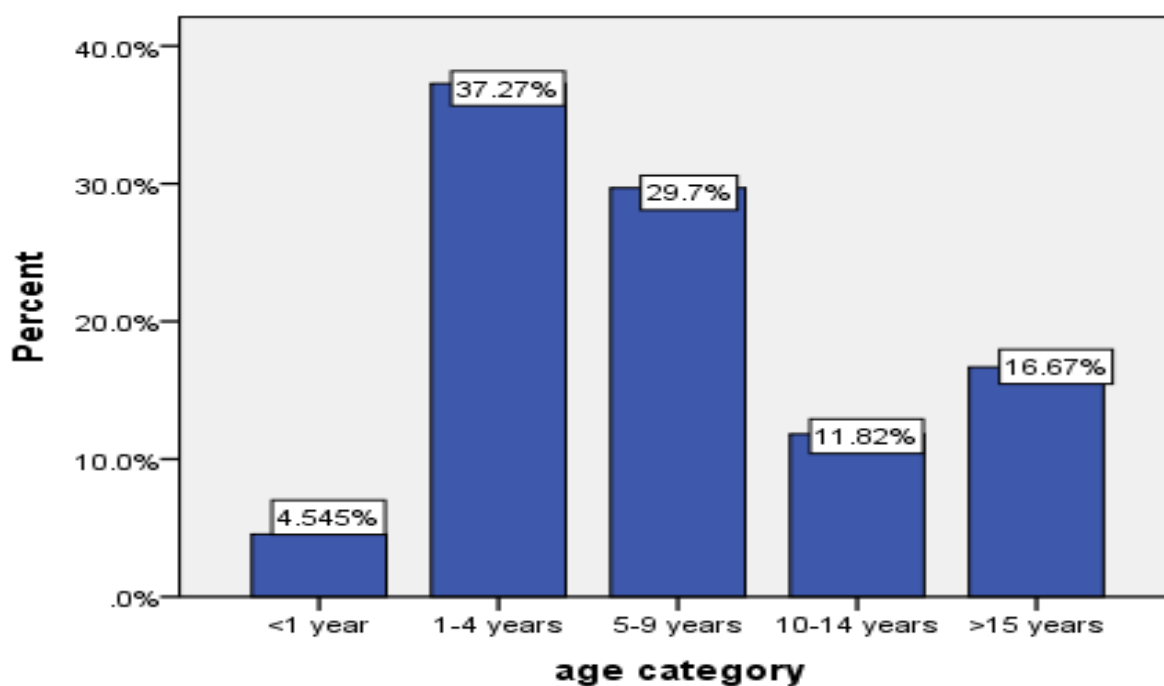


Figure 3 distributions of measles suspected cases by age category from 2010 to 2014, Yeka sub city, Addis Ababa, 2016

The highest proportion of cases 93 (27.6%) with cumulative incidence 21.9 per 100,000 population/year was reported in year 2014 and the least 45(13.3%) with 11.4 cases per 100,000 population were reported in 2011. Similarly the proportion of confirmed measles cases were increased over the period from 7 (11.9%) in 2010 to 34 (36.6%) in 2014 (table7).

Table 7 Distribution of suspected cases per 100,000 populations per year and frequency of final classification of cases in 2010 to 2014 Yeka sub city, Addis Ababa

Year	Population	Confirmed (IgM positive)	discarded (IgM negative)	Clinical/compatible	Unidentified	Total suspected cases	Cases per 100,000 population	Proportion of confirmed cases
		N (%)	N (%)	N (%)	N (%)	N (%)		
2010	382998	7	27	14	11	59(17.5)	15.4	11.9
2011	393020	9	25	10	1	45(13.3)	11.4	20
2012	403098	14	61	0	0	75(22.2)	18.6	18.7
2013	413175	14	50	1	0	65(19.4)	15.6	21.5
2014	423316	34	54	2	3	93(27.6)	21.9	36.6
Total		78(23.1)	217(64.4)	27(8)	15(4.4)	337(100)		

From all 337 suspected cases 78(23.1%) of them were confirmed (IgM positive) cases (table1). About 41 (52.6%) of those confirmed measles cases were males and 37(47.4%) were females. The age category under one year accounts 7(9%), 1-4 years 19(24.3%), 5-9 years 8(10.3%), 10-14 years 15(19.2%) and above 15 years accounts 29(37.2%) of confirmed measles cases.

Measles vaccine coverage of Yeka sub city was decreased from 85% in 2010 to 77% in 2014 while numbers of reported measles cases were increased from 59 in 2010 to 93 in 2014 (figure 3). In the five years of reporting period, only 14.5% (49) of suspected measles cases get two or more measles vaccine doses, 28.7% (97) get one dose, 11.3% (38) not vaccinated and 40.3% (136) with unknown vaccination status.

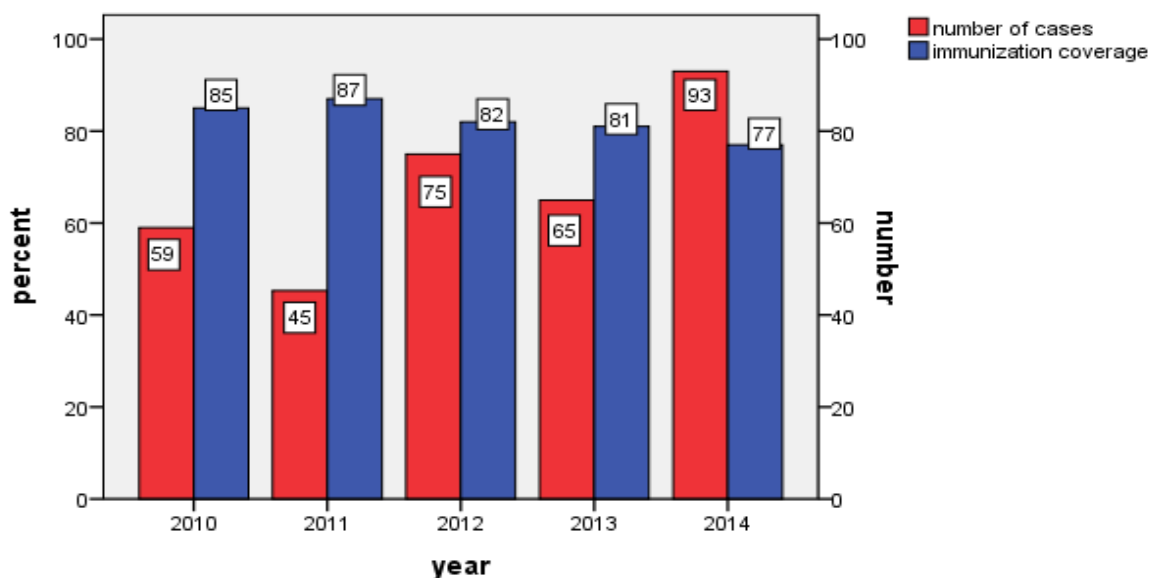


Figure 4 Measles cases and immunization coverage in 2010 to 2014 Yeka sub city, Addis Ababa, 2016

From 13 district woredas of Yeka sub city, 12 (92.3%) of them were reported suspected measles cases at least once over the five year period. Proportion of woredas notifying suspected measles cases were 8(61.53%) in 2010, 7(53.8%) in 2011, 9(69.2%) in 2012, 11(84.6%) in 2013 and 12(92.3%) in 2014. Woreda 5 was notified 115 (34.1%) of cases and woreda 12 did not notified any measles cases over the period while 33 (9.8%) of suspected cases have no record of their district name (Table8).

Table 8 distribution of measles cases by districts and final classification from 2010 to 2014, Yeka sub city, Addis Ababa

district name	Total Suspected cases N (%)	confirmed (IgM +ve) N (%)	discarded (IgM _ve) N (%)	Clinical /compatible N (%)	Unidentified cases N (%)
woreda 01	14(4.2)	5	9	0	0
woreda 02	16(4.7)	5	8	2	1
woreda 03	63(18.7)	3	54	6	0
woreda 04	10(3.0)	5	5	0	0
woreda 05	115(34.1)	13	81	9	12
woreda 06	5(1.5)	0	4	1	0
woreda 07	10(3.0)	2	8	0	0
woreda 08	11(3.3)	1	10	0	0
woreda 09	43(12.8)	24	17	2	0
woreda 10	1(0.3)	0	1	0	0
woreda 11	9(2.7)	2	6	1	0
woreda 13	7(2.1)	3	4	0	0
Unknown woreda	33(9.8)	15	10	6	2
Total	337(100)	78(23.1)	217(64.4)	27(8.0)	15(4.4)

In each month of the five-year period a minimum of zero cases and a maximum of 23 cases were reported. The cumulative number of cases over the five years period was reported during the month of March 56 (16.6%) and the least eight (2.37%) in September (figure 5).

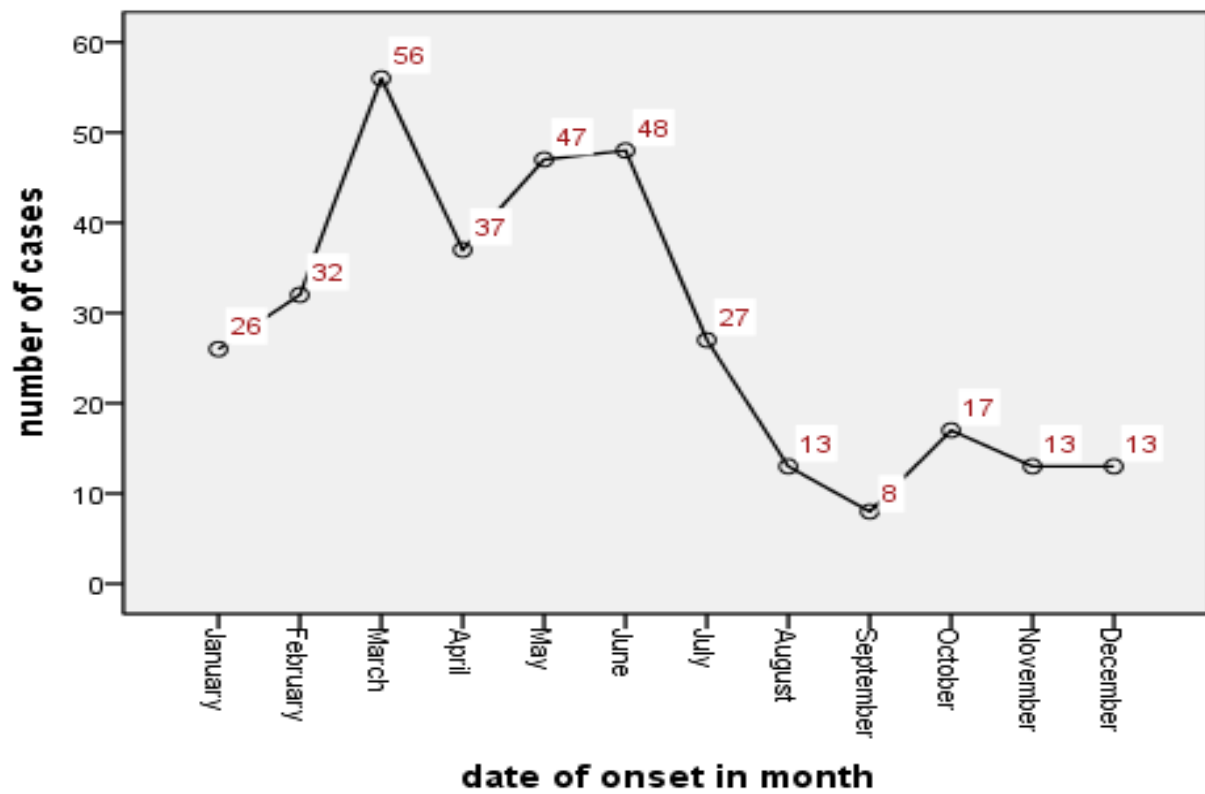


Figure 5 Trend of cumulative measles cases by month of onset of illness, 2010 to 2014, Yeka sub city, 2016

2.1.5 DISCUSSIONS

This study revealed that from 2010 to 2014 about 337-suspected measles cases of which 23.1% confirmed were reported without outbreak and death. Our study found that males 182 (54%) were affected than females and the cumulative case fatality rate in five years period was zero. The absence of death could be due to improvement of case management in health facilities or due to absence of outbreak. The age group 1-4 years was the most affected age group constituting 36.5% of the total measles cases (figure 3). This could be the immaturity of immune system in this age group and it is documented that in developing countries the most vulnerable children are between the ages of 9 months and 5 years.^{1,7} In addition, this finding is supported with Ethiopian national measles surveillance analysis study, where 1-4 years age group have highest proportion 41.2%.¹⁰ The cumulative incidence of suspected measles cases were increased from 2010 to 2014 (table1). This could be mainly because of increased susceptible peoples in the community, decreased measles immunization coverage and increased notification of cases. This incidence of suspected measles cases over the five-year period ranges from 11to 21 cases per 100,000 populations per year and it was higher than national measles cases incidence ranges (2 to 7 cases per 100,000 populations per year) according to national measles data analysis.¹⁰ Similarly, proportion of confirmed cases (IgM positive) was increased over the period from 11.9% in 2010 to 36.6 % in 2014(table 7). This increment could be due to improved laboratory facility or skills of laboratory professions. But this result is lower than WHO annual report in which national positivity rate were increased from35% in2013 to 53% in 2014.¹¹

Regarding the measles immunization coverage in our study, the coverage were decreased from 85% in 2010 to 77% in 2014 (figure 4). This result is lower than recent African regional goal(>90% coverage) of measles immunization as adopted by Federal Ministry of Health Ethiopia.¹ Moreover, WHO annual report stated that the national measles immunization coverage of Ethiopia started to decrease since 2012 from 80% to 74% in 2014.¹¹ As it was evidenced in our study majority of suspected measles cases174 (51.6%) had unknown vaccination status or unvaccinated for measles. This shows that measles affects those unvaccinated children's and it supports the low measles vaccine coverage of the sub city during the period.

It was also observed that the number of woredas notifying of measles cases were increased year to year with in the sub city during 2010 to 2014. This could probably be due to improvement of measles surveillance of detecting and notifying of any suspected cases of measles. However, all

district woredas of the sub city has no similar performance in notifying total suspected and confirmed cases (table 8). The largest proportion of cases 34.1% of total suspected cases were reported by woreda 5 district where as woreda 12 did not report any cases. This difference could be due to difference in surveillance activity performance, populations' size, and differences in number of health facility or immunization coverage.

The higher number of cumulative suspected measles cases were seen during the months of March (16.6%), June (14.24%) and may (13.9%) (Figure 5).The number of cases shows increment during dry windy seasons of winter and autumn (January to May) and shows decrement during summer and spring of rainy season starting from July which shows seasonality of the disease. The changes in host behavior, particularly patterns of movement and contact (during school seasons) have a strong tradition as explanations for the seasonality of measles diseases. The ability the virus to survive outside a host in low humidity air is also likely to be an important cause of seasonal incidence.^{1,4}

2.1.6 LIMITATION OF THE STUDY

The limitation of this study is that it used secondary surveillance data that affects its reliability and validity since some variables from databases are incomplete.

2.1.7 CONCLUSSION AND RECOMMENDATION OF THE STUDY

The number and cumulative incidence of measles cases was increased during 2010 to 2014 without outbreak and death. The age group 1 to 4 years and male were the most affected group. In addition, proportions of woreda notifying measles cases were increased over the period. Measles immunization coverage of the sub city was low during 2010 to 2014 and majority of suspected measles cases 51.6% had unknown vaccination status or unvaccinated for measles. Higher transmissions of measles cases were seen during dry windy seasons of winter and autumn (highest peak during the month of March, May and June) which shows seasonality of the disease. The sub city and district health office should improve measles immunization coverage through strengthening the routine EPI and SIA for all under five year children. Health educations on mode of transmission and prevention of measles should be given to the community as an outreach program for organizations like schools where there is overcrowdings and vulnerable groups. The district health office should also improve surveillance activities in early detection of cases and maintaining data quality for incomplete variables from data base especially in woredas having low performance on notification of cases. Further investigation is needed for seasonal transmission and causes for mostly affected districts.

2.1.8 REFERENCE

1. Ethiopian Health and Nutrition Research Institute. guideline on measles surveillance and outbreak management.3rd edition.Addis Ababa: Ethiopian health and nutrition research institute, 2012
2. Simons E, Burton A. Assessment of the 2010 global measles mortality reduction goal : results from a model of surveillance data. Pubmed,2012;300.
3. WHO. Global Measles and Rubella Strategic plan:2012-2020.Switzerland, Geneva: World Health Organization 2012
4. WHO / UNICEF. WHO and UNICEF Joint Annual Measles and Rubella Report in 2011. Switzerland, Geneva: World Health Organization 2012
5. WHO Regional Office for Africa. Measles Elimination by 2020:a strategy for the African region. WHO Regional Office for Africa, 2011;(September).
6. FMOH. Ethiopia National Expanded Programme on Immunization: comprehensive multi - year plan 2016 - 2020: Addis Ababa, Federal Ministry of Health,2016;
7. WHO Regional Office for Africa. Measles SIAs Planning & Implementation Field Guide. WHO Regional Office for Africa, 2010;(April):1–95.
8. Ethiopian Health and Nutrition Research Institute. Guideline on Public Health Emergency Management. Addis Ababa: Ethiopian health and nutrition research institute, 2012
9. WHO Ethiopia Country Office. Key Achievements in Strengthening Routine Immunization in Ethiopia. Addis Ababa:WHO Ethiopia Country Office, 2014
10. Wayessa J, Enqueselassie F. National measles surveillance data analysis , 2005 to 2009 Ethiopia. Journal of PH and Epi.2016;8(March):27–37.
11. WHO Ethiopia Country Office. Annual Report of Expanded programme on Immunization in Ethiopia in 2014. Addis Ababa:WHO Ethiopia Country Office, 2015

CHAPTER III- SURVEILLANCE SYSTEM EVALUATION

3.1 EVALUATION OF TYPHOID FEVER SURVEILLANCE SYSTEM IN YEKA SUBCITY, ADDIS ABABA, ETHIOPIA 2017

ABSTRACT

Background: Ethiopia is undertaking different strategies to have functioning and effective surveillance system down from the community level up to the regional and national level. Currently, PHEM is implemented in the country to strengthen surveillance and early warning system for public health emergencies and events. However, the performance of core surveillance activities and quality of the system is not yet assessed especially in the study area. So, the aim of this study is to assess the performance of core activities and attributes of surveillance system of typhoid fever in Yeka sub city, Addis Ababa, Ethiopia.

Objective: To evaluate the performance of the existing public health surveillance system of typhoid fever in terms of surveillance core activities, supportive activities and its attributes.

Methods: A descriptive cross sectional study was conducted from April 5-25/2017. Thirteen study units/sites: sub city Health office, six district health offices and six health centers were selected randomly. Typhoid fever was used as proxy indicator for the evaluation of performance and attributes of the surveillance system. Primary data were collected using semi-structure questionnaire and Secondary data were collected from weekly reports of the study units. Data was entered to EPI info version 7.1. Univariate descriptive analysis like frequency, percentages and graphs was performed by using Microsoft excels. The result was presented by using tables, graphs and texts.

Result: Typhoid fever was the major disease burdens of the sub city. Over the past 12 weeks health centers and health offices reported 12 times (100%). All assessed districts reports with their personal mobile. Standard case definition and laboratory cases confirmation was available in all facilities. Data analysis was not performed in all study units and computer is available only at sub city level. The overall completeness of the reporting facilities at the level of districts ranges from 83% to 98% and sub city has 96%. The average completeness of cases in the last one month (WHO week 9-12/2017) for all assessed health centers were 78%.

Conclusions: Reporting and completeness of health facilities and availability of laboratory case confirmation is good. There is poor utilization of surveillance data, absence of regular supervision, Poor data quality and inadequate resources. Districts and sub city health office

should conduct regular surveillance data analysis, perform supportive supervisions, avail budgets and resource constraints and improve data quality through on job training and supportive supervision

Key words: Typhoid fever, surveillance system, evaluation, Yeka sub city

3.1.1 INTRODUCTION

Back ground

Public health surveillance is the ongoing, systematic collection, analysis, interpretation, and dissemination of data regarding a health-related event for use in public health action to reduce morbidity and mortality and to improve health. Data disseminated by a public health surveillance system can be used for immediate public health action, program planning and evaluation, and formulating research hypotheses. A functional disease surveillance system is essential for defining problems and taking action. Proper understanding and use of this essential epidemiological tool (public health surveillance) helps health workers to set priorities, plan interventions, mobilize and allocate resources, detect epidemics early, initiate prompt response to epidemics, and evaluate and monitor health interventions. It also helps to assess long-term disease trends(1).

Surveillance should be conducted for diseases and conditions considered to be of public health importance. The list of diseases and syndromes in the national health information system (HIS) is useful for planning and routine management but too expensive for effective and useful surveillance in view of the limited human and financial resources. Therefore, depending on the objectives of the system, priority diseases for surveillance should be identified and reviewed regularly. This ensures that whether the diseases under surveillance remain to be considered as priority public health problems of that community. The selection of priority diseases for surveillance is based on criteria's like epidemic potential, internationally concerned, disease under eradication and eliminations, disease with effective prevention and control measures(1–3).

Ethiopia had introduced Integrated Disease Surveillance and Response (IDSR) in 1998, focusing on 17 priority communicable diseases for early detection and effective response. In 2009 Federal Ministry of Health (FMOH) underwent the Business Process of Reengineering (BPR) and identified the PHEM to be one of the core processes of FMOH. One of the major activities of PHEM is to take over the diseases surveillance parallel to preparedness, response and rehabilitation in any health related emergencies and outbreaks. PHEM identified 19 communicable diseases and two health problems (Sever Acute Malnutrition (SAM) and Maternal Death) based on their potential to cause outbreaks, became international concern and diseases on eradication/elimination and health burden for the country (Table 9). Typhoid fever is one among the 19 communicable diseases under surveillance in Ethiopia (3).

Table 9 National weekly and immediately reportable diseases

Immediately reportable disease	Weekly reportable disease
1.Acute Flaccid Paralysis(AFP)	1.Dysentery
2.Antrax	2.Malaria
3.Avian Human Influenza	3.Meningitis
4.Cholera	4.Relapsing Fever
5.Dracunculiasis (Guinea worm)	5.Typhoid Fever
6.Measels	6.Typhus
7.Neonatal Tetanus	7.Severe Acute Malnutrition(SAM)
8.Pandemic Influenza	
9.Rabies	
10.Severe Acute respiratory Syndrome (SARS)	
11.Small Pox	
12.Viral Hemorrhagic Fever	
13. Yellow Fever	
14. Maternal death	

The identified 21 priority diseases are classified in weekly and immediately reporting periods depending on their epidemic potential, diseases targeted for elimination and eradication. For the immediately reportable diseases, a single suspected case is considered as a suspected outbreak and it should be notified from level to level starting from community or health facility to the next level, within 30 minutes of identifications and reach national level within 24 hours of detection.

Reporting of the total number of cases and deaths seen within a week (Monday to Sunday) should be reported from health facility to wereda on Monday. Wereda report to zone every Tuesday and Zone report to region every Wednesday. Region report to EPHI every Thursday and EPHI report to stakeholders World Health Organization (WHO) every Friday.

Statement of the Problem

Typhoid fever is a systemic prolonged febrile illness caused by certain *Salmonella* bacteria serotypes. Human beings are the only reservoir host for typhoid fever, and the disease is transmitted by contaminated water and food by feces. The WHO estimates about 21 million cases of typhoid fever with >600,000 deaths annually. The cases are more likely to be seen in India, South and Central America, and Africa i.e. in areas with rapid population growth, increased urbanization, and limited safe water, infrastructure, and health systems. Surveillance for typhoid fever is hampered by the lack of laboratory resources for rapid diagnosis, culture confirmation and antimicrobial susceptibility testing (4).

In 2010, typhoid fever was estimated to cause 725 incident cases and 7 deaths per 100,000 person years in sub-Saharan Africa(5). In Ethiopia, several factors including under and malnutrition, HIV-AIDS, the unhygienic living circumstances and the close relations between humans and animals may substantially contribute to the occurrence of typhoid fever. In Ethiopia in 2012, the pooled prevalence estimates of Salmonella in stool samples of diarrheic children, diarrheic adults and carriers were 8.72%, 5.68%, and 1.08% respectively(6). Typhoid fever is one of the prioritized public health problems, which are under routine surveillance system of Ethiopia. It is one of the top ten causes of morbidity for Yeka sub city in the year of 2016 and it is the leading cause from all communicable diseases under surveillance (7). Public health surveillance systems should be evaluated periodically to ensure that problems of public health importance are being monitored efficiently and effectively. However, to the study area public health surveillance system evaluation was not conducted before especially for this high burden disease (typhoid fever). Therefore, our study tried to evaluate typhoid fever surveillance system of Yeka sub-city, in order to identify its gaps, and recommend possible intervention for strengthening of typhoid fever surveillance system.

Significance of the Study

Evaluation of a public health surveillance system focuses on how well the system operates to meet its purpose and objectives. The finding of this study can provide policy makers and Non Governmental Organizations (NGOs) with relevant information for future planning and interventions. Program implementers may use the output of this study as an input towards supporting and improving surveillance system for early outbreak detection and taking intervention in their district area accordingly.

3.1.2 OBJECTIVES

General Objective

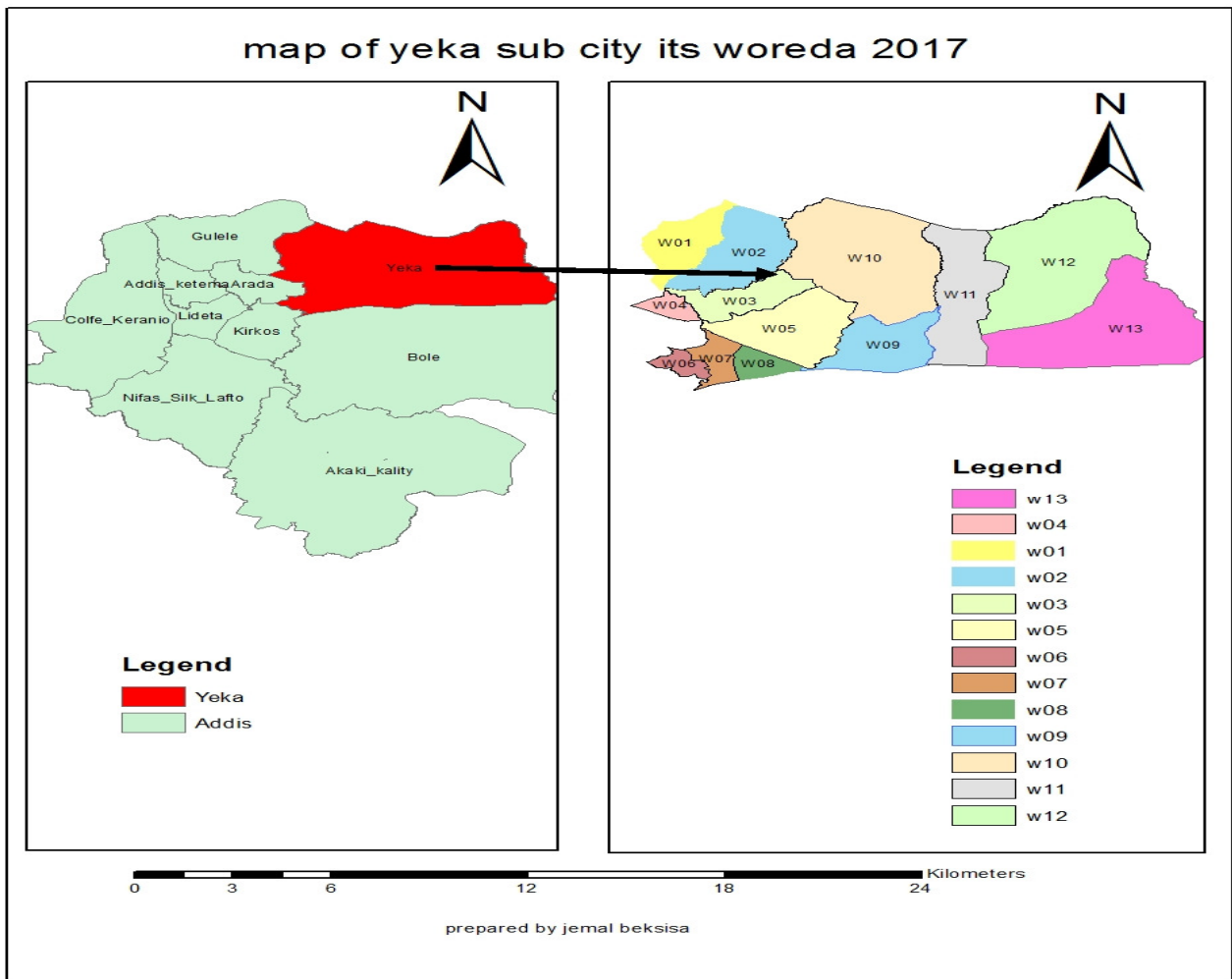
To evaluate the performance of the existing surveillance system of typhoid fever in Yeka sub city.

Specific Objective

- To assess the core activities of typhoid fever surveillance system in respect to case detection, registration, confirmation, reporting, epidemic preparedness and response.
- To assess supportive activities of surveillance system such as supervision, staff training, information feedback, equipment and financial support.
- To assess the status of surveillance system attributes like sensitivity, simplicity, positive predictive value, flexibility, completeness, timeliness, acceptability, representativeness, acceptability and specificity

3.1.3 METHODS AND MATERIALS

Study Area and Period: The study was conducted in Yeka sub city, Addis Ababa Ethiopia. Yeka sub city is one of the ten sub cities of Addis Ababa city Administration located at northeastern part of the city. It has population of 433672 by year of 2017, based on 2007 national population census projection. The sub city consists of 13 weredas/districts administratively and there are 13 health centers, 67 private clinics and 5 private hospitals. The study was conducted from April 5-25/2017.



Map 3Map of Yeka sub city and its woreda, Addis Ababa, 2017

Study Design

A descriptive cross sectional study was undertaken to evaluate the performance of Yeka sub city typhoid fever surveillance system.

Source Population: All health facilities and health offices of Yeka sub-city were the study population. Only governmental health centers and health offices were included in the study.

Study Population: All health offices and health centers included in the study were the study populations. Six district health offices with their corresponding six health centers were selected randomly from 13 total woreda/district health offices and 13 health centers. In addition, sub city health office was included in the study.

Study Unit: each health office and health center included in the study

Source of Data: Secondary data of typhoid fevers reports from the most recent four consecutive weeks during data collection were obtained from PHEM departments of the study units. Records of disease registration books, feedback reports of surveillance and summery report sheet of typhoid fever were used. PHEM Focal persons of the study units were interviewed to get the important data of the existing surveillance system of the sub city.

Data Collection: Data was collected using tools of updated CDC questionnaires, which are designed for the assessment of national communicable disease surveillance system. It was collected through interviews, observations of posted charts, case definition, tables and guidelines monitored by the principal investigator. Also reviewing records from registrations and report formats were used to collect data.

Data Quality Control: Data was collected using WHO and updated CDC questionnaires by converting to Amharic during interviewing by principal investigator. Completeness and consistency of collected data were checked during data collection and entry.

Data Analysis: The collected data was entered to Epi info version 7.1 software and transferred to Microsoft excels software for analysis. Univariate descriptive analysis like frequency, percentages and graphs was performed. The result was presented by using tables, graphs and texts.

Ethical Consideration: After approval of proposal by SPHMMC Department of Public Health, Official letter of co-operation was written to Yeka Sub city health office and permission was obtained from health office. Then letter of cooperation was written to wereda /district health offices and health facilities. The consent of the respondents was obtained before data collection starts. The variables from the data base will not contain the name of the study subjects (cases) which address concern of the study subject privacy and it is not transferred to the third body without the owner's consent.

Dissemination of the Result: The result of this study will be presented to SPHMMC Department of Public Health. It will be communicated to Yeka Sub city Health Office, Addis Ababa City Administration Health Bureau (AACAHB) PHEM department and to other stake holders. In

addition it will be presented on different conference and seminars. Finally, an attempt will be made to publish the paper in reputable journal

3.1.4 RESULT

A. Description of Public Health Importance of Typhoid fever in Yeka sub city and Relevance of the Surveillance System

Typhoid fever is one of the prioritized public health problems, which are under routine surveillance system of Ethiopia. It is one of the top ten causes of morbidity for Yeka sub city in the year of 2016 and it is the leading cause from all communicable diseases under surveillance. In Yeka sub city, in 2016 (2008 E.C) of all outpatients typhoid fever took 6% (with 11884 cases) and is the eighth leading cause of morbidity (8). From WHO week 1-12 of 2017, 6299 (56.6%) of all cases reported by surveillance system was typhoid fever (table10) and it is reported from all districts of the sub city (figure 6).

