Addis Ababa University, College of Health Science,

School of Public Health,

Ethiopian Field Epidemiology Training Program (EFETP)

Compiled body of works in Field Epidemiology

By:

Dereje Dechasa (BSc)

Submitted to the School of Graduate Studies of Addis Ababa University in partial fulfillment for the degree of Master of Public Health in Field Epidemiology

June, 2018

Addis Ababa, Ethiopia

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Approval by examining board

Advisor

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Examinor

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Acknowledgments

I would like to acknowledge Addis Ababa University Health Science College, School of Public Health, Ethiopian Field Epidemiology Training Program (EFETP) for giving me the chance to prepare this document. Also I would like to express my gratitude to my Mentors Dr. Negusse Deyessa and Mr. Abdulnasir Abagero for their consultation and support they provided me during the preparation of this body of work. I would like to thank my field supervisor w/ro Tigist Belayneh for the all rounded support she provided me to access and collect different data used to prepare this body of work. Furthermore I extend many thanks for the city administration of Addis Ababa health bureau public health emergency management staffs, Gulele sub city, Yeka subcity, and Nifas Silk Lafto sub cities health office public health emergency management officers and staffs for their support in providing the necessary information to prepare this document. Moreover I express many thanks for woreda four health office public health emergency management officer of Gulele sub city, woreda three health office public health emergency management officers of Nifas Silk Lafto Sub city and kibebe-tsehay orphanage staffs for their support to access all the available data.

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Abbreviations

AIDS	Acquired immunodeficiency syndrome
ACT	Arthemecine containing therapy
AFP	Acute flaccid paralysis
ANC	Ante natal care
AOR	Adjusted odds ratio
ART	Anti retroviral therapy
BSC	Bachelor of science
CDC	Center for disease prevention and control
EDHS	Ethiopian health and demographic survey
EHNRI	Ethiopian health and nutrition research institute
ETB	Ethiopian birr
GOV	Government
HEP	Health extension program
HHs	House holds
HIV	Human immunodeficiency virus
HMIS	Health management information system
IDSR	Integrated disease surveillance response
IHR	International health regulation
IRS	Indoor residual spray
ITNs	Insecticide treated nets
IUCD	Intra uterine contraceptive device
KG	Kilo gram
Lab.	Laboratory
LLINs	Long lasting insecticide treated nets
MCV	Measles containing vaccine
MOH	Ministry of health
NGO	None governmental organization
NNT	Neonatal tetanus
OPD	Outpatient department
OR	Odds ratio
ORS	Oral rehydration salt
PF	Plasmodium falciparum

PHEM	Public health emergency management
PI	Principal Investigator
PMTCT	Prevention of mother to child transmission
PV	Plasmodium Vivaax
PVP	Predictive value positive
PW	Pregnant women
RDT	Rapid diagnostic test
RRT	Rapid response team
TB	Tuberculosis
TTC	Tetracycline
TVET	Technical vocation Education and training
UNICEF	United nation children's fund
USA	united States of America
WHO	World health organization
WK	week

Executive summary

This document contains two years Field Epidemiology Training Program outputs, to be submitted to school of public health for fulfillment of Master Degree in Field Epidemiology. This Compiled Body of Work has seven chapters. Two Reports of diseases outbreak investigations, public health surveillance data analysis, surveillance system evaluation, Health profile assessment, scientific manuscript, and scientific abstract and Epidemiological research project proposal.

Chapter one: This chapter describes about two outbreak investigation reports. The first outbreak is measles outbreak investigation conducted in Kibebe-tsehay orphanage, Gulele sub city, Addis Ababa in 2017. The objective was to describe the magnitude of the outbreak and to identify risk factors associated with the outbreak. We used unmatched case control study design with the case to control ratio of 1:2.The outbreak affected 45 persons with the attack rate and case fatality rate of 20.6% and 8.9%, respectively. Contact history with measles cases was significantly associated with measles infection after adjusting all other factors. Addis Ababa health bureau, Gulele sub city and the affected woreda health offices need to achieve and maintain high measles vaccination coverage to increase population immunity and improve measles case management based on WHO recommendation.

The second outbreak is rubella outbreak investigation conducted in woreda 03, Nifas Silk Lafto sub city, Addis Ababa in 2018. The objective was to describe the magnitude of the outbreak and take control and prevention measures. In this outbreak a total of 45 Rubella cases with crude attack rate of 0.1 and no deaths were reported. The age-specific attack rate was high (0.9) for age group 1-4 years. Sex specific attack rate was 0.2% for males and 0.1% for females. We recommended further study to describe the extent of the that Addis Ababa health bureau in collaboration with Federal ministry of health and partners need to consider the introduction of rubella vaccine.

Chapter two: This chapter covers the malaria surveillance data analysis done in Addis Ababa from 2012-2016. The objective of the analysis was to describe the malaria cases in Addis Ababa. The incidence was ranged between 0.9/1000 in 2014 and 1.7/1000 in 2016. The five years average incidence was highest (4.2/1000) in Akaki. We recommended that Addis Ababa health

bureau and respective sub city health offices need to encourage the travelers to malaria endemic area to sleep under insecticide-treated mosquito net and apply mosquito replant lotions.

Chapter three: This chapter contains the malaria surveillance system evaluation report conducted in Nifas Silk Lafto sub city of Addis Ababa. The objective of this chapter is to address the systematic aspect of the gap identified during the analysis of five years malaria surveillance data done in Addis Ababa which is presented in chapter three of this document. The analysis report indicated that many of the studied woredas and health centers had no multi-sectoral task force and malaria epidemic preparedness and response plan. The Flexibility, predictive value positive and acceptability of malaria surveillance system were 54.2%, 65.2% and 78.1%, in their respective order. The woreda health offices and health center need to establish emergency task force and prepare malaria epidemic preparedness and response plan. They also need to aware the community and all stakeholders to improve the acceptability of the surveillance system.

Chapter four: This chapter describes the health profile of Yeka Sub city. The objective of the assessment was to describe health and health related information and identify the priority health problem of the sub city. The assessment identified low contraceptive acceptance rate, low delivery service attended by skilled person and low outpatient department attendance per capita. The sub city reported low (37%) contraceptive acceptance rate, low (64%) delivery service attended by skilled person and low (0.99) outpatient department attendance per capita. Therefore, the health facilities, woreda and sub city health offices need to identify and intervene on factors contributed for these low performances.

Chapter five: This chapter presents a scientific manuscript on malaria surveillance data analysis done in Addis Ababa city administration. The contents of this manuscript were described in chapter two of this summary.

Chapter six: This chapter contains the scientific abstract prepared on malaria surveillance data analysis done in Addis Ababa city administration.

Chapter seven: This chapter describes the Epidemiological project proposal prepared on Prevalence of malaria and associated risk factors among residents of Akaki kality sub city, Addis Ababa in 2018. The objective of the proposal is to determine the prevalence of malaria and identify the risk factors associated with malaria in Akaki kaliti sub city in 2018.

Chapter I: Outbreak/ Epidemic Investigation

1.1. Measles outbreak Investigation in Kibebe-tsehay orphanage, Gulele sub city, Addis Ababa, 2017

Summary

Background: Measles is highly contagious vaccine preventable disease with case fatality rate of 3-5% in developing countries during epidemics. Several measles outbreaks have been occurring in Ethiopia despite efforts made to improve measles vaccination coverage. The objective of this outbreak investigation was to describe the magnitude of outbreak and identify risk factors associated with the outbreak.

Methods: we used unmatched case control with case to control ratio 1:2, from December 08 to 26, 2017. All 45 cases identified from the orphanage during the outbreak investigation period and 87 randomly selected controls were included in this study. Socio-demographic characteristics and risk factors information of cases and controls were collected from their guardians using structured questionnaire. We calculated the frequencies, crude attack rate, case fatality rate, age specific attack rate of cases and odds ratio using Epi Info 7 software program taking 95% confidence limit. We also performed logistic regression to identify independent associated factors for measles infection.

Result: A total of 45 cases and four deaths were reported. The attack rate and case fatality rate were 20.6% and 8.9%, respectively. Age specific attack rate for 0 – 59 months was 21.6%. On bivariate analysis malnutrition with 17.59 (7.15-43.27), being younger than nine months with COR 38.96 (11.00- 137.96) were significantly associated with measles infection. On multivariate analysis contact with measles cases with AOR 10.69(1.04-109.80) was significantly associated with contracting measles after adjusting all other variables.

Conclusion: High attack rate and case fatality rate were reported. Addis Ababa health bureau, Gulele sub city and woreda four health offices need to vaccinate all eligible to increase population immunity and interrupt transmission. Woreda four surveillance officer, need to regularly receive and analyze surveillance report to early detect and prompt control the outbreak.

Key words: Measles, Outbreak, Kibebe-tsehay orphanage, Gulele sub city, Ethiopia.

Introduction

Measles is an acute infection caused by a virus of the genus morbilli virus. It is transmitted through airborne droplet and direct contact with the nasopharyngeal secretions of infected person (1). Humans are the only natural hosts of measles virus. The average incubation period is 10 days from exposure to onset of fever and 14 days from exposure to the onset of rash (1). The symptoms are fever, generalized rash, non-productive cough, runny nose and red eyes. Complications include Pneumonia, ear infection, mouth ulcer, diarrhea, croup, corneal ulceration and blindness (2). The case fatality rate is less than 0.1% in developed countries and 3%-5% in developing countries (2). Measles is prevented by vaccination of susceptible individual with safe and effective measles containing vaccine (3). Prior to the development of safe and effective measles vaccine in 1963, measles caused an estimated 2.6 million deaths each year, globally (3). After widespread use of measles containing vaccine, measles incidence and deaths were declining across the world. From 2000-2015, the number of measles cases reported worldwide decreased by 85% (from 853,479 to 214,812); annual reported measles incidence decreased by 87% (from 145 to 29) cases per million persons; and annual estimated global measles deaths decreased by 79% between 2000 and 2015(4). The world is still far from achieving measles elimination goal set for 2020 and measles is continued to be the leading cause of death in many parts of the world, particularly in Africa and Asia. In 2016 about 132,137 measles cases and 89,780 measles related deaths were reported globally. About 75% of the aforementioned global measles deaths occurred in six countries: India, Indonesia, Nigeria, Pakistan, Democratic Republic of Congo, and Ethiopia (4). In Ethiopia, measles containing vaccine was introduced as one of the components of an expanded program on immunization (EPI) in 1980 (5). Since then the country has adopted measles reduction strategies recommended by the world health organization to reduce measles morbidity and mortality (6). Through implementation of these strategies measles coverage was increased from 62% in 2013 to 70% in 2016 and measles incidence per million population decreased from 129 in 2014 to 44 in 2016 (6, 7). Despite these efforts, measles vaccination coverage of the country in 2016 was far below the administrative coverage target set for the year 2016 which is 90% (5). About 1,912 confirmed measles cases reported in Ethiopia in 2017(3). Forty outbreaks were reported as of 31 March in 2017(8). The purpose of this outbreak investigation is to control the current outbreak and to prevent similar

outbreaks in the future by improving the surveillance system in the way it early detects outbreaks.

Objectives

To describe the magnitude of the outbreak and identify the risk factors for the occurrence of measles outbreak in Kibebe-tsehay orphanage, Addis Ababa, 2017.

Specific objectives:

To describe the outbreak by time, place and person;

To identify the risk factors for measles outbreak.

To take control and prevention measures for the outbreak.

Methods and Materials

Study area and period

The outbreak investigation was conducted in Kibebe-tsehay orphanage which is located in woreda four, Gulele sub city, Addis Ababa. Woreda is the lowest administrative level in Addis Ababa. The average annual temperature of the woreda four is 22 degree centigrade. The altitude of the woreda is 2400 meters above sea level. Based on the central statistics agency projection, the 2017 estimated population of the woreda is 18551. Of which 9461 were females. The under five and under one age population of the woreda were 1329 and 433, respectively. Woreda four has one health center and an integrated disease surveillance system led by one public health emergency management officer. Previously, measles outbreak was reported from this orphanage in 2015. From 2015 to November, 2017 no measles outbreak was reported from the orphanage and woreda as well. Kibebe-tsehay orphanage was established in 1956. Currently it provides shelter, clothing and food services for 218 orphan children. The orphanage has 89 permanent and 40 contract workers. The outbreak investigation was conducted from December 08 to 26, 2017.

Study design:

Unmatched case control study design was used to describe the outbreak by time, place, and person and to identify the risk factors associated with the outbreak.

Definitions based on Ethiopian PHEM guide line

Measles suspected case: any person living in Kibebe-tsehay orphanage and its vicinity from November 1, 2017 to January 20, 2018 and develops fever and generalized rash and cough, running nose or red eyes.

Confirmed case: suspected case with laboratory confirmation (positive IgM antibody) or epidemiologically linked to confirmed cases.

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

Measles death: any death from an illness that occurs in a confirmed case or epidemiologically linked case of measles within one month of the onset of rash.

Sample size and techniques

All 45 orphan children living in kibebe-tsehay orphanage that fulfilled the measles case definition were included in the study. Controls were selected using systematic random sampling method. To select controls the list of beds in the orphanage that occupied by the orphans were used as sampling frame. First the beds occupied by cases (the orphans that fulfilled measles case definition) were excluded from the list. Then the remaining beds were given numbers from 1 to 173. There were 173 orphan children in the orphanage that did not fulfill measles case definition. The case to control ratio was 1:2. Therefore, the size of the cases and controls were 45 and 90, respectively. Ninety controls were selected from the total 173 non measles cases orphan children. The sampling interval was obtained by dividing 137 by 90 which is equal to $1.92 \approx 2$. The first bed number, "bed number one" was selected using simple random sampling method. Then we selected every 2^{nd} bed number after the first bed number. Finally we obtained 87 beds. The size of the bed numbers was limited to 87 by the total number of none measles cases (173 none case children). The total sample size was 45 case + 87 controls = 132.

Data collection tools and procedures

Descriptive epidemiology:

As soon as suspected measles outbreak report was received from Gulele sub city PHEM officer on December 08/2017, the Addis Ababa PHEM case team held discussion with its staffs about the suspected disease outbreak and how to investigate it. Then a team of two Field epidemiology training program residents (Principal investigator and co investigator) were mobilized to the area for investigation. The team reviewed one year weekly measles surveillance reports of woreda four to observe changes occurred in the surveillance system and population of the woreda. The team also discussed with sub city and woreda RRTs on the possible cause, source, and extent of the outbreak. At woreda level, the woreda RRT with a team sent from Addis Ababa PHEM formed new team before they moved to the affected site. Finally, the team departed to affected orphanage on December 08, 2017 to investigate the outbreak and implement control activities. The team interviewed some guardians of the cases and staffs of the orphanage using unstructured questionnaire. Some cases were examined, the medical and laboratory records of the cases were reviewed to confirm whether the cases meet measles case definition. Additional cases were searched in the orphanage and community and referred to the health facilities for treatment. The information of the first five cases was recorded on measles case based reporting formats and

additional cases were recorded on the line list. The data obtained from case based reporting format and line list was used to construct the epidemic curve.

Laboratory investigations

We collected five blood samples from suspected cases that had rash at the time of receiving samples and sent the samples to Ethiopian Public health institute (EPHI) for confirmation.

Case control study (Analytical Epidemiology)

The guardians of the cases and controls were interviewed using structured questionnaires. We used the questionnaires adapted from the tools previously used by other researchers for similar study in Ethiopia (9). The questionnaires were downloaded from the internet and modified in the way they address the objective of this study. Data was collected by principal investigator (PI). The data collected during the interview includes socio-demographic characteristics and exposure to risk factors.

Data Analysis and presentation

All collected data were entered, cleaned for its completeness and analyzed using statistical software program. We calculated frequencies, crude attack rate, age specific attack rate, sex specific attack rate, case fatality rate, the percentage of cases by age group and sex, and odds ratio using Epi Info 7 software program taking 95% confidence limit. Logistic regression was performed to identify independent factors for contracting measles. The results of the analysis were presented in narrative form and using tables, graphs and charts.

Ethical Consideration

Prior to the start of the outbreak investigation the team discussed with the concerned sub city and woreda officials (administrator and health office head) to get permission and facilitate the investigation process. Informed verbal consent was secured from the head of the orphanage and guardians of the cases and controls before starting the data collection.

Result:

A total of 45 cases with crude attack rate per 100 populations 20.6 and four deaths with case fatality rate 8.9% were reported from November 23/2017 - December 20/2017. The age specific attack rates for 0 – 11 months was 43.3 and for 0 – 59 months was 21.6. Sex specific attack rate was 26.2 for females and 18.3 for males. The age specific case fatality rate was 7.1% for younger than one year children. Twenty eight (62.22%) of the cases and three (75%) of the deaths were males. The percentage of cases by age group, 42(93 %) were less than 12 months. Cases were not reported from age group older than 12 - 59 months. Table 1.

Table 1. Socio-demographic characteristics of cases Kibe-tsehay orphanage, Addis Ababa, 2017

Age group	Case # (%)
0-11months	42(93%)
12- 59 months	3(7%)
60 months and above	0(0%)
Total	45(100)
Sex	
Males	28(62.2)
Females	17(37.8)
Total	45(100.0)
Educational status	
Under school age	45(100%)
Kindergarten	0(0%)
Elementary school	0(0%)
Not go to school due to illness	0(0%)
Total	45(100%)
Occupation	
Unemployed	45(100%)
Student	0(0%)
Total	45(100%)

Measles Cases and deaths by dormitories

Twenty-nine (64.4%) of cases and three (75%) of deaths were reported from dorm one where 0-6 months old children live. The highest (51.6/100) attack rate was reported from dorm two where 7 – 12 months old children live. The highest (10.3%) case fatality rate was reported from dorm one. Cases were not reported from dorm 3,4,5,6 and 7 where children older than 24 months live. Table 2.

Table 2. Measles cases and deaths by dormitories, Kibebe-tsehay orphanage, Addis Ababa, 2017.

Dorm number	Age groups per dorm	Number of children per dorm	Cases (%)	Deaths (%)	Attack rate	Case fatality rate
01	0- 6 months	76	29(64.4%)	3(75%)	38.2%	10.3%
02	7 – 12 months	31	16(35.6%)	1(25%)	51.6%	6.3%
03	1 – 2 years	32	0(0%)	0(0%)	0%	0%
04	2 – 4 years (A)	30	0(0%)	0(0%)	0%	0%
05	2 – 4 years (B)	26	0(0%)	0(0%)	0%	0%
06	4 – 8 years	12	0(0%)	0(0%)	0%	0%
07	Special need children	11	0(0%)	0(0%)	0%	0%
Total		218	45(100)	4(100)	20.6%	8.9%

On November 23/2017 one year female (possible index case) was brought to the orphanage by police. On admission she had fever, small desquamated skin scattered over the whole body and abnormal body movement. The orphanage had no adequate space and experience to isolate newly admitted children and she was directly admitted to the dorm one where 0-6 months old children live. Two days after her admission, she referred to Yekatit 12 Hospital for further investigation and treatment. However, she was died on arrival to the emergency department. Within ten days of the admission of possible index case to the orphanage, one child developed

measles symptoms from the same dorm. On the following days additional suspected measles cases were identified from the same and nearest dorms until they reached the first peak on December 7, 2017. The suspected outbreak was reported to woreda health office after the outbreak reaches the first peak. The second peak was on December 10, 2017. After the second peak, cases gradually started to decline to zero on December 21, 2017. Following the last report of rash on December 20, 2017 the orphanage was followed for additional cases for the next one month. However, cases were not reported. Figure 1.

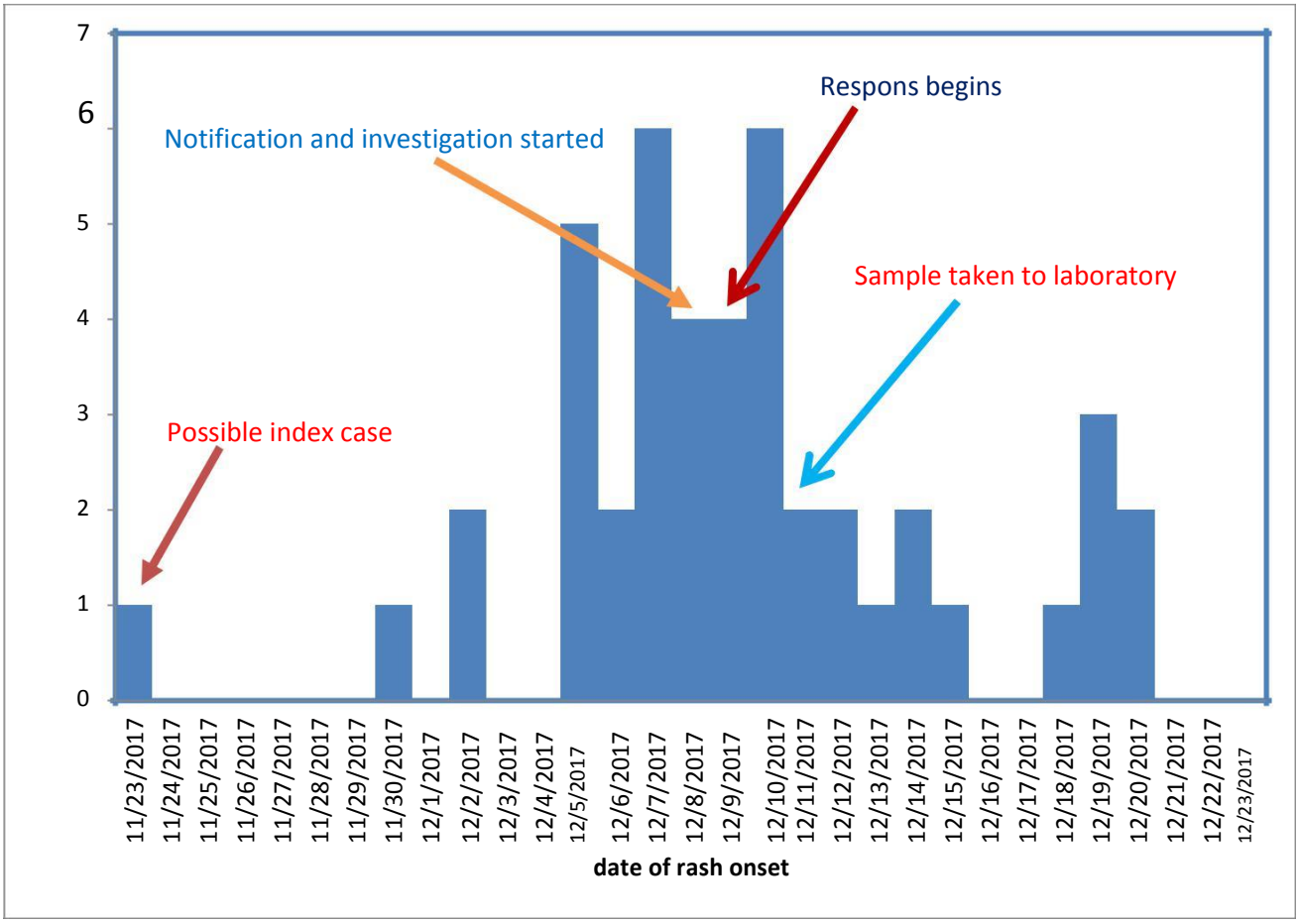

Figure 1. Measles cases by date of rash onset, Kibebe-tsehay orphanage, Addis Ababa,2017.

With respect to the symptoms manifested by cases 45(100%) had rash, 41(91%) had fever and 36(80%) had cough. Table 3.

Table 3. Main symptoms reported by cases, kibebe-tsehay orphanage, Addis Ababa, 2017.

Symptom	Number(n=45)	Percent
Rash	45	100
Fever	41	91
Cough	36	80
Runny nose	11	24.4
Red eyes	6	13.3

Based on the health facility report 40 (88.9%) of the cases were complicated with other diseases. Among these complications 36(90%) were Pneumonia, three (7.5%) were diarrhea and one (2.5%) was seizure. From the total of 45 cases who received the treatment, 41 (91%) improved from their illness. The survivors were not developed long term disability. Four (9 %) of measles infected cases were died. The possible index case was one year female brought to the orphanage by police. During her arrival at the orphanage she had fever, desquamated skin scattered over the whole body and abnormal body movement. After two days she referred to Yekatit 12 Hospital for further investigation and treatment. The second deceased was six months child who developed moderate malnutrition and diarrhea. He was referred to hospital and ventilated with oxygen. The third child was five months child who developed severe pneumonia and referred to Yekatit 12 hospital. He was also ventilated with oxygen. The forth deceased was four months child who developed severe pneumonia and admitted to yekatit 12 hospital. He was ventilated. Except the index case other children were repeatedly admitted to hospital prior to the occurrence of this outbreak.

All (100%) cases were treated according to their symptoms. Among the cases 97.8% was supplied with vitamin A and 82.2% was treated with antibiotics. Table 4.

Table 4. Type of treatment given for cases, kibebe-tsehay orphanage, Addis Ababa, 2017.

Types of treatment	Number of cases	Percent

Antibiotics	37	82.2
Vitamin A	44	97.8
Antipyretics	44	97.8
TTC eye ointment	6	13.3
ORS	3	6.7
Supplementary food	7	15.6

Laboratory Investigation

Of the five blood samples collected from the suspected cases and sent to Ethiopian Public Health Institute for confirmation, three were positive for measles specific IgM antibody and the rest were negative.

