

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



**Ethiopian Field Epidemiology and Laboratory
Training Program (EFELTP)**

Compiled Body of Works in Field Epidemiology

By:

JAFER KEZALI HASSEN

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

March, 2018

Addis Ababa, Ethiopia

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Advisor:

Dr. Mamo Wubshet

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

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

Name of the student: -**JAFER KEZALI HASSEN**

Signature_____

Date _____

Place _____

Date of Submission _____

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Date _____

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I would also acknowledge Sister Hawa Mohamed Dano woreda health office head, Ato Girma vice head of Dano woreda health office and Mr. Fekadu Dano woreda health office PHEM officer for their cooperation while conducting outbreak investigation. I owe my deepest gratitude to the workers for Dano woreda Administration, Dano woreda health office and HEWs in Dire Hujuba and Dano Shenan kebeles of Dano woreda. Finally I would like to acknowledge Oromia Public Health Emergency Management core process staffs for their whole hearted support during the residency period.

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List of Abbreviations and Acronyms

ART	Anti-Retroviral Treatment
ANC	Antenatal care
AWD	Acute Watery Diarrhea
BMI	Body Mass Index
CSA	Central Statistical Agency
BCG	Bacilli Calmette Guerin
E.F.Y	Ethiopian Fiscal Year
EPI	Expanded Program on Immunization
FP	Family Planning
HC	Health Center
HEW	Health Extension Worker
HIV	Human Immune deficiency virus
HP	Health Post
KG	Kilogram
OPD	Outpatient Department
OPV	Oral Polio Vaccine
Penta	Pentavalent
PIHTC	Provider Initiated HIV testing and Counseling
PMTCT	Prevention of Mother to Child Transmission
TSF	Targeted Supplementary Food
VCT	Voluntary Counseling and Testing
CI	Confidence Interval
COR	Crude Odds Ratio

CSA	Central Statistical Agency
DOTS	Direct Observation and Treatments
EMPCP	Ethiopian Malaria Prevention and Control Program
FETP	Field Epidemiology Training Program
FMOH	Federal Ministry of Health
HEWS	Health extension workers
HH	Household
HIV	Human Immune-deficiency Virus
IGM	Immunoglobulin M
MCV	Measles Containing Vaccine
MDR	Multiple Drug Resistance
MMR	Measles Mumps and Rubella
NGO	Non-Governmental Organization
NICD	National Institute for Communicable Diseases
OPD	Outpatient Department
OR	Odds Ratio
PHEM	Public Health Emergency Management
PTB	Pulmonary Tuberculosis
RNA	Ribo Nucleic Acid
SD	Standard Deviation
SPHMMC	St. Paul's Hospital Millennium Medical College
SPSS	Statistical Package for Social Science

Executive Summary

In spite of many intervention activities undertaking recurrent and emerging public health diseases are remain a public health problem globally especially in developing countries. The Ethiopian government policy is more emphasis on prevention measures of communicable and non-communicable diseases. Ethiopian Field Epidemiology Training Program that adapted from the United States Centers for Disease Control and Prevention (CDC) Epidemic Intelligence Service (EIS) is one of the programs focusing on capacity building public health practitioners. The training enables trainers to conduct disease surveillance and implement prevention and control measures of prioritized diseases.

I stayed from October 2015 to March 2018 in St. Paul's Hospital Millennium Medical College, Department of Public Health- Field Epidemiology Training Program and at Oromia Public Health Research Capacity Building and Quality Assurance Laboratory Field Base. During my stay; I carried out one outbreak investigation; one surveillance data analysis; one surveillance system evaluation; one Woreda health profile description; two Standard Operating Procedures; one Lab Manual; submission of two abstracts for scientific conference and a research.

Chapter I: Mumps outbreak investigation in Dano woreda, western Ethiopia was conducted during my stay at the field base. Descriptive and Analytic Epidemiology was used during investigations to describe magnitude of the diseases and identify risk factors associated with diseases. We used 40 cases and 120 controls 1 to 3 ratio. The outbreak was occurred within two kebeles of Dano Woreda which were Dire Hujuba 28(70%) and Dano Shenen 12(30%). We identified that Mother's level of education and contact with mumps cases were contributed for mumps outbreak in the woreda. We recommend National vaccination campaign of Mumps vaccination should be initiated to avoid further occurrence of sporadic Mumps outbreak and further complication.

Chapter II: Surveillance data analysis of Measles was conducted at East Shewa zone health office that was reported from September 2011 up to March 2016 which contains all measles case. A total of 955 Measles cases and 2 deaths with a Case Fatality Rate of 0.21% were reported from September 2011 up to March 2016 in East Shewa Zone. We recommend Measles vaccine

campaign and health education for the community should be addressed in all areas of East Shewa Zone.

Chapter III: Evaluation of surveillance system was conducted at Boset Woreda, East Shewa Zone, Oromia Regional State from 13-25 February 2017. During this evaluation, surveillance of malaria was assessed. The system is useful, simple, acceptable, flexible, but system attributes such as; Data quality, positive predictive value, and stability at woreda level still need great attention and improvement. Providing of updated guideline and training should be mandatory.

Chapter IV: - Health profile description of Boset Woreda of East Shewa Zone of Oromia region was collected, analyzed and interpreted accordingly from April - May, 2016. Diarrhea and Helminthiasis are still in the lists of top 10 leading causes of morbidity in both adults and under 5 children which suggest that, there were no proper utilizations of latrine and low awareness of sanitation and Hygiene practices, therefore the Woreda health office with stakeholder have to promote hygiene and sanitation for the community.

Chapter V:-two abstracts were submitted for scientific conference .This includes:

1. Health Profile Description of Boset Woreda, East Shewa Zone, Oromia Region, Ethiopia, 2015/16
2. Measles Surveillance Data Analysis Report of East Shewa Zone, Oromia Region from 2011 to 2016.

Chapter VI: two Standard operating procedures for Oromia Public Health Research Capacity Building and Quality Assurance Laboratory, this includes:

1. Procedure for Quanti-FERON IFN- γ test using ELISA
2. Procedure for Quanti-FERON-TB Gold incubation of blood and harvesting of plasma

Chapter VII: Laboratory quality manual for Mojo Hospital, East Shewa Zone, Oromia, Ethiopia.

Chapter VIII: a thesis of “Determinants of pulmonary tuberculosis in public health facilities of Dire Dawa city administration, Eastern Ethiopia, case control study” Was conducted from October to December 2017. This study showed Gender, Educational status, Monthly income, Housing affordability, Smoking cigarette, Contact history, Body Mass Index, HIV status, and having separated kitchen were significantly associated with being infected with Pulmonary TB

among patients aged 15 years or older in all governmental public health facilities of Dire Dawa city administration, Eastern Ethiopia. Health education on pulmonary TB should be given exhaustively by Dire Dawa health office through health extension workers for the community especially who had no formal education.

Chapter – I Outbreak Investigation

1.1. Mumps outbreak investigation in Dano woreda, Oromia region, western Ethiopia, 2017.

Abstract

Background:-Mumps virus is a single-stranded RNA virus which is a member of the *Paramyxovirus* genus. Humans serve as the only natural host for mumps virus. Mumps is highly infectious and spreads rapidly among susceptible people living in close quarters. Mumps virus is typically transmitted by respiratory droplets, direct contact, or fomites. Classic mumps is characterized by enlargement of the parotid and other salivary glands. In the pre-vaccine era in Sweden, mumps was estimated to cause about 1000 cases of meningitis each year. The aim of this study is to assess the occurrence of Mumps outbreak and identify factors associated with contracting mumps in Dano Woreda, West Shewa Zone, Oromia Region, Ethiopia 2017.

Method:-We conducted community based unmatched case-control study to investigate the outbreak in Dano Woreda, West Shewa Zone, Oromia Region from January to February, 2017. We used 40 cases and 120 controls 1 to 3 ratio.

Result:-The outbreak was occurred within two kebeles of Dano Woreda which were Dire Hujuba 28(70%) and Dano Shenen 12(30%). The mean age for cases was 11.7 ± 9.0 SD and for controls 10.2 ± 8.7 SD. Considering of the gender of participants males are 18 (45%) and 57(47.5%) for cases and for controls respectively, and Females are 22(55%) of all cases and 63(52.5%) of all controls. During Bivariate analysis seven independent variables were associated with the occurrence of mumps outbreak while during multivariate analysis, factors that remained independently associated with contracting mumps outbreak in Dano Woreda were, Mothers level of education(AOR=30.1; 95%CI: 6.1-148.4) and contact with mumps cases(AOR=52.2; 95%CI:12.7-217.1).

Conclusion:-Cases were identified based on manifestation with classic symptoms of mumps. Prolonged mumps outbreak was occurred in this woreda due to delayed in notification of the outbreak to the higher level which shows that there was poor active Public Health Emergency Management system at the woreda level. National vaccination campaign of Mumps should be initiated to avoid further occurrence of sporadic Mumps outbreak and further complication.

Keywords: Mumps, Outbreak, Dano, Ethiopia.

Introduction

Background

Mumps virus is a single-stranded RNA virus and is a member of the Paramyxovirus genus, which also includes human par influenza virus. Humans serve as the only natural host for mumps virus. The mumps virion possesses a helical core containing the genomic nucleocapsid portion, which is surrounded by an external glycoprotein envelope (1). The major surface glycoprotein provide two discrete functions: hem agglutination-neuraminidase activity and cell fusion activity (1, 2). Only one mumps serotype has been identified. Primary viral isolation culture techniques use a number of cell types, including monkey kidney cell lines; mumps may be isolated from saliva, cerebrospinal fluid, and urine (3-5). The mumps virus causes an acute, self-limited, viral syndrome. Prior to the widespread use of an effective vaccine, mumps mainly occurred in young children attending primary grade school; mumps was also a leading cause of viral meningitis and the most common cause of unilateral acquired sensor neural deafness in children (6). Sporadic outbreaks have occurred in the United States and Europe; some of these patients have required hospitalizations due to complications of infection.

Mumps is highly infectious and spreads rapidly among susceptible people living in close quarters. Mumps virus is typically transmitted by respiratory droplets, direct contact, or fomites (7). Infants less than one year rarely acquire mumps due to passage of maternal antibodies. The incubation period is usually 14 to 18 days from exposure to onset of symptoms. Viral shedding in respiratory secretions precedes the onset of symptomatic illness and the period of peak contagion is just before the onset of Parotitis (approximately three days) (8). Mumps epidemics have occurred worldwide with school-aged children generally serving as the vector for horizontal spread to household family members. Infection with mumps virus is asymptomatic in one-third of cases. Nonspecific prodromal symptoms include low-grade fever, anorexia, malaise, and headache. The disease can vary from a mild upper respiratory illness to viraemia with widespread systemic involvement. Classic mumps is characterized by enlargement of the parotid and other salivary glands; Parotitis is bilateral in three-quarters of cases; and other salivary glands are involved in 10% of cases (9).

Statement of the problem

Epididymo-orchitis occurs in about 25% of post-pubertal men who contract mumps. In one large cohort study the median age for mumps orchitis was 29 years (range, 11–64 years) (10). Testicular atrophy occurs in about one-third of patients with mumps orchitis, but sterility is rare. Mumps orchitis appears to be a risk factor for testicular cancer, though not a major one (11). In post-pubertal women, mastitis and oophoritis can occur; one study found mastitis in 31% of women over 14 years of age (12).

Among women who acquire mumps during the first 12 weeks of pregnancy, more than a quarter suffer spontaneous abortion; in a large cohort study, the rate of spontaneous abortion in the first trimester due to mumps infection was higher than that due to rubella infection (13). An increased incidence of con-genital malformations following maternal mumps infection during pregnancy has not been found (14). Pancreatitis is seen in about 4% of patients with mumps (15). There is evidence suggesting that mumps virus can infect human pancreatic beta cells, and may trigger the onset of insulin-dependent diabetes mellitus in some individuals (16). In mumps cases the central nervous system is frequently infected and about 50% of asymptomatic patients exhibit pleocytosis in the cerebrospinal fluid (17). Aseptic meningitis occurs in up to 10% of all mumps patients, more often in males. Meningitis is clinically manifest by severe headache aggravated by movement, photophobia, and neck stiffness due to spasm of the spinal muscles (18). Mumps meningitis is a benign condition that appears within a few days of parotid swelling, although some meningitis patients do not have any parotid swelling. Patients recover without complications, but many require hospitalization during the course of the illness. The incidence of mumps encephalitis is reported to range from 1 in 6000 mumps cases (0.02%) (20) to 1 in 300 mumps cases (0.3%) (21). The associated symptoms vary from mild alterations of consciousness to coma; emotional lability, irritability, and focal neurological signs are also common (18). The age distribution of encephalitis cases parallels that of mumps cases, with 75% of patients being below 15 years of age. For unknown reasons, mumps encephalitis affects three times as many males as females (21). In the USA, mumps was the main cause of viral encephalitis during the pre-vaccine era, and in 1967 was responsible for 36% of cases of viral encephalitis (21). In China, before mumps vaccine was routinely used, a retrospective study of children hospitalized for encephalitis found that mumps was the second most frequently identified viral pathogen after enteroviruses (22).

Deafness is a well-recognized complication of mumps. In Finland, among 298 military personnel with mumps who were assessed by audiometric tests, 13 (4%) had evidence of high frequency hearing loss (16); for 12 of these patients, hearing loss was reversible within a few weeks and one patient progressed to permanent deafness (23). In one Welsh community, 33 children acquired profound unilateral sensory-neural hearing loss over 1 year, and in 12 (36%) of the children the onset of deafness was temporarily related to mumps (24). A study from the United Republic of Tanzania reported mumps as the etiology of permanent deafness in 53 (15%) of 354 students at a school for the deaf (25). A variety of other clinical symptoms are seen with mumps. Mild renal function abnormalities are common (26, 27), but these usually resolve spontaneously. Transient electrocardiogram abnormalities, mainly changes in T waves and ST segments, have been reported in up to 15% of cases (28), while rare case reports of fatal nephritis or myocarditis have been published (29). Death due to mumps is exceedingly rare, and is mostly caused by mumps encephalitis. In the USA, over the period 1966–71 there were two deaths per 10 000 mumps cases, with 38% of such deaths involving persons aged 40 years (21). In the United Kingdom, 93 deaths were registered from mumps over the period 1962–81, with 53 (57%) of those who died being aged 45 years (30). In the pre-vaccine era in Sweden, mumps was estimated to cause about 1000 cases of meningitis each year, leading to 20,000 days of hospitalization and 20,000–40,000 days of disability (19). Ethiopia is one of the countries in which vaccine against Mumps is not given yet. On January 19, 2017 the deployed team of AWD investigators in Dano Woreda reported to Oromia Regional Health Bureau that there were increased numbers of suspected Mumps cases in the area. Therefore, the aim of this study is to estimate the burden and identify factors associated with contracting mumps in Dano Woreda, West Shewa Zone, Oromia Region, 2017.

Objectives

General Objective

- To assess the occurrence of Mumps outbreak and identify factors associated with contracting mumps in Dano Woreda, West Shewa Zone, Oromia Region, 2017.

Specific Objectives:

- To establish the existence of the outbreak and describe the magnitude of the outbreak
- To determine associated factors for Mumps infection

Methods

Study area and period

Dano Woreda is located in West Shewa zone, Oromia Regional state. Administratively the woreda is divided in to 21 rural kebeds and one town. The Woreda has a total population of 125,759, of which males are 62,621(49.7 %) and females are 63,138 (50.3 %). Rural population of these woreda is 115,960 (92.2 %) and the Urban population makes 9,799 (7.8%)(CSA, 2017). Dano Woreda is located at a distance of 125K.m from the Zonal town (Ambo) and 250 from capital town, Addis Ababa. Dano Woreda shares boundaries with Chaliya and IlluGelan Woreda to the North, Nono Woreda to the South, Nono Benja to the West and Jibat Woreda to the East. The weather condition of the Woreda is 7.5 % Dega, 19.5% weynadega and 73.5% Kola. The Woreda has 22 health posts with 40 health extension workers and 4 health centers with 66 health care providers currently on service. The physical health service coverage of the Woreda is one health center served for 31751 and one health post for 5773 population in 2017. The outbreak investigation conducted in this Woreda from January 25, 2017 to February 10, 2017.

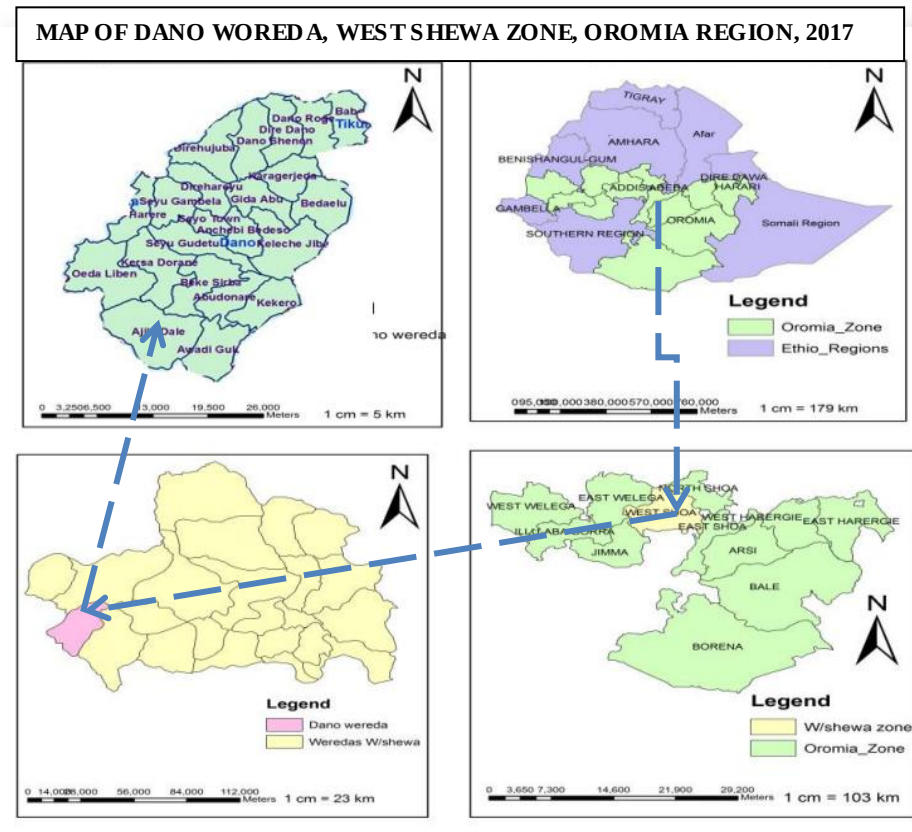


Figure 1: Map of Dano Woreda, West Shewa Zone, Oromia Region, Ethiopia 2017

Study design

We conducted community based unmatched case-control study to investigate the outbreak

Study population

Cases: Anyone with Mumps signs and symptoms like bilateral Parotitis (enlargement of parotid gland), neck stiffness, difficulty in swallowing, fever, headache or cough (40 cases).

Controls: were all people without mumps sign and symptoms (120 controls) during the study period.

Study variables

The dependent variable is mumps infection status, whereas the independent variables are Age, Sex, Occupation, Level of Education, Mother level of education, Father level of education, Contact history, Travel history, Person with mumps in household, Time to take to the health facility from home, Number of windows/doors .

Operational definition

Mother and Father Level of education: - Illiterates are those who couldn't write and read and Educated are those who could write and read with at least primary level of education.

Case Definitions

Suspected:

Parotitis, acute salivary gland swelling, orchitis, or oophoritis unexplained by another more likely diagnosis (31).

Probable: An acute onset of bilateral tender, self-limited swelling of the parotid or other salivary gland lasting 2 or more days (31).

Inclusion and Exclusion criteria

Inclusion Criteria

Cases: Those who had acute Parotitis or other salivary gland swelling lasting at least 2 days.

Controls: Any resident of Dano Woreda during the study period who was a neighbor to a case and who did not develop signs and symptoms of mumps and agreed to participate were included.

Exclusion criteria

Those who refused to participate were excluded

Laboratory Diagnosis

The diagnosis of mumps is usually done based on clinical manifestations, So that we diagnosed the patients based on the presence of Parotitis. Even if Mumps virus can be isolated from clinical specimens, but the lab diagnosis is not done in Ethiopia.

Sample size and sampling procedure

We used 40 cases and 120 controls in 1 to 3 ratios, with a total sample size of 160 participants. Total cases were collected using active case search within the community and 3 controls without the sign and symptoms for each cases were included.

Data collection

A structured questionnaire which was adopted from WHO Measles outbreak investigation questioner (Annex) was used to collect data on factors associated with contracting mumps,

community knowledge and practices on mumps for both cases and controls. Data was collected by two FETP Residents, who can speak Afan Oromo and they were translating English in to Afan Oromo for study participant.

Data analysis

The data was entered, edited and analyzed using Epi-Info version 7, Excel and SPSS version 20 software respectively. Descriptive statistics were used to determine the frequency of different variables. Bivariate and multivariate logistic regression analysis was applied. Independent predictor variables with a P -value ≤ 0.2 in Bivariate analysis was entered into the final multiple logistic regression model. Results were displayed using tables and graphs and it was interpreted using Odd ratio, P value <0.05 and 95% confidence interval to see the significance of the study.

Ethical issues

Ethical clearance was obtained from Ethiopian Public Health Institute (EPHI), Oromia Regional Health Office and from Dano Health Office. An informed oral consent was obtained from all study participants. Confidentiality was assured throughout by not writing participant's names.

Result

Descriptive Epidemiology

There were 40 cases identified through the active community search. The mean age for cases was 11.7 ± 9.0 SD and for controls 10.2 ± 8.7 SD (Table 1). Considering of the gender of participants males are 18 (45%) and 57(47.5%) for cases and for controls respectively, Considering of the occupation of the total cases majority 22(55%) are students followed by Pre-school age children 14(35%), 3(7.5%) were Housewife and 1(2.5%) were Merchant. The outbreak was occurred within two kebeles of Dano Woreda which were Dire Hujuba 28(Attack rate= 6 per 1000) and Dano Shenan 12(Attack rate=2 per 1000). Thirty two (80%) of cases and 111(92.5%) of controls fathers' were farmer by occupation. Active Cases were managed by giving Anti-pain treatment and application of hot water filled with plastic bottle on the swelling area for temporary relief and we gave advice them to visit health facilities . The health seeking behavior is very low since it was indicated that only 1(2.5%) of case visited health facility within days of onset of illness.

Table 1:- The mean Age of Cases and Controls of Mumps outbreak in Dano Woreda, West Shewa Zone, From January- February 2017.

Cases				
	Observation	Total	Mean	Std Dev
Age	40	469	11.725	9.0327
Controls				
	Observation	Total	Mean	Std Dev
Age	120	1221	10.175	8.6536

With regards to education majority 27(67.5%) of cases Mothers' were illiterate whereas only 25(20.8%) of controls Mothers' were illiterate and 15(37.5%) of cases Fathers' where educated whereas majority 93(77.5%) of controls Fathers' were educated.

The most affected age group by this outbreak was 10 up to14 years of Age 14 (35%) followed by the age group from 5 up to 9 years of age 12 (30%) cases.

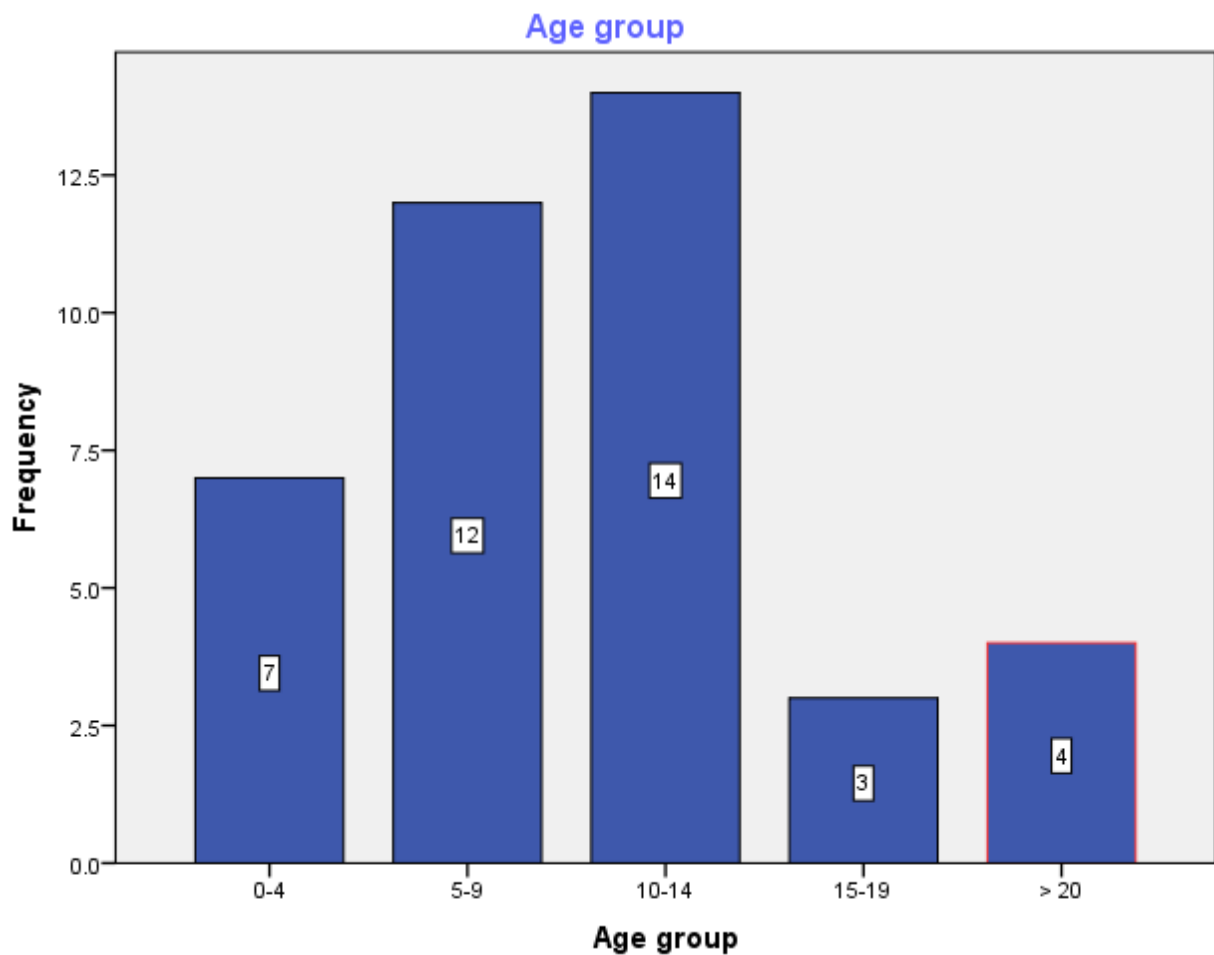


Figure 2: - Total Mumps cases by Age group in Dano Woreda, Oromia Region, 2017

All of the cases presented with typical sign and symptoms of mumps infection like Swelling of the Parotid gland in all cases 40 (100%), Neck stiffness presented by all cases 40(100%) and Difficulty to swallow foods presented by all cases 40 (100%). (Table 2)

Table 2:- Mumps sign and symptoms of Mumps outbreak in Dano Woreda, West Shewa Zone, From January- February 2017.