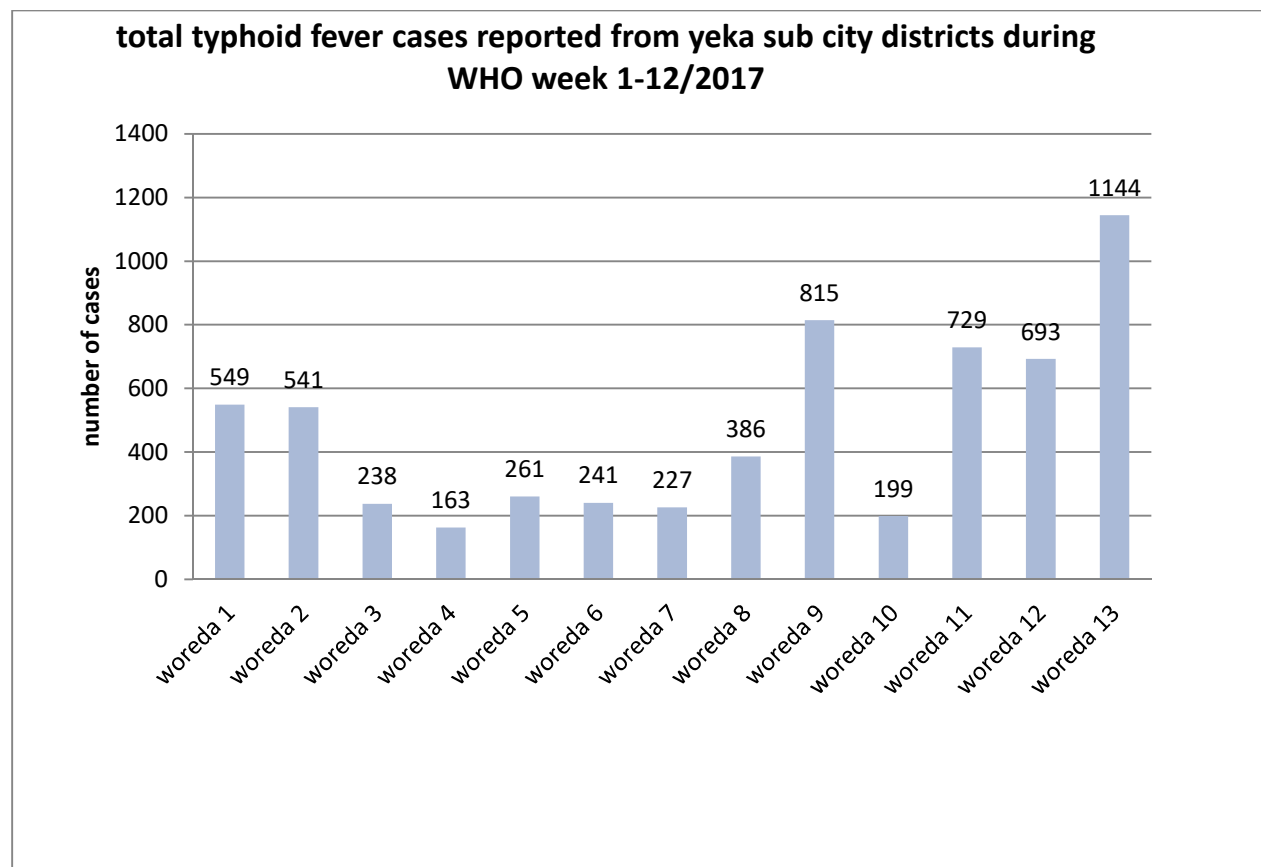


Figure 6Typhoid fever cases by Yeka sub city districts during WHO week 1-12/2017

Table 10 Report of diseases under surveillance system of Yeka sub city from WHO week 1-12/2017, Addis Ababa, Ethiopia

diseases reported by surveillance system	number of cases	percentage
Typhoid fever	6299	56.7
Epidemic Typhus	4191	37.7
dysentery	477	4.3
malaria	91	0.8
SAM	23	0.2
measles	21	0.1
relapsing fever	9	0.08
Maternal death	1	0.009
total	11112	100

B. Description of Purpose and Operation of Existing Surveillance System

In Ethiopia, the health information system for surveillance of communicable and non communicable diseases is organized in two main categories, the surveillance system under Public Health Emergency Management core process (PHEM) and the Health Information Management System (HIMS). These systems are set at the central level and extending down to the regions and the health facilities under FMoH. Public Health Emergency Management is defined as the process of anticipating, preventing, preparing for, responding to and recovering from the impact of epidemics and health consequences of natural and manmade disasters. The sub processes identified for the process include Preparedness, Early Warning, Response and Recovery. The early warning sub-process contains the Integrated Public Health Surveillance.

Objectives of the Surveillance System in PHEM: The overall objective is to improve the ability of health workers to detect and respond to priority communicable diseases. Evidence based effective and timely decision increases efficient utilization of available resources for preventing and controlling communicable diseases and improving the health status of the population.

Surveillance is established with the following specific objectives:

- To detect epidemics/outbreaks so that they can be controlled in a timely manner

- To predict epidemics so that health services can plan to respond, prevent where possible, treat and control priority diseases,
- To monitor trends of priority diseases in order that changing trends inform policy decision,
- To evaluate an intervention so that effective and efficient actions/policies are identified and supported.

The objective of Typhoid fever surveillance is to detect cases and respond quickly when their alert threshold is observed. In addition, it strengthens the report of cases and diseases whenever outbreaks occurred. Number of typhoid cases seen at health facility will be collected from registration by PHEM focal person and reported with weekly report format to district health office on Monday. District health office collects weekly surveillance report of typhoid fever from health centers, hospitals and private health facilities on Monday afternoon and reports to sub city on Tuesday. Sub-city health office reports to regional health bureau on Wednesday and region to EPHI on Thursday. EPHI reports to WHO on Friday (figure 7).

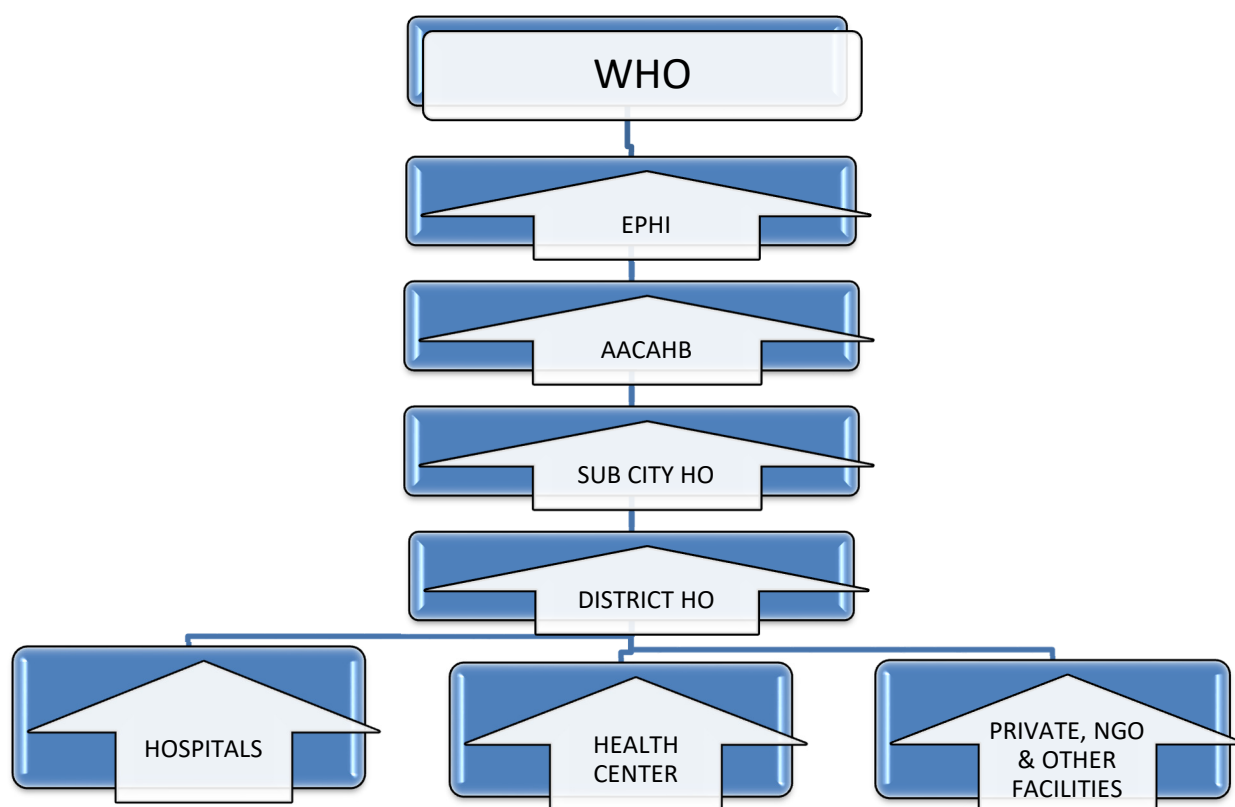


Figure 7 Diagram illustrating the formal flow of surveillance data and information throughout a health system, Addis Ababa, Ethiopia, 2016

Case Definition

Standard case definition: is a case definition that is agreed upon to be used by everyone within the country. There are suspected and confirmed typhoid fever case definitions.

Suspected case: of typhoid fever is defined as any person with gradual onset of remittent fever (rising in step ladder fashion) in the 1st week, headache, athralgia, anorexia, constipation and abdominal pain.

Confirmed case: is suspected case with Widal test, “o” titer of 1/160 and more or a suspected case with positive blood culture at the 1st week or positive stool culture at 3rd, 4th, and 5th week of illness. Simplified/community Case Definition is a case definition of disease and conditions adapted to suit to health extension workers (HEWs) and community members including community health workers, traditional healers, birth attendants, kebele administration, agricultural workers, teachers, drug outlets, etc. community case definition of typhoid fever is a case definition used for all acute febrile illness (AFI). It is defined as any person with fever, severe headache and /or diarrhea.

Populations under Surveillance: The national PHEM targets all the population in the country to be under surveillance for all twenty one priority diseases. Yeka sub city follows the same structure, with a total population of 433672 (projected from the 2007 national census) (table 11).

Table 11 Population under Surveillance in the assessed districts of Yeka sub city 2017

District name	Population
Yeka sub city health office	433672
woreda 13 health office	40541
woreda 5 health office	42642
woreda 9 health office	42140
woreda 10 health office	27179
woreda 11 health office	34525
Woreda 12 health office	40048

C. Description of Performance of Core and Supportive Surveillance Functions

Case Detection and Registration: Typhoid fever case definition was available in all visited health centers at the office of surveillance focal person. It was posted in three of visited six health centers. Community case definitions of typhoid fever were not available in all visited health centers and not distributed to the community.

Clinical registers were available in all of the visited health facilities; but they used one registry (HMIS) for all the priority diseases which makes difficult to collect the data easily for all the

diseases. Rumor logbook was available at Yeka sub-city health office only. All health centers have the capacity and guideline to conduct laboratory test for typhoid fever cases which took 40 minutes to an hour.

Reporting: There was no shortage of reporting format in the past six months in all visited health center and health offices. All visited health centers and health offices were reported typhoid fever weekly over the past 12 weeks (WHO week 1-12/2017) 12 (100%) without interruption. There was no community based surveillance report in all visited districts during the past 12 weeks. All reports were sent to the next level via personal mobile phones except sub city health office uses e-mail and telephone service to report to the regional health bureau.

Data Analysis: In all sampled health centers and health offices there were no data analysis conducted. All assessed district health office PHEM have no computers. There were no action threshold for typhoid fever in all visited health centers and health offices.

Epidemic Preparedness and Response: There was no typhoid fever outbreak reported from all assessed study units in the past one year. All visited health facilities and health offices had rapid response team but they didn't have written plan and regular meetings. They only actively participate in meeting during outbreak response. Visited district health office has no written plan but sub city had written epidemic preparedness and response plan.

Feedback and Supervisions; Dissemination of surveillance information and supervision at all levels of health system assessed were limited. All visited health offices conducted supervision. About six out of seven health offices provide supervision every two weeks. All districts conduct without support of checklist except sub city health offices and there were no written and regular feedback given in the past three months. Only one district health office provides feedback to his districts health facilities twice in the past three months.

Training: All visited district health office have one trained PHEM focal person and sub city health office have two trained PHEM focal persons. All health centers assessed have 1-2 trained surveillance focal person except in wereda 5 health center trained person changed working environment. Training was short term (3-5 days) and given by Yeka sub city health office, Addis Ababa Health Bureau and EPHI. However, health care providers in all assessed health centers were not trained or oriented.

Material Resources Available for Surveillance: All visited health centers and health offices have PHEM guidelines. Resources for data management, communications and logistics were available at sub city health office level only. Sub city health office PHEM has computers, internet

service and telephone but didn't have independent access of budget line. The districts health offices PHEM have no computers and internet services. The logistics and budget constraints were complained at all assessed level of health institutions'.

The laboratory: The laboratory capacity to collect, test, transport and roles in surveillance of typhoid fever and other priority diseases like measles and AFP were assessed. In typhoid fever surveillance laboratory confirmation was done at level health centers and all visited health centers have the capacity to perform laboratory confirmation test for typhoid fever. Other priority diseases of surveillance like measles and AFP laboratory test (virology) was performed at regional and EPHI lab center. All visited health centers have the capacity and guidelines to collect and transport these samples to regional or national (EPHI) lab center.

D. Description of Performance of Surveillance System Attributes

Usefulness: Early detection of epidemics of diseases under surveillance was a common understanding of all the respondents as the major use of the surveillance system but the use of the system for assessment of routine program monitoring was very limited. Surveillance system is considered use full if it satisfactorily addresses detection of diseases or events, detecting changes in trends including outbreak detection and permitting assessment of prevention and control programs. Moreover, this well understood use of the surveillance system has so many challenges in the area of case detection, reporting and response following it. Dissemination of case definitions of these diseases was very limited and there were no community cases definitions in all visited districts. Furthermore, lack of resources and logistic for early case investigation at the community level and lack of budget for supervision of the health facilities affects surveillance performance. In addition, there was no regular surveillance data analysis in all assessed districts to detect changes in disease trends or to detect outbreaks. In general, the users of the surveillance system, though they understood the usefulness in this regard, were not satisfied with the system and the utility of the system was very low.

Simplicity: All respondents agreed that the case definitions of typhoid fever for identification of suspected cases are easy to understand and apply by all levels of health professionals. But to confirm cases, it was found that sometimes there is shortage of widal reagent, thus typhoid cases were not detected and reported. The route of data flow is clear and simple as it was set in the surveillance guideline and the reporting entities do not complain any problem in this regard. There was no lack of reporting format but the data collection is assumed to be time taking particularly the weekly reporting formats which took 40 min to 4 hours to fill a single report by

collecting data from registers. The major problem mentioned here was lack of reporting means to report cases to the next higher bodies especially from the health facilities and district health office. Logistics like telephone, public transport and internet were indicated as constraints. This impacted timeliness of the report. The health workers at the health facility and districts usually use their personal mobile phones.

Flexibility: All respondents reported that the current reporting format (weekly and immediately) is not difficult to use for new diseases or events. Some gaps raised by the respondents were no place is available for personal variables like age and sex in the current reporting format for weekly reportable diseases that makes difficult to analyze the personal variables. However, adding new variables like age and sex for weekly reportable diseases is difficult for implementation but it is easy for immediately reportable diseases (case based format).

The Quality of Data: Data quality reflects the completeness and validity of the data recorded in the public health surveillance system. Data quality at districts and sub city health office were measured with proportion of health facilities reported weekly surveillance data in the last one month (WHO week 9-12/2017). Accordingly, the overall completeness of the reporting facilities at the level of sub city was 96%. The completeness of reporting facilities were high 100% in woreda 10 and low 83% in woreda 12 district health office (figure 8).

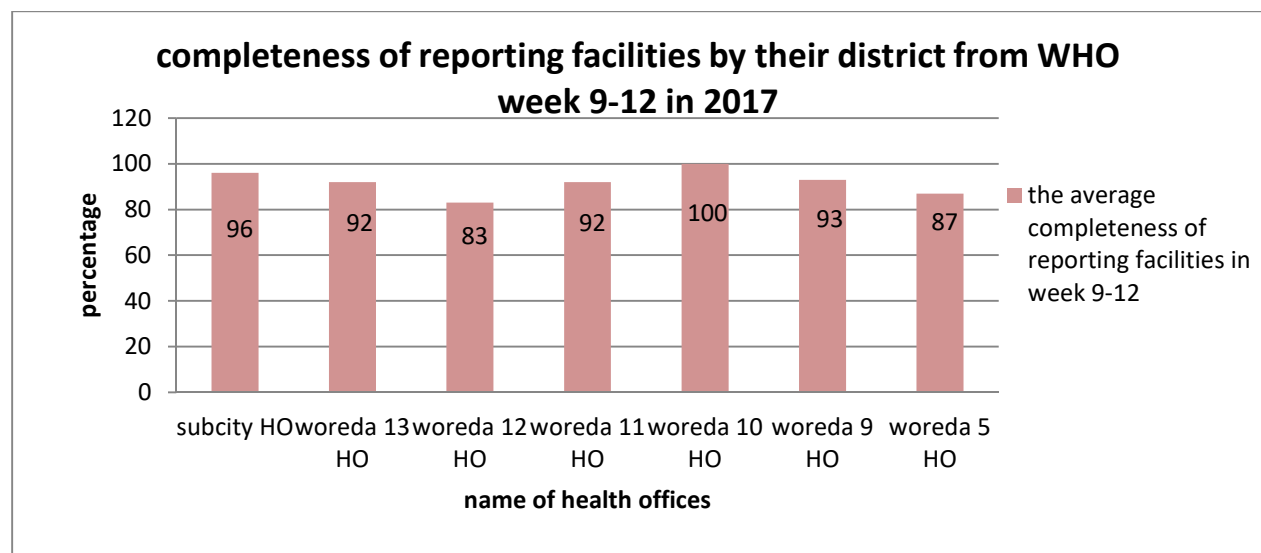


Figure 8 completeness of reporting facilities at district health office of Yeka sub-city, Addis Ababa, 2017

Also, data quality is measured by the validness of the number of cases in registration and those in reporting format, inclusion of all the necessary variables that should filled in reporting format and

summary report of weekly reportable disease on weekly basis. For health facilities, we counted and compared the reported Typhoid fever cases with summary report to go to higher level and Out Patient Department (OPD) registration books for the previous one month. The completeness of cases in the last one month (WHO week 9-12/2017) were high 98% in wor 10 health center and low 53% in wor 5 health center (figure 9). The average completeness of cases for all health centers is 78%. Some of the missed variables in the weekly reporting formats were date of report sent to next higher level, epidemic week number and inconsistency of recorded dates and the actual date of report was the missed variables we found. There were no any regular crosschecking of the data and feedback.

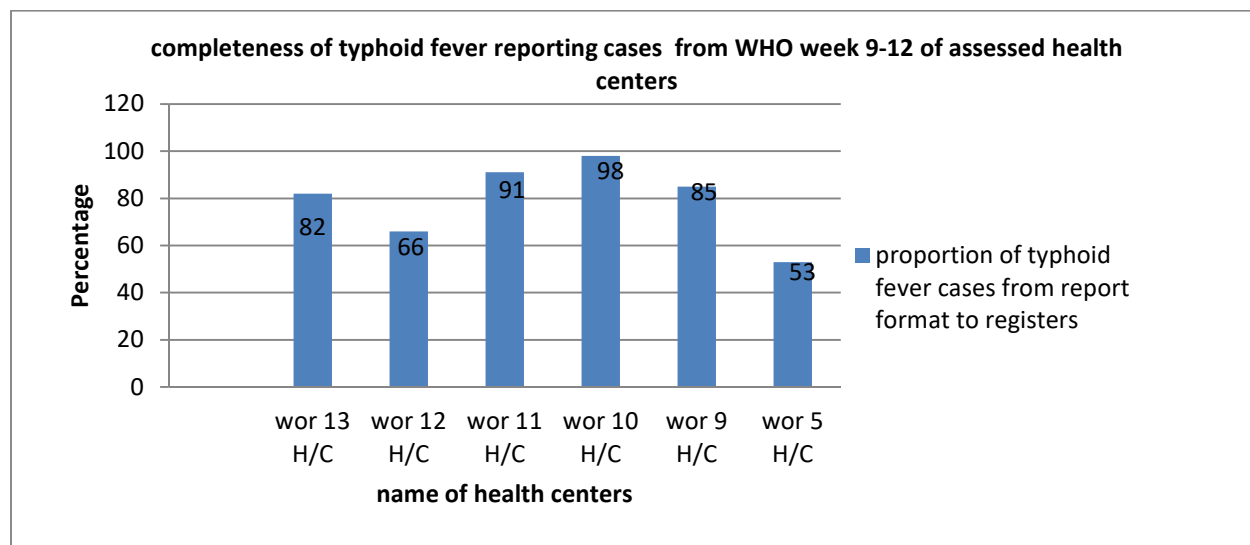


Figure 9 Completeness of typhoid fever reporting cases of assessed health centers of Yeka sub city, Addis Ababa, 2017

Acceptability: Acceptability of the surveillance system assessed based on engagement of the reporting agents and active participation in case detection and reporting. All assessed health centers and health offices reported completely twelve times over the past 12 reporting weeks. However, completeness of surveillance data ranges from 53% to 98% in all visited health centers with an average of 78% at sub city level (figure 9). Major reasons explained by respondents for poor engagement to the surveillance activities were poor means of communication and lack of feedback or of dissemination of the results.

Representativeness: The representativeness of the surveillance system was related to the health service coverage, the reporting rate of the health facilities, the health seeking behavior of the community, and the technical capacity of the health care providers and so on. Also it depend on case detection and laboratory confirmation of cases. Even though there were good health service

coverage, high completeness of reporting health facilities as discussed above, the representativeness of the system in the study area can't be determined based on the above activities only.

Stability: After the introduction of the BPR, the system is well established and structured but lack of budget line affects the stability of the system. Recently district level PHEM officer were employed to perform surveillance activities in Addis Ababa city administration. Their employments had increased surveillance performance especially completeness of data were improved. But budget constraints is affecting stability of the system and further change in this system and the work force will make the system more unstable and resource intensive.

Sensitivity and Positive Predictive Value: It was not possible to measure sensitivity and positive predictive value of the surveillance system in our assessment. Because, the laboratory confirmation of all suspected cases by the case definition were not done in all assessed health centers. Whenever widal reagent is available, the health centers did not register typhoid suspected and confirmed cases separately.

Timeliness: The reporting rates of the health facilities and health offices visited were found to be high as discussed above. But of those which reported, the number of facilities which reported timely was difficult to know since the reports were not segregated and date report received were not recorded in almost all forms as mentioned earlier in the data quality.

3.1.5 DISCUSSION

Typhoid fever was the major disease burdens of the sub city that were reported from all districts and remain main threats of epidemic to community. Detection of a priority disease under surveillance depends on availability and sensitivity of its case definitions. These case definitions must be used at all levels including the community, health professionals working at health posts, health centers, hospitals, health offices at different levels, private health facilities, other government health facilities and NGO clinics(1). However, availability of typhoid fever case definitions in assessed health centers was limited and there were no community case definition seen. The uses of typhoid fever standard case definition by all health profession were low since there were no orientations given to them and case definition not distributed or posted. There were no community based surveillance report in all visited districts during the past 12 weeks and HEW are not participated in surveillance system. Availability of standard registration books, PHEM guidelines and laboratory tests to confirm suspected typhoid fever cases at all visited health centers were an encouraging activities in detection of cases.

Reliable reporting of surveillance data throughout the country is important so that program managers, surveillance officers and other health care staff can use the information for action. The routine flow of surveillance data is usually from reporting sites (community and health facility) to the next level up to the central levels. All visited health centers and health offices have reported typhoid fever cases weekly over the past 12 weeks twelve times as recommended by national guideline. The main objective of typhoid fever surveillance is detecting and/or predicting typhoid fever epidemics or outbreaks, assessing and monitoring long term trends and evaluating its interventions(2,3). This is performed through regular data analysis at all levels of health institutions. Even though health professionals are aware of surveillance uses as early detection of epidemics of diseases under surveillance, there was no regular data analysis performed in all assessed health offices which is important to detect outbreak and see trend of the disease. The supportive functions of typhoid fever surveillance system of the sub city in terms of having trained surveillance focal person, guideline availability and conducting supervision is an encouraging performances. But the quality of supervision is poor since it is not supported with checklist or regular written feedback. Also absence of computer at district and health centers affected the system. In general Lack of Feedback and supervision, orientation to all staff,

refunding of transport and telephone expenditures and per diem has impact on the overall performance of the surveillance system.

Surveillance system is considered use full if it satisfactorily addresses detection of diseases or events, detecting changes in trends including outbreak detection and permitting assessment of prevention and control programs. Moreover, this well understood use of the surveillance system has so many challenges in the area of case detection, reporting and response following it. The surveillance system in the PHEM is organized in such a way that the community and all other health facilities under the FMOH will have active role in the detection of cases with the help of case definitions. However dissemination of case definitions of these diseases was very limited as discussed above and the utility of the system was very low. Furthermore, lack of resources and logistic for early case investigation at the community level and lack of budget for conducting supervision and providing feedback to health facilities and districts affects the use fullness of the system.

Additionally the completeness of reporting health facilities at district health office ranges from 83% to 100% and 96% at sub city level. This includes all private and governmental health facilities of the sub city, which is related to the representativeness and acceptance of the surveillance system through active engagement in surveillance reporting activities. According to national PHEM guidelines acceptable level of completeness were 80% and above. But the average completeness of typhoid fever case surveillance data cross checked from registry and summery report format of all visited health centers were low (78%) which is below the acceptable standard. Additionally variables like reporting date sent and number of weeks there the major missed variables from assessed weekly report format. Time lines of the report were not identified at all levels since report was not recorded with their status of timelines.

The sensitivity of a surveillance system can be considered on two levels. First, at the level of case reporting, sensitivity refers to the proportion of cases of a disease (or other health-related event) detected by the surveillance system. Second, sensitivity can refer to the ability to detect outbreaks, including the ability to monitor changes in the number of cases over time. Data on typhoid fever cases detected by the system (suspected) and confirmed cases were not available separately. Also data on true typhoid fever cases which are not detected by the system (not suspected) were not available. It was not possible to measure sensitivity and positive predictive value of the surveillance system in our assessment. The number of facilities which reported timely was

difficult to know since the reports were not segregated and date report received were not recorded in almost all forms as mentioned earlier in the data quality.

3.1.6 STRENGTH AND LIMITATION OF THE STUDY

The strength of this study is that it has tried to take sample from all stake holders or program implementers at different level with in the study area which may increase representativeness of the result. Also, involvement of study participants working on that area may increase the reliability of information obtained. The limitation of this study is that it used secondary surveillance data which affects its reliability and validity. The study did not assessed some attributes of the surveillance system like sensitivity, predictive values and timeliness since there was no available data on this specific attributes.

3.1.7 CONCLUSSION AND RECOMMENDATION

The conclusion we made from this surveillance system evaluation includes:

- Reporting rate and completeness of health facilities, availability of laboratory case confirmation and prevalence of at least one trained PHEM focal person at all assessed health institutions is an encouraging performance.
- Distribution of typhoid fever case definition in health facilities and to the community to detect cases with it and conducting surveillance data analysis were low performed core surveillance activities in the sub city.
- Absence of regular supervision with feedback, lack of communication facilities (telephone, internet) and logistic materials (computer) and absence of budget line access separately were the major gaps identified in supportive activities of typhoid fever surveillance system. Also there is poor data quality in term of completeness of cases and format(variables) with poor utilization of surveillance data at all assessed level

The following points are considered as recommendation of this study

- Districts and sub city health office should increase case detection through providing training and distributing case definition to the community and health facilities. Also they should conduct regular surveillance data analysis
- Sub city and district health office should perform regular supportive supervisions and should provide feedback , they should give attention to avail budgets to support supervision and training
- Regions, sub city health office and districts should facilitate resource for availing logistics like computer and communication facilities
- Data quality at all level should be improved by responsible person through on job training and supportive supervision

3.1.8 REFERENCE

1. Alertresponse E. Communicable disease surveillance and response systems. 2006;
2. Services H. Inside : Continuing Education Examination Inside : Continuing Continuing Medical Education for U . S . U . S . Physicians and and Nurses Nurses Inside : Medical Education for for Evaluating Public Health Surveillance Systems Recommendations from the Guidelines Working Group. 2001;50(Cdc).
3. Public Health Emergency Management. FMOH, Addis Ababa, 2012;
4. Crump JA, Luby SP, Mintz ED. The global burden of typhoid fever. 2004;2295(3).
5. Slayton RB, Date KA, Mintz ED. Vaccination for typhoid fever in Sub-Saharan Africa. 2013;(April):903–6.
6. Tadesse G. Prevalence of human Salmonellosis in Ethiopia : a systematic review and meta-analysis. 2014;
- 7 . Yeka sub city health office. case based and HMIS data of 2016/17.

3.1.9 ANNEX

Annex 2 structured questionnaire for Typhoid Fever case based surveillance system evaluation of Yeka sub city, Addis Ababa, 2017

Introduction: Hello Sr. /Mr. My Name is **Jemal Beksisa**; I have been studying **MPH in FE at SPHMMC** and conducting evaluation of the existing surveillance system particularly **Typhoid Fever surveillance system** and now I am asking your willingness to have some discussion concerning surveillance system. The aim of the evaluation is to know how the system is functioning and whether the intended objectives are being met or not and finally to give recommendations so as to improve the system. Thanks for your unreserved cooperation!!!

No.	Question	Coding Classification
1. Background Information		
1.1	Region	Addis Ababa
1.2	Zone/Sub-city	Yeka sub-city
1.3	Woreda	
1.4	Name of Health Facility	
1.5	Respondent Name:	
1.6	Catchment total Population	_____
2. Case Detection and Registration		
2.1	Is there national manual/guide line for surveillance at your office?	1.Yes 2.No
2.2	Do you have Typhoid Fever case definition?	1.Yes 2.No
2.3	If yes, is it posted?	1.Yes 2.No
2.4	Does all professionals are aware of it?	1.Yes 2.No
2.5	Do you have rumour log book?	1. Yes 2.No
2.6	If answer for 2.5 is yes did you register rumour and did verification?	1. Yes 2. No
3. Case confirmation		
3.1.	do your health facility/health office have the capacity to collect sputum, blood/serum, stool or other specimens?	1.Yes 2.No

3.2	Does your Woreda/HC have the capacity to transport specimens to a higher level lab?	1.Yes 2.No
3.3	Does your Woreda/HC have guide line for specimen collection, handling and Transportation?	1.Yes 2.No
4. Reporting		
4.1	Did you send Typhoid Fever surveillance data to the next level?	1.Yes 2.No
4.2	Did you know national time dead line report for immediately and weekly reportable disease?	1.Yes 2.No
4.3	If answer for 4.2 is Yes , in what time and when did you report to the next level respectively?	_____
4.4	Does your Woreda/HC have access to communication facility?	1.Internet 2.Fax 3.Phone
4.5	How do you send the data to the next level?	1.mail 2.phone 3.others
4.6	When do you expected to send surveillance data to next level?	
4.7	Have you lacked a recommended format in last 6 month?	1.Yes 2.No
5. Data analysis and interpretation		
5.1	Had you trained on Typhoid Fever surveillance system?	1.Yes 2.No
5.2	Did you have computer?	1.Yes 2.No
5.3	Is it functional?	1.Yes 2.No
5.4	Did you have computer skill?	1.Yes 2.No
5.5	Did you analyze Typhoid Fever surveillance data?	1.Yes 2.No
5.6	Did you use computer to analyze Typhoid Fever surveillance data?	1.Yes 2.No
5.7	If answer for 5.6 is yes , did you describe data by time, place and person?	1.Yes 2.No
5.8	Did you perform trend analysis of case by time(line graph)	1.Yes 2.No
5.9	Did you have appropriate denominator for data analysis?	1.Yes 2.No
5.10	Did you notify the results of your analysis to the sub-city?	1.Yes 2.No
5.11	Do you have an action threshold for any of country priority disease/ (Typhoid Fever ...)?	1. Yes 2.No
5.12	If answer for 5.11 is yes , what is it? (Ask 2 priority disease)	_____case _____% increase
5.13	How often did you analyze collected data? (Daily, weekly,	_____

	monthly, Quarterly, as needed_____)	
6. Outbreak investigation		
6.1	Is there suspected outbreak of Typhoid Fever in the last 6months? (Obs. Report and take copies if possible)	1.Yes 2.No
6.2	If answer for 5.2 is Yes , has your Woreda/HC investigated the outbreak?	1.Yes 2.No
7. Epidemic preparedness		
7.1	Did your Woreda/HC have written plan for Epidemic preparedness and response?	1.Yes 2.No
7.2	Did your Woreda/HC had emergency stocks of drugs and supplies at all time in the last 1 year?	1.Yes 2.No
7.3	Has your Woreda/HC experienced shortage of drugs, Vaccines or supplies during the most recent Epidemic/outbreak?	1.Yes 2.No
7.4	Is there a budget line or access to funds for epidemic response?	1.Yes 2.No
7.5	Does your Woreda/HC have rapid response team for epidemics?	1.Yes 2.No
8.Responses and Controls		
8.1	Has your Woreda/HC have implemented prevention and control measures based on local data for Typhoid Fever? (at least for 1 disease)	1.Yes 2.No
8.2	Does your Woreda /HC responded within 48 hrs.of notification of most recently reported out break?	1.Yes 2.No
8.3	Does your woreda's/HC's rapid response team /Epidemic management committee have evaluated their preparedness and response activities in the last year?(Obs. written report to conform)	1.Yes 2.No
9. Feedback		
9.1	Did you provide Feedback to lower level in the last 6 months?	1.Yes 2.No
9.2	How did you give your feedbacks?	1.Oral 2.Written
9.3	If answer for 9.2 is yes, how often did you provide? (weekly, monthly quarterly biannually ,annually)	_____
9.4	Did you receive feedback from higher level in the last 6 months on the data you provided?	1. Yes 2.No

No.	Question	Coding Classification
10. Training		
10.1	Did you take training on Typhoid Fever surveillance within the last year?	1.Yes 2.No
10.2	How many staffs were trained?	_____
11. Supervision		
11.1	Did you conduct supervision in the last 6 months?	1.Yes 2.No
11.2	If answer for 11.1 is yes , how many times did you supervise?	_____
11.3	How often you supervise? (Weekly, monthly, quarterly ...)	_____
11.4	Did you have supervision checklist?	1.Yes 2.No
Surveillance Attribute		
12. Completeness		
12.1	Number of sites expected to report and reported in the last 1 month respectively	_____
12.2	Is all typhoid cases in the last one month from registry was reported?	1.Yes 2.No
12.3	number of typhoid cases from registry and report format in the last 1 month respectively	_____
13. Timeliness		
13.1	Is the surveillance data come on time?	1.Yes 2.No
13.2	Percentages of HF submit their report on time?	_____
14. Usefulness		
14.1	Did the suspected outbreaks were detected early by the surveillance system?	1.Yes 2.No
14.2	Did the response initiated in a timely manner?	1.Yes 2.No
14.3	Did any epidemiological investigation conducted?	1.Yes 2.No
14.4	For what purposes do you use the surveillance data? (E.g. early warning and routine programme monitoring)	_____
15. Simplicity of the system		

15.1	Is the case definition easy?	1.Yes 2.No
15.2	Does the system allow all levels of professionals to fill data?	1.Yes 2.No
15.3	Does the system help to record and report data on time?	1.Yes 2.No
15.4	How long does it take to fill the format?	_____
15.5	How long does it take to have laboratory confirmation?	_____
16. Acceptability		
16.1	Did you believe the surveillance is important for public health intervention?	1.Yes 2.No
16.2	Did you accept the Typhoid Fever surveillance system?	1.Yes 2.No
16.3	Do you think the reporting agents accept and well engaged to Typhoid Fever surveillance activities?	1.Yes 2.No
16.4	If yes, how many are active participants in your health center/Woreda	_____
16.5	If No, what is the reason for their poor participation in the surveillance activity	_____
16.6	Were all participants using the standard case definition to identify cases?	1.Yes 2.No
16.7	Were all the reporting agents send their report using the current and appropriate surveillance reporting format?	1.Yes 2.No
No.	Question	Coding Classification
17. Flexibility		
17.1	Can the current reporting formats be used for other newly occurring health event (disease) without much difficulty?	1.Yes 2.No
17.2	Did you think that any change in the existing procedure of case detection and reporting format will be difficult to implement?	1.Yes 2.No
17.3	Is the system easy to add new variables?	1.Yes 2.No
17.4	Is the system easy to integrate with other systems?	1.Yes 2.No

18. Data quality		
18.2	Are all reported forms Complete?	1.Yes 2.No
18.4	Is the recorded data clear to read and understand?	1.Yes 2.No
19. Representativeness		
19.1	Was the surveillance system enabled to follow the health and health related events in the whole community?	1.Yes 2.No
20. Stability		
20.1	Was any new restructuring affected the procedures and activities of the surveillance?	1.Yes 2.No
20.2	Was there lack of resources that interrupt the surveillance system?	1.Yes 2.No
20.3	Was there any time /condition in which the surveillance is not fully operating?	1.Yes 2.No

Collected by: Jemal Beksisa; FE, resident Date: _____/_____/_____

CHAPTER IV- HEALTH PROFILE DESCRIPTION

4.1 HEALTH PROFILE DESCRIPTION OF YEKA SUB CITY, ADDIS ABABA, ETHIOPIA MAY 2016 ABSTRACT

Background: The health profile description highlights several important aspects of public health data. Assessing the health profile of a community is very important to understand the health status of the community and clearly present their needs and issues. Data generated from health profile has very crucial role in priority setting, resource allocation, identifying gap of health event and future planning. Prioritizing prominent health and health related problems of the community at any level is very vital for basic planning and appropriate public health interventions; However in low income countries like Ethiopia such comprehensive district or provincial health information is usually absent, or incomplete. Particularly to the study area, there is no organized, completed and well documented health profile before.