Cases and controls (Analytic epidemiology)

A total of 45 cases and 87 controls were included in this study. The response rate for both cases and controls were 100%. The mean age of cases was 6.1 with standard deviation of 2.5 months and the mean age of controls was 34.5 with standard deviation of 31.7 months. About 28(62%) of cases and 55(63%) of controls were males. Forty-two (93.3%) of cases and 23(26.4%) of controls were less than one year. All the guardians for both cases and controls were females. Regarding the occupational status of guardians 89 (69%) was government employee and the rest were contract workers. With respect to the educational status of guardians 99(76.52%) attended secondary school, 21(16.67%) attended college level and the rest attended up to elementary school. The knowledge of the guardian was assessed and 82.6% of them responded that measles is transmitted through contact with person infected with measles cases. About 99% of the respondents said measles is vaccine preventable disease. About 23% of the guardians responded that measles is cured using traditional medicine. (Table 5).

Table 5. Status of caregiver's knowledge about measles, kibebe-tsehay orphanage, Addis Ababa, 2017.

Knowledge questions	Response	Number (percent)
Do you Know Mode of transmission of measles	Yes	115(89.4%)
	No	14(10.6%)
How do people get measles	Contact with virus from ill person	107(82.6%)
	I don't know	22(17.4%)
does measles vaccine preventable	Yes	127(98.5%)
	No	2(1.5%)
Who can be affected by measles	Children < 5 years	41(31.8%)
	Any non immunized person	88(68.2%)
How does measles can be cured	Using modern medicine	100(77.3%)
	Using traditional medicine	29(22.7%)

On the bivariate analysis contact with measles cases (COR = 83.6, 95% CI 10.97- 637.08), being younger than 12 months (COR = 38.96, 95% CI 11.00- 137.96), being malnourished (COR = 17.59, 95% CI 7.15- 43.27) and new child join the dorm (COR = 5.93, 95% CI 1.74 - 20.18) were significantly associated with acquiring measles. On the other hand, being vaccinated (COR = 0.03, 95% CI 0.01-0.08) were protective factor for acquiring measles. Sharing a bed with another child, educational status of guardians and knowledge of the guardians about measles were not statistically significant with developing measles.

Table 6. Factors associated with contracting measles on bivariate analysis, kibebe-tsehay orphanage, Addis Ababa, 2017.

characteristics		Case	control	COR(95% CI)	P value

Vaccination status	vaccinated	5(11%)	71(81.6%)	0.03(0.01-0.08)	0.0001
	Not vaccinated	40(89%)	16(18.4%)	1	
Nutritional status	malnourished	34(75.6%)	13(15.0%)	17.59(7.15- 43.27)	0.0001
	Well nourished	11(24.4%)	74(85.0%)	1	
Contact with measles case	yes	44(97.8%)	30(34.5%)	83.6(10.97-637.08)	0.0001
	no	1(2.2%)	57(65.5%)	1	
New child join the dorm	yes	10(22.2%)	4(4.6%)	5.93(1.74-20.18)	0.005
	no	35(77.8%)	83(95.4%)	1	
Age < 12months	yes	42(93.3%)	23(26.4%)	38.96(11.00- 137.96)	0.0001
	no	3(6.7%)	64(73.6%)	1	

On multivariate analysis only having contact history with measles cases (AOR = 10.69, 95% CI 1.04-109.80) was significantly associated with measles infection.

Table 7. Factors associated with measles on multivariate analysis, kibebe-tsehay orphanage, Addis Ababa, 2017

Characteristics		case	control	COR(95% CI)	AOR(95%CI)
Vaccination status	vaccinated	5(11%)	71(81.6%)	0.03(0.01-0.08)	0.67(0.03-13.21)
	Not vaccinated	40(89%)	16(18.4%)	1	1
Nutritional status	Malnourished	34(75.6%)	13(15.0%)	17.59(7.15- 43.27)	1
	Well nourished	11(24.4%)	74(85.0%)	1	0.36(0.11-1.14)
Contact with measles case	Yes	44(97.8%)	30(34.5%)	83.6(10.97-637.08)	10.69(1.04-109.80)
	No	1(2.2%)	57(65.5%)	1	1
New child join	Yes	10(22.2%)	4(4.6%)	5.93(1.74-20.18)	1.88(0.40-8.83)

the dorm	No	35(77.8%)	83(95.4%)	1	1
Age < 12 months	Yes	42(93.3%)	23(26.4%)	38.96(11.00- 137.96)	1
	No	3(6.7%)	64(73.6%)	1	0.24(0.01- 4.38)

Public health Intervention done:

The following control and prevention activities were implemented.

- Six months and older children, living in the orphanage and admitted in the same room at hospital with measles cases were given measles vaccine regardless of their immunization status.
- Two doses of vitamin A supplementation was given for all measles cases. First dose immediately on diagnosis and second dose on the next day.
- Supportive drugs (Antibiotics, tetracycline ointment, oral rehydrating salt, Vitamin A, and anti-pyretic) were distributed to the orphanage and health center located around the orphanage.
- Complicated cases were identified and referred to hospital and non severe cases were treated at the orphanage based on their symptoms.
- All children suspected for Measles were isolated both at the orphanage and at the hospitals until four days after development of rash.
- Health education was given for the orphanage workers and guardians of children about the cause and mode of transmission of Measles.
- Vaccination defaulters in the neighbors of the orphanage were searched and vaccinated.

- The Woreda health office and Health center professionals were sensitized on measles case detection and management.
- Continuous active case search was conducted in the communities including the families that have contact with the orphanage children (guardians and their families) to refer the cases to health facilities for treatment, to isolate the cases and to document on line list.
- Active case search was conducted in the Health facilities (Government and non Government) located in the neighboring village of the orphanage and nearby woredas to check weather cases were appropriately treated, to isolate cases and to document on line list.
- Community was informed on Measles case definition and mode of transmission through health extension workers.

Discussion

High attack rate and high case fatality rate were reported from this outbreak. More than 90% of the cases were less than 12 months. Females were more affected. When we look at the distribution of cases and deaths by dormitories the highest attack rate was reported from dorm two where 7 – 12 months old children live. On multivariate analysis Contact with measles case was significantly associated with measles infection.

In this study, high case fatality rate was reported. It is in line with the case fatality rate expected in many sub-Saharan countries that ranges from 5% to 10% during outbreaks (10). On the contrary, the case fatality rate reported in this study was higher when compared with the expected case fatality rate of Ethiopia which is between 3% and 6% (2) and the case fatality rate (0.2%) reported from the study done in oromia region Guji zone (11).This can be related to the late response of the outbreak and high malnutrition level in this study.

In the current study, females were more affected than males. The study conducted in Nigeria in 2014 showed there was no significant difference in the incidence of measles among males and females children (12). In this study, females might be more exposed to measles cases than males but requires further study.

In the present study, highest attack rate was reported from age group younger than nine months. The study conducted in 2017 in Southern Ethiopia and the current WHO measles report indicated

that measles infection was highly affected the age group 14 – 25 years, followed by 1– 4 years as (3,13). This can be attributed to passive immunity lost before the child reaches the recommended age for immunization and the mothers of the children might not be vaccinated or naturally infected with measles in the case of current study.

In this study, the guardian's knowledge about measles was not associated with measles infection. However, it was associated in other study (14).

In this study, Contact with measles case was significantly associated with measles infection after adjusting all other variables. Other studies also showed that Contact with measles case was significantly associated with measles infection after adjusting all other variables (16, 17).

Limitations

As majority of the children have no birth certificate, the appropriateness of information obtained from guardians regarding the age of cases and controls may decrease.

Conclusion

- High attack rate and high case fatality rate were reported from this outbreak
- Females were more affected than males.
- Age specific attack rate was highest for age group younger than one year.
- Higher Attack rate was reported from dorm two and higher case fatality rate was reported from dorm one.
- Contact with measles case was significantly associated with measles infection after adjusting all other variables.
- Sharing a bed with another child, educational status of guardians and knowledge of the guardians about measles were not statistically significant with developing measles.

Recommendation

- The orphanage need to screen newly admitted orphans for measles.
- Woreda four public health emergency management officer need to regularly receive data from health facilities, analyze and report measles surveillance data to the next level to detect and control the outbreak as early as possible.

- Addis Ababa health bureau, Gulele sub city and Woreda four health office need to vaccinate all eligible with MCV1and consider supplementary immunization activities to raise population immunity and interrupt measles transmission.
- Woreda four health office need to increase the awareness of the community on isolating and limiting the movement of measles infected person for four days after onset of rash.
- Further study is needed to generate more evidence weather measles is predominant in age group younger than one year and affected females than males in similar study area.

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1.2. Rubella outbreak investigation in woreda03, Nifas Silk Lafto sub city, Addis Ababa, 2018

Summary

Back Ground: Rubella is an acute, usually mild, contagious disease caused by virus of the genus rubivirus. When a woman is infected with the rubella virus early in pregnancy, it can cause miscarriage, stillbirth or severe birth defects (blindness, deafness, congenital heart disease and mental retardation). The objective of this outbreak investigation was to describe the magnitude of the outbreak and implement control and prevention measures.

Methods: A cross sectional study was used. Rubella case was defined as any person residing in woreda three of Nifas Silk Lafto Sub city from March 16, 2018 to May 17, 2018 and presents

with fever, generalized rash and cervical, sub-occipital, or post-auricular adenopathy; or arthralgia/arthritis. We interviewed and examined some cases, and reviewed the medical and laboratory records of the patients and additional cases were searched and referred to health facilities for treatment. We calculated the frequencies, crude attack rate, age specific attack rate and sex specific attack rate using Excel soft ware program.

Result: A total of 45 Rubella cases with crude attack rate of 0.1 and no deaths were reported. The age-specific attack rates were 0.9 and 0.5 for the age group 1-4 year and 5-14 years, respectively. Sex specific attack rate was 0.2% for males and 0.1% for females.

Conclusion: Majority of the reported cases was younger than the age group 5 - 14 years and males were more affected in this outbreak. Woreda three health office needs to provide health education for the communities about the cause and mode of transmission of rubella and further studies are needed to incorporate rubella vaccine in the current immunization program.

Key words: Rubella outbreak, Woreda three, Nifas Silk lafto, Addis Ababa.

Word numbers: 264

Introduction

Rubella is an acute, usually mild, contagious disease caused by virus of the genus rubivirus. It is transmitted through direct or droplet contact from nasopharyngeal secretions of infected person. Rubella can also be transmitted from infected pregnant women to their unborn babies (1). Humans are the only known host. The average incubation period is 17 days but can range from 12–23 days. The most infectious period is usually 1–5 days after the appearance of the rash, but they can shed virus from 7 days before to 7 days after rash onset (1-2). Symptoms usually appear 2 to 3 weeks after exposure. In children, the disease is usually mild, with symptoms including a rash (50-80%), low fever (<39°C), nausea and mild conjunctivitis. Swollen lymph glands behind the ears and in the neck are the most characteristic clinical feature. Infected adults, more commonly women, may develop arthritis and painful joints that usually last from 3–10 days. When a woman is infected with the rubella virus early in pregnancy (during the first trimester),

she has a 90% chance of passing the virus on to her fetus. This can cause miscarriage, stillbirth or severe birth defects known as congenital rubella syndrome (CRS). Infants with CRS may excrete the virus for a year or more (2-4). Congenital rubella syndrome is a cause for blindness, deafness, congenital heart disease and mental retardation (5). Rubella is prevented by safe and effective live attenuated rubella vaccine (6).

Safe and effective rubella vaccine was introduced in 1969. However, worldwide, more than 100 000 children are born each year with congenital rubella syndrome (CRS) with most of the CRS occurring in South East Asia, Africa, and Western Pacific regions (7, 8).

Ethiopia established measles case-based surveillance, in which suspected cases are screened with laboratory tests. Rubella is also integrated into measles case-based surveillance when specimens found to be negative or indeterminate for measles specific IgM antibody. Negative and indeterminate samples for measles specific IgM antibody are tested for rubella specific IgM antibody. The analysis of this data showed that the seropositivity rate of rubella specific IgM antibody was 12% in the period 2004-2009 (9) and 15% in the period from 2009-2015(10). Previously rubella outbreak was not reported from Nifas Silk Lafto sub city and woreda three.

Objectives

General objective

To describe the magnitude and to control the outbreak occurred in Woreda three of Nifas Silk Lafto sub city, Addis Ababa, 2018.

Specific objectives:

To describe the outbreak by time, place and person

To formulate the risk factors for the occurrence of the outbreak

To take control and prevention measures.

Methods and Materials

Study area and period

The outbreak investigation was conducted in woreda 03, which is one of the 13 woredas located in Nifas Silk Lafto sub city. Nifas Silk Lafto sub city is one of the 10 sub cities of city administration of Addis Ababa. Woreda is the lowest administrative level in Addis Ababa City administration. To facilitate the administrative and development activities, woreda is also sub divided into several ketenas. Woreda three has 05 ketenas. The average annual temperature of woreda 03 is 22 degree centigrade. The altitude of the woreda is 2400 meters above sea level. Based on the central statistics agency projection, the 2018 estimated population of the woreda is . 37,777 Of which 19644 (52%) were females. The under five and under one year age population of the woreda are 2704 and 880, respectively. One year to five years old population was 1677. Five years to 14 years old population of the woreda was 6351.Woreda 03 has one health center and functional integrated disease surveillance system led by one public health emergency management officer. The outbreak investigation was conducted from April 20 to 30, 2018.

Study design:

A cross sectional study was used to describe the outbreak by time, place and person and to generate the hypothesis.

Data collection tools and procedures

Nifas Silk Lafto Sub city, public health emergency management officer reported suspected rubella outbreak with 11 cases and no death from ketena one and two of woreda three on April 20, 2018. Then the Addis Ababa city administration public health emergency management case team discussed about the suspected disease outbreak and decided to send a team (one field epidemiology training program resident) to the area to investigate the outbreak in collaboration with woreda three rapid response team (RRT). The team discussed with sub city and woreda health office RRTs on possible, source, risk factors, and extent of the outbreak before the arrival at the affected woreda. At woreda level, a team that contains woreda three RRT and a team sent from Addis Ababa PHEM unit was reformed and departed to affected site on April 20, 2018 to investigate the outbreak and implement control activities. Rubella case was defined as any person residing in woreda three of Nifas Silk Lafto Sub city from March 16, 2018 to May 17, 2018 and presents with fever, generalized rash and cervical, sub-occipital, or post-

auricular adenopathy; or arthralgia/arthritis and Confirmed case as suspected case with laboratory confirmation (positive rubella specific IgM antibody) or epidemiologically linked to confirmed cases. Epidemiologically linked case was also defined as suspected rubella case that has not had a specimen taken for serologic confirmation and is linked (in place, person and time) to a laboratory confirmed case. We interviewed some cases and staffs of the health facility to formulate hypotheses about potential risk factors and sources of infection. Some cases were examined; the medical and laboratory records of the cases were reviewed to confirm whether the cases meet rubella case definition. Active cases were searched in the family and neighbors of cases and in the community and referred to the health facilities for treatment. Active search also conducted in the ANC unit of the health center. Families/Guardians of cases, health extension workers, community leaders, religious leaders, and school directors were contacted to obtain information about additional cases. The information of the first five cases was recorded on case based reporting formats and additional cases were recorded on the line list. The data obtained from case based reporting format and line list was used to construct the epidemic curve. Control and prevention activities were implemented.

Laboratory investigations

We collected five blood samples from suspected cases that had rash and sent the samples to Ethiopian Public health institute (EPHI) for rubella specific IgM antibody confirmation.

Data Analysis and presentation

All collected data were entered, cleaned for its completeness and analyzed using statistical software program. We calculated frequencies, crude attack rate, age specific attack rate, sex specific attack rate, the percentage of cases by age group and sex using Excel software program. The results of the analysis were presented in narrative form and using tables, graphs and figures.

Ethical Consideration

Prior to the start of the outbreak investigation we discussed with the concerned woreda officials (Woreda administrator and woreda health office head) to facilitate the investigation process. Informed verbal consent was obtained from the cases and parents (guardians) before starting the data collection.

Result

A total of 39 rubella cases with Attack rate of 0.1 and no deaths were identified from April 1-30, 2018. Of these 11 cases were identified through active case search. Rubella suspected pregnant women were not identified from active case search conducted in the community and health center. The mean age was 5 with S.D 1.5 years. The age-specific attack rates were varied with 0.8 and 0.4 for the age group 1-4 years and 5-14 years, respectively. Sex specific attack rate was 0.1% for both males and females. There were 24/39(61.5%) males. Among the total cases, 26/39(66.7%) were in the age group 5-14 years. Of the reported cases 36/39(92.3%) were students. Cases were not reported from the age group older than 5 – 14 years. (Table 8).

Table 8. Socio-demographic characteristics of cases, Woreda three, Nifas Silk Lafto sub city, 2018.

Age group	Case # (%)
0 - 11 months	0(0.0%)
1-4 years	13(33.3%)
5 - 14 years	26(66.7%)
Total	39(100%)
Sex	
Males	24(61.5%)
Females	15(38.5%)
Total	39(100%)
Educational status	
Under school age	3(7.7%)
Kindergarten	32(82.0%)
Elementary school	4(10.3%)
Total	39(100%)
Occupation	
Unemployed	3(7.7%)
Student	36(92.3%)
Total	39(100%)

In 2018, woreda three health office reported rash cases since February 7, but the number was not exceeded five cases per month until the end of March. On April 9 and 10, 2018, two rash cases (one case on each day) were identified from ketena one. After one week additional rash cases were reported from the same and nearest ketena until they reached peak on April 22, 2018. After this peak cases gradually started to decline to less than two cases per week since April 25, 2018. Then we searched for additional cases in the woreda for the next one month, but less than five rash cases were reported during the month. (Figure 2).

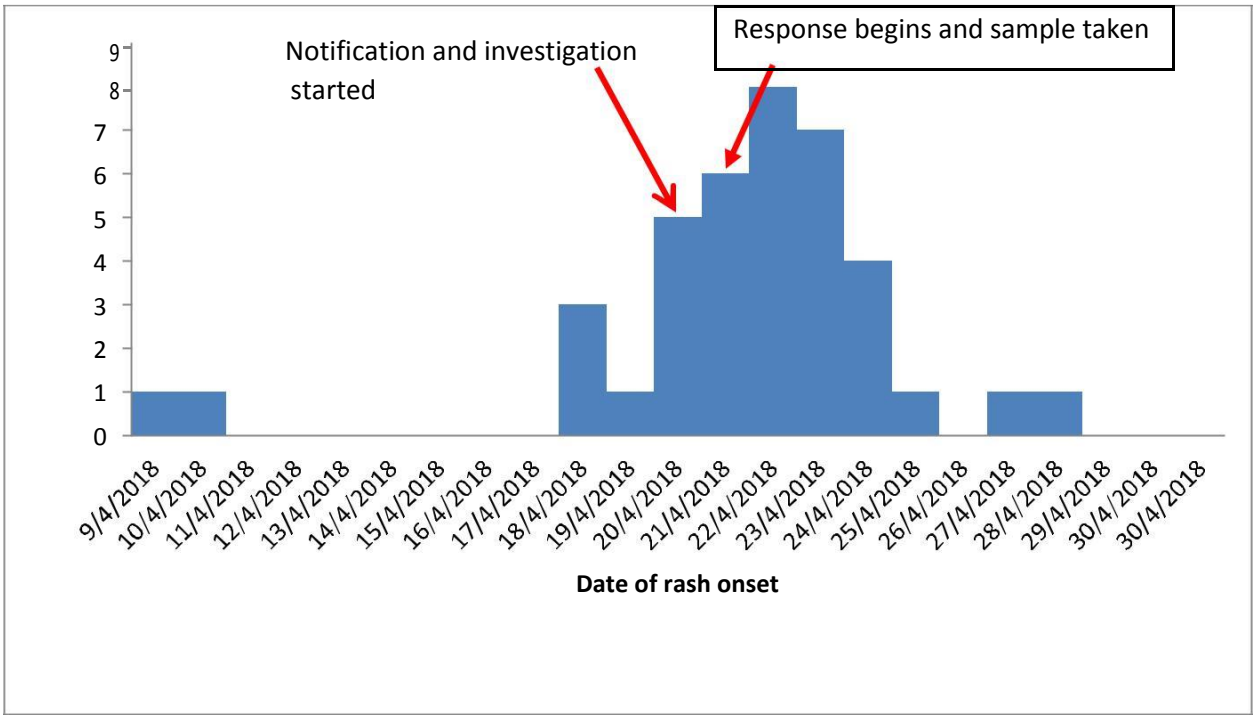

Figure 2. Measles cases by Date of rash onset, woreda three, Nifas Silk Lafto sub city, 2018.

Cases were reported from all five ketenas of the woreda. The number of reported cases was varied among the ketenas and it was highest (41%) in ketena one and lowest (8%) in ketena four (Table 9).

Table 9.Distribution of Rubella cases by ketena, woreda three,Nifas Silk Lafto sub city, 2018

Ketena name	Number of rubella cases	Percent (%)
Ketena 01	16	41
Ketena 02	9	23
Ketena 03	5	12
Ketena 04	3	8
Ketena 05	6	16
Total	39	100

Laboratory Investigation

Five blood samples were collected from measles and rubella suspected cases on April 21, 2018 and sent to EPHI for laboratory confirmation and all were positive for rubella specific IgM antibody..

Public health Intervention done:

The following control and prevention activities were implemented.

- Additional cases were searched in the family and neighbors of cases and in the community and referred to the health facility for treatment.
- Health education was given for the cases, families of cases and communities about the cause and mode of transmission of rubella and on the importance of isolating the cases for five days after the appearance of rash.
- The Woreda health office staffs and health center health workers were sensitized on rubella case detection and management.
- Supportive drugs (Antibiotics, tetracycline ointment, Vitamin A, and anti-pyretic) were distributed to the woreda three health center.

Discussion

In this outbreak investigation all reported cases were younger than the age group 5 – 14 years. The sex specific attack rate was nearly similar for both sexes. More cases were reported from ketena one.

In the present study, all reported cases were younger than the age group 5 – 14 years. The analysis of the data collected through measles case based surveillance that tested negative for measles indicated that 20.7% positive rubella specific antibody were in the age group 5-9 years (10). On the contrary, facility based study conducted in Hawasa in 2017, reported high (86.3%) IgG positive among pregnant women attending antenatal care clinics (11). The sub clinical nature of rubella infection limits us to find the adult pregnant women during active case search in the current study.

In this outbreak, rubella affected both sexes equally. This is in line with the study conducted in Nigeria that reported almost similar attack rate in both sexes (12) but, other study conducted in South east Nigeria in 2014 indicated females were more affected (13). Females might be more exposed to the infected cases while caring the rubella infected persons in the Nigeria study, but requires further study.

Limitation

As about 50% of rubella infection is asymptomatic, cases could be under reported in this outbreak investigation.

Conclusion

- Death was not reported in this outbreak.
- Majority of the reported cases were younger than the age group 5 – 14 years.
- In this outbreak both sexes were affected equally.
- More cases were reported from ketena one specifically, from Mekanisa kinder garten.

Recommendation

- Woreda three health office needs to provide health education for the communities about the cause and mode of transmission of rubella.

- Addis Ababa health bureau in collaboration with Federal ministry of health need to conduct further study to consider the need to incorporate rubella vaccine in the current expanded program on immunization.

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Chapter two- Surveillance Data Analysis Report

2.1. Malaria surveillance data analysis in Addis Ababa, 2012-2016.

Summary

Back ground: In 2015, malaria affected 212 million people and caused 429,000 deaths globally. Malaria also affected 12,216 peoples and caused 16 deaths in Addis Ababa in 2016. We described malaria cases and deaths by time and place and described the dominant malaria parasite in Addis Ababa.

Methods: We reviewed, edited and analyzed malaria surveillance data reported to public health emergency management (PHEM) of Addis Ababa from 2012-2016. We analyzed the data using micro soft excel. We calculated the incidence and case fatality rate by years and sub cities. We calculated the percentage of dominant malaria parasite in Addis Ababa.

Result: A total of 20,381 malaria cases (753 clinical & 19628 confirmed) and five deaths were reported during the study period. The incidence was ranged between 0.9/1000 in 2014 and 1.7/1000 in 2016. Malaria distribution varied among the sub cities. The five years average incidence was highest in Akaki (4.2/1000) and lowest in Yeka (0.4/1000). The case fatality rate was highest (0.1) in 2012 and lowest (0.0) from 2013-2015. The case fatality rate was highest (0.4%) in Arada sub city. Of 19,628 confirmed malaria cases reported during the study period 12,681(64.6%) were Plasmodium Vivax and the rest were plasmodium Falciparum.

Conclusion: The highest malaria incidence was reported in 2016 and the highest case fatality rate was reported in 2012. The highest incidence rate and highest case fatality rate were reported from Akaki kaliti and Arada sub cities, respectively. Plasmodium Vivax was the dominant malaria parasite identified in Addis Ababa. Addis Ababa health bureau and the sub city health offices need to aware the travelers to malaria endemic regions about the prevention method of malaria. Further study is required to identify factors related to high incidence of malaria in Akaki kality sub city and increased plasmodium Vivax parasite in Addis Ababa.

Key word: surveillance data analysis, Malaria, incidence rate, Case fatality rate, Addis Ababa.

Words:296

Introduction

Malaria is an acute infection of the blood caused by protozoa of the genus plasmodium. It is transmitted through the bite of an infected female anopheles mosquito (1). Plasmodium Falciparum and Vivax are the main species of genus plasmodium that causes malaria (2-3).

The typical symptoms of malaria include fever, tiredness, chills, rigor, back pain and headache (5).

In 2015, malaria affected 212 million people and caused 429,000 deaths globally(6). Children less than five years of age contributed for more than two thirds of these deaths (6). Most of the malaria cases and deaths were occurred in sub-Saharan Africa (7,8).