Sign and Symptoms	Number (%)
Swelling of Parotid gland	40 (100%)
Neck Stiffness	40(100%)
Difficult to swallow	40(100%)
Fever	34(85%)
Cough	24(60%)
Nasal congestion	13(32.5%)

Analytical Epidemiology

From Bivariate analysis five independent variables were P-value less than 0.2

Mother level of education=>P-value=0.000, COR=7.89 (3.56-17.47).

Father level of education=>P-value=0.000, COR=5.74 (2.66-12.40).

Contact history=>P-value=0.000, COR=24.7 (9.85-61.86).

Travel history for the last 3 weeks=>P-value=0.01, COR=4.88 (1.45-16.38).

Age group=>P-value=0.14, COR=1.18 (0.86-1.63).

While in multivariate analysis, factors that remained independently associated with contracting mumps outbreak in Dano Woreda were Mothers level of education, contact with mumps cases and Age group.

Table 3: Bivariate and Multivariable analysis on predictors of Mumps outbreak in Dano Woreda, Oromia Region 2017

Variable	Case	Control	COR(P-value)	AOR(95%CI)	P-Value
Mothers Education					
Illiterate					
Educated	27(67.5%)	25(20.8%)	7.89(0.000)	30.1 (6.1-148.4)	0.000*
	13(32.5%)	95(79.2%)		1	
Contact with mumps case					
Yes	30(75%)	13(10.8%)	24.7(0.000)	52.2 (12.7-217.1)	0.000*
No	10(25%)	107(89.2%)		1	
Age group					0.012*
0-4	7(17.5%)	17(14.2%)	1.18(0.14)	32.2(2.8-372.3)	0.005*
5-9	12(30%)	64(53.3%)		6 (0.6-55.1)	0.11
10-14	14(35%)	23(19.2%)		40.8 (3.8-441)	0.002*
15-19	3(7.5%)	5(4.2%)		29.7 (1.6-535)	0.0021*
>20	4(10%)	11(9.2%)		1	

Discussion

Parotitis is the most common or typical manifestation of mumps infection. In our investigation 100% of the cases manifested Parotitis in all age group. However Rates of typical Parotitis among all age groups normally range from 31% to 95% (32). Parotitis may be unilateral or bilateral, and any combination of single or multiple salivary glands may be affected. During our investigation we noticed that Symptoms tend to decrease after one week for adults and usually resolve after 10 days for pre-school aged children which are within normal symptom resolving date ranges 1 week – 10 days (32).

The occurrence of sporadic mumps outbreaks is well described even in populations with high vaccine coverage (33), whereas in Ethiopia the accumulation of susceptible individuals in the population is higher due to the absence of Mumps vaccination campaign nationally. Although there are no specific guidelines on mumps outbreak management, there is international consensus on the use of supplementary vaccination and patient isolation early in the course of the outbreak as tools to prevent the spread of infection to susceptible groups (34). The attack rate of this outbreak is higher in young age children less than 20 years which is 90% of all cases. However number of cases within the age group of 5 to 15 years of age (65%) is lower than the same age group in the study done in Palestine and Israel mumps outbreak investigation 76.3% and 75.3% (35, 36).

This study identified Children whose mothers was not educated were 30 times more likely to developed mumps compared to children who had educated mothers (AOR=30.1; 95%CI: 6.1-148.4) and Children who had contact with mumps cases were 52 times more likely to developed mumps compared to children who hadn't contact history (AOR=52.2; 95%CI:12.7-217.1). Also children whose Age groups were 0-4, 10-14 and 15-19 years of ages were 32, 41 and 30 times more likely to developed mumps compared to the Age group of greater than 20 years old. (AOR= 32.2; 95%CI: 2.8-372.3), (AOR= 40.8; 95%CI: 3.8-441) and (AOR=29.7; 95%CI: 1.6-535) respectively.

Due to unavailability of laboratory diagnosis to mumps virus in our country we are forced to identify patient depend on clinical diagnosis that had Parotitis manifestation, in addition to this In patients with classic symptoms of mumps, laboratory confirmation is not required.

Prolonged mumps outbreaks was occurred in Dano Woreda due to delayed in notification and communication of the outbreak to higher level so that we couldn't got the total cases in the woreda. Despite we collected the cases from January to February, 2017 from the two affected kebeles. An overall attack rate of the outbreak was 32 cases per 100,000 populations. During the time of investigation we have tried to identify the communities' awareness towards mumps, modes of transmission, prevention and control measures were very low. The health seeking behavior is also very low since it was indicated that only one among the cases visited health facility within days of onset of illness. This difference could be lack of awareness on the need of visiting health facility whenever there is an illness with in the household.

Different mumps outbreak investigation in different countries proves the importance of sustaining a high rate of two-dose Mumps vaccine coverage in all communities (35, 36). However in Ethiopia Mumps vaccination is not applied.

Action Taken/ Intervention

During the course of this outbreak we conduct intervention by giving Anti-pain drugs and by order the parents to apply plastic bottle filled with hot water on swelling area for temporary relief and convincing the parents to visit health facility to avoid further complication and transmission.

Limitation of the Study

Due to delay in notification of the disease by the Woreda Health Office we couldn't identify the primary case of the outbreak and the whole burden. Because of lack of concern to the disease nationally we couldn't get access to send samples to abroad for further investigation so we depend on suspected and probable case definitions to identify cases.

Conclusion

The attack rate of this outbreak is higher in young age children less than 20 years which is 90% of all cases. Predictors significantly associated with the occurrence of mumps outbreak in Dano Woreda were, mother's level of education, Age group and contact with cases.

Recommendation

National vaccination campaign for Mumps should be initiated to avoid further occurrence of sporadic Mumps outbreak and further complication. Health Education towards Mumps infection should be given to the community through trained health extension workers and improving health seeking behavior of the community through awareness creation towards modern treatment and its importance should be given in alliance with community leaders.

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Annex 1: Questionnaire for mumps outbreak investigation in Dano woreda, 2017.

Instructions: italics don't read out loud.

1. Data collector information: Name: _____ Phone number: _____

2. Date of Data collection: _____

Region _____ Zone _____ Woreda _____

Kebele _____ Got _____

House: Longitude: _____ Latitude: _____

3. Who is answering the questionnaire?:

☐ Parent/ guardian of sick person ☐ Sick person ☐ Other (please specify)

4. Respondent category: ☐ case ☐ control Active case: Yes ☐ No ☐

I. Socio-demographic information

1. Patient Name _____

2. Patient phone number: _____ (whose phone#?) _____

3. How old are you? : _____ months _____ years

4. Sex: ☐ Male ☐ Female

5. What is your occupation?:

☐ Farmer ☐ Merchant ☐ Housewife ☐ Unemployed ☐
Government ☐ Pastoralist ☐ Student ☐ Not applicable ☐ Other _____

6. What is your ethnicity?

☐ Oromo ☐ Tigre ☐ Amhara
☐ Gurage ☐ Other (specify) _____

7. What is your religion?: ☐ Orthodox ☐ Protestant ☐ Muslim ☐ Catholic ☐
other _____

8. What is your marital status?: ☐ Single ☐ Married ☐ Widowed ☐ Divorced ☐ Not applicable

9. Have you ever attended school?: ☐ yes (go to question 10) ☐ No (go to question 11)

10. What is the highest level of education you have completed? (read answers): ☐ KG ☐
 Primary ☐ Secondary ☐ Tertiary ☐ Not applicable
11. Father's occupation : ☐ Farmer ☐ Merchant ☐ Unemployed
☐ Government ☐ Student ☐ Pastoralist ☐ Other _____
12. Parents' of case/control's education : Mother: ☐ Illiterate ☐ Primary ☐ Secondary ☐
 Tertiary
 Father: ☐ Illiterate ☐ Primary ☐ Secondary ☐ Tertiary

13. What is the main material of the roof. RECORD OBSERVATION

(Natural roofing)

☐ no roof ☐ thatch/leaf/mud

(Rudimentary roofing)

☐ Rustic mat/plastic sheets ☐ reed/bamboo ☐ wood planks ☐ cardboard

(FINISHED ROOFING)

☐ CORRUGATED IRON /METAL ☐ WOOD ☐ ASBESTOS/CEMENT FIBER

☐ CEMENT/CONCRETE ☐ ROOFING SHINGLES ☐ OTHER (SPECIFY)

II. Clinical presentations (for case ONLY)

1. What were the symptoms?
 - a) Difficult to swallow: ☐ Yes ☐ No
 - b) fever: ☐ yes ☐ No
 - c) nasal congestion: ☐ yes ☐ No
 - d) Swelling of one or more of the salivary glands: ☐ yes ☐ No
 - e) Cough: ☐ yes ☐ No
 - f) Neck stiffness

☐ Yes ☐ No
 - g).BodyacheWhat is the date when you got Parotitis? : ____/____/____
2. Were you in your home village when you first noticed you were ill?

☐ Yes (skip to question 12) ☐ No (go to next question)
3. Where were you when the illness started?

District; _____ Kebele; _____

4. How long have you had a Parotitis? _____ days
5. Do you still have the Parotitis? ☐ yes ☐ No
6. Did you visit health facility for this illness?
- ☐ Yes (date went to facility ____/____/____) ☐ No (go to RISK FACTORS section)
7. How long were you sick before visiting the health facility? _____ in days/hours
8. Admitted: ☐ Yes ☐ No, If yes, date admitted: ____/____/____
- a. Treatment given? ☐ yes ☐ No, if yes
- ☐ ORS ☐ Antibiotics ☐ Vitamin A ☐ Supplementary food
- ☐ TTC ointment ☐ Anti pyretic ☐ other _____
- b. Outcome: ☐ Alive ☐ death
9. Did you travel three days prior to or three days after parotitis onset?
- ☐ Yes (go to question #19) ☐ No (go to question #20)
10. Where did you travel to? _____

EXPOSURE

11. Did you have contact with a person with mumps symptoms the 2-3 weeks before onset of illness?
- ☐ Yes ☐ No ☐ don't know
12. Have you travelled outside of your village the 2-3 weeks before onset of illness?
- ☐ Yes, ☐ No. If yes, District _____ Kebele _____
13. Is there other person with mumps symptoms in your household?: ☐ Yes ☐ No
14. Does the case have any symptoms of malnutrition? (Malnutrition being...): ☐ yes, ☐ No.
- a. If yes, on OTP: ☐ Yes, ☐ No
15. How long does it take you to walk to the health center from your house?
- ☐ Less than 10 minutes ☐ 10-30 minutes ☐ 31 minutes – 1 hour
- ☐ More than 1 hour ☐ More than 2 hours
16. How many windows does the house have
- ☐ Two or more windows or doors ☐ less than two windows or doors Illumination ☐ yes ☐ No
17. How many sleeping rooms are there in your house? _____

18. How many people slept in your house last night? _____

Chapter II – Surveillance Data Analysis Report

2.1.Measles Surveillance Data Analysis Report of East Shewa Zone, Oromia Region from 2011 to 2016.

Abstract

Background:-Measles is an acute viral disease that spreads from person to person. It is highly contagious virus which transmitted primarily by respiratory droplets or airborne sprays to mucous membranes in the upper respiratory tract or the conjunctiva. It causes an estimated 2.6 million deaths each year worldwide. We conducted this surveillance analysis report to describe measles distribution by person, place, and time and recommend possible solutions for East Shewa Zone, Oromia Region, Ethiopia.

Methods: - Data was collected from East Shewa zone health office that was reported from September 2011 up to March 2016 which contains all measles case. Data was entered, cleaned and analyzed using EPI-info 7. Distribution of cases by place, person, and time was made.

Result: - A total of 955 Measles cases and 2 deaths with a Case Fatality Rate of 0.21% were reported from September 2011 up to March 2016 in East Shewa Zone. From the total reported measles cases less than 4 years of age group is the most affected age group 404(42.3%) followed by age group between 5 and 14 years of age 354(37.07%) and age group greater than or equal to 15 years 197(20.63%). With regards to geographical distribution, the most affected area is Bora Woreda 169(17.7%) followed by Metehara woreda 151(15.8%) and Fentale woreda 113(11.8%). The Monthly Report indicates that February 153(16.0%), January 139(14.6%), April 128(13.4%) and March 105(11.0%) are the months that more than half of all case 525(55%) was occurred.

Conclusion:- February, January, April and March were the months that more than half of all case was occurred which demonstrate that measles outbreak occur during dry season and school opening time that increase contact with susceptible individuals. Measles vaccine campaign and health education for the community should be addressed in all areas of East Shewa Zone.

Introduction

Measles is an acute viral illness caused by a virus in the family paramyxovirus, genus Morbillivirus. Measles is characterized by a prodrome of fever (as high as 40 °C) and malaise, cough, coryza, and conjunctivitis, followed by a maculopapular rash. The rash usually appears 14 days after exposure and spreads from head to trunk to lower extremities. Approximately two to three deaths may occur for every 1,000 reported measles cases. The average incubation period for measles is 14 days, with a range of 7-21 days. Persons with measles are usually considered infectious from 4 days before until 4 days after onset of rash with the rash onset being considered as day zero.

This highly contagious virus is transmitted primarily by respiratory droplets or airborne spray to mucous membranes in the upper respiratory tract or the conjunctiva (1). It usually does not kill children directly; however, as a result of its associated immune suppression, measles can lead to lethal complications, such as pneumonia, croup, and diarrhea. Measles can also lead to lifelong disabilities, including blindness, brain damage, and deafness (2) The risk factors for measles virus infection include: infants who lose passive antibody before the age of routine immunization, children with vitamin A deficiency and immunodeficiency due to HIV or AIDS, leukemia, alkylating agents, or corticosteroid therapy, regardless of immunization status and children who travel to areas where measles is endemic or contact with travelers to endemic areas. Malnourished and young children are at higher risk of developing complications and mortality from measles infection.

In 1980, before widespread vaccination, measles caused an estimated 2.6 million deaths each year. Despite the availability of a safe and effective vaccine, measles remains one of the leading causes of death among young children globally. More than 95% of measles deaths occur in low-income countries with weak health infrastructures (3).

Increased measles vaccination resulted in a 74% drop in measles deaths between 2000 and 2010 worldwide. In 2010, about 85% of the world's children received one dose of measles vaccine by their first birthday through routine health services up from 72% in 2000 (3).

In Ethiopia measles surveillance is case-based with laboratory confirmation of suspected measles (4). Estimated MCV1 coverage in Ethiopia was 56% in 2010 and 57% in 2011; the

percentage of districts reporting $\geq 80\%$ MCV1 coverage was 45% in 2010 and 43% in 2011. Measles is probably the commonest of vaccine preventable diseases that occur repeatedly in Ethiopia; mothers recognize it as a self-limited common childhood illness for which no medical care is often sought (5). One dose of measles vaccine at 9 months of age protects 85% of infants but with the second dose, all children who remained unprotected after the first dose will receive protection (6).

Public health surveillance has been defined as the ongoing, systematic collection, analysis, interpretation and dissemination of data regarding a health related event for use in public health action to reduce mortality and to improve health. Data generated from such public health surveillance systems is used for guiding immediate public health action, program planning and evaluation, monitor trends in the burden of disease and formulating research hypotheses. Ethiopia is in the eradication phase of measles control. The NICD is accredited by WHO to perform measles and rubella IgM testing for national case based surveillance to confirm true measles cases and trace the molecular epidemiology of the virus in Ethiopia.

Therefore, this analysis was undertaken to describe proportion of confirmed measles cases, vaccination status and determine the extent, distribution, and occurrence of measles in east Shewa zone, Oromia region. Surveillance is an essential component of enhanced measles control initiatives. Very high quality active and passive surveillance is now necessary to determine whether measles elimination objectives and coverage targets are being achieved.

Objectives

General Objective:

- To Analyze Measles Surveillance Data and describe proportion and its distribution in East shewa zone, Oromia region from September 2011 to March 2016

Specific Objectives:

- To assess the magnitude of measles in East shewa zone, Oromia region
- To assess the distribution of measles cases
- To describe proportion of confirmed measles cases

Methods

Study area

The study area is Misraq Shewa (or "East Shewa") which is one of the Zones of Oromia Region. East Shewa is located in the middle of Oromia, connecting the western regions to the eastern ones. This zone is bordered on the south by the West Arsi Zone, on the southwest by the Southern Nations, Nationalities and Peoples Region, on the west by South west Shewa and Oromia Special Zone Surrounding Finfinne, on the northwest by North Shewa, on the north by the Amhara Region, on the northeast by the Afar Region, and on the southeast by Arsi; its western most reach is defined by the course of the Bilate River. Towns and cities in East Shewa include Bishoftu (Debre Zeit), Metehara, and Ziway.

Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia (CSA), this Zone has a total population of 1,356,342, of whom 696,350 are men and 659,992 women; with an area of 8,370.90 square kilometers, East Shewa has a population density of 162.03. While 340,225 or 25.08% are urban inhabitants, a further 664 or 0.05% are pastoralists. A total of 309,726 households were counted in this Zone, which results in an average of 4.38 persons to a household, and 296,342 housing units.

Source Population

Population of Oromia Regional State

Study population

Population of East shewa zone

Study Unit

Secondary measles data base from East shewa zonal health office through active case search and routine surveillance, each case of measles is the study unit.

Study Design and Period

Cross-sectional retrospective surveillance data analysis was conducted from September 2011-March 2016.

Source of data

Secondary data that was reported from September 2011 up to March 2016 from all Woredas of East shewa zone from HMIS department was used.

Data analysis

Descriptive statistical analysis frequency, percent and 95% confidence interval were made using Epi-Info 7. And Microsoft Excel

Case Definition

- **Suspected measles case:** Is any person with fever and maculopapular (non-vesicular) generalized skin rash with cough, coryza or conjunctivitis (red eyes)
- **Confirmed measles case:** A suspected case with laboratory confirmation (positive IgM antibody) or epidemiologically linked to confirmed cases in an outbreak.
- **Epidemiologically linked case:** A suspected measles case that has not had a specimen taken for serologic confirmation and is linked (in place, person and time) to a laboratory confirmed case or another epidemiologically-confirmed case.
- **Laboratory-confirmed case** is a suspected case which has laboratory results indicating infection (measles IgM positive or isolation of a measles virus).
- **Compatible case** is a suspected case which has not been adequately investigated.
- **Discarded case** is a suspected case which, upon adequate investigation that includes a blood specimen collected in the appropriate time frame, lacks serologic evidence of a measles virus infection.
- **Suspected measles outbreak:** Occurrence of five or more reported suspected measles cases in one month in a defined geographic area such as a kebele, woreda or health facility catchment area.
- **Confirmed measles outbreak:** Occurrence of three or more laboratory confirmed measles cases in one month in a defined geographic area such as a kebele, woreda or health facility catchment area.

Ethical Consideration

We obtained written support letter from Oromia Regional Health Bureau prior to the arrival to the study area. Names of patients were omitted from the analysis. Confidentiality was assured and maintained.

Result

A total of 955 Measles cases and 2 deaths with a Case Fatality Rate of 0.21% were reported from September 2011 up to March 2016 in East Shewa Zone of the total reported measles cases less than or equal to 4 years of age group is the most affected age group 404(42.3%) followed by age group between 5 and 14 years of age 354(37.07%) and age group greater than or equal to 15 years 197(20.63%) (Table 4).

Table 4: Distribution of Measles case by different age group of East Shewa Zone, from September 2011-March 2016.

Age distribution	Frequency	Percent	95% CI Lower	95% CI Upper
<=4	404	42.30%	39.16%	45.51%
5-14	354	37.07%	34.01%	40.23%
>=15	197	20.63%	18.13%	23.36%
TOTAL	955	100.00%		

Concerning on cases distribution by sex Male accounts 513(53.72%) whereas Female 442(46.28%) (Table 5).

Table 5: Distribution of Measles case by Sex, East Shewa Zone from September 2011-March 2016

Sex	Frequency	Percent	95% CI Lower	95% CI Upper
Male	513	53.72%	50.49%	56.91%
Female	442	46.28%	43.09%	49.51%
TOTAL	955	100.00%		

With regards to geographical distribution, the most affected area is Bora Woreda 169(17.7%) followed by Metehara woreda 151(15.8%) and Fentale woreda 113(11.8%).Where as low cases reported from liben woreda 16(1.7%),Gimbichu woreda 40(4.2%) and Zeway town 44(4.6%) (Table 3 and Figure 1).

Table 6: Distribution of Measles case by geographical location, East Shewa Zone, September 2011-March 2016

Adress	Frequency	Percent	95% CI	
			Lower	Upper
Bora woreda	169	17.70%	15.40%	20.30%
Metehara town	151	15.80%	13.60%	18.30%
Fentale woreda	113	11.80%	9.90%	14.10%
Dugda woreda	82	8.60%	6.90%	10.60%
Adami tulu jido kombolcha woreda	73	7.60%	6.10%	9.60%
Mojo town	56	5.90%	4.50%	7.60%
Adaa woreda	55	5.80%	4.40%	7.50%
Adama woreda	54	5.70%	4.30%	7.40%
Lume woreda	53	5.50%	4.20%	7.20%
Boset woreda	49	5.10%	3.90%	6.80%
Zeway Batu town	44	4.60%	3.40%	6.20%
Gimbichu woreda	40	4.20%	3.00%	5.70%
Liben woreda	16	1.70%	1.00%	2.80%
TOTAL	955	100.00%		

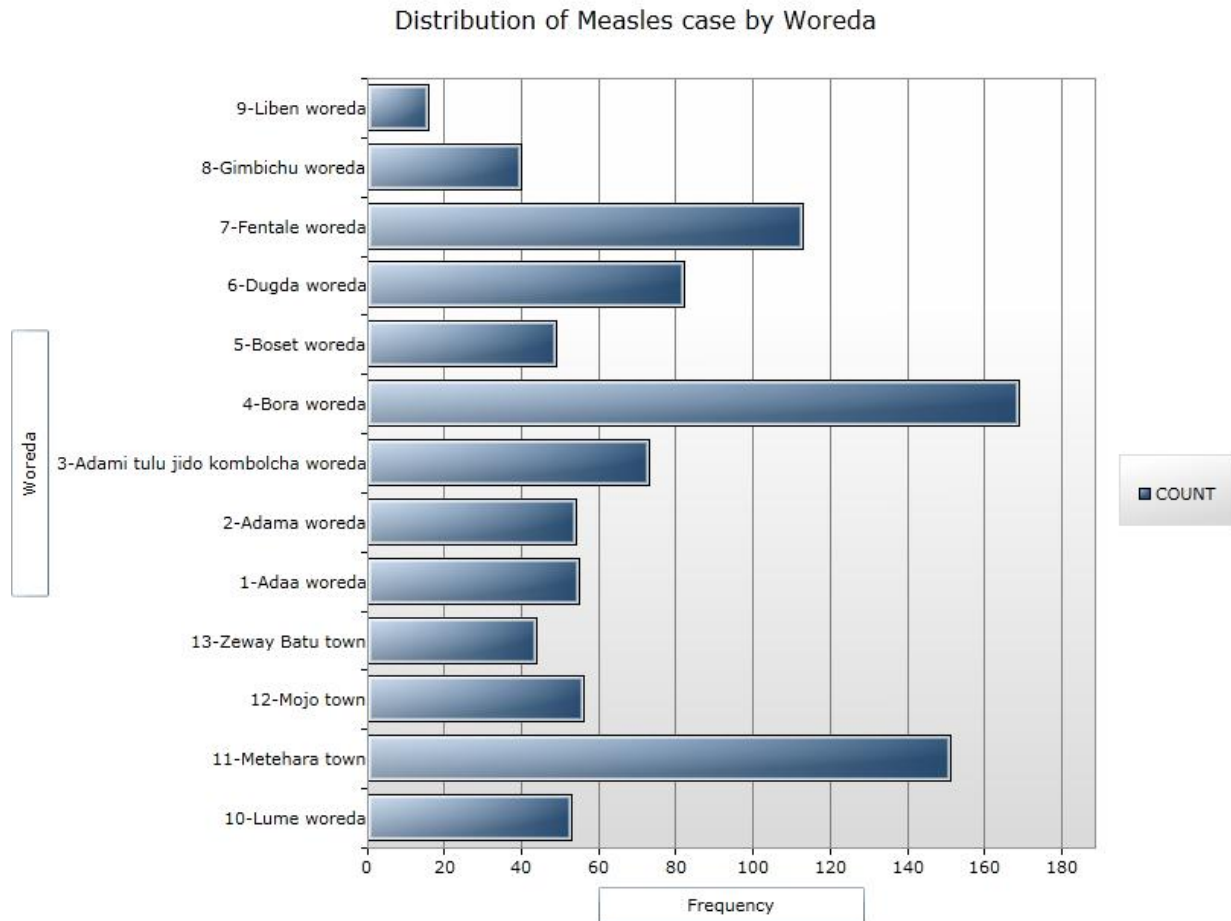


Figure 3: Measles distribution by woredas of East ShewaZone, September 2011-March 2016

When we see the distribution of Measles case based on Time, the year 2014 is the time period where most the case 338(35%) had occurred followed by the year 2011 and 2015 (183(19%) and 184(19%) respectively) but In 2012 relatively low case 128(13%) reported within the study period.(Figure 2).