Objective: To asses and describe health profile of Yeka sub city during 2015/16.

Methods: A descriptive cross sectional study was undertaken on secondary health and health related data of the sub city. Data was collected from sub city health office and other sectors by using checklists, interviewing of head of offices and reviewing of records/reports. Descriptive analysis like frequency, graphs and ratio was performed by using Microsoft excel software and results were presented using graphs, tables and texts.

Result: Yeka sub city has 13 weredas administratively and total population of 423316 of which 52 %(220103) were females in 2015/16. Wereda 12 has largest population size (46048) and the total average house hold size of the sub city was 4.8 per house hold. There are 13 governmental health centers, 105 all clinics, 75 pharmacy/drugstore and one laboratory diagnostics. The government health center to population ratio is 1:32563 and the ratio of G.P/Doctors to populations 1:141105. Acute upper respiratory infection is the first leading cause of outpatient visit (morbidity) of the sub city with 47131(23.46%) in adult OPD and 19617 (45.26%) for under five OPD. From a total screening of 14924 for HIV, 480(175 males and 305 females) diagnosed positive for HIV with overall attack rate of 1.13 per 1000 population. In 2014 the immunization coverage for measles, penta 3 and BCG were 79 %, 69 %, 73% and it was increased to 100%, 116% and 93% in 2015/16 respectively. The proportion of deliveries attended by skilled health personnel is 67.2% and ANC were 94%.

Conclusions: The health access coverage (number of health institutions delivering services for the people) is high (>100%). There are inadequate number of physicians which is below the standard requirements. Acute upper respiratory infection is the leading cause morbidity both in adults and pediatrics. The average immunization coverage of measles, penta vaccine, polio vaccine and pneumococcal vaccine shows increment when compared with last year. There is low ANC coverage and skilled delivery when compared with the last year performance.

Recommendations: Sub city health office should focus on mass health education to the community should be given intensively on ways to prevent the common communicable and non communicable disease of the sub city. Food hygiene, safe water, and environmental sanitation protection may reduce the burden of communicable disease, while healthy nutrition (low calorie diet, vegetables and fruits), physical exercise, reduction of alcohol drinking and smoking decrease communicable disease burden. Priority should be given to inadequate health profession like physicians training and deployment to health centers. Emphasis should be given to maternal health of increasing skilled delivery through intersect oral collaboration and stake holder involvements. Data on environmental sanitation, latrine coverage and safe water supply is not found so sub cities health office should give priority to collecting this essential data soon as possible through collaboration with other stake holders.

4.1.1 INTRODUCTION

Background

World Health Organization (WHO) defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. Taking this perspective, one moves beyond disease absence as defining health status to one that incorporates the complex perceptions about health and health conditions. Health systems are undergoing rapid change and the requirements for conforming to the new challenges of changing demographics, disease patterns, emerging and re emerging diseases coupled with rising costs of health care delivery have forced a comprehensive review of health systems and their functioning(1).

Comprehensive community health profiles are about the health of people and the conditions in which they live. It includes: A narrative description of the given community, community strengths and challenges, demographic and economic data, health status data, community resources, including services, coalitions, and systems and interpretation of data presented, from both the perspective of the health council and the broader community. Health profile description is a system of collecting and organizing or summarizing health and other health related events to describe health condition/status, demographic, socio-economic, political, cultural and other aspect of a particular community or geographic area of interest. It is common knowledge that the health and socio-economic well being of people are fundamentally linked to their natural and built environment. In epidemiologic point of view, it is crucial to prioritizes health and health related conditions occurred in the communities. The prioritized and summarized health data of a given community is important for public health officials and other stake holders, as they can uses it as a frontline of planning, implementation and evaluation of public health program conducted at communities level. It is essential tool for change and thus must be an integral part of local decision-making and strategic planning processes. The preparation of profiles provides a lively, scientifically and evidence based account of health in the district; it can stimulate public interest and political commitment; and it can identify targets for the future and monitor progress towards them.

Statement of the Problem

Health systems are undergoing rapid change and the requirements for conforming to the new challenges of changing demographics, disease patterns, emerging and re emerging diseases coupled with rising costs of health care delivery have forced a comprehensive review of health systems and their functioning. As the countries examine their health systems in greater depth to

adjust to new demands, the number and complexities of problems identified increases. Some health systems fail to provide the essential services and some are creaking under the strain of inefficient provision of services. A number of issues including governance in health, financing of health care, human resource imbalances, access and quality of health services, along with the impacts of reforms in other areas of the economies significantly affect the ability of health systems to deliver. Decision-makers at all levels need to appraise the variation in health system performance, identify factors that influence it and articulate policies that will achieve better results in a variety of settings. Meaningful, comparable information on health system performance, and on key factors that explain performance variation, can strengthen the scientific foundations of health policy at international and national levels (1,2). The health profile description highlights several important aspects of public health data. Assessing the health profile of a community is very important to understand the health status of the community and clearly present their needs and issues. Based on that, possible to plan, prioritize public health action and interventions accordingly. Moreover it can give baseline information to other sectors of the community. Comparison of performance across countries and over time can provide important insights into policies that improve performance and those that do not.

The WHO regional office for Eastern Mediterranean has taken an initiative to develop a Regional Health Systems Observatory, whose main purpose is to contribute to the improvement of health system performance and outcomes in the countries of the EM region, in terms of better health, fair financing and responsiveness of health systems. This will be achieved through the development of health system profile of each of the member states. The EMRO Health Systems Profiles are country based reports that provide a description and analysis of the health system and of reform initiatives in the respective countries. The profiles can be used to learn about various approaches to the organization, financing and delivery of health services; describe the process, content, and implementation of health care reform programs; highlight challenges and areas that require more in-depth analysis; and provide a tool for the dissemination of information on health systems and the exchange of experiences of reform strategies between policymakers and analysts in different countries (2).

Prioritizing prominent health and health related problems of the community at any level is very vital for basic planning and appropriate public health interventions; However in low income countries like Ethiopia such comprehensive district or provincial health information is usually absent, or incomplete. Particularly to the study area, there is no organized, completed and well

documented health profile before. Therefore conducting this study is important to have organized and complete health profile document which helps in different public health interventions. Rationale of the Study: The finding of this health profile description is used by health office and stakeholders to allocate available resource on prioritized health problems, to plan and undertake appropriate public health interventions. Also other researchers may use the finding of this study as base line information.

4.1.2 OBJECTIVE

General Objective: To assess and describe current health profile of Yeka sub city, Addis Ababa City Administration in 2015/16GC.

Specific Objective:

To describe health service status of the sub city in 2015/16GC

To describe health and health related problems of the sub city.

4.1.3 MATERIALS AND METHODS

Study Area and Period: The study was conducted in Yeka sub city, Addis Ababa Ethiopia. Yeka sub city is one of the ten sub cities of Addis Ababa city Administration and located at northeastern part of the city. The sub city consists of 13 weredas administratively. The study was conducted from April to June 2016.

Study Design: Descriptive cross sectional study was conducted to assess health profile of Yeka sub city, Addis Ababa City Administration in 2015/16.

Source of Population: Based on the projection from national population census of 2007, Yeka sub city has an estimated total population of 423316 of which 203213(48%) were males, 220103(52%) were females, 9482(2.24%) were under 1 age children and 98643(23.3%) were under 5 age children by year of 2015/16. The source populations for this study were the total population of the sub city during data collection of the study. The study population was the total population of the sub city during data collection in 2015/16.

Source of Data: Secondary data from health service report of the sub city health office and other health related data from report of the concerned sectors within the sub city were used. Also health and health related data of the sub city were obtained from interviewing concerned person like the head of the offices within the sub city.

Data Collection: Health and health related data were collected by the investigator using tools like checklist to obtain relevant data from primarily collected data and reports of different governmental organizations like: Sub city health office, education office, finance office, transportation office, communication office and other offices. Also reviewing annual reports of relevant sectors and interviewing with head of the offices was performed.

Data Analysis: After health and health related data had obtained, it was edited and checked for completeness. Descriptive analysis like frequencies, graphs, ratios and proportions were performed by using Microsoft excels soft ware and results were presented by using tables, graphs and texts. Also Arc GIS soft ware was used to have a map of the district.

Ethical Consideration: After approval of proposal by SPHMMC Department of Public Health, Official letter of co-operation was written to Yeka Sub city health office and permission was obtained from health office. Then secondary data collection from different sectors was performed with a letter of co-operation obtained from health office. The collected data will not contain the name of the study subjects (cases) which will address concern of the confidentiality and it will not transferred to the third body without the owner's consent.

Dissemination of Result: The result of the study will be presented to SPHMMC Department of Public Health. It will be communicated to Yeka Sub city Health Office, Addis Ababa City Administration Health Bureau (ACAHB) PHEM department and to other stake holders. In addition it will be presented on different conference, seminars. Finally an attempt will be made to publish the paper in reputable journal.

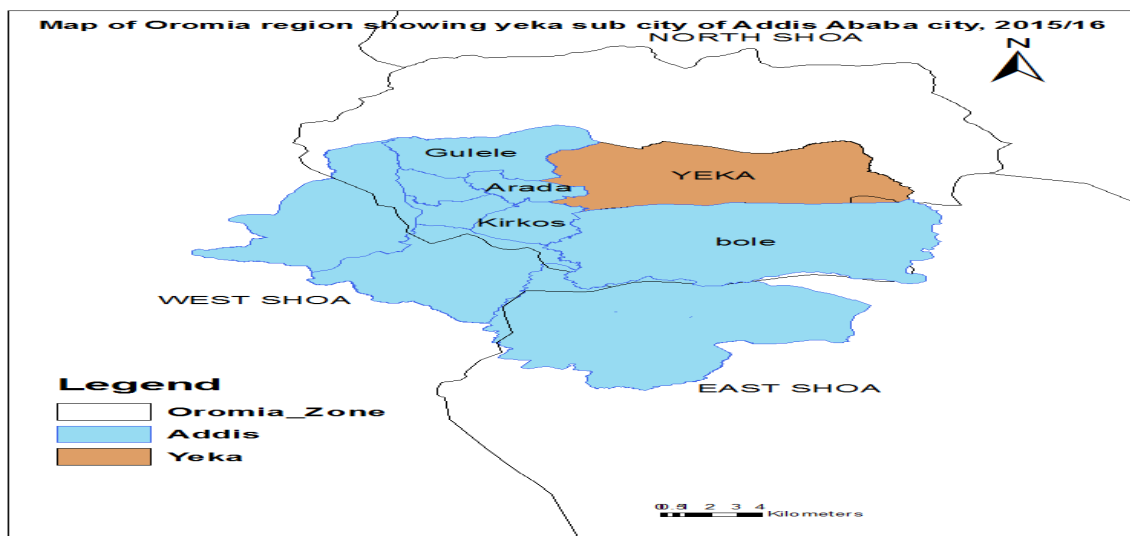
4.1.5 RESULTS

A. Geography and climate

Yeka sub city is located at northeastern part of Addis Ababa city and lies at 9°2'14.28" N latitude and 38°50'9.03" E longitude. Currently the sub city has an area of 8213.11 hectares which is about 15.8% of the Addis Ababa city area which makes the sub city the third place land area covered from the ten sub cities next to Bole and Akaki Kality sub city. The attitude of the sub city ranges from 3025-2314 meters above sea level. The annual rain fall in single month ranges from 0-300 mm where as the amount of lowest and highest temperature in degree centigrade is 7 and 25 respectively. The climate of the sub city is sub tropical highland.

B. Administration and political structure

Yeka is one of the ten sub cities of Addis Ababa city administration which was established in 2003/4 by Addis Ababa city administration charter proclamation of “Addis Ababa sub cities and kebele establishment proclamation number 1/1995. Addis Ababa is the largest and capital city of federal government Ethiopia having the status of both a city and a state. The city is divided in to ten sub-cities which are the second administrative units next to city administration and sub-cities are also divided in to wereda, which are the smallest administrative unit in the city and Yeka sub city has 13 weredas. The sub city is bounded by Bole sub city to the south, kirkos, Areda and Gulelle sub cities to the west and Oromia region to the north and east.



Map 4 map of Yeka sub city in 2015/16 showing its boundary

C. Demographic information

According to Ethiopian 2007 census projection, the total population of the sub city by the year of 2015/16 was 423316 of which 52 %(220103) were females. From total population 23.97 %(101469) were under fifteen age years old, 7.1 %(30309) were under five age group, 2.24%(9482) were under one year age group and women's of reproductive age group (15-49 year) were about 32.3 %(136731) (table 12).

Table 12 population Size by weredas of Yeka sub city AA, 2015/16

Wereda	Population number	Male	Female	House hold number
Wereda1	33505	16084	17421	8172
Wereda 2	42720	20507	22213	10419
Wereda 3	20448	9816	10632	4987
Wereda 4	15990	7675	8315	3900
Wereda 5	42761	20527	22234	10429
Wereda 6	37675	18085	19590	9189
Wereda 7	29798	14304	15494	7268
Wereda 8	31715	15224	16491	7736
Wereda 9	42140	20229	21911	10278
Wereda 10	27179	13047	14132	6630
Wereda 11	34525	16573	17952	8421
Wereda 12	46048	22105	23943	11231
Wereda 13	38541	18501	20040	9400
Sub city	423316	203213	220103	103248

Yeka wereda 12 has largest population size (46048) followed by wereda 5 (42761) and wereda 2 (42720), the least population is found in wereda 4. The average house hold size was 4.8 per house hold and No data was available for age group above 65 years old due to this dependency ratio could not be calculated.

D. Health Related Sectors

Education: The total school enrolled students in 2015/16 in the sub city were 77639 of which 41815 (53.82%) were females. Female student accounts 31992(53.23%) of primary school and 9823(55.99%) of secondary school students. Both primary and secondary school has a total of 3604 teachers of which 55.52% (2001) were males and. All schools within the sub city has an access to safe water (pipe) and latrine coverage. All elementary and high schools have Anti HIV/AIDS clubs (table 13).

Table13 Number of Schools/College Institutions of Yeka Sub city AA, 2015/16

Type of educational institution	Number of institution		Total institution in the sub city
	governme ntal	Private or others	
TVET	5	34	39
High school and preparatory	8	14	22
Elementary	28	100	128
KG	23	157	180

Environmental sanitation and safe water supply

Solid waste management: solid waste is collected from house hold level by organized social worker group (Micro and Small Enterprises) of each wereda 2days per week. Then the collected solid waste is segregated into inorganic and organic type and collected in separated containers. Containers are available at each zone within the wereda and when filled taken to the Addis Ababa land fill found in sendafa by concerned body of the wereda. In the sub city there are about 760 workers working in this solid waste management and they were organized into 78 micro groups and each micro group takes waste from a zone which has 700-1000 households.

Liquid waste management: A liquid waste from each household (domestic liquid waste) is drain to the main pipe, then move to treatment plant of Addis Ababa city found in Kality sub city. Data concerning safe water coverage and latrine coverage of the sub city is not available. But according to the 2011 survey study of CSA, 14.9% of housing units of Addis Ababa had flush toilets, 70.7% pit toilets (both ventilated and unventilated), and 14.3% had no toilet facilities. Water access and adequacy is one the conditions that makes an urban centre comfortable place to live in. The city administration provided water for its residents from underground and surface water source. Regarding water coverage, it had risen from 52% in 2008 to reached 97% in 2015/16.

Transportation and communication

Transport service is a vital economic sector that helps for swift movement of people and goods from one location to another. All wereda within the sub city has access of transportation of which the main roads are asphalted and the other road types that connects sub city with its wereda, sub wereda and sefers are asphalt, gravel, care/big stone, and cobble stone are available in the sub

city. The Addis Ababa simple railway which was recently constructed also passes through the sub city (table 14).

Table14 Road type coverage and its length in km (kilometers) of Yeka sub city AA 2015/16

road type	length in km	drainage in Km	Pipe drainage in Km	Open Ditch
Asphalt	45.033	5.24	9.62	
Cobble	146.954	4.57	6.38	
Gravel	140.171	44.45	80.36	
Care Stone	18.02	7.83	10.18	

Data concerning the number of available fixed phones, mobiles, post offices and other means of communications' in the sub city were not found.

E. Health Sector

Health institutions, infrastructure and personnel are important inputs that help to ensure healthy society. The city administrations and sub city health office has been making effort to render health care access services based on prevention policy.

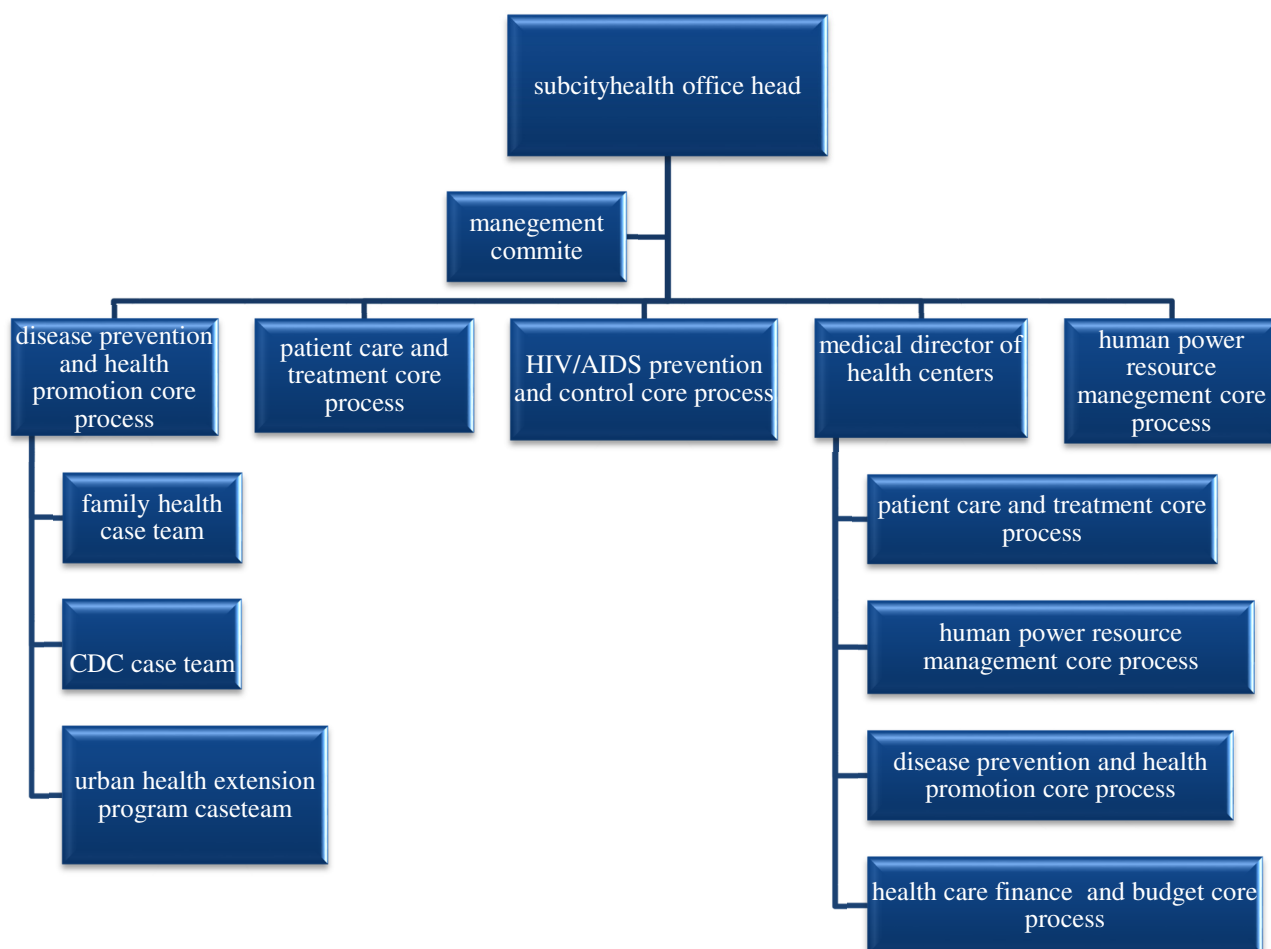


Figure 10 Organizational structure of Yeka sub city health office, Addis Ababa, 2015/16

Health Facility

There are 13 governmental health centers, 105 all clinics, 75 pharmacy/drugstore and 1 laboratory diagnostics. The government health center to population ratio is 1:32563, which implies Health service coverage was above 100% according to the national standard of 1 urban health centers to 40,000 populations (table 15). Menelik II referral hospital is one of the referral hospitals of Addis Ababa city located in wereda 04 of Yeka sub city and give service to the communities of Yeka and other sub cities. The sub city also uses other government hospitals in Addis Ababa like Zewditu hospital, Yekatit 12 hospital and Gandhi Memorial hospitals.

Table 15 Distribution of health institution by wereda of the sub city, AA, 2015/16

name of wereda	Government Health center	Primary clinics	Medium clinics	Higher clinics	Specialty clinics	Pharmacy store	Drug store	Lab diagnostic
Wereda 1	1	0	2	0	1	2	2	0
Wereda 2	1	0	2	0	0	1	2	0
Wereda 3	1	0	2	0	0	0	0	0
Wereda 4	1	0	1	1	3	3	0	0
Wereda 5	1	1	3	2	5	3	1	0
Wereda 6	1	0	2	0	2	0	1	0
Wereda 7	1	1	1	2	5	4	0	0
Wereda 8	1	1	4	2	7	12	3	0
Wereda 9	1	5	10	4	5	10	3	0
Wereda 10	1	0	0	0	0	1	1	0
Wereda 11	1	2	5	2	4	4	4	1
Wereda 12	1	4	5	0	1	4	5	0
Wereda 13	1	4	2	0	2	2	7	0
Total	13	18	39	13	35	46	29	1
Ratio to population	1:32563	1:23518	1:10854	1:32563	1:12095	1:9203	1:14597	1:423316

N.B The above table did not include data concerning governmental and private hospitals so the ratio of hospitals to population is not calculated.

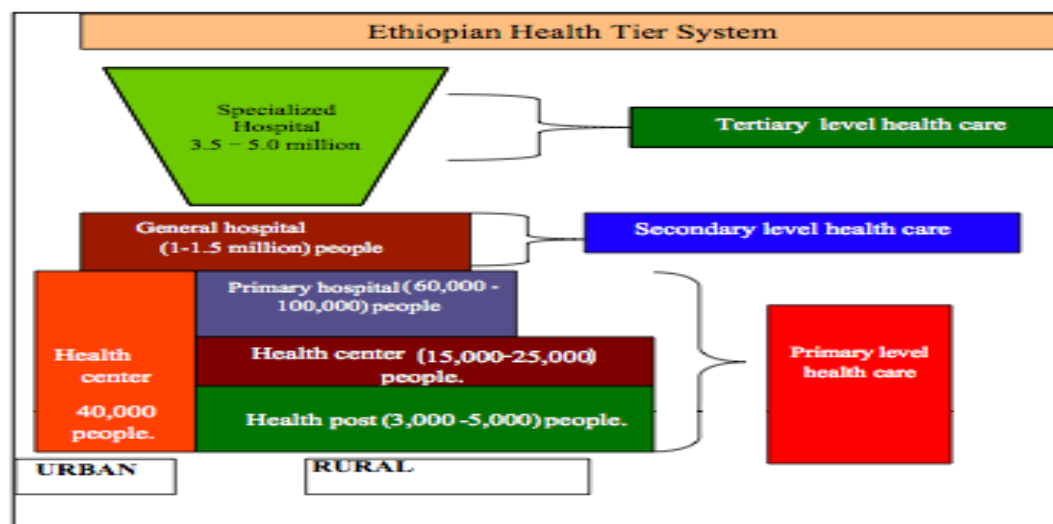


Figure 11 national health tier system and standard service provision of health facility to population ratio

Source: HSDP IV, 2010/11-2014/15: Addis Ababa, Ethiopia FMOH 2010.

Man Power of the Sub city

Number of health care personnel is one of the indicators of health access. As indicated in table 4 the number of doctors, health officers, nurses, pharmacist, laboratory technologist, midwives, environmental health professions and health extension workers in the health centers of the sub city were listed. The ratio of G.P/Doctors to populations 1:141105 shows low number of doctors at health centers (table 16).

Table 16 Distribution of man power of Yeka sub city health centers, AA 2015/16

health centers name	G.P	HO	all nurses	all mid wife's	laboratory profession	pharmacy profession	Environmental health	HEW
Woreda 1	0	2	38	13	6	7	0	14
Woreda 2	0	8	30	10	6	4	3	16
Woreda 3	0	15	35	8	6	6	0	9
Woreda 4	0	15	18	9	6	7	0	6
Woreda 5	2	10	35	9	6	6	0	15
Woreda 6	0	11	17	8	6	6	0	10
Woreda 7	0	10	23	10	6	6	0	10
Woreda 8	0	13	24	7	6	6	2	6
Woreda 9	1	15	49	9	5	6	2	18
Woreda 10	0	15	19	10	5	5	0	15
Woreda 11	0	14	27	10	5	7	0	15
Woreda 12	0	7	19	11	5	5	2	21
Woreda 13	0	7	25	13	6	4	1	14
Total	3	142	359	127	74	75	10	169
Ratio	1:141105	2.11181	0.86042	2.35625	4.01389	3.96111	1:42331	1.78056

Morbidity

The first leading cause of adult outpatient visit (morbidity) in the health centers of the sub city is acute upper respiratory infection 47131(23.46%) followed by 25655 (12.77 %) acute febrile illness and 25457 (12.67%) urinary tract infection (figure 12).

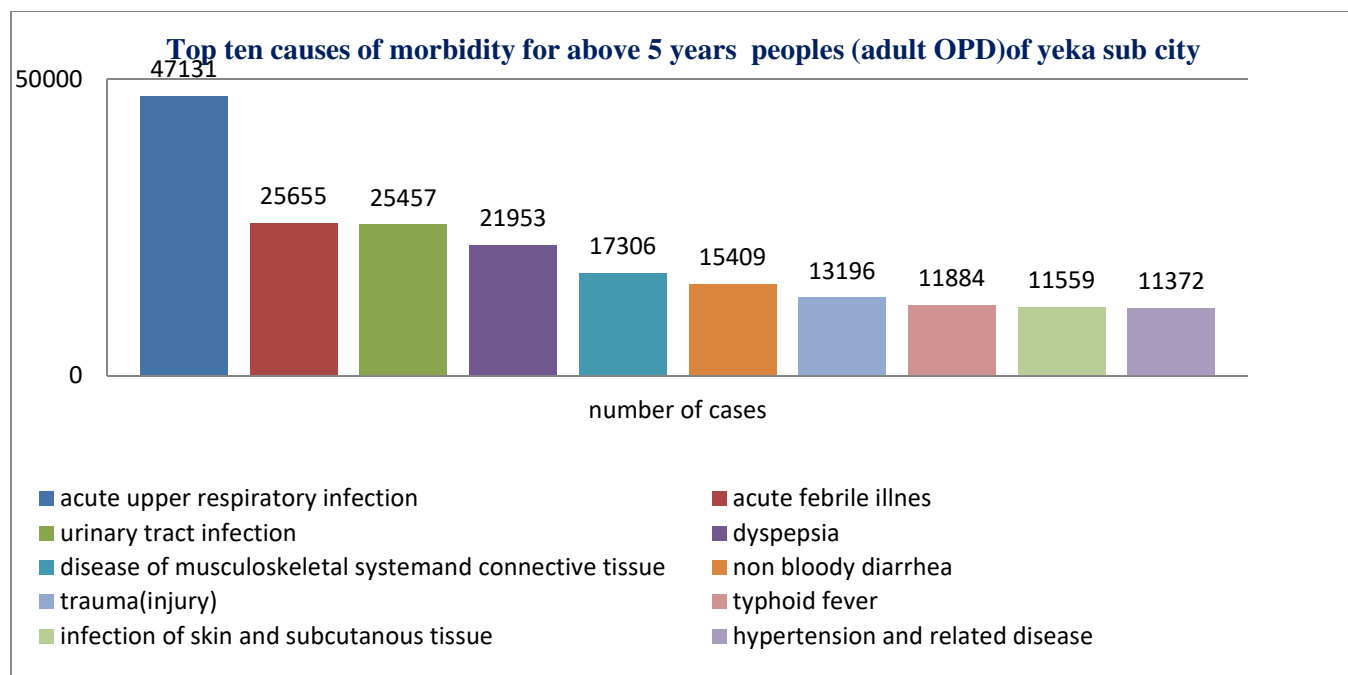


Figure 12 Top ten causes morbidity (OPD visit) for above 5 years of the sub city AA, 2015/16

Similarly the first leading cause of morbidity <5 children is acute upper respiratory infection 19617 (45.26%) followed by non bloody diarrhea 9719 (22.43%) (Figure 13).

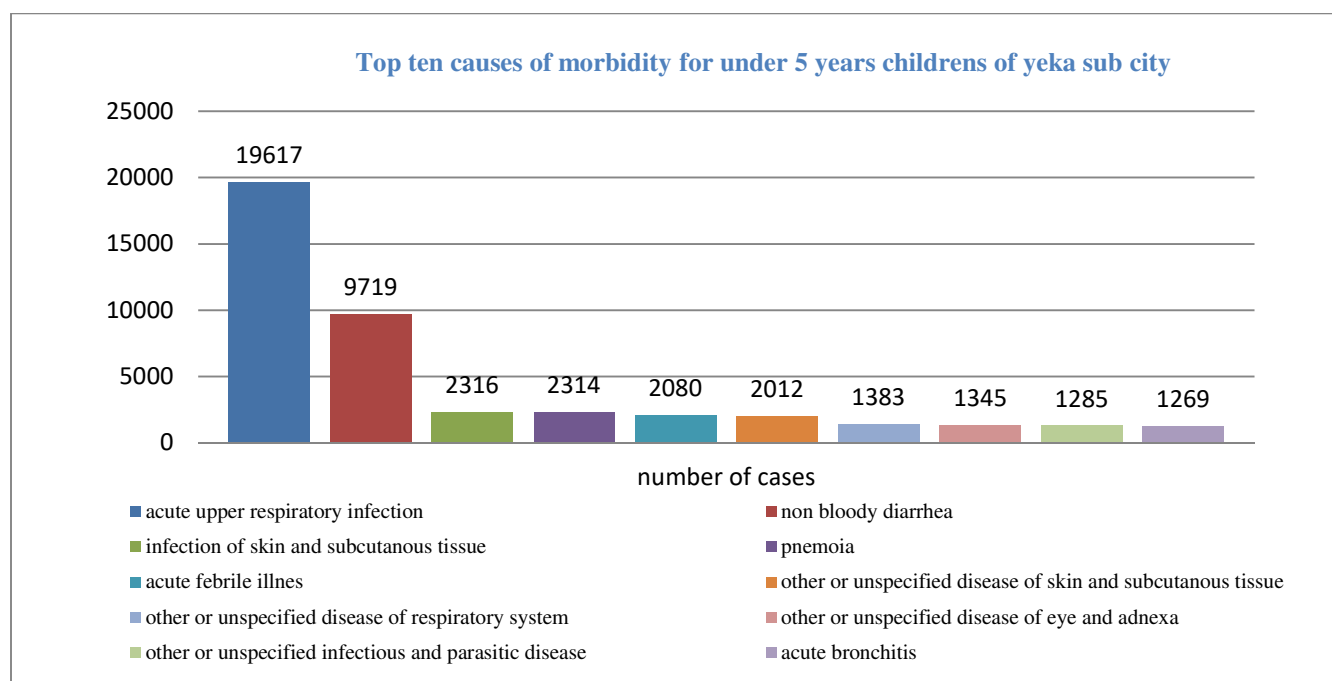


Figure 13 Ten top causes of morbidity (OPD visit) for under five children of the sub city, AA 2015/16

Maternal and Child Health

BCG, polio and other child immunization coverage shows increments from the last year. Also maternal health indicators ANC was increased from 94% in 2014 to 100% in 2015/16, while skill delivery decreased from 69% to 67% (figure 14).