In Ethiopia, approximately 75% of the landmass is favorable for malaria transmission and about 68% of the country's population is at risk of malaria (9). Malaria in Ethiopia was characterized by epidemics occurring every 5-8 years until 2004. The epidemic occurred in 2003-2004 contributed for more than 2 million cases and 3000 deaths, but since then, no major outbreaks have been reported (10). In 2016, Malaria affected 1,962,996 people and caused 510 deaths in Ethiopia (11). The Addis Ababa Health bureau health management information system (HMIS) reported 12,216 cases and 16 deaths in 2016.

The Objective of Addis Ababa health bureau surveillance system is to detect outbreaks, predict epidemics and monitor trends of priority diseases. The surveillance system receives reports of 21 priority diseases (4) including malaria from the sub city health offices and analyze on weekly base. The findings of the analysis is interpreted and provided as feedback for the reporting sub city health offices. The surveillance system also compiles the reports of priority diseases that comes from the sub city health offices and reports to Ethiopian Public Health Institute (EPHI) on weekly base.

Rational of the study

The Addis Ababa malaria surveillance data was not analyzed for a long time. Therefore, the result of this analysis will help to identify the challenges of malaria surveillance in Addis Ababa and provide updated information for public health emergency management, decision makers and partners.

Objectives

General objective

To describe malaria cases and deaths by time and place and to describe seasonal variability of malaria in Addis Ababa, from 2012-2016

Specific Objectives

To describe malaria cases and deaths by time and place in Addis Ababa

To describe seasonal variability of malaria in Addis Ababa To describe trends of malaria incidence

To describe malaria positivity rate in Addis Ababa.

To describe the dominant malaria species in Addis Ababa

Methods and Materials

Study area

This surveillance data analysis was conducted in the city administration of Addis Ababa which is the capital of Ethiopia. Addis Ababa is located in the center of the country and in all directions it is surrounded by oromia regional state. The average annual rainfall of the city is 1161 millimeters. Its average altitude is 2,400 meters (ranges from 2100 meters at Akaki sub city – 3000 meters at Gulele sub city) above sea level. Administratively Addis Ababa city is divided into 10 sub cities. Each sub city further divided into administrative woredas. Woreda is the lowest administrative level in Addis Ababa. Based on the Ethiopian central statistical agency estimate, the 2016 total population of Addis Ababa was 3,433,999 of which 52% was females.

Study design and period

A retrospective descriptive document review was used to analyze the malaria surveillance data reported to Addis Ababa health bureau public health emergency management, from 2012-2016. The data was extracted at Addis Ababa health bureau PHEM unit during January 16-31/2017 using check list.

Variables

Malaria cases and deaths, time and malaria parasite were the main variables used in this surveillance data analysis.

Numerator and Denominator

The malaria cases and deaths reported to Addis Ababa health bureau public health emergency management per each year and per each sub city during 2012-2016 were used as numerators and the population at risk for malaria per each year and per each sub city were used as the main denominator for this surveillance system data analysis.

Malaria case definition based on Ethiopian PHEM guide line

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

Confirmed case: Are suspected case confirmed by microscopy or RDT for plasmodium parasites.

Malaria outbreak: when cases crossing the norm line OR Doubling of cases compared to the same week of the previous year.

Total malaria: Clinical malaria plus confirmed malaria

Data collection tools and procedures

All malaria cases and deaths recorded at Addis Ababa health bureau PHEM from 2012-2016 were identified; collected; checked for its completeness, abnormal values and missing values using check list. Moreover, the Addis Ababa health bureau PHEM staffs were interviewed for clarification of data. We described malaria cases and deaths by years and sub cities. We also described the malaria case trends and seasonal variability. The data include surveillance reports from all government health facilities (health centers and hospitals) and some none governmental health facilities located in Addis Ababa.

Data analysis and presentation

We performed descriptive analysis using Excel software program. We calculated frequencies, malaria incidence rate and case fatality rate. We calculated malaria positivity rate and the percentage of dominant malaria species in the study area. We presented the findings in narrative form and using text, tables and figures.

Ethical considerations

A formal letter was sent from Addis Ababa University School of public health to Addis Ababa health bureau to cooperate with the principal investigator to access the data and facilitate the analysis. The PHEM staffs were briefed about the objective of the surveillance data analysis and their oral consent was obtained before starting data collection.

Result

Malaria morbidity and Mortality

Within the study period (2012-2016) a total of 20,381 malaria cases (19,628 confirmed & 753 clinical) with average incidence rate 1.2 per 1000 population and five deaths with case fatality rate 0.02 were reported to Addis Ababa PHEM. The mean number of cases reported per year was 4076.2 with the standard deviation 552.3. The incidence was highest (1.7/1000) in 2016 and lowest (0.9/1000) in 2014. About 753/20381(3.6%) malaria cases were diagnosed clinically in Addis Ababa. (Figure 3).

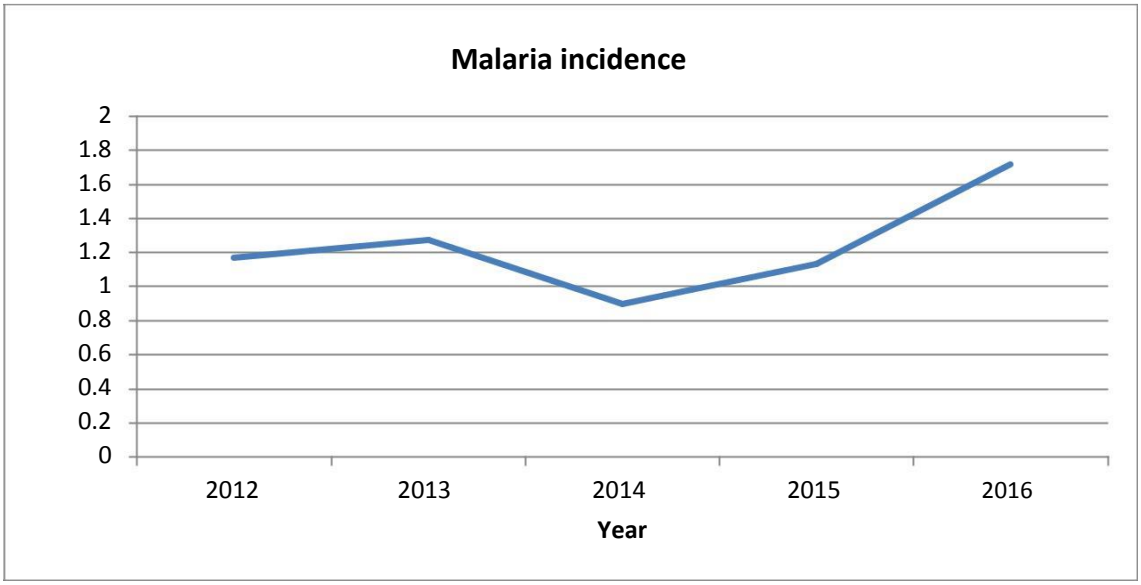

Figure 3 . Trends total malaria incidence, Addis Ababa,2012 – 2016.

Note: The denominator used to calculate the incidence rate was the respective year at risk population (mid year) population.

During the last five years (2012-2016) 277 malaria cases were admitted. The mean number of cases admitted per year was 55.4 with standard deviation 28.7.The admission rate per 10,000 populations was ranged between 0.00 in 2013 and 0.37 in 2016. (Table 1). Of 277 admitted cases during the study period five were died. The death rate per 100,000 populations was lowest (zero) during 2013 to 2015 and highest (0.13) in 2012. The case fatality rate was highest (0.11) in 2012. (Table 10).

Table 10. Distribution of malaria incidence, admissions and deaths by year, Addis Ababa, 2012-2016.

Year	Outpatient per 1000	Admission per 10,000	Death per 100,000	CFR
2012	1.17	0.33	0.13	0.11
2013	1.27	0.00	0.00	0.00
2014	0.89	0.11	0.00	0.00
2015	1.13	0.03	0.00	0.00
2016	1.72	0.37	0.03	0.02

Note: To calculate admission and death rate we used each year malaria at risk population as denominator.

The malaria cases reported to PHEM during the study period were varied among the sub cities. The highest five years average incidence (4.17/1000) was reported from Akaki and the lowest (0.42/1000) was reported from Yeka. (Figure 4)

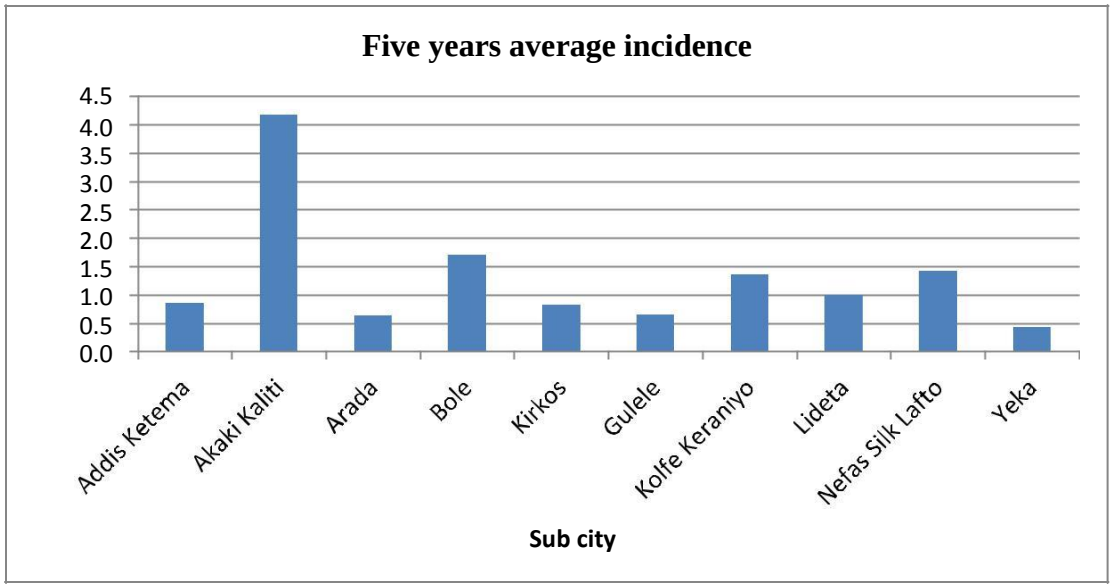

Figure 4. Distribution of five years average malaria incidence, by sub cities, Addis Ababa, 2012-2016.

Note: To calculate five years average malaria incidence, we first add up each year incidence for every sub city and took the average to compare with other sub cities.

During the study period, Arada sub city reported highest (0.37%) case fatality rate and Akaki Kaliti, Bole, Chirkos, Kolfe Keraniyo, Lideta, Nefas Silk Lafto and Yeka sub cities reported the lowest (0.00%) case fatality rate. (Table 11.)

Table 11. Distribution of malaria admission and death by sub city, Addis Ababa, 2012-2016.

Sub city	Inpatient/10,000	Inpatient deaths/100,000	CFR
Addis Ketema	0.03	0.33	0.08
Akaki Kaliti	2.78	0.00	0.00
Arada	1.06	1.18	0.37
Bole	1.11	0.00	0.00
Chirkos	0.87	0.00	0.00
Gulele	0.47	0.31	0.12
Kolfe Keraniyo	0.59	0.00	0.00
Lideta	1.78	0.00	0.00
Nefas Silk Lafto	0.64	0.00	0.00
Yeka	0.29	0.00	0.00
Addis Ababa	0.85	0.15	0.02

Note: To calculate inpatient/10000 and death/100000 we used 2014(middle year) population of each sub city as denominator.

Seasonal variability of malaria

The malaria surveillance data reported to PHEM during the study period indicated the incidence was varied across a year. It was highest (0.68/1000) in October and lowest (0.35/1000) in April and February. (Figure 5).

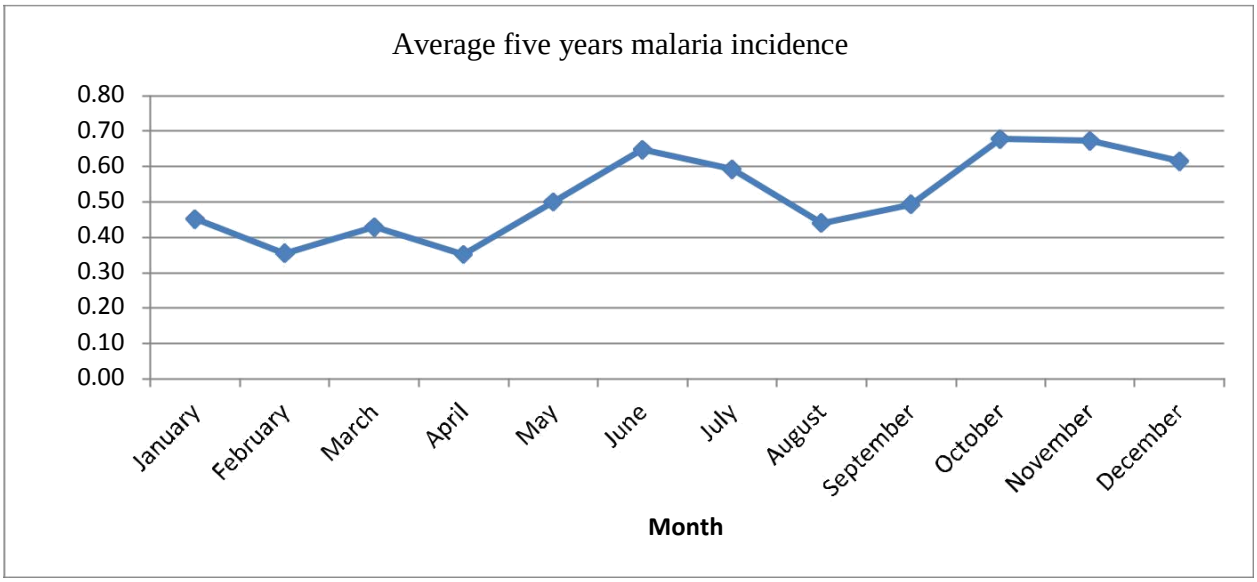

Figure 5. Distribution of five years average malaria incidence by months of the year, Addis Ababa, 2012-2016.

Note: To calculate the average incidence, we add up the five years cases for each month and divided it by the middle year (2014) population for all months of the year.

Malaria positivity rate

During the study period the malaria positivity rate was highest 3340/10775(31%) in 2012 and lowest 2615/16462 (15.89%) in 2014. To calculate malaria positivity rate we used confirmed malaria cases of each year as numerator and malaria suspected fever cases of each year as denominator. (Figure 6).

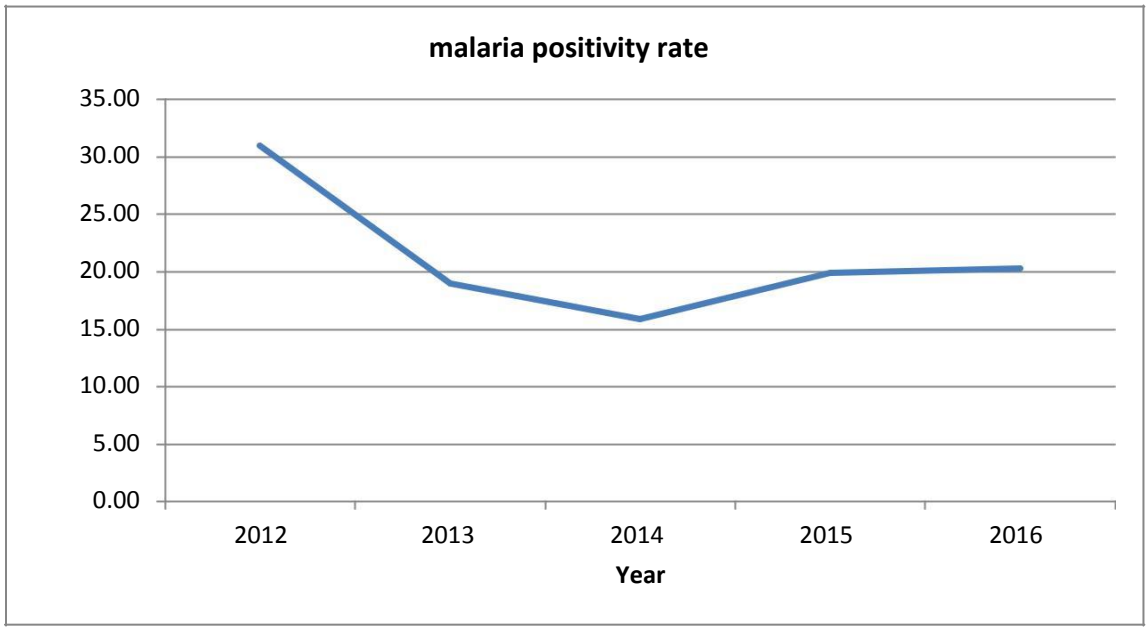

Figure 6 . Trends of malaria positivity rate, Addis Ababa, 2012-2016.

Malaria parasite species

During the study period, of the total 96,328 suspected fevers cases examined for malaria by RDT or microscopy 19,628(20.4 %) were positive for plasmodium parasite. Of these positives 12,681(64.6%) were Plasmodium Vivax and 6,947(35.4 %) were plasmodium Falciparum. (Figure 7).

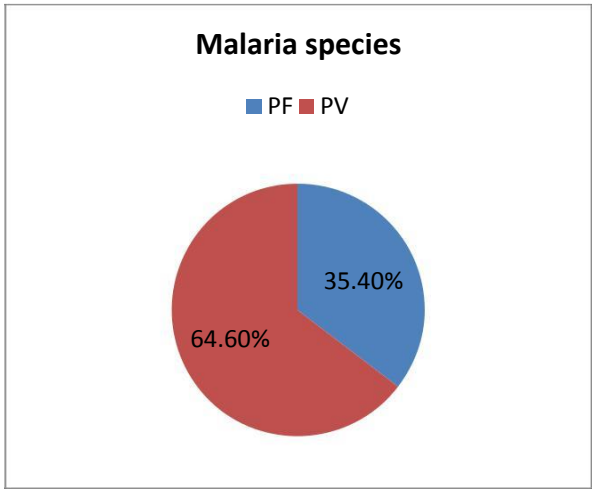

Figure 7. Distribution of malaria parasites by species, Addis Ababa, 2012-2016

Discussion

The malaria cases reported to public health emergency management (PHEM) from 2012 – 2016, indicated that the incidence was increased from 2012 to 2013 and from 2014 to 2016.The highest five years average incidence was reported from Akaki and the lowest was reported from Yeka. During the study period the incidence was highest in October and lowest in April and February. The malaria positivity rate was variable and highest in 2012 and lowest in 2014. Plasmodium Vivax was the dominant species identified during the study period.

This malaria surveillance data analysis indicated the incidence was increased from 2014 to 2016. This increment contradicted with the declining trends of malaria cases and deaths reported globally and in Ethiopia (5, 11). This might be due to improved surveillance system report in Addis Ababa and increased movement of malaria infected peoples from malaria endemic regions to Addis Ababa to seek job in the construction sector. It can also be due to movement of some susceptible peoples from Addis Ababa to malaria endemic regions for various social reasons.

This analysis showed that the highest malaria incidence was reported from Akaki kaliti sub city. The result is consistent with the malaria incidence reported in the same period from health management information system of Addis Ababa health bureau. This is due to the fact that some malaria cases from the neighboring oromia zone treated in the health facilities of Akaki kaliti sub city, but it needs further study.

This analysis showed the seasonal variability of malaria incidence was highest from October to December and lowest from February to April. This seasonal variability is almost similar with that of the national (11). The high malaria incidence follows the main rainy seasons from June to August.

This analysis revealed plasmodium Vivax was the frequently reported parasite in Addis Ababa. This is in line with the result of the surveillance data analysis conducted in Halaba, northern Ethiopia (12). On the contrary, plasmodium Vivax was less commonly seen at national level (11). This can be related to the relapsing characteristics of Vivax parasite but this needs further study.

Limitation

There were two main limitations in this study. The first one is the surveillance data had no important variables (sex and age) that used to describe the malaria case and death by person characteristics. The second limitation was significant number of none governmental health facilities located in Addis Ababa were not reported the priority diseases to the concerned government reporting level.

Conclusion

- Increased malaria incidence was reported from 2014 to 2016 during the study period.
- . Highest malaria incidence was reported from Akaki kality sub city.
- Seasonal increment of malaria cases was reported during October to December.
- Malaria positivity rate was increased from 2014 to 2016.
- Plasmodium Vivax was the common malaria parasite reported during the study period.

Recommendation

- Addis Ababa health bureau and sub city health offices need to aware the communities and travelers to malaria endemic regions about malaria prevention methods.

- Addis Ababa health bureau need to encourage the health facilities to follow malaria treatment guide lines to reduce the current level of malaria cases diagnosed without microscopy or RDT.

- Further study is needed to identify the factors associated with high malaria incidence in Akaki kaliti sub city and high proportion of Plasmodium Vivax parasite in Addis Ababa.

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Chapter three- Evaluation of Surveillance System

3.1. Malaria Surveillance system evaluation of Nifas Silk Lafto sub city,Addis Ababa, Ethiopia,2017.

Summary

Background: Malaria is continued to be a cause for morbidity and mortality in Ethiopia. Surveillance is a cornerstone for early detection and prompt response of malaria outbreak. We evaluated the core function, support function and attribute of Nifas Silk Lafto Sub City malaria surveillance system.

Methods: We conducted a cross-sectional study from June 1 - 7, 2017. We used purposive sampling to select the sub city and simple random sampling method to select the studied units. The study units were sample public health emergency management officers randomly selected from government health centers, woreda health offices and sub city health offices. We interviewed key informants and reviewed records. We performed the analysis using Excel software program. We calculated the percentage of studied woredas that had multi-sectoral public health emergency management task force, prepared malaria epidemic preparedness and response plan, analyze malaria surveillance data by time, and measurements of Flexibility, acceptability and predictive value positive.

Resulst: All (100%) the visited woredas had no multi-sectoral task force, 75% of the studied woredas and 66.6% of the studied health centers had no malaria epidemic preparedness and response plan. seven (87.5%) of the studied units analyzed the surveillance data manually on weekly base. The Flexibility, predictive value positive and acceptability of the malaria surveillance system were 54.2%, 65.2% and 68.75%, in their respective order.

Conclusion: Many of the studied units had no multi-sectoral emergency task forces and Malaria epidemic preparedness and response plan. The malaria surveillance system had medium acceptability and predictive value positive, and less flexible. The woreda health offices and health centers need to establish emergency task force, prepare Malaria epidemic preparedness and response plan and perform regular malaria surveillance data analysis and disseminated to reporting levels. They also need to improve the acceptability of the surveillance system.

Key words: Surveillance system evaluation, Attributes, Malaria, Nifas Silk Lafto, Addis Ababa.

Words: 291

Introduction

Malaria is an acute infection of the blood caused by protozoa of the genus plasmodium which is transmitted through the bite of an infected female anopheles mosquito (1). Plasmodium Falciparum and Vivax are the main species of genus plasmodium that causes malaria (2-4).

Malaria causes typical symptoms that include fever, tiredness, chills, rigor, back pain and headache (5).

Despite several activities have been done to control and prevent malaria, it is continued to affect and kill people across the world (6). Children less than five years and pregnant mothers are the most affected groups. According to world malaria report, in 2015, globally malaria affected 212 million and 429000 people died. Ninety- nine percent of global malaria death was due to plasmodium Falciparum species (7). The same report indicated that Children less than five years of age contributed for more than two thirds of the aforementioned global deaths. Most of the malaria cases and deaths were occurred in sub-Saharan Africa (8).

In Ethiopia, approximately 75% of the landmass is favorable for malaria transmission and about 68% of the country's population is at risk of malaria (9). Malaria in Ethiopia was characterized by widespread epidemics occurring every 5-8 years until 2004 (10). The epidemic that had occurred in 2003-2004 contributed for more than 2 million cases and 3000deaths, but since then, no major outbreaks have been reported (11- 12). In 2016,the Ethiopian health and health related indicator report indicated that 1,718,504 confirmed malaria cases and 510 deaths reported nationally and 8,669 cases and 16 deaths reported in Addis Ababa (3). The data obtained from city administration of Addis Ababa health bureau public health emergency management (PHEM) report indicated that confirmed malaria accounted for 920 cases in Nifas Silk Lafto sub city in 2016.The establishment and maintenance of effective surveillance system is very important to reduce the aformentioned malaria burden. In Ethiopia, including Addis Ababa, 21 priority diseases are selected to be included into the routine surveillance system. Among these diseases 14 are immediately reportable and 7 are weekly reportable to the next reporting level

(5). Suspected outbreak of immediately reportable diseases notified from level to level within 30 minutes of identification. The suspected outbreak reaches the Addis Ababa health bureau PHEM within 90 minutes of identification at health facility level.

The total number of cases and deaths of weekly reportable diseases seen in the health facilities within a week (Monday to Sunday) reported from level to level within 24 hours and reaches the Addis Ababa health bureau PHEM every Wednesday.

Significant of the study

There are malaria cases being reported in Addis Ababa.The public health emergency management unit of the Addis Ababa health bureau capturing the malaria cases through the surveillance system. Evaluating the surveillance system helps to describe how the surveillance system is functioning, challenges encountered and contributes towards better malaria cases detection timely.

Objectives:

General objective

To describe the core functions, supportive functions and attributes of malaria surveillance system of Nifas Silk Lafto sub city, Addis Ababa, 2017.

Specific objectives:

To describe the core functions of the surveillance system (case detection, reporting, analysis and response system)

To describe support functions (training, standards/guidelines, supervisions, resources) To evaluate the attributes (simplicity, flexibility, data quality, acceptability, sensitivity, Predictive value positive, representativeness, timeliness and stability) and usefulness of the malaria surveillance system of Nifas Silk Lafto sub city.