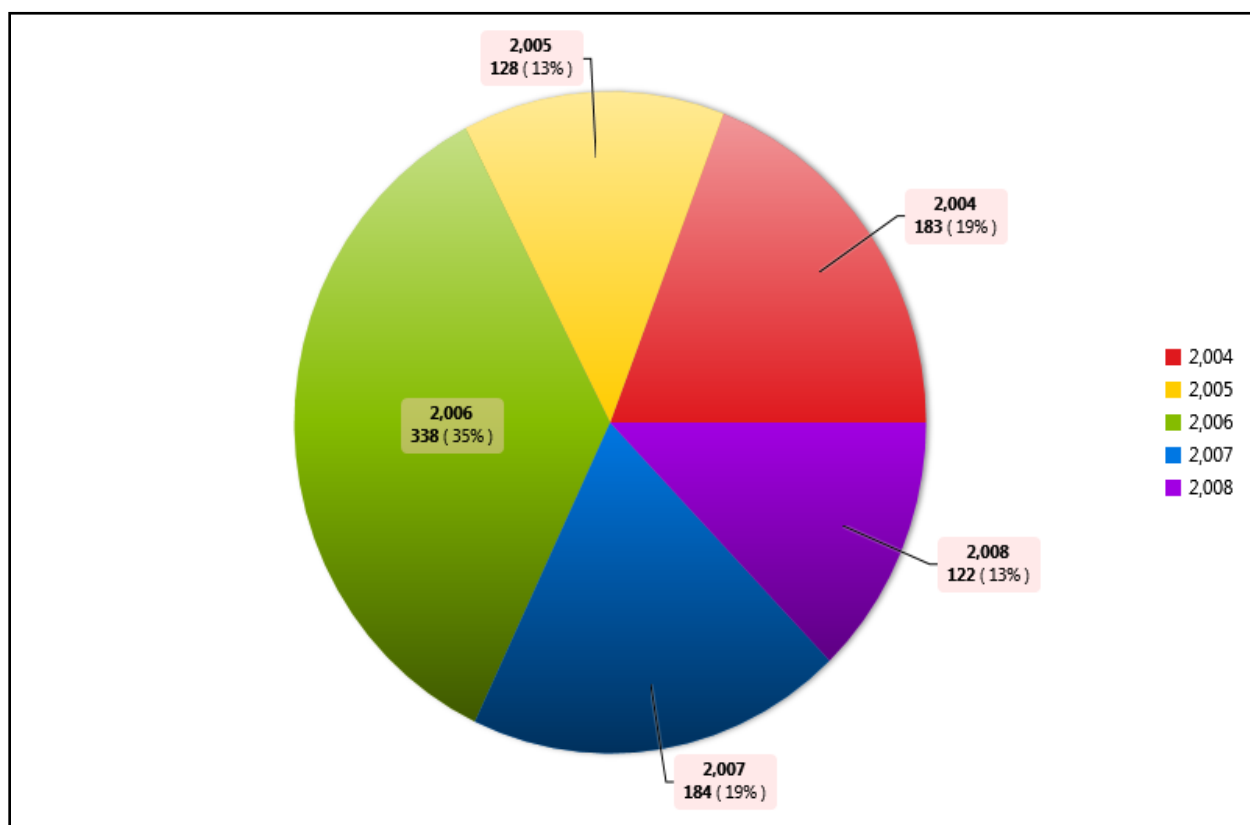


Figure 4: Distribution of Measles case by Time (year) in East Shewa Zone, September 2011-March 2016.

The Monthly Report indicates that February 153(16.0%), January 139(14.6%), April 128(13.4%) and March 105(11.0%) are the months that more than half of all case 525(55%) are occurred. Whereas July 30(3.1%), October 33(3.5%), August 35(3.7%) and September 51(5.3%) are among the months in which relatively low Measles case 149(15.6%) had occurred. (Figure 3)

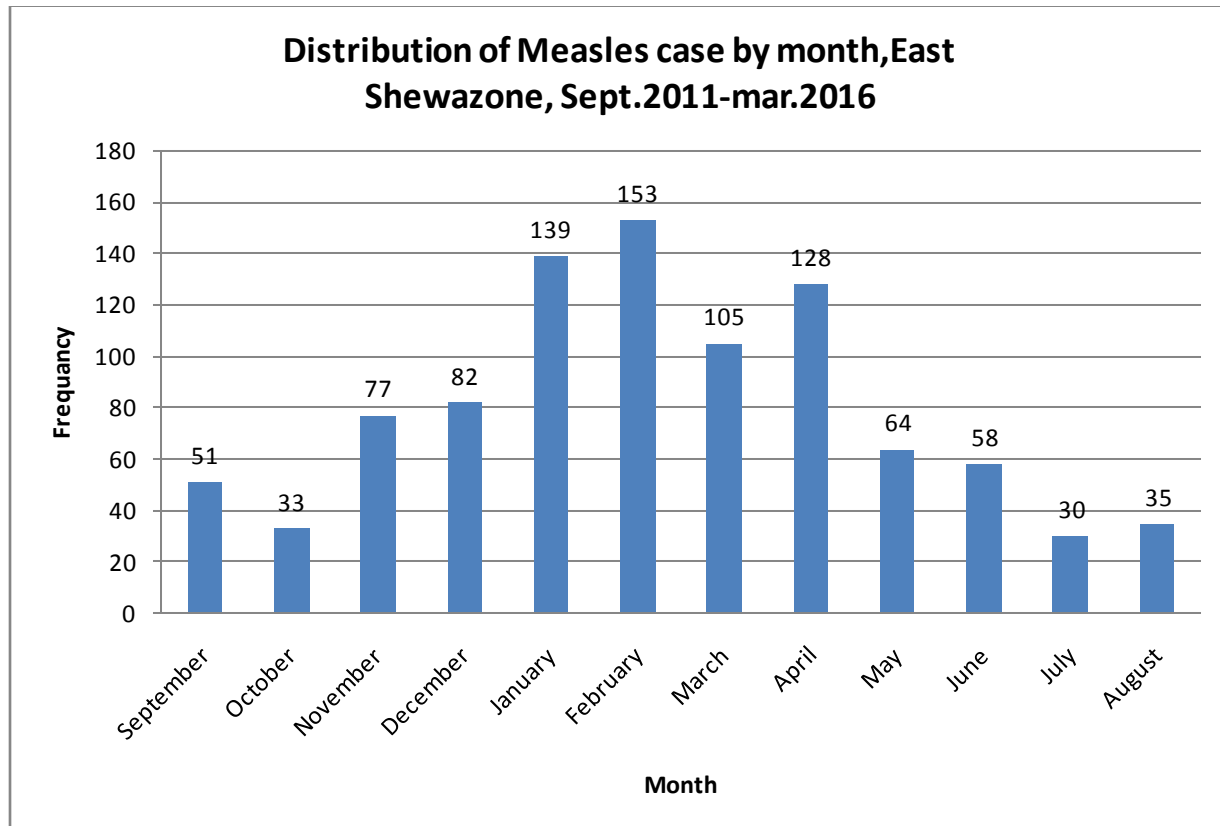


Figure 5: Distribution of Measles case by Time (Month), in East Shewa zone, September 2011-March 2016.

The trend of the Annual Measles attack rate in East Shewa Zone was highest in 2014 which is 24 cases per 100,000 population followed by 2011 which accounts 14 cases per 100,000 population.

At woreda level highest Annual measles attack rate was occurred in Metehara town 255 cases per 100,000 population and 223 cases per 100,000 populations in 2014 and 2015 respectively. (Table4-8)

Table 7: Distribution of Measles case and Annual attack rate by Woredas of East Shewa Zone, 2011

Woreda	Population	Case	Percentage (%)	AR/100,000 population
Adaa Woreda	148,254	17	9.3	12
Adama Woreda	163,528	7	3.8	5
Adami tulu Woreda	180,803	33	18	19
Bora Woreda	68,073	1	0.55	2
Boset Woreda	164,553	3	1.6	2
Dugda Woreda	168,795	3	1.6	2
Fentale woreda	69,642	33	18	48
Gimbichu woreda	99,549	12	6.6	12
Liben woreda	87,176	2	1.1	3
Lume woreda	100,581	5	2.7	5
Metehara Town	25,579	18	9.8	71
Mojo Town	36,871	20	11	55
Zeway Town	54,419	29	15.8	54
Total	1,367,777	183	100	14

Table 8: Distribution of Measles case and Annual attack rate by Woredas of East Shewa Zone, 2012

Woreda	Population	Case	Percentage (%)	AR/100,000 population
Adaa Woreda	152,681	2	1.6	2
Adama Woreda	168,412	23	18	14
Adami tulu Woreda	186,202	6	4.7	4
Bora Woreda	70,106	7	5.5	10
Boset Woreda	169,467	10	7.8	6
Dugda Woreda	173,836	2	1.6	2
Fentale woreda	71722	10	7.8	14
Gimbichu woreda	102522	28	21.8	28
Liben woreda	89779	2	1.6	3
Lume woreda	103585	18	14	18
Metehara Town	26343	0	0	0
Mojo Town	37972	15	11.7	40
Zeway Town	56044	5	3.9	9
Total	1408627	128	100	9

Table 9: Distribution of Measles case and Annual attack rate by Woredas of East Shewa Zone, 2014

Woreda	Population	Case	Percentage (%)	AR/100,000 population
Adaa Woreda	121,721	23	6.8	19
Adama Woreda	173,372	23	6.8	13
Adami tulu Woreda	191523	6	1.8	3
Bora Woreda	72,179	26	7.7	36
Boset Woreda	174,458	27	8	16
Dugda Woreda	179,137	60	17.7	34
Fentale woreda	73,611	64	18.9	87
Gimbichu woreda	105,348	0	0	0
Liben woreda	93,205	1	0.3	1
Lume woreda	106,498	24	7.1	23
Metehara Town	27,445	70	20.7	255
Mojo Town	39,515	10	3	26
Zeway Town	58,390	4	1.2	7
Total	1416402	338	100	24

Table 10: Distribution of Measles case and Annual attack rate by Woredas of East Shewa Zone, 2015

Woreda	Population	Case	Percentage (%)	AR/100,000 population
Adaa Woreda	137613	6	3.3	5
Adama Woreda	178322	1	0.5	1
Adami tulu Woreda	197158	6	3.3	3
Bora Woreda	74231	60	32.6	81
Boset Woreda	193733	9	4.9	5
Dugda Woreda	184065	15	8.1	9
Fentale woreda	75942	5	2.7	7
Gimbichu woreda	108554	0	0	0
Liben woreda	95062	1	0.5	1
Lume woreda	109680	4	2.2	4
Metehara Town	27893	62	33.7	223
Mojo Town	40160	9	4.9	23
Zeway Town	59342	6	3.3	11
Total	1481755	184	100	13

Table 11: Distribution of Measles case and Annual attack rate by Woredas of East Shewa Zone, 2016

Woreda	Population	Case	Percentage (%)	AR/100,000 population
Adaa Woreda	138383	7	5.7	5
Adama Woreda	183755	0	0	0
Adami tulu Woreda	202643	22	18	11
Bora Woreda	76521	75	61.5	98
Boset Woreda	199351	0	0	0
Dugda Woreda	190254	2	1.64	1
Fentale woreda	77540	1	0.82	1
Gimbichu woreda	111243	0	0	0
Liben woreda	97250	10	8.2	10
Lume woreda	112578	2	1.64	2
Metehara Town	29791	1	0.82	4
Mojo Town	42892	2	1.64	5
Zeway Town	63379	0	0	0
Total	1526137	122	100	8

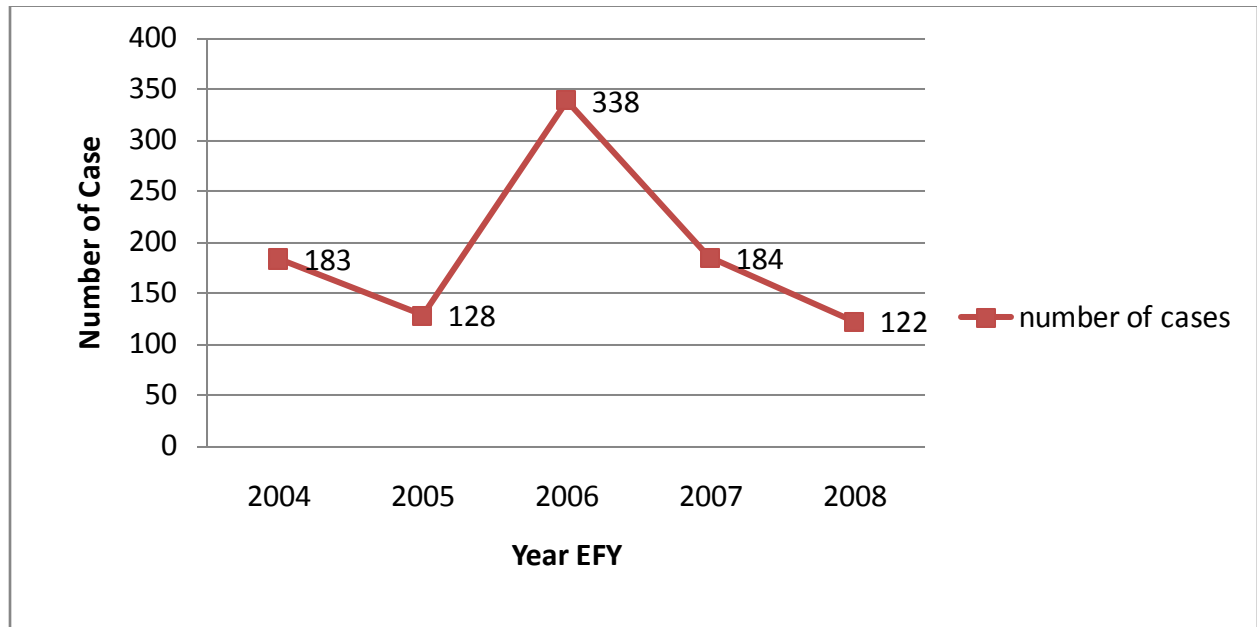


Figure 6: Annual Measles case trend of East shewa zone, September 2011-March 2016

The annual measles case trend shows that highest cases was reported during the year 2014 (338) cases and the lowest cases reported during 2012 (128). In 2016 there were 122 cases but its only 7 month report so that within 5 remaining months there will be expected number of measles cases.

Laboratory Findings

Out of the 820 cumulative suspected measles cases reported with samples send to referral laboratory from September 2011 up to March 2016, 249(30.4%) of cases were confirmed for measles IgM where as 65(7.9%) of cases were confirmed for Rubella IgM.

Discussion

This data analysis indicated that the average annual attack rate was 14 per 100,000 populations in 2011 then decreased to 9 per 100,000 in 2012 and again rises to 24 per 100,000 populations in 2014 which is the highest annual attack rate in the study period and then decreased to 13 per 100,000 populations in 2015.

The study demonstrated that most 79.37% of affected age groups were the under 15 years, with 42.3% of them being children less than or equal to 4 years and 37.07% of them are children between the age of 5-14 years. This finding was slightly lower than other African countries in which 53.4% of cases occur in children aged 5-14 years (7, 8). This highlights the fact that the 1-15 year age group still remains a risky population for contracting measles in Ethiopia and interventions like immunization campaigns need to be targeted at this age group if morbidity and mortality due to measles are desired to be drastically reduced (8).

With regards to geographical distribution, the most affected area is Bora Woreda 169(17.7%) followed by Metehara woreda 151(15.8%) and Fentale woreda 113(11.8%). Possible reasons for this include the fact that these woredas have a high density population and experiences relatively high rates of immigration from other areas.

The Monthly Report indicates that February 153(16.0%), January 139(14.6%), April 128(13.4%) and March 105(11.0%) are the months that more than half of all case 525(55%) are occurred. this is by the fact that measles outbreak can occur during dry season and school opening time that increase contact with susceptible individuals.

The laboratory plays a central role in the confirmation of suspected measles cases and outbreaks, and in the identification of circulating strains of measles viruses. Information regarding the circulating strains is useful to track importations of measles virus when a country is in the elimination phase. Detection of measles-specific IgM antibody and measles RNA by real-time RT-PCR are the most common methods for confirmation of measles infection. Serum specimens should be collected during the acute stage of the disease, preferably during the first week after onset of illness, and again during convalescence, ≥ 3 weeks after the acute sample was collected. Measles virus is sensitive to heat and infectivity decreases markedly when samples are not kept cold. It is important to transport samples with cold packs as soon as possible

following sample collection. Avoid repeat freeze-thaw cycles or freezing at -20°C (standard freezer temp) because formation of ice crystals decreases infectivity (9). In this study Out of the 820 cumulative suspected measles cases reported with samples send to the laboratory, 249(30.4%) of cases were confirmed for measles IgM. This finding was slightly lower than Analysis of National Measles Surveillance Data in Italy during 2013(7).

Limitations

There were difficulties in searching of data which contain full information of our interest such as vaccination status of all the reported case and their laboratory results. The surveillance report of the zonal health office was only numbers (figure) which was difficult to analyze it, so that we agreed to use the HMIS data.

Conclusion

The study highlights the fact that the 1-15 year age group (79.37% of the total cases) still remains a risky population for contracting measles in East Shewa zone and interventions like immunization campaigns need to be targeted at this age group if morbidity and mortality due to measles are desired to be drastically reduced in this zone. The most affected area is Bora Woreda followed by Metehara woreda and then Fentale woreda. Possible reasons for this include the fact that these woredas have a high density population and experiences relatively high rates of immigration from other areas. The Monthly Report indicates that January, February, March and April are the months that more than half of all case was occurred. this is by the fact that measles outbreak can occur during dry season and school opening time that increase contact with susceptible individuals.

Recommendation

Efforts to maintain high routine measles vaccination coverage should be emphasized in East shewa Zone. Measles surveillance system should be strengthening in this zone, especially woredas with high measles cases like Bora Woreda, Metehara woreda and Fentale woreda. Majority of samples of measles suspected where discarded due to many reasons like Measles virus is sensitive to heat and infectivity decreases markedly when samples are not kept cold. It is important to transport samples with cold packs as soon as possible following sample collection and arranging training for the health professionals on how samples are transported.

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Chapter – III:

Evaluation of

Surveillance System

3.1. Malaria surveillance evaluation of Boset Woreda, East Shewa Zone, Oromia Region, Ethiopia, 2017

Abstract

Background: The Federal Ministry of Health of Ethiopia identified 21 top priority diseases under surveillance. Malaria is within 21 top priority diseases which are reported weekly. It is caused by intra erythrocytes protozoa of the genus Plasmodium and is vector-borne disease caused by a parasite. It is one of the leading causes of morbidity and mortality in Ethiopia. Hence, we conducted this study to assess malaria surveillance system and Performance to generate evidence based information for the better improvement of the surveillance system and to provide recommendation based on the findings in Boset woreda, East Shewa Zone, Oromia region, 2017

Methods: We conducted Cross-sectional descriptive study in Boset Woreda, East Shewa Zone, Oromia Regional State from 13-25 February 2017. From this Zone we selected Boset Woreda Health office purposely which had relatively high malaria cases then two health centers from this woreda and two health posts from each health centers using simple random sampling, a total of 8 health facilities were included. All surveillance focal persons in the selected health office and facilities were interviewed. We used WHO standard checklist for surveillance system evaluation for data collection. Data was entered, edited and analyzed by graphs and table using Microsoft office excel-2013.

Result: East Shewa zone has a total population of 1, 788,258, of these, male accounted 912,184(51%) and Female accounted 876,074(49%). At all visited sites, it was identified that the current surveillance system is helpful for early detection of outbreaks. All respondents agreed that case definition of malaria is easy and applicable for case detection by all level professionals. Public Health Emergency Management guideline is distributed for all Woredas but 5/8 (62.5%) of the visited sites were without PHEM guideline during observations. The case definition of malaria was only available in 2 (25%) of the 8 visited sites at zonal and woreda level. The positive predictive value (PPV) or the proportion of cases reported by the system that actually have malaria in Boset woreda was 10,407 from a total of 36,794 suspected malaria cases by the case definition (PPV=28.3%) . Boset woreda contribute 10,407/37,452 (28%) of the total zonal malaria case.

Conclusion and Recommendation

There was shortage of national technical guideline for standard case definitions at the health facilities. The system is useful, simple, acceptable, flexible, but system attributes such as; Data quality, positive predictive value, and stability at woreda level still need great attention and improvement. Providing of updated guideline and training should be mandatory.

Introduction

Disease surveillance has been recognized as successful strategy in the control and prevention of most disease especially communicable diseases. An effective surveillance system allows early intervention for the prevention and reduction of the morbidity and mortality that may result from epidemics of communicable diseases (1). Effective surveillance is the key to control disease in the community. However it is weak with duplication of data collection and multiple reporting channels. There is also lack of clarity with regards to data submission responsibilities. However, the knowledge of reporting requirements and responsibilities among health personnel has not been examined adequately as a cause of under reporting (2).

The Federal Ministry of Health of Ethiopia identified 21 top priority diseases which are epidemic prone, of international concern and diseases on eradication and elimination programs for surveillance activities. These diseases are monitored by a designated bodies through available means of communication- telephone, paper based reporting etc. These diseases are set to be reported as mandatory notification which are immediately reportable diseases and routine surveillance which are to be reported weekly (3). Malaria is within 21 top priority diseases which are reported weekly.

Malaria is caused by intra erythrocytes protozoa of the genus *Plasmodium* and is vector-borne disease caused by a parasite. These parasites are transmitted by the bite of an infective female *Anopheles* mosquito. People with malaria often experience fever, chills, and flu-like illness. Left untreated, they may develop severe complications and die. In 2010 an estimated 219 million cases of malaria occurred worldwide and 660,000 people died, most (91%) in the African Region. Malaria is the leading cause of death and disease in many developing countries worldwide. Three point three billion People live in areas at risk of malaria transmission in 106 countries and territories. More than 207 million developed symptomatic malaria (4).

Malaria remains one of the most important causes of human morbidity and mortality with enormous medical, economic and emotional impact in the world. More than half of the world's population is at risk of acquiring malaria, and the proportion increases each year because of deteriorating health systems, growing drug and insecticide resistance, climate change and natural disasters. Combating malaria is one of the millennium development goals; which is planned to halt the incidence of malaria by halve in 2015 (5).

Malaria is the leading communicable disease in Ethiopia with over 5 million clinical cases of malaria reported annually. The Ethiopian Malaria Prevention and Control Program (MPCP) have set the goal of reducing the burden of malaria by 50% and eventually halting transmission of parasite infections by 2015 (6).

In Ethiopia, malaria is one of the leading causes of morbidity and mortality and it is endemic in most part of the country with an altitude below 2,000 meter. About 75% of the land mass is potentially malarious and about 40 million people are at risk of infection. On average, 60-70% of malaria cases have been due to *P. falciparum*, with the rest caused by *P. vivax*. The risk of disease in Ethiopia is also highly variable by location that is affected by rainfall, altitude, and seasonal factors; malaria is classified as unstable, and host immunity to malaria is thought to be low in most parts of Ethiopia (7).

To reduce the overall burden of morbidity and mortality due to malaria in Ethiopia comprehensive approach to vector control, early diagnosis and prompt treatment and surveillance, prevention and rapid management of malaria epidemics when and where it occurs are being implemented by incorporating in the country health sector development program since 1999 (8). The evaluation should assess how well the public health surveillance system is integrated with other surveillance and health information system e.g., data exchange and sharing in multiple formats, and transformation of data. The purpose of the system indicates why the system exists, where as its objectives relate to how the data are used for public health action. The objective of public health surveillance system is, addressing immediate public health action, program planning and evaluation, and formation of research hypotheses including the planned uses of its data; establish a frame of reference for evaluating specific components. Oromia region especially East Shewa Zone, has many malaria hot spot areas which are affected repeatedly by malaria episode. Hence, this evaluation is conducted to evaluate the gap and the attributes and purposes of the surveillance system.