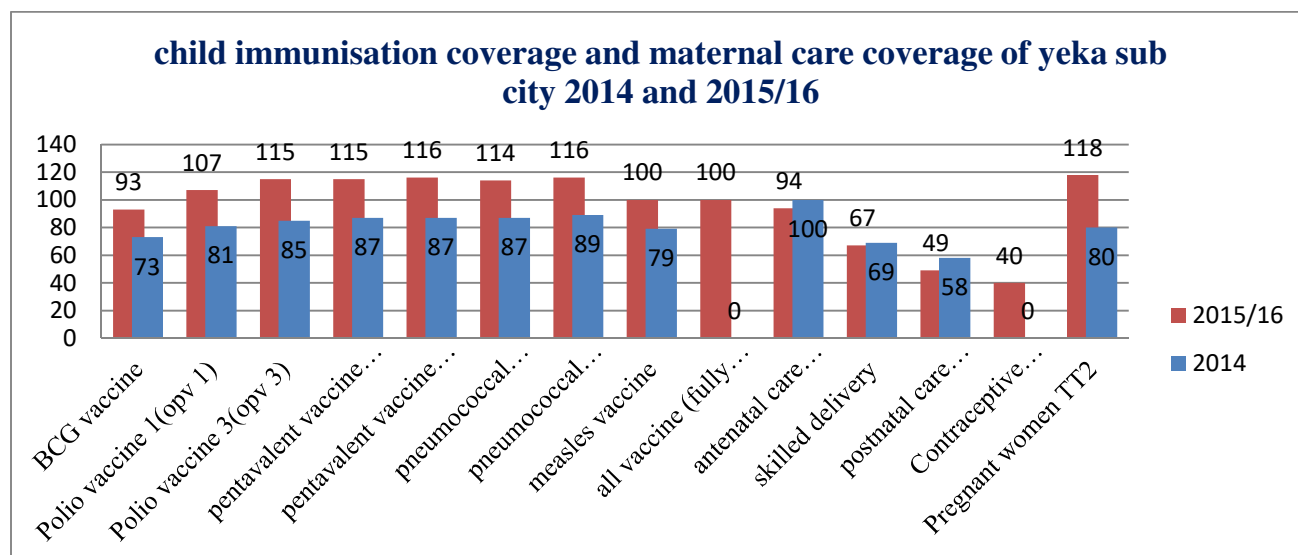


Figure 14 maternal care coverage and EPI coverage of the sub city over 2014 and 2015/16 year AA 2015/16

Endemic diseases

Tuberculosis (TB) and Leprosy: The totals of 695 were screened for all forms of TB in the year of 2015/16. There are 695 all TB cases of which 225 were smear negative PTB, 175 were smear positive PTB, and 295 were EPTB. The detection rate of the sub city is 73.4% and TB Rx completion rate is 90.2%. There was 22 defaulter and 10 deaths while on treatment. From total 695 all TB cases 657 (94.5%) were screened for HIV and 137(20%) of them were positive for HIV test (TB HIV co infection). From 695 new cases, 2 cases were detected and confirmed of MDR TB. There was no leprosy cases reported from the sub city during 2015/16.

HIV/AIDS: In 2015/16 a total of 14924 clients were screened for HIV among those females composed 78% (11728). From a total screened 480(175 males and 305 females) diagnosed positive for HIV. The overall AR was 1.13 per 1000 population. Females experienced 1.38/1000 higher incidence than males who have 0.86/1000. There were a total of 24206 PLWHA currently and those 6819 patients were on ART currently. This year the numbers of newly started ART cases were 709. Health education was given to 1,047,861 peoples and 1,160,000 condoms had been distributed to users (at youth center and hotels for commercial sex worker).

Malaria: In the sub city there is no any malaria's area or wereda but By the year of 2015/16, there was about a total 270 of laboratory (slide & RDT) confirmed cases of all malaria species types reported. Malaria positivity rate was about 28.2%. There is no ITN distribution and IRS in this year since the sub city has no any malaria's area.

Cervical cancer screening (neoplasm): Cervical cancer screening of women age 30-49yrs program were started in the sub city at 2 health centers since a year back. A total of 372 were screened and 21 (5.6%) of them have precancerous lesion and 10 (2.6%) of them have cancerous lesion.

Nutrition intervention: There are about 4 outpatient therapeutic program sites (OTP) and no stabilizing center (SC) in the sub city. About 30,731 of under five year children were screened for malnutrition and about 1131 (3.68%) have moderate malnutrition (MAM), 140 (0.45%) were having severe malnutrition. There are also malnutrition in adults especially in peoples having HIV infection. 2914 of PLWHA were undernourished and 83 of them are on therapeutic feeding.

F. Health service expenditure and financing

The total budget allocated to the sub city from the government was 593,585,751.00birr of which 83,473,612.00 birr (14%) were allocated to the health sector during 2015/16. There are NGOs who support the sub city in technically and financially on HIV prevention programs, EPI (immunization), deworming, review meeting or training to health professionals and disease surveillance. The financial support was 1,664,055.00birr and the engaged NGOs were WHO and CDC.

G. LIMITATIONS

- Relevant information regarding district background and how it gets its name was not obtained.
- There was no complete recorded data for the year 2015/16 only a nine month record was found.
- Data for top leading causes of admissions and mortality in health centers was not found.
- There was no compiled death and vital statics report at health facilities as well as in sub city health office
- There was a discrepancy of data about estimated population, altitude, average temperature and rain fall between different sector offices.
- Data concerning safe water coverage and latrine coverage was not found.

4.1.5 DISCUSSIONS

The aim of this study is to describe current health profile of Yeka sub city. Our finding shows that health service coverage is above 100% because health center to population ratio is 1:32,563 which is greater than standardized national recommendation of urban health centers to population ratio 1:40,000. There are also private health facilities which deliver service to the community. The sub city uses four hospitals as referral hospitals. These are Menelik specialized hospital, Zewditu hospital, Yekatit 12 hospital and Gandhi memorial hospitals. Menelik specialized hospital is located in Yeka sub city wereda 4 geographically and gives service to population of the Yeka sub city and other sub cities. This shows that access to health facility of the sub city is high which is also explained in nationally in improved physical access to health services with an emphasis on primary health care units, resulting in potential health service coverage estimated at 92.2% (1, 3). There was no health post in the sub city and HEW give service to the community as outreach mostly and their office is at health center. Also the current national health organizations structures has three tier system of primary level, secondary level and tertiary levels of which health center is the only health structures at primary level in urban areas and health post, health centers and district hospitals are the at primary level in rural areas(1,2)

The overall health worker ratio per 1000 population was 2.26 versus the national 0.7 per1000 population. This result is similar with the standard set by the World Health Organization of 2.3per 1000 population (2). Also the sub city has a ratio of nurse 1:1179, health officer 1:2981 and midwives 1:3333 which is adequate according to the minimum WHO recommendation of 1 nurse per 5000 population. But there is 1:141105 physician ratios which is low and no x ray professions in the sub city. Nationally Health extension workers and general nurses dominate the available supply of health workers and there are critical shortages of physicians, dentists, and anaesthesia professionals. The greatest inadequacy is for physicians, whose numbers show a decreasing trend over past years and are now 1: 42 706 population, which is among the lowest ratio in sub-Saharan Africa (2). Acute upper respiratory infection was the top causes of morbidity in 2015/16 in both adult and under five children's and accounts about 47131 (23.46%) in adults and 19617 (45.26%) in under five children's (figure 13). Mainly it is due to increased air pollution from released gas wastes of vehicles and factories and overcrowdings of people's especially on public transport. Acute febrile illness is the second leading cause of morbidity in adults and non bloody diarrhea among under five children's. This is contributed due to problem with personal hygiene, food handling and unsafe water. Females experience higher incidence of HIV/AIDS

1.38/1000 than males who have 0.86/1000, this may be attributed to the biological vulnerable nature of females and/or more of those were engaged as commercial sex workers. TB HIV co infection is also high 20%.

As part of preventing and control vaccine-preventable diseases the sub city health system delivering vaccination activities for surviving children. The average immunization coverage has been increased from last year's coverage. In 2014/15 the immunization coverage for measles were 79 %, penta 3 69 % and BCG was 73%. The immunization coverage increased 100% for measles, 116% for penta3 and 93% for BCG in 2015/16 (figure 14). Extraordinary attention is therefore given to antenatal care by the health care systems of most countries. The goal of antenatal care is to prevent health problems in both infant and mother and to see that each newborn child has a good start. The sub cities antenatal care coverage by itself could prevent both the infant and maternal mortality and morbidity before delivery since the coverage is high (94.7%). It should be followed by deliveries attended by skilled health personnel. All women should have access to skilled care during pregnancy and at delivery to ensure detection and management of complications. Whereas, the sub cities proportion of deliveries attended by skilled health personnel is low (67.2%) which is insufficient to decrease maternal morbidity and mortality during pregnancy and neonatal death (figure 14). ANC coverage of sub city was high but institutional delivery coverage was low when compared with 2014 EMDHS of Addis Ababa 87%.

4.1.6 CONCLUSION

- The health access coverage (number of health institutions delivering services for the People) is high (>100%).
- There are adequate manpower of nurse, HEW and Health Officers according to standard and inadequate number of physicians which is below the standard requirements’.
- Communicable diseases are still the major public health concern of the sub city. Acute upper respiratory infection is the leading cause morbidity both in adults and pediatrics. AFI, diarrheal disease (food and water born diseases) and HIV infections are also the common cause of morbidity. Non communicable chronic diseases like trauma, hypertension, diabetes mellitus and neoplasm are recorded in top ten causes of morbidity (outpatient visit).
- The average immunization coverage of measles, penta vaccine, polio vaccine and pneumococcal vaccine shows increment when compared with last year.
- There is low ANC coverage and skilled delivery when compared with the last year performance.

4.1.7 RECCOMENDATION

Sub city health office should focus on mass health education to the community should be given intensively on ways to prevent the common communicable and non communicable disease of the sub city. Food hygiene, safe water, and environmental sanitation protection may reduce the burden of communicable disease, while healthy nutrition (low calorie diet, vegetables and fruits), physical exercise, reduction of alcohol drinking and smoking decrease communicable disease burden. Priority should be given to inadequate health profession like physicians training and deployment to health centers. Emphasis should be given to maternal health of increasing skilled delivery through intersect oral collaboration and stake holder involvements. Data on environmental sanitation, latrine coverage and safe water supply is not found so sub cities health office should give priority to collecting this essential data soon as possible through collaboration with other stake holders.

4.1.8 REFERENCES

1. EFMOH. Annual performance report of HSDP-IV, Final draft, Addis Ababa October 2010
2. WHO Health profile system of Sudan WHO regional health bureau, 2006.
3. Ethiopian Mini-demographic Health Survey, 2014.
4. CSA, Population and housing census. Addis Ababa, Central Statistics Authority, 2007.
5. CSA, Ethiopia Demographic and Health Survey. Addis Ababa, Central Statistics Authority, 2005
6. EFMOH. Health and health related indicators. Planning and programming department, Addis Ababa Ethiopia, 2007/08

4.1.9 ANNEX:

Annex 3 Data collection tool /checklists for health profile description of Yeka sub city, Addis Ababa, Ethiopia, 2016

1. Historical Aspects of the area (Culture & tourism office).

- District Name _____
- When was the district established _____
- How & why the name given _____
- Any other historical aspect _____

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

- District map _____
- Location (distance from Addis Ababa) _____ Direction _____
- Altitude _____, _____
- Surface Area _____ (_____%) from Addis Ababa City Administration
- Geographical coordinate
 - ✓ Annual rain fall _____ average annual temperature _____
 - ✓ Climatic zones in % _____, _____, _____
- District boundaries North _____, South _____, East _____, West _____

3. Political and Administrative Organization

- Total number of woredas in the sub city: _____

4. Population and Population structures

A. Demographic data

- Total Population _____ Male _____ Female _____
Sex ratio _____
- Population under 1 year _____ Population under 5 years _____
- Population <15 years _____ Population >64 years _____
- Women 15-49 years of age _____
- Total population by woreda (each woreda population) _____
- Average household size _____

- Annual population growth rate (%) _____
- Population pyramid by age and sex _____

B. Ethnic/language

- Oromo _____ (____ %),
Amhara _____ (____ %),
Others _____ (____ %)

C. Religion

- Muslim _____ (____ %), Orthodox _____ (____ %),
• Protestant _____ (____ %), Other _____ (____ %)

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

- **Main income sources**
 - ✓ Trade _____
 - ✓ Mixed economy _____
 - ✓ Other business _____

6. Education and school Health

- **Number of educational institution**
 - ✓ Kindergartner _____
 - ✓ Primarily School (1-8) _____
 - ✓ Secondary school _____
 - ✓ Preparatory _____
 - ✓ TVET _____
 - ✓ College/ University _____
- Total School Age Children (target) _____ Male _____ Female _____
 - ✓ Total Enrolment _____ (____ %), Male _____ (____ %), Female _____ (____ %)
 - ✓ Primary school _____ (____ %), Male _____ (____ %), Female _____ (____ %)
 - ✓ Secondary school _____ (____ %), Male _____ (____ %), Female _____ (____ %)
 - ✓ Preparatory _____ (____ %), Male _____ (____ %), Female _____ (____ %)

✓ School dropout rate of last year 2007 _____

If there is school dropout, specify the reason:

1. _____ # _____ (_____%)

2. _____ # _____ (_____%)

- Educational status of the community (Literacy status)

✓ Total Educated people _____

Male _____, Female _____

- Number of teacher in the district

Total _____ Male _____ Female _____

Grade 1-8, Total _____ Male _____ Female _____

Grade 9-10, Total _____ Male _____ Female _____

Grade 11-12, Total _____ Male _____ Female _____

TVET Total _____ Male _____ Female _____

7. Other Facilities

A. Transportation

- Road network with respect to health facility:
- Number of Health center with access to all weather road _____
- How many weredas have access to transportation _____
All weather road _____, Dry weather road _____, No access to road _____

B. Telecommunication

- How many people have access to fixed telephone? _____
- How many people have access to mobile phone? (coverage) _____

C. Post Office _____

D. Bank _____

E. Power supply

- How many house hold get power supply (24 hours)? _____

F. Water supply

- Total safe water supply coverage of the sub city _____ (_____%)
- Main source of water supply
Municipal piped water _____, spring on spot _____,

Hand dug well _____, spring with distribution _____,

Deep well with motorized pump _____

- Number of weredas with safe water _____ (_____ %)
- Population getting safe water _____ (_____ %)
- Daily water consumption per day per person _____

8. District Health system

- The general health system structure of the district(flow chart)

- Is there health management team at district level? Yes/No
- If yes , describe the health management team in detail (composition and function)

- Do you have NGOs working on health and health related issues? Yes/No
- If yes, list the NGOs and their work in related to health

9. Vital Statistics and Health Indicators

- Infant Mortality Rate _____ (total <1 year deaths 2007 _____)
- Child Mortality Rate _____ (last year total <15 year deaths _____)
- Crude Birth Rate _____
- Crude Death Rate _____
- Maternal Mortality Rate _____
- ANC rate (how many of the total expected pregnancies attended 1st ANC) _____
- ANC rate (how many of the total expected pregnancies attended 4th ANC) _____
- Percentage of deliveries attended by skilled birth attendants _____
- Percentage of deliveries attended by Health Extension Workers _____
- **Immunization Coverage (for children and Women);**
 - ✓ BCG _____ (_____ %).
 - ✓ OPV0 _____ (_____ %),
 - OPV1 _____ (_____ %),
 - OPV3 _____ (_____ %)

- ✓ Penta1 _____ (_____ %),
penta3 _____ (_____ %)
- ✓ Measles _____ (_____ %).
- ✓ Rota 1 _____ (_____ %),
Rota 2 _____ (_____ %)
- ✓ PCV₁₀ 1 _____ (_____ %),
PCV₁₀ 3 _____ (_____ %),
- ✓ Full immunization _____ (_____ %)
- ✓ TT2 + PW _____ (_____ %),
TT2 + NPW _____ (_____ %)
- ✓ TT coverage _____ (_____ %)

10. Health Service

A. Type and Number of Health Institution

Type		Number	Total Number of beds
Government Hospital			
Government Health center	Type A		
	Type B		
Private Health Facilities (clinics/diagnostic laboratory/drug stores)	Clinics (all type)		
	Diagnostic Laboratory		
	Drug store		
Government Health posts			
NGOs	Health Posts		
	Health Centers		
	Hospitals		
	Clinics		
Facilities under constrictions	Health Post		
	Health Center		
	Hospital		

- Health institution to population ratio:
Total population _____
Hospital _____,
Health Center _____,
Health Post _____
- Health service coverage _____

B. Type and Number of health professionals

Type	Number of human power	Remark
Specialist		
General practitioner		
Health officer and BSc nurse		
Clinical nurses		
Mid wife		
Laboratory technician		
Pharmacy technician		
Environmental Health professional		
Health Information Technology		
Health education		
Health Extension Workers		
Others		

- Doctor to population ratio _____,
- Health officer and BSc nurse to population ratio _____,
- Nurse to population ratio _____,
- Midwife to population ratio _____
- Health Extension Worker to population ratio _____

C. Top ten causes of morbidity and mortality

- Top ten leading causes of Out Patient Department visit (morbidity):

S/N	Adult	Pediatrics (< 5 years)
-----	-------	------------------------

1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

- **Top ten causes of admissions**

S/N	Adult	Pediatrics (<5 year)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

- **Top ten causes of deaths (mortality).**

S/N	Adult	Pediatrics (<5 year)
1		
2		
3		

4		
5		
6		
7		
8		
9		
10		

D. Health budget allocation:

- **Government**

- ✓ Annual budget allocated for the District(Ethiopian birr) _____
- ✓ Annual budget allocated for health institutions _____ (___ %)
- ✓ Annual budget allocation increment percent comparing to the previous year _____ %

- **Funds from NGO**

- ✓ Total _____ (purpose/programs) _____

11. Community Health Services

- Status of services provided by Health Development Army (HDA)

- ✓ Number of HDA _____ and their responsibility _____
- ✓ Responsibility of Health Extension Workers _____
- ✓ Others _____

12. Status of Primary Health Care Components

- MCH (Delivery, ANC, PNC) _____
- Family Planning (Methods _____
Contraceptive prevalence rate _____, Contraceptive acceptance rate _____
- EPI(cold chain management, vaccine arrangement) _____

- Environmental Health and sanitation

Latrine coverage _____, Latrine utilization rate _____,

Solid waste management _____, Liquid waste management _____
- **Endemic diseases:**
 - **Malaria**
 - ✓ Total malarious wereda _____ Population at risk _____
 - ✓ LLITNs coverage (including current year distribution) _____
 - ✓ Is there IRS conducted (Number of kebeles planned for IRS) _____,
 - Number of kebeles sprayed _____, HH planned _____, HH sprayed _____, Population protected _____ (_____ %)
 - ✓ Total cases/year _____ deaths/year _____,
 - <5year cases/year _____ <5year deaths/year _____
 - ✓ Anti Malaria commodities (Coartem, Rapid Diagnostic Test) _____
 - ✓ Other issues _____
 - **TB/Leprosy**
 - ✓ Total TB cases _____
 - PTB negative _____ PTB positive _____ Extra PTB _____
 - ✓ TB detection rate _____ TB treatment completion rate _____
 - ✓ TB cure rate _____ TB treatment success rate _____
 - ✓ TB defaulter _____ Death on TB treatment _____
 - ✓ Total TB patients screened for HIV _____
 - ✓ Total Leprosy cases _____ on treatment _____
 - **HIV/AIDS;**
 - ✓ Total people screened for HIV (last one year) (HCT) _____
 - ✓ VCT _____ PITC _____ PMTCT _____
 - ✓ HIV prevalence _____ HIV Incidence (new cases/year) _____
 - ✓ Total PLWHA _____ On ART _____ on Pre-ART _____
 - ✓ Other HIV prevention activities _____
 - **Nutrition (malnutrition related OTPs, SC, TSF, CBN and PSNP activities)**
 - ✓ Total OTP sites _____, total admissions to OTP/year _____

2005 _____, 2006 _____, 2007 _____

Total SC sites _____, newly opened _____, total admissions to SC/year _____

2005 _____, 2006 _____, 2007 _____

✓ Is there TSF (targeted supplementary feeding) program in the district? _____

✓ CBN program _____ PSNP _____ other _____

✓ General food security condition _____

○ **Essential drugs (shortage):-**

13. Disaster situation in the district

- Was there any disaster (natural or manmade) in the district in the last one year? ____
- Any recent disease outbreak/other public health emergency _____
- If yes number of cases _____ and deaths _____

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

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

16. Conclusions made about the health status of the District based on the findings

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

CHAPTER V- SCIENTIFIC MANUSCRIPT FOR PEER REVIEWED JOURNAL

5.1 YEKA SUB CITY MEASLES SURVEILLANCE DATA ANALYSIS OF 2010 TO 2014- ADDIS ABABA, ETHIOPIA 2016

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ABSTRACT

Background-Measles is an acute, contagious and vaccine preventable viral disease caused by measles virus. It causes morbidity and mortality among children worldwide especially in developing countries like Ethiopia. This study attempts to describe the epidemiology of Yeka sub city measles cases reported in between 2010 to 2014, and ultimately contribute to design a better intervention and control programme.

Methods-We conducted descriptive cross sectional study on measles surveillance data of 2010-2014. We used National Measles guideline for case definitions and classification. Selected variables from measles surveillance database were analyzed using SPSS version 21 and Microsoft excel.

Result-A total of 337 cases were reported in 2010-2014 and about 34.1% were reported from woreda 5. Male accounts 54% and 37.3% of cases were in 1-4 years age group. Higher cumulative incidence of 21.9 per 100,000 populations per year was reported in 2014. About 11.9% of cases were not vaccinated and 42.5% with unknown vaccination status. The sub cities measles vaccine coverage was 85% and 77% while numbers of cases were 59 and 93 in 2010 and 2014 respectively. The highest number of cases reported during March 16.6% and May 14.2%.

Conclusion- The cumulative incidence of measles cases were increased during 2010-2014. The age group 1-4 years and male were mostly affected group. Measles immunization coverage was low and higher transmissions of measles were seen during dry windy seasons of winter and autumn. Sub city health office should improve measles immunization coverage and further investigation is needed for seasonal transmission and causes for mostly affected groups.

Key words: Measles epidemiology, IgM antibody, surveillance data, Yeka sub city, Addis Ababa.

INTRODUCTION

Measles is an acute, highly contagious viral disease caused by measles virus and transmitted from person to person by respiratory droplets. The incubation period is approximately 10–12 days from exposure to the onset of rash and has Prodromal symptoms like fever, malaise, cough, coryza (runny nose), and conjunctivitis during this period. Measles can be transmitted from four days before start of rash to four days after rash disappeared. The risk factors for measles virus infection include infants who lose passive antibody before the age of routine immunization, children with vitamin A deficiency and immunodeficiency. Complications and case fatality are common in young children below 5 years of age, malnutrition (vitamin A deficiency), and inadequate vaccination. The case fatality from measles is estimated to be 3 – 5% in developing countries but may reach more than 10% in outbreaks especially when it is compounded by malnutrition. In certain high-risk populations, case-fatality rates may reach 30% in infants aged less than 1 year of age.¹

Prior to the availability of measles vaccine, measles infected over 90% of children before they reached 15 years of age with 20 million estimated cases per year globally. These infections were estimated to cause 2.6 million deaths and between 15,000 to 60,000 cases of blindness annually worldwide and the majority (85%) in Africa and Asia. From 2000-2013 there was decrease of death by 75% and cases by 72% globally^{2, 3} Improving measles vaccination coverage and reducing measles-related deaths is a global imperative, particularly as it relates to the United Nation's Millennium Development Goal 4 (MDG). In 2006, the African Region adopted a goal to achieve 90% measles mortality reduction by 2010 with strategies of improving routine vaccination coverage, providing measles vaccination through supplementary immunization activities (SIAs) and establishing measles surveillance.^{4,5}

Ethiopia initially introduced measles vaccination programs in 1980 as part of the Expanded Program on Immunization (EPI) and, in 2002 has launched SIA program that has targeted children aged six months to 14 years.^{6,7} Also measles is prioritized diseases that is under surveillance of the country and every suspected measles cases are reported immediately, using the case based report form. Laboratory investigation for identification and confirmation is performed at Ethiopian national laboratory center.⁸

However, between 2008 and 2010 an increase in measles outbreaks occurred in many African Nations including Ethiopia.⁹ Ethiopia has experienced numerous measles outbreaks and

increasing morbidity affecting different regions. Between 2005 and 2009 a total of 17521 cases and 127 deaths were reported from Ethiopia.¹⁰ About 26.9% were not vaccinated and 35.3% with unknown vaccination status during this period. In 2013 and 2014, 243 and 302 measles outbreak had reported in the country with increased affected woredas from 192 to 249 respectively.¹¹ Similarly, measles positivity rate has increased for the last two years reaching 35% and 53% in 2013 and 2014 respectively.

Since measles is a vaccine preventable disease, measles surveillance data analysis is use full to describe measles epidemiologically and to guide intervention and vaccination activities. Nevertheless, there are little studies, which assess the epidemiology of measles in the country and particularly in the study area, there is no such studies conducted before. This study can provide relevant information used in interventions and control programs of measles and it may be used as a baseline data for further study. Therefore, this study attempts to describe the epidemiology of Yeka sub city measles cases reported in between 2010 to 2014, and ultimately contribute to design a better intervention and control programme.

METHODS AND MATERIALS

Study Area, population and Period: Yeka sub city is one of the ten sub cities of Addis Ababa city Administration and located at northeastern part of Addis Ababa. The sub city consists of 13 district woredas administratively. Based on the projection from national population census of 2007, Yeka sub city has an estimated total population of 423316 of which 203213(48%) were males, 9482(2.24%) were under 1-age children and 98643(23.3%) were under 5 age children by year of 2015/16. The study populations for this study were all suspected measles cases reported to the sub city during 2010 to 2014. Measles surveillance data of Yeka sub city was analyzed from April to June 2016 in Addis Ababa, Ethiopia.

Study Design and Data Collection: Descriptive cross sectional study was undertaken on 2010-2014 measles surveillance data of Yeka sub city. To get secondary measles surveillance data, first concept paper was developed and submitted to SPHMC for review. Then Addis Ababa city health bureau and Yeka sub city PHEM office approved the request of a five-year measles database. The database has many variables but selective variables like age, sex, date of specimen collection/date of report, reporting wereda/health facility; number of measles vaccine doses, type of reporting form, final classification of cases and presence of outbreaks were analyzed for this study.

Case definitions

National Public Health Emergency Management and WHO measles guidelines were used for the case definitions. According to the Federal ministry of health of Ethiopia-Public health emergency management, measles is one of the immediately reportable diseases and suspected cases or deaths of measles will be filled with case-based reporting form, serum sample collected and sent to Central virology laboratory for confirmation.

Suspected case: Any person with fever and maculo-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 epidemic. All suspected cases of measles are finally classified based on the adequacy of the blood specimen collected, and sample taken or not in to the following four categories;

Laboratory confirmed: A suspected measles case that is investigated, including the collection of an adequate blood specimen (5 ml), and has serological confirmation of recent measles virus infection (IgM positive).

Epidemiologically linked: A suspected measles case that has not had a blood specimen taken for serologic confirmation, but is linked to a laboratory confirmed case (being in the same geographic area (place) during the infectious period within 30 days).

Discarded: A suspected measles case that has been completely investigated, including the collection of adequate blood specimen (5 ml), but lacks serologic evidence of recent measles virus infection (that is, IgM negative).

Clinical / Compatible: A suspected measles case that has not had a blood specimen taken for serologic confirmation, and cannot be epidemiologically linked to a laboratory-confirmed case.

Data Processing and Analysis: The collected data was checked for completeness, cleaned, coding and recoding was done. Descriptive statistical analysis like mean, frequency, percentages and graphs were performed using SPSS version 21 and Microsoft excels software's.

Ethical Consideration: The study had ethical clearance from SPHMMC and Addis Ababa city health bureau. The variables from the data base will not contain the name of the study subjects (cases) which will address concern of the study subject confidentiality and it will not transferred to the third body without the owner's consent.

RESULTS

About 337 measles suspected cases were reported throughout the sub city in 2010 to 2014 and all cases were reported with case based report format. There were no outbreaks and measles death

report during this period. About 182 (54%) of cases were males while 155(46%) were females. The median age was 6 years old and the age ranges from 5 month up to 33 years. The age group1-4 years constituted 123 (37.27 %) of suspected measles cases reported over the five years period and the least were under one year age group 15 (4.5%) (Figure15).

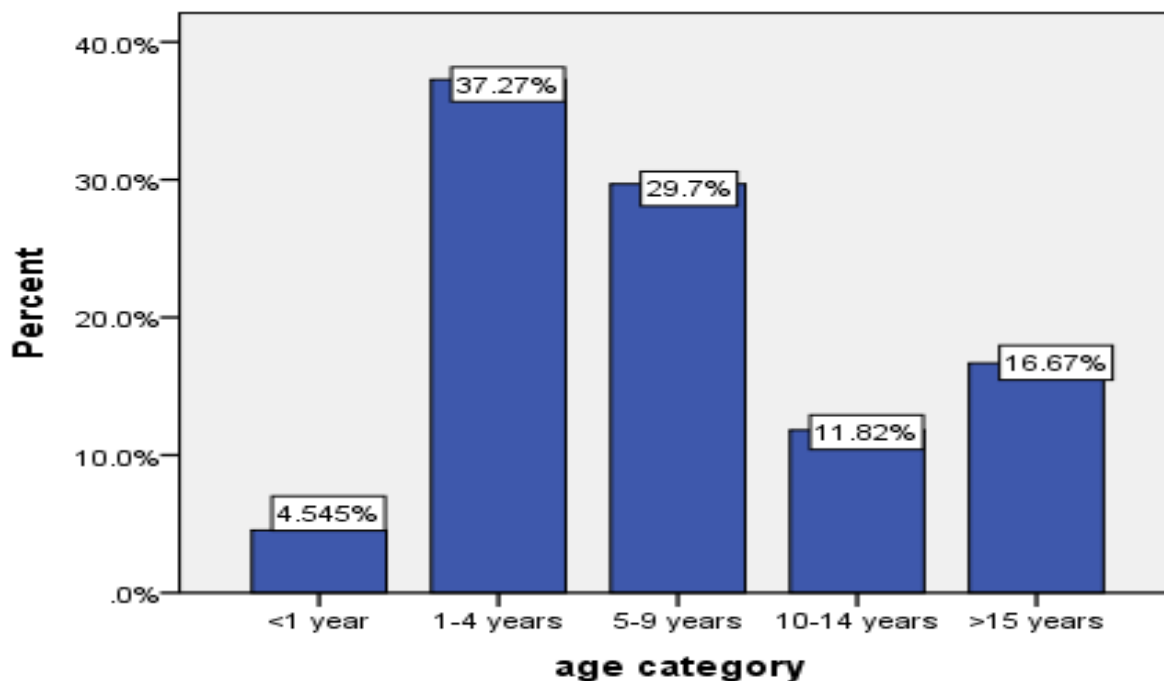


Figure 15 distributions of measles suspected cases by age category from 2010 to 2014, Yeka sub city, Addis Ababa, 2017

The highest proportion of cases 93 (27.6%) with cumulative incidence 21.9 per 100,000 population/year was reported in year 2014 and the least 45(13.3%) with 11.4 cases per 100,000 population were reported in 2011. Similarly the proportion of confirmed measles cases were increased over the period from 7 (11.9%) in 2010 to 34 (36.6%) in 2014 (table17).

Table 17 Distribution of suspected cases per 10,000 populations per year and frequency of final classification of cases in 2010 to 2014 Yeka sub city, Addis Ababa

Year	Population	Confirmed (IgM positive)	discarded (IgM negative)	Clinical/compatible	Unidentified	Total suspected cases	Cases per 100,000 population	Proportion of confirmed cases
		N (%)	N (%)	N (%)	N (%)	N (%)		
2010	382998	7	27	14	11	59(17.5)	15.4	11.9
2011	393020	9	25	10	1	45(13.3)	11.4	20
2012	403098	14	61	0	0	75(22.2)	18.6	18.7
2013	413175	14	50	1	0	65(19.4)	15.6	21.5
2014	423316	34	54	2	3	93(27.6)	21.9	36.6
Total		78(23.1)	217(64.4)	27(8)	15(4.4)	337(100)		

From all 337 suspected cases 78(23.1%) of them were confirmed (IgM positive) cases (table1). About 41 (52.6%) of those confirmed measles cases were males and 37(47.4%) were females. The age category under one year accounts 7(9%), 1-4 years 19(24.3%), 5-9 years 8(10.3%), 10-14 years 15(19.2%) and above 15 years accounts 29(37.2%) of confirmed measles cases.

Measles vaccine coverage of Yeka sub city was decreased from 85% in 2010 to 77% in 2014 while numbers of reported measles cases were increased from 59 in 2010 to 93 in 2014 (figure 2). In the five years of reporting period, only 14.5% (49) of suspected measles cases get two or more measles vaccine doses, 28.7% (97) get one dose, 11.3% (38) not vaccinated and 40.3% (136) with unknown vaccination status.