Methods and Materials:

Study area

The study area is Nifas Silk Lafto sub city. It is one of the 10 sub cities of city administration of Addis Ababa. Administratively the sub city is divided into 13 woredas. The sub city has 9 health centers. Nifas Silk Lafto sub city is bounded by Lideta and Kirkos sub cities in the north, Bole and Akaki sub cities in the east, Oromia regional state in the south and oromia regional state and Kolfe keranyo sub city in the west. The sub city covers the total of 68.3 square kilometers, with the density of 5786 People per square kilometer. The altitude of the sub city is 2400 meters above sea level. Based on the central statistics agency projection, the 2016 estimated population was 395206. Of which 201555 were females.

Study design and Period

A descriptive cross sectional study was conducted from June 01 - 07, 2017.

Definitions of attributes and usefulness based on CDC guidelines:

Acceptability: Willingness of persons and organizations to participate in the surveillance system.

Accessibility: Way by which statistical information can be obtained from the organization and this includes the ease with which the existence of information can be ascertained, as well as the suitability of the form or medium through which the information can be accessed.

Simplicity: The surveillance system structure and operation should be as simple as possible, with still meeting their objectives appropriately.

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

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

Sensitivity: The sensitivity of a surveillance system can be considered at the level of case reporting as the proportion of cases of a disease (or other health-related event) detected by the surveillance system (A/A+C) and the ability to detect outbreaks, including the ability to monitor changes in the number of cases over time.

Positive Predictive Value: Predictive value positive (PVP) is the proportion of reported cases that actually have the health-related event under surveillance.

Representativeness: A public health surveillance system that is representative, precisely describes the occurrence of a health-related incident over time and its spread in the population by place and person.

Timeliness: Interval between the occurrences of an unwanted health event, detection/ identification of the event by the reporting source, reporting to responsible public health agency and the realization of control measures and response to the stakeholders.

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

Usefulness: A public health surveillance system is useful if it contributes to the prevention and control of unpleasant health-related events, including an improved understanding of the public health implications of such events and if it helps to find out that an adverse health-related event previously thought to be unimportant is actually important.

Core function of the surveillance system includes case detection, reporting, analysis and response system.

Support function of the surveillance system includes training, standards/guidelines,supervisions, resources.

Sample size and Technique

Nifas Silk Lafto sub city was purposively selected from the ten sub cities of the city administration of Addis Ababa, based on its high malaria incidence. Nifas Silk Lafto sub city

health office, four woreda health offices and three health centers were selected for this study. The woreda and health centers were selected by simple random sample method. There were a total of 13 districts and Nine Health centers in the Nifas Silk Lafto sub city.

Source population

All public health emergency management officers working at government health centers and woreda health offices of Nifas Silk Lafto sub city.

Study unit

The study units were sample public health emergency management officers randomly selected from government health centers and woreda health offices of Nifas Silk Lafto sub city. There were a total of eight public health emergency management officers included in this study (one from sub city health office, four from woreda health offices and three from health centers).

Data source:

The main source of data for the surveillance system evaluation was malaria surveillance reports, malaria epidemic preparedness and response plan, health facility patients registration books, and key informants interview.

Data collection tools and procedures

The tools for data collection were adapted from the CDC guideline for evaluating public health surveillance systems. Sub city and woreda level public health emergency management (PHEM) officers and health facility staffs such as Head of health center and surveillance staffs were interviewed using semi-structured tools. We collected the information that measures the core function, support function and attribute of the malaria surveillance system. In addition to the interview, document was reviewed to assess the data reporting process and to identify problems with data completeness, appropriateness of the filled information and aggregation.

Data analysis and Presentation

Data was cleaned, entered and analyzed using Excel software program. We calculated the percentage of studied health centers and woreda health offices that timely report malaria surveillance data to the next reporting level. We calculated the percentage of studied health centers and woreda health offices that had PHEM guideline, different reporting formats, malaria case definitions, computer, vehicle, supervision plan. We calculated the percentage of studied health centers and woreda health office that regularly analyze malaria surveillance data, had malaria epidemic preparedness and response plan, had budget assigned for epidemic response.

We also calculated the measurements of attributes of the studied health centers, woreda health offices and sub city health office. The findings of the analyzed data were presented by using text, tables and figures.

Ethical issues

The consent letter was written to Nifas Silk Lafto sub city health office from City administration of Addis Ababa health bureau to cooperate the principal investigator during conducting this surveillance system evaluation. The objective of the evaluation was briefed and consent was reached with every respondent before starting the interview and document review.

Result

Availability of PHEM guideline, Formats, Case definitions, Vehicles and Computers

Public health emergency management (PHEM) guideline, formats (case based reporting format, weekly reporting format, line list, daily epidemic reporting format) and malaria standard case definition were observed in all visited offices and health centers.

All the visited health centers posted standard case definitions for at least 20 notifiable diseases including malaria in their outpatient department rooms. All the visited woredas and sub city health office posted AFP, NNT, cholera and measles standard case definitions, however, malaria case definition was not observed on the wall of all visited health offices. All visited health centers reported that malaria prevention and control guide line was available in their facility during the last 6 months. All the studied sites had no vehicles assigned for PHEM activities and 87.5% of them had no computer to analyze surveillance data. (Table 12).

Table 12. Availability of resources (Guide line, formats, case definitions, vehicle and computer),Nifas Silk Lafto sub city,2017.

List of functions	Measurement methods	Sub city health office respondent (n=1)		Woreda health office respondents (n=4)		Health center respondents (n=3)		% of total respondents
Supptive functions (Resources, Training, Supervision and Feedback)	Availability of PHEM guide line	1	0	4	0	3	0	100
	Availability of case definition for all priority diseases	1	0	4	0	3	0	100
	Availability of different reporting formats	1	0	4	0	3	0	100
	Availability of computer	1	0	0	4	0	3	12.5
	Availability of vehicle for PHEM activity	0	1	0	4	0	3	0
	Basic Training given for PHEM officers.	1	0	4	0	2	1	87.5
	Computer skill on Ms word	1	0	4	0	2	1	87.5
	Computer skill on Ms excel	1	0	4	0	2	1	87.5
	Computer skill on Epi info	1	0	0	4	0	3	12.5
	Availability of supervision plan	1	0	4	0	1	2	75
	Supervision as planned	1	0	3	1	0	1	66.6
	Send feedback of supervision to lower level	1	0	3	1	0	1	66.6
Core	Completeness of reporting	0	1	4	0	3	0	87.5

functions	Timeliness of reporting	1	0	4	0	3	0	100
	Weekly based data analysis	1	0	4	4	2	1	87.5
	Notification of analysis to higher level	1	0	2	2	0	3	37.5
	Notification of analysis to lower level	1	0	3	1	0	3	50
	Availability of epidemic preparedness and response plan	1	0	1	3	1	2	37.5
	RRT developed	1	0	4	0	3	0	100
	Budget assigned for epidemic response	1	0	0	4	0	3	12.5
	Outbreak investigated in 2016	1	0	1	3	2	1	50
	Availability of outbreak investigation check list	1	0	0	4	0	3	12.5

Training, Supervision and feedback

Seven (87.5%) of the public health emergency management officers were received training on data quality management and outbreak investigation for 3-5 days. The training was given by the collaboration of sub city PHEM and WHO. Regarding supervision, Six (75%) and five (62.5%) of the eight studied units had supervision plan and supervision check list, respectively. Among the six study units that had plan for supervision four (66.6%) reported that they supervised according to their plan but none of them had copy of the feedbacks in their offices.(Table 1).

Availability of Epidemic preparedness and response plan, Multi-Sectoral PHEM taskforce and RRT

This study depicted that 75% of the studied woreda health offices and 66.6% of the studied health centers had no epidemic preparedness and response plan. The sub city health office had both epidemic preparedness and response plan and multi- sectoral PHEM task force. All the studied woreda health offices had no multi- sectoral PHEM task force. However, all the studied units developed multi disciplinary RRT that activated when the outbreak occurs.

Surveillance data analysis and outbreak investigation

With respect to surveillance data analysis, seven (87.5%) of the studied units analyzed the surveillance data manually on weekly base. Only the sub city health office analyzed data by using computer. Of those seven studied units that analyzed surveillance data three (37.5%) were

not notified the interpretation of the analysis to the higher level and four (50%) were not notified to the lower level.

Among the interviewed officers half of them participated in acute watery diarrhea (AWD) outbreak investigation in 2016. The main challenges they encountered during the 2016 AWD outbreak investigation were lack of experience; shortage of equipments (coach, hazard bag and elbow gloves); lack of vehicle; and weak support and integration with stakeholders**.** Seven (87.5%) of the eight studied units had no budget assigned for epidemic response.

Table 13. Summary of responses to measurements of attributes and usefulness of the surveillance system, Nifas Silk Lafto sub city, 2017.

List of respondents	Measurement methods	Sub city health office respondent N=1		Woreda health office respondents N=4		Health center respondent N=3		% of the total respondents
		yes	no	yes	no	yes	no	yes
Simplicity	Reporting formats easy to understand?	1	0	4	0	3	0	100
	Current malaria case definition easy to understand?	1	0	4	0	3	0	100
	Laboratory confirmation of malaria not takes much time	1	0	4		3	0	100
	Data Analysis and Dissemination of information not requires much time?	1	0	4	0	3	0	100
	Not reporting malaria cases for different organizations	1	0	4	0	3	0	100
	High level training requires performing the surveillance system activities?	1	0	4	0	3	0	100
	Data sources easily accessible and manageable during data collection?	0	1	4	0	3	0	87.5
	information generated from the surveillance analysis easily accessible for users	1	0	3	1	1	3	62.5
Flexibility	The system easy to add new variables?	0	1	3	1	3	0	75
	The system easy to integrate	0	1	2	2	3	0	62.5

	with other systems?							
	The reporting format easy to add new disease?	0	1	2	2	0	3	25
Data quality	Reporting formats clear and easy to fill for all reporting sites	0	1	4	0	2	1	75
	All reporting sites fill malaria reporting format appropriately	1	0	2	2	1	2	50
	Training given for PHEM officers and focal persons on data quality management	1	0	4	0	2	1	87.5
	Reporting site and data collectors supervised regularly	1	0	3	1	2	1	75
	All reported forms Complete?	0	1	4	0	3	0	87.5
Acceptability	All the reporting agents accept and well engaged to the surveillance activities?	1	0	3	1	2	1	75
	All the reporting agents sending their report using appropriate reporting format?	1	0	4	0	3	0	100
	All PHEM officers send report on time?	1	0	4	0	3	0	100
	All stakeholders fully participating in system strengthening	1	0	1	3	1	2	37.5
Sensitivity	The malaria case definition able to pick all cases?	1	0	4	0	3	0	100
Predictive value positive	All Cases and deaths reported in malaria surveillance system were actually malaria cases and deaths.	1	0	4	0	3	0	100
Representativeness	The system enabled to detect the health related events in the whole community?	0	1	3	1	2	1	62.5
	All the Socio demographic variables included in the reporting format?	1	0	4	0	3	0	100
Timliness	All reporting sources reporting on time?	0	1	4	0	3	0	87.5
Stability	New restructuring not affect the	1	0	4	0	3	0	100

	surveillance system?							
	There was no any time /condition in which the surveillance is not fully operating?	1	0	4	0	3	0	100
Usefulness	The system estimates the morbidity and mortality occurred due to malaria?	1	0	3	1	3	0	87.5
	The system enabled to detect trends of malaria?	0	1	3	1	3	0	75
	The system helps to detect malaria outbreak?	1	0	3	1	3	0	87.5
	The system stimulates research that lead on prevention and control of malaria?	0	1	3	1	3	0	75

Simplicity

Eight (100%) of the respondents responded that the malaria case definition was easy to understand at all reporting levels and the laboratory confirmation of malaria takes 30-45minutes. Similarly, all the respondents replied that medium level training is required to execute surveillance activities. Data analysis and dissemination takes 30-60 minutes for the officers who received training. Seven (87.5%) of the respondents replied surveillance data sources were easy accessible and manageable during data collection and 5(62.5%) of the respondents answered the information generated from the surveillance analysis is easy accessible for users. (Figure 8).

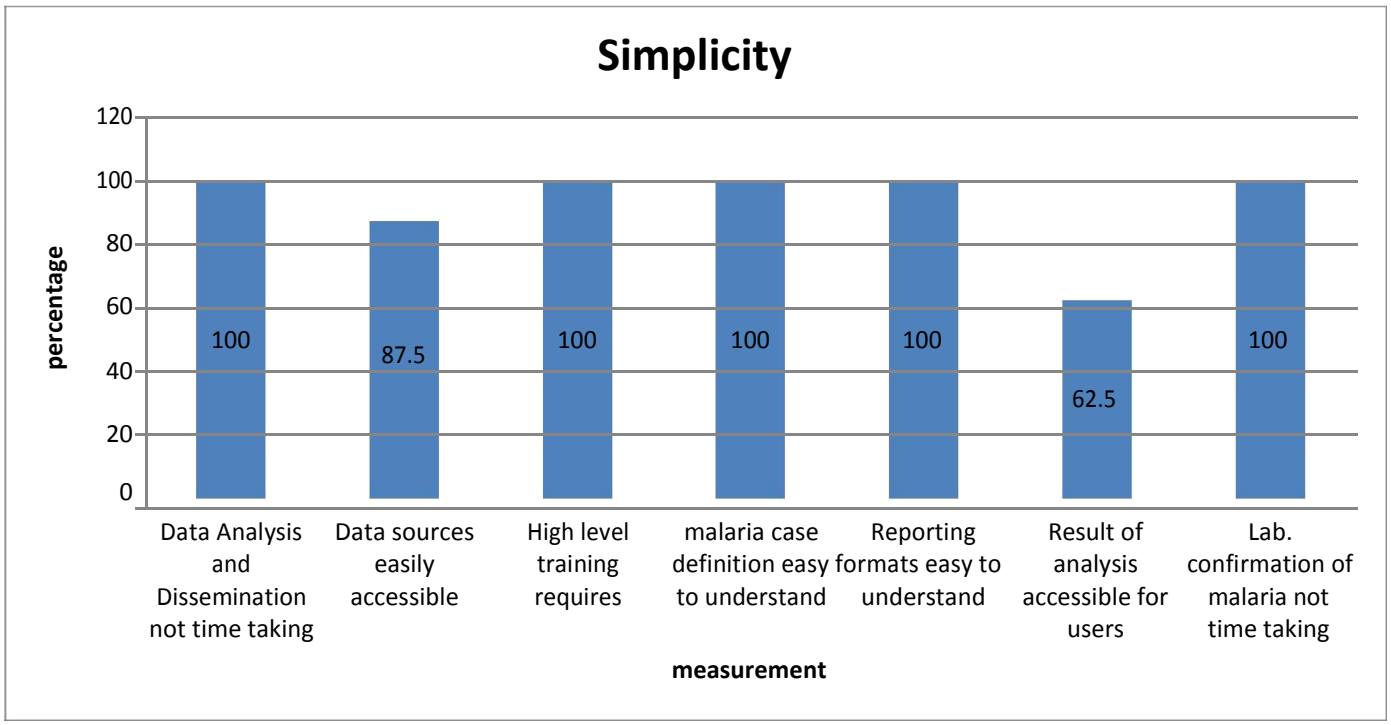

Figure 8. Score given to measurements of simplicity, Nifas silk lafto scb city, 2017.

Flexibility:

Six (75%) and two (25%) of the respondents replied that the existing surveillance system is easy to add new variables and new diseases, respectively. Five (62.5%) of the respondent replied the system is easily integrated with other system.

Data quality

Six (75%) of the respondents agreed that reporting sites and data collectors were supervised regularly, reporting formats were clear and easy to fill by all reporting sites, all reported forms were complete and training was given for PHEM officers and focal persons on data quality management. On the other hand, observation of the compiled data of two health centers and two woreda health offices revealed that the report formats of malaria was not appropriately filled.

Acceptability

Eight (100%) of the respondents replied that all reporting sites were sent their report on time using appropriate reporting formats. Eight (75%) of the respondents responded that all the reporting sites were accepted and well engaged to the surveillance activities and three (37.5%) of

the respondents answered that all stakeholders were fully participated in the surveillance system strengthening.

Sensitivity and Predictive value positive

The 2016 malaria surveillance system predictive value of the sub-city was 65%. All the respondents of this study replied that malaria case definition was able to pick all malaria cases and all the cases and deaths reported in malaria surveillance system were actually malaria cases and deaths. As there were no false negatives identified by the case definition and later confirmed by Gold test as true negative, it was difficult to calculate the sensitivity of malaria surveillance.

Representativeness

All the respondents answered that the surveillance system incorporated all socio-demographic characteristics of the population and five (62.5%) of the respondents replied that the surveillance system was able to detect the health related events in the whole communities.

Timeliness

Seven (87.5%) of the respondents agreed that all the reporting sites were reported on time.

Stability

All the respondents replied that any new restructuring was not affected the surveillance system and the system was not interrupted under any condition**. Distributions of Attributes of the surveillance system**

Flexibility, PVP and acceptability of the malaria surveillance system were 54.2%, 65.2% and 78.1%, respectively. (Figure 9)**.**

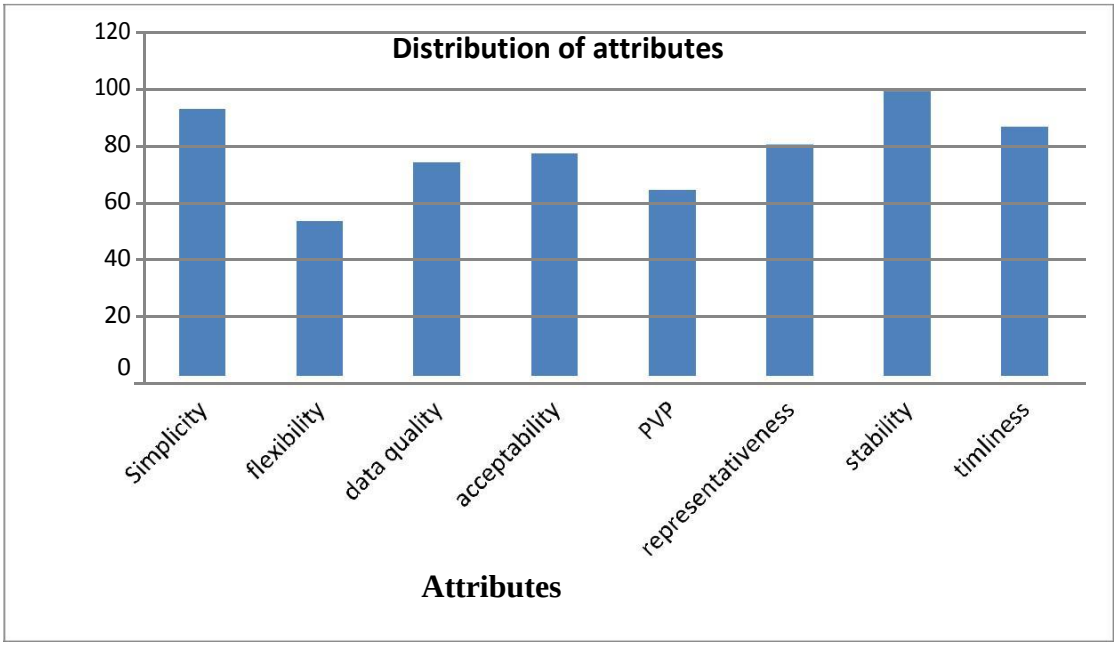

Figure 9. Percentage of the Attributes of the surveillance system, Nifas Silk Lafto Sub city, 2017.

Usefulness

Seven (87.5%) of the respondents agreed that the malaria surveillance system is useful to estimates the mortality and morbidity occurred due to malaria and the system was also helped to detect malaria outbreaks. Six (75%) of the respondents answered that the system is usefull in terms of detecting the trends of malaria.

Discussion

The result of this evaluation showed that many of the required references and formats for public health surveillance system were available at the studied health offices and health centers. The case definitions of most of the priority diseases, including malaria case definition, were posted in the outpatient department of the studied health facilities. On the other hand, majority of the studied units had no vehicles assigned for PHEM activities and computer to analyze the surveillance data. About two third of the studied units had supervision plan and received training on data quality management and outbreak investigation. All the studied woreda health offices and health centers had RRT but all woreda health offices had no multi- sectoral PHEM task force. The epidemic preparedness and response plan was also not observed in more than half of the studied units.

In this evaluation, the availability of reference documents and formats was better as compared with similar evaluation conducted in Bale zone, oromia regional state in 2014 in which PHEM guide line was available in 66% of the studied units (21). This difference can be due to the proximity of the health facilities in this study to the sub city health office to mobilize the resources from sub city to health facilities.

In the current study, the studied health facilities posted the case definitions of most of the priority diseases, including malaria case definition, in the outpatient department rooms. This result is higher when compared with similar study conducted in West Arsi zone, oromia regional state in 2014 that showed only 22% of the studied health facilities posted the case definition of priority diseases in the outpatient room (15). This might be attributed to increased awareness of the health facilities PHEM officers about the importance of case definition for the health person working in the outpatient department in the current study.

Many of the PHEM officers involved in this study received short training (for 3-5) days on surveillance activities by the collaboration of sub city PHEM and WHO. This is not far from the result of the same evaluation conducted in Halaba special woreda, southern nation nationalities and peoples regional state in 2015(17).

In this study, about one fourth of the studied unit had no supervision plan at all and also 33.4% of those studied units that had plan did not supervise their lower level as planned. This finding is consistent with similar study conducted in West Arsi zone in 2014 that indicated 33% of the studied facilities were not supervised for six months (15). This can be attributed to shortage of budget and no vehicle assigned for PHEM activities in both areas. Planned regular supervision and prompt feedback for the concerned bodies and levels help PHEM officers to measure the efficiency and effectiveness of the surveillance system (5). In the absence of epidemic preparedness and response plan, it will be difficult to estimate the required resources for predictable emergencies (5).

In the current study, majority of the studied health centers and woreda health offices had no epidemic preparedness and response plan. This is far below the study conducted in Bale zone oromia regional estate in 2016 that showed all studied woredas and hospitals had epidemic preparedness plan (22). The health facility's and woreda's PHEM officers of this study expected the Sub city PHEM to provide direction on preparing epidemic preparedness and response plan.

In the present study, all the studied woreda health offices had no multi-sectoral PHEM task force that helps to coordinate the public health emergency activities. When we compared with the report of similar evaluation conducted in Bale zone oromia region in 2014 in which 88% of the studied woreda health offices established PHEM taskforce (22).The finding of our study is by far lower than that of Bale's study. In this study the woreda health offices PHEM waited for the sub city PHEM to provide them guides to select multi-sectoral PHEM task forces. Regular surveillance system data analysis and notifying its interpretation to the concerned bodies are important to early detection and prompt response to outbreak (1, 5).

In this study many PHEM officers analyzed surveillance data manually, however, about half of the interpretation of this analysis was not reported to the lower and higher reporting levels. This makes the outbreak detection more difficult.

Simplicity

This study indicated that the malaria case definition was easy to understand at all reporting levels which is in line with the finding of the study conducted in West Arsi (15) and the laboratory confirmation of malaria was performed at health center level and takes 30-45minutes. Also all the respondents of this study agreed that training is crucial to execute PHEM activities and data analysis and dissemination of information takes less time for those who received the training.

Flexibility

This study also indicated that the flexibility of the existing surveillance system to add new disease and variable were lower as compared with the result of similar study conducted in Amhara region awi zone in 2015 (16). Many respondents of this study explained that adding new disease and variable to the system can make the reporting formats more congested and unpleasant for the reader.

Data quality

Majority of the respondents of this study replied that the data of the surveillance system had reasonable quality and the quality has been maintained through provision of training on data quality management and conducting regular supervision. But observation of document depicted that in some health centers and woreda health offices the malaria report format was not appropriately filled.

Acceptability

This study indicated that all the reporting sites were used appropriate reporting formats and sent their reports on time. Also more than half of the reporting sites were properly participated in the surveillance activities. But the stake holders were not actively participated in the system at health facility and woreda health office level.

Representativeness

This study point out that the surveillance system was incorporated all socio-demographic characteristics of the population but not enabled to detect the priority diseases in the whole communities. This can be due to low health service utilization of the communities (3).

Timeliness

This study showed that timeliness of reporting by studied sites was a bit higher as compared to similar studies done in southern nation nationalities and people region (17). This difference may be due to the availability of public transportation to deliver report to the next reporting level in this study.

Usefulness

This study indicated that the malaria surveillance system was useful because about two third of the respondents agreed that the malaria surveillance system was detected malaria cases and trends.

Conclusion

- Public health emergency management guidelines and reporting formats were available in most of the visited areas;
- Most Public Health Emergency Management (PHEM) officers received training;
- Significant number of the studied units had no supervision plan;
- There were no epidemic preparedness and response plan observed in the majority of the studied sites;
- There were no functional multi-sectoral public health emergency management (PHEM) task forces in all of the visited woreda health offices;
- Budget was not allocated for outbreak investigation and control at all woreda and health center levels;
- About half of the studied units were not reported the analysis of malaria surveillance data to the lower and higher reporting level;

- The surveillance system was highly stable, simple and useful; mildly acceptable, representative and timelines; but less flexible.

Recommendation

- Effective supervision with check list and appropriate feed back to the respective level is needed;
- Epidemic preparedness and response plan need to be developed and regularly updated at woreda and health facility levels;
- Establishing Multi-sectoral PHEM task force that coordinates the activities of the outbreak at woreda level is needed;
- Woredas need to allocate budget for PHEM activities to early detection and effective control of outbreaks.
- Malaria surveillance data need to be analyzed at health centers and woreda health offices levels on weekly based. Also the information obtained from the analysis need to be reported to the lower and higher reporting levels;
- The sub city and woreda health offices need to improve the acceptability and predictive value positive of the malaria surveillance system by provision of training for the communities about malaria through health extension workers.