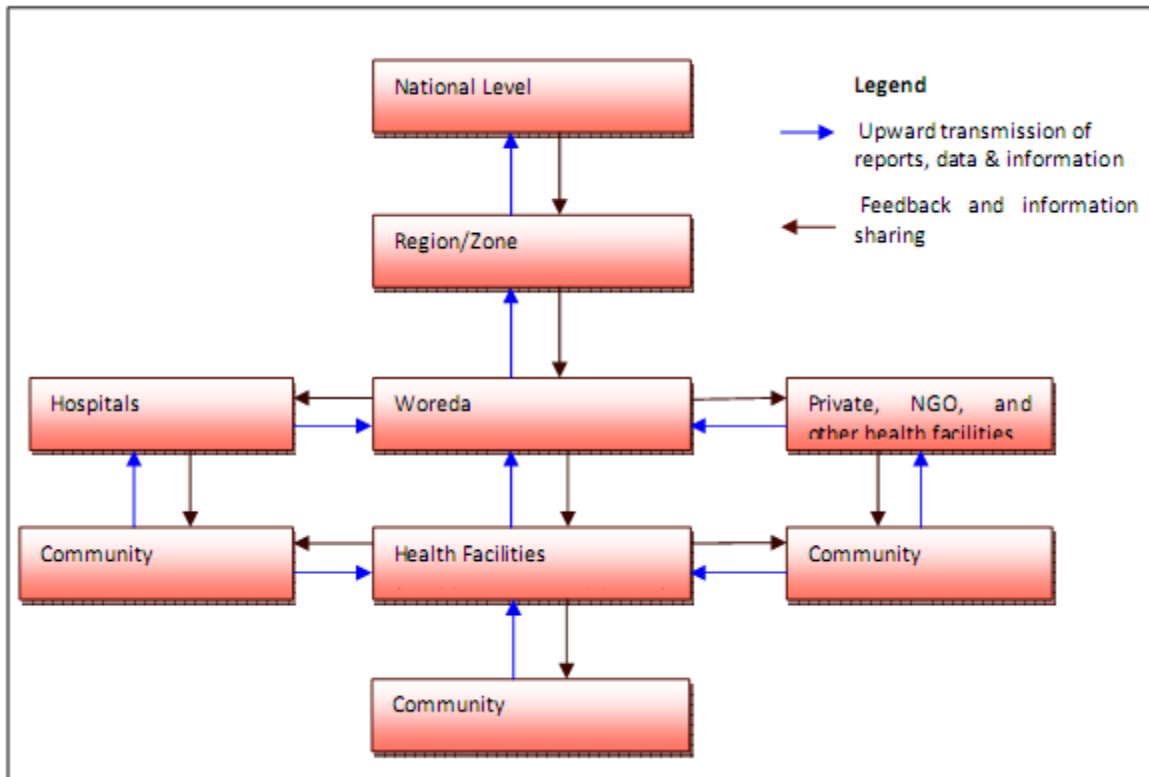


Figure 7: Diagram illustrating the formal and informal flow of surveillance data and information throughout a health system (source Public Health Emergency Management Guidelines for Ethiopia 2012).

Rationale for Evaluation

Malaria is one of the leading causes of morbidity and mortality in Ethiopia. Hence, we conducted this study to evaluate whether the system is in a way of performing to the set objective and to identify the gap for improving the surveillance system. Malaria surveillance system has been useful in providing information of malaria trends and also it provides magnitude of morbidity and mortality due to malaria in the woreda. The finding of this evaluation will be utilized for planning, effective health interventions and procure of equipment that helps for diagnosis, treatment and prevention of malaria cases in Boset Woreda, East Shewa Zone.

OBJECTIVES

General objective

- To assess malaria surveillance system and Performance to generate evidence based information for the better improvement of the surveillance system in Boset Woreda, East Shewa Zone, Oromia Region, 2017

Specific Objectives

- To assess the Performance of the surveillance system and the challenges of quality of surveillance system in early detection of malaria outbreaks and morbidity and mortality.
- To evaluate the key attributes of surveillance system

Methods

Study Area

The study was conducted on East Shewa Zone in Oromia Regional State. The Zone has an estimated area of 9788.13 Km², a total population of **1,788,258** in which male is **912,184(51%)** and female **876,074(49%)**. The rural population accounts for 71% of the zone total population(Projected from 2016 CSA). East Shewa Zone has a population density of 148 persons per Km². The Zone has 10 woredas (Fentale, Bosat, Adama, Lumme, Gimbichu, Ada'a, Adami Tulu Jido kombolcha, Bora, Dugda and Liban) and 3 Towns (Mojo,Batu,Metehara). The zone has three geo climatic zones, highland "Dega" > 2500m altitude accounts for 5%, Mid-land "Weyinadega" 2000-2500m altitude) constitutes 25% and low land "Kola" <2000m accounts for the remaining 70%. The zone town, Adama, is 100 kms east of Addis Ababa. In 2013, there were two Governmental hospitals, one Non Governmental Organization hospital, 58 health centers, 288 health posts, three Pharmacies, 94 drug stores and 34 rural drug vendors. The potential health service coverage of the zone was estimated at 100%.

Boset Woreda is one of the Woredas in East Shewa zone that lies between 8°24' to 8°51' North latitude and 39°16' and 39°50' East Longitude which is located about 125 Kilometers south east of the capital Addis Ababa. It is bounded by Fentale Woreda in the East, Awash River in the West, Arsi Zone in the south and Amhara region in the north. The Woreda is divided into 33 rural kebele (the smallest unit of Local government) Administrations and four sub-urban towns. The total land area of the Woreda is 1378.4 square kilometers. According to the agricultural Bureau of the Woreda, its altitude varies from 1000-2000 meters above sea level which is mainly Kolla (low lands) and it is characterized by hot and dry weather with the annual average temperature in the range of 25⁰c to 37⁰c and receives an average 700 to 800 mm of rainfall per annum. The district has an estimate total population of 184,668 (Projected from 2016 CSA). The Woreda has 1 Government hospital, 7 Health Centers, 33 Health Post and 21 Private clinics.

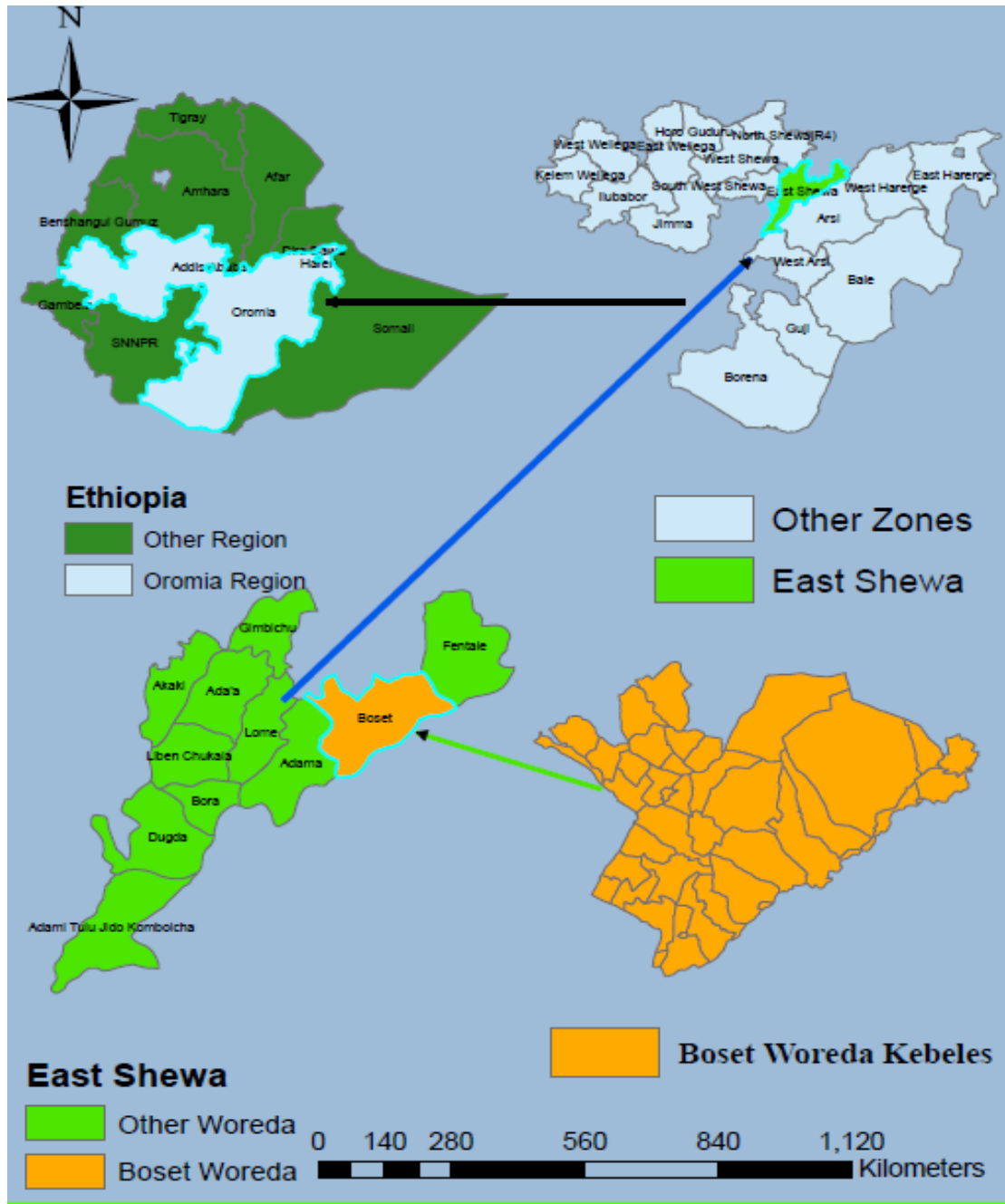


Figure 8: Map of the Boset Woreda, East Shewa Zone, Oromia Region, Ethiopia, 2009 EC (Source: prepared by: ARC GIS)

Study design and period

A cross-sectional descriptive study was conducted from 13-25 February 2017.

Study unit

The study subjects were health facilities (Health Centers, and Health Posts) and health offices (Woreda Health Offices and Zonal Health office).

Table 12: Name of the visited health facilities in East Shewa Zone, Oromia Region, 2017.

Name of Zone	Name of Woreda	Name of health center	Name of health post
East Shewa Zone	Boset	Wolenchiti	Borchota
			Tedecha
		Doni	Nura Hase
			Sifa Bate

Sample Size and Sampling Technique

From East shewa zone we selected Boset woreda health office on purpose (convenience sampling) which had relatively high malaria cases then Simple random sampling for two health centers from this woreda and two health posts from each health centers with a total of 8 health facilities were included.

Data collection Method

Data was collected using questionnaire which was adopted from WHO standard checklist for surveillance system evaluation from all surveillance PHEM focal persons in the selected health office and health facilities were interviewed and observation of some practical tools for surveillance was done (Annex 1-4).

Data analysis

Data was entered, edited and analyzed by graphs and table using Microsoft office excel-2013.

Data Dissemination

The findings, Conclusions and recommendations was forwarded to all concerned bodies like PHEM department of Zone and woreda, mentors, supervisors and coordinators.

Case definition

According to National PHEM guideline Malaria case definition categorized in to two, Clinical and community case definition.

- **Clinical case definition:** Any person with fever, headache, back pain, chills, sweats, myalgia, nausea and vomiting diagnosed as malaria clinically.
- **Community case definition:** Any person with fever OR fever with headache, back pain, chills, sweating, muscle pain, nausea and vomiting OR suspected case confirmed by RDT.

Operational definition

- **Flexibility:** is the ability of the system to adapt to changing needs with little additional time, persons or allocated funds. A flexible public health surveillance system can adapt to changing information needs or operating conditions with little additional time, personnel, or allocated funds. Flexible systems can be easily integrated with other systems.
- **Data Quality:** Data quality reflects the completeness and validity of the data recorded in the public health surveillance system.
- **Timeliness:** is the ability of the system to trigger appropriate action in time. The surveillance system must provide information in time to control communicable diseases.
- **Representativeness:** is the ability of the system to describe health events accurately in terms of time, place and person. A public health surveillance system that is

representative accurately describes the occurrence of a health-related event over time and its distribution in the population by place and person.

- **Simplicity:** The simplicity of a public health surveillance system refers to both its structure and ease of operation. Surveillance systems should be as simple as possible while still meeting their objectives.
- **Acceptability:** reflects the willingness of persons and organizations to participate in the surveillance system.
- **Sensitivity:** is a surveillance system can be considered on two levels. First, at the level of case reporting, sensitivity refers to the proportion of cases of a disease (or other health-related event) detected by the surveillance system. Second, sensitivity can refer to the ability to detect outbreaks, including the ability to monitor changes in the number of cases over time.
- **Stability:** refers to the reliability (i.e., the ability to collect, manage, and provide data properly without failure) and availability (the ability to be operational when it is needed) of the public health surveillance system.

Results

Overview of Performance of the Surveillance System

Populations under surveillance

East Shewa zone has a population of 1, 788,258. Of the total, male accounted 912,184(51%) and Female accounted 876,074(49%). Majority of the population 1,264,632(71%) found in rural areas where as 523,623(29%) of the population found in urban areas.

Regarding of health care service; East Shewa zone has 1 district hospital, 56 Health Centers, 288 health posts, 15 all types of private clinics and 6 NGO clinics. The health service coverage of the zone was 100% in 2008 EFY. Boset woreda has 7 health centers and 33 health posts. In all assessed health facilities, the respondents agree that the population under surveillance have satisfactory health seeking behavior for malaria.

Table 13: Population under surveillance of Boset woreda, East Shewa Zone 2016/17.

Areas of assessment	Total population			Urban population			Rural population		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
East Shewa zone	912,184	876,074	1,788,258	258,522	265,101	523,623	653,659	610,973	1,264,632
Boset woreda	95,513	89,155	184,668	20,343	20,460	40,803	75,170	68,695	143,865

Availability of National PHEM Guideline

Public Health Emergency Management guideline is distributed for all Woredas of East Shewa Zone. In the same way Boset Woreda had distributed this guideline for the Health centers. However, among 2 visited health centers, one health center did not have National PHEM guideline during this assessment. All visited health posts did not have National PHEM guideline.

Table 14: Health facilities with Public Emergency management Guideline in East shewa Zone, Oromia Region, February, 2017.

S/N	Visited sites	With guideline	Without guideline	Percent (%)
1	Zone(1)	1	0	100
2	Woreda(1)	1	0	100
3	Health center(2)	1	1	50
4	Health post(4)	0	4	0
Total(8)		3	5	37.5

As indicated in (Table 2) from 8 visited sites only 3/8 (37.5%) of them had national PHEM guideline. However, the rest 5/8 (62.5%) of the visited sites were without PHEM guidelines during observations.

Case definitions, Registration and Case detection

The case definition of malaria was only available in 2 (25%) of the 8 visited sites at zonal and woreda level. Even if all health care providers in the visited health facilities properly replied the standard case definition of malaria but they didn't posted in the wall. Clinical register was found in all visited health facilities which is filled properly all the variables. Malaria treatment guideline was found in all of the health facilities. Laboratory confirmation of malaria took only 20-30 minutes.

Data Reporting

WHO was responsible for providing reporting formats to East shewa zone but cease this support in the meantime. During the last six months, shortage of weekly surveillance reporting formats was observed in zonal health office, woreda health office and one health center. However, they were solved their problem by copying and manually preparing the formats. The weekly reporting rate for Boset Woreda over the past 12 weeks was 82/84 (97.6 %) for health centers and 396/396 (100%) for health posts. East Shewa zone is using mail to report weekly surveillance activities to next level. Doni health center and Boset woreda health office are using telephone to report for the next level but wolenchiti health center and all visited health posts reports directly using hard copy (formats) to the next level.

Data Analysis

At zonal and woreda level, malaria is analyzed weekly by person, place and time. During this assessment, malaria is analyzed in two health centers (Doni and Wolenchiti) weekly and its line graph was observed too. Among four visited health posts, two of them (Borchota and Tedecha) are performing trend analysis for malaria in weekly basis. In other health posts, analysis of diseases was not done totally. At all levels, PHEM and malaria focal persons are responsible for data analysis of selected diseases.

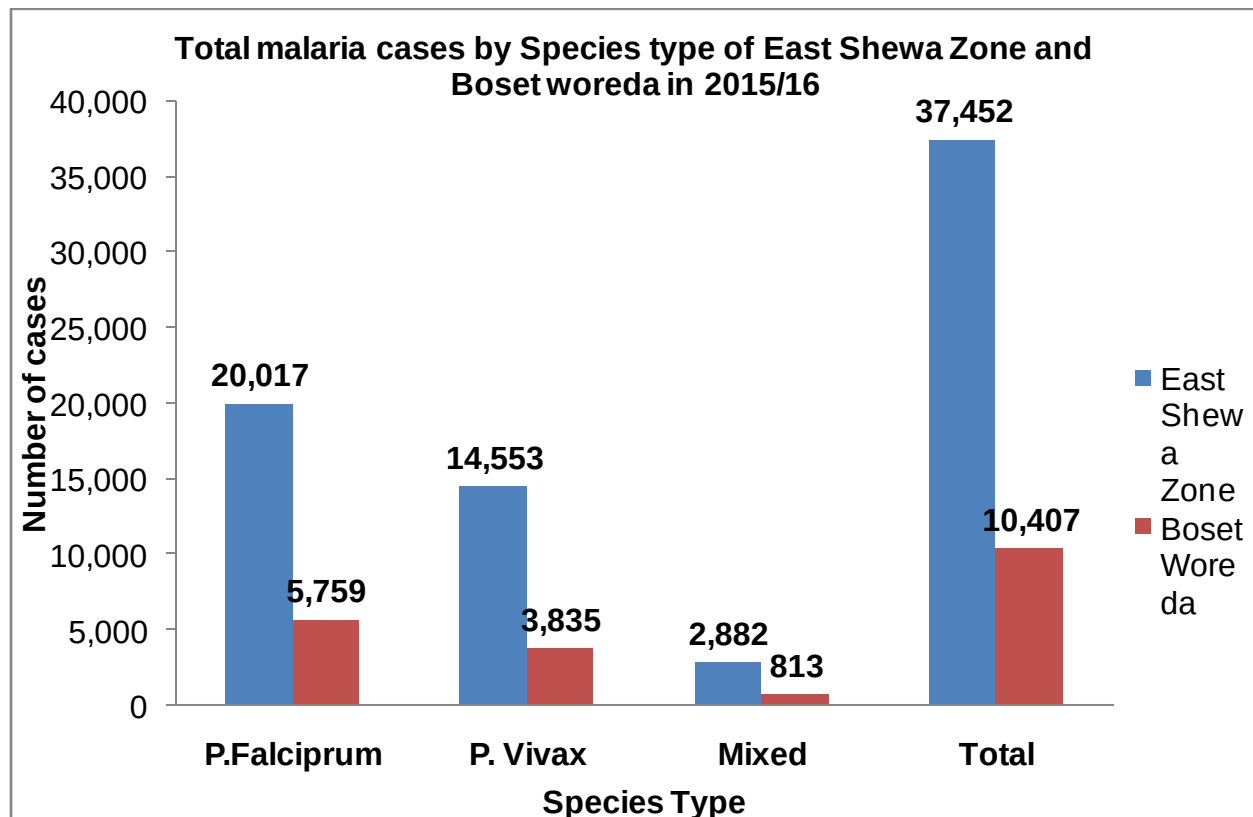


Figure 9: Total malaria cases by species type in East Shewa Zone and Boset Woreda, 2015/16

Existence of Action Threshold Levels

Action threshold level is available at Zonal and woreda level on National PHEM Guideline. In addition, all of health centers have action threshold levels for all selected diseases including malaria.

Outbreak Investigation

In East Shewa zone, AWD, Malaria and Measles outbreaks were occurred in 2016. Zonal staff was participated in investigation of these outbreaks with regional and hospital professionals including EFETP residents. At this zone, risk factors and its finding used for action were looked for during investigation of AWD outbreak at 7 Woredas. But there was no malaria outbreak occurred in Boset woreda.

Epidemic Preparedness and Management

There is written epidemic preparedness and response plan at zonal level. However, there were no emergency stocks of drugs, vaccines and supplies and also shortage of emergency drugs and supplies were encountered in the past one year at this level. There was no written epidemic preparedness and response plan at all visited Health facilities and Boset woreda health office. In addition, there was a shortage of medical drugs and supplies for emergency management in Boset woreda health office during the past one year.

Regarding existence and activities of epidemic management committee, there are established committee at zonal and woreda level. During this assessment, it was identified that established committee at these levels is not working regularly and not formulated with all necessary disciplines. The magnitude of this problem is high at woreda level and they had never met after termination of last outbreak (AWD). Boset woreda health office was implemented prevention and control measures based on local data. There is no budget line for epidemic response at zonal and woreda level. Nevertheless, they use from others budget sources and supported by regional health bureau during epidemic. In addition there is epidemic rapid response team at all visited sites. At all visited sites, cases of AWD were detected within less than 48 hours after date of onset of first case.

Availability of Budget and Resources for Surveillance Activities

There is no allocated budget from government source for public health emergency activities at zonal level. This problem is extended to the woreda and the health facilities. Even though all visited sites except health posts, had computers and its accessories, they did not have for PHEM activities separately rather they use it for all activities. Stationery is not enough at some health posts. In addition shortage of hygiene and sanitation materials was observed at some health facilities.

Feedback

East Shewa zone health department has given written feedback for all Woredas in 2015/16. Boset woreda gave written feedback for health facilities with integration of other activities that consists few indicators of surveillance activities quarterly and all visited health posts received at least 2 feedbacks from the health centers in 2015/16.

Supportive Supervision

During the past six months, East shewa zonal department didn't conducted supportive supervision on surveillance activities for Woredas and health facilities. Shortage of vehicle, budget and logistics were attributed for incapability of conducting regular supportive supervision at zonal level. But Boset woreda had supervised health facilities once for the past six month by the support from Addis continental.

Laboratory

Laboratory capacity in the surveillance of malaria was assessed at health facilities. The health center laboratories were able to test malaria by microscopy and health posts with RDT. There was no shortage identified in the health facilities to do malaria test during our visit.

Training of Surveillance Activities

This year, zonal PHEM unit being with partners have conducted training for 11 woreda PHEM focal persons on PHEM Guideline, Woreda Rapid Response Team and Community Integrated Disease Surveillance and Response for seven days. Additionally, there is at least one trained personnel at all visited health facilities.

Attributes of the Surveillance System

Usefulness

At zonal level, woreda level and visited all health facilities, it was identified that the current surveillance system is helpful for early detection of outbreaks. This was confirmed during recent outbreak of AWD in this zone that the system was well enough in disease detection and control activities were led by data generated by surveillance system. Government and non-government organizations have used surveillance data to make decisions and take actions. Respondents at zonal, woreda and all visited health facilities believe that the system is good enough to estimate magnitude of morbidity and mortality of selected diseases, identify factors associated with these diseases and able to evaluate of prevention and control programs.

Simplicity

All respondents at zonal, woreda and health facility agreed that case definition of malaria is easy and applicable for case detection by all level professionals. In addition, they believe that community case definitions are easy to understand at community level. All respondents at each level were familiar with when and for whom report will send. PHEM focal persons at zonal and woreda level thought that additional data collection on cases are not time consuming rather it is important to deal with. Respondents at all level told that it takes 10 - 15 minutes to fill weekly reporting format on morbidity and mortality of priority disease.

Flexibility

System is flexible as it can accommodate new variables and information, can be operated with other system. Daily case register for malaria management modified to captured RDT positive cases & dose-regimen of treatment administered but not clinical cases of malaria, date of onset of fever and other symptoms. All respondents agreed with a flexible public health surveillance system can be and easily adjusted to use, change can be implemented with little information but without additional time, personnel, or allocated funds. Now it is modified and easy to integrate with other system.

Data Quality

Reporting formats of weekly and immediately reportable diseases are well understood at zonal, woreda and health center levels. But, due to lack of training some health extension workers were observed to be confused with this format. Even though training has been conducted at regional and zonal level for PHEM officers on data quality management, some problems occurs pertaining reporting system that resulted from lack of attention. Additionally, reporting sites and data collectors did not supervised regularly. At health post level, due to many health extension workers are not good in English they did not understand some variables and phrases on reporting formats. Major problems identified at different levels on filling reporting format are stated as follow:

- Date of sent and received, reporter and receiver information did not written on reporting formats
- Blank spaces that should be filled with zero (0) number but not were observed at woreda and health facility level. This problem is insignificant at zonal level

- Duration of activity report(week at which activities were performed) is missed during report compiling mainly at health post level
- Documenting copies of report in sequential manner is poor at woreda and health facility levels

Acceptability

Active participation of agents in reporting system of surveillance activities in regular pattern is a major attribute for system's acceptability. Of all facilities, NGO and privates are less likely to send weekly PHEM report. Also, some governmental institutions did not send a report timely and completely. Different stakeholders like WHO, UNICEF, CDC and others are participating in strengthening surveillance system in collaboration with Regional and Zonal health offices.

Representativeness

Representativeness shows how far the routine surveillance report is covered by the health service delivery system and how many facilities are reporting to the offices. The routine surveillance covers all governmental health facilities zonal, Woredas health office, health center and health posts private health facility, and all population under surveillance in the catchment area. Representativeness was good for the reason that large febrile patient was diagnosed by HEW using RDT at community level and microscopic examination of blood film at health center and hospital level.

Timeliness and Completeness

Timely report of surveillance data is important for early public health interventions. Timeliness is a speed between steps in a public health surveillance system. As per standard of National PHEM the expected level of report timeliness is 80% and above. Early case detection is another key attribute of timeliness assessment. The timeliness and completeness of east shewa zone in 2008 EFY is 87% and 94% respectively.

Predictive Value of Positive

The positive predictive value (PPV) or the proportion of cases reported by the system that actually have malaria in Boset woreda was 10,407 from a total of 36,794 suspected malaria cases (PPV=28.3%) . The capacity of the diagnostic test was confirmed by microscopic examination.