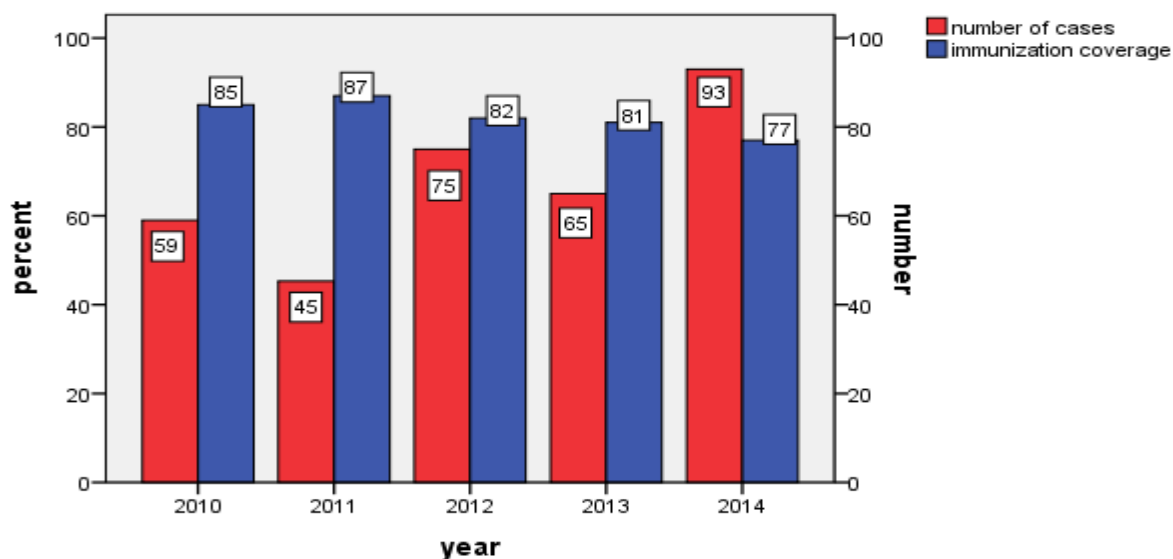


Figure 16 Measles cases and immunization coverage in 2010 to 2014 Yeka sub city, Addis Ababa

From 13 district woredas of Yeka sub city, 12 (92.3%) of them were reported suspected measles cases at least once over the five year period. Proportion of woredas notifying suspected measles cases were 8(61.53%) in 2010, 7(53.8%) in 2011, 9(69.2%) in 2012, 11(84.6%) in 2013 and 12(92.3%) in 2014. Woreda 5 was notified 115 (34.1%) of cases and woreda 12 did not notified any measles cases over the period while 33 (9.8%) of suspected cases have no record of their district name (Table 18).

Table 18 distribution of measles cases by districts and final classification from 2010 to 2014, Yeka sub city, Addis Ababa, 2017

district name	Total Suspected cases N (%)	confirmed (IgM +ve) N (%)	discarded (IgM _ve) N (%)	Clinical /compatible N (%)	Unidentified cases N (%)
woreda 01	14(4.2)	5	9	0	0
woreda 02	16(4.7)	5	8	2	1
woreda 03	63(18.7)	3	54	6	0
woreda 04	10(3.0)	5	5	0	0
woreda 05	115(34.1)	13	81	9	12
woreda 06	5(1.5)	0	4	1	0
woreda 07	10(3.0)	2	8	0	0
woreda 08	11(3.3)	1	10	0	0
woreda 09	43(12.8)	24	17	2	0
woreda 10	1(0.3)	0	1	0	0
woreda 11	9(2.7)	2	6	1	0
woreda 13	7(2.1)	3	4	0	0
Unknown woreda	33(9.8)	15	10	6	2
Total	337(100)	78(23.1)	217(64.4)	27(8.0)	15(4.4)

In each month of the five-year period a minimum of zero cases and a maximum of 23 cases were reported. The cumulative number of cases over the five years period was reported during the month of March 56 (16.6%) and the least eight (2.37%) in September (figure 17).

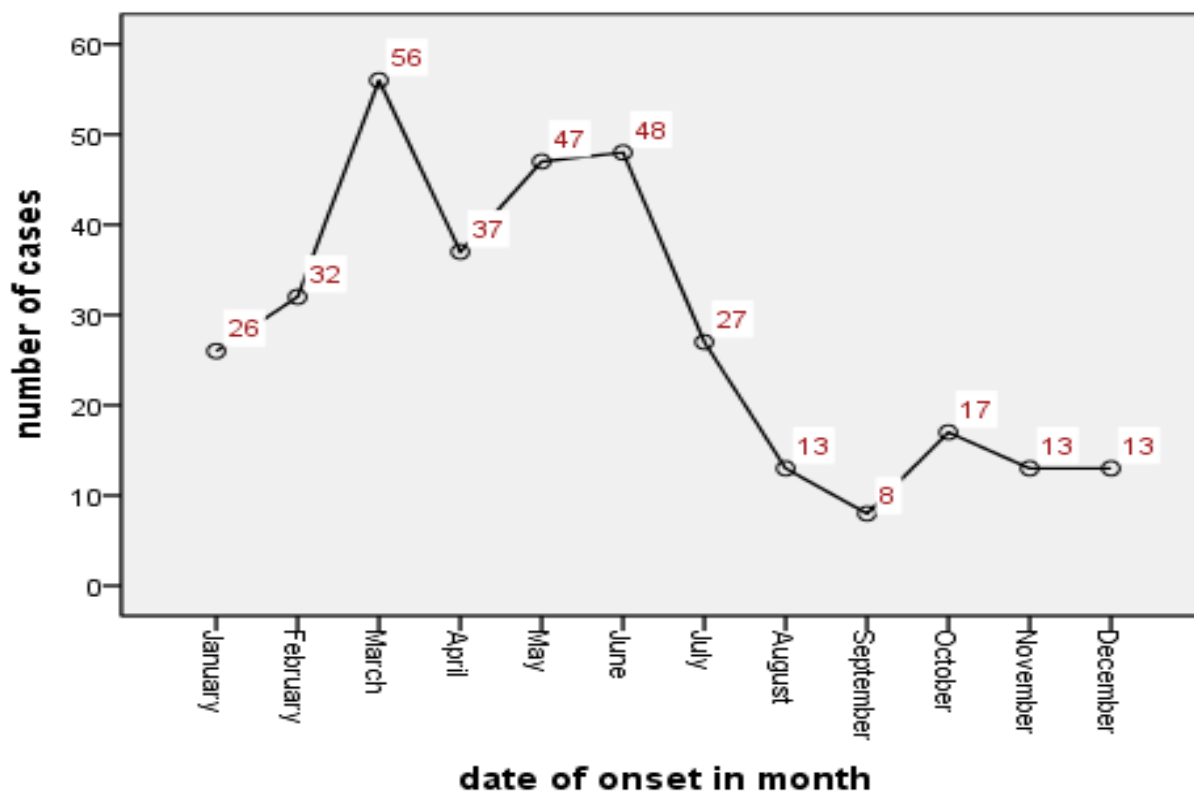


Figure 17 Trend of cumulative measles cases by month of onset of illness, 2010 to 2014, Yeka sub city, 2017

DISCUSSIONS

This study revealed that from 2010 to 2014 about 337-suspected measles cases of which 23.1% confirmed were reported without outbreak and death. Our study found that males 182 (54%) were affected than females and the cumulative case fatality rate in five years period was zero. The absence of death could be due to improvement of case management in health facilities or due to absence of outbreak. The age group 1-4 years was the most affected age group constituting 36.5% of the total measles cases (figure 15). This could be the immaturity of immune system in this age group and it is documented that in developing countries the most vulnerable children are between the ages of 9 months and 5 years.^{1,7} In addition, this finding is supported with Ethiopian national measles surveillance analysis study, where 1-4 years age group have highest proportion 41.2%.¹⁰ The cumulative incidence of suspected measles cases were increased from 2010 to 2014 (table 17). This could be mainly because of increased susceptible peoples in the community, decreased measles immunization coverage and increased notification of cases. This incidence of suspected measles cases over the five-year period ranges from 11 to 21 cases per 100,000 populations per year and it was higher than national measles cases incidence ranges (2 to 7 cases per 100,000

populations per year) according to national measles data analysis.¹⁰ Similarly, proportion of confirmed cases (IgM positive) was increased over the period from 11.9% in 2010 to 36.6 % in 2014(table 17). This increment could be due to improved laboratory facility or skills of laboratory professions. But this result is lower than WHO annual report in which national positivity rate were increased from 35% in 2013 to 53% in 2014.¹¹

Regarding the measles immunization coverage in our study, the coverage were decreased from 85% in 2010 to 77% in 2014 (figure 16). This result is lower than recent African regional goal(>90% coverage) of measles immunization as adopted by Federal Ministry of Health Ethiopia.¹ Moreover, WHO annual report stated that the national measles immunization coverage of Ethiopia started to decrease since 2012 from 80% to 74% in 2014.¹¹ As it was evidenced in our study majority of suspected measles cases 174 (51.6%) had unknown vaccination status or unvaccinated for measles. This shows that measles affects those unvaccinated children's and it supports the low measles vaccine coverage of the sub city during the period.

It was also observed that the number of woredas notifying of measles cases were increased year to year with in the sub city during 2010 to 2014. This could probably be due to improvement of measles surveillance of detecting and notifying of any suspected cases of measles. However, all district woredas of the sub city has no similar performance in notifying total suspected and confirmed cases (table 18). The largest proportion of cases 34.1% of total suspected cases were reported by woreda 5 district where as woreda 12 did not report any cases. This difference could be due to difference in surveillance activity performance, populations' size, and differences in number of health facility or immunization coverage.

The higher number of cumulative suspected measles cases were seen during the months of March (16.6%), June (14.24%) and may (13.9%) (Figure 17).The number of cases shows increment during dry windy seasons of winter and autumn (January to May) and shows decrement during summer and spring of rainy season starting from July which shows seasonality of the disease. The changes in host behavior, particularly patterns of movement and contact (during school seasons) have a strong tradition as explanations for the seasonality of measles diseases. The ability the virus to survive outside a host in low humidity air is also likely to be an important cause of seasonal incidence.^{1,4} The limitation of this study is that it used secondary surveillance data that affects its reliability and validity since some variables from databases are incomplete.

Conclusion: The cumulative incidence of measles cases were increased during 2010 to 2014 while measles immunization coverage was low over the period. The age group 1 to 4 years and

male were the most affected group. High transmissions of measles cases were seen during dry windy seasons of winter and autumn.

Recommendations: The sub city and district health offices should improve measles immunization coverage through strengthening the routine EPI and SIA for all under five year children. Further investigation is needed for seasonal transmission and causes for mostly affected groups. Also, surveillance activities need improvement in early detection of cases and completeness of variables especially for districts having low performance in notifying cases.

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REFERENCE

1. Ethiopian Health and Nutrition Research Institute. guideline on measles surveillance and outbreak management.3rd edition.Addis Ababa: Ethiopian health and nutrition research institute, 2012
2. Simons E, Burton A. Assessment of the 2010 global measles mortality reduction goal : results from a model of surveillance data. Pubmed,2012;300.
3. WHO. Global Measles and Rubella Strategic plan:2012-2020.Switzerland, Geneva: World Health Organization 2012
4. WHO / UNICEF. WHO and UNICEF Joint Annual Measles and Rubella Report in 2011. Switzerland, Geneva: World Health Organization 2012
5. WHO Regional Office for Africa. Measles Elimination by 2020:a strategy for the African region. WHO Regional Office for Africa, 2011;(September).
6. FMOH. Ethiopia National Expanded Programme on Immunization: comprehensive multi - year plan 2016 - 2020: Addis Ababa, Federal Ministry of Health,2016;
7. WHO Regional Office for Africa. Measles SIAs Planning & Implementation Field Guide. WHO Regional Office for Africa, 2010;(April):1–95.
8. Ethiopian Health and Nutrition Research Institute. Guideline on Public Health Emergency Management. Addis Ababa: Ethiopian health and nutrition research institute, 2012
9. WHO Ethiopia Country Office. Key Achievements in Strengthening Routine Immunization

- in Ethiopia. Addis Ababa:WHO Ethiopia Country Office, 2014
10. Wayessa J, Enqueselassie F. National measles surveillance data analysis , 2005 to 2009 Ethiopia. Journal of PH and Epi.2016;8(March):27–37.
 11. WHO Ethiopia Country Office. Annual Report of Expanded programme on Immunization in Ethiopia in 2014. Addis Ababa:WHO Ethiopia Country Office, 2015

5.2 ACUTE WATERY DIARRHEA OUTBREAK INVESTIGATION IN WOREDA 8-13 DISTRICTS OF YEKA SUBCITY, ADDIS ABABA, ETHIOPIA 2016

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ABSTRACT

Background-Cholera remains a major public health threat of developing countries including Ethiopia according to World Health Organization report of 2016. Yeka sub-city was reported the first Acute Watery Diarrhea (AWD) case in June 2016 and in July 2016 all woredas of the sub-city was affected, despite the response had started. The information obtained from this study helps to control the outbreak and can be utilized to manage future similar outbreaks.

Objective-To identify factors associated with AWD infection and describing cases epidemiologically in woreda 8-13 districts of Yeka sub-city, Addis Ababa, 2016

Methods-health facility based case control study was conducted in woreda 8-13 districts of Yeka sub-city, from July to August 5/2016 on 58 cases and 58 controls. National AWD case definition was used to select cases conveniently from Cholera Treatment Center. Controls were selected from community randomly. Principal investigator collected data using written questionnaires. Data was entered to EpiInfo version 7.1 and transferred to SPSSversion21software for analysis. Logistic regression analysis was performed and Variables with p-value of ≤ 0.05 were considered to be significantly associated with AWD infection.

Result: Male accounts 25(43.1%) among controls and 34(58.9%) among cases. The mean age of controls were 33.3(SD=13.7) and 38.3(SD=17.2) in cases. The age category 15-44 years accounts 85(73.3%) from total respondents and 40(69%) among cases. Water treatment before use (AOR=0.23, 95% CI=0.06-0.81), raw meat food item consumption in the past five days (AOR=13.9, 95% CI=3.04-63.8), eating food outside your home in the past five days (AOR=3.8, 95% CI=1.09-13.45) and regular hand washing with detergents after toilet (AOR=0.04, 95% CI=0.009-0.18) were significantly associated with AWD infection.

Conclusions- males and 15-44 year age category were the most affected group. Consumption of raw meat in the preceding 5 days of illness, eating outside, water treatment before use and regular hand washing after toilet were significantly associated factors. The district and sub-city health

bureau should mobilize and educate the community on proper hand wash after latrine, not to consume raw foods like raw meat, not to eat out side and to treat water before use.

Key words-AWD, outbreak, Yeka sub city, Addis Ababa

INTRODUCTION

Cholera is an infectious disease that present with acute watery diarrhea and caused by infection of the intestine with the gram-negative bacteria *Vibrio cholera*, either type O1 or O139 sero-group. Both serotypes can cause cholera in epidemic form. It remains a major public health threat in developing countries where safe water and sanitation facilities are inadequately available. The World Health Organization (WHO) estimates that annually, about 3 to 5 million people are affected worldwide by cholera and over 100,000 cases result in death. In 2011, 589 854-cholera cases including 7816 deaths were reported globally. Twenty-seven countries from the African continent reported 188 678 cases, including 4183 deaths (CFR, 2.22%). Compared with 2010(115 106 cases), the number of cases reported from Africa increased by 65% and having highest case fatality rate. Cholera cases from Africa represented one third of the global report in 2011(1, 2).

The risk factors for cholera include poverty, underdevelopment, population density, low education levels, travel to high-risk areas, consumption of leftover food, and consumption of unsafe fruits and vegetables (3). Other risk factors for cholera outbreaks are posed by sudden changes in sanitary behavior involving water and toilet use. Natural disasters such as floods can lead to the deterioration of sanitary conditions and inadequate health services. Sudden population movements and the need to find accommodation for refugees may likewise affect water and health resources. Climatic factors such as rainfall, water and sea surface temperatures, and the El Niño Southern Oscillation events have a significant impact on the incidence of cholera (4) . Epidemic regions are located near regional rivers and are characterized by sporadic outbreaks, which are likely to be initiated during episodes of prevailing warm air temperature with low river flows, creating favorable environmental conditions for growth of cholera bacteria. Heavy rainfall, through inundation or breakdown of sanitary infrastructure, accelerates interaction between contaminated water and human activities, resulting in an epidemic(5).

In East Africa, cholera epidemics have been closely associated with living near to large body of water or lake (fishing community), lack of health facilities nearby, seasonal changes in rainfall (high rainfall), and were aggravated by the low socioeconomic status, inadequate healthcare systems and inadequate sanitary facilities. Some studies have shown that cholera cases occur in

highly urbanized, densely populated areas close to water bodies, while others have shown a higher incidence in small, rural populations with high poverty levels, low urbanization, and lack of sanitation(6–8).

In Ethiopia AWD outbreak had happened in Afar region in the year of 2009. During this outbreak three districts were affected and the overall attack rate (AR) and case fatality rate (CFR) 0.85% and 4.4% respectively. Factors that are associated with AWD infection in this outbreak were, Hand washing after latrine usage (OR = 0.13), access to latrine (OR = 10.5) and contact with a known case (OR = 2) (9,10). The current Acute Watery Diarrhea outbreak was reported in Ethiopia in July 2016 and Addis Ababa city and other regions of country were affected. Between 17 and 23 August (34th epidemiological week), a total of 2,330 new cases of AWD and 22 deaths with 0.9 per cent case fatality rate have been reported from 61 woredas and 10 sub-cities in Addis Ababa, Afar, Amhara, Somali, Oromia and SNNPR regions (11). A single confirmed AWD case is considered as an outbreak in Ethiopia(12). The outbreak of AWD in Addis Ababa started in June 2016 and it was laboratory confirmed by culture. All the ten sub cities have reported cases. Yeka sub city was reported the first confirmed case on 10 June 20 16. On July 13 all woredas of the sub city was affected and the cumulative number of cases reported was 233 with two deaths (CFR 0.8%). Despite the response like case management, health promotion on Water Sanitation and Hygiene (WASH) and surveillance interventions started, the number of cases was increased. The onset of the rainy season, large scale population movements in and out of Addis Ababa city, may increases the potential of further spread of the disease. Investigating of any outbreak timely may provide relevant information for taking immediate action and improving long-term disease prevention activities. The finding of this study can provide relevant information on risk factors and exposed groups to districts outbreak response team to control outbreak early. Also policy makers and Program implementers may use the output of this study as an input to manage future similar outbreak. The aim of this study was to describe AWD cases epidemiologically and to identify factors associated with it in woreda 8-13 districts of Yeka sub city, Addis Ababa, Ethiopia.

METHODS AND MATERIALS

Study Area and Period

The study was conducted in woreda 8-13 districts of Yeka sub city, Addis Ababa Ethiopia. Yeka sub city is one of the ten sub cities of Addis Ababa city Administration and located at

northeastern part of the city. The sub city consists of 13 woredas/districts administratively and there are 13 health centers, 67 private clinics and 5 private hospitals. Based on the 2007 population census of Ethiopia Yeka sub city has estimated total population of 423316 by year of 2016.

Study Design and population

Health facility based case control study was undertaken to identify factors associated with AWD infection in woreda 8-13 districts of Yeka sub city, Addis Ababa, Ethiopia. The study Population for cases were all AWD cases in woreda 8-13 districts of Yeka sub city sought at Cholera Treatment Center (CTC) during the study period. The study Population for controls were all healthy individuals (free from AWD infection) living in district 8-13 of Yeka sub city.

All laboratory (RDT) confirmed and admitted AWD cases were included as a case while all healthy individuals (free from AWD infection clinically) who are above five years of age were included as a control. Suspected AWD cases, age below five years and those who were unable to respond during interview due to severe illness were excluded from the study. Also controls who had recently recovered from AWD infection were excluded from the study.

Case Definition

Cases were defined according to WHO standard case definition as adopted by the Ethiopian Minister of Health(12).

Case: is a person/patient who has sign and symptoms of cholera infections which can be suspected or confirmed

Suspected case: Any person 5 years of age or more with profuse acute watery diarrhea and/ or vomiting

Confirmed case: A suspected case in which *Vibrio cholera* O1 or O139 has been isolated from their stool by RDT or culture test.

Acute Watery Diarrhea: is simplified community level case definition given to cholera and is defined as any person 5 years of age or more with profuse acute watery diarrhea and vomiting.

Controls: are persons living in the same districts/neighborhood of a case but who had not suffered cholera until the date of the interview.

Sample Size and Sampling Procedure

Sample size was calculated based on sample size calculation for unmatched case control study design using EpiInfo Statcalc by taking the following assumptions: 95% confidence interval, 80%

power, odd ratio (0.27) and proportion of exposed controls (34.7) referred from the study conducted in Ethiopia Afar region. The ratios of cases to controls were one to one (1:1) and the final total sample size was 116 of 58 cases and 58 controls. All new laboratory confirmed AWD cases fulfilling the eligibility criteria were selected from CTC conveniently while Controls were selected randomly from the community. First house hold neighbor to the cases home were selected conveniently. Then one control was selected from family members of the selected household randomly.

Data Collection and Analysis

Following the selection of respondents and receipt of informed verbal consent, cases and control subjects were assessed using the structured questionnaire. The questionnaire has certain variables related to socio-demographic information, water exposure, food exposure, environmental sanitation and personal hygiene information that was collected by Principal investigator.

Data was entered to EPI info version 7.1 and transferred to SPSS version 21 software for analysis. Univariate descriptive analysis like frequency, percentages and graphs were performed. The associations between risk factors and infection among cases and controls were analyzed using logistic regression and expressed as Crude Odds Ratios (COR) during Bivariate analysis. Variables whose p-value were ≤ 0.2 and other variables that are considered to be important were included in multivariable analysis. Finally those significantly associated risk factors with AWD infection at $P < 0.05$ were explained with Adjusted Odd Ratio (AOR) and CI.

Study variables

AWD Infection status were dependent variable while age, sex, occupations, water source for domestic and drinking, water treatment, holly water exposure, raw meat, vegetables & fruits, eating outside, hand washing habit, latrine access and AWD contact history were independent variables.

Ethical Consideration

Addis Ababa City Administration Health Bureau (AACAHB) wrote first official letter of co-operation to Yeka Sub city health office and permission to conduct the study was obtained from health office. During the visit to both cases and controls, the purpose of the study explained to all eligible subjects and their verbal consent obtained by principal investigator. Also respondents were introduced that their confidentiality is respected and they have told that the right to stop or

not to answer to the question if they need. Variables are not contain the name of the study subjects (cases) which will address concern of the study subject privacy.

RESULT

Description of Socio Demographic Characteristics of Respondents

A total of 116 respondents' (58 cases and 58 controls) were recruited. Male sex accounts 57(50.9%) of total respondents, 25(43.1%) among controls and 34(58.9%) among cases. The minimum and maximum ages were 6 and 80 respectively with mean age of 35.85(SD-15.7) years. The mean age among controls and cases were 33.3(SD-13.7) and 38.3(SD-17.2) respectively. The age category 15-44 years accounts 85(73.3%) of total respondents, 45(77%) of controls and 40(69%) of cases. From total respondents house wives occupation accounts 26 (22.4%) followed by 20 (17.2%) daily laborers. The highest proportion of occupations were daily laborers 15(25.9%) among cases and house wives 13(22.4%) among controls (table 19).

Table 19 socio demographic characteristics of respondents by study group at 8-13 districts of Yeka sub city, 2016.

Socio demographic variables		AWD status		
		control	Case	total
sex	male	25(43.1%)	34(58.9%)	57(50.9%)
	female	33(56.9%)	24(41.1)	55(49.1%)
age categories	5-14 year	1(1.7%)	1(1.7%)	2(1.7%)
	15-44 year	45(77.6%)	40(69%)	85(73.3%)
	above 45	12(20.7%)	17(29.3%)	29(25%)
occupation	civil servant	11(19%)	6(10.7%)	17(14.7%)
	daily laborer	5(8.6%)	15(25.9%)	20(17.2%)
	house wife	13(22.4%)	13(22.4%)	26(22.4%)
	merchant	11(19%)	10(17.2%)	21(18.1%)
	retire	6(10.3%)	8(13.8%)	14(12.1%)
	other	12(20.7%)	6(10.3%)	18(15.5%)
district name	woreda 8	9(15.5%)	9(15.5%)	18(15.5%)
	woreda 9	5(8.6%)	5(8.6%)	10(8.6%)
	woreda 10	10(17.2%)	11(19%)	21(18.1%)
	woreda 11	7(12.1%)	7(12.1%)	14(12.1%)
	woreda 12	13(22.4%)	12(20.7%)	25(21.6%)
	woreda 13	14(24.1%)	14(24.1%)	28(24.1%)

About 28(24.1%) of the study participant were from districts of woreda 13 followed by 25(21.6%) in woreda 12. Woreda 13 and 12 districts account about 14(24.1%) and 12(20.7%) of cases respectively (table19). Woreda 10 district were the most affected wereda with highest attack rate 4(figure18)

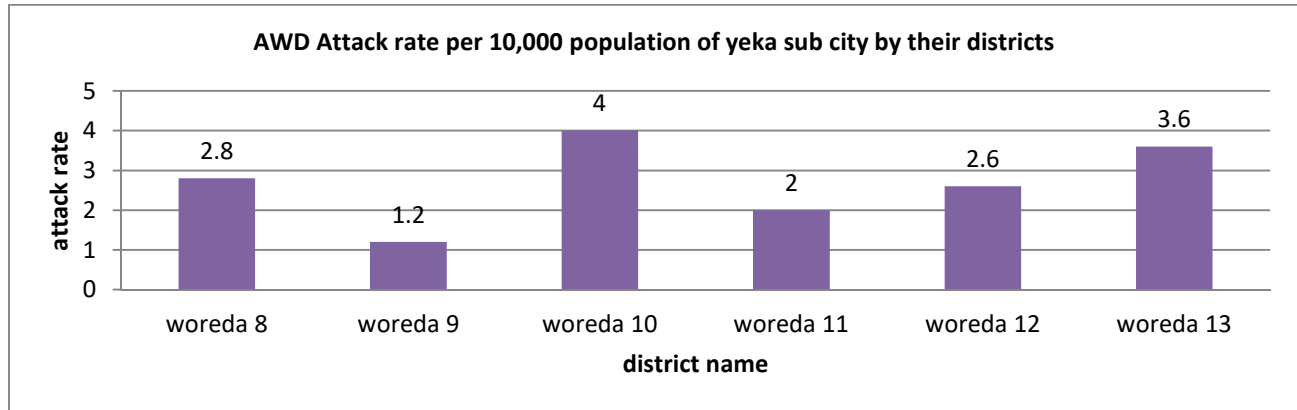


Figure18 AWD attack rate by districts name of Yeka sub city, July 2016

Date of onset of illness for recruited cases ranges from July 17 to August 3/2016. Three peaks of outbreak were seen during this period on July 20, 26 and On August 1/2016 with 6 cases reported on each day (figure 19). The epidemic curve graph below shows that there are multiple peaks that happened in different incubation period, which give a clue of propagated source of infection in this outbreak.

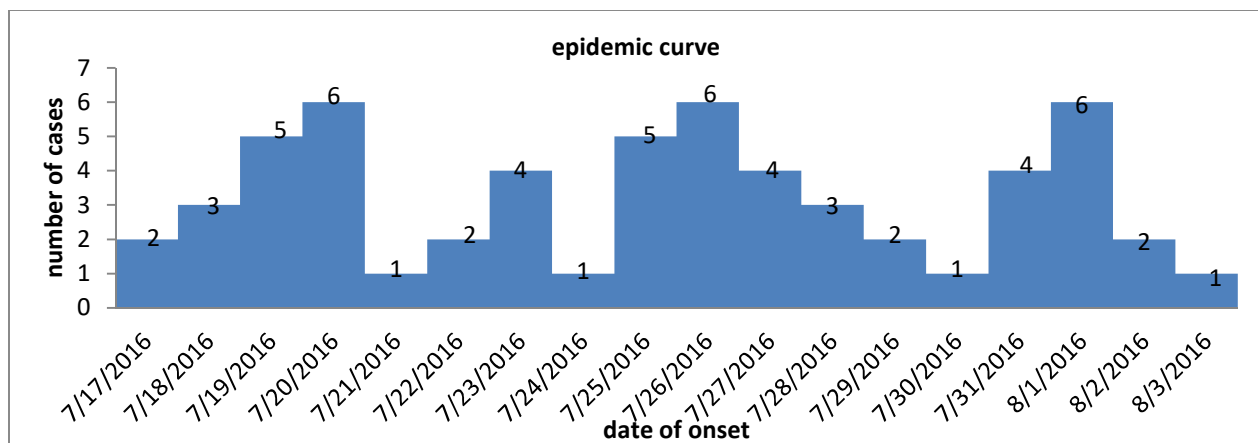


Figure 19 Epidemic curve for AWD outbreak in woreda 8-13 districts of Yeka sub city from July 17 to August 4/2016.

Description of Water, Food and Beverage Exposure patterns of Respondents

Common piped water was used by 82 (70.7%) and 80(72.2%) of respondents for drinking and domestic purposes respectively. it was used for drinking purpose by 46(80%) cases and 37(63.7%) of controls. Water treatment before use were performed by 53(45.7%) of respondents, 39(67.2%) of controls and 14(24.1%) of cases. About 86(74.1%) of respondents, 45(77.6%) of cases and 41(70.7%) of controls buy their food from local market. Eating food outside to their home in the past five days were performed by 63(54.3%) of respondents, 43(74.1%) of cases and 20(34.1%) of controls while, Raw meat and vegetable or fruit were eaten by 34(29.3%) and 38(32.8%) of respondents respectively. Half of cases 29(50%) and 5(8.6%) of controls ate raw meat in the past five days before onset of illness (table 20).

Table 20 water, food and beverage exposure patterns of respondents in the past five days by study group at woreda 8-13 districts of Yeka sub city, 2016

water exposure related variables	AWD status		
	control	case	total
Water source for domestic use			
Household piped	17(29.3%)	7(12.1%)	24(20.7%)
Common piped	37(63.8%)	45(77.6%)	82(70.7%)
Non piped water	4(6.9%)	6(10.3%)	10(8.6%)
Water source for drinking			
Household piped	13(22.4%)	5(8.8%)	18(15.7%)
Common piped	37(63.8%)	46(80.7%)	80(72.2%)
Non piped water	8(13.8%)	6(10.5%)	14(12.2%)
Water treatment before use in past 5days			
Yes	39(67.2%)	14(24.1%)	53(45.7%)
No	19(32.8%)	44(75.9%)	63(54.3%)
If yes, how you treat water			
Filter	1(2.6%)	0	1(1.9%)
Boiling	3(7.7%)	5(35.7%)	8(15.1%)
Aqua tab	14(35.9%)	2(14.3%)	16(30.2%)
Water guard	21(53.8%)	7(50%)	28(52.8%)
Holy water exposure			
Yes	8(13.8%)	6(10.8%)	14(12.1%)
No	50(86.2%)	52(89.7%)	102(87.9%)
Where did you get/buy food			
Local market	41(70.7%)	45(77.6%)	86(74.1%)
Supermarket	17(29.3%)	13(22.4%)	30(25.9%)
Eating food outside in the past 5 days			
Yes	20(34.5%)	43(74.1%)	63(54.3%)
No	38(65.5%)	15(25.9%)	53(45.7%)
If yes where you eat			
Hotel	8(40%)	11(25.6%)	19(30.2%)
Restaurant	6(30%)	19(44.2%)	25(39.7%)
Cafeteria	4(20%)	5(11.6%)	9(14.3%)
Street vendor	2(10%)	8(18.6%)	10(15.9%)
Food item eaten in the past five days			
Vegetables and fruits	19(32.8%)	19(32.8%)	38(32.8%)
Raw meat	5(8.6%)	29(50%)	34(29.3%)
Other	34(58.2%)	10(17.2%)	44(37.9%)
Eating cold/leftover food in Past 5 days			
Yes	0	2(3.4%)	2(1.7%)
No	58(100%)	56(96.6%)	114(98.3%)
Drink locally soft drink in past 5 days			
Yes	1(1.7%)	5(8.6%)	6(5.2%)
No	57(98.3%)	53(91.4%)	110(94.8%)

Description of Environmental Sanitations and Hygiene of Respondents

Environmental sanitation and personal hygiene of respondents are shown in Table 21. Majority 112(96.6%) of the respondents, 56(96.6%) of cases and 56(96.6%) of controls have latrine access. About 61(73%) and 31(27.7%) of this latrine were common and private respectively. Three fourth 87(75%) of respondents, 39(67.2%) of cases and 48(82.8%) of controls answered that they wash their hands with soap before meal. Half 57(50.9%) of respondents, 12(21.4%) of cases and 45(80.4%) of controls wash their hands with detergents after toilet. Only 5 (8.6%) of cases have contact history with known AWD infection in the past five days (table 21).

Table 21 Environmental sanitation and hygiene of respondents by study group at woreda 8-13 districts of Yeka sub city, 2016

sanitation and hygiene related variables		AWD status		
		control	case	total
latrine access	yes	56(96.6%)	56(96.6%)	112(96.6%)
	no	2(3.4%)	2(3.4%)	4(3.4%)
is your latrine communal or private	common	36(64.3%)	45(80.4%)	61(72.3%)
	private	20(35.7%)	11(19.6%)	31(27.7%)
regular hand wash with detergent before meal	yes	48(82.8%)	39(67.2%)	87(75%)
	no	10(17.2%)	19(32.8%)	29(25%)
regular hand wash with detergent after toilet	yes	45(80.4%)	12(21.4%)	57(50.9%)
	no	11(19.6%)	44(78.6%)	55(49.1%)
how you dispose your domestic solid waste	open dump	4(6.9%)	5(8.6%)	9(7.8%)
	open pit	2(3.4%)	1(1.7%)	3(2.6%)
	by collector	52(89.7%)	52(89.7%)	104(89.7%)
contact history with known AWD in past five days	yes	0	5(8.6%)	5(4.3%)
	no	58(100%)	53(91.4%)	111(95.7%)

Factors Associated with AWD infection

Predictors of AWD infection are presented in table 22 below. Those variables with P-value ≤ 0.2 on Bivariate analysis and some important variables were entered to the multivariate Analysis. Multivariate logistic regression was done to identify their associations with AWD infection after adjusted for socio-demographic and other related variables. Then those variables with P-value ≤ 0.05 on multivariate analysis were considered as associated factors for AWD infections

Table 22 risk factors associated with AWD infection at woreda 8-13 districts of Yeka sub city, 2016

Variables	Controls N (%)	Cases N (%)	Crude OR (95% CI)	Adjusted OR (95 CI)
sex			p-0.096	p-0.98
male	25(43.1%)	34(58.9%)	1.87(0.89, 3.9)	0.98(0.25, 3.74)
female	33(56.9%)	24(41.1)	1	1
water treatment before use			p-0.001	p-0.02
yes	39(67.2%)	14(24.1%)	0.15(0.07, 0.35)	0.23(0.06,0.81)*
no	19(32.8%)	44(75.9%)	1	1
food item eaten in the past 5 days			p-0.001	p-0.002
vegetable and fruit	19(32.8%)	19(32.8%)	3.4(1.3, 8.78)	1.72(0.4, 6.75)
raw meat	5(8.6%)	29(50%)	19.7(6.04, 64.3)	13.9(3, 63.87)*
other	34(58.2%)	10(17.2%)	1	1
eating food outside in the past 5days			p-0.001	p-0.035
yes	20(34.5%)	43(74.1%)	5.44(2.4, 12.1)	3.8(1.09, 13.45)*
no	38(65.5%)	15(25.9%)	1	1
latrine type			p-0.06	p-0.612
common	36(64.3%)	45(80.4%)	2.2(0.96, 5.3)	0.71(0.19, 2.66)
private	20(35.7%)	11(19.6%)	1	1
regular hand washing before meal			p-0.057	p-0.91
yes	48(82.8%)	39(67.2%)	0.42(0.17, 1.02)	0.90(0.29, 3.0)
no	10(17.2%)	19(32.8%)	1	1
regular hand washing after toilet			p-0.001	p-0.040
yes	45(80.4%)	12(21.4%)	0.06(0.02, 0.16)	0.04(0.009,0.18)*
no	11(19.6%)	44(78.6%)	1	1

*significant at level of $p < 0.05$

Accordingly, water treatment before use (AOR=0.23, 95% CI=0.06-0.81), raw meat food item consumption in the past five days (AOR=13.9, 95% CI=3.04-63.8), eating food outside your home in the past five days (AOR=3.8, 95% CI=1.09-13.45) and regular hand washing with detergents after toilet (AOR=0.04, 95% CI=0.009-0.18) was significantly associated with AWD infection.