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Chapter four- Health Profile Assessment Report

4.1. Health profile Assessment Report of Yeka Sub city

Summary

Back ground: Health profile is a comprehensive compilation of up to date health and health related information about the population of specific geographic area. It helps to identify and prioritize problems, proposes areas for improvement and stimulates action.

The objective of this health profile assessment was to describe health and health related information and identify the priority health problem of yeka sub city.

Methods: Data was collected through review of documents of woreda health offices and health facilities of Yeka sub city. We interviewed and discussed with health offices officials using semi structured tools. Data was entered, cleaned and analyzed using Excel soft ware program. We calculated Contraceptive acceptance rate, the percentage of delivery service attended by the skilled person, the percentage of vaccinated children, and the leading cause of morbidity for all ages and under five children and outpatient department attendance per capita.

Result: The contraceptive acceptance rate of sub city was 37% and the coverage of delivery service attended by the skilled person was 64%. The immunization coverage of the sub city for penta3, PCV3, Measles and fully immunized children were above 100%. Acute upper respiratory tract infection was the leading cause of morbidity for all ages and under five children. The outpatient department attendance per capita of the sub city was 0.99.

Conclusion: The sub city reported low contraceptive acceptance rate, low delivery service attended by skilled person and low outpatient department attendance per capita. The percentage of vaccinated children was above 100 for all antigens. Therefore, the health facilities, woreda and sub city health offices need to identify and intervene on factors contributed for these low performances.

Key words: Health profile, Demographic characteristics, reproductive health service, Yeka .

Words: 268

Introduction

Health profile is a comprehensive compilation of up to date health and health related information about the population of specific geographic area. Health of a given community is influenced by many factors, including the environmental condition, socioeconomic condition, educational status, and income level. Understanding and accessing which of these factors determine the health of the community at most and planning the proper strategies and partnership to improve them are the results of health profile assessment (1). A good profile describes a specific geographic area and the factors affecting its citizen's health and should provide a focus for community involvement and political support. A health profile is not a one-off document. A series of profiles should be planned for publication at regular intervals. Ideally they should be produced annually, but where resources are limited a two year cycle may be more appropriate.

Yeka sub city is one of the ten sub cities located in city administration of Addis Ababa. City administration of Addis Ababa is located at the center of the country. The average altitude of the city is 2400 meters above sea level (ranging from 2,100 meters at Akaki in the south to 3,000) meters at Entoto Hill in the North. The city occupies a total area of 540 square kilometers (1). The city is divided in to ten sub-cities which are the second administrative units next to city administration. The sub-cities are also divided in to weredas, which are the smallest administrative unit in the city. There are 117 weredas in the city administration (2). Yeka is the third largest sub city after Bole and Akaki kality sub cities. yeka sub city is bounded by Finfine special zone of oromia regional state in the north and east, Bole in the South, Gullele and Arada in the West. It covers a total area of 85.98 square kilometer and 5044 people live in one square kilometer (2). Administratively the sub city is divided into 13 woredas. Based on Central statistics agency population projection the estimated 2016 total population of the sub city was 433,438. The sub city shares 12.9% of the total population of the city administration of Addis Ababa. Generally the Sub city is a home to 8 Embassies, 24 hotels, 4 parks, 2 universities and 1 university college. There are also 15 orthodox, eight Muslim, and 16 protestant religion institutions. Moreover, many Federal and Addis Ababa city administration offices and some Oromia national regional state offices are located in the sub city (3). Recently health profile assessment was not conducted in Yeka sub city and planning and intervention programs were not based on priority problem of the community.

Rationale

The information generated from this health profile description will help yeka sub city administration, health office and other stake holders as an input for planning and to address the identified gaps. The findings of this health profile assessment may also use as a base for further studies in the area.

Objectives

General Objective

To describe health and demographic situation and characterize the priority health problem of yeka sub city.

Specific Objectives

To describe the demographic characteristics of the population in yeka sub city

To describe the health status of the sub city

To characterize the priority health problem of the sub city

To identify health related problems for priority setting of yeka sub city.

Methods and Materials

Study area and period

This health profile assessment was conducted in Yeka sub city. Yeka sub city is one of the ten sub cities of city administration of Addis Ababa. The sub city is located in the North East of Addis Ababa. The sub city is bordered by Oromia special zone in the north and in the East, Bole sub city in the South, and Gulele and Arada sub cities in the West direction. Administratively yeka sub city is divided into 13 woredas. Woreda is the lowest administrative unit. Based on the Ethiopian central statistics agency estimate the 2016 yeka sub city total population was 433,438, of which 52% was females. One year (July 7/2015 to July 6/2016) data was collected from February 1 to 8, 2017.

Study design

A descriptive retrospective cross sectional review of available health and health related records in health offices, health facilities and relevant offices was used.

Data Source

Data was collected through review of documents of woreda health offices and health facilities of Yeka sub city, Education and Finance and Economic Development bureau of yeka sub city using check list. We reviewed literatures about the sub city. We interviewed and discussed with responsible officials using semi structured tools.

Data Management

Health and Health related data was collected, entered, cleaned and analyzed using Excel soft ware program. We calculated frequencies, sex ratio, dependency ratio, Contraceptive acceptance rate and percentages. The result was presented in narrative form and using tables and figures.

Ethical Consideration

A formal letter was sent from city administration of Addis Ababa Health Bureau to different offices from where data were collected. Before starting data collection verbal consent was obtained from the respective organizations where data were collected.

Results

Demographic characteristics of Yeka sub city

Based on Ethiopian central statistics estimate the 2016 total population of Yeka sub city was 433438. Of these 221053 were females which give Male to Female sex ratio of 0.96. Annual growth rate of the population was 2.4%. From the total population 316,539 were productive age group; hence the total dependency ratio of the sub city was 36.9.

The distribution of yeka sub city population varied across the woredas. It was highest (45,101) in woreda eight and lowest (15,166) in woreda 10. (figure 10.)

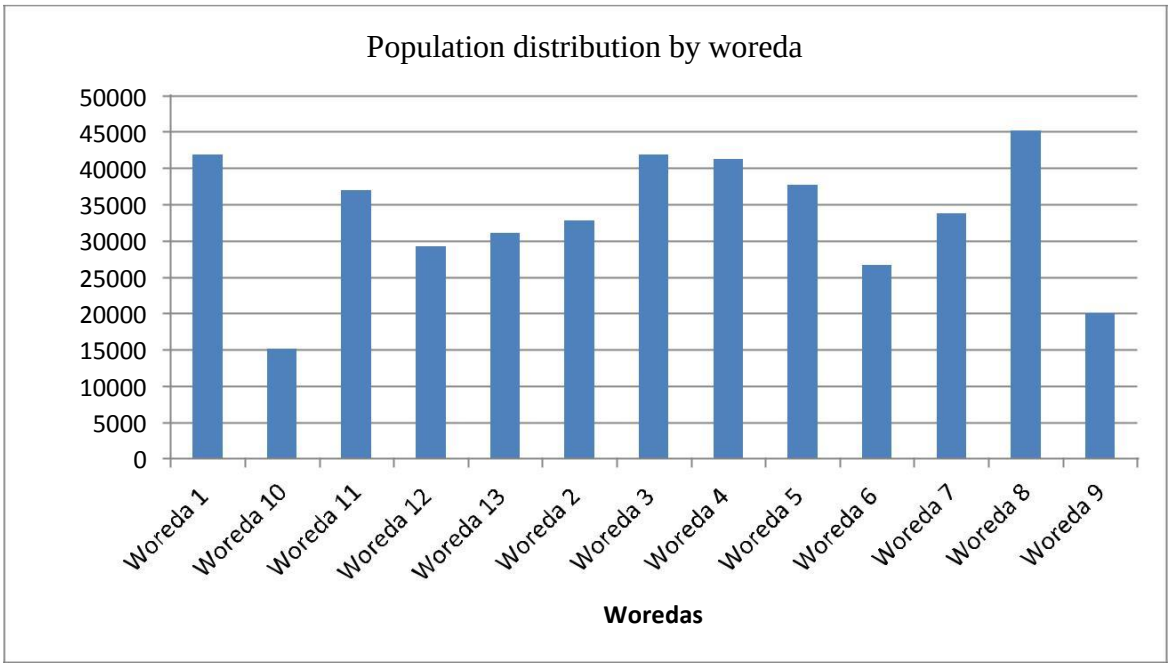

Figure 10. Distribution of population by woreda, yeka sub city, 2016.

Table 14. Estimated population by woreda , age and sex categories, Yeka sub city, 2016.

Woreda	Male	Female	Total population	< 1 yr 2.24	< 5 yrs7.16	<15yrs 23.97	Above >65 yrs 3%	Women 15-49yrs 34.64
Entoto Number 2 Health Centre	16080	16736	32816	735	2350	7866	984	11367
Entoto Number One Health Center	20502	21339	41841	937	2996	10029	1255	14494
Kotebe Health Center	9813	10214	20027	449	1434	4800	601	6937
Woreda 10 Health Center	7431	7735	15166	340	1086	3635	455	5254
Woreda 1 Health Center	20522	21360	41882	938	2999	10039	1256	14508
Woreda 11 Health Center	18081	18819	36900	827	2642	8845	1107	12782
Woreda 12 Health Center	14301	14884	29185	654	2090	6996	876	10110
Woreda 13 Health Center	15221	15842	31063	696	2224	7446	932	10760
Woreda 4 Health center	20224	21049	41273	925	2955	9893	1238	14297
Woreda 6 Health Center	13044	13576	26620	596	1906	6381	799	9221
Woreda 7 Health Center	16569	17246	33815	757	2421	8105	1014	11714
Woreda 8 Health Center	22099	23002	45101	1010	3229	10811	1353	15623
Yeka health center	18497	19252	37749	846	2703	9048	1132	13076
Sub city	212385	221053	433438	9709	31034	103895	13003	150143

Education

According to the Urban Employment and Unemployment Survey study conducted in 2011, the average literacy rate of the city administration of Addis Ababa was 86.4%. The literacy rate by sex reveals that there was a significant difference between males and females. Ninety-four point three percent of the males and 80% of the females were literate. In Yeka sub city, there were 141KG, 66 Primary schools, 22 secondary schools, 31 TVET and 2 Universities.

There were 7986 KG students, 25003 primary school students and 17544 secondary school students**.** The percentage of female students in primary school level was 51.1% and this percentage was increasing in secondary school level to 55.9%.Table 2 and 3.

Table 15. List of all formal schools by ownership yeka sub city, 2016.

Owner	KG	Primary school	Secondary school	TVET	University
Government	14	7	8	6	2
Private	115	58	14	25	0
NGO	6	0	0	0	0
Public	6	1	0	0	0
Total	141	66	22	31	2

Table 16. Number of students in KG, primary and secondary schools by sex, yeka sub city, 2016.

Owner	KG		Primary school		Secondary school		Total	
	Male	Female	Male	Female	Male	Female	Male	Female
Government	745	734	6492	7626	4105	5529	11342	13889
Private and others	3008	3499	5740	5145	3616	4294	12364	12938
Total	3753	4233	12232	12771	7721	9823	23706	26827

Maternal and Reproductive Health Services

According to the 2016 HMIS performance report the contraceptive acceptance rate of yeka sub city was 37% but the rate varied among the 13 woredas of the sub city. The contraceptive acceptance rate was highest (61%) for woreda four and 12 and lowest (2%) for woreda seven. Figure 11.

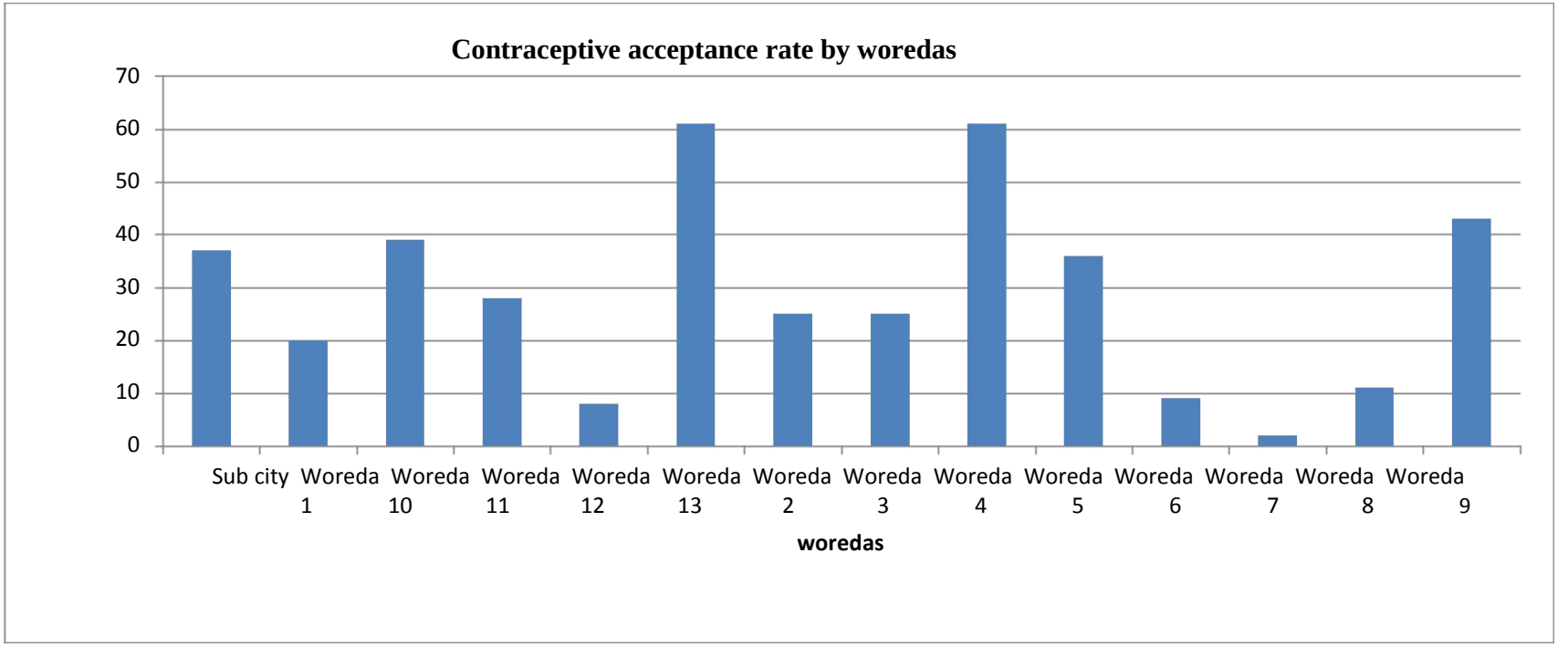

Figure 11. Contraceptive acceptance rate, by woredas, yeka, 2016.

When we look at the contraceptive acceptance rate by methods, Injectable was the most frequently used method (47.2%) followed by oral contraceptives (20.1%). IUCD was the least frequently used methods (6.4%).Figure 12.

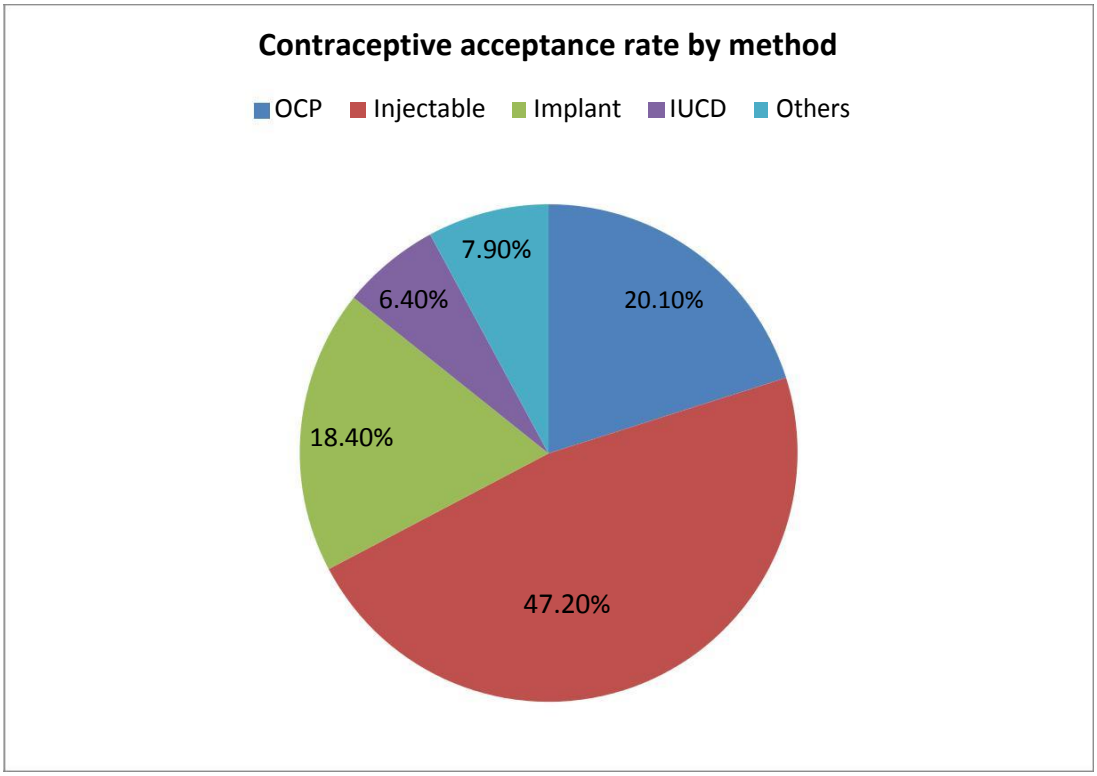

Figure 12. Contraceptive acceptance rate by methods, yeka sub city, 2016.

The first Ante natal care coverage of the sub city was above 100% and the coverage of at least fourth ante natal coverage was 93%. The dropout rate between the first ante natal care and at least fourth ante natal care coverage was greater than 10%. The coverage of both ANC1 and ANC4+ were varied among the different woredas of yeka sub city. Figure 5.

The delivery service of the sub city attended by the skilled person was 64% which was low when compared with the fourth ante natal coverage. The post natal coverage was 92%. Figure 13.

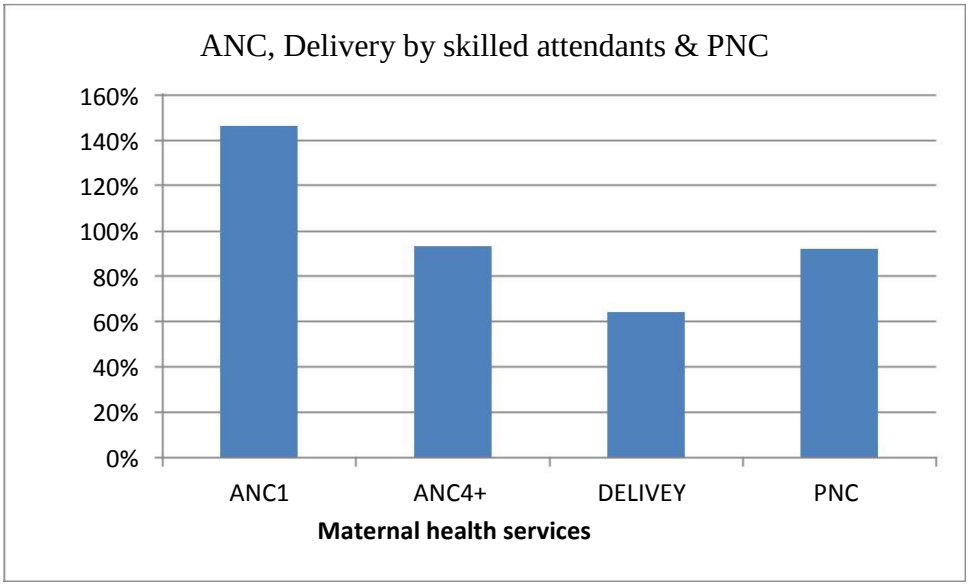

Figure 13. ANC, Delivery by Skilled Attendants and PNC Coverage by woredas, yeka sub city, 2016

In the study area the proportion of pregnant women who tested for HIV and knew their result was 94% but the coverage was varied among different woredas. It was highest (144%) for woreda 10 and lowest (8%) for woreda 7. Table 17.

Table 17. Distribution of pregnant women tested for HIV and knew their results by woreda, yeka sub city, 2016

Woreda	Number of expected pregnancy(2.33)	Number of pregnant women tested for PMTCT	%
Woreda 2	975	728	73
Woreda 3	467	340	71
Woreda 9	962	1063	108
Woreda 10	620	914	144
Woreda 1	765	635	81
Woreda 11	788	883	110
Woreda 12	1051	121	11
Woreda 13	880	1217	136
Woreda 4	353	309	83
Woreda 6	860	154	18
Woreda 7	680	58	8
Woreda 8	724	359	49
Woreda 5	976	1156	116
Privates		1720	
Sub city	10101	9657	94

The estimated HIV positive among pregnant women for yeka sub city was 3%. From this estimate the percentage of pregnant women who newly received ART during ANC for the study area was 33.7%. The percentages were widely varied among woredas of the yeka sub city. It was highest (90.9%) for woreda 13 and lowest (0%) for worda 7, 11 and 12.

Table 18. Number of HIV Positive pregnant women who received ART for the first time, by woreda,yeka sub city,2016.

Woreda (Health facility)	Estimated HIV positive pregnant women (3%)	HIV Positive Pregnant Women Who Newly Received ART	%
Woreda 2 Health Centre	29	4	13.7
Woreda 3 Health Center	14	5	35.7
Woreda 9 Health Center	29	23	79.7
Woreda 10 Health Center	19	5	26.9
Woreda 1 Health Center	23	1	4.4
Woreda 11 Health Center	24	0	0.0
Woreda 12 Health Center	32	0	0.0
Woreda 13 Health Center	26	24	90.9
Woreda 4 Health center	11	6	56.7
Woreda 6 Health Center	26	8	31.0
Woreda 7 Health Center	20	0	0.0
Woreda 8 Health Center	22	7	32.2
Woreda 5 Health center	29	19	64.9
Sub city	304	102	33.7

The immunization coverage of the sub city for less than one year children (penta3, PCV3, Measles and fully immunized) children were above 100% but the coverage was different among the woredas found in the sub city. Figure 14.

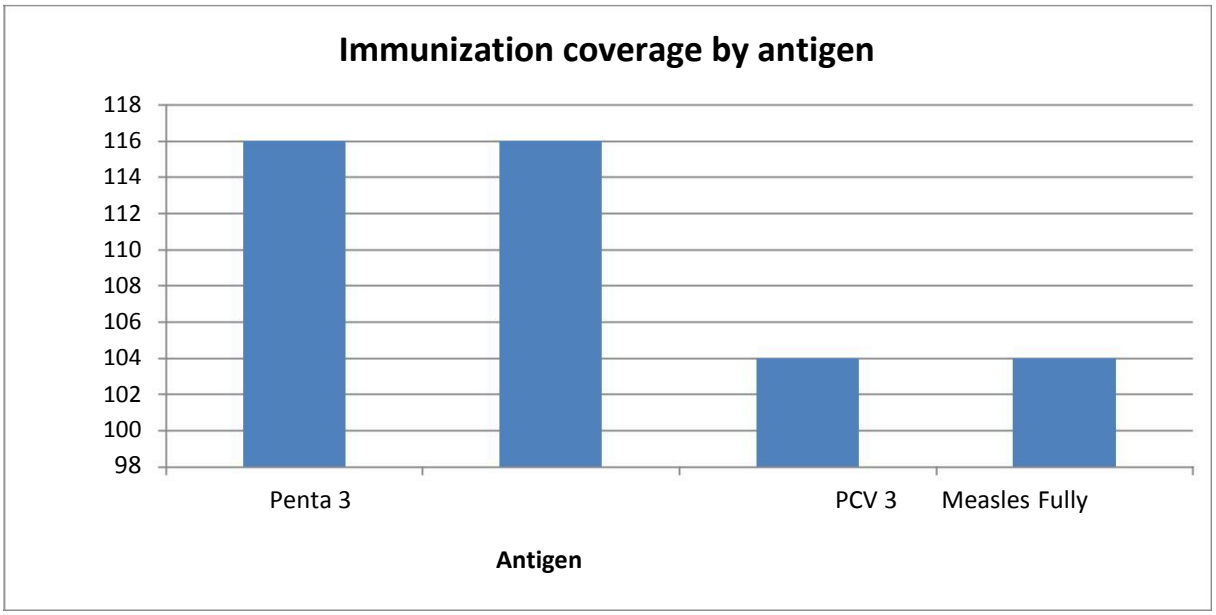

Figure 14. Immunization coverage by antigen, yeka sub city, 2016.

Top ten causes of morbidity and mortality

Among the top ten causes of morbidity for all ages, acute upper respiratory tract infection was the first cause (84178 cases) in the sub city followed by acute febrile illness (33731 cases). Table 19.

Table 19. Top 10 causes of morbidity all ages, yeka sub city, 216.