Table 15:-Positive predictive value of malaria suspected case in Boset wore da, East she wa Zone, 2017.

Month	Suspected cases	Confirmed case	PPV (%)
September	5096	1914	37.5
October	3499	1130	32.3
November	3518	1020	29
December	2509	544	21.7
January	2351	425	18.1
February	2459	314	12.8
March	2361	385	16.3
April	1949	415	21.3
May	2091	404	19.3
June	3362	933	27.8
July	4037	1618	40.1
August	3562	1361	38.2
Avarage	36,794	10,407	28.3

Stability

Stability is reliability and availability of the public health surveillance system without interruption. Availability of PHEM focal persons at Zonal, woreda and Health facility level is a good opportunity for running surveillance system even with limited resources. Shortage of budget and logistics is hindering supervision and capacity building activity at zonal and woreda level.

Discussion

The perceptive ability of the health care providers and PHEM focal persons to the case definition of malaria was found to be good but there is some gap at the health facilities on posting of malaria case definition on the wall. In addition to this, the health care providers and the HEWs were clear about the weekly reporting formats of PHEM.

The arrangement of data reporting flow from the lower to the upper level is well organized in understandable way and defined roles and responsibilities of each reporting entities. But the flow has many impediments with reporting means like telephone, fax and computer skills for data management and analysis which impacted the overall generation of reports by the expected health facilities. This low reporting rate together with delayed or no analysis of the collected data will make the surveillance system less useful to meet its objectives. This could be due to poor supervision and feedback system, lack of appropriate training, lack of sense of ownership, and lack of logistics.

The epidemic preparedness and response activities of the Boset Woreda were not well organized and had only planning, but there was no financial and/or logistic support. Moreover the epidemic response committees and rapid response team had no regular meetings and they do not review their plans, actions, and learn from their experiences to reduce their dependence on the Zonal Health Bureau in case of disasters or any public health emergency. This makes responses to be late and disasters to spread fast and may cause many suffering, disability & preventable death. Besides, the woreda Health Offices were allowed for emergency budget from the Woreda Administration only after an event has occurred which hinders timely investigation, and mitigation of expected events in the woreda. Due to this reason, PHEM focal persons of the visited sites were become Demotivated for surveillance activities.

There was no written epidemic preparedness and response plan at all visited sites. This may cause weak case detection and response during epidemics. The aim of preparedness is to strengthen capacity in recognizing and responding to public health emergencies through conducting regular risk identification and analysis, establishing partnership and collaboration, enhancing community participation and implementing community-based interventions and

strategic communication during the pre-emergency phase and ensuring their monitoring and evaluation (2).

There were no problems on the simplicity of the system concerning on the case definition malaria, reporting system and additional data collected on cases at all visited levels. It was agreed by all respondents that the surveillance system is flexible for newly occurring health and health related events. Timeliness and completeness of report is important for timely public health interventions. The average annual timeliness and completeness of weekly report at zonal level is above expected national level (80%) which is 87% and 94% respectively.

It was found that nearly all areas of east shewa zone and all areas of Boset woreda 90% and 100% respectively are at risk of malaria and Malaria was found to be the major disease burden in East shewa zone this can be due to high population mobility in the area from high Landers and presence of irrigation which is conducive breeding site for malaria as it was identified by this study. Boset woreda contribute 10,407/37,452 (28%) of the total zonal malaria case.

Conclusion

The Disease surveillance system in East Shewa Zone is useful, simple, acceptable, flexible, and representative but system attributes such as; quality, positive predictive value, and stability at woreda level still need great attention and improvement. There was shortage of national technical guideline for standard case definitions at the health facilities.

Emergency stocks of recommended drugs were not observed in all visited sites, feedback to lower level was provided mainly verbally and there was no budget allocated for epidemic response. Even if the entire respondent were satisfied on the surveillance system, they advise that efforts should be exerted to improve the system mainly on supervisory activities, proper and timely feedback, data management and analysis of prioritized diseases. There is also shortage of trained professional at PHEM unit of all visited sites; there is single PHEM focal person except at zonal level which is two focal persons, problems raised when this staff takes annual leave, sick leave or maternal leave.

Recommendations

- Means of reporting should be improved by Oromia Regional Health office like using mail at peripheral sites sometimes mobile network is not working so that delay in reporting occurred.
- Oromia Regional Health office should Increase number of PHEM focal persons, most of visited sites had single focal person so that reporting was in difficulty during his/her annual leave or sick leave.
- Supportive supervision should be reinforcing at lower levels by East Shewa Zone and there should be documented feedback.
- Short term trainings should be given on data analysis, interpretation and usage for all PHEM officers especially at the woreda level by Oromia Regional Health Bureau.
- At some of peripheral site they are using outdated guideline, so therefore providing of updated guideline and training should be mandatory.
- Increasing accessibility of reporting formats especially at zonal and woreda level
- Providing of surveillance budget at zone level for supervision, review meeting and for gap filling training.
- Data quality assessment should be carried out at all levels as many problems were identified on reporting system during this evaluation.
- The case definition of malaria was only available at zonal and woreda health office, it should be posted on the wall of all health facilities within this woreda.

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Annex 2: checklist to evaluate the surveillance system of East shewa zone, 2016.

ANNEX 3.1

Zonal Level Questionnaire for Surveillance System Evaluation

Identifiers

Date __/__/__

Region _____

Respondent Name _____

Zone _____

Interviewer _____

General

I. Availability of a National Surveillance Manual;

1. Is there a national manual for surveillance?

a. Yes b. No c. Unknown

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

II. Case Detection and Registration;

2. Do you have standard case definitions for Malaria?

a. Yes b. No c. Unknown d. Not applicable

If yes, observe the standard case definition _____

III. Data reporting:

3. Who is responsible for providing you reporting formats of surveillance?
- a. Federal Ministry of Health PHEM unit.
 - b. NGOs
 - c. Others _____
4. Have you encountered shortage of appropriate surveillance forms at any time during the last 6 months? a. Yes b. No c. Unknown
5. What are the reporting entities for the surveillance system?
- a. Public health facilities
 - b. NGO health facilities
 - c. Military health facilities
 - d. Private health facilities
 - e. Others _____
6. Number of districts has reported weekly and immediately report in the last 3 months compared to expected number? _____
7. Number of Health post, Health centers, Hospitals, NGO health facility, Others (private) sent weekly report in the last three months? _____

Weekly: _____

Immediately: _____

8. On time (use national deadlines)

Number of districts has sent weekly reports on time in the last 3 months:

9. Was there any report of the immediately reportable diseases in the past 1 month?
- a. Yes b. No

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

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

f. Other _____

10. How do you report to the next level?

- a. Mail
- b. Fax
- c. Telephone
- d. Radio
- e. Electronic
- f. Other

IV. Data analysis

11. Do you describe data by person (case based, outbreaks, and sentinel)?

- a. yes b. no c. don't know

If yes, observe analyzed data by person: _____

12. Do you describe data by place?

- a. yes b. no c. don't know

If yes, Observe description of data by district (tables, maps)

13. Do you describe data by time?

- a. yes b. no c. don't know

If yes, observe description of data by time:

14. Do you perform trend analysis?

- a. yes b. no c. don't know

If yes, observe line graph of cases by time

List disease(s) for which line graph is observed

V. Availability of defined threshold;

15. Do you have defined threshold level for Malaria?

- a. yes b. no c. don't know

If yes, observe _____

16. Who is responsible for the analysis of the collected data? _____

17. How often do you analyze the collected data?

- a. Daily
- b. Weekly
- c. Every 2 weeks
- d. Monthly
- e. Quarterly
- f. As needed.....

18. Have you an appropriate denominators?

- a. Yes b. No c. don't know

If yes, observe presence of demographic data (E.g. population by district and hard to reach groups)

VI. **Outbreak Investigation**

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

20. List the diseases: _____

21. Of those suspected/detected, how many of them were investigated? _____

(Observe reports and take copies if possible) _____

22. Number and percentage of outbreaks in which risk factors were looked for: _____

23. Number and percentage of outbreaks in which findings were used for action: _____

[Observe report]

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

25. Number of districts that used the data for action [observe in final report]

VII. Epidemic preparedness(relevant for epidemic prone diseases)

26. Is there Zonal plan for epidemic preparedness and response?

- a. Yes B. No c. Unknown

If yes, observe a written plan of epidemic preparedness and response

27. Has the zone had emergency stocks of drugs, vaccines, and supplies at all times in past 1 year?

- a. Yes b. No c. Unknown

28. Has the zone experienced shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)?

- a. Yes b. No c. Unknown

29. Are there standard case management protocols for Malaria?

- a. Yes b. No c. Unknown

If yes, list the exists protocols, _____

Observe the existence of a written case management protocol for at least 1 priority disease

VIII. Presence of a budget line for epidemic response;

30. Is there a budget line for epidemic response?

- a. Yes b. No c. Unknown

If yes, describe total budget allocated and utilized in the past last year _____

IX. Existence of zonal epidemic management committee;

31. Is there established zonal epidemic management committee?

- a. Yes b. No c. Unknown

If yes, observe minutes (or report) of meetings of epidemic management committee

32. Has epidemic management committee evaluated its preparedness and response activities during the past year?

a. yes b. no c. don't know

If yes, observe written report to confirm _____

X. Zonal rapid response team for epidemics;

33. Does the zone have a rapid response team for epidemic?

a. Yes b. No c. Unknown

34. Is there any notification of recently reported outbreak to which you had response within 48 hrs?

a. Yes b. No c. Unknown

If yes, observe that the zone responded within 48 hours of notification of most recently reported outbreak (from written reports with trend and intervention)

a. Yes b. No c. Unknown

XI. Feedback;

35. How many feedback bulletin or reports has the regional level produced in the last year?

Observe the presence of a report or bulletin that is regularly produced to disseminate surveillance data _____

XII. Supervision;

36. How many supervisory visits have you made in the last 6 months compared to expect?

_____ (%)

37. If no supervision was not made during the past 6 months, please mention the reasons,

XIII. Training on surveillance activities;

38. What percent of your subordinate personnel have been trained in surveillance?

39. On what topics have you gave training in the last 6 months?

40. What are your stakeholders those supporting you in giving training? _____

41. Major challenges during and after training activities _____

42. Strengths during and after training _____

XIV. Resources

Do you have;

43. Data management equipment

Computer _____

Printer _____

Photocopier _____

Data manager _____

Statistical package _____

Stationary _____

44. Communications:

Telephone service _____

Fax _____

Radio call _____

Mobile phone _____

Computers that have modems _____

45. **Budget line (from donors)** _____

XV. **Surveillance Networking**

46. Do you have functional computerized surveillance network at this level?

a. Yes b. No c. Unknown

XVI. **Budget for surveillance**

47. Is there a budget allocated for surveillance activities from the Regional Health Bureau budget (governmental source)?

a. Yes b. No c. Unknown

If yes, what is the proportion of this budget from total allocated budget for other activities?

_____ (%)

48. How could surveillance be improved?

XVII. **Surveillance Co-ordination**

49. Is there a focal unit for surveillance at the this level?

a. Yes b. No c. Unknown

If yes, observe organogram of the zone to confirm

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

Questionnaire for Attributes and level of Usefulness:

- a. Total population under surveillance_____
- b. In 2012/13, what is the incidence / Prevalence of:
 - Malaria incidence _____ prevalence _____ Deaths _____

I. Level of Usefulness of the Surveillance System for these selected priority diseases

Does the surveillance system help;

- c. To detect outbreaks of these selected priority diseases early? Yes/ No
- d. To estimate the magnitude of morbidity and mortality of these diseases, including identification of factors associated with these diseases? Yes/ No
- e. Permit assessment of the effect of prevention and control programs? Yes/ No

Observe (confirmation):

- interventions and diseases trends analyzed _____
-

II. Description of Each System Attributes:

i. Simplicity:

- 1. Is the case definition of Malaria easy for case detection by all level health professionals? a. Yes b. No c. Unknown
 - 2. What are the organizations which need to receive reports of the surveillance data?

-

- 3. Do you feel that additional data collected on cases are time consuming?
a. Yes b. No c. Don't know
- 4. How long it takes to fill the reporting format?
a. <5 minutes b. 10-15 minutes c. >15 minutes

Overall comments of on the above points _____

ii. Flexibility:

1. Can the current reporting formats be used for other newly occurring health event (disease) without much difficulty? a. Yes b. No c. Don't know
2. Do you think that any change in the existing procedure of case detection, case definition, allocating funds, report forms, and formats will make difficult to implement? a. Yes b. No c. Don't know

Overall comments on the above points

:

iii. Data Quality: (Completeness of the reporting forms/and validity of the recorded data)

1. Are the data collection formats for these priority diseases clear and easy to fill for all the data collectors/ reporting sites? a. Yes b. No
2. Have you ever gave training for data collectors on data quality management?
a. yes b. no. c. don't know
3. Are the reporting site and data collectors supervised regularly? a. Yes b. No
4. **Observe:** Review the last month report of selected diseases
 - A. Average number of **unknown or blank responses** to variables in each of the reported forms

 - B. Percent of reports which are complete(that is with no blank or unknown responses) from the total reports

iv. Acceptability:

1. Do you think all the reporting agents accept and well engaged to the surveillance activities? a. Yes b. No

If yes, how many are active participants (of the expected)? _____

If no, what is the reason for their poor participation in the surveillance activity?

- A. Lack of understanding of the relevance of the data to be collected
- B. No feedback or recognition given by the higher bodies for their contribution; 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. Cost of data reporting
- F. Other:

2. Are all stakeholders are fully participate in surveillance system strengthening?
a. yes b. no c. don't know

If no, what are the reasons make them discomfort? _____

v. Representativeness:

- 1. What is the health service coverage of the zone? _____ %
- 2. Do you think that the populations under surveillance have good health seeking behavior for these diseases? Yes / No
- 3. Whom do you think is well represented by the surveillance data?
a. the urban b. the rural c. equal

vi. Timeliness:

1. Do you think that the existing surveillance system is timely detecting the outbreak? a. yes b. no c. don't know

Comment _____

2. During the most recent outbreak of malaria, meningitis and measles within how many days these outbreaks were reported to the region after the first case/index case/

3. Is enough information is available for control of selected diseases during outbreak? a. yes b. no c. don't know

Comment _____

4. How long does it take to have laboratory confirmation of Malaria _____

vii. Stability:

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

ANNEX 3.2

Woreda Level Questionnaire for Surveillance System Evaluation

Identifiers

Date ____/____/____

Region _____

Interviewer _____

Zone _____

Respondent _____

District _____

Availability of national surveillance manual

1. Is there a national manual for surveillance at this site?

a. Yes b. No c. Unknown

If yes, observe national surveillance manual _____

I. Case confirmation

2. Does the district have the capacity to transport specimens to a higher-level lab?

a. Yes b. No c. Unknown d. Not applicable

3. Does the district have guidelines for specimen collection, handling and transportation to the next level?

a. Yes b. No c. Unknown c. Not applicable

II. Data reporting

4. Have you got shortage forms recommended for the country at any time during the last 6 months?

a. Yes b. No c. Unknown

5. Number of health facilities (Health posts, Health centers, Private/NGO) sent weekly reports in the last 3 months compared to expected number

Weekly: _____ /12 times the number of health facilities

Immediately: _____ /----- times the number of health facilities

On time (use national deadlines)

6. Number of weekly reports submitted on time: ____/12 times the number of health facilities

7. Number of immediately reports submitted on time: _____/3 times the number of health facilities

8. How do you report to the next level:

- a. Mail
- b. Fax
- c. Telephone
- d. Radio
- e. Electronic
- f. Other

Strengthening reporting

9. How can reporting be improved?

III. **Data analysis for Malaria**

10. Have you appropriate denominators (<5 years children, total population, population by kebeles, and so on)

a. yes b. no c. Don't know

If yes, Observe for each denominators _____

11. Do you describe data by person (case based, outbreaks, sentinel)?

a. Yes b. No c. Unknown

Observe description of data by age and sex _____

12. Do you describe data by place (locality, village, work site etc)?

a. Yes b. No c. Unknown

Observe description of data by place _____

13. Do you describe of data by time?

a. Yes b. No c. Unknown

If yes, observe the description _____

14. Do you perform trend analysis (line graph of cases by time) for malaria?

a. Yes b. No c. Unknown

If yes, Observe and list diseases _____

IV. Availability of threshold level for selected diseases

15. Do you have an action threshold for any of the country priority diseases?

a. Yes b. No c. Unknown

If yes, for which diseases and mention what are their threshold levels _____

16. Who is responsible for data analysis? _____

17. How often do you analyze the collected data?

- a. Daily
- b. Weekly
- c. Every 2 weeks
- d. Monthly
- e. Quarterly
- f. As needed.....

V. Outbreak investigation

18. Number of outbreaks suspected in the past 6 months: _____

Observe the investigations (Observe reports and take copies if possible): _____

19. Has your district ever investigated an outbreak?

- a. yes b. No c. Unknown

VI. Epidemic preparedness

20. Is your district has a plan of epidemic preparedness and response?

- a. yes b. no c. Unknown

If yes, observe a written plan of epidemic preparedness and response _____

21. Has the district had emergency stocks of drugs and supplies at all times in past 1 year?

- a. yes b. no c. unknown

If yes, observe the stocks of drugs and supplies at time of assessment _____

22. Has the district experienced shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)?

- a. Yes b. No c. Unknown

If yes, how did you solve the problem at that time? _____

23. Is there a budget line or access to funds for epidemic response?

- a. Yes b. No c. Unknown

VII. Epidemic management committee

24. Is established epidemic management committee at district level?

- a. yes b. no c. unknown

If yes, observe minutes (or report) of meetings of epidemic management committee

25. Does the district have a rapid response team for epidemics?

- a. Yes b. No c. Unknown

VIII. Responses

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

- a. Yes b. No c. Unknown

27. Is your district responded with 48 hours of notification of most recently reported outbreak?

- a. yes b. no c. don't know

If yes, observe that the district responded within 48 hours of notification of most recently reported outbreak (from written reports) _____

28. What were the case fatality rates during most recent outbreak mainly for malaria?

Observe that the district achieved an acceptable case fatality rate for most recent outbreak
(Observe from outbreak report) _____

29. Has epidemic management committee evaluated their preparedness and response activities during the past year?

a. Yes b. No c. Unknown

If yes, observe written report to confirm _____

IX. Feedback

30. How many feedback written reports has the district produced in the last year?

Observe the presence of a written report that is regularly produced to disseminate surveillance data for health facilities, _____

31. How many feedback bulletin or reports has the district received in the last year from zone/region? _____

Observe at least 1 report or bulletin at district from a higher level during the past year on the data they have provided _____

X. Supervision

32. How many times had you supervise health facilities in the last 6 months?

Observe supervision report or any evidence of supervision in last 6 months _____

33. Is appropriate review of surveillance practices were done during supervision?

a. yes b. no don't know

If yes, observe supervision report or any evidence for appropriate review of surveillance practices _____

34. If not all the required supervisory visits were conducted, mention the reasons.

Reason 1 _____

Reason 2 _____

Reason 3 _____

XI. Training

35. Number of health personnel trained in disease surveillance

36. What percent of your personnel in the district have been trained in surveillance and epidemic management? _____

XII. Resources

37. Is your district has enough logistics for surveillance activities?

- a. Electricity
- b. Bicycles
- c. Motor cycles
- d. Vehicles

38. Data management

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

39. Communication

- a. Telephone service

- b. Fax
- c. Computers that have modems

40. Information education and communication materials

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

41. Hygiene and sanitation materials

- a. Spray pump
- b. Disinfectant

XIII. Surveillance co-ordination:

42. Is there a surveillance co-ordination focal point within the district epidemic management committee?

- a. yes b. no c. don't know

If yes, observe some documents _____

XIV. Satisfaction with surveillance system

43. Are you satisfied with the surveillance system?

Yes No Unknown Not applicable

44. ***If no***, how can the surveillance systems is improved?

XV. Opportunities for integration

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

ANNEX 3.3

Health Center Level Questionnaire for Surveillance System Evaluation

Identifiers

Date ____/____/____

Region _____

Interviewer _____

Zone _____

Respondent _____

District _____

Name of health facility _____

I. Availability of national surveillance manual

1. Is there a national manual for surveillance at this site?

a. yes b. no don't know

If yes, observe national surveillance manual _____

II. Case detection and registration

2. Within what time interval (between date of onset and reach health facility) have you detected the most recent malaria outbreak? _____

3. Is there clinical register at this facility?

a. yes b. no c. Unknown

If yes, observed the existence of a clinical register _____

4. Is clinical register is filling correctly?

a. yes b. no c. unknown

Observe the last month filled clinical register if correctly done _____

5. Do you have a standard case definition for Malaria?

a. Yes b. No c. Unknown

Observe the standard case definition _____

6. Are you using standardized case definitions for malaria?

a. yes b. no c. don't know

Observe the respondent correctly diagnosing of the diseases using a standard case definition

III. Case confirmation

7. Are you able to collect sputum Y N U N/A

Stool Y N U N/A

Blood Y N U N/A

CSF Y N U N/A

Observed the presence of materials required to collect

Stool Y N U N/A

blood/serum Y N U N/A

CSF Y N U N/A

8. Do you have the capacity to handle sputum, stool, blood/serum and CSF until shipment at this facility?

a. Yes b. No c. Unknown d. Not applicable

If yes, observe presence of functional cold chain at health facility _____

9. Observe presence of packing materials for shipment of specimens at health facility

IV. Data reporting

10. Have you lacked appropriate surveillance forms at any time during the last 6 months?

a. Yes b. No c. Unknown

11. Can you report accurately cases from the registry into the summary report to send to higher level?

a. yes b. no c. don't know

Observe that the last monthly report agreed with the register for malaria;

Y N U N/A

12. How many times have you sent surveillance report in the last three months?

Number of reports in the last 3 months compared to expected number

Weekly: ____ /12 times the number of sites

Immediately: /-- times the number of sites

13. On time (use national deadlines)

Number of weekly reports submitted on time:- ____ /12 times the number of sites

Number of immediately reports submitted on time: ____/____ times the number of sites

14. How do you report?

- a. Mail
- b. Fax
- c. Telephone
- d. Radio
- e. Electronic
- f. Other

15. Strengthening reporting

How can reporting be improved?

V. Data analysis

16. Do you describe data by person (outbreaks, sentinel)?

a. yes b. no c. Don't know

If yes, Observe description of data by age and sex _____

17. Do you describe data by place (locality, village, work site etc)?

a. yes b. no c. don't know

If yes, Observe description of data by place _____

18. Do you describe data by time?

a. yes b. no c. don't know

If yes, Observe description of data by time _____

19. Do you perform trend analysis?

a. yes b. no c. don't know

If yes, Observe line graph of cases by time _____

20. Who is responsible for data analysis? _____

21. How often do you analyze the collected data?

- a. Daily
- b. Weekly
- c. Every 2 weeks
- d. Monthly
- e. Quarterly
- f. As needed.....

22. Have you appropriate denominators?

a. yes b. no c. don't know

If yes, Observed presence of demographic data at site (E.g. population <5 yr., population by village, total population) _____

VI. *Availability of threshold levels for each priority disease*

23. Do you have an action threshold levels for any of the Country priority diseases?

a. Yes b. No c. Unknown

VII. Epidemic preparedness

24. Is your health facility has a standard case management protocol for epidemic prone diseases?

a. yes b. no c. don't know

If yes, observed the existence of a written case management protocol for 1 epidemic prone disease _____

VIII. Epidemic response

25. Has the health facility implemented prevention and control measures based on local data for at least one epidemic prone disease?

a. Yes b. No c. Unknown

26. Did your facility achieve acceptable case fatality rates (e.g. 10% for Meningococcal CSM 1% for Cholera) during the most recent outbreak?

a. Yes b. No c. Unknown d. Not applicable

Observe case facility rate for most recent outbreaks _____

IX. Feedback

27. Have you received a report or bulletin from a higher level during the past year on the data they have provided?

a. yes b. no c. Don't known

28. How many feedback bulletin or reports has the health facility received in the last year?

Observe at least 1 report or bulletin at the health facility from a higher level during the past year on the data they have provided _____

29. Have you conducted at least semi-annual meetings with community members to discuss results of surveillance or investigation data?

a. yes b. no c. don't know

If, yes how many meetings has this health facility conducted with the community members in the past six months? _____

Observe the minutes or report of at least 1 meeting between the health facility team and the community members within the six months _____

X. Supervision:

30. How many times have you been supervised in the last 6 months? _____

Observe supervision report or any evidence of supervision in last 6 months _____

31. Is appropriate review of surveillance practices were done during the past supervision activities?

a. yes b. no c. don't know

Observe supervision report or any evidence for appropriate review of surveillance practices

XI. Training

32. Number of health personnel trained in disease surveillance and epidemic management

33. On what topics of surveillance they trained? _____

34. Are they any training, which is relevant to your job that facility's personnel did not get yet?

XII. Resources

Have you:

35. Logistics

- a. Electricity
- b. Bicycles
- c. Motor cycles
- d. Vehicles

36. Data management

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

37. Communications

- a. Telephone service
- b. Fax
- c. Radio call

- d. Computers that have modems

38. Information education and communication materials

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

39. Hygiene and sanitation materials

- a. Spray pump
- b. Disinfectant

40. Protection materials (list) _____

XIII. Satisfaction with surveillance system

41. Are you satisfied with the surveillance system?

- a. Yes b. No c. Unknown d. Not applicable

42. If no, how can the surveillance system is improved? _____

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

ANNEX 3. 4

Health Post Level Questionnaire for Surveillance System Evaluation

Identifiers

Date ____/____/____

Region _____

Interviewer _____

Zone _____

Respondent _____

District _____

Name of health facility _____

I. Availability of national surveillance manual

1. Is there a national manual for surveillance at this site?

a. Yes b. No c. Unknown d. Not applicable

If yes, observe national surveillance manual _____

II. Case detection and registration

2. Have you clinical register?

If yes, observe the existence of a clinical register

a. Yes c. No c. Unknown d. Not applicable

3. Do you correctly register cases?

a. Yes b. No c. Unknown d. Not applicable

If yes, observed the correct filling of the clinical register during the previous 30 days _____

III. Presence of standardized case definitions for the country's priority diseases

4. Do you have a standard case definition for Malaria?

- a. Yes b. No c. Unknown d. Not applicable

If yes, observed the standard case definition for malaria.