DISCUSSION

This study revealed that AWD infection outbreak that happened in woreda 8-13 districts of Yeka sub city had affected males (58.9%) than females and 15-44 age categories (69%). This may be due to that they are adults who are taking responsibility of their homes and moving outside for works which may increase their exposure to the disease through consumption of food from poor hygiene area. Also this idea is supported with highest proportion of occupation among cases were daily laborers (25%) who works mostly moving from place to place and living in low socio-economic status. This result is similar with the study conducted in Ethiopia Afar region that states about 82% of males, 78.3% of 15-44 year age category and most of the respondents were daily laborers(9). Also study conducted in Malawi shows that (95%) of cases were male and Patients' age ranged from 7 to 70 years with 93% in 15-44 age category(7). The attack rate of the districts of the sub city is variable with high attack rate happening in woreda 10 and 13 districts. Small attack rate was happened in woreda 9. The difference could happen due to difference in population size, socio-economic status, environmental sanitation and difference to response activities at district levels. The epidemic curve graph shows that there are multiple peaks that happened in different incubation period, which give a clue of propagated source of infection in this outbreak. This may be happen due to that there might be multiple possible source of infection and delayed identification of it resulting in favoring the transmission of the disease.

Our study also tried to identify an association with AWD infections and factors related with variables of water exposure, raw food items consumption, environmental or personal hygiene and socio demographic data. Accordingly all most all respondents of both cases and controls uses piped water may be communal and private and there were only 3% of respondents who were used non piped water in the last five days preceding time of data collections. In addition to this using non piped water didn't show association in our study as the study conducted in Kenya shows association(6). Water treatment before use was significantly associated with AWD infections with (AOR=0.23, 95% CI= 0.06 to 0.81) and those who treat water before use were 77% less likely to have AWD infections than those who did not treat the water. This is similar with the study conducted in Ethiopia Afar region showing that there is an association of water treatment before drink and AWD infection with p-value of 0.03. Even though, most of the rivers that are around the city of Addis Ababa were confirmed with laboratory to have cholera, tap water (piped water) were not confirmed with laboratory to support these evidence. Since majority of the respondents

uses piped water the association may be due to that water contamination may happen at home during storage and use even though it is piped water.

Raw meat food consumption in the last five days preceding to onset of illness was significantly associated with AWD infection with (AOR=13.9, 95% CI =3.04 to 63.8). Those who ate raw meat in the last five days preceding to onset of illness were 13.9 times more likely to have AWD infections than those who did not ate raw meat. Contamination of meat might be happened exogenously during processing, cooking, storage or consumption. Also washing of the meat products with contaminated water or storing in contaminated materials may cause cross contamination. So eating raw meat without proper cooking to kill bacteria may increase risk of infection. This is supported with the study that shows association of AWD infection with raw food consumption like raw or undercooked fish and sea food(3,13). However, other studies have showed that eating raw food like vegetables and fruit showed an association with cholera infection and our study didn't show it(3). Also eating outside the home or from hotels and others in the past five days was significantly associated with AWD infection (AOR=3.8, CI=1.09 to 13.45). Those who ate outside to their home in the last five days preceding to onset of illness were 3.8 times more likely to have AWD infection than those who did not ate outside.

The other risk factor that was significantly associated with AWD infection was the habit of regular hand washing after toilet (AOR =0.04, 95% CI 0.009 to 0.18). Those respondents who regularly wash their hands with detergents after toilet were 99.96% less likely to have AWD infection than those who do not wash their hands regularly with detergents after toilet. These implies that the odd ratio was very small that majority of respondents or cases did not wash their hands with soap regularly and those who wash their hands irregularly and without soap were not considered. This result is similar with the study conducted in Ethiopia Afar region AWD outbreak investigation in 2009 which shows association with p-value 0.03(9). Consumption of vegetables and fruit shows significant association in bivariate analysis and become insignificant during multivariable analysis. The comparative nature of the study with appropriate sample size and using of laboratory confirmation for cases are the strength of this study. Absence of environmental laboratory investigations to identify possible source of AWD infection and conduction of the study during the outbreak causes difficult to design and collect data comprehensively were limitation of this study.

CONCLUSSION: This study revealed that AWD infection outbreak happened in woreda 8-13 districts of Yeka sub city had more affected males and 15-44 year age category. Water treatment

before use, consumption of raw meat in the past 5 days, eating food outside in the past five days and regular hand washing with detergent after toilet were significantly associated with AWD infection.

RECOMMENDATION: The district health office, sub city health office and AACAHB should mobilize the whole community on WASH proper hand washing after latrine, before meal and other environmental sanitations activities. They should mobilize and educate the whole community not to consume raw foods like raw meat and not to eat food outside. The community should treat water before domestic use or before drink to decrease cross contamination.

ACKNOWLEDGEMENT: We would like to acknowledge Saint Paulo's Hospital Millennium Medical College (SPHMMC), Addis Ababa City Administration Health Bureau (AACAHB), Yeka sub city health Office for their support and giving us opportunity to investigate this study. In addition, we want to thank those study participants, cholera case management team and other stakeholders for their support during outbreak investigation and response.

REFERENCES

1. Health E. Guideline on CHOLERA OUTBREAK MANAGEMENT Ethiopia.
2. Repub- D. Weekly epidemiological record Relevé épidémiologique hebdomadaire. 2012;(31):289–304.
3. Moradi G, Rasouli MA, Mohammadi P, Elahi E, Barati H. A cholera outbreak in Alborz Province , Iran : a matched case- control study. 2011;1–6.
4. Jutla A, Whitcombe E, Hasan N, Haley B, Akanda A, Huq A, et al. Environmental Factors Influencing Epidemic Cholera. 2013;89(3):597–607.
5. Xu M, Cao C, Wang D, Kan B. Identifying Environmental Risk Factors of Cholera in a Coastal Area with Geospatial Technologies. 2015;354–70.
6. Stoltzfus JD, Carter JY, Akpinar-elci M, Matu M, Kimotho V, Giganti MJ, et al. Interaction between climatic , environmental , and demographic factors on cholera outbreaks in Kenya. 2014;1–9.
7. Khonje A, Metcalf CA, Mlozowa DD, Akesson A, Corbet T. Cholera outbreak in districts around Lake Chilwa , Malawi : Lessons learned. 2012;24(June):29–33.
8. Access O. High case fatality cholera outbreak in Western Kenya, August 2010. 2013;8688(August 2010):1–7.
9. Beyene BB, Tumato M, Abera B, Maskai O, Luce R. Epidemiology of Acute Watery Diarrhea Outbreak and Challenges of Control — Afar , Ethiopia , 2009 Epidemiology of Acute Watery Diarrhea Outbreak and Challenges of Control — Afar , Ethiopia , 2009.

2016;(October 2014).

10. Bwire G, Munier A, Ouedraogo I, Heyerdahl L, Komakech H, Kagirita A, et al. Epidemiology of cholera outbreaks and socio- economic characteristics of the communities in the fishing villages of Uganda : 2011-2015. 2017;2011–5.
11. AWD Affects Ten Sub-cities in Addis Ababa. :330.
12. Public Health Emergency Management. 2012;
13. Rabbani GH, Iii WBG. Food as a Vehicle of Transmission of Cholera. 1999;17(1):1–9.

CHAPTER VI-ABSTRACT FOR SCINTIFIC PRESENTATIONS

6.1 YEKA SUB CITY MEASLES SURVEILLANCE DATA ANALYSIS OF 2010 TO 2014- ADDIS ABABA, ETHIOPIA 2016

ABSTRACT

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Title: Yeka sub city measles surveillance data analysis of 2010 to 2014- Addis Ababa, Ethiopia 2016

Background-Measles is an acute, contagious and vaccine preventable viral disease caused by measles virus. It causes morbidity and mortality among children worldwide especially in developing countries like Ethiopia. This study attempts to describe the epidemiology of Yeka sub city measles cases reported in between 2010 to 2014, and ultimately contribute to design a better intervention and control programme.

Methods-We conducted descriptive cross sectional study on measles surveillance data of 2010-2014. We used National Measles guideline for case definitions and classification. Selected variables from measles surveillance database were analyzed using SPSS version 21 and Microsoft excel.

Result-A total of 337 cases were reported in 2010-2014 and about 34.1% were reported from woreda 5. Male accounts 54% and 37.3% of cases were in 1-4 years age group. Higher cumulative incidence of 21.9 per 100,000 populations per year was reported in 2014. About 11.9% of cases were not vaccinated and 42.5% with unknown vaccination status. The sub cities measles vaccine coverage was 85% and 77% while numbers of cases were 59 and 93 in 2010 and 2014 respectively. The highest number of cases reported during March 16.6% and May 14.2%.

Conclusion- The cumulative incidence of measles cases were increased during 2010-2014. The age group 1-4 years and male were mostly affected group. Measles immunization coverage was low and higher transmissions of measles were seen during dry windy seasons of winter and autumn. Sub city health office should improve measles immunization coverage and further investigation is needed for seasonal transmission and causes for mostly affected groups.

KEY WORDS: Measles epidemiology, IgM antibody, surveillance data, Yeka sub city, Addis Ababa.

6.2 ACUTE WATERY DIARRHEA OUTBREAK INVESTIGATION IN WOREDA 8-13 DISTRICTS OF YEKA SUB CITY, ADDIS ABABA, ETHIOPIA 2016

ABSTRACT

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Title: Acute watery diarrhea outbreak investigation in woreda 8-13 districts of Yeka Sub city, Addis Ababa, Ethiopia 2016

Background-Cholera remains a major public health threat of developing countries including Ethiopia according to World Health Organization report of 2016. Yeka sub-city was reported the first Acute Watery Diarrhea (AWD) case in June 2016 and in July 2016 all woredas of the sub-city was affected, despite the response had started. The information obtained from this study helps to control the outbreak and can be utilized to manage future similar outbreaks.

Objective-To identify factors associated with AWD infection and describing cases epidemiologically in woreda 8-13 districts of Yeka sub-city, Addis Ababa, 2016

Methods-health facility based case control study was conducted in woreda 8-13 districts of Yeka sub-city, from July to August 5/2016 on 58 cases and 58 controls. National AWD case definition was used to select cases conveniently from Cholera Treatment Center. Controls were selected from community randomly. Principal investigator collected data using written questionnaires. Data was entered to EpiInfo version 7.1 and transferred to SPSSversion21software for analysis. Logistic regression analysis was performed and Variables with p-value of ≤ 0.05 were considered to be significantly associated with AWD infection.

Result: Male accounts 25(43.1%) among controls and 34(58.9%) among cases. The mean age of controls were 33.3(SD=13.7) and 38.3(SD=17.2) in cases. The age category 15-44 years accounts 85(73.3%) from total respondents and 40(69%) among cases. Water treatment before use (AOR=0.23, 95% CI=0.06-0.81), raw meat food item consumption in the past five days (AOR=13.9, 95% CI=3.04-63.8), eating food outside your home in the past five days (AOR=3.8,

95% CI=1.09-13.45) and regular hand washing with detergents after toilet (AOR=0.04, 95% CI=0.009-0.18) were significantly associated with AWD infection.

Conclusions- males and 15-44 year age category were the most affected group. Consumption of raw meat in the preceding 5 days of illness, eating outside, water treatment before use and regular hand washing after toilet were significantly associated factors. The district and sub-city health bureau should mobilize and educate the community on proper hand wash after latrine, not to consume raw foods like raw meat, not to eat out side and to treat water before use.

Key words-AWD, outbreak, Yeka sub city, Addis Ababa

CHAPTER VII-PUBLIC HEALTH EMERGENCY MANAGEMENT WEEKLY BULLETIN

7.1 WEEKLY EPIDEMIOLOGIC BULLETIN OF YEKA SUB CITY WEEK 10/2017

Highlights of the week

- Yeka sub city surveillance report completeness rate and timeliness is 96%
- Number of typhoid fever cases was 608 while number of epidemic typhus was 405
- Number of dysentery cases was 51 and number of total malaria cases were 10
- Numbers of measles cases were 6, reported from 4 woredas and there were a zero cases of all the rest of immediately reportable disease.

Introduction

This epidemiological weekly bulletin serves to provide key information on public health emergency management activities, and summarizes surveillance data and performance on epidemic prone diseases and other public health emergencies. The bulletin mainly includes surveillance data of week 10 of 2017 received through email, phone call and line list reports. It highlights the surveillance completeness and timeliness across all health facilities (governmental health centers and private clinics) within the woredas of the sub city, trends of diseases under surveillance, cluster of cases and events, ongoing outbreaks and responses undertaken at all levels in the sub city. But in this week there were no outbreak reported.

Surveillance report completeness and timeliness: the sub city surveillance report completeness and timeliness from both governmental and private health facility is 96% which is similar with previous week. Except woreda 4 all woredas of the sub city had completeness rate and timelines above 80% as shown (figure 20).

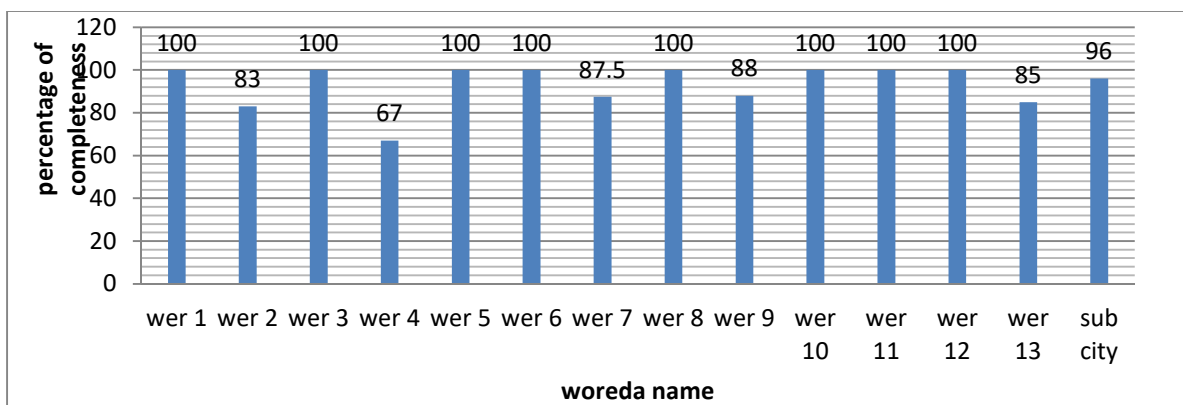


Figure 20 surveillance data report completeness and timeliness by woredas of Yeka sub city, in week 10, Addis Ababa, 2017

Diseases and conditions

Typhoid fever: a total of 608 typhoid cases were reported in week 10 of 2017. Number cases were increased when compared with the previous week (558). Fifty seven percent of typhoid cases were reported from four woredas (1, 9, 12 & 13) as shown in figure below.

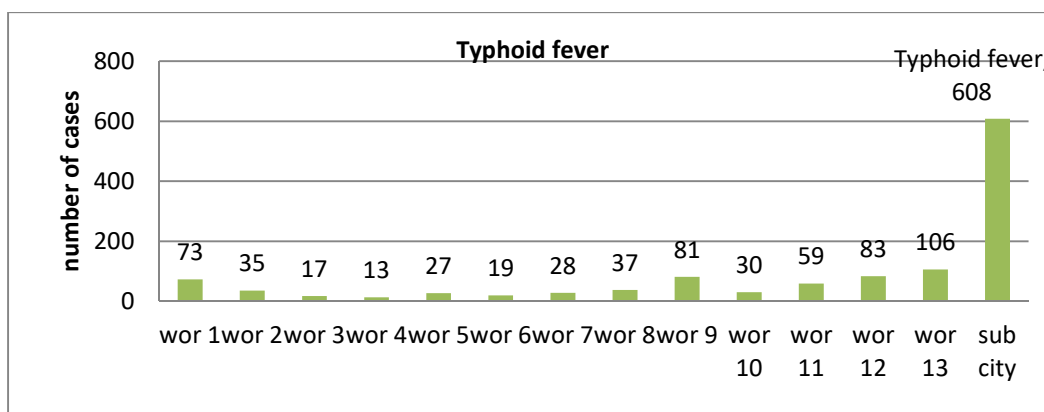


Figure 21 typhoid fever cases by weredas of Yeka sub city in week 10 / 2017

Epidemic typhus: a total of 405 epidemic typhus cases were reported in week 10 of 2017. Number cases were increased when compared with the previous week (342). Woreda 2, 9 & 10 had reported the higher cases (45%) as shown in figure below.

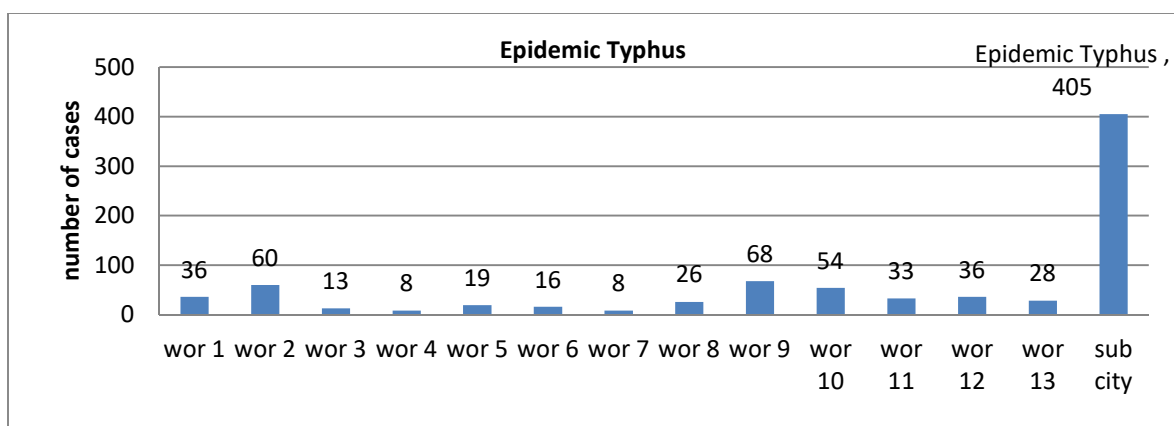


Figure 22 epidemic typhus cases by woredas of Yeka sub city in week 10 /2017

Dysentery: the number of dysentery cases reported in week 10/2017 was 51. it was increased from previous week which was 39 cases only. Woreda 6 and 7 had reported higher cases while woreda 1, 3, 4, 5 and 6 reported zero cases as shown in figure below.

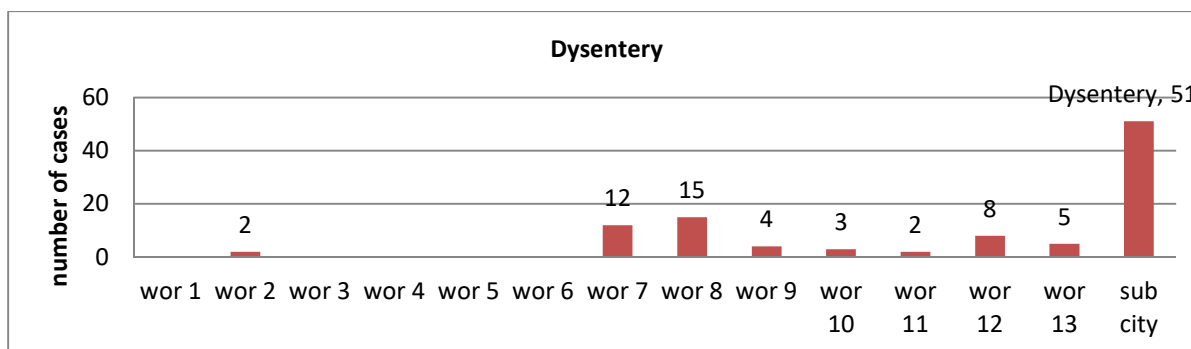


Figure 23 dysentery cases by woredas of Yeka sub city in week 10 /2017

Malaria: The total numbers of malaria cases reported in week 10 were 10. Number cases was similar with the previous week (10) and 70% reported cases were plasmodium vivax species.

SAM/ malnutrition: A new case of severe acute malnutrition reported during week 10 was two which was reported from wereda 10.

Measles: six new suspected measles cases were reported from different four weredas of the sub city in week 10/2017. All cases were not confirmed and it was not related to outbreak.

Others: there are no other immediately reportable diseases, cluster of cases and other events reported during this week.

Recommendations

- The aggregated completeness and timeliness of reporting rates for health facilities should be closely monitored

- It is better to perform active search on regular basis to cross check the data reported from health facilities
- It is better to give sensitization training for health center PHEM focal persons on cases reporting and cases definitions so that relevant data will be obtained
- Typhoid fever, epidemic typhus and dysentery cases reported in week 10 shows increments from previous week, so it is better to cross check/do active search the specific reporting health facilities for reliability of the report or checking validity of the laboratory.

7.2 WEEKLY EPIDEMIOLOGIC BULLETIN OF YEKA SUB CITY WEEK 11/ 2017

Highlights of week 11 (march 13-19/ 2017)

- Yeka sub city surveillance report completeness rate and timeliness is 96%
- number of typhoid fever cases was 555 while number of epidemic typhus was 405
- number of dysentery cases was 51 and number of total malaria cases were 10
- number of measles cases were 3 reported from 2 weredas
- There were a zero cases of all the rest of immediately reportable disease.

Introduction

This epidemiological weekly bulletin serves to provide key information on public health emergency management activities, and summarizes surveillance data and performance on epidemic prone diseases and other public health emergencies. The bulletin mainly includes surveillance data of week 11 of 2017 received through email, phone call and line list reports. It highlights the surveillance completeness and timeliness across all health facilities (governmental health centers and private clinics) within the weredas of the sub city, trends of diseases under surveillance, cluster of cases and events.

Surveillance report completeness and timeliness: the sub city surveillance report completeness and timeliness from both governmental and private health facility is 96% which is similar with previous week. Except woreda 4 all weredas of the sub city had completeness rate and timelines above 80% (see the figure 24 below).

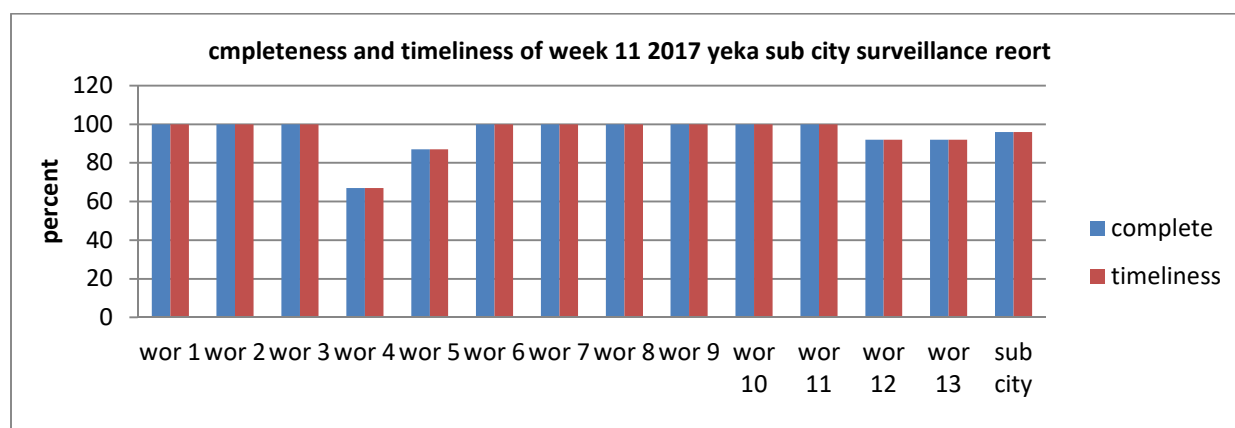


Figure 24 surveillance data report completeness of Yeka sub city by its woreda in week 11, Addis Ababa, 2017

Diseases and conditions

Typhoid fever: a total of 553 typhoid cases were reported in week 11. Numbers of cases were decreased when compared with the previous week (608). Fifty six percent of typhoid cases were reported from four woredas (1, 9, 11 & 13) (figure 25 below).

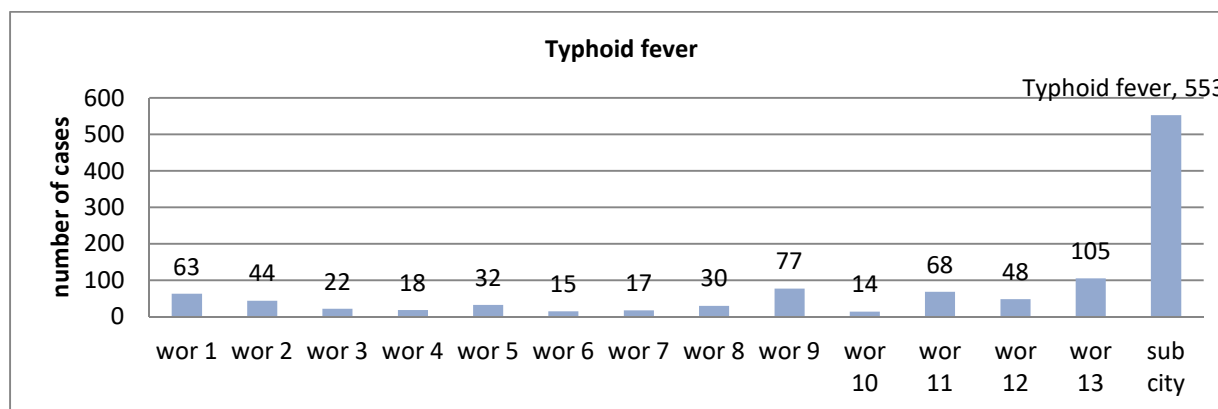


Figure 25 typhoid fever cases by woredas of Yeka sub city in week 11 / 2017

Epidemic typhus: a total of 417 epidemic typhus cases were reported in week 11 of 2017. Number cases were slightly increased when compared with the previous week (405). Woreda 2, 9 & 11 had reported the higher cases (36%) (See figure 26 below).

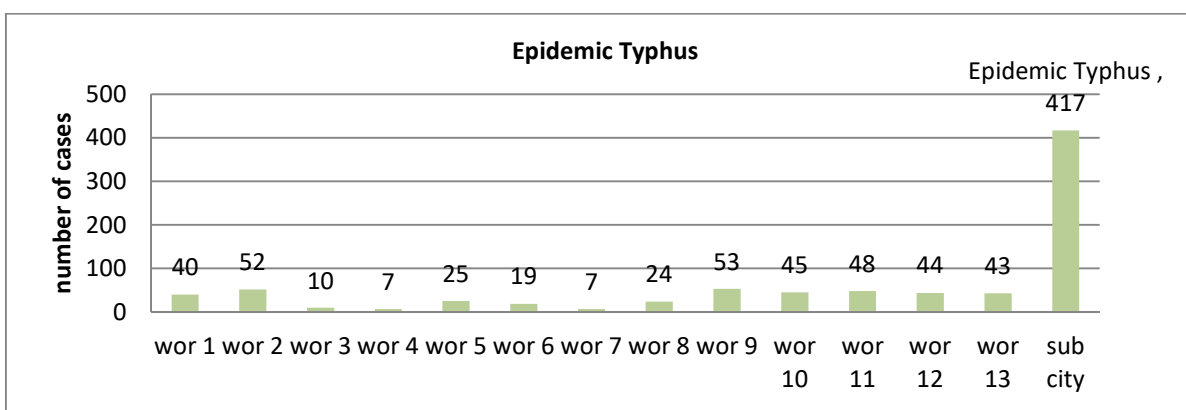


Figure 26 epidemic typhus cases by woredas of Yeka sub city in week 11 /2017

Dysentery: the number of dysentery cases reported in week 11/2017 was 56. It was increased from previous week which was 51 cases. Woreda 7 and 11 had reported higher cases while, woreda 1, 3, 4, and 5 reported zero cases (see figure 27 below).

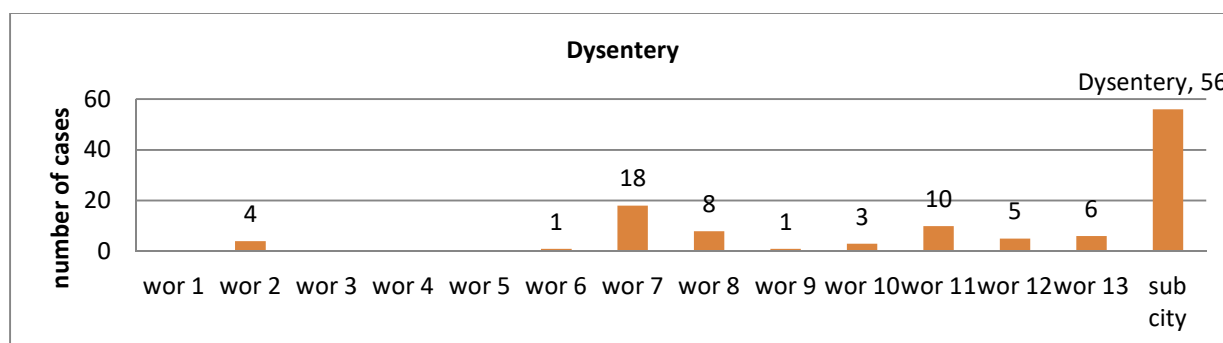


Figure 27 dysentery cases by woredas of Yeka sub city in week 11 /2017

Malaria: The total numbers of malaria cases reported in week 11 were 10. A number case was similar with the previous week (10 cases) and all reported cases were plasmodium vivax species.

SAM/ malnutrition: new cases of severe acute malnutrition (SAM) reported during week 11 was seven which was increased from previous week (2 cases).

Measles: three new-suspected measles cases were reported from two weredas of the sub city in week 11/2017. Cases were not confirmed and it was not related to outbreak.

Maternal death: there was one maternal death in this week reported from wereda 9 of the sub city. The resident of dead mother was from neighbor sub city (bole sub city) and death was happened during transfer from woreda 9 health center to Yekatit 12 hospital.

Others: there are no other immediately reportable diseases, cluster of cases and other events reported during this week.

Recommendations

- The aggregated completeness and timeliness of reporting rates for health facilities should be closely monitored
- It is better to perform active search on regular basis to cross check the data reported from health facilities
- It is better to give sensitization training for health center PHEM focal persons on cases reporting and cases definitions so that relevant data will be obtained

CHAPTER VIII-EPIDEMIOLOGIC RESEARCH REPORT

8.1 SURVIVAL AND ITS DETERMINANTS AMONG PROSTATE CANCER PATIENTS IN TIKUR AMBESSA SPECIALIZED HOSPITAL ADDIS ABABA ETHIOPIA 2017

ABSTRACT

Background: Prostate cancer incidence rate is faster growing with higher mortality in developing countries than developed countries and it is the most common cancer disease among men in both developed and developing countries. It is the 2nd most common cancer among men in Ethiopia and is the 4th cause cancer death in men. Few studies are conducted regarding to prostate cancer burden in Ethiopia. There is scarcity of information on survival time and its determinants' among prostate cancer patients in the country. Hence, this study tried to estimate, survival and its determinants among prostate cancer patients, which in turn enables us to understand the survival of the patient.

Objective: is to assess survival and its determinants among prostate cancer patients diagnosed during 2012-2016 at Tikur Ambessa specialized hospital (TASH) Addis Ababa, Ethiopia.

Methods: prostate cancer patients diagnosed at oncology department of TASH were followed retrospectively by using retrospective cohort study design. All newly diagnosed cases during 2012-2016 were included in the study through obtaining their medical record numbers from cancer registry. Data extraction was performed by oncologic nurses from all retrieved patient charts by using checklist. The current event status was taken through phone call. Collected data were entered, cleaned and edited by Epi info version 7.1 and transferred to SPSS version 21 for analysis. Kaplan Meir survival analyses with log rank test were used to estimate probabilities of survival and to test for the presence of difference in survival among categories of covariates. Independent variables, which became significant during Bivariate Cox regression analysis at 20% level of significance was included in Cox proportional model for multivariable analysis. Independent variables whose p value were less than 0.05 during multivariable Cox regression analysis were considered as being the determinants of prostate cancer survival.

Result: The median survival time was 30.7 months with overall survival of 22% at 5-years and 57% at 2-years. The five year survival rates for stage I, II, III and IV were, 83%, 61%, 16% and 0% respectively. The group of prostate cancer patients with distant metastasize and non metastasized have a five year survival of 0% and 44% respectively. Prostate cancer patients who

were treated with ADT have 27% survival at five years while those who did not treated with ADT have had 7% survival rates. The stage of cancer, metastasize status and ADT treatment categories of covariates have significant difference in survival with 0.0001, 0.001 and 0.03 p values. Then stage of cancer (AHR 6.9, CI: 1.81-26.7) and androgen deprivation therapy (AHR 0.48, CI: 0.23-0.99) become significant on the final Cox proportional hazard model.