Rank	Diagnosis	Case	%
1	Acute upper respiratory tract infections	84178	28.52
2	Acute febrile illness (AFI)	33731	11.43
3	Diarrhea (non bloody)	33015	11.19
4	Urinary tract infection	31251	10.59
5	Dyspepsia	27000	9.15
6	Diseases of the musculoskeletal system and connective tissue	21294	7.21
7	Trauma (injury, fracture etc.)	17260	5.85
8	Infections of the skin and subcutaneous tissue	16863	5.71
9	Typhoid fever	15653	5.30
10	Dental and gum diseases	14912	5.05
Sum of top ten		295157	100

Table 20. Top 10 causes of morbidity for under five years of age, yeka sub city,2016

Rank	Diagnosis	Cases	%
1	Acute upper respiratory tract infections	24717	45.33
2	Diarrhea (non bloody)	12719	23.33
3	Infections of the skin and subcutaneous tissue	2869	5.26
4	Pneumonia	2801	5.14
5	Unspecified diseases of the skin and subcutaneous tissue	2567	4.71
6	Acute febrile illness (AFI)	2523	4.63
7	Unspecified diseases of the eye and adnexa	1752	3.21
8	Unspecified infectious and parasitic diseases	1566	2.87
9	Unspecified diseases of the respiratory	1514	2.78

	system		
10	Acute bronchitis	1498	2.75
Sum of top ten		54526	100

From the top ten causes of mortality for all age groups Schizophrenia was the leading causes with (9 deaths) and followed by typhoid fever with (5 deaths). Table 21

Table 21. top 10 causes of mortality all cases, yeka sub city,2016.

Rank	Diagnosis	Death	%
1	Schizophrenia	9	30
2	Typhoid fever	5	16.67
3	Dyspepsia	4	13.33
4	Unspecified obstetric conditions	3	10
5	Urinary tract infections	3	10
6	Dementia	2	6.67
7	Diarrhea with blood (dysentery)	1	3.33
8	Diarrhea with dehydration	1	3.33
9	Hypertension & related diseases	1	3.33
10	Unspecified diseases of the circulatory system	1	3.33
Sum of top ten		30	100

Based on the 2016 yeka sub city HMIS report, there were 7 deaths that occurred among less than five years children. The first cause of death was Schizophrenia (4 deaths) and followed by Typhoid fever (2 deaths) and dementia (1 death).Table 22

Table 22. Causes of Mortality for Children under 5 years of Age, Yeka sub city, 2016

Rank	Diagnosis	Cases	%
1	Schizophrenia	4	57.14
2	Typhoid fever	2	28.57
3	Dementia	1	14.29
Total		7	100

In the study area the case detection rate from the estimated number of new TB cases was 5.8%. But the performance was varied among the 13 woredas of the sub city. The case

detection rate was highest (37.9%) for woreda 9 and lowest (0 %) for woreda 1, 2,4,6,7,8 and 12.Table23.

Table 23. Case detection rate of all type of TB+ by woreda, yeka sub city, 2016.

Woreda	Estimated # of new TB cases (all forms) 224/100,000 popu.	Number of new TB cases detected (all forms)	Case detection rate (%)
Woreda 2 Health Centre	74	0	0.0
Woreda 3 Health Center	94	2	2.1
Woreda 9 Health Center	45	17	37.8
Woreda 10 Health Center	34	3	8.8
Woreda 1 Health Center	94	0	0.0
Woreda 11 Health Center	83	4	4.8
Woreda 12 Health Center	65	0	0.0
Woreda 13 Health Center	70	14	20.1
Woreda 4 Health center	92	0	0.0
Woreda 6 Health Center	60	0	0.0
Woreda 7 Health Center	76	0	0.0
Woreda 8 Health Center	101	0	0.0
Woreda 5 Health center	85	16	18.9
Sub city	971	56	5.8

Immediately and weekly reportable diseases

The yeka sub city HMIS reported a total of 9538 cases and 6 deaths of immediately and weekly reportable diseases. Typhoid fever was the leading causes of morbidity (5642 cases) followed by Typhus (2324 cases). During the study period there were four and two deaths that were caused by Typhoid fever and Dysentery, respectively. Timeliness of the report was 100% . No disaster condition occurred in the sub city in 2016. Table 24.

Table 24. Immediately and weekly reportable disease cases and deaths reported in Yeka sub city, 2016.

Type of disease	Number of cases	Number of deaths
Typhoid fever	5642	4
Typhus	2324	0
Dysentery	1110	2
Malaria	386	0
Sever acute malnutrition	72	0
Relapsing fever	2	0
Rabies	2	0
Total	9538	6

Human Resources

A total of 830 health professionals (3 medical doctors, 169 health officers, 393 Nurses (Degree+Dip.), 109 midwives, 78 pharmacy (degree +dip.), 70 Laboratory (degree + dip.), 8 other professionals) and 177 health extension workers. The proportion of health officer, nurses (Dip.+ Degree) and midwives (dip.+ Degree) per 10,000 population were 3.62, 8.35 and 2.08 respectively. These proportions were varied among the woredas (health facilities). Table 25

Table 25. Distribution of health professionals by woreda, yeka sub city, 2016.

Health workers	Woreda 1	Woreda 2	Woreda 3	Woreda 4	Woreda 5	Woreda 6	Woreda 7	Woreda 8	Woreda 9	Woreda 10	Woreda 11	Woreda 12	Woreda 13	Sub city
Medical doctor	0	0	0	0	2	0	0	0	1	0	0	0	0	3
Health officer	13	8	16	15	12	14	6	12	13	12	18	18	12	169
Pharmacist	3	1	2	3	4	4	2	3	2	2	3	2	3	34
Pharmacy Tec.	4	6	3	3	3	2	3	2	5	3	4	3	3	44
Nurse BSC	3	10	8	8	8	3	12	11	17	7	3	9	9	108
Nurse Diploma	12	25	26	17	27	11	23	12	28	8	38	36	22	285
Midwife(BSC+Dip)	10	10	8	9	8	8	4	8	8	6	10	10	10	109
Medical lab tech. BSC	2	1	3	3	2	3	1	4	2	1	2	2	2	28
Medical lab tech. DIP	2	5	3	2	4	3	3	1	4	3	4	4	4	42
Environmental Health BSC	2	0	0	0	0	0	0	0		0	0	0	1	3
All other health professionals	2	0	1	0	1	0	1	0	0	0	0	0	0	5
Extension workers	14	17	10	10	15	11	11	9	12	16	14	22	16	177

Total	67	83	80	67	86	59	66	62	12	58	96	106	82	1007

Table 26. Density of public health center and health professional per 10,000 population by woreda, yeka sub city, 2016.

Woreda	population	Health officer		Nurse all types		Midwifery (DIP.+Degree)	
		Number	Density per 10,000	Number	Density per 10,000	Number	Density per 10,000
Woreda 2 Health Centre	41841	8	1.91	35	8.37	0	2.39
Woreda 3 Health Center	20027	16	7.99	34	16.98	8	3.99
Woreda 9 Health Center	41273	13	3.15	45	10.90	8	1.94
Woreda 10 Health Center	26620	12	4.51	15	5.63	6	2.25
Woreda 1 Health Center	32816	13	3.96	15	4.57	0	3.05
Woreda 11 Health Center	33815	18	5.32	41	12.12	0	2.96
Woreda 12 Health Center	45101	18	3.99	45	9.98	0	2.22
Woreda 13 Health Center	37749	12	3.18	31	17.47	0	2.65
Woreda 4 Health center	15166	15	9.89	25	16.48	9	5.93
Woreda 6 Health Center	36900	14	3.79	14	3.79	8	2.17
Woreda 7 Health Center	29185	6	2.06	35	11.99	4	1.37

Woreda 8 Health Center	31063	12	3.86	23	7.40	8	2.58
Woreda 5 Health center	41882	12	2.87	35	8.36	8	1.91
Sub city	433438	157	3.62	362	8.35	90	2.08

The outpatient department attendance per capita of the sub city was 0.99 but it differs among the health facilities. The OPD attendance per capita was highest (1.56) for woreda 3 and woreda 4 health center and lowest (0.25) for woreda 7 health center. Table 27.

Table 27. Distribution of OPD attendance per capita by woreda, yeka sub city, 2016

Woreda	population	# of OPD visits (including first and repeat visits)	OPD attendance per capita
Woreda 2 (Entoto Number 2 Health Centre)	41841	41699	1.00
Woreda 3 (Entoto Number One Health Center)	20027	31271	1.56
Woreda 9(Kotebe Health Center)	41273	60095	1.46
Woreda 10 Health Center	26620	34538	1.30
Woreda 1 Health Center	32816	26096	0.80
Woreda 11 Health Center	33815	27510	0.81
Woreda 12 Health Center	45101	17006	0.38
Woreda 13 Health Center	37749	53545	1.42
Woreda 4 Health center	15166	23659	1.56
Woreda 6 Health Center	36900	23607	0.64
Woreda 7 Health Center	29185	7240	0.25
Woreda 8 Health Center	31063	26476	0.85
Woreda 5 (Yeka Health center)	41882	54243	1.30
Sub city	433438	426985	0.99

Health Extension Activities

The health extension activities of the sub city were focused on health education of the community on different health issues, creating model families and screening of children, pregnant and lactating mothers for malnutrition. Most of the activities performed above 100%. This can be due to accumulation of new families in the sub city that were not included in the planning. The low performance of nutritional screening for pregnant women and lactating mother may attributed to the low coverage of ANC4+ and PNC. Table 28 and 29.

Table 28. Health Education given on Health extension packages, yeka sub city, 2016.

Health Extension package	Unit	Plan	Achievement		Remark
			Number	%	
Hygiene and Environmental health	Individual	20000	38985	194	
Family healthcare	Individual	20000	30295	151	
Disease prevention and control	Individual	20000	31328	156	
First aids	Individual	20000	22637	113	
Other health related events	Individual	20000	25470	127	

Nutritional Screening

Table 29. Plan and achievement of nutritional screening of under five, pregnant and lactating mothers, yeka sub city, 2016.

Nutritional screening	Plan	Achievement	
		Number	%
Under five years children	4000	6408	100+
Pregnant mothers	2000	982	49.1
Lactating women	2000	1083	54.2

Health Infrastructure

Table 30. Types and ownership of Health service delivering facilities in Yeka sub city, 2016

Owner	Hospital	Specialty clinic	Health center	Higher clinic	Medium clinic	Lower clinic	Diagnostic Laboratory
Government	1	0	13	0	0	0	0
Private	4	3	0	6	42	3	1
NGO	0	0	0	0	0	0	0
Total	5	3	13	6	42	3	1

There were 13 government Health centers, 1 government hospital, 3 private specialty clinics, 6 higher clinics, 42 medium clinics and 3 lower clinics in the city. All these health facilities have 24 hours electric power supply, telephone service and water supply. Moreover two government health centers are currently under construction. Table21.

Table 31. Number of Available, Functional and Under Construction government Health Centers and Hospital by woreda ,yeka sub city, 2016.

Woreda	Number of Health centers			Number of Hospitals		
	Available	Functional	Under construction	Available	Functional	Under construction
Woreda 2 (Entoto Number 2 Health Centre)	1	1	0	0	0	0
Woreda 3 (Entoto Number One Health Center)	1	1	0	0	0	0
Woreda 9(Kotebe Health Center)	1	1	0	0	0	0
Woreda 10 Health Center	1	1	0	0	0	0
Woreda 1 Health Center	1	1	0	0	0	0
Woreda 11 Health Center	1	1	0	0	0	0
Woreda 12 Health Center	1	1	1	0	0	0
Woreda 13 Health Center	1	1	1	0	0	0
Woreda 4 Health center	1	1	0	0	0	0
Woreda 6 Health Center	1	1	0	0	0	0
Woreda 7 Health Center	1	1	0	0	0	0
Woreda 8 Health Center	1	1	0	0	0	0
Woreda 5 (Yeka Health center)	1	1	0	0	0	0
Sub city	13	13	2	1	1	0

The population to health center ratio of the sub city was 33342 and the population to hospital ratio was 433438.Table 18.

Table 32. Number of health centers and Health facility to population ratio by woreda, yeka sub city, 2016.

Woreda	Functional Health center	
	Number	Pop./H C ratio
Woreda 2 (Entoto Number 2 Health Centre)	1	41841
Woreda 3 (Entoto Number One Health Center)	1	20027
Woreda 9(Kotebe Health Center)	1	41273
Woreda 10 Health Center	1	26620
Woreda 1 Health Center	1	32816
Woreda 11 Health Center	1	33815
Woreda 12 Health Center	1	45101
Woreda 13 Health Center	1	37749
Woreda 4 Health center	1	15166
Woreda 6 Health Center	1	36900
Woreda 7 Health Center	1	29185
Woreda 8 Health Center	1	31063
Woreda 5 (Yeka Health center)	1	41882
Sub city	13	33342

Finance

The total budget allocated for the sub city health office was 117763868 (ETB). From this allocated budget for the sub city health office, woreda 13 health center received the highest(13.1%) share and woreda 7 received the lowest(4%) share. Table 33.

Table 33. Share of health budget by woredas from total allocated budget for the sub city health office,yeka sub city, 2016

Woreda	Population	Allocated budget(ETB)	Allocated budget per capita	Share from allocated budget
Woreda 2 (Entoto Number 2 Health Centre)	41841	7804177	187	6.6
Woreda 3 (Entoto Number One Health Center)	20027	6677455	333	5.7
Woreda 9(Kotebe Health Center)	41273	10629848	258	9
Woreda 10 Health Center	26620	7181488	270	6.1
Woreda 1 Health Center	32816	7834212	239	6.7
Woreda 11 Health Center	33815	7880254	233	6.7
Woreda 12 Health Center	45101	9755500	216	8.3
Woreda 13 Health Center	37749	15697853	416	13.1
Woreda 4 Health center	15166	7403753	488	6.3
Woreda 6 Health Center	36900	6988487	189	6
Woreda 7 Health Center	29185	4647750	159	4
Woreda 8 Health Center	31063	6440598	207	5.5
Woreda 5 (Yeka Health center)	41882	8031986	192	6.8
Health office	433438	10790507	25	9.2
Total	433438	117763868	272	100

Discussion

The male to female ratio of the sub city was slightly higher than that of Addis Ababa. This can be due to in migration of more females from the nearest region to the sub city. The total dependency ratio of the sub city was lower than Addis Ababa and the national (5). This may be due to construction of new settlement houses in the sub city by productive age group population. The contraceptive acceptance rate of Yeka sub city was 37% which is not far from the contraceptive acceptance rate reported by city administration Addis Ababa 38.1% (5). On the contrary, it was lower than National coverage 71% and national target 80%. This can be due to the availability of contraceptive methods in private pharmacies, clinics and hospitals in Addis Ababa where significant numbers of users served in their neighbors but not reported to the concerned government body.

The ANC4+ coverage of the sub city was higher than the national (76%). It was also higher than the ANC4+ coverage (63%) for urban women reported by EDHS 2016 (7). However, the coverage was lower than Addis Ababa (143%). The delivery services attended by skilled person coverage of yeka sub city was by far lower than the coverage of Addis Ababa which was 134% and the coverage reported by EDHS 2016 (5,7). This can be explained by the fact that there were significant numbers of mothers in the yeka sub city who prefer private health facilities for ANC and delivery services and also some Mothers prefer to give birth at their home (6).

In the study area the proportion of pregnant women who tested for HIV and knew their result was almost similar with national but lower than Addis Ababa which was 140.3%. The percent of pregnant women who tested positive for HIV and newly received ART during ANC service in the study area was lower than Addis Ababa(5). These low performances of the study area can be attributed to weak service provision.

The coverage of penta3, PCV3, Measles and fully immunized for less than one year children of the sub city was above 100%. Similarly, the coverage of Addis Ababa for these antigens was above 100%. The high performance achieved by the sub city might be due to increased number of clients from the neighboring oromia region and sub cities to seek the immunization services.

The leading cause of morbidity for all ages and under five children in the study area was acute upper respiratory tract infection which is similar with the leading cause of morbidity for the national (5).

The outpatient department attendance per capita of yeka sub city was lower than the city administration of Addis Ababa (1.76) but higher than the national (0.63).

The proportion of health officer per 10,000 population of the sub city (3.63) was in line with that of the national (3.18). Moreover the proportion of Midwives per 10,000 population of the sub city (2.08) was almost similar with the national (2.80). On the other hand, the proportion of Nurses (Degree+Dip2.) per 10,000 population of yeka sub city (8.35) was lower than the proportion of the city administration of Addis Ababa (13.74). The observed difference can be explained by the fact that large number of nurses required in hospitals than health centers .

The reported population to health center ratio of the sub city was 33,342:1. This ratio was low as compared with the population to health center ratio of Addis Ababa 38,091:1 but higher as compared with the national figure 25,901:1. On the opposite the population to hospital ratio of the sub city was 433,438:1 which is higher than the proportion of City administration of Addis Ababa 304,728:1(2).

The per capita of the budget allocated for the sub city health office was 272 ETB. This amount was found to be low when compared with the per capita of city administration of Addis Ababa which was 608 ETB (5)

Identified and prioritized problems

Low delivery services attended by skilled person

- Low percentage of PW who tested HIV+ and newly received ART during ANC service
- Low utilization of long term contraceptive methods
- Acute upper respiratory tract infection was the leading cause of morbidity for all ages and under five children
- Low outpatient attendance per capita
- Low per capita budget allocation
- Low hospital to population ration

Conclusion

The distribution of population varied among the woredas of the sub city.

Low coverage of contraceptive acceptance rate reported

Low delivery service attended by skilled person was reported during the studied year.

The percent of pregnant women who tested positive for HIV and newly received ART during ANC service in the study area was low.

The coverage of penta3, Measles and fully immunized children was above 100%

The leading cause of morbidity for all ages and under five children in the study area was acute upper respiratory tract infection

The outpatient department attendance per capita of yeka sub city was low

Low hospital to population ratio reported.

Low per capita budget allocated for the sub city health office.

Recommendation

The woreda and sub city health offices need to identify factors that contributed for low coverage of delivery attended by skilled person and contraceptive acceptance rate and address them accordingly.

Awareness creation activities need to be done by woreda health offices and health development army to increase the health service utilization

Health education needs to be given on the cause and mode of transmission of acute upper respiratory tract infection by health workers and health extension workers..

All children residing in the sub city need to be incorporated during planning for immunization

The woreda and sub city health offices need to communicate with respective administration to increase the per capita budget allocated for health sector.

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Chapter Five – Scientific Manuscript

5.1. Malaria surveillance data analysis in Addis Ababa, 2012-2016.

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Abstract

Back ground: In 2016, malaria affected 12,216 peoples and caused 16 deaths in Addis Ababa. We described malaria cases by time, place and described the dominant malaria parasite in Addis Ababa.

Methods: We reviewed, edited and analyzed malaria surveillance data reported to public health emergency management (PHEM) of Addis Ababa from 2012-2016. We defined suspected malaria as any person with fever headache, rigor, back pain, chills, sweats, nausea, and vomiting diagnosed clinically as malaria. We analyzed the data using micro soft excel. We calculated the incidence and described by year and sub cities. We calculated the percentage of dominant malaria parasite.

Result: A total of 20381 malaria cases (753 clinical & 19628 confirmed) were reported during the study period. The incidence was ranged between 0.9/1000 in 2014 and 1.7/1000 in 2016. Malaria distribution varied among the sub cities and the five years average incidence was highest in Akaki (4.17/1000) and lowest in Yeka (0.42/1000). Of 19628 confirmed cases 12681(64.6%) were Plasmodium Vivax.

Conclusion: The highest malaria incidence was reported in 2016. Akaki kaliti sub city reported the highest malaria incidence. Plasmodium Vivax was the dominant malaria parasite identified. Addis Ababa health bureau and the sub city health offices need to aware the travelers to malaria endemic regions about the prevention method of malaria. Further study is required to identify factors related to high incidence of malaria in Akaki kality sub city and increased plasmodium Vivax parasite in Addis Ababa.

Word count; 235

Key word: surveillance data analysis, Malaria, incidence rate, Addis Ababa

Background

Malaria is an acute infection of the blood caused by protozoa of the genus plasmodium. It is transmitted through the bite of an infected female anopheles mosquito (1). Plasmodium Falciparum and Vivax are the main species of genus plasmodium that causes malaria (2-3). Malaria cause typical symptoms that include fever, tiredness, chills, rigor, back pain and headache (5).

In 2015, malaria affected 212 million people and caused 429000 deaths globally and Children less than five years of age contributed for more than two thirds of these deaths (6). Most of the malaria cases and deaths were occurred in sub-Saharan Africa (7). In sub-Saharan Africa, malaria was the highest cause of death, accounted for 10% of less than five years children deaths (8).

In Ethiopia, approximately 75% of the landmass is favorable for malaria transmission and about 68% of the country's population is at risk of malaria (9). Malaria in Ethiopia was characterized by epidemics occurring every 5-8 years until 2004. The epidemic occurred in 2003-2004 contributed for more than 2 million cases and 3000deaths, but since then, no significant outbreaks have been reported (10).

In 2016, Malaria affected 1,962,996 people and caused 510 deaths in Ethiopia (11). The Addis Ababa Health bureau health management information system (HMIS) reported 12,216 cases and 16 deaths in 2016. Addis Ababa is the capital city of Ethiopia. The objective of this surveillance data analysis is to describe malaria cases and deaths by time and place, describe the seasonal variability of malaria, and describe the dominant malaria parasite in Addis Ababa.

Materials and Methods

We reviewed and edited (checked for its completeness, abnormal and missing values) the malaria surveillance data reported to Addis Ababa health bureau PHEM during 2012-2016 using check lists. We performed descriptive analysis. We defined suspected case of malaria as any person with fever or fever with headache, rigor, back pain, chills, sweats, myalgia, nausea, and vomiting diagnosed clinically as malaria and confirmed case of malaria as a suspected case confirmed by microscopy or RDT for plasmodium parasites. We calculated malaria incidence and case fatality

rate. We described] malaria cases and deaths by year and sub cities. We presented the findings using text, tables and figures. We obtained oral consent from Addis Ababa health bureau PHEM team before starting data collection.

Result

Within the last five years (2012-2016) a total of 20381 malaria cases (753 clinical & 19628 confirmed) were reported to PHEM. The mean number of cases reported to PHEM per year was 4076.2. The incidence was highest (1.7) in 2016 and lowest (0.9) in 2014. (Figure 15).

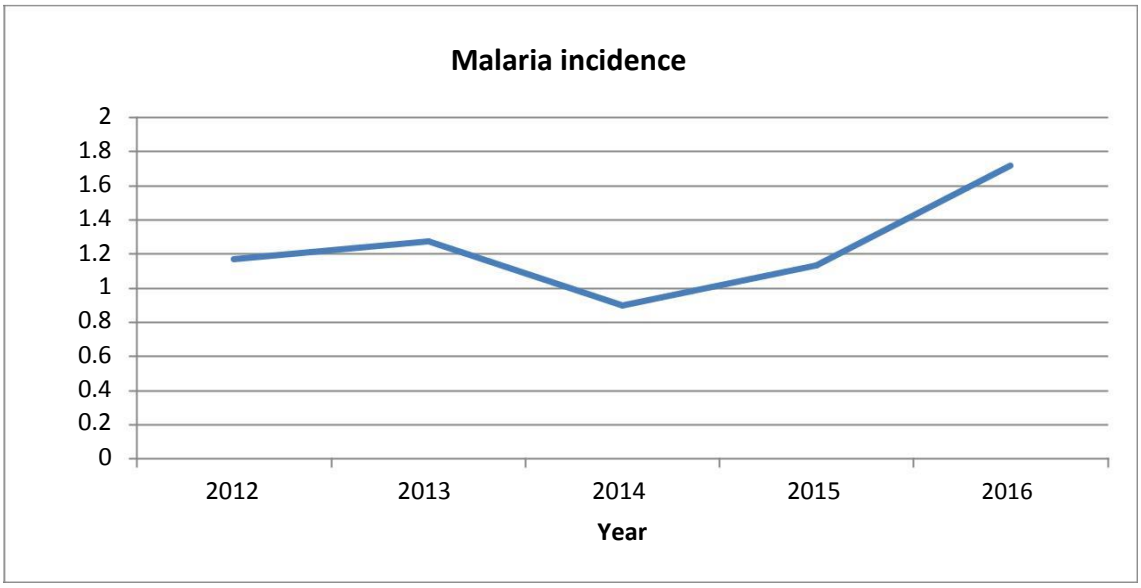

Figure 15. Total malaria incidence reported to PHEM by year, Addis Ababa,2012 – 2016.

During the last five years (2012-2016) 277 malaria cases were admitted. The mean number of cases admitted per year was 55.4.The admission rate per 10,000 populations was ranged between 0.00 in 2013 and 0.37 in 2016. (Table 1). Of 277 admitted cases five were died within the study period. The death rate per 100,000 populations was lowest (zero) during 2013 to 2015 and highest (0.13) in 2012. The case fatality rate was highest (0.11) in 2012. (Table 34).

Table 34. Distribution of malaria incidence, admissions and deaths by year, Addis Ababa, 2012-2016.

Year	Outpatient per 1000	Admission per 10,000	Death per 100,000	CFR
2012	1.17	0.33	0.13	0.11
2013	1.27	0.00	0.00	0.00
2014	0.89	0.11	0.00	0.00
2015	1.13	0.03	0.00	0.00
2016	1.72	0.37	0.03	0.02

The malaria cases reported to PHEM during the study period were varied among the sub cities. The highest five years average incidence (4.17) was reported from Akaki and the lowest (0.42) was reported from Yeka.