- a. Yes b. No c. Unknown d. Not applicable

IV. Using standardised case definitions for the country's priority diseases

Observe the respondent correctly diagnosing one of the country's priority diseases using a standard case definition _____

(Select one of the priority diseases in the facility's clinical register and ask how they diagnosed it — interviewer should have the standard case definition from MoH)

V. Data reporting

5. Have you lacked appropriate surveillance forms at any time during the last 6 months?

- a. Yes b. No c. Unknown d. Not applicable

6. Have you reported accurately cases from the registry into the summary report to go to higher level?

- a. yes b. no c. don't know d. Not applicable

Observe that the last monthly report agreed with the register for 4 diseases (1 for each targeted group [eradication; elimination; epidemic prone; major public health importance])

a. Malaria	Y	N	U	N/A
b. Meningitis	Y	N	U	N/A
c. Measles	Y	N	U	N/A

7. Number of reports sent to the next higher level during the past 3 months;

Weekly: _____ /12 times the number of sites

Immediately: _____ /-- times the number of sites

8. On time (use national deadlines)

Number of weekly reports submitted on time:- ____ /12 times the number of sites

Number of immediately reports submitted on time: ____/-- times the number of sites

9. How do you report?

- a. Mail
- b. Fax
- c. Telephone
- d. Radio
- e. Electronic
- f. Other

10. Strengthening reporting

How can reporting be improved?

VI. Data analysis

11. Describe data by person (outbreaks, sentinel)

- a. Yes b. No c. Unknown d. Not applicable

If yes, Observed description of data by age and sex _____

12. Describe data by place

- a. Yes b. No c. Unknown d. Not applicable

If yes, observed description of data by place (locality, village, work site etc) _____

13. Describe data by time

- a. Yes b. No c. Unknown d. Not applicable

If yes, observe description of data by time _____

14. Did you perform trend analysis?

- a. Yes b. No c. Unknown d. Not applicable

If yes, Observe line graph of cases by time _____

VII. Epidemic response

15. Has the health facility implemented prevention and control measures based on local data for at least one epidemic prone disease?

- a. Yes b. No c. Unknown d. Not applicable

VIII. Feedback

16. have you received a report or bulletin from a higher level during the past year on the data they have provided?

- a. Yes b. No c. Unknown d. Not applicable

How many feedback bulletin or reports has the health facility received in the last year? ____

17. Have you conducted meetings with the community members in the past six months on surveillance activities?

- a. Yes b. No c. Unknown d. Not applicable

If, Observe the minutes or report of at least 1 meeting between the health facility team and the community members within the six months

IX. Supervision:

18. How many times have you been supervised in the last 6 months? _____
Observe supervision report or any evidence of supervision in last 6 months _____

19. Is appropriate surveillance practices were reviewed by higher level during supervision?
a. yes b. no c. Don't know d. Not applicable
If yes, observe supervision report or any evidence for appropriate review of surveillance
practices _____

X. Training

20. Number of personnel trained in disease surveillance and epidemic management

Topics on which training were given _____

By whom you were trained? _____

XI. Resources

Have you:

21. Logistics

- a. Electricity
- b. Bicycles
- c. Motor cycles
- d. Vehicles

22. Data management

- a. Stationery
- b. Calculator
- c. Computer

- d. Software
- e. Printer
- f. Statistical package

23. Communications

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

24. Information education and communication materials

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

25. Hygiene and sanitation materials

- a. Spray pump
- b. Disinfectant

26. Protection materials (list) _____

XII. Satisfaction with surveillance system

27. Are you satisfied with the surveillance system?

- a. Yes b. No c. Unknown d. Not applicable

28. If no, how can the surveillance system be improved? _____

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

Chapter – IV: Health Profile Description

4.1. Health Profile Description of Boset Woreda, East Shewa Zone, Oromia Region, Ethiopia, 2015/16

Abstract

Background: - A community health profile is a comprehensive, narrative description of the given community health status in align with historical, geographical, demographical and economical background of the area. In Boset woreda there is no well organized health and health related information. The aim of this study was to assess health and health related information in Boset woreda, East Shewa Zone, Oromia Region, Ethiopia during 2015/16.

Methods: - Data was collected from Boset woreda, Ethiopia from April - May, 2016. Boset Woreda is located about 125 Km south east of the capital city Addis Ababa. A cross-sectional descriptive study was conducted which includes interview and standard check-list to collect the data from different sectors. Data were compiled and analyzed using Microsoft Excel-2007.

Result: - In 2015/16 it was estimated a total of 179,621 populations were residing in Boset Woreda. Acute febrile illness 7147 (21.41%) followed by malaria 6354(19.04%), and acute upper respiratory tract infection 5255(15.74%) were the top three causes of morbidity in adults whereas Diarrhea (non-bloody) 2822(23.94%) followed by Pneumonia 2634(22.35%) and Acute upper respiratory tract infection 2548(21.62%) were the top three causes of morbidity in children under 5 in Boset woreda 2015/16.

Conclusion: - Even though Insecticides Treated Nets coverage was hundred percent in these woreda, malaria remains the main public health problem. Therefore, Health Extension Workers and other health professionals should emphasize on proper utilization of it. Diarrhea and Helminthiasis are still in the lists of top 10 leading causes of morbidity in both adults and under 5 children which suggest that, there were no proper utilizations of latrine and low awareness of sanitation and Hygiene practices, therefore the Woreda health office with stakeholder have to promote hygiene and sanitation for the community.

Introduction

A community health profile is a comprehensive, narrative description of the given community health status in align with historical, geographical, demographical and economical background of the area. The data in a profile reflects the health of a given community from many different angles. It is a system of collecting, organizing and summarizing health and others health related events to describe health and others health related conditions such as demographic, socio-economic, political, cultural and others aspect of a particular geographic areas of interest, and are useful for designing and preparation of development plans as well as for monitoring and evaluation of the impact of the implementation of the development plans. It is known that the health and socioeconomic well-being of the community are fundamentally connected to their natural and built environment. It is difficult to prepare meaningful developmental plan (1).

In epidemiologic point of view, it is crucial to prioritizes health and others health related condition occurred within the communities. These summarized and prioritized data is important for public health surveillance officials, as they can uses it as a baseline for planning, implementation and evaluation of public health surveillance program conducted at communities level. Therefore, the main objectives of this document are to present compiled information concerning physical and socio-economic condition of the district and its health profile constraints.

Boset Woreda is one of the Woredas in East Shewa zone that lies between 8°24' to 8°51' North latitude and 39°16' and 39°50' East Longitude which is located about 125 Kilometers south east of the capital Addis Ababa. The current Boset Woreda prior to 1988 was administered under the “Yerer and Kereyu Awraja” along with other ten districts (Dulecha, Fentale, Lume, Ada’a, Liben- Chukala, Gimbichu, Minjar, Shenkora and Berehet) of Shewa Administrative Region. During that period Awash Town (currently in Afar Region) was the capital of the District. With the formation of regional states in 1993 Boset was restructured as an independent District of East Shewa Zone. It is bounded by Fentale Woreda in the East, Awash River in the West, Arsi Zone in the south and Amhara region in the north. The Woreda is divided into 33 rural kebele and four sub-urban towns. The total land area of the Woreda is 1378.4 square kilometers. Boset woreda is

located in the midst of the Rift valley, which extends from the North to South. According to the agricultural Bureau of the Woreda, its altitude varies from 1000- 2000 meters above sea level which is mainly Kolla (low lands), characterized by warm Climate. A topography that varies from flat or gently undulated areas to sloppy hill and ranges and deep incised gullies is a typical land feature of Boset woreda. Boset Guddo (2247m) is the highest peak in the district. Awash is the most significant river in the district. Tebo is another river that flows in the district. According to the same source, soil mostly derived from volcanic ashes origin, varies from red ash in hilly areas to light sandy loam in the lower and flat areas.

Rationale

Health description is important for prioritizing health and health related problems of the community at any level especially detail assessment of current nutritional status of the priority woredas are mandatory. In related to this, there is no organized, completed and well documented profile data in Boset Woreda. It is fundamental for planning and helps to provides appropriate intervention and will be an entry point for operational research. Therefore describing the health profile of this woreda is helpful to give evidence based information for prioritizing and instituting appropriate public health interventions in the woreda.

Objectives

General Objective

- To provide a broad overview of the health and health related profile of the residents of the **Boset** Woreda.

Specific objective

- To identify and prioritizing the major problem related to communicable diseases
- To summarize the health service status of Boset woreda.
- To identify the problem observed in the health care system

Methods

Study Area

The study will be conducted in Boset Woreda. The Woreda is one of the Woredas in East Shewa zone that lies between 8°24' to 8°51' North latitude and 39°16' and 39°50' East Longitude which is located about 125 Kilometers south east of the capital Addis Ababa. It is bounded by Fentale Woreda in the East, Awash River in the West, Arsi Zone in the south and Amhara region in the north. The Woreda is divided into 33 rural kebele (the smallest unit of Local government) Administrations and four sub-urban towns. The total land area of the Woreda is 1378.4 square kilometers. According to the agricultural Bureau of the Woreda, its altitude varies from 1000-2000 meters above sea level which is mainly Kolla (low lands) and it is characterized by hot and dry weather with the annual average temperature in the range of 25⁰c to 37⁰c and receives an average 700 to 800 mm of rainfall per annum. The district has an estimate total population of 179,621 in 2007 EFY.

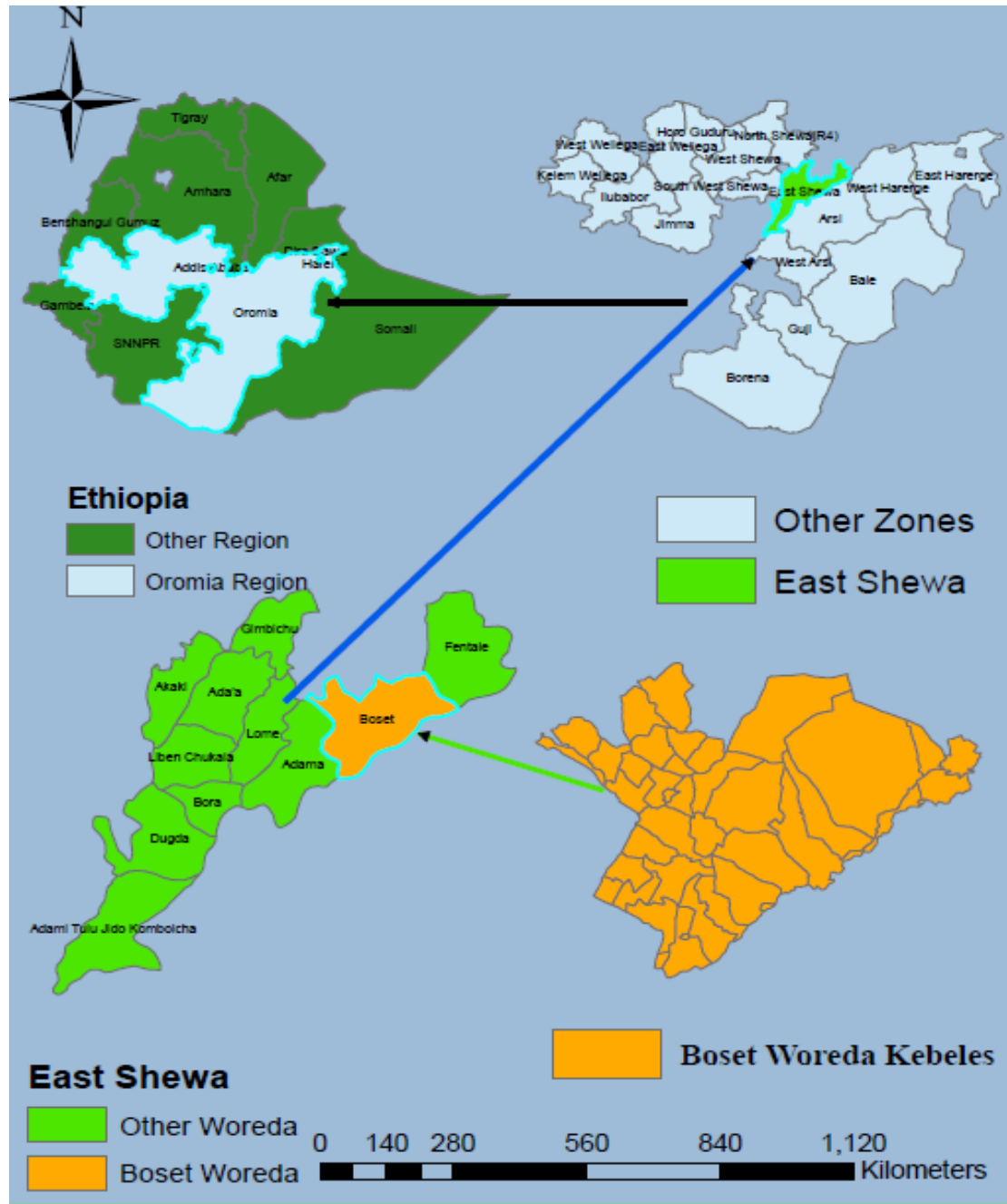


Figure 10: Map of the Boset Woreda, East Shewa Zone, Oromia Region, Ethiopia, 2007 EC
(Source: prepared by: ARC GIS)

Study Period

The study period was from April - May, 2008

Study Design

A cross-sectional descriptive study was conducted.

Study Population

All population of the Boset Woreda (179,621)

Data Collection Procedures

Both qualitative and quantitative data collection mechanisms were used, such as key informant interview by using semi-structured questionnaire, and reviewing of legally approved documented reports and documents. Questionnaires were adapted from WHO (Annex 1).

Data dissemination

Written report was arranged and shared to SPHMMC School of Public Health, EFETP Resident advisors and coordinators and East shewa zone health bureau.

Results

Historic Aspects and Establishment of Boset District

The name Boset has come from, ones up on a time “a woman has begged the God to give her child and she had got child finally she brought this child to elders in her village and ask them to propose name to her child and they called him name as ‘Boset’” The Capital Town “Welenchiti has established in 1944.

The current Boset Woreda prior to 1988 was administered under the Yerer and Kereyu Awraja along with other ten districts (Dulecha, Fentale, Lume, Ada’a, Liben- Chukala, Gimbichu, Minjar, Shenkora and Berehet) of Shewa Administrative Region. During that period Awash Town (currently in Afar Region) was the capital of the District. With the formation of Regional States in 1993 Boset was restructured as an independent District of East Shewa Zone.

Geography and climate

Boset Woreda is one of the Woredas in East Shewa zone that lies between 8°24’ to 8°51’ North latitude and 39°16’ and 39°50’ East Longitude which is located about 125 Kilometers south east of the capital Addis Ababa. . It is bounded by Fentale Woreda in the East, Awash River in the West, Arsi Zone in the south and Amhara region in the north. The Woreda is divided into 33 rural kebele and 5 sub-urban towns. The total land area of the Woreda is 1378.4 square kilometers. Boset woreda is located in the midst of the Rift valley, which extends from the North to South.

According to the agricultural Bureau of the Woreda, its altitude varies from 1000-2000 meters above sea level which is mainly Kolla (low lands) and it is characterized by hot and dry weather with the annual average temperature in the range of 25⁰c to 37⁰c and receives an average 700 to 800 mm of rainfall per annum.

A topography that varies from flat or gently undulated areas to sloppy hill and ranges and deep incised gullies is a typical land future of Boset woreda. Boset Guddo (2247m) is the highest peak in the district. Awash is the most significant river in the district Tebo is another river that flows in the district. According to the same source, soil mostly derived from volcanic ashes origin, varies from red ash in hilly areas to light sandy loam in the lower and flat areas.

Political and Administration

In the Woreda There were 38 kebeles in which 33 rural kebele and 5 sub-urban towns. All Sectors, offices located in the capital town Welenchiti.

Demography

In 2007 E.C it was estimated a total of 179,621 populations were residing in Boset Woreda of which, 88,911(49.5%) were males and 90,710(50.5%) were females. Majority of the population 152,676(85%) were in rural in which 75,575(49.5%) were male whereas 77,101(50.5%) were female, whereas 26,945(15%) were Urban. The pyramidal age structure reflects that 5,784(3.2%) were children under 1 year of age, 29,511(16.4%) were population under five years of age and predominant age group accounting for nearly half 85,517 (47.6 %) of the total population found under 15 years of age, 78,713(43.8%) were population between 15-49 years of age. The total household in the Woreda was 37,421 with an average family size of 5.

Table 16: Demographic data by Kebeles, Boset Woreda, Ethiopia, 2007

S/N	Name of KEBELE	Total Population	S/N	Name of KEBELE	Total Population
1	W/t	14321	20	D/Kombe	7074
2	D/Wanga	2626	21	Sifa Bate	5940
3	Terii Bereti	2499	22	Nura Hase	7181
4	R/Bokore	4123	23	Bo fa 01	3193
5	Tedecha	2882	24	D/Dagaga	6123
6	Borchota	5218	25	Q/Guja	5737
7	Garii Dhera	5162	26	Sara Arada	5656
8	D/xiyo	6291	27	Farso Bero	5120
9	D/Furda	3768	28	B/A/Bora	3429
10	M/O/Laga	2697	29	S/Chare	3666
11	B/Mome	2648	30	B/Badhaso	3294
12	D/Chale	6107	31	B/D/Gada	3186
13	H/Kurkufa	5351	32	B/Denqore	1305
14	G/Bitmiti	4191	33	B/Wagare	880

15	Ruketi	2712	34	Bole 01	6215
16	S/Kasal	2451	35	Q/H/Mirkasa	5150
17	K/G/Wasan	3771	36	H/Huruta	3108
18	C/Jawis	3198	37	Bose Dache	4710
19	Doni 01	3783	38	Nura Hera	14855
Total		179,621			

Ethnic Compositions

Oromo ethnic is the majority in the district and it constitutes 80 % and the other 20% constituted for Amhara and other ethnic groups. Afan Oromo language is the dominant that most people speak it and it is the official language in the woreda.

Economic situation

The People of the area practice various livelihood and income generating activities mainly crop production and animal husbandry in addition to petty trading and daily labor. Crop production plays a major role in income generation in the area and cereals such as Maize, teff, haricot beans, wheat, barley and sorghum are the major crops grown. Crop production is mainly rain fed. According to the Agriculture and Rural Development Office of the Woreda, rain water harvesting is practiced at low level in the area. There are 43,457 hectors of Cultivated area, 10,556 Hectors of Grazing area. Households who practice rain water harvesting activity mainly produce onion, tomato, mango and papaya for market consumption. Next to crop production, rearing livestock is the most important means of livelihood in the Woreda amongst the majority of the farmers there are a total of 645,498 livestock population.

Education

In this Woreda there were a total of 95 Schools of which, 12 (K.G) grade-level of school, 78 (1-8) Primary, 3 (9-10) Secondary schools, It had one Preparatory school (11-12) and one TVET School. The numbers of students enrolled were 38,147 of which 19,616(51.4%) & 18,531(48.6%) were males and females students respectively. There were 750 Teachers in this Woreda of which 451(60.1%) were male and 299(39.9%) were Female.

Facilities

Overall there is 5772.2 Kilometers (Kms) of all types of road, of which a total of 203 Kms all weather type roads in the district of these 46kms is the main asphalt that cross the district from Addis Ababa to Djibouti, 45.5 KMs is Gravel road that connect rural Kebeles and towns to the district and 111.7 KMs long Gravel road. There are also 1262.7 Kms of dry weather road (427 Kms length are feeder road, while 835.7 Kms length are dry weather road). Regarding health facilities all (100%) Health Centers have roads and 31/33 (93%) of Health Posts have accesses to the road.

Boset has Mobile net-work coverage is 100% across the District and 3 manual Telephone stations. There is post office.

Regarding water service total safe water coverage for the whole woreda is 45.36% in which 48.06% for Rural and 34.96% for Urban, there are 24(63%) safe water supply for the kebeles in which 19 in rural and 5 in urban, There are 21 main sources of water supply in which 20 are deep well and 1 treated water from awash river, total population getting safe water was 81,478(45.4%), Daily water consumption per day per person was 25 liters for rural and 30 liters for urban . Firewood, crop residue, dung, charcoal and kerosene were sources of domestic energy supply in their order of importance.

Other infrastructures such as 24 hours hydroelectric service and one commercial bank are also found in the woreda.

Health System

Woreda Health Office Structure (Organ gram)

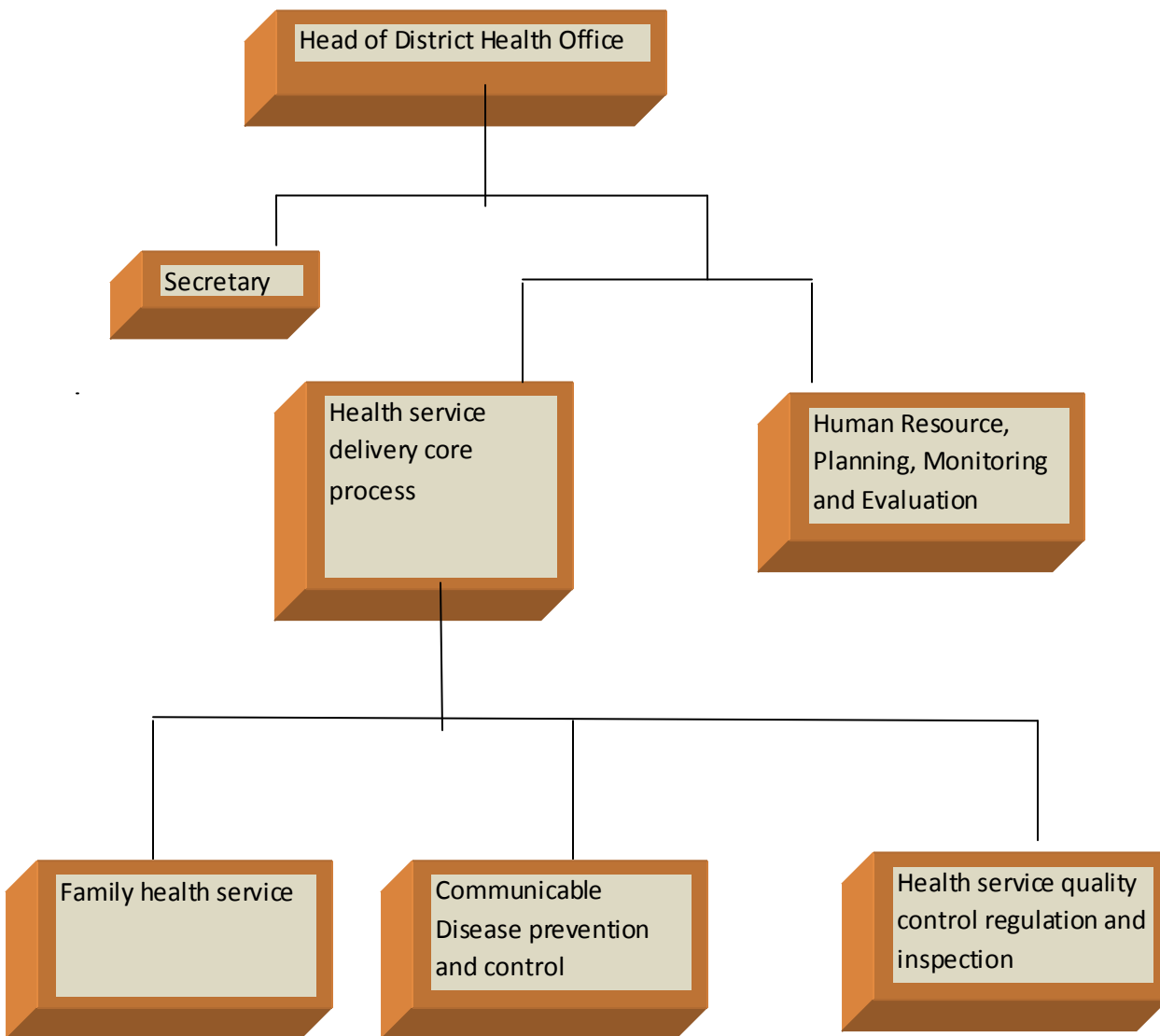


Figure 11: Organo- gram of Boset Woreda Health office, Ethiopia, 2007

The District Health Office was well structured and member of the district administrative cabine. The potential health coverage of the district was 100%; estimated from seven functional health centers

and 33 health posts. One health center provides VCT, PMTCT, PIHTC/PITC, and ART follow up services.

There were 2 NGOs working on health and health related issues which are World Vision and Child Fund specifically they are working on Environment, MCH, Child and Women health and on HIV.