Conclusions: The overall five year survival was 22% and covariates like stages of prostate cancer, distant metastatic status and ADT treatment modalities showed significant survival difference. Stages and ADT treatment modality were determinants of prostate cancer survival. In general our study shows poor survival or prognosis by late stage and treatments, indicating the key role of early detection and timely treatment for improving survival or reducing mortality from prostate cancer.

Key words: prostate cancer, survival, Ethiopia

8.1.1 INTRODUCTION

Background

Prostate is male sexual accessory gland located in front of the rectum surrounding the neck of the bladder and urethra. Its function is primarily to secrete prostatic secretions one component of seminal fluid that nourishes the sperm and its smooth muscles helps to expel semen during ejaculation. The prostatic secretion makes up 25% of seminal fluid and its major constituent is prostate specific antigen (PSA). PSA is glycoprotein produced by the prostate acinar cells and present in high concentrations in seminal fluid (0.5 - 2.0 mg/mL) but it has a much lower concentration in the blood (0 - 4 ng/mL). PSA is a widely used tumor marker since prostate cancer tissue releases approximately 10 times more PSA into serum than normal or benign prostatic hyperplasia tissue. Cancer is general term for diseases in which abnormal cells divide without control and can invade nearby tissues. Due to mutations in DNA, normal cells transformed into cancer cells that divide uncontrollably and disruption in maintenance of balance between proliferation and cell death happens. A cancer can be carcinoma that arises from epithelial tissues of the skin or lining cavity of organs or sarcoma that arise from mesenchymal tissue like bone, muscles and other connective tissues(1).

Prostatic adenocarcinoma is the most frequent form of prostate cancer and accounts for 90 to 95% of prostate cancer. It occurs in the epithelial cells lining the glandular organ of the prostate. In the early stages of prostate cancer, there are often no symptoms. Prostate cancer symptoms include frequent and difficulty in urination, blood in the urine, painful urination and difficulty of erection or painful ejaculation. If the cancer is advanced, it can spread to other organs, causing bone pain in the pelvis or ribs. Prostate tumors are only felt in a small percentage of cases during a digital rectal examination (DRE). Diagnosis of prostate cancer must be confirmed by a needle biopsy. According to American Joint Committee on Cancer(AJCC) Prostate cancer has 4 stages which uses TNM stage to evaluate extent of primary tumor (T), affected regional lymph node (N) and if it spread or metastases (M). In Stage I is only small non palpable part of prostate is affected, stage II if large part of prostate is affected, stage III if tumor involves beyond prostate and stage IV if it spread to far lymph nodes or organs. The Gleason Grading System is also grading prostate cancer where cancers are scored according to their appearance under a microscope. Gleason scores range from 2 to 10 where 10 has the poorest prognosis(2,3).

Statement of the problem

Cancer already constitutes a major public health burden globally. In 2015 alone, there were 17.5 million new cases and 8.7 million deaths from cancer worldwide and it was the second leading cause of death behind cardiovascular disease. Disability-Adjusted Life Year (DALYs) due to cancer were increased from 196.3 million in 2013 to 208.3 millions in 2015 globally. In 2013, Cancer caused 14.9 million incident cancer cases and 8.2 million cancer deaths. About 56% of incident cases, 62% of deaths, and 70% of DALYs occurred in developing countries. Between 1990 and 2013, absolute DALYs due to all cancers for both sexes increased by 29% globally, by 10% in developed countries, and by 40% in developing countries(4,5).

Worldwide, prostate cancer is rated the first most common cancer and fifth leading cause of cancer deaths among men, with over 1.6 million cases and 366,000 deaths estimated in 2015. Prostate cancer caused 6.3 million DALYs globally in 2015. It was the cancer with the highest incidence for men in 103 countries and the leading cause of cancer deaths for men in 29 countries. Between 1990 and 2013, Prostate cancer cases were increased by 217% globally, by 169% in developed countries, and by 361% in developing countries. Prostate cancer Age Standardized Incidence Rates (ASIR) are highest in Australia and Northern America (ASR 111.6 and 97.2 per 100,000, respectively), and in Western and Northern Europe (ASR 94.9 and 85 per 100,000), largely because the widespread practice of PSA testing and subsequent biopsy in those regions. Incidence rates are also relatively high in certain less developed regions such as the Caribbean (79.8), Southern Africa (61.7) and South America (60.1), but remain low in Asian populations, with estimated rates of (4.5-10.5). Prostate cancer incidence rates are still lower in developing countries than in developed countries, but because of a faster increase in rates in developing countries, the gap decreased between 1990 and 2013 from a 4-fold to a 3-fold difference(4–6).

The number of deaths from prostate cancer is larger in less developed regions (165,000) than in high developed regions (142,000). Mortality rates are generally high in populations of African descent (Caribbean, 29 per 100,000 and Sub-Saharan Africa, ASRs 19-24 per 100,000), intermediate in the Americas and Oceania, and very low in Asia (2.9 per 100,000). Prostate cancer incidence and mortality rates in Africa were reported to be 23.2 and 17.0 per 100,000, respectively in 2012(7). Reports show that higher incidence and mortality rates were observed in eastern African region at 23.3 and 18.7 per 100,000, compared to the average rates in northern African regions 10.6 and 7 per 100,000 populations respectively. With continued urbanization, population growth and increasing life expectancies in Africa, its burden is still expected to

increase. Similarly there is prevailing challenges like poor screening and diagnostics practices, treatment options, research and trainings, availability of population based cancer registration makes the burden prostate cancer in Africa to be underestimated or make difficult to know the exact burden of the disease(7–9). Reports from population based national cancer registry exploitation from neighbor countries like Sudan, Kenya and Uganda show that prostate cancer is the most incident cancer in men with 26.1, 9.4 and 37.1 per 100,000 population respectively(10). In Ethiopia Prostate cancer is the 3rd cancer in incident and 8th cause of cancer death in both sexes next to breast and cervical cancer in 2015 (4). According to Addis Ababa city population based cancer registry (AACCR) report in 2011 to 2014, prostate cancer is the third incident (11%) cancer in males next to colorectal cancer and leukemia indicating. AACCR is the only population based cancer registry in the country established in 2011 at Tikur Anbessa Specialized Hospital (TASH) and registering cases from the city only. Despite this seemingly disproportionate burden and the prevailing challenges, it is still quite difficult to describe the burden of Prostate cancer in the country(10,11). Few studies are conducted regarding to prostate cancer burden in Ethiopia. There is no data on the survival time and factors associated with it among prostate cancer patients in the country. Hence, this study was tried to estimate 5-year survival and its determinants among prostate cancer patients, which in turn enables to understand the quality and effectiveness of care or treatments introduced and to improve the survival.

Significance of the study

Studying survival of different cancers has important practical value for patients, providers, and researchers. The result from this study may help prostate cancer patients wishing to know how their prognosis is changing over time, and what is their life expectancy based on the disease status. Inline to this proper understanding of prognosis may help both of the physicians and the patients decide on treatment options, balancing the personal values for quality versus quantity of life. Also, health care providers can make use of survival information to more objectively determine an appropriate frequency of follow-up visits and aggressiveness of surveillance testing based on patient's current risk profile. Identifying contributing factors of survival time among prostate cancer patients is very mandatory so as to reach on some recommendations to improve survival especially policy makers may use this information. Improvement in cancer survival is considered a valid indicator of the quality of care introduced to the patients. The data will be a key indicator for monitoring progress against cancer. Moreover, the study can be an input to

policy makers, program managers, health professionals to decide based on evidence about prostate cancer and serves as a base line data for further studies.

8.1.2 LITERATURE REVIEW

Burden of Prostate cancer

In 2015 according to GBD report of cancer estimates, prostate cancer was the fourth most common cancer and globally 1.6 million men developed the disease while 366,000 died of it. ASIRs for men were the lowest in low middle SDI countries (17.6 per 100,000) and the highest in high SDI countries (123.6 per 100,000). Prostate cancer caused 4.8 million DALYs globally in 2013, with 57% occurring in developed countries, and 43% occurring in developing countries. The ASIRs per 100 000 increased by 69% globally (32.42 to 54.68), by 135% in developing countries (13.29 to 31.25), and by 63% in developed countries (61.51 to 100.29) between 1990 to 2013. Prostate cancer incidence rates are still lower in developing countries than in developed countries, but because of a faster increase in rates in developing countries, the gap decreased between 1990 and 2013 from a 4-fold to a 3-fold difference. Between 1990 and 2013, Prostate cancer cases were increased by 217% globally, by 169% in developed countries, and by 361% in developing countries. During the same timeframe, age-standardized DALY rates have decreased by 3% at the global level and by 9% in developed countries but have increased by 28% in developing countries(4–6).

Prostate cancer is the second most common cause of cancer death among men in the United States, with 33 720 fatalities in 2011. Prostate cancer incidence and mortality rates differ by race/ethnicity. In the United States, incidence and mortality rates are the highest among African-American men. African-American men have mortality rates 2.4 times greater than those of Caucasian men. Both incidence and mortality rates are lower among Asian/Pacific-Islanders, Native Americans and Hispanic men than among non-Hispanic whites. Part of the variation in incidence rates across populations can be explained by differences in screening practices, particularly screening with prostate-specific antigen, which often diagnoses a significant proportion of otherwise latent prostate cancer(7,12).

Prostate cancer incidence and mortality rates in Africa were reported to be 23.2 and 17.0 per 100,000, respectively in 2012. Study from 16 African countries stated that the overall pooled incidence in Africa was 21.95 per 100,000 populations, with the highest incidence was 39.0 per 100,000 population estimated in people aged 70 years and above. Prostate cancer incidence and mortality rates were lower in northern Africa at 10.6 and 7.0 per 100,000, compared to the average rates in Sub-Saharan Africa (SSA) with 34.3 and 22.1 per 100,000, respectively. Some of these variations have been attributed to the relatively higher poverty levels, dietary differences,

genetic differences and the presence of infectious diseases in SSA(6,8,9). Similarly, reports from population based national cancer registry exploitation from Sudan, Kenya and Uganda show that prostate cancer is the most incident cancer in men with 26.1, 9.4 and 37.1 cases per 100,000 populations respectively(10). In Ethiopia the review of Addis Ababa cancer registry in 2014 shows that prostate cancer is the third most common cancer in males. According to GBD cancer estimate reports of 2015, in Ethiopia, Prostate cancer is the 3rd cancer in incident in both sexes next to breast and cervical cancer and it is the most common cancer in males. It is the 8th cause of cancer death in both sexes. Ethiopia there is no population based cancer registry except Addis Ababa cancer registry that was started in 2011 which is avail only in capital city and poor screening, research, diagnosis, treatment and data handling were the challenges to know the exact burden of the disease in the country. Compared to Europe and the Americas, Africa seemed to have lower prostate cancer incidence in general. Prostate cancer incidence in African nations could be underestimated due to the lack of population-based cancer surveillance and poor cancer screening practices. However the incident rate of prostate cancer case and Prostate cancer death is highly increasing in Africa due to population aging , an adoption of cancer-associated lifestyle(smoking, physical inactivity, “westernized” diets), few options of cancer treatment and diagnostic facilities(4,9–11).

Survival and Associated factors of Prostate cancer

Established risk factors for total prostate cancer risk are few and include older age, race, family history and gene changes. Prostate cancer rarely is diagnosed among men before the age of 40 years, and mortality is relatively rare before the age of 50 years. Men with a family history of prostate cancer are at increased risk of prostate cancer diagnosis and mortality. The risk of death from prostate cancer is approximately twofold higher for men with a father or a brother who died of prostate cancer, compared to men with prostate cancer who do not have a positive family history(12,13). Also study showed that prostate cancer incidence and mortality were associated with balding men, presence of diabetes, aspirin usage, PSA levels ≥ 10 , obesity or high BMI, smoking habit, chemical exposures and inflammation of prostate(14,15). They increase risk of developing advanced stage prostate cancer, higher rates of recurrence and cancer-specific mortality after diagnosis. However foods like vitamin E, selenium, coffee, zinc and drugs (aspirin, 5 alpha reductase inhibitors) reduces the risk of getting prostate cancer(16).

The cohort study conducted in Brazil state that, the five-year survival rates were 87.8%. The five-year survival for patients with pretreatment PSA <40 ng/mL was 91.2% and for patients with

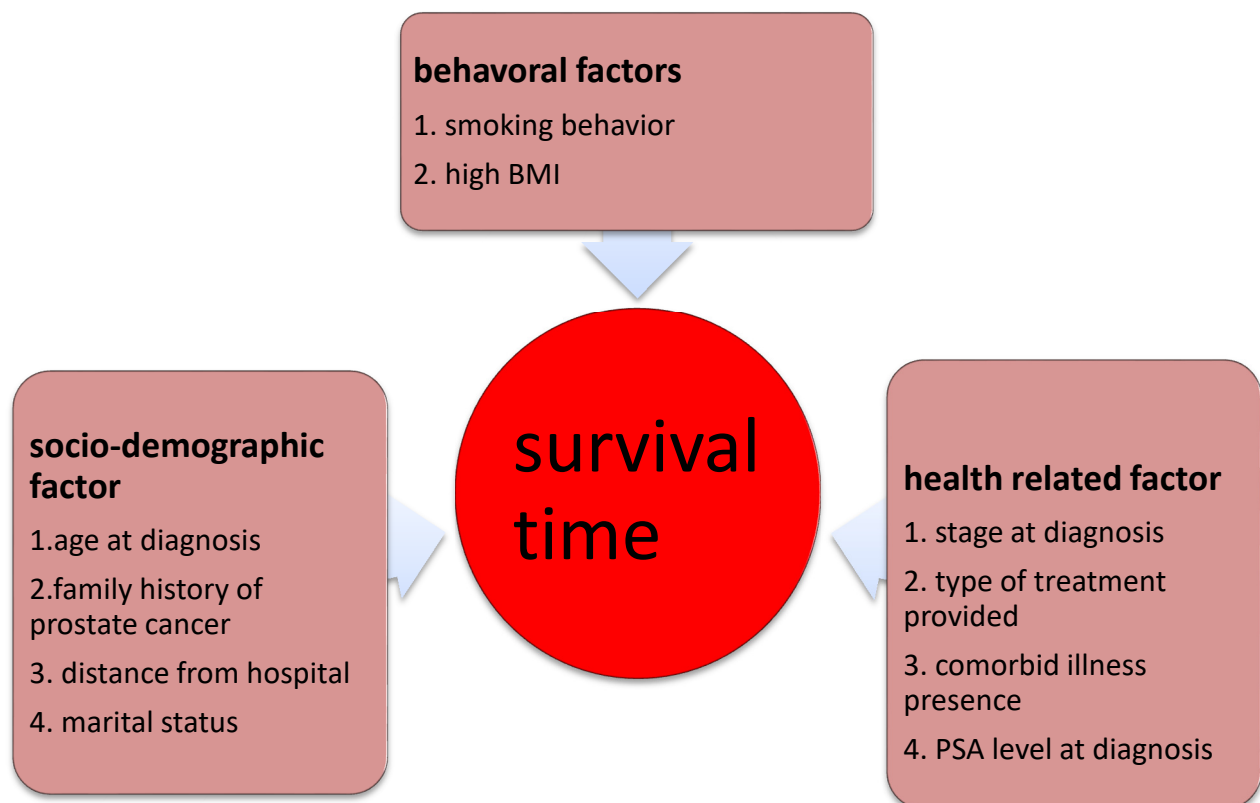
≥ 40 ng/mL was 70.1%. The five-year survival rate for Gleason score 5 or 6 was 87.3%. The five-year survival of patients with tumor stage B1 and B2 was 98.1% and 81.7%, respectively. Patients treated with radiation therapy had lower 5-year survival rates than those treated with radical prostatectomy of 79.8% and 96.5% respectively. The poorest prognosis was seen among those aged 70 years or more who showed a risk of dying from cancer almost four times higher than that of patients aged 50 to 59 years. The effect of stage B2 became significant, indicating a risk almost three times higher of dying from prostate cancer for each year of follow-up compared to that of patients with tumors classified as stage B1. Patients with moderately differentiated tumors had a 58% lower risk of dying from prostate cancer than patients with poorly differentiated tumors. Patients with pretreatment PSA levels ≥ 40 ng/mL were almost four times more likely of dying than patients with lower PSA levels(17).

According to study conducted in Harvard University to identify predictors of time to prostate cancer specific death (PCSD) after radiation therapy (RT) on 381PCa patients. Pretreatment identified risk (low, intermediate and high risk) based on their Gleason score and PSA level and post treatment factors for 94 patients who developed PSA failure included time to PSA failure, post treatment PSA doubling time (DT) and timing of salvage hormonal therapy. In Pretreatment Prognostic Factors, the 10-year estimates of PCS survival were (100% v 94% v 55%; $P = .005$) for low, intermediate and high risk groups respectively. The relative risk (RR) of death caused by prostate cancer was 6 (95% CI, 2.5 to 10) for high-risk compared with low- or intermediate-risk patients. For Post treatment Prognostic Factors, men with a short PSA DT (ie, ≤ 12 months), estimates of PCSD and all-cause death after PSA failure were nearly identical. Specifically, the 5-year estimate of PCSD after PSA failure was 52%. The RR of PCSD and all cause death was 5.1 (95% CI, 2 to 8.9; $p=0.03$) and 2.2 (95% CI, 1.2 to 4; $p=0.05$) for patients, respectively, with a PSA DT ≤ 12 compared with more than 12 months. Patients who began salvage hormonal therapy when the bone scan was positive versus negative had an RR of 12 (95% CI, 6.2 to 18; $p=0.0006$) and 9.1 (95% CI, 4 to 14.3; $p=0.0001$) for PCSD and all-cause death, respectively(18).

The study reviewing prostate cancer patients managed in the University of Maiduguri teaching hospital (UMTH), Nigeria shows that age ranged from 42- 90 years with peak age group of 60 – 69 years. The 2 year and 5 year survival were 71% and 27% respectively. Carcinoma of the prostate is common and patients present late with advanced disease and complications(19). According to a five year retrospective cohort study conducted in Sudan, the 5-years survival rate was 91.6% for patients who diagnosed in grade 1 of the disease, 76.5% in grade 2, 24% in grade 3

and 7.5% in grade 4(20). The study found that there were many factors affected the survival rate in Sudanese population such as treatment type and diagnosis date. The observed, corrected and relative 5-years survival rate of cancer in Sudan are 40.5%, 52% and 47% respectively. A nine year prostate cancer survival analysis in Ghana shows that 13.6% of the patients diagnosed at the age of 68 died with the prostate cancer when the cancer has developed into stage three. Only the stage of cancer at which a patient was diagnosed contributed to the survival or hazard of a patient, $p\text{-value} < 0.05$ (21).

Annex 4Conceptual Frame work of the study



8.1.3 OBJECTIVES

General Objectives

- To assess survival and its determinants among prostate cancer patients diagnosed during 2012-2016 at Tikur Anbessa Specialized hospital, Addis Ababa, Ethiopia

Specific Objectives

- To estimate the time to death of prostate cancer patients in TASH, AA, Ethiopia, 2012-2016
- To compare the survival among categories of covariates of prostate cancer patients in TASH, AA, Ethiopia, 2012-2016
- To identify determinants' of survival in prostate cancer patients in TASH, AA, Ethiopia ,2012-2016

8.1.4 METHODS AND MATERIALS

Study Area and Period

This study was conducted in Tikur Anbessa Specialized Hospital (TASH), which is found in Addis Ababa city, the capital of Ethiopia. TASH is a teaching, central tertiary generalized referral hospital with approximately 800 in patient's beds. TASH Cancer treatment Center (radiotherapy center) is the only cancer referral center of the country. This radiotherapy center is housed in a separate, newer building on hospital grounds and consists of three floors. With the support of Ethiopia's governmental institutions, None governmental organizations and international partners, TASH had developed Addis Ababa Population Based Cancer Registry(AAPBCR) at radiotherapy center in 2011. AAPBCR is the first population based cancer registry of the country and cancer cases who was stayed in Addis Ababa city at least for six months were considered as dwellers of the city to be registered by this program. The main sources for population based cancer registry (PBCR) in Addis Ababa city are Hospitals (from different departments and radiotherapy center), Higher diagnostic Clinics and Diagnostic Laboratory with pathology services. The starting point for retrospective follow-up was the time from first confirmed diagnosis of prostate cancer and the endpoint was date of death, date of lost to follow up, date of last contact or the end date of follow-up period (December 30/2016). The study period for this study was from to October 20-December 30/2017.

Study Design

A facility based retrospective cohort study design was employed.

Source populations: All prostate cancer patients in TASH who were newly diagnosed from January 2012 to December 2016

Study populations: All prostate cancer patients in TASH who were newly diagnosed from January 2012 to December 2016 and who fulfill the eligibility criteria

Inclusion and Exclusion Criteria: All prostate cancer patients who were newly diagnosed in TASH during the required time (2012-2016) and whose charts are available were included. Patients who registered during the required period but their diagnosis were prior to that were excluded from the study. Incomplete charts or charts having neither of histopathology or PSA level report and cancer stage report were also excluded.

Sample Size Determination and Sampling Procedure

All incident cases of prostate cancer patients diagnosed between January 2012 to December 2016 and who fulfill the eligibility criteria were included in the study.

The chart number (medical record number) of all prostate cancer patients diagnosed during 2012-2016 at oncology department of TASH was obtained from Addis Ababa Population Based Cancer Registry and local cancer registry. Then the charts of all prostate cancer patients reported were retrieved using this medical record number. From 171 prostate cancer cases registered during the period, the charts of 149 cases were retrieved. From this 12 incomplete charts (no report of histopathology, PSA level and cancer stage) were excluded from the study. Finally the records from 137 retrieved charts were extracted.

Dependent/Outcome Variables: Time to death of prostate cancer patients

Independent variables /Covariates:

- Age of patients at diagnosis
- Stage of cancer at diagnosis
- Gleason score at diagnose
- PSA level at diagnose
- Histological types and grade of prostate cancer
- Treatment type
- Place of residence
- smoking
- Hypertension, Diabetes and HIV infection co morbidities

Operational Definition:

Time to death – is the survival of prostate cancer patients from the first confirmed date of diagnosis to death of patients

Event – is death of prostate cancer patients who are under the study due to prostate cancer

Censoring – is prostate cancer patients who are under the study and who have incomplete information on time to death due to the cancer. Prostate cancer patients who do not develop death, who were lost to follow up before developing event, who were died due to other cause than prostate cancer and patients who have no phone number and whose current status is unknown, to know their event status were considered as censored individual.

Data Collection Tools

Record review checklist was prepared in English language based on available information on patient charts and through referring some important variables from literatures on related topics.

Data Collection Procedure

Prostate cancer patients those diagnosed and enrolled from 2012-2016 periods at TASH were followed retrospectively through retrieving their charts from cancer registries of the hospital. Two oncologic nurses who are working at the cancer treatment center were extracted the data. Before data collection started the charts of all prostate cancer patients were identified and retrieved by their medical registration number from central card room and radiotherapy center of the hospital. Then data collectors reviewed the records (both baseline and follow up) of the patient from their charts. As there were no mortality data in the patient charts, there was phone interviewing to all patients who have phone numbers to ascertain their current event status, date of death if died, presence of other co morbidity like hypertension or diabetes and other data mainly not found from the chart. Patients with unknown current event status and who do not have phone number (lost from follow-up) or who didn't develop the outcome of interest (death) at the end of follow-up period were considered as censored cases.

Data Quality Assurance

Discussions were made with oncologic nurses (data collectors) regarding to data collection checklists, objective of the study and how to maintain the quality of data for data for one day before data collection was started. The review checklist filled were collected daily and checked for completeness by principal investigator.

Data Processing and Analysis

Data were coded and then entered, cleaned, edited using Epi info version 7.1 and transferred to SPSS version 21 for analysis. Basic descriptive analysis like mean, median and frequency were done. Kaplan Meier method of estimating survival time was performed to estimate the survival. Kaplan Meier curve together with Log rank test was used to test for the presence of difference in survival among categories of covariates (groups of prostate cancer patients'). For the Bivariate analysis, Cox regression was performed and the independent variables, which became significant at 20% level of significance, were included in final Cox proportional model for multivariable analysis. The multiple Cox regression was therefore fitted for eight variables after checking for the presence of multicollinearity and proportional hazard assumption fulfillment.

Accordingly Co linearity were seen between the variable bone metastasize and distant metastasize showed, therefore bone metastasize were excluded from final model. All variables included in the final model have p value of greater than 0.05 during partial residual schoenfeld test done for checking proportionality of hazard assumption. The result of the model was expressed as adjusted hazard ratios (AHRs) with 95 %CI to determine the net effect each explanatory variable on time to death after diagnosis of prostate cancer.

Ethical Considerations

An ethical clearance for the proposed study was obtained from the research and ethical committee of Public Health Department of SPHMMC. Permission from medical director and focal person of cancer treatment center of Tikur Anbessa specialized Hospital was obtained. Verbal consent was also obtained from patients before starting phone call interview which were done by the oncologic residents. Confidentiality of the information maintained throughout the study by anonymously excluding patient names as identification from data extraction form and it is used for the purpose of the proposed study only. In additions, health professionals (oncologic nurses) from the cancer treatment center extracted the data from patient to keep confidentiality.

Dissemination of Result

The result of the study will be presented to SPHMMC Department of Public Health. It will be communicated to TASH Oncology department and to other stake holders. In addition it will be presented on different conference and seminars. Finally, an attempt will be made to publish the paper in reputable journal

8.1.5 RESULT

There were 171 patients diagnosed in Tikur Anbessa Specialized Hospital from 2012-2016. From among these, complete data were obtained for 137 cases and patient who was enrolled from January 2012 to September 2016 was followed for 5 years retrospectively. The minimum and maximum age of cases was 43 and 91 years with median age of 68 years (IQR 15). About 50 (36.5%) of cases were found in 61-70 years age category. The residents of Addis Ababa city were 81 (59.1%) followed by Oromia regions 33 (24.1%) table 23.

Table 23 Socio-demographic characteristics of prostate cancer patients in Tikur Anbessa Specialized Hospital, Addis Ababa, 2012 - 2016

variables	categories of variables	vital status at last contact					
		censored		dead		Total	
		N	%	N	%	N	%
Age category	<= 50 yrs	5	83.3	1	17	6	4.4
	51-60 yrs	18	58.1	13	42	31	22.6
	61-70 yrs	31	62	19	38	50	36.5
	71-80 yrs	24	55.8	19	44	43	31.4
	>= 81 yrs	4	57.1	3	43	7	5.1
	Total	82	59.9	55	40.1	137	100
marital status	married	59	60.8%	38	39.2%	97	70.3
	widower	8	50%	8	50%	16	11.7
	divorced	5	72.4%	2	27.6%	7	5.1
	unknown	10	58.8%	7	41.2%	17	12.4
	total	82	59.9%	55	40.1	137	100
region	Addis Ababa	45	55.6%	36	44.4%	81	59.1
	Oromia	20	60.6%	13	39.4%	33	24.1
	SNNPR	9	90.0%	1	10.0%	10	7.3
	Amhara	6	75.0%	2	25.0%	8	5.8
	Somalia	0	0.0%	2	100.0%	2	1.5
	Gambella	0	0.0%	1	100.0%	1	0.7
	Harar	1	100.0%	0	0.0%	1	0.7
	Tigray	1	100.0%	0	0.0%	1	0.7
	Total	82	59.9%	55	40.1%	137	100

Clinical and Pathological Characteristics

The tumor marker test (pre treatment serum PSA level) were performed in 116 (85%) patients, of which about 105 (90%) have a PSA value of above 4 ng/ml. Histopathology test were performed for 92 (67.2%) of the cases and imaging test for 121 (88%). From the cases having histopathology test report, about 89 (96.7%) have adenocarcinoma cancer cell type with 50 (54.3%) having poorly or undifferentiated prostate cancer cell. Most of cases 86 (62.8%) were diagnosed with stage four followed by stage three 19(13.95%) (Table24).

The number of cases diagnosed with distant metastasize were high 81 (59.1%). Form this bone metastasize were reported in 70 (86%) of cases followed by lymph nodes 13 (16%), liver 6(7.4%) and 2 (2.4%) lung involvement. The prevalence of chronic co morbidities like hypertension, diabetes mellitus and HIV infection in our study population were 13.9%, 10.9% and 2.9% respectively with less than 11% of incomplete data. About 19% of the cases have history of smoking. Most of cases 112 (81.8%) were treated with ADT, 103 (75.2%) with radiotherapy, 69 (50.4%) with surgery and 37 (27%) with combination of ADT + radiotherapy + surgery (table 24). Only 7 (5%) of cases were treated with chemotherapy.

Table 24 Clinical and pathological characteristics of prostate cancer patients in Tikur Anbessa Specialized Hospital, Addis Ababa, 2012 to 2016

	vital status at last contact					
	censored		dead		Total	
	N	%	N	%	N	%
Serum PSA level						
0-4 ng/ml	7	58.3	5	41.7	12	8.8
4.1-10 ng/ml	7	77.8	2	22.2	9	6.6
10.1-20 ng/ml	4	80.0	1	20.0	5	3.6
above 20.1 ng/ml	51	56.0	40	44.0	91	66.4
unknown	13	65.0	7	35.0	20	14.6
Stage at diagnosis						
stage IV	43	50.0	43	50.0	86	62.8
stage III	11	57.9	8	42.1	19	13.9
stage II	11	84.6	2	15.4	13	9.5
stage I	9	90.0	1	10.0	10	7.3
unknown	8	88.9	1	11.1	9	6.6
Histologic grade						
well differentiated (Gs 2-4)	14	77.8	4	22.2	18	13.1
Moderately differentiated (Gs 5-6)	15	68.2	7	31.8	22	16.1
Poorly/undifferentiated (Gs 7-10)	26	52.0	24	48.0	50	36.5
unknown	27	57.4	20	42.6	47	34.3
Distant metastasis						
yes	42	51.9	39	48.1	81	59.1
No	40	71.4	16	28.6	56	40.9
Bone metastasize						
Yes	37	52.9	33	47.1	70	51.1
No	45	67.2	22	32.8	67	48.9
Lymph node involvement						
Yes	5	38.5	8	61.5	13	9.4
no	77	62.1	47	37.9	124	90.6
Hypertension						
yes	12	63.2	7	36.8	19	13.9
no	56	54.4	47	45.6	103	75.2
unknown	14	93.3	1	6.7	15	10.9
Diabetes						
yes	12	80.0	3	20.0	15	10.9
no	59	53.6	51	46.4	110	80.3
unknown	11	91.7	1	8.3	12	8.8
Smoking status						

yes	16	61.5	10	38.5	26	19.0
no	51	53.1	45	46.9	96	70.1
unknown	15	100.	0	0.0	15	10.9
Chemotherapy						
yes	5	71.4	2	28.6	7	5.1
no	77	59.2	53	40.8	130	94.9
Surgery						
yes	42	60.9	27	39.1	69	50.4
no	40	58.8	28	41.2	68	49.6
ADT						
yes	74	66.1	38	33.9	112	81.8
no	8	32.0	17	68.0	25	18.2
Radiotherapy						
yes	56	54.4	47	45.6	103	75.2
no	26	76.5	8	23.5	34	24.8
Combination of surgery, Radiotherapy and ADT						
yes	26	70.3	11	29.7	37	27.0
no	56	56.0	44	44.0	100	73.0

Gs=Gleason score

Survival from Time of Diagnose to Death

From a total of 137 patients whose chart were reviewed **55** of them were found to be dead during the overall follow up period that is 60 months. The minimum and maximum time that cases were followed is one and 59 months respectively. The mean and median survival time was 30.7 and 28 months respectively. The overall survival rate was 22% at 5-years and 57% at 2-years. One can also see on the Kaplan Meir survival curve for time to death of prostate cancer patients, the probability of survival decreases as the follow-up time increases (figure28).

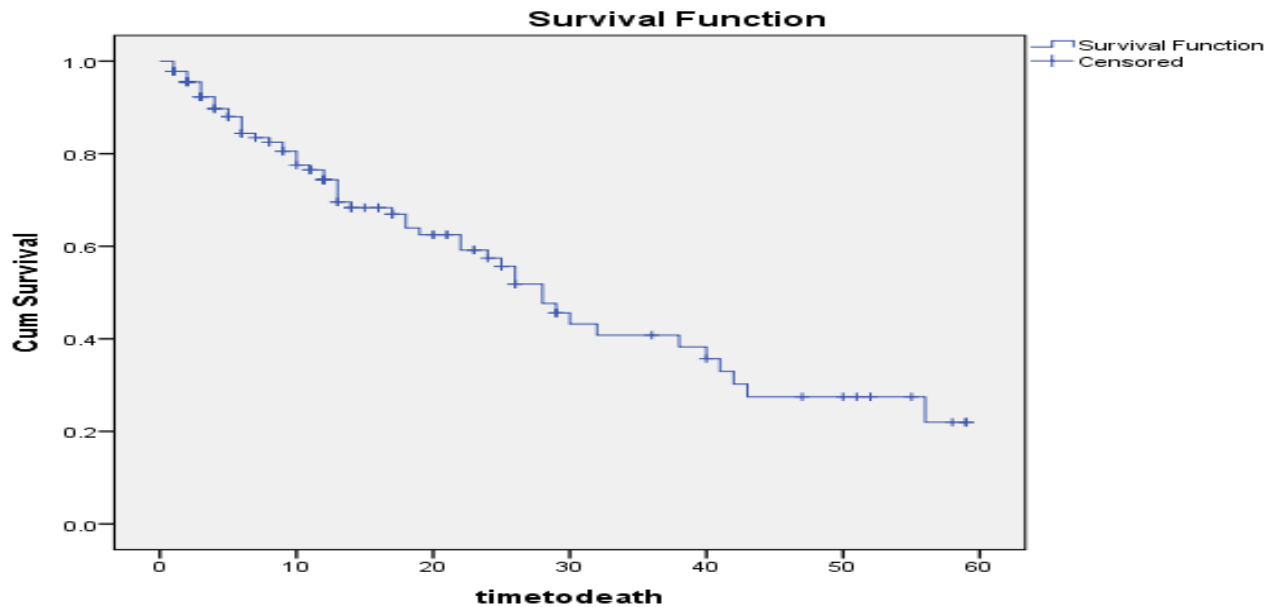


Figure 28Kaplan Meir survival curve for time to death among prostate cancer patients in Tikur Anbessa Specialized Hospital, Addis Ababa, 2012 to 2016.