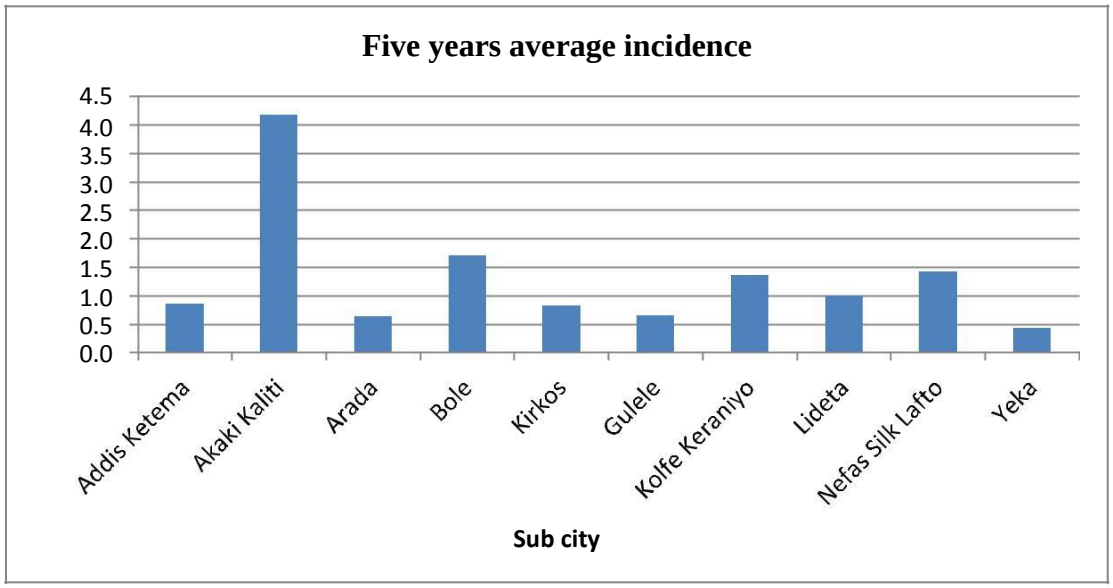

Figure 16. Distribution of five years average malaria incidence, by sub cities, Addis Ababa, 2012-2016.

During the study period, Arada sub city reported highest (0.37%) case fatality rate and Akaki Kaliti, Bole, Chirkos, Kolfe Keraniyo, Lideta, Nefas Silk Lafto and Yeka sub cities reported the lowest (0.00%) case fatality rate. (Table 35)

Table 35. Distribution of malaria admission and death by sub city, Addis Ababa, 2012-2016.

Sub city	Inpatient/10,000	Inpatient deaths/100,000	CFR
Addis Ketema	0.03	0.33	0.08
Akaki Kaliti	2.78	0.00	0.00
Arada	1.06	1.18	0.37
Bole	1.11	0.00	0.00
Chirkos	0.87	0.00	0.00
Gulele	0.47	0.31	0.12
Kolfe Keraniyo	0.59	0.00	0.00
Lideta	1.78	0.00	0.00
Nefas Silk Lafto	0.64	0.00	0.00
Yeka	0.29	0.00	0.00
Addis Ababa	0.85	0.15	0.02

The malaria surveillance data reported to PHEM during the last five years indicated the incidence was varied across a year. It was highest (0.68) in October and lowest (0.35) in April and February. (Figure 17).

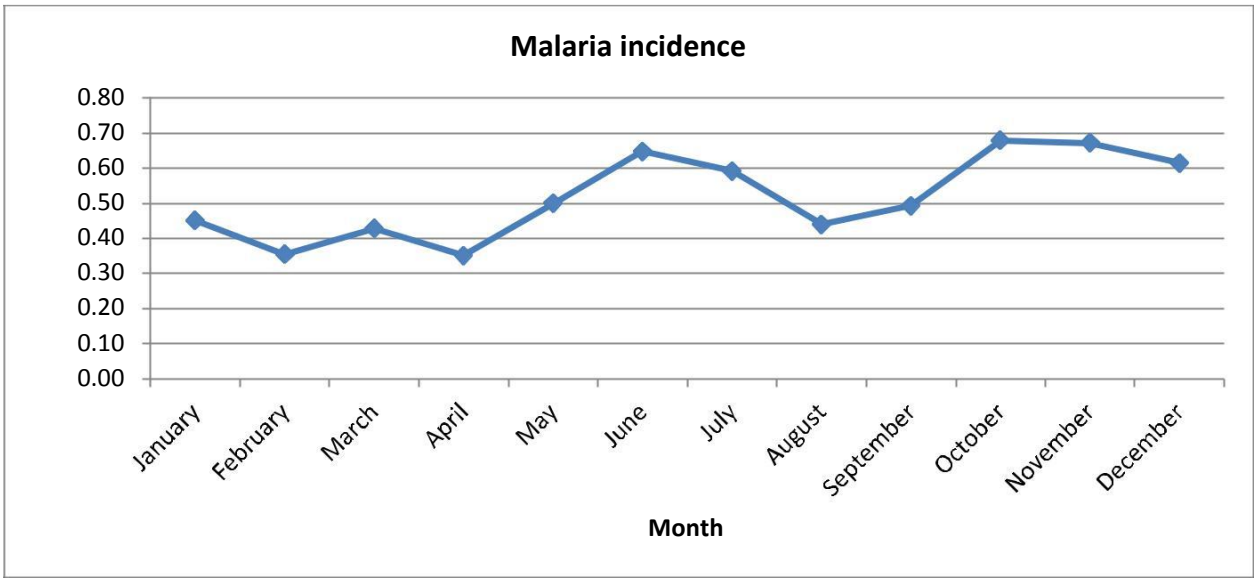

Figure 17. Distribution of five years average malaria incidence by months of the year, Addis Ababa, 2012-2016.

During the study period from the total of 96328 suspected fevers cases examined for malaria by RDT or microscopy 19628(20.4 %) were positive for plasmodium parasite. Of these positive

12681(64.6%) were Plasmodium Vivax and 6947(35.4 %) were plasmodium Falciparum. (Figure 18).

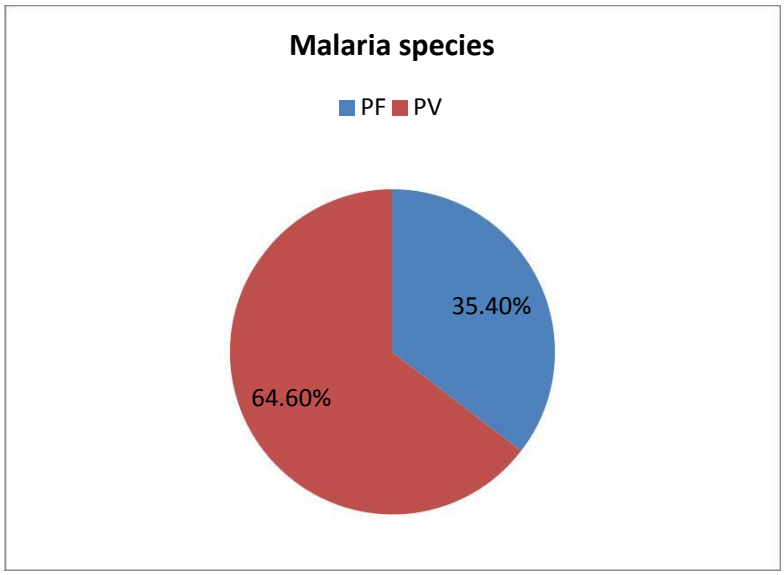

Figure 18. Distribution of malaria parasites by species, Addis Ababa, 2012-2016

Discussion

The malaria cases reported to public health emergency management (PHEM) during the last five years indicated the incidence was increasing from 2012 to2013 and from 2014 to 2016. The case fatality rate was also high in 2016.These increment were contradicted with the declining trends of malaria cases and deaths both globally and in Ethiopia (5, 11). This might be due to improved surveillance report and movement of infected peoples from malaria endemic regions to Addis Ababa and also due to movement of susceptible peoples from Addis Ababa to malaria endemic regions. As we observed from this study the distribution of incidence varied among sub cities, the highest incidence was reported from Akaki and the lowest was form Yeka. This can be related to the relatively increased temperature and decreased altitude in Akaki (12), but further study is needed to check this relation. The five years case fatality rate calculated from admitted cases was highest for Addis ketema as compared to other sub cities and Addis Ababa. It may be related to less awareness of health workers in Addis ketema sub city to appropriately diagnose and treat malaria. Seasonality of malaria transmission was seen during the study period and the incidence was highest from October to December and lowest in February and April. This seasonal malaria transmission pattern is almost similar with that of the national (11). Of the total laboratory confirmed malaria cases identified during the study period plasmodium Vivax was the frequently identified species. But plasmodium Vivax was less commonly seen at national level. This can be related to the relapsing characteristics of Vivax parasite but it needs further study to check this relation.

The main limitation of this study was the data had no important variables sex and age that used to describe the malaria case and death by person.

Conclusion and recommendation

During the study period, increased malaria incidence was reported from 2014 to 2016. Akaki sub city reported the highest incidence. Seasonal increment of malaria cases was reported during October to December. Plasmodium Vivax was the common malaria species identified and reported during the study period.

Implementing appropriate Malaria prevention methods for the area is needed. Further study is needed to identify the risk factors associated with presence of high malaria incidence in Akaki kaliti sub city and factors for high proportion of Plasmodium Vivax species in Addis Ababa.

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Chapter Six – Scientific Abstract

6.1. Malaria surveillance data analysis in Addis Ababa, 2012-2016.

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Abstract

Back ground: In 2016, malaria affected 12,216 peoples and caused 16 deaths in Addis Ababa. We described malaria cases by time, place and described the dominant malaria parasite in Addis Ababa.

Methods: We reviewed, edited and analyzed malaria surveillance data reported to public health emergency management (PHEM) of Addis Ababa from 2012-2016. We defined suspected malaria as any person with fever headache, rigor, back pain, chills, sweats, nausea, and vomiting diagnosed clinically as malaria. We analyzed the data using micro soft excel. We calculated the incidence and described by year and sub cities. We calculated the percentage of dominant confirmed malaria parasite.

Result: A total of 20381 malaria cases (753 clinical & 19628 confirmed) were reported during the study period. The incidence was ranged between 0.9/1000 in 2014 and 1.7/1000 in 2016. Malaria distribution varied among the sub cities and the five years average incidence was highest in Akaki (4.17/1000) and lowest in Yeka (0.42/1000). Of 19628 confirmed cases 12681(64.6%) were Plasmodium Vivax.

Conclusion: The highest malaria incidence was reported in 2016. Akaki kaliti sub city reported the highest malaria incidence. Plasmodium Vivax was the dominant malaria parasite identified. Addis Ababa health bureau and the sub city health offices need to aware the travelers to malaria endemic regions about the prevention method of malaria. Further study is required to identify factors related to high incidence of malaria in Akaki kality sub city and increased plasmodium Vivax parasite in Addis Ababa.

Word count; 236

Key word; surveillance data analysis, Malaria, incidence rate, Addis Ababa

Chapter Seven- Proposal for Epidemiologic Research Project

7.1. Prevalence of malaria and associated risk factors among residents of Akaki kality sub city, Addis Ababa, 2018.

Summary

Back ground: Several strategies have been implemented to prevent, control and eliminate malaria globally and at national level. However, it remains the causes of morbidity and mortality. Africa contributed for 90% of global malaria burden. The incidence of malaria is high in Ethiopia and in Addis Ababa. The objective of this study is to determine the prevalence of malaria and identify the risk factors of malaria in Akaki kaliti sub city of Addis Ababa in 2018.

Methods: A cross sectional study will be conducted from October 1 to November 30, 2018. Akaki kaliti sub city will be purposively selected from the 10 sub cities of Addis Ababa based on the five years (2012-2016) malaria incidence report. five health facilities (one hospital and four health centers) will be selected from the total 11 health facilities of the sub city using simple random sampling technique. The required sample size will be calculated using a single population proportion formula taking 95% confidence level , 5% margin of error(d = 0.05). The total sample size will be proportionally allocated to each selected health facility based on their catchment population size. Information concerning demographics characteristics, malaria symptoms and risk factors associated for malaria infection will be collected through interview of suspected malaria cases using structured questionnaire. Blood sample will be collected by experienced laboratory technicians before administering the interview. Frequencies, percentages and rates will be calculated using Epi Info 7 software program. Moreover, logistic regression will be performed to identify independent factors for acquiring malaria.

Result: Empty tables will be created for results. The hard and soft copies the findings of the study will be submitted to concerned bodies.

Key words: Malaria, Epidemiological project proposal, Prevalence, Akaki Kaliti, Ethiopia.

Word numbers:270

Introduction

Back Ground

Malaria is an acute infection of the blood caused by protozoa of the genus plasmodium. It is transmitted through the bite of an infected female anopheles mosquito (1). Plasmodium Falciparum and Vivax are the main species of genus plasmodium that causes malaria (2-3). The typical symptoms of malaria include fever, tiredness, chills, rigor, back pain and headache (4). In severe cases the symptom can progress to coma and death. Globally malaria cases and deaths have been declining through a rapid scale-up of effective prevention and treatment measures that includes provision of insecticide treated mosquito nets, indoor residual spraying, accurate diagnosis and prompt treatment with artemisinin-based combination therapies, and intermittent preventive treatment of pregnant women (5). Through implementing of the recommended strategies malaria cases decreased from 237million in 2010 to 212 million in 2015. Malaria mortality rate was also declined by 29% worldwide between 2010 and 2015 (5). Despite the efforts made to control and prevent malaria, it is continued to be the causes of morbidity and mortality worldwide.

In 2016, world health organization reported 216 million malaria cases globally, an increase in more than four million over the 2015 year world report. By the same year 445,000 malaria deaths were reported worldwide. The WHO African Region countries contributed for about 90% of the global malaria cases and deaths (6). In sub-Saharan Africa, Malaria is the highest cause of death, accounting for 10% of less than five years children deaths. Ninety- nine percent of malaria death was due to plasmodium falciparum species(7). As indicated in world malaria report of 2016, Ethiopia still accounts for 6% of malaria cases globally and about 12% of the global cases and deaths due to Plasmodium Vivax occur in Ethiopia (7).

Statement of the problem

In Ethiopia, approximately 75% of the landmass is favorable for malaria transmission and about 68% of the country's population is at risk of malaria (8). Malaria transmission in Ethiopia is seasonal and unstable with two peaks. The first peak transmission occurs between September and December in most parts of Ethiopia, after the main rainy season from June to August. The second peak occurs in certain areas from April to June following a short rainy season from February to March (8).

Ethiopia is one of the malaria-epidemic prone countries in Africa (9). Prior to 2004, malaria was known to affect 5–10 million peoples and kill 70,000 peoples each year (10). Since then the country scale-up its malaria prevention and control interventions in line with the global malaria control initiative. Between 2004 and 2012, nearly 46 million long-lasting insecticidal nets (LLINs) were distributed, over 70% of targeted households (HHs) covered with IRS and 9 million doses of malaria treatment provided to public health facilities all free of charge (11). As a result of these intervention the number of new cases of malaria declined from 2.8 million in 1990 to 621,345 in 2015 (12). Malaria deaths also decreased from 30, 324 in 1990 to 1562 in 2015(13). Between 2006 and 2011, malaria deaths and admissions in children under-5 years decreased by 81 and 73%, respectively. According to Ethiopia Malaria indicator surveys, malaria prevalence was low and estimated at 0.9% in 2007, 1.3% in 2011 and 0.5% in 2015 (14-16).

The introduction of scale-up malaria prevention and control intervention and the health extension program (HEP) contributed for the decline of malaria incidence and mortality rates in Ethiopia (17-18). However, malaria transmission and incidence rate were higher in communities living around hydro-electric dams and irrigation areas in Ethiopia (19). The high malaria transmission seasons in Ethiopia usually coincide with the planting and harvesting season when there is a greatest need for agricultural work. The disease has also been associated with loss of earnings, low school attendance, and high treatment cost. The study conducted in south central Ethiopia, 2017 indicated that the median cost of malaria per episode to the household was USD 5.06(20). Based on Ethiopian Ministry of health report, in 2016, Malaria affected 1,962,996 people and caused 510 deaths in Ethiopia (21). The Addis Ababa Health bureau through its health management information system reported 12,216 cases and 16 deaths in 2016. The malaria surveillance data analysis conducted in Addis Ababa in 2017 also indicated that the 2016 malaria incidence per 1000 population of Akaki kaliti sub city was 5.1.

There is shortage of information on the prevalence and associated individual, household and environmental factors for acquiring malaria among suspected fever cases attending health facilities in Akaki kaliti sub city. The finding of this study will help the Akaki kality sub city administration, health office and other stake holders as an input for planning and to implement proper malaria prevention and control methods that suits for the area. Also the finding of this study will help as a base for further study in the area.

Literature Review

Malaria incidence and prevalence studies

After implementation of Effective malaria prevention, control and elimination interventions globally and at national level malaria incidence has decreased since 2010, but the rate of decline has delayed and even the rate reversed in some WHO regions since 2014 (7). The study conducted in Ghana in 2017 to determine the prevalence of malaria among children under five years in rural and urban communities showed that, malaria prevalence among children was higher in rural than urban communities (42.5% vs. 25.2%) by RDT and (28.5% vs. 16.0%) by microscopy (22). The study conducted in the outskirt of Addis Ababa in Akaki town indicated that indigenous transmission of malaria occurred in the area with the prevalence of 3.7% (23). The study conducted in Ethiopia and Uganda in 2015 indicated that the prevalence of malaria was 1.4 % in Guba (Ethiopia) and 9.9 % in Butemba (Uganda)(11). The Ethiopian malaria indicator survey conducted in 2015 also indicated that the national malaria prevalence was 0.5% (14). A Seven-Year Retrospective prevalence study conducted in Metema hospital in 2013 indicated that the overall slide positive rate of malaria was 17%. (24).

Risk factors for malaria infection

The study conducted in high altitude villages of Northwest, Ethiopia, in 2014 indicated that travel of vulnerable individuals to malaria endemic area, being male and engaged in agricultural activity were associated with malaria infection (25). The study conducted in Ethiopia, Hadiya Zone, in 2016, revealed that history of travel to malaria endemic area, not using bed net, poor practice related to malaria prevention and control, poor knowledge about malaria and residing near stagnant water were significantly associated with acquiring malaria (26).

Dominant malaria species in Ethiopia

Many studies conducted in Oromia regional state and Southern Nation Nationalities and People regional state indicated plasmodium Vivax was the predominant parasite that transmits malaria (26, 27). Other studies conducted in Ethiopia also showed that plasmodium Falciparum was the main parasite to transmit malaria (21). The study conducted in Metema hospital in 2013 indicated that the predominant Plasmodium species was P.falciparum (90.7%), followed by P. vivax (9%)(24). Study conducted in Akaki town showed that the proportion of plasmodium Vivax and falciparum were 69% and 31%, respectively (23). The Addis Ababa health bureau

Health management information system (HMIS) report of 2017 and malaria surveillance data analysis report conducted in Addis Ababa in 2017 indicated plasmodium Vivax was the dominant species (28).

Objectives

General objective

To determine malaria prevalence and identify associated factors of malaria among individuals living in Akaki kaliti sub city, Addis Ababa, 2018.

Specific objectives

To determine the prevalence of malaria in Akaki kality sub city

To identify risk factors associated with malaria among individuals living in Akaki kaliti sub city.

To identify the dominant plasmodium species in the area

Methods and Materials

Study population and period

The study will be carried out in Akakai kaliti sub city of Addis Ababa. Akaki kaliti is one of the ten sub cities of Addis Ababa city administration. It is located in the southern part of Addis Ababa and bordered by oromia regional state in the East and South direction, Nifas Silk Lafto sub city in the West and Nifas Silk Lafto and Yeka sub cities in the North direction. The Average annual temperature of the sub city is 22 ^{0} C. The altitude of the sub city is 2100 meters above sea level. Administratively the sub city divided in to 11 woredas. Based on the Ethiopian central statistical agency estimate, the 2018 population of the sub city is 229,859, of which 52% are females. The sub city has 10 health centers and one hospital. The 2016 malaria incidence of the sub city was 5.1 per 1000 populations. The study will be conducted from October to November, 2018.

Study design

Facility based cross sectional study will be used.

Case Definitions based on Ethiopian public health emergency Management guideline

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

Confirmed case: A suspected case confirmed by microscopy or RDT for plasmodium parasites

Variables

Malaria suspected cases, demographics characteristics, symptoms of malaria, and risk factors associated with malaria infection will be the main variables used in the study.

Sample size and sampling techniques

The required sample size will be calculated using a single population proportion formula taking 95% confidence level , 5% margin of error(d = 0.05). There was no previous proportion of slide positivity in and near the study area. Therefore, 50% expected proportion of slide positivity (p = 0.5) will be used.

$$n = \frac{(z_{\alpha/2})^2 \times pq}{d^2}$$

Using the above assumptions, the calculated sample size with 5% non response rate will be 403 individuals with malaria symptoms. Akaki kaliti sub city will be purposively selected from the 10 sub cities of Addis Ababa based on the information obtained from the report of five years

malaria surveillance data analysis done in Addis Ababa in 2017.The result of the surveillance data analysis indicated that the five years (2012-2016) average malaria incidence of Akaki kaliti sub city was 4.2/1000 population. Then five health facilities (one hospital and four health centers) will be selected from the total 11 health facilities of the sub city using simple random sampling technique. The total sample size will be proportionally allocated to each selected health facility based on the catchment population of the health facilities. Tirunesh bejeing hospital (n = 216), Akaki health center (n = 57), Kela health center (n = 31), Gelan health center (n = 48) and Kaliti health center (n = 51).

Source population and study unit

Source population: All suspected malaria cases among people residing in Akaki kaliti sub city.

Study unit: The study units will be sample suspected malaria cases who will visit the selected health facilities during the study period (from October - November, 2018).

Data collection tools and procedure

Data collection tool will be adapted from the questionnaires previously used by other researchers for similar study in Ethiopia. The data collectors will receive one day training before they deployed to the study sites. The interview will take place after a blood sample draw by finger prick. The trained laboratory technicians will administer the questionnaire after obtaining informed consent from an individual with malaria symptoms (suspected malaria cases) or caregiver of cases if the case is a child. The recruitment of the study participants into the study at each site continue until the required sample size for each health facility will complete. The questionnaire will include demographics characteristics, clinical manifestation of malaria, and risk factors associated with malaria infection. Blood will be collected by experienced laboratory technicians from the finger of patients. Then thick and thin smears will be prepared according to the protocol to identify the parasite and species, respectively.

Data Quality Assurance

Before the start of data collection, one day orientation will be given for data collectors. The English version questionnaire will be translated to Local language (Amharic). The questionnaire will be pre-tested in similar community outside the study area to check the reaction of the respondents, language barriers and to make amendments if needed. Each completed

questionnaire will be reviewed daily by the principal investigators to check the completeness and logical inconsistent values.

Data analysis

All collected data will be entered, cleaned for its completeness and analyzed using statistical software program. Frequencies, percentages and rates will be calculated using Epi Info 7 software program. Moreover, logistic regression will be performed to identify the independent factors for acquiring malaria.

Ethical Consideration

Prior to the start of the data collection we will obtain consent from National Ethical review committee. Then we will discuss with the concerned zone and woreda officials to get permission and facilitate the data collection process. Informed verbal consent will be secured from the individual with malaria symptoms or caregiver if the case is a child, before starting the data collection.

Work plan

Table 36. Time allocated for activities to be performed, Akaki kaliti sub city, 2018.

Activities	March 2018	April 2018	May 2018	October 2018				November 2018			
				wk1	wk2	wk3	wk4	wk1	wk2	wk3	wk4
Topic selection and submission											
Proposal writing and submission											
Submission of finalized proposal											
Training of data collectors											
Preparing for field work											
Data collection											
Data entry and analysis											
Writing and submission of draft report											
Submission of finalized report											
Final presentation											

Table 37. Proposed budget for activities to be performed, Akaki kaliti sub city, 2018

Activity	Quantity	Rate (pay/day) $USD	Duration of work in days	Total ($USD)
I. Training				936
1. Data collectors	10	15	3	450
2. Supervisors	2	15	3	90
3. Principal investigator	1	20	3	60
4. Tea or coffee for training	28	4	3	336
II. Data collection				4400
1. Data collectors	10	15	22	3300
2. Supervisors	2	15	22	660
3. Principal investigator	1	20	22	440
III. Stationery and Hard disk for data back up				1000
IV. T Transport / Driver and Fuel and oil/				700
			Grand total	7036

Result

Table 1.

Table 38. Socio-demographic characteristics of malaria cases, Akaki kaliti sub city, Addis Ababa, 2018

Age group	Case # (%)
Less than 5 years	
5 Years and above	
Total	
Sex	
Males	
Females	
Total	
Educational status	
Under school age	
Illiterate	
Read and write	
Elementary school	
Secondary school	
College and above	
Total	
Occupation	
Unemployed	
Student	
Government employee	
Non government employee	
Others (specify)_____	
Total	

Table 2. Distribution of malaria cases by health facility, Akaki kaliti sub city, Addis Ababa, 2018

Health facility	Malaria at risk population	Number of malaria cases	Incidence /1000
Tirunesh Beijing hospital			
Akaki health center			
Kela health center			
Gelan health center			
Kaliti health center			
Total			

Table 3. Slide positivity rate by health facility, Akaki kaliti sub city, Addis Ababa, 2018 .

Health facility	Number of fever cases	Number of positive slides	Slide positivity rate
Tirunesh Beijing hospital			
Akaki health center			
Kela health center			
Gelan health center			
Kaliti health center			
Total			

Dissemination of the Results

The hard and soft copies of the findings of the study will be submitted to Akaki kaliti sub city health office, respective health facilities and woreda health offices, Addis Ababa city administration health bureau and Addis Ababa university school of public health.

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Annexes

Annex 1 : Measles outbreak investigation tool in Kibebe-tsehay orphanage,Addis Ababa ,2018.