Vital statistics and Health Indicators

Vital statistics and health indicators are playing a main role in estimating population size and in guiding countries policy making and program development. It's the majority influential tool for monitoring and communicating critical information about population health. In Boset Woreda the crude birth rate is 34.7 per 1000 population, this is proportional when compared with the national crude birth rate (34.5/1000 population). Total expected pregnancies attended 1st ANC(Rate) Was 100% whereas 4th ANC rate was 58%, Percentage of deliveries attended by skilled birth attendants were 61%, there was no deliveries that attended by health extension worker. Data on other measures of fertility like crude death rate, child and infant mortality rate are not available in the Woreda.

Immunization Status

Both static and outreach immunization services was conducted in 2007. Of 6216 targeted population, immunization coverage for children under one years of age was 6223(100%) for BCG, 116% for Penta 1, 111% for Penta 3, 116% for PCV1, 111% for PCV3, 105%, and 105% for measles and fully vaccinated respectively.(Table 2)

Table 17:-Immunization coverage in Boset woreda ,East Shewa Zone, Oromia Region,2007

S/N	Types of immunization	Plan	Performed	Coverage(%)
1	BCG	6216	6223	100
2	OPV1	5760	6729	116
3	OPV3	5760	6394	111
4	Penta 1	5760	6729	116
5	Penta 3	5760	6394	111
6	PCV1	5760	6729	116
7	PCV3	5760	6394	111

8	Measles	5760	6078	105
9	F/Immunization	5760	6065	105
10	PWTT2 ⁺	39648	17413	69
11	PAB	5760	6508	112

Health Service

There were 70 Health facility in Boset woreda in 2007 in which the H.F : population ratio was 1:2566

Table 18: Available health facilities by type, Boset District, Ethiopia, 2007

S/N	TYPE		NUMBER	HF:POPULATION RATIO
1	Gov't Hospital		1	1:179,621
2	Gov't Health Center	Type A	0	0
3		Type B	7	1:25,661
4	Private H.Fs	Clinics(all type)	21	1:8554
5		Diag.Laboratory	0	0
6		Drug Store	8	1:22,453
7	Gov't Health Post		33	1:5443
8	NGOs	H.Ps	0	0
9		H.Cs	0	0
10		Hospitals	0	0
11		Clinics	0	0
12	Facilities under constructions	H.P	0	0
13		H.C	0	0
14		Hospital	0	0

Based on the health extension program one Health Post serves for 5,000 people, one Health Center Serves for 25,000 people and one District Hospital Serves 100,000 people. This makes the Boset Woreda health service coverage overloaded in which one health post serves for 5443, one Health center serves for 25,661 and one District Hospital serves for 179,621.

Human resource; health workers and supportive staffs

The Woreda had a total of 171 health workers and 65 other supportive employees. The health workers found in the Woreda were; 22 Health Officer ,38 Nurses , 15 Mid wives , 12 Laboratory Technicians , 4 Pharmacists , 5 Environmental Health worker, One Health Information Technologists , and 74 Health Extension Workers but there was no General Practitioners and Specialist in the woreda. Nurses to Population ratio was 1:4727, Midwives: Population ratio was 1:11,975 and HEW: Population ratio was 1:2428.

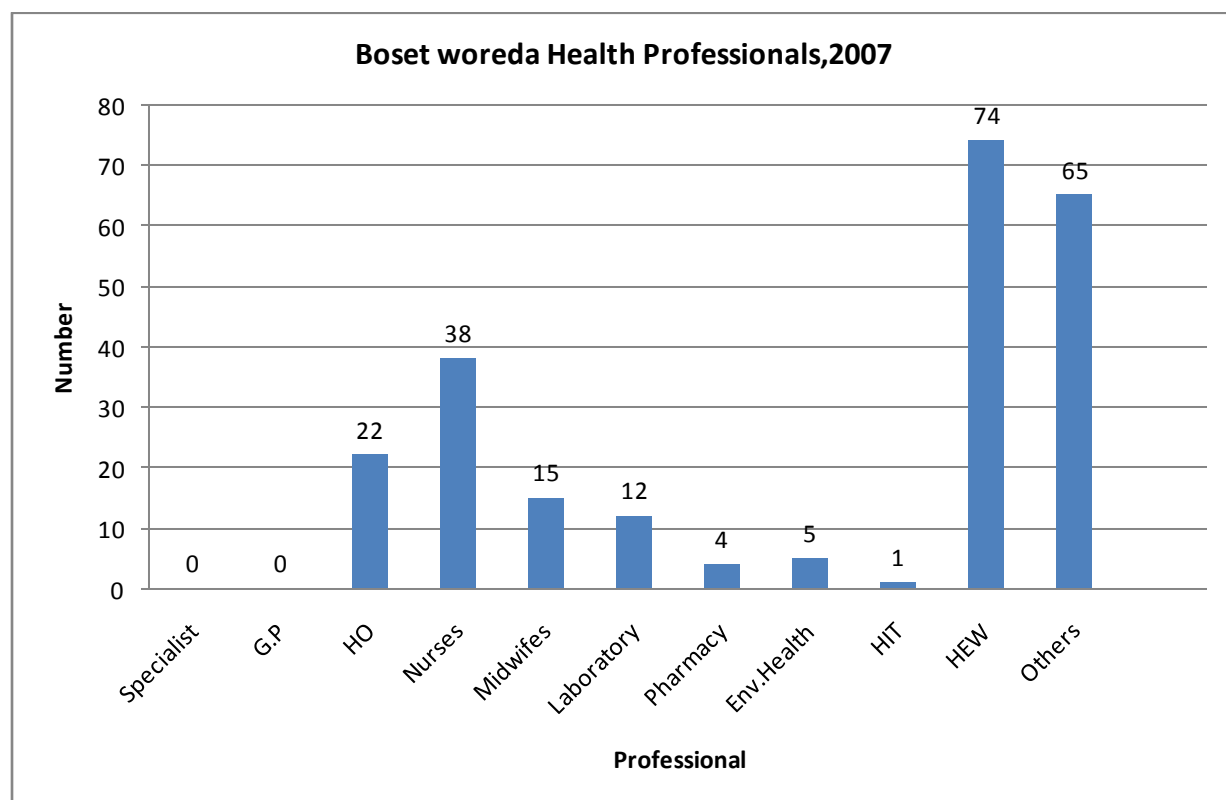


Figure 12: Health Professionals, Boset Woreda, Oromia Region, Ethiopia, 2007

Top ten leading cause of OPD visit (Morbidity)

Acute febrile illness (AFI) 7147 (21.41%) followed by malaria (all types) 6354(19.04%), and acute upper respiratory tract infection (AURTI) 5255(15.74%) were the top three causes morbidity in adults whereas Diarrhea (non-bloody) 2822(23.94%) followed by Pneumonia 2634(22.35%) and Acute upper respiratory tract infection 2548(21.62%) were the top three causes morbidity in children less than 5 outpatient department visit in Boset District 2007 E.C. According to the information obtained from the Woreda Health Office, the ten leading causes of outpatient visit in the Woreda during 2007 E.C are listed below in their descending order. (Table 4)

Table 19: The top ten leading cause of Morbidity both in adult and children under five years in Boset woreda, 2007

S/N	Morbidity above five			Morbidity bellow five		
	Illnesses	Num.of case	Percent (%)	Illnesses	Num.of case	Percent
1	Acute febrile illness	7147	21.41	Diarrhea(non-bloody)	2822	23.94
2	AURTI	5255	15.74	Pneumonia	2634	22.35
3	Malaria(P.F)	3995	11.97	AURTI	2548	21.62
4	UTI	2860	8.57	Acute febrile illness	1380	11.71
5	Typhoid fever	2845	8.52	Malaria(P.F)	565	4.79
6	Diarrhea(non-bloody)	2753	8.25	Helminthiasis	508	4.31
7	Helminthiasis	2537	7.6	Other or unspecified eye disease	381	3.23
8	Malaria non P.F	2359	7.07	Malaria non P.F	357	3.03
9	Dyspepsia	1843	5.52	Infection of skin	315	2.67
10	Pneumonia	1792	5.37	Otitis	277	2.35

Health budget allocation

The budget allocated for the woreda health office was 6,939,766 ETB in 2006 where as in 2007 it was 10,460,050 ETB so that the budget in 2007 was increased by 50.7% from the previous year.

Status of Primary health care components with focus on the eight PHC

There were 3229 women used Oral Contraceptive, 17,554 Injectable, 3181 Implants, 67 IUCD and 79 other method. The contraceptive acceptance rate in this woreda was 69%.EPI coverage was 105%.

When we saw the Enviromental health &Sanitation of this woreda; there were 88% Latrine coverage and 100% utilization rate, 96% Solid and Liquid waste management.

Endemic diseases

Malaria

All kebeles of the Woreda are under risk of malaria infection throughout the year .Malaria was one of the leading causes of outpatient visit disease of the Woreda. The total case was 7276,the incidence per 100,000 population at risk was(4051/100,000) and prevalence of malaria in the Woreda were 4% in 2007. Of the total malaria cases 4560 (62.6%) were *P.Falciprum*. insecticide treated bed nets (ITN) distribution as replacement was 92150(100%) and there was 20 indoor residual spray (IRS) in the woreda in 2007 EC.

TB/Leprosy

A total of three hundred sixty eight (368) tuberculosis (all forms) cases were reported to the district in 2007 EC. The Woreda TB prevalence was 0.2% with the mortality rate due to TB was 2.4% and there were 5 Leprosy case,108 PTB negative,135 PTB positive and 118 Extra TB in this woreda in 2007. Other TB indicators are listed bellow in table 5.

Table 20: TB Indicators, Boset, Woreda Oromia Region, Ethiopia 2007 E.C

S/N	Tuberculosis indicators	Coverage by percent (%)
1	TB detection Rate	69
2	TB Rx completion rate	88.3
3	TB cure rate	87.6
4	TB Rx success rate	84
5	Total TB Patients screened for HIV	92

HIV/AIDS prevention and control

According to the 2007 EFY Boset Woreda Health Bureau Report, 16188 people screened for HIV. Of these 6991 people by VCT service, 9197 by PITC and 5918 by PMTCT, Among tested 139 (0.86%) were positive for HIV. There were 1,100 people living with HIV/AIDS in the Woreda and of those, 961 (87.3%) were taking anti- retroviral (ART) drugs and 139(12.7%) were on pre-ART. HIV prevalence and incidence was 0.69% and 0.08% respectively in the woreda's general population. The priority intervention area in the Woreda in relation to HIV/AIDS were condom promotion and distribution, voluntary counseling and testing (VCT), management of sexually transmitted infections (STIs), prevention of mother to child transmission of HIV (PMTCT), management of opportunistic infections, blood safety, infection prevention/universal precaution, care and support to the infected and affected.

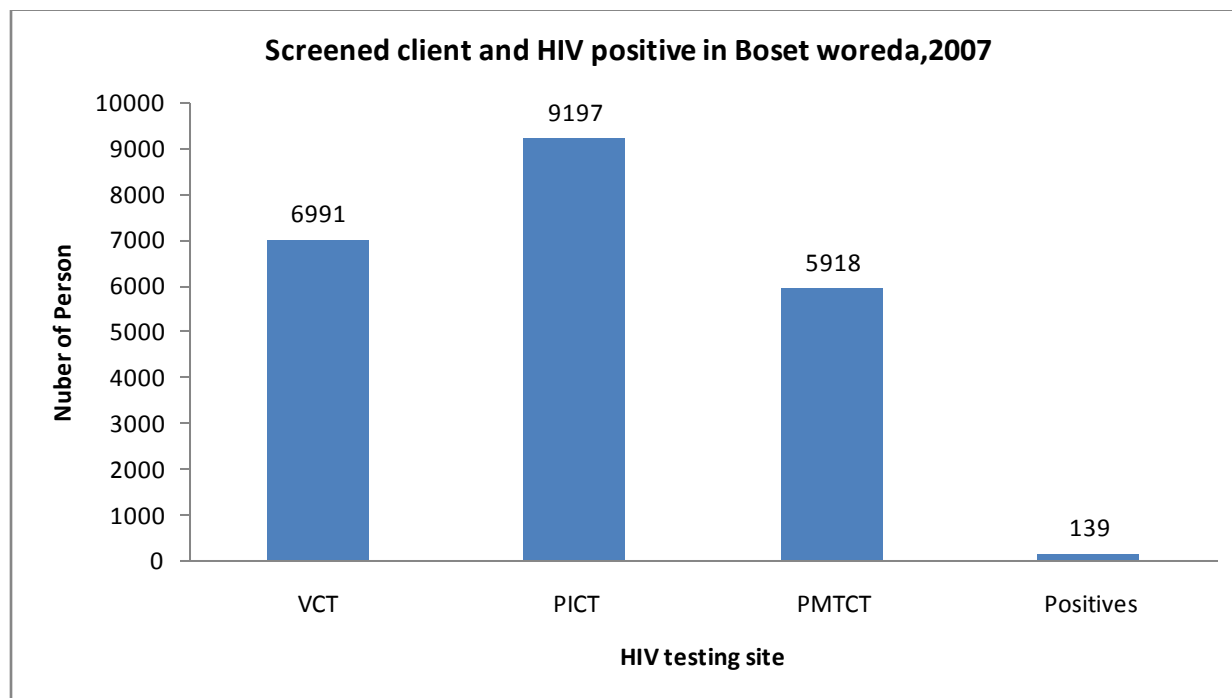


Figure 13: Distributions of all screened clients and HIV positive in different sites in Boset District, Ethiopia, 2007

Nutrition, Food Shortage and any Other Disasters

There was no full data on nutrition and food shortage but there was 39 OTP sites and 578 total admissions to OTP. There were no Disaster situation in the woreda in 2007 EC. There was no devastating disaster in the district in the last three years but, in 2013 there was 3 times (on 31-July-2013, 11-August-2013, and 28-August-2013) flood hit a total of 9 Kebeles: 2 kebeles of (01, 02) Welenchiti Town (capital of Boset District) and 7 rural kebeles surrounding Welenchiti, with an estimated 20,694 people (3,001 households) was displaced. An estimated 90 Hectors of land has been flooded and ruined residents' property with an estimated amount of 1,034,572 ETB. The District Disaster Preparedness Prevention and Relief (DPPR) Office in collaboration with the regional DPPR Office and other stakeholders was playing role in resettlement of the affected population. They have tried to handle the situation, and there was no loss of human life by these occurrences. (Source: Boset District Disaster Preparedness and Prevention Office, March, 2014).

Discussion

Acute febrile illnesses (AFI) were the leading cause of morbidity (8527 total case adult + child) which accounts for 1st (21.41%) of top ten adult OPD visits and ranking 4th (11.71%) in children (under 5 year) OPD. Acute upper respiratory infection (AURI) ranked the second leading cause of morbidity (7803 total case adult + child) which accounts for 2nd (15.74%) of adult OPD visits and 3rd (21.62%) in children. Malaria of all forms ranked the third by 7276 cases in both adult and children. Non bloody Diarrhea is the leading cause of morbidity in children under five (23.94%) and by 5575 cases it ranked the fourth leading cause of morbidity in the population. Pneumonia ranked the second leading cause of morbidity in children under five (22.35%).

Based on the health extension program one Health Post serves for 5,000 people, one Health Center Serves for 25,000 people and one District Hospital Serves 100,000 people. This makes the Boset Woreda health service coverage overloaded in which one health post serves for 5443, one Health center serves for 25,661 and one District Hospital serves for 179,621.

The target set nationally for TB control in EFY 2003 was to increase TB detection rate from 36% to 59%, TB treatment Success rate from 84% to 85%, and TB cure rate from 65% to 80% and increase the proportion of PLWHA screened for TB from 15% to 80% (2). In 2007 EC the district TB detection rate was 69% which is higher than the regional case detection rate 39% and national TB detection rate 34% in 2003 but it was slightly below 70% which is recommended by World Health Organization (WHO) (3). In 2007 a total of 368 all forms of TB cases diagnosed and reported to the Boset District health office with an estimated TB prevalence of 205/100,000 population. This is less than national prevalence 258/100,000 population for all forms of TB (3, 4). The TB cure rate (84%) less than the target (95%) set for the year 2005 and treatment success rate (87.6%) which was less than the national target (95%) set for the year 2012/13 (2005 EFY) (5).

There were 1100 people lived with HIV/AIDS in the town with the prevalence of %. Of this positive cases 961 (87.3%) were initiated and put on ART and 139 (12.7%) were enrolled for pre ART chronic care. HIV prevalence rate of the town was 0.69% and the incidence was 0.08%.

The proportion of pregnant women in these wereda who had at least one ANC visit were 100% in 2007 EFY. It was encouraging and the facility should work for more success in achieving MDG 5 in 2015. And the percentage of deliveries attended by skilled health personnel was 61% which was much greater than national and Oromia region figure 17% and 19% respectively DHS report in 2003 EFY(6). In these woreda proportion of women of reproductive age (15-49 years) who were not pregnant accepting a modern contraceptive method (contraceptive acceptance rate) was 69%, this was higher compared with the national 61.7% and Oromia Regional State Health Bureau 62% (6).

Conclusion

Malaria of all forms ranked the third leading cause of morbidity in both adult and children. But there was no death due to malaria this might be explained as; improvement in health services as well 100% ITNs distribution in the district plays great role in minimizing the risk of suffering from malaria, but still needs to encourage utilization of ITNs for its better reduction of morbidity. Diarrhea and Helminthiasis are still in the lists of top 10 leading causes of morbidity in both adults and under 5 children OPD this suggests that, there were no proper utilizations of latrine and low awareness of sanitation and Hygiene practices in the district. There was sustainable immunization coverage even higher than 100% in some immunization programs in the year targeted to children less than one year old to prevent suffering from vaccine preventable diseases. This might be due to increased visits of the health facilities from the neighboring districts where children are coming to the district to get these health services.

Recommendations

ITNs coverage was 100% in the district but malaria remains the main public health problem as it was indicated in top 10 causes of morbidity, therefore, HEWs and other health workers should emphasize on proper utilization of it.

Communicable disease like, Acute febrile illness (AFI), other unspecified and parasitic disease, acute upper respiratory infection and Non bloody Diarrhea are the most commonly occurring disease in all age group both in Adult and pediatric attending outpatient department. These diseases can be easily prevented by promoting hygiene and sanitation therefore the Woreda

health office have to promote hygiene and sanitation for the community in addition to this the woreda health office should have to work with stakeholder who is directly or indirectly benefited from or affected with hygiene and sanitation.

Limitations

In the Woreda, Language, Religion and Occupational characteristics were not clearly documented, and some essential health and economic indicators like Infant mortality, Child mortality, maternal mortality, ITN utilization rate, data on nutrition and food shortage and Average income per capital, Fund from NGOs were also not documented. Moreover, there was also difficulty to find out detailed information about the Woreda Disaster situation.

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Annex 3: Data collection tools for Boset woreda health profile description, 2007

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

Woreda at a glance: where it is _____

The name (how& why) _____

How the woreda was formed _____

Any other historical aspect _____

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

Woreda map _____

Location (distance and direction) _____ Altitude _____

Annual rain fall (average) _____ Max _____ Min _____ annual temp(average) _____ High
_____ Low _____ Climatic zones Highland _____ % Midland _____ % Lowland
_____ %

Accessibility (main roads) _____

3. Administrative setup

Total no. of kebeles: _____ Rural _____ Urban _____

Woreda boundaries North _____ south _____ East _____ West _____

4. Demographic information

Population: Total _____ urban _____ .rural _____ Male-----Female-----

--- sex ratio----- Under1yrs _____. Under five yrs _____. < 15 years _____

>64 years _____ Women 15-49 years of age _____

Total population by Kebele (each Kebele pop) _____ Ethnic composition/language _____

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

Main source of the economy _____

Average income per HH/year _____

6. Education and school Health

Distribution of Schools :

kG _____ Primary (1-8) _____ 1st Cycle(1-4) _____ 2ndCycle (5-8) _____ Secondary (9-10) _____ Preparatory
schools (11-12) TVET/colleges _____

School health activities: Water supply: schools with water supply_____

Toilets: schools with functional latrines (Male& Female)_____

Schools with HIV/other Health clubs_____ Dropout rate_____

Eligible enrollment_____

7. Facilities (Transport, Telecommunication, Power supply, Water supply...)

How many of the health posts have access to transportation_____ (%)

Telecommunication_____ (%) Electric power_____ (%)

8. Health delivery system

8.1 District **Health Structure**/organo-gram

8.2 Health Facilities

Type	Number	Total no beds
Hospital		
Health center		
Private Health facility		
Health post		

N

Health institution to pop ratio :

Hospital: Pop----- HC: Pop-----HP: Pop-----Health service coverage-----

8.3 Human resource for health (all type)

Type	Number	Remark
------	--------	--------

Physician		
-----------	--	--

Health officer		
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Nurse		
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Laboratory		
------------	--	--

Pharmacy		
----------	--	--

Enviroment		
------------	--	--

HEW		
-----	--	--

Others		
--------	--	--

Doctor: population ratio_____, Nurse: pop ratio_____ HEW: pop ratio_____

8.4. Top causes of morbidity and mortality

Top ten leading causes of OPD visit (morbidity):

No	Adult	Pediatrics
----	-------	------------

1		
---	--	--

2		
---	--	--

3		
---	--	--

4

5

6

7

8

9

10

Top ten causes of deaths (mortality).

No Adult Pediatrics

1

2

3

4

5

6

7

8

9

10

8.5 Vital Statistics and Health Indicators

Infant Mortality Rate (IMR) _____ Total <1yr deaths this yr_____)

PMR_____ (The last year 2005yr: Total live births_____ Total still births_____

Total neonatal deaths_____ Child Mortality Rate_____

2003EFY year's total <15yr deaths_____) Crude Birth Rate_____

Crude Death Rate_____ (total deaths this yr_____) Maternal Mortality Rate_____ (2003EFY total maternal deaths_____) Contraceptive Prevalence rate_____

ANC rate (how many of the total expected pregnancies attended ANC) _____

Percentage of deliveries attended by skilled birth attendants_____

8.6 Immunization Coverage (for children);

BCG ___ OPV___ Measles ___ Penta1___ Penta3 ___ fully immunized___

8.7 Health budget allocation:

Gov't----- (break down to d/t activities NGO----- Purpose/programs)_____

9. Disaster situation in the woreda

Was there any disaster (natural or manmade) in the woreda in the last one year?_____

Any recent disease outbreak/other public health emergency_____ If yes cases_____

and deaths_____

10. Community Health Services;

Status of services provided by community health workers namely TBAs_____

(no. of TBAs)_____ CHWs/CHPs_____ (no. of CHPs)_____

HEWs_____ (no. Of HEWs If Others_____

Status of Primary Health Care Components – with focus on the eight PHC elements

MCH_____ FP

_____ EPI:

Environmental Health, Sanitation Hygiene . (WASH) Latrine coverage_____ & utilization rate_____

Water supply_____

others_____

Health Education_____

11. Endemic diseases;

11.1 Malaria: Total malarious kebeles_____ & Pop at risk_____ ITNs coverage (including current dist) _____ is there IRS this year (No of kebeles) _____ Total malaria cases/yr_____

Deaths/yr_____ <5yr cases_____ deaths_____ Malaria supplies (Coartem, RDT, etc) shortage _____ If, Other issues_____

11.2. TB/Leprosy

Total TB cases_____

PTB negative_____ PTB positive_____ Extra PTB _____ TB detection rate _____

TB Rx completion rate _____ TB cure rate _____

TB Rx success rate _____ TB defaulter_____

Death on TB Rx_____ Total TB patients screened for HIV_____

Total Leprosy cases_____ on Rx_____

11.3 HIV/AIDS;

Total people screened for HIV (last one year)_____ VCT_____

PIHTC_____PMTCT_____ HIV prevalence_____

HIV Incidence (new cases/yr)_____ Total PLWHA_____

ON ART_____ on Pre-ART Other HIV prevention activities_____

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

Total OTP sites_____, total admissions to OTP/yr_____ Total SC sites_____, Newly opened/yr_____, Total admissions to SC/yr_____ Is there TSF (targeted supplementary feeding) program in the woreda ? CBN program_____ PSNP_____ other_____ General food security condition_____

Essential drugs (shortage):_____ What do you think the major Health problem/s of the woreda?

13. Discussion of the highlights and the main findings of the health profile assessment and description_____

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

CHAPTER V:-

Scientific Manuscript for peer review journals

5.1 Determinants of Mumps Outbreak in Dano Woreda, West Shewa Zone, Oromia Region, Central Ethiopia, 2017.

Jafer Kezali¹, Mamo Wubshet², Tewodros Getinet³ Wake Abebe⁴

Abstract

Background:-Mumps virus is a single-stranded RNA virus which is a member of the *Paramyxovirus* genus. Humans serve as the only natural host for mumps virus. It is highly infectious and spreads rapidly among susceptible people living in close quarters. In January 2017, the team of Acute Watery Diarrhea outbreak investigators deployed in Dano Woreda reported that there were increased numbers of suspected Mumps cases in the area. Therefore, the objective of this study is to estimate the burden and identify factors associated with contracting mumps in Dano Woreda, West Shewa Zone, Oromia Region, Ethiopia 2017.

Method:-The outbreak investigation was conducted in Dano Woreda, West Shewa Zone, Oromia Region, Ethiopia from January to February, 2017. We conducted a community based unmatched case-control study to investigate the outbreak. We used 40 cases and 120 controls in 1 to 3 ratios with a total sample size of 160. Cases were identified based on the manifestation of sign and symptoms of mumps where as controls were any residents who were neighbors of a case and did not develop signs and symptoms of mumps. Bivariate and multivariate logistic regression analysis was applied to determine factors associated with the outbreak of mumps. Independent predictor variables with a P -value ≤ 0.2 in bivariate analysis were entered into the final multiple logistic regression model.