Survival experience among different groups of prostate cancer cases

The tests for the presence of statistically significant difference in survival time between different categories of covariates were done by using log rank test. Then it is found that there is a difference in survival experience between categories of stage of prostate cancer, distant metastasize status of cancer, bone metastasize, Androgen Deprivation Therapy (ADT), serum PSA level and radiotherapy treatment modalities. All other categories of covariate did not showed statistically significant difference in survival experience between them. The difference in survival among categories of covariates of prostate cancer patients during the pair wise comparison log rank test is shown in table 25 below.

Table 25 Log-rank test for the presence of difference in survival experience between comparison groups and among categories of covariates for prostate cancer patients in Black Lion Hospital, Addis Ababa, 2012 to 2016

covariates	Difference in survival experience among groups	Chi-square	P-value(pair wise comparison)
Stage of cancer	stage I versus stage II	2.5	0.113
	stage I versus stage III	7.18	0.008
	stage I versus stage IV	14.1	0.0001
	stage I&II versus stage III&IV	18.832	0.001
Serum PSA level	< 20ng/ml versus $\geq$ 20ng/ml	1.5	0.20
	<20ng/ml versus unknown	4.7	0.03
Distant Metastasis status	Metastasis versus non metastasized	12.95	0.001
Bone metastasis	bone metastasized versus non metastasized	10	0.002
Androgen Deprivation Therapy	Treated with ADT versus not treated with ADT	4.6	0.031
Radiotherapy	Treated with combination of radiotherapy , surgery and ADT versus radiotherapy only	4.4	0.036

The five year survival rates for stage I, II, III and IV of prostate cancer were, 83%, 61%, 16% and 0% respectively. This stage of prostate cancer showed survival difference with overall (log-rank test $p=0.0001$)

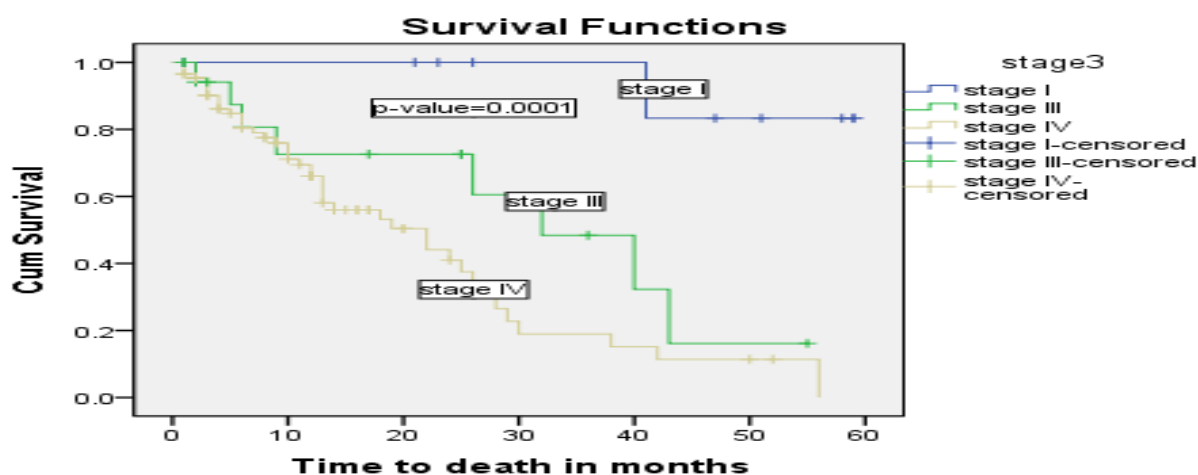


Figure 29 Kaplan Meir survival curve for time to death among categories of stages of prostate cancer patients in Tikur Anbessa Specialized Hospital, Addis Ababa, 2012-2016

Similarly patients having serum PSA level less than 20 ng/ml during diagnose in comparisons to those having above 20 ng/ml and unknown have better five year survival with (log-rank test $p=0.048$) (figure 30). The five year survival is 25%, 19% and 0 in patients with <20mg/ml, >20mg/ml and unknown PSA levels respectively.

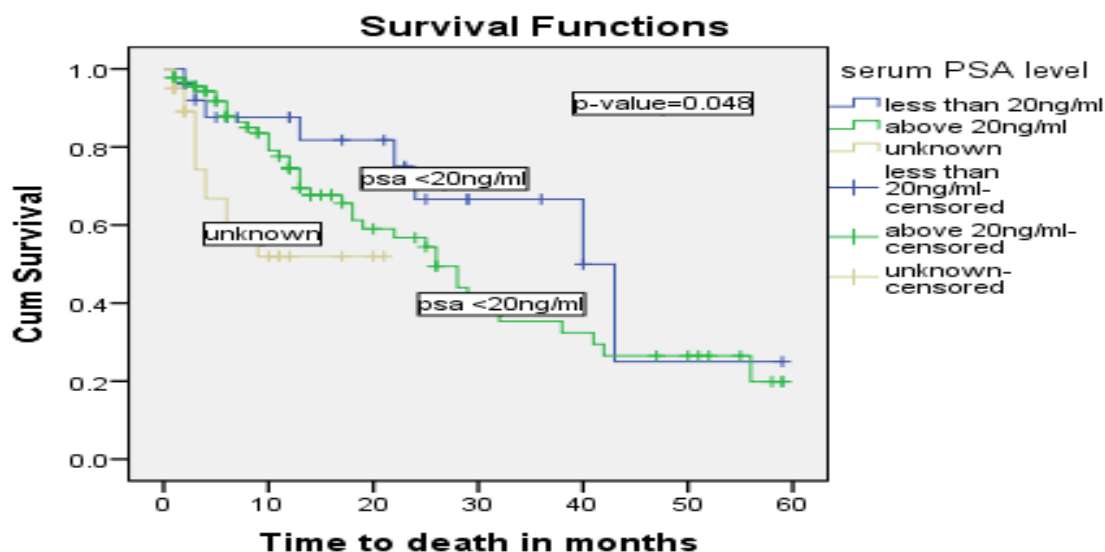


Figure 30 Kaplan Meir survival curve for time to death by level of serum PSA among prostate cancer patients in Tikur Anbessa Specialized Hospital, Addis Ababa, 2012-2016

The group of prostate cancer patients having distant metastasize at the time of diagnose were experienced 40% and 0% survival for two and five years respectively, while for those with no distant metastasize the two and five year survival were 67% and 44% respectively with (log rank test, $p=0.001$) (figure 31).

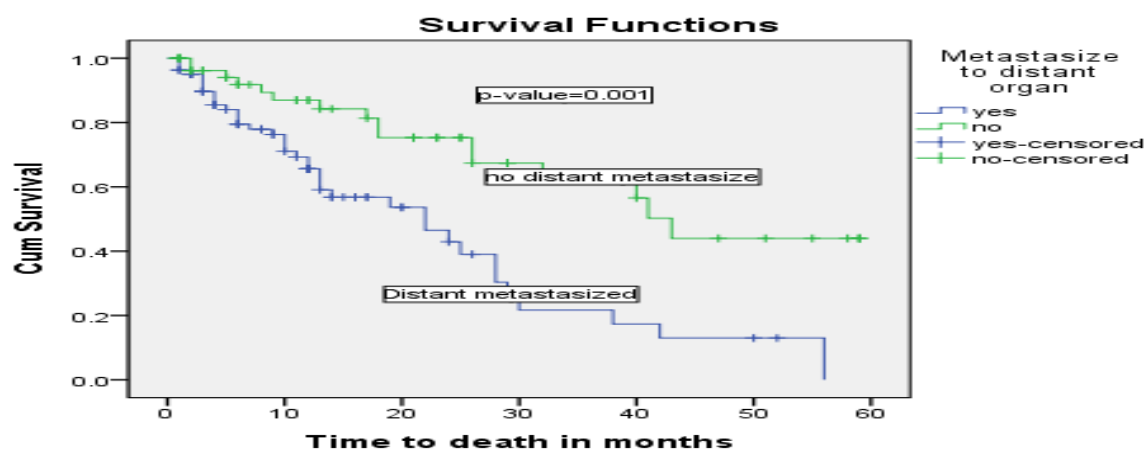


Figure 31 Kaplan Meir survival curve for time to death among categories of prostate cancer patients with distant metastatic status in Tikur Anbessa Specialized Hospital, Addis Ababa, 2012 to 2016

Similarly group prostate cancer patients who were treated with ADT (either of orchiectomy or other ADT drugs) were experienced 58% and 27% survival at two and five years respectively, and those who did not treated with ADT have had 49% and 7% survival rates at two and five year (figure 32).

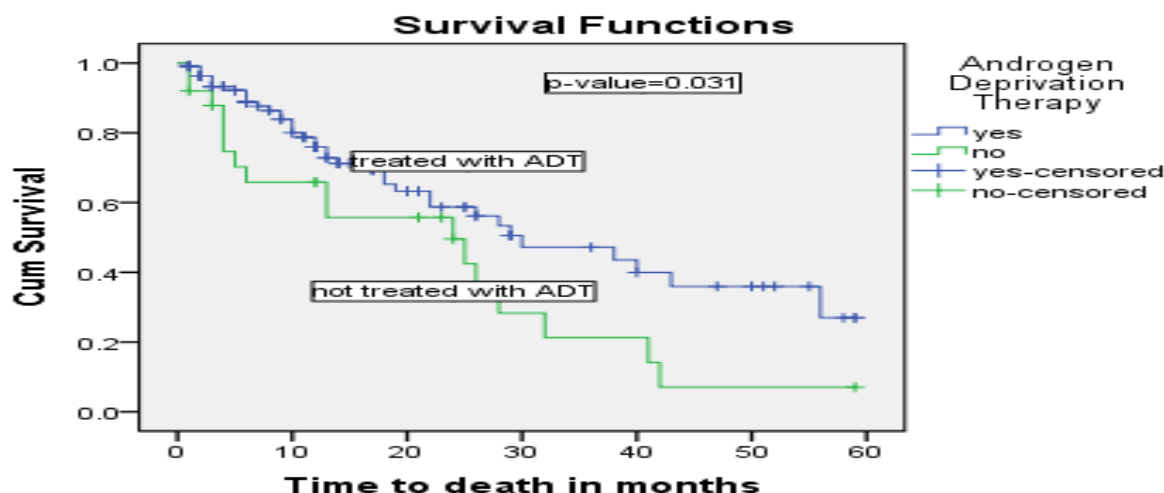


Figure 32 Kaplan Meir survival curve for time to death among categories of prostate cancer patients with ADT treatment modality in Tikur Anbessa Specialized Hospital, Addis Ababa, 2012-2016

In general longer survival is seen in patients with early diagnosis, PSA level less than 20ng/ml, without distant metastasize, no bone involvement and treated with ADT with log-rank test pooled over strata p-values of 0.0001, 0.048, 0.001, 0.002 and 0.031 respectively.

Determinants of survival time among prostate cancer cases

During Bivariate co regression analysis eight variables were significant at p-value of 0.2. These variables are: poorly differentiated Histologic grade (CHR=2.2, P=0.13), serum PSA >20ng/ml (CHR=1.6, P=0.06), cancer stage III & IV (CHR=7.8, P=0.001), distant metastasize cancer (CHR=2.8, P=0.001), bone metastasize (CHR=2.4, P=0.002), lymph node metastasize cancer (CHR=1.8, P=0.11), ADT treatment (CHR=0.5, P=0.035) and combination therapy of ADT, surgery & radiotherapy (CHR=0.6, P=0.13) (table 26).

Table 26 Bivariate Cox regression analysis describing possible determinants of prostate cancer survival at Tikur Anbessa Specialized Hospital, Addis Ababa, 2012-2016

VARIABLES	outcome status		CHR (95% CI)	p-value
	Censored n (%)	Dead n (%)		
Age category				
<= 50 yrs	5(83.3)	1(17)	1	0.75
51-60 yrs	18(58.1)	13(42)	3.1(0.40, 23.8)	0.27
61-70 yrs	31(62)	19(38)	3.5(0.47, 27.10)	0.21
71-80 yrs	24(55.8)	19(44)	3.2(0.43, 24.6)	0.25
>= 81 yrs	4(57.1)	3(43)	4.6(0.47, 45.7)	0.18
Histologic grade				
well differentiated (Gs 2-4)	14(77.8)	4(22.2)	1	0.18
Moderately differentiated (Gs 5-6)	15(68.2)	7(31.8)	1.0(0.30, 3.6)	0.92
Poorly/undifferentiated (Gs 7-10)	26(52)	24(48)	2.2(0.77, 6.4)	0.13
unknown	27(57.4)	20(42.6)	2.1(0.71, 6.1)	0.17
serum PSA level				
less than 20ng/ml	18(69.2)	8(30.8)	1	0.06
above 20ng/ml	51(56)	40(44)	1.6(0.74, 3.4)	0.22
unknown	13(65)	7(35)	3.5(1.5, 9.9)	0.019
Staging				
stage III & IV	54(51.4)	51(48.6)	7.8(2.3, 25.6)	0.001
stage I & II	20(87)	3(13)	1	
Distant metastasis				
yes	42(51.9)	39(48.1)	2.8(1.5, 5.1)	0.001
No	40(71.4)	16(28.6)	1	
Bone metastasize				
Yes	37(52.9)	33(47.1)	2.4(1.3, 4.3)	0.002
No	45(67.2)	22(32.8)	1	
Lymph node involvement				

Yes	5(38.5)	8(61.5)	1.8(0.85, 3.8)	0.118
no	77(62.1)	47(37.9)	1	
Hypertension				0.36
yes	12(63.2)	7(36.8)	2.9(0.3, 24.3)	0.31
no	56(54.4)	47(45.6)	3.8(0.52, 27.7)	0.18
unknown	14(93.3)	1(6.7)	1	
Diabetes				0.42
yes	12(80)	3(20)	1.5(0.15, 14.6)	0.72
no	59(53.6)	51(46.4)	2.6(0.35, 19.18)	0.34
unknown	11(91.7)	1(8.3)	1	
Chemotherapy				
yes	5(71.4)	2(28.6)	0.17(0.09, 1.5)	0.37
no	77(59.2)	53(40.8)	1	
Surgery				
yes	42(60.9)	27(39.1)	0.79(0.46, 1.3)	0.40
no	40(58.8)	28(41.2)	1	
ADT				
yes	74(66.1)	38(33.9)	0.5(0.3, 0.95)	0.035
no	8(32)	17(68)	1	
Radiotherapy				
yes	56(54.4)	47(45.6)	1.6(0.7, 3.4)	0.22
no	26(76.5)	8(23.5)	1	
Combination of surgery, Radiotherapy and ADT				
yes	26(70.3)	11(29.7)	0.6(0.3, 1.16)	0.13
no	56(56)	44(44)	1	

During multivariable Cox regression analysis seven variables were those significant during Bivariate and age variable were included and only two variables became significant at level of p-value 0.05. These are stage of prostate cancer (AHR 6.9, CI: 1.81-26.7) and androgen deprivation therapy (AHR 0.48, CI: 0.22-0.99) become significant on the final Cox proportional hazard model (table 27).

Table 27 variables included in the multiple Cox proportional hazards model among prostate cancer patients at Tikur Anbessa Specialized Hospital, Addis Ababa, 2012-2016

Variables	Outcome status		CHR(95% CI)	AHR(95% CI)	p-value
	Censored n (%)	Dead n (%)			
age category					
<= 50 yrs	5(83.3)	1(17)	1	1	0.31
51-60 yrs	18(58.1)	13(42)	3.1(0.40, 23.8)	5.7(0.58, 56.6)	0.13
61-70 yrs	31(62)	19(38)	3.5(0.47, 27.10)	9.55(1.0, 88.67)	0.04
71-80 yrs	24(55.8)	19(44)	3.2(0.43, 24.6)	7.07(0.7, 66.2)	0.08
>= 81 yrs	4(57.1)	3(43)	4.6(0.47, 45.7)	6.4(0.5, 75.4)	0.14
histological grade					
well differentiated(Gs 2-4)	14(77.8)	4(22.2)	1	1	0.64
Moderately differentiated(Gs 5-6)	15(68.2)	7(31.8)	1.0(0.30, 3.6)	0.68(0.17, 2.7)	0.59
Poorly/undifferentiated(Gs 7-10)	26(52)	24(48)	2.2(0.77, 6.4)	1.24(0.39, 3.9)	0.7
unknown	27(57.4)	20(42.6)	2.1(0.71, 6.1)	0.97(0.28, 3.3)	0.97
serum PSA level					
<= 20 ng/ml	18(69.2)	8(30.8)	1	1	0.08
>20 ng/ml	51(56)	40(44)	1.6(0.74, 3.4)	1.03(0.42, 2.48)	0.94
unknown	13(65)	7(35)	3.5(1.5, 9.9)	3.08(0.9, 10.5)	0.07
stage					
stage III & IV	54(51.4)	51(48.6)	7.8(2.3, 25.6)	6.96(1.81, 26.7)*	0.005
stage I & II	20(87)	3(13)	1	1	
distant metastasize					
yes	42(51.9)	39(48.1)	2.8(1.5, 5.1)	1.14(0.53, 2.4)	0.73
no	40(71.4)	16(28.6)	1	1	
limp node metastasize					
yes	5(38.5)	8(61.5)	1.8(0.85, 3.8)	1.69(0.63, 4.5)	0.29
no	77(62.1)	47(37.9)	1	1	
ADT treatment					
yes	74(66.1)	38(33.9)	0.5(0.3, 0.95)	0.48(0.23, 0.99)*	0.049
no	8(32)	17(68)	1	1	
Surgery + ADT + radiotherapy					
yes	26(70.3)	11(29.7)	0.6(0.3, 1.16)	0.61(0.26, 1.39)	0.24
no	56(56)	44(44)	1	1	

* indicates significant variables at level of p value 0.05

8.1.6 DISCUSSION

Our study tried to assess survival of prostate cancer patients generally and among groups with its determinants for cases diagnosed at TASH from 2012 to 2016. Accordingly our study found that a five year survival of 22% and presence of significant survival difference among stages, metastasize status, serum PSA levels and different treatment modalities. Also having advanced stage of the cancer (stage III & IV) and being treated with ADT treatment becomes the determinants of the five year survivals in this study. The overall five year survival was 22% which mean the percentage of prostate cancer patients who lived at least five year after they were diagnosed irrespective of their stage and treatments undergone. This result is almost similar with the studies in Nigeria 26% and in Sudan 36.5%(19,20). The survival for stage I-IV was 83%, 61%, 16%, and 0% respectively. This indicates that better survival was observed in patients with early stages of the diseases (stage I & II) than advanced stages (stage III & IV). This finding is supported with the study conducted in Sudan and Ghana(20,21)

But median and overall survival in early stage, advanced stage, non metastatic and distant metastatic stage in our study was lower compared to the studies in the western countries(2,17,18,22). In our study the five year survival for early stage (stage I &II) were 83% and 61% which is lower compared to the studies in Brazil on localized prostate cancer patients (stage I, II & III) having the five-year survival rates of 87.8% and 100% in USA(17,18).The observed differences in survival between countries seem to be largely a result of differences in the availability and accessibility of early diagnosis and treatment. The reason for the poor survival in this study may be due to the relatively advanced extent of disease, with most cases having advanced stage with distant spread at diagnosis. Most of cases were diagnosed at advanced stage (stage III & IV) with distant metastasize mostly involving the bone (86%), followed by lymph nodes rather than as precancerous or early cancers. This could be due to the lack of screening programs or confirmatory test to detect early stages of the disease in our country and prostate cancer did not have symptoms until it become invasive. Thus most cases came to health facility with advanced stage of cancer so numbers of cases with advanced stage were high in our study with poor survival. The other reason for the difference could be attributed due to high availability and accessibility of screening programmers, early detection services, and cancer treatment facilities in the western (developed) countries. Early detection and treatment greatly improves the survival time of prostate cancer patients.

In the log rank test it is found that there is a significant difference in survival experience between categories of stage of prostate cancer, distant metastasize status, bone metastasize, PSA levels and ADT treatment modalities. Patients with stage I diagnosis had a significantly better survival than stage III & IV disease (log-rank test, $p=0.0001$). Also the merged clinical stage I and II (early stage) have a significantly better survival than those of having advanced stage (stage III & IV) patients (log-rank test, $P=0.001$). Survival declined steadily with advancing stage of disease at diagnosis. This is consistent with the study in Ghana in which stages of prostate cancer shows survival difference at (log-rank test, $p=0.0004$) (21). Patients with distant metastatic (stage IV patients with distant organ involved) had significantly lower survival than those who have localized or regional prostate cancer (stage I-III and stage IV with no distant spread) with (log rank test, $p=0.001$). This result is similar with the findings in eastern regions of Sweden conducted on national cancer registry showing that there is significant survival difference among M category stage (M0 & M1) of prostate cancer and cases with M0 category showed better survival than those with M1 category(22). Similarly patients with bone metastatic at time of diagnose compared to those with no bone involvement showed significant survival difference at (log-rank test, $p=0.002$). This result is supported with the study conducted in Indonesia among bone metastatic prostate cancer patients comparing their survival based on their bone scan index measurement shows cases with high bone scan index value have showed survival difference at (log-rank test, $p=0.004$) (23). Probably presence of high proportion of cases with bone metastasize (86%) in our study may have contributed.

In our study a group of patients who were treated with ADT have had significantly better survival than those who were not treated with ADT (log-rank test $p=0.031$). This could be due to that ADT was the most effective therapeutic options provided for advanced or metastatic cases and in our study since most of cases have metastatic cancer disease and thus most of patients (82%) provided these treatment modalities than surgery and radiotherapy. ADT is hormone therapy that is used to reduce levels of male hormone that can be bilateral orchiectomy or other anti androgen drugs. We considered any patient who have taken either one or combination of the drug as treated with ADT and those haven't taken any type of ADT as not treated with ADT. Radiotherapy and surgical prostatectomy are the treatment modalities preferred for patients with non advanced stage of cancer (2). Radiotherapy only treated cases had showed poor survival compared to combination of ADT, surgery and radiotherapy treated groups (log-rank test, $p=0.036$) in this study may strengthen the above idea. The study conducted in Japan on metastatic prostate cancer

patients treated with combination of ADT have shown better survival than those treated with single ADT treatment with (log-rank test, $P = 0.034$). Similarly patients having serum PSA level less than 20 ng/ml during diagnose in comparisons to those having above 20 ng/ml and unknown have better five year survival with (log-rank test $p = 0.048$). This implies that cases having less than 20ng/ml PSA showed better survival. In clinical practice, a PSA level of 20 ng/ml is used as the cutoff value for advanced Prostate cancer and PSA 4 ng/ml is used as cutoff point for prostate cancer diagnosis((2,26)). This justify that cases with advanced stage have poor survival as discussed in the above paragraph.

In the Cox proportional hazard model stage of cancer and ADT treatment modality were statistically significant. Accordingly, stage III & IV (advanced stage) Patients are 6.9 times as likely as to be dead at any time than stage I & II (early stage) patients with (AHR 6.9, 95% CI, 1.81-26.7). This means that cases with advanced stage after adjusted with age, treatment and other clinical patterns identified as prognostic factors, it is the determinant for survival of prostate cancer patients. This result is supported with the findings in Sweden and USA shows that cases with higher T category have poor survival (18,22). Patients who were treated with ADT are also significantly associated with reduced incidence of death (AHR, 0.48, 95% CI, 0.23- 0.99). That is patients who were treated with ADT had 52% more chance of surviving than those who didn't taken ADT at any time. This indicates that generally ADT treatment provision has showed better survival without considering whether it was given in combination or singly. This could be due to that most cases in our study are those who need ADT than other treatments since there were high cases with metastatic disease. The study In Japan and Italy support this result in which cases of having metastatic stage treated with combination of ADT treatment showed significantly associated with a favorable overall survival compared with single ADT with (hazard ratios 0.66 and 0.15, respectively) (24,25). In our study PSA level, histological grade/Gleason score and age at diagnose were not identified as having significant effect on prostate cancer survival as seen in other studies. This could be due to that the nature of the study retrospective (record review) thus incomplete data (for Gleason score or tumor grade). The other reason could be that we have included all cases without considering extent of the disease (local/distant, early/advanced stage) that may have great variation on records since we have small number of cases. Distant metastatic and bone metastatic were significantly associated survival during Bivariate Cox-regression and became non significant during multivariable Cox regression.

8.1.7 STRENGTH AND LIMITATIONS OF THE STUDY

One of the strength of the study is that use of analytical methods (survival analysis) allowing simultaneous analysis of progress for different durations of follow-up which give consideration for times to event analysis through accounting for censored data. Additionally inclusion of all study participants in our study may decrease the probability of sampling errors.

The limitations of this study are, since it is retrospective study and based on records, availability of data for all variables are difficult and some of information was missed (incomplete chart). Some cards/charts are not found. However, for more than 80% of the study participants, their charts were found so it may not affect the result of the study. The ascertainment and the cause of death are based on phone interview from their family or care takers. This may lead to under or over detection of deaths due to prostate cancer, which may cause outcome ascertainment bias.

8.1.8 CONCLUSIONS

This study revealed that, overall five year survival of prostate cancer patients was 22% with different survival experience among different groups at different time. There is a significant survival differences among categories of stage of prostate cancer covariate, distant metastatic status covariates, bone involvement, PSA level and among different treatment modality covariates. ADT treatment modality and stage of prostate cancer were the determinants of survival which are significantly associated with time to death (survival) of prostate cancer patients in our study. In general our study shows poor survival or prognosis by late stage and treatments, indicating the key role of early detection and timely treatment for improving survival or reducing mortality from prostate cancer.

8.1.9 RECOMMENDATIONS

Improving and integrating of prostate cancer control program including prevention, early detection and treatment with other cancer control program is mandatory. Also expanding and availing prostate cancer screening programs (PSA tumor marker test) in different levels of health facilities and creating public awareness in collaboration with public Medias about prostate cancer is needed at the level of governmental and nongovernmental organizations working on cancer control program including FMOH.

Creating public and professional awareness in early detection and using feasible and effective treatment regimen is recommended in all service providing facilities. Also including detailed patient characteristics on their chart or cancer registry and proper handling of the patient chart is needed in health facilities. Further studies on survival time among prostate cancer patients with large sample size, considering different level of extent the cancer and different research methods that overcome the limitations of this study are needed.

8.1.10 REFERENCE

1. Sciences P. DETERMINANTS OF PROSTATE CANCER : The Birmingham Prostatic Neoplasms Association Study Unit of Urologic and Genetic Epidemiology. 2011;(August).
2. American Cancer Society. Prostate Cancer What is prostate cancer ? 2016;88.
3. Edition F. Global Cancer. 2012;(800).
4. Westerman R. Global , Regional , and National Cancer Incidence , Mortality , Years of Life Lost , Years Lived With Disability , and ... Global , Regional , and National Cancer Incidence , Mortality , Years of Life Lost , Years Lived With Disability , and Disability- Adjusted Life-years for 32 Cancer Groups , 1990 to 2015 A Systematic Analysis for the Global Burden of Disease Study. 2016;(December).
5. Manuscript A. Europe PMC Funders Group The Global Burden of Cancer 2013. 2015;1(January 2014):505–27.
6. Ferlay J, Soerjomataram I, Dikshit R, Eser S, Mathers C, Rebelo M, et al. Cancer incidence and mortality worldwide : Sources , methods and major patterns in GLOBOCAN 2012. 2015;386.
7. Torre LA, Bray F, Siegel RL, Ferlay J. Global Cancer Statistics , 2012. 2015;65(2):87–108.
8. Adeloye D, David RA, Aderemi AV. An Estimate of the Incidence of Prostate Cancer in Africa : A Systematic Review and. 2016;0:1–18.
9. Jemal A, Bray F, Forman D, Brien MO, Ferlay J. Cancer Burden in Africa and Opportunities for Prevention. 2012;1–13.
10. Fadlelmola FM. Cancer Registries and Cancer Genomics Research in East Africa : Challenges and Lessons Learned. 2016;2(4).
11. African Cancer Registry Network.
12. Wilson KM, Giovannucci EL, Mucci LA. Lifestyle and dietary factors in the prevention of lethal prostate cancer. Asian J Androl [Internet]. 2012;14(3):365–74. Available from: <http://dx.doi.org/10.1038/aja.2011.142>
13. Manuscript A. NIH Public Access. 2015;15(11):1–19.
14. Tindall EA, Bornman MSR, van Zyl S, Segone AM, Monare LR, Venter PA, et al. Addressing the contribution of previously described genetic and epidemiological risk factors associated with increased prostate cancer risk and aggressive disease within men from South Africa. BMC Urol [Internet]. 2013;13:74. Available from:

<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3882498&tool=pmcentrez&rendertype=abstract>

15. Davies NM, Gaunt TR, Lewis SJ, Holly J, Donovan JL, Hamdy FC, et al. The effects of height and BMI on prostate cancer incidence and mortality: a Mendelian randomization study in 20,848 cases and 20,214 controls from the PRACTICAL consortium. *Cancer Causes Control*. 2015;26(11):1603–16.
16. Mahmoud AM, Al-Alem U, Dabbous F, Ali MM, Batai K, Shah E, et al. Zinc intake and risk of prostate cancer: Case-control study and meta-analysis. *PLoS One*. 2016;11(11):1–18.
17. Migowski A. Survival of patients with clinically localized prostate cancer. *Epidemiology*. 2010;44(2).
18. D'Amico A V., Cote K, Loffredo M, Renshaw AA, Schultz D. Determinants of prostate cancer-specific survival after radiation therapy for patients with clinically localized prostate cancer. *J Clin Oncol*. 2002;20(23):4567–73.
19. Ibrahim AG, Aliyu S, Dogo HM, Babayo UD, Zarami AB. Carcinoma of the Prostate - A Five Year Experience in Maiduguri North Eastern Nigeria. 2015;1(8):512–4.
20. Mohamed FA, Abdallah YMY, Gar-el-nabi MEM, Science R, Arabia M-S. TUMOR METASTASIS DILEMMA : BONE SCAN AND PSA LEVEL IN RELATION TO PROSTATIC MALIGNANCY AMONG SUDANESE. 2017;5(5):275–80.
21. Kwes AS, Isaac N. Determination of Predictor Variables Contributing to the Survival of Prostate Cancer Patients in Komfo Anokye Teaching Hospital , Ghana. 2014;4(6):77–83.
22. Robinson D. aspects on localised , locally advanced and metastatic. 2008;(1073).
23. Wiyanto J, Shintawati R, Darmawan B, Hidayat B. Automated Bone Scan Index as Predictors of Survival in Prostate Cancer. 2017;266–70.
24. Abdollah F, Karnes RJ, Suardi N, Cozzarini C, Gandaglia G, Fossati N, et al. Predicting Survival of Patients with Node-positive Prostate Cancer Following Multimodal Treatment. *Eur Urol* [Internet]. 2014;65(3):554–62. Available from: <http://dx.doi.org/10.1016/j.eururo.2013.09.025>
25. Sugihara T, Yu C, Kattan MW, Yasunaga H, Ihara H, Onozawa M. Long-term Survival of Extremely Advanced Prostate Cancer Patients Diagnosed with Prostate-specific Antigen over 500 ng / ml. 2018;44(September 2014):1227–32.
26. Hsu C, Wildhagen MF, Poppel H Van, Bangma CH. radical prostatectomy
CONCLUSION. 2009;1536–40

8.1.11 ANNEX

Annex 5 Data extraction form for the Assessment of survival time and associated factors among prostate cancer patients at BLH, AA Ethiopia, 2012-2016

Part I: Socio demographic characteristic.	
1. Medical record number(MRN)	_____
2. Age in years	_____
3. Place of residence	1. urban (if regional, zonal or district(woreda) town)
	2. rural
4. name of place and distance from Addis Ababa in kilometers	1. _____(woreda name for rural)
	2. _____Km
5. Marital status	1. Single
	2. Married
	3. Widowed
	4. Divorced
Part II:- Medical History	
1. Patient age at diagnosis in years	_____
2. Basis for diagnosis	1. Clinical only 2. Tumor marker (PSA)
	3. Imaging test/x-ray(CT scan or MRI)
	4. Biopsy (histopathology)
	5. Transrectal Ultrasound (TRUS) 6. unknown
3. Date of diagnosis	____/____/____ (DD/MM/YEAR)
4. serum PSA level at time of diagnose	1. _____(ng/mL) 2. not done
5. gleasonscore at time of diagnose	1. _____ 2. not done
6. Stage of cancer at diagnosis	1. Stage I
	2. Stage II
	3. Stage III
	4. Stage IV
	5. Unknown
7. Histological grades of prostate	1. Well differentiated

15. presence of other chronic co morbidities	diabetes mellitus 1. yes 2. no
	Hypertension 1. yes 2. no
16. Date of last contact	____/____/____ (DD/MM/YEAR)
17. Status of the patient during last contact	1. Alive
	2. Dead
18. Current status of the patient	1. Alive
	2. Dead
19. If alive, functional status of the patient	1. Working
	2. Ambulatory
	3. Bed ridden
20. If dead, date of death	____/____/____(DD/MM/YEAR)
21.If lost to follow up, date of lost to follow up	____/____/____(DD/MM/YEAR)

Annex 6 Biography of the Principal Investigator (Resident)

My name is Jemal Beksisa Shuramu. I was born on October 29/1989 G.C in Alge, Ilu Ababor zone, Western Oromia, Ethiopia. I attended my primary education at Dupha Elementary School and my high school at Alge Secondary School.

Then I had joined Hawassa University in 2008 and graduated with Junior Public Health profession in 2011G.C. Since that I was worked in chefe health center, east Showa zone, Oromia regional state and in Yeka sub city Woreda 13 health center, Addis Ababa city Administration at different departments for about five years. I had worked in health centers as a coordinator for diseases prevention and control core process, as Health Officer giving health care service at adult and pediatric departments and as disease surveillance focal person. By the year of 2015 I started to study my post graduate study of master of public health in Field Epidemiology at Saint Paul's Hospital Millennium Medical College.