1. Case **2. Control**

Name_____ Date of Data collection_____

Address: Sub city _____ Woreda_____

Ketena_____ Dormitory number (name)_____

Birth place: _____

I- **Socio-demographic Characteristics**

S/N	Question	Alternatives
1.1	Sex	1.Male 2.Female
1.2	Age	Years____ Month_____
1.3	Respondent relation to case or controls?	1. Mother 2. Father 3. Guardian
1.4	Occupation of parent (Guardian)	1. Government employee 2.House wife 3.Student 4.Unemployed 5. Daily laborer 6.Merchant 7.Others(specify)_____
1.5	Occupation of the case or control	1. Government employee 2.House wife 3.Student 4.Unemployed 5. Daily laborer 6.Merchant 7.Others(specify)_____
1.6	Educational level of parent or guardian	1. Illiterate 2.Read & write 3. Elementary 4.Secondary 5. College and above
1.7	Educational level of the case or control	1. Under school age 2. Read and write 3. Elementary 4. Secondary 5. Above secondary

II. Clinical presentation

2.1	What were the sign and symptoms	1.Fever 2.Rash 3. Cough 4.Coryza (runny nose) 5. Red eyes 6.Others (specify)_____
2.2	Ask ONLY if complication	a) Pneumonia: ☐ yes ☐ no b) Corneal ulcer: ☐ yes ☐ no c) Blindness : ☐ yes ☐ no d) Convulsion ☐ yes ☐ no e) Otitis media (ear discharge): ☐ yes ☐ no

		f) diarrhea : ☐ yes ☐ no
2.3	Date of rash onset	_____/_____/_____
2.4	Admission status	1-inpatient 2-outpatient
2.5	Date of admission	_____/_____/_____

III. Treatment Information (only for cases).

3.1	Did the case go to health facility for treatment?	1. Yes 2. No
3.2	If yes date seen at health facility?	_____/_____/_____
3.3	Did the case receive any drugs?	1. Yes 2. No
3.4	If Yes, treatment taken	1.ORS 2.Antibiotics 3.Vitamin A 4.TTC ointment 5. Anti pyretic 6. Supplementary food 7. Others (specify)_____
3.5	Treatment outcome	1. Improved 2. Partially improved 3.Died

Iv. Risk factors

4.0	When did you join the orphanage?	_____/_____/_____ dd/mm/yy
4.1	Did you have history of travel outside of your camp before onset of the disease?	1. Yes 2. No
4.2	If Yes to where and when? (might be local or abroad)	_____ _____/_____/_____
4.3	Is there any child in the dorm with the same sign and symptoms?	1. Yes 2. No
4.4	Did the case has contact history with someone who has rash before onset of the disease?	1. Yes 2. No
4.5	Were new child joined the dorm before three weeks the onset of the disease?	1. Yes 2. No
4.6	If yes, when?	_____/_____/_____
	Were the new child joined the dorm had rash?	1. yes 2. no
4.7	Were you playing together with the new child joined your dorm?	1. yes 2. No
4.8	How many children are living in your dorm?	_____
4.9	A bed for two or more child?	1. Yes 2. No
4.10	Area of your dorm in meter	

	square(m^2)	_____
4.11	Did the camp population have contact with outside/village community?	1. Yes 2. No
4.12	Housing condition? (more than one answer is possible)	1- ventilated 2- Not ventilated 3- Have separate kitchen 4- Have separate toilet
4.13	Mid upper arm circumference (MUAC) measurement	_____ cm.

V. Vaccination Status and knowledge questions

5.1	Have you vaccinated for measles?	1. Yes 2. No 3.Unknown
5.2	If yes, date of last vaccination	1.Guardian recall_____ /___/_____ dd/mm/yy 2. vaccination card____/____/_____dd/mm/yy 3. I don't remember
5.3	Source of information?	1. History 2. Vaccination card 3. Log book
5.4	Number of vaccine doses received	1. One 2. Two &above 3.Dont know
5.5	Age at first vaccination.	_____month (s). _____ year(s).
5.6	If not vaccinated why?	☐ lack of knowledge about vaccination. ☐ absence during vaccination campaign, ☐ Religious exemptions ☐ other (specify)_____
5.7	Do you know modes of transmission for measles?	1.Yes 2.No 3. If yes. specify_____
5.8	Where did you take your child first when gets ill?	1. Health Facility 2. Traditional Healers 3. Holy Water 4. Stayed at home 5. Other :(Specify)_____
5.9	How do you think people get measles?	1. Contact with a virus from ill person 2. From God 3. Bad attitude of other people 4. Other(Specify)_____
5.10	Do you Know measles is vaccine preventable?	1. Yes 2. No 3. Don't Know
5.11	Who do you think can be affected by measles?	1. Children whose age less than 5 years 2. Children whose age less than 18 years 3. Women of any ages

		4. Any age groups of both male and women 5. Other (specify):_____
5.12	How do you think measles can be cured?	1. Using modern medicine 2. Using traditional Medicine 3. Holy water 4. By feeding nutritious foods 5. Keeping the sick person indoor 6. Other(Specify)_____

General questions prepared for Guardians and Nurses of the orphanage

1. Did you observe any strange things in your living area? □Y □N If yes please explain it

_____
_____
_____
_____

2. What could you say about the source of illness?

_____
_____

Annex 2 : Rubella outbreak investigation tool in Nifas Silk Lafto sub city, Woreda 03,Addis Ababa Ethiopia,2018.

Name of the case –patient _____ Date of Data collection_____ ____ Address: Sub city _____

Woreda_____ Ketena _____

Birth place: _____

I- **Socio-demographic Characteristics**

S/N	Question	Alternatives
1.1	Sex	1.Male 2.Female
1.2	Age	Years_____ Month_____
1.3	Respondent relation to case?	1. Mother 2. Father 3. Guardian 4. Other (Specify)_____
1.4	Occupation of parent (Guardian)	1. Government employee 2.House wife 3.Student 4.Unemployed 5.Others(specify)_____
1.5	Occupation of the case	1. Government employee 2.House wife 3.Student 4.Unemployed 5.Others(specify)_____
1.6	Educational level of parent or guardian	1. Illiterate 2.Read & write 3. Elementary 4.Secondary 5. College and above
1.7	Educational level of the case	1. Under school age 2. Read and write 3. Elementary school 4. Secondary school 5. Above secondary school

II. Clinical presentation

2.1	What were the sign and symptoms	1.Fever 2.Rash 3. Cough 4.Coryza (runny nose) 5. Red eyes 6.Others (specify)_____
2.2	Ask ONLY if complication	1) Pneumonia 2) Corneal ulcer 3) Blindness 4) Convulsion 5) Otitis media (ear discharge) 6) diarrhea 7) Other(specify)_____
2.3	Date of rash onset	_____/_____/_____

III. Treatment Information.

3.1	Did the case go to health facility for treatment?	1. Yes 2. No
3.2	If yes date seen at health facility?	_____/_____/_____
3.3	Admission status	1-inpatient 2-outpatient
3.4	Did the case receive any drugs?	1. Yes 2. No
3.5	If Yes, treatment taken	1.ORS 2.Antibiotics 3.Vitamin A 4.TTC ointment 5. Anti pyretic 6. Supplementary

		food 7. Others (specify)_____
3.6	Treatment outcome	1. Improved 2. Partially improved 3.Died

IV. Knowledge Questions

4.1	Do you know modes of transmission for rubella?	1.Yes 2.No 3. If yes specify_____
4.2	Where did you go first when you get ill?	1. Health Facility 2. Traditional Healers 3. Holy Water 4. Stayed at home 5. Other(Specify)_____
4.3	How do you think people get rubella?	1. Contact with a virus from ill person 2. From God 3. Bad attitude of other people 4. Other(Specify)_____
4.4	Do you Know rubella is vaccine preventable?	1. Yes 2. No 3. Don't Know
4.5	Who do you think can be affected by rubella?	1. Children of aged less than 5 years 2. Children of aged less than 18 years 3. Women of any ages 4. Any age groups of both male and women 5. Other (specify):_____
4.6	How do you think rubella can be cured?	1. Using modern medicine 2. Using traditional Medicine 3. Holy water 4. By feeding nutritious foods 5. Keeping the sick person indoor 6. Other(Specify)_____

V. General questions prepared for Guardians and Nurses of the orphanage

5.1. Did you observe any strange things in your living area? If yes please explain it

_____

_____

_____

_____

_____

_____

5.2. What could you say about the source of illness?

_____

_____

_____

_____

_____

Annex 3:Questionnaire developed for Malaria surveillance system evaluation.

Background

Sub city _____

Woreda_____

Name of health facility_____

Type of health facility _____

Total catchment population_____

Respondent(s) Name_____ Phone Number_____

e-mail_____

Date of interview _____

Interviewer: _____

PART ONE:

A. Communication and reporting system assessment

1. Which communication material did you have? □E-mail, □wired phone, □mobile, □fax ,□other (specify)_____

2. Did you have address of Health Bureau/Sub city/woreda PHEM officers? □Yes , □No

3. How frequently you communicate with the Health Bureau/Sub city/woreda PHEM officers on emergencies and other daily activities? □Daily, □weekly, □every 2 week, □monthly, □others (specify)_____

4. Did you have address of health extension workers (HEW)? □Yes, □No

5. How frequently you communicate with the HEWs on emergencies and other daily activities? □daily, □weekly, □every 2 week, □monthly, □others (specify)_____

6. When are you expected to send weekly report to the woreda PHEM Unit?

□Monday, □Tuesday, □Wednesday, □Thursday, □Friday, □Saturday, □Sunday

7. When are you expected to receive weekly report from HEWs?

□Monday, □Tuesday, □Wednesday, □Thursday, □Friday, □Saturday, □Sunday

8. How is the Health Center communicating the HEWs in case of immediately reportable diseases? □by e-mail, □by phone, □by fax, □regular weekly report, □others(specify)_____

B .Assessment of availability of Surveillance Documentation, Registers, and Forms

1. Did you have National Guide line for PHEM? □Yes, □No □

2. Did you have standard case definition for all country priority diseases? □Yes, □No

3. Was the case definition posted? □Yes, □No

4. If answer for Q2 is No, for which disease(s) did you lack the case definition?

_____

5. Did you have case based reporting formats for out breaks? □Yes, □No

6. Was there guide line for specimen collection, handling and transportation to the next level? □Yes, □No □

8. Did you have line list for reporting outbreaks? □Yes, □No, □Not Applicable

C .Data analysis, Computer skill and training assessment

1. Had you trained on surveillance system? □Yes, □No

2. If answer for Q1 is yes a) when?_____

b)Topic_____ _____c) For how long?_____

3. Was data compiled? □Yes, □No

4 . Did you have computer? □Yes, □No

5 . Is it functional)? □Yes, □No

6. How the data entry and compilation is accomplished? □ Manual,□ Computer, □other (specify)_____

7. Did you have computer skill on? □Ms word, □Ms excel, □MS power point, □Epi-info

8. Did you analyze data of the surveillance system? □Yes, □No

9. If answer for Q8 is yes, did you describe data by time? □Yes, □No by place? □Yes, □No, by person? □Yes, □No

10. Did you have denominators for data analysis? □ total pop, □male, □female, □<5yrs

11. Please indicate the frequency of your data analysis. □weekly, □every two week, □Monthly, □quarterly, □every 6 month, □annually, □No regular time

12. Did you notify the results of your analysis to the higher level PHEM? □Yes, □No

13. Did you notify the results of your analysis to the lower level PHEM (HEW)? □Yes, □No

D. Epidemic response and preparedness assessment

1. Did you have plan for epidemic response and preparedness? □Yes, □No

2. Did you have emergency stocks of drugs and supplies? □Yes, □No

3. If answer for Q2 is No, how did you control epidemics?

_____

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

5. Was an epidemic management committee built in your office? □Yes, □No

6. Did the epidemic management committee have regularly scheduled meeting time? Yes, □No

7. Was Rapid response team (RRT) built in your office? □Yes, □No,

8. Did the RRT have regularly scheduled meeting time during epidemics? □ Yes, □ No

9. Did you have case management protocol for epidemic prone diseases? □Yes, □No

10. Did your PHEM have multi-sectoral emergency preparedness and response task □force? □Yes, No

11. Were partners working together with your office on emergencies? □Yes, □No

12. If answer for Q11 is yes, what type of supports did they give to your office?

_____

13. Was there a budget for epidemic response? □Yes, □No

14. Who had the authority to mobilize the emergency finance? □Health Bureau head, □PHEM case team leader, □PHEM officer, □other (specify)_____

15. Had you a vehicle assigned for emergencies (PHEM)? □Yes, □No

16. If answer for Q15 is No, how did you address emergencies?_____

_____.

E. Outbreak investigation and case confirmation assessment

1. Did you investigate any outbreak in 2008 EFY? □Yes, □No,

list if any_____

2. Did you have outbreak investigation check list? □Yes, □No

3. If answer for Q2 is No, how did you know possible factors for the outbreak?_____

_____

4. Where was laboratory confirmation of cases? □regional lab, □Hospital, □EHNRI, □HC □other (specify)_____

5. Who was responsible to investigate an outbreak? □RRT, □HEWs, □Health Bureau staffs, □experts organized randomly, □health facility staffs, □other (specify)_____

_____

6. Had you faced any challenge in outbreak investigation in 2008 EFY? □Yes, □No

7. If answer for Q6 is yes, a) List the challenges_____

_____

b) List the alternatives that you take to tackle the challenges_____

_____

F. Supervision and feedback assessment

1. Did you have supervision plan in 2008 EFY? □Yes, □No

2. If answer for Q1 is No, how did you supervise?_____

_____

3. If for Q1 is yes, did you supervise the HCs and HEW according to your plan in 2008 □EFY?□Yes, No 4.

If answer for Q3 is No, what is the reason?

_____

_____

5. If answer for Q3 is yes, how many times did you supervise each HC and HEW in 2008 EFY?

_____

6. Did you have regular supervision checklist? □Yes, □No

7. If answer for Q6 is No, how did you supervise the health facilities & HEWs?_____

_____

8. Were you supervised by higher level officers in 2008 EFY? □Yes, □No

9. If answer for Q8 is yes, how many times in 2008 EFY? _____

10. Did you send feedback of your supervision to the (HCS) and HEWs that commenting/indicating their strong and weak sides? □Yes, □No

11. If answer for Q10 is No, why? _____

12. If answer for Q10 is yes, for how many HCs and HEWs did you send a feedback in 2008EFY_____

13. Had you received feedback from higher level supervisors in 2008 EFY? □Yes, □No

14. If answer for Q13 is yes, how many feedbacks did you received in 2008 EFY?_____

15. Had you faced any challenge on supervision and feedback in 2008EFY? □Yes, □No

16. If answer for Q15 is yes, list the challenges_____

_____

G. Attributes

1. Simplicity

1. Are the notifiable diseases reporting formats easy to understand? □Yes, □No
2. Does the current malaria case definition easy to understand? □Yes, □No
3. Can the system be easily integrated? □Yes, □No
4. Is Sending report to the next level is easy? □Yes, □No
6. Is Data management (transfer, entry, editing, storing, backup) simple? □Yes, □No
8. Are Data Analysis and Dissemination of information requires much time? □Yes, □No
9. How long it takes to fill the format?_____
10. How long does it take to have laboratory confirmation of Malaria?_____
11. Are there many organizations that receive the report of surveillance system? □Yes, □No
12. Does **High level training** require performing the surveillance system activities? □Yes, □No
13. Are Data sources easily accessible and manageable during data collection? □Yes, □No
14. Is the information generated from the surveillance analysis easily accessible for users (for example, on web sites)? □Yes, □No

2. Flexibility

1. Is the system easy to add new variables? □Yes, □No
2. Is the surveillance system easy to integrate with other systems? □Yes, □No
3. Is the current reporting format easy to add new disease (health event)? □Yes, □No
4. Do you think that any change in the existing procedure of case detection, reporting, and Formats will be difficult to implement? □Yes, □No

3. Data quality

1. Are the data collection formats for these priority diseases clear and easy to fill for all the data collectors/ reporting sites? □Yes, □No
2. Have you ever given training for data collectors on data quality management? □Yes, □No
3. Are the reporting site and data collectors supervised regularly? □Yes, □No
4. Are all reported forms Complete? □Yes, □No
5. Percentage of unknown or blank responses to variables from the total reports of 2008 EFY report ____
4. Percent of reports which are complete (that is with no blank or unknown responses) from the total

report_____

4. Acceptability

1) Do you think all the reporting agents accept and well engaged to the surveillance activities?

□Yes, □No

2) If yes for Q #1, how many are active participants (of the expected)? __/__

3) If No for Q #1, what is the reason for their poor participation in the surveillance activity? A. Lack of understanding of the relevance of the data to be collected

B. No feedback or recognition given by the higher bodies for their contribution; i.e. no dissemination of the analysis data back to reporting facilities C. Reporting formats are difficult to understand

D. Report formats are time consuming

E .Other (specify)_____

4. Were all the health professionals aware about the surveillance system? Yes/No (if yes how)?____

_____

5. Were all the reporting agents send their report using the current and appropriate surveillance reporting format? Yes/ No (if yes observe the documents)

6. Were all PHEM officers send report on time? □Yes/No

7. Are all stakeholders are fully participate in surveillance system strengthening?

□Yes/No

5. Sensitivity:

1. Does the malaria case definition able to pick all cases? ☐ Yes, ☐ No
2. What was the total malaria cases occurred in your wereda/site in 2008 EFY? _____

3. What were the total numbers of suspected malaria cases examined? ____

4. How many of those cases were laboratory confirmed? _____-

6. Representativeness

1. Was the surveillance system enabled to follow the health and health related events in the whole community? ☐ Yes, ☐ No
2. Were all the Socio demographic variables included in the surveillance reporting format?

☐ Yes, ☐ No

3. If the answer for Q 2 is No, which variable was less represented? a) Sex, b) age group, C) ethnic group, d) religion

7. Timeliness

1. Are all reporting sources reporting on time? ☐ Yes, ☐ No
2. Percent of reporting sources that report on time_____

8. Stability:

1. Was the new restructuring affected the procedures and activities of the surveillance of these diseases? 1. ☐ Yes, ☐ No
2. Was there lack of resources that interrupt the surveillance system? ☐ Yes, ☐ No
3. If your answer is yes for question number 2 What was lacking_____
_____
4. Was there any time /condition in which the surveillance is not fully operating? ☐ Yes, ☐ No
5. Is there a surveillance officer or focal person (PHEM unit)? Yes/No Number _____

9. Usefulness:

1.. Can the current system have an ability to timely report malaria to the next reporting level?

2. Can the system measure the morbidity and mortality occurred due to malaria?

3. Can the system detect trends of notifiable diseases?

4. Can the system helps to detect malaria outreak?

5. Can the system stimulate research that lead on prevention and control of malaria?

6. Can the system helps to identify risk factors for malaria?

Annex 4.Checklist for Health Profile Assessment of Yeka Sub City in 2016

Date_____-

Name of the data collector: _____

Date: ----------Respondent (s):----------

1. Historical Aspects of the area (only if relevant)

_____

_____

_____

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

Map of the sub city----------

Location _____ _____ _____

Altitude _____

Annual rain fall_____

Mean annual temperature in

O

C ----------

Climatic zones_____ _____ _____

No of woreds----------Urban----------Rural----------

List their names

_____

_____sub city boundary

North ----------South----------East----------West

Ethnic composition _____ _____ _____

Languages of the sub city----------

Official language (Work language) ----------

Religion –Protestant----------Orthodox----------Muslim----------catholic ------- other

Historical heritages---------- Federal offices---------- Addis Ababa city governmental offices---------- Oromia regional estate offices---------- governmental

development agencies ---------- embassies---------- parks----------
hotels which has stars---------- normal hotels----------.
and **Health budget allocation**

- **Government**
- Total budget allocated for the sub city _____
- Total budget allocated for health _____(____%)
- Total budget allocated for emergency_____
- **Funds from NGO**
- Total _____ (purpose/programs)_____

4. Demography and Vital Statistics

4.1. Total Population in the Sub City _____

4.2. Total Male Population _____

4.3. Total Female Population _____

4.4. Total Under Five Children in the Sub City _____

4.5. Total Women of reproductive age group _____

4.6. Average house hold size _____

4.7. Total new life birth in the year _____

4.8 Total mortalities in the year _____

5. Health Resource, Infrastructure and Utilization

5.1 Health professional ratio to population

Health Professionals	**Number**	**Ratio per total Population**
General Practition		
Specialist		
Health Officer		
Pharmacist		

Pharmacy Technician		
Nurse (B.Sc)		
Nurse (Diploma)		
Midwives (Diploma+BSC)		
All Other Nurses		
Lab.Technologist		
Lab Technician		
Radiographer		
X-Ray Technician		
Environmental Health (Diploma+BSC)		

5.3 Total number of public General Hospital _____

5.4 Total number of public referral Hospitals _____

5.5. Total number of private clinics _____

5.6. Total number of private hospitals _____

5.7. Total number of Ambulances _____

5.10. Outpatient attendance per capital _____

5.11. Rate of referral _____

5.12. Bed occupancy rates of hospitals in the sub city _____

6. Maternal Health

6.1. Total number of expected pregnancies in the year _____

6.2. Contraceptive prevalence rate _____

6.3. Contraceptive acceptance rate _____

6.4. General fertility rate _____

6.5. Antenatal care coverage (4 rounds) _____

6.6. Proportion of deliveries attended by skilled professional _____

6.7. Caesarian section rate _____

6.8. Institutional maternal mortality rate _____

6.9. Total maternal mortality rate _____

6.10 Still birth rate _____

6.11. Postnatal care coverage _____

6.12. Top three causes of maternal death in the sub city (if available)

7. Child Health

7.1. Proportion of low birth weight _____

7.2. Proportion of moderate/severe malnutrition children _____

7.3. Pentavalent first dose (DPT1-HepB1-Hib1) immunization coverage _____

7.4. Pentavalent third dose (DPT3-HepB3-Hib3) immunization coverage _____

7.5. Measles immunization coverage _____

7.6. Full immunization coverage _____

7.9. Top 10 causes of under five morbidity and mortality _____

S.No	Top 10 causes of under five morbidity	Top 10 causes of under five mortality
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

7.10. Neonatal Mortality rate _____

7.11. Infant mortality rate _____

7.12. Child mortality rate _____

8. General Diseases Burden and Distribution

8.1. Top 10 causes of morbidity

S.No	Top 10 causes of morbidity in the general population	Top 10 causes of morbidity in female population
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

8.2. Top 10 causes of mortality

S.No	Top 10 causes of mortality in the general population	Top 10 causes of morbidity in female population
1		
2		
3		
4		
5		

6		
7		
8		
9		
10		

8.3. Top 3 Weekly IDSR reported diseases in the year

S.No	Reported IDSR disease	Total Number
1		
2		
3		

8.4. Number and cases of any report of immediately reportable diseases in the year

8.5 TB and HIV

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

8.5.2. TB Case detection rate _____

8.5.3. Health Facilities Providing VCT Services _____

8.5.4. Health Facilities Providing PMTCT Services _____

8.5.5. PMTCT testing rate _____

8.5.6. Health Facilities Providing ART Service _____

8.5.7. Cumulative ART care enrollment rate _____

8.5.8. Number of new HIV cases _____

9. Hygiene and Sanitation

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

9.2. Proportion of households using an improved water source _____

9.3. Proportion of open defecation free Kebeles/Woredas _____

10. Major challenges of the sub city regarding delivery and quality of health services

_____

_____

_____

_____

_____

11. Economy (mainstay of the economy, average income levels

etc) Average income/year_____ Source

Economic status

High---------- Low---------- Medium---------- other

Productivity----------

12. Education

12.1. Total Number of Schools Gov._____ NGOs._____ Private Schools _____

KG Gov. _____ NGO _____ Private Schools _____

Primary Gov._____ NGO_____ Private Schools _____

Secondary Gov._____ NGO_____ Private Schools _____

Preparatory Gov_____ NGO _____ Private Schools _____

TVET Gov_____ NGO _____ Private _____

College/university Gov_____ NGO _____ Private Schools

_____

12.2. Total Enrollment

KG M _____ F_____ Total _____

Primary M _____ F _____ Total _____

Secondary M _____ F_____ Total _____

Preparatory M _____ F_____ Total _____

TVET M _____ F_____ Total _____

College/university M _____ F_____ Total _____

12.3. School distribution by woreda ----------

12.4. Number of Schools with access to water----------

12.5. Reasons for absence of water for certain schools----------

---

12.6. Literacy status (%) ---------- Illiterate (%) ----------

12.7. Schools with Access to Latrine Facility:

A. One Block Latrine for the school as a whole: _____

B. Two Block Latrine for Male & Female Separated: _____

C. No Latrine at all: _____-

12.8. Total Dropout rate (Total Registered during the year_____ - Total Completed) _____

12.9. Proportion of Female dropout rate _____

6.13. Possible reasons for dropout rate

_____

_____

_____

_____

7.7. Primary school coverage _____

7.8. Primary school completion rate _____

8. Facilities (Transport, Telecommunication, Power supply,) Sub city health structure

Number of health facility in the sub city

Gov	NGOs	Private	Standard
HOSP	-------	-------	Pop ratio---------
HCS	-------	-------	Pop ratio---------
HPS	-------	-------	Pop ratio---------
Clinics	----------	-------	
Diagnostic lab	----------	------	

10. Water Sources _____

10.1. Types of Water supply Sources Available: _____

10.2. Number of Water schemes Constructed during the year:

_____

10.3. Functional water sources during the year_____

10.4. Non Functional water sources during the year _____

10.5. Reason for non-functionality _____

10.6. Average Cost needed per Water scheme for construction: _____

10.7. Average service year/duration of one Water scheme: _____

10.8. Number of sub city with Protected water supply source: (Lists of these woredas)

_____

_____

10.9. Water supply coverage of the sub city during 2008: _____

10.10. What are the Water sources of population uncovered in the supply: _____

_____-

10.11. Possible reasons for the shortage of water

_____

_____

11. Disaster Status in the area

Was there any disaster in the district in the last years?

_____

_____-