Result:-The outbreak was occurred in two kebeles of Dano Woreda, Dire Hujuba 28(70%) and Dano Shenan 12(30%). The overall attack rate of the woreda was 32 cases per 100,000 populations. Fathers' educational status (AOR=10.8; 95%CI; 2.6-45.0), contact with mumps cases (AOR=11.55; 95%CI; 3.2-41.4), and Time to take to walk to health facilities; (AOR= 0.02; 95%CI; 0.005-0.096) were factors that significantly associated with the mumps outbreak.

Conclusion and recommendation

The attack rate of this outbreak is higher in young age children less than 15 years. Father's level of education, Time to walk to health facility and Contact with cases were associated with the mumps outbreak in Dano woreda. National vaccination campaign for Mumps should be initiated. Moreover community awareness towards mumps should be provided.

Keywords; Mumps outbreak, Dano woreda, West Shewa Zone.

Introduction

Mumps virus is a single-stranded RNA virus and is a member of the Paramyxovirus genus. Humans serve as the only natural host for mumps virus. The mumps virion has a helical core containing the genomic nucleocapsid segment, which is surrounded by an external glycoprotein envelope (1). The major surface glycoprotein contributes two discrete functions: hem agglutination-neuraminidase activity and cell fusion activity (1, 2).

The mumps virus causes an acute, self-limited, viral syndrome. Before the widespread utilization of an effective vaccine, mumps mainly occurred in young children attending primary grade school; mumps was also a leading cause of viral meningitis and the most common cause of unilateral acquired sensor neural deafness in children (3).

It is highly infectious and transmits quickly among susceptible people living in close area. Mumps virus is usually transmitted by respiratory droplets, direct contact, or fomites (4). Infants less than one year rarely acquire mumps due to passage of maternal antibodies. The incubation period is usually 14 to 18 days from exposure to onset of symptoms. Viral shedding in respiratory secretions precedes the onset of symptomatic illness and the time of peak contagion is just before the onset of Parotitis (5). Mumps epidemics have occurred worldwide with school-aged children generally acting as the vector for horizontal spread to household family members. Infection with mumps virus is asymptomatic in one-third of cases. Nonspecific prodromal symptoms include low grade fever, anorexia, malaise, and headache. The disease can vary from a mild upper respiratory illness to viraemia with widespread systemic involvement. Classic mumps is characterized by enlargement of the parotid and other salivary glands; Parotitis is bilateral in three-quarters of cases; and other salivary glands are involved in 10% of cases (6).

In the pre-vaccine era in Sweden, mumps was estimated to cause about 1000 cases of meningitis each year, leading to 20,000 days of hospitalization and 20,000–40,000 days of disability (7). Ethiopia is one of the countries in which vaccine against Mumps is not given yet. On January 19, 2017 the deployed team of Acute Watery Diarrhea outbreak investigators in Dano Woreda reported to Oromia Regional Health Bureau that there were increased numbers of suspected Mumps cases in the area. Therefore, the aim of this study is to estimate the burden and identify factors associated with contracting mumps in Dano Woreda, West Shewa Zone, Oromia Region, 2017.

Study Setting and study design

[illegible]

Figure 14:- Map of Dano Woreda, West Shewa Zone, Oromia Region, Ethiopia 2017

We used 40 cases and 120 controls with 1 to 3 ratios with a total sample size of 160. Total cases were collected using active case search within the community and 3 controls without the sign

and symptoms for each cases were included. Neighbors of each case without mumps sign and symptoms were selected as Controls. Neighbors (Right, left and Front) of each case without mumps sign and symptoms were selected as Controls.

Study variables

The dependent variable is mumps infection status Whereas the independent variables are Age, Sex, Occupation, Mother level of education, Father level of education, contact history, travel history, Presence of person with mumps in the household, Time taken to walk to the health facility from home, number of windows/doors, Age group.

Data collection and Analysis

The case definition of Parotitis during the data collection was as described by the WHO as follows: An acute onset of bilateral tender, self-limited swelling of the parotid or other salivary gland lasting 2 or more days and without other apparent cause. A structured questionnaire was used to collect data. The data was entered, edited and analyzed using Epi-Info 7, Excel and SPSS version 20 software respectively. Descriptive statistics like frequencies was performed. All variables with P-value < 0.2 in bivariate analysis were included into a multivariate logistic regression model.

Result

There were 40 cases identified through the active community search. The mean age for cases was 11.7 ± 9.0 SD and for controls 10.2 ± 8.7 SD. Considering of the gender of participants males are

18 (45%) and 57(47.5%) for cases and for controls respectively. Females are 22(55%) of all cases and 63(52.5%) of all controls. Considering of the occupation of the total cases 22(55%) are students followed by Pre-school age children 14(35%), 3(7.5%) were Housewife and 1(2.5%) were Merchant. The outbreak was occurred within two kebeles of Dano Woreda. Dire Hujuba 28(Attack rate= 6 per 1000) and Dano Shenen 12(Attack rate=2 per 1000). Active Cases were managed by giving Anti-pain treatment. With regards to education majority 27(67.5%) of cases Mothers' were illiterate where as only 25(20.8%) of controls Mothers' were illiterate. 15(37.5%) of cases Fathers' were educated where as majority 93(77.5%) of controls Fathers' were educated.

Table 21:- The mean Age of Cases and Controls of Mumps outbreak in Dano Woreda, West Shewa Zone, From January- February 2017.

Cases				
	Observation	Total	Mean	Std Dev
Age	40	469	11.725	9.0327
Controls				
	Observation	Total	Mean	Std Dev
Age	120	1221	10.175	8.6536

All of the cases presented with typical sign and symptoms of mumps infection like Swelling of the Parotid gland in all cases 40 (100%), Neck stiffness presented by all cases 40(100%) and Difficulty to swallow foods presented by all cases 40 (100%).

Table 22:- Mumps sign and symptoms of Mumps outbreak in Dano Woreda, West Shewa Zone, From January- February 2017.

Sign and Symptoms	Number (%)
Swelling of Parotid gland	40 (100%)

Neck Stiffness	40(100%)
Difficult to swallow	40(100%)
Fever	34(85%)
Cough	24(60%)
Nasal congestion	13(32.5%)

The most affected age group by this outbreak was young age children less than 15 years 33 (82.5%).

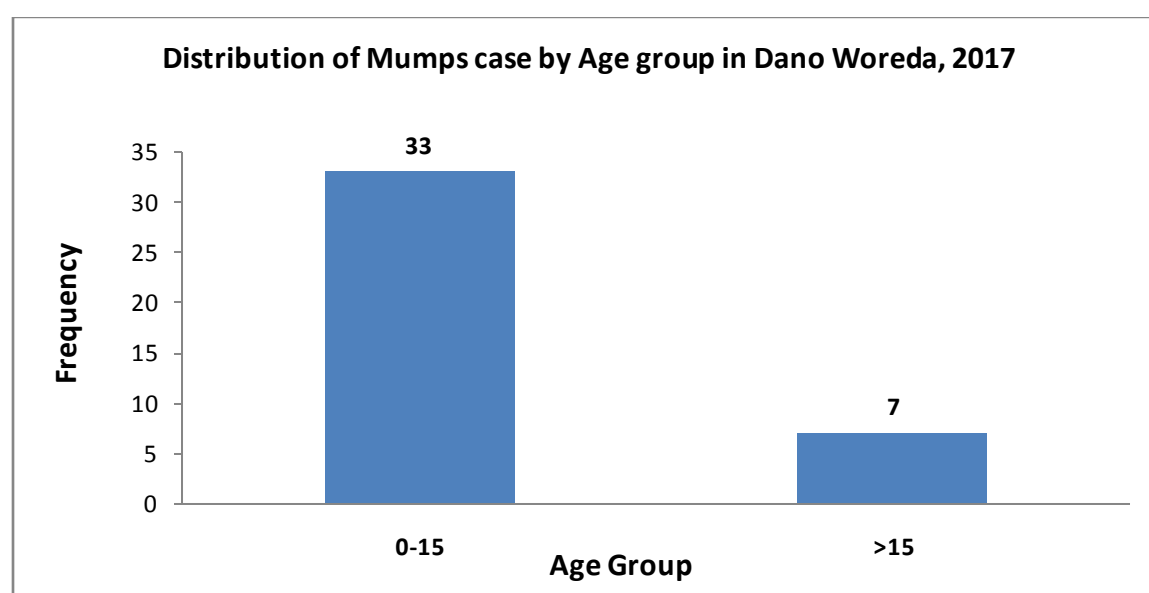


Figure 15: - Mumps cases by Age group in Dano Woreda, Oromia Region, 2017

Action Taken/ Intervention

During the course of this outbreak we conduct intervention by giving Anti-pain drugs and by order the parents to apply plastic bottle filled with hot water on swelling area for temporary relief and convincing the parents to visit health facility to avoid further complication and transmission.

Analytical study

From Bivariate analysis four independent variables were P-value less than 0.2; Father Level of education, Contact history, Time to take to walk to health facility from home and Age group.

Table 23: Bivariate and Multivariable analysis on predictors of Mumps outbreak in Dano Woreda, Oromia Region 2017

Variable	Case	Control	COR(P-value)	AOR(95 %CI)	P- Value
Fathers' Education					
Illiterate	25(62.5%)	27(22.5%)	5.74 (0.000)	10.8 (2.6-45.0)	0.001*
Educated	15(37.5%)	93(77.5%)		1	
Contact with mumps case					
Yes	30(75%)	13(10.8%)	24.7(0.000)	11.5 (3.2-41.4)	0.000*
No	10(25%)	107(89.2%)		1	
Time to walk to health facilities					
≤ 1hour	9(22.5%)	113(94.1%)	0.018(0.000)	0.02 (0.005-0.096)	0.000*
>1 hour	31(77.5%)	7(5.9%)		1	
Age group					
0-15	33(82.5%)	105(87.5%)	0.67(0.14)	1.67 (0.3-9.4)	0.56
>15	7(17.5%)	15(12.5%)		1	

Discussion

Parotitis is the most common or typical manifestation of mumps infection. In our investigation 100% of the cases manifested Parotitis in all age group. However Rates of typical Parotitis among all age groups normally range from 31% to 95% (8).

The occurrence of sporadic mumps outbreaks is well described even in populations with high vaccine coverage (9), whereas in Ethiopia the accumulation of susceptible individuals in the population is higher due to the absence of Mumps vaccination campaign nationally. Although there are no specific guidelines on mumps outbreak management, there is international consensus on the use of supplementary vaccination and patient isolation early in the course of the outbreak as tools to prevent the spread of infection to susceptible groups (10). The attack rate of this outbreak is higher in young age children less than 15 years which is 83% of all cases. However number of cases within the age group of 5 to 15 years of age (65%) is lower than the same age group in the study done in Palestine and Israel mumps outbreak investigation 76.3% and 75.3% (11, 12).

This study identified Children whose Father was not educated were 11 times more likely to developed mumps compared to children who had educated Father (AOR=10.8; 95%CI: 2.6-45.0) and Children who had contact with mumps cases were 12 times more likely to developed mumps compared to children who hadn't contact history (AOR=11.55; 95%CI: 3.2-41.4). However, 98% of children whose home were near to health facility in which it takes less than one hour to walk were unlikely to developed the disease or they were protected (AOR=0.02; 95%CI: 0.005-0.096).

Prolonged mumps outbreaks was occurred in Dano Woreda due to delayed in notification and communication of the outbreak to higher level so that we couldn't got the total cases in the woreda. Despite we collected the cases from January to February, 2017 from the two affected kebeles. An overall attack rate of the outbreak during this period was 32 cases per 100,000 populations. During the time of investigation we have tried to identify the communities' awareness towards mumps, modes of transmission, prevention and control measures were very low. The health seeking behavior is also very low since it was indicated that only one among the cases visited health facility within days of onset of illness. This difference could be lack of awareness on the need of visiting health facility whenever there is an illness with in the household.

This study is without limitation Due to delay in notification of the disease by the Woreda Health Office we couldn't identify the primary case of the outbreak and the whole burden and because of lack of attention to the disease nationally we couldn't get access to send samples to abroad for further investigation so we depend on suspected and probable case definitions to identify cases.

As a conclusion, the attack rate of this outbreak is higher in young age children less than 15 years which is 83% of all cases. Predictors significantly associated with the occurrence of mumps outbreak in Dano Woreda were, Father's level of education, Time to walk to health facilities and contact with cases. National vaccination campaign for Mumps should be initiated by Ministry of Health of Ethiopia to avoid further occurrence of sporadic Mumps outbreak and further complication. Health Education towards Mumps infection should be given to the community through trained health extension workers and improving health seeking behavior of the community through awareness creation towards modern treatment and its importance should be given by Dano Woreda Health office in alliance with community leaders.

Acknowledgement

First of all, I would like to express my deepest gratitude to my academic Advisors Dr. Mamo Wubshet and Mr. Tewodros Getinet for being tolerant with my mistakes and giving confidence, helping and guiding me out at each step. Next I would like to acknowledge to my field Mentor for Mr. Wake Abebe for being providing early as well as precise feedbacks and for Mr. Daba Muleta for his coordination between zones and Oromia health bureau.

I would also acknowledge Sister Hawa Mohamed Dano woreda health office head, Ato Girma vice head of Dano woreda health office and Mr. Fekadu Dano woreda health office PHEM officer for their cooperation while conducting this study. I owe my deepest gratitude to the workers for Dano woreda Administration, Dano woreda health office and Health Extension Workers in Dire Hujuba and Dano Shenene kebeles of Dano woreda.

Ethics approval and consent to participate

Ethical clearance was obtained from Ethical committee of St. Hospital Millennium Medical College. Then permission obtained from Ethiopian Public Health Institute Department of Public Health Emergency Management. The purpose of study was well explained to the study participants and informed consents were obtained. Confidentiality was maintained at all levels of the study by avoiding use of name and other identifiers. Participants' involvement in the study

was on voluntary basis, participants who were unwilling to participate in the study were informed to quit without any restriction.

Author details

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Chapter – VI: Abstracts for Scientific Presentation

6.1 Health Profile Description of Boset Woreda, East Shewa Zone, Oromia Region, Ethiopia, 2015/16

Authors: Jafer Kezali, Mamo Wubshet, Wake Abebe

Background: - A community health profile is a comprehensive, narrative description of the given community health status in align with historical, geographical, demographical and economical background of the area. In Boset woreda there is no well organized health and health related information. The aim of this study was to assess health and health related information in Boset woreda, East Shewa Zone, Oromia Region, Ethiopia during 2015/16.

Methods: - Data was collected from Boset woreda, Ethiopia from April - May, 2016. Boset Woreda is located about 125 Km south east of the capital city Addis Ababa. A cross-sectional descriptive study was conducted which includes interview and standard check-list to collect the data from different sectors. Data were compiled and analyzed using Microsoft Excel-2007.

Result: - In 2015/16 it was estimated a total of 179,621 populations were residing in Boset Woreda. Acute febrile illness 7147 (21.41%) followed by malaria 6354(19.04%), and acute upper respiratory tract infection 5255(15.74%) were the top three causes of morbidity in adults whereas Diarrhea (non-bloody) 2822(23.94%) followed by Pneumonia 2634(22.35%) and Acute upper respiratory tract infection 2548(21.62%) were the top three causes of morbidity in children under 5 in Boset woreda 2015/16.

Conclusion: - Even though Insecticides Treated Nets coverage was hundred percent in these woreda, malaria remains the main public health problem. Therefore, Health Extension Workers and other health professionals should emphasize on proper utilization of it. Diarrhea and Helminthiasis are still in the lists of top 10 leading causes of morbidity in both adults and under 5 children which suggest that, there were no proper utilizations of latrine and low awareness of sanitation and Hygiene practices, therefore the Woreda health office with stakeholder have to promote hygiene and sanitation for the community.

6.2 Measles Surveillance Data Analysis Report of East Shewa Zone, Oromia Region from 2011 to 2016.

Authors: Jafer Kezali, Mamo Wubshet, Wake Abebe

Abstract

Background:-Measles is an acute viral disease that spreads from person to person. It is highly contagious virus which transmitted primarily by respiratory droplets or airborne sprays to mucous membranes in the upper respiratory tract or the conjunctiva. It causes an estimated 2.6 million deaths each year worldwide. We conducted this surveillance analysis report to describe measles distribution by person, place, and time and recommend possible solutions for East Shewa Zone, Oromia Region, Ethiopia.

Methods: - Data was collected from East Shewa zone health office that was reported from September 2011 up to March 2016 which contains all measles case. Data was entered, cleaned and analyzed using EPI-info 7. Distribution of cases by place, person, and time was made.

Result: - A total of 955 Measles cases and 2 deaths with a Case Fatality Rate of 0.21% were reported from September 2011 up to March 2016 in East Shewa Zone. From the total reported measles cases less than 4 years of age group is the most affected age group 404(42.3%) followed by age group between 5 and 14 years of age 354(37.07%) and age group greater than or equal to 15 years 197(20.63%). With regards to geographical distribution, the most affected area is Bora Woreda 169(17.7%) followed by Metehara woreda 151(15.8%) and Fentale woreda 113(11.8%). The Monthly Report indicates that February 153(16.0%), January 139(14.6%), April 128(13.4%) and March 105(11.0%) are the months that more than half of all case 525(55%) was occurred.

Conclusion:- February, January, April and March were the months that more than half of all case was occurred which demonstrate that measles outbreak occur during dry season and school opening time that increase contact with susceptible individuals. Measles vaccine campaign and health education for the community should be addressed in all areas of East Shewa Zone.

Chapter – VII:

Standard operating

procedures

7.1 SOPs for Quanti-FERON IFN- γ test using ELISA

	OROMIA PUBLIC HEALTH RESERCH , CAPACITY BUILDING & QUALITY ASSURANCE LABORATORY		
	ADAMA ,ETHIOPIA		
	Title: IFN- γ test using ELISA	Version: 1	
	Document ID :	Effective Date:16/08/2009 E.C	
	Section: Surveillance		

PROCEDURE CHANGE HISTORY:

	Name	Position	Signature:	Date:
Written	Mr. Jafer Kezali	Lab Feild Epidemiologist		
Reviewed	Mr. Daba Muleta	Quality manager		
Authorized	Mr. Wake Abebe	Referral process owner		

Purpose

This procedure provides instrcutions for IFN- γ test using ELISA for latent Tuberculosis detection.

Scope

This procedure is used in Surveillance section of OPHRCBQAL when QuantiFERON specimen sends from health facilities.

Responsibility

Focal person of surveillance section is responsible for ensuring effective implementation of this procedure.

Principle

The plasma is removed and the amount of IFN- γ (IU/ml) is measured by ELISA. A QFT-Plus assay is considered positive for an IFN- γ response to either TB Antigen tube that is significantly above the Nil IFN- γ IU/ml value. The plasma sample from the Mitogen tube serves as an IFN- γ positive control for each specimen tested. A low response to Mitogen (<0.5 IU/ml) indicates an indeterminate result when a blood sample also has a negative response to the TB antigens. This pattern may occur with insufficient lymphocytes, reduced lymphocyte activity due to improper specimen handling, incorrect filling/mixing of the Mitogen tube, or inability of the patient's lymphocytes to generate IFN- γ . The Nil tube adjusts for background (e.g., excessive levels of circulating IFN- γ or presence of heterophile antibodies). The IFN- γ level of the Nil tube is subtracted from the IFN- γ level for the TB Antigen tubes and Mitogen tube.

1. Reagent and supplies (Materials)

- Nunk tube
- IFN- γ Standard, lyophilized (contains recombinant human IFN- γ , bovine casein, 0.01% w/v Thimerosal)
- Micro-pipettes (10 μ l to 1000 μ l with disposable tips)
- Microplate Strips (12 x 8 wells) coated with murine anti-human IFN- γ monoclonal antibody
- Green Diluent (contains bovine casein, normal mouse serum, 0.01% w/v Thimerosal)
- Conjugate 100x Concentrate, lyophilized (murine anti-human IFN- γ HRP, contains 0.01% w/v Thimerosal)
- Wash Buffer 20x Concentrate (pH 7.2, contains 0.05% v/v ProClin® 300)
- Enzyme Substrate Solution (contains H₂O₂, 3,3', 5,5' Tetramethylbenzidine)
- Enzyme Stopping Solution (contains 0.5M H₂SO₄)

Equipment

- ELISA machine
- refrigerator

Specimens

Plasma

Environmental and Safety Precautions

QuantiFERON Conjugate

Contains boric acid which is Danger! This can damage fertility or the unborn child. Dispose of contents/container to an approved waste disposal plant. IF exposed or concerned: Get medical advice/attention. Obtain special instructions before use. Store locked up. Wear protective gloves/protective clothing/eye protection/face protection.

Obtain special instructions before use. Wear protective gloves/protective clothing/eye protection/face protection. IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. **IF IN EYES:** Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If exposed or concerned: Get medical advice/attention. Immediately call a POISON CENTER or doctor/physician. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. Store locked up. Dispose of contents/container to an approved waste disposal plant.

QuantiFERON Enzyme Stopping Solution

Contains sulfuric acid, Causes severe skin burns and eye damage. Dispose of contents/container to an approved waste disposal plant. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Immediately call a POISON CENTER or doctor/physician. Store locked up. Wear protective gloves/protective clothing/eye protection/face protection.

QuantiFERON Enzyme Substrate Solution

Causes mild skin irritation, if skin irritation occurs: Get medical advice/attention.

Calibration

Not applicable

Quality control

- The mean OD value for Standard 1 must be ≥ 0.600 .
- The %CV for Standard 1 and Standard 2 replicate OD values must be $\leq 15\%$.
- Replicate OD values for Standard 3 and Standard 4 must not vary by more than 0.040 optical density units from their mean.
- The correlation coefficient (r) calculated from the mean absorbance values of the standards must be ≥ 0.98 .

The QFT-Plus Analysis Software calculates and reports these quality control parameters.

If the above criteria are not met, the run is invalid and must be repeated.

The mean OD value for the Zero Standard (Green Diluent) should be ≤ 0.150 . If the mean OD value is > 0.150 the plate washing procedure should be investigated.

Procedure

- All samples and reagents should be at room temp (except Conjugate 100x Concentrate)
- Remove strips that are not needed for the current analysis
- Document the layout of samples in the Quantiferon ELISA protocol. Include date of analysis.
- Preparing the kit standard
 - ✓ Reconstitute IFN-gamma standard (kit standard) in deionized/distilled water according to label on the vial
 - ✓ Label 4 tubes S1, S2, S3, S4

- ✓ Add 150 microl of Green Diluent (GD) to each tube
 - ✓ Add 150 microl kit standard to S1 and mix thoroughly
 - ✓ Transfer 50 microl from S1 to S2 and mix thoroughly
 - ✓ Transfer 50 microl from S2 to S3 and mix thoroughly
 - ✓ S4 contains only GD
- Reconstitute Conjugate 100x Concentrate with 0.3 ml of deionized/distilled water. Note the date of reconstitution. Store at 2-8°C.
 - Prepare working strength conjugate according to table in manual (volume depends on number of strips used). Cannot be stored!
 - Add 50 microl of working strength conjugate to all wells used
 - Add 50 microl of plasma sample to appropriate well according to the prepared layout of samples
 - Add 50 microl of standards (S1, S2, S3, S4) to the appropriate wells.
 - Cover the plate and mix thoroughly
 - ✓ Preferable using a shaker for one minute
 - ✓ **Note!** Avoid splashing
 - Cover the plate and incubate at room temperature (17-27 °C) for 120 minutes
 - ✓ **Note!** Time of incubation should be exact. Any inconsistency should not exceed +/- 5 minutes.
 - During incubation prepare wash buffer
 - ✓ One part Wash Buffer 20x Concentrate is mixed with 19 parts distilled/deionized water
 - ✓ **Note!** Each kit contains Wash Buffer 20x Concentrate for 2 liters of working strength wash buffer. This volume is more than enough for 2 complete ELISA-plates but the volume needed has to be according to the number of strips used (1 plate: 1 liter; 0.5 plate: 0.5 liter; etc).
 - Washing ELISA-plates

- ✓ Wash wells with 400 microl of wash buffer for at least 6 cycles. If there is enough washing buffer – increase to 8 cycles.
 - Use a multichannel pipette and change tips between each well to avoid carry-over
 - Make sure that each well is completely filled for each wash cycle. If need be – increase the volume added.
 - Allow for at least 5 seconds of soaking before removing wash buffer in each cycle.
- ✓ Tap plates face down on a paper towel to remove any residual wash buffer
- Add 100 microl Enzyme Substrate Solution to each well and cover the plate and incubate in room temperature for 30 minutes.
 - ✓ **Note!** Plates should not be exposed to light during incubation.
- Add 50 microl Enzyme Stopping Solution to each well and mix thoroughly.
 - ✓ **Note!** Add stopping solution in the same order as the Enzyme Substrate Solution
- Measure the Optical Density (OD) of the wells within 5 minutes of stopping the reaction fitted with a 450nm filter (and, if possible, a 620nm reference filter).

Calculation

QFT-Plus Analysis Software may be used to analyze raw data and calculate results. It is available from www.QuantiFERON.com. Please make sure that the most current version of the QFT-Plus Analysis Software is used. The software performs a quality control assessment of the assay, generates a standard curve, and provides a test result for each subject, as detailed in the Interpretation of Results section.

Performance characteristics

As there is no definitive standard test for Latent TB Infection, an estimate of sensitivity and specificity for QFT-Plus cannot be practically evaluated. Specificity of QFT-Plus was approximated by evaluating false-positive rates in the persons with low risk (no known risk

factors) of tuberculosis infection. Sensitivity was approximated by evaluating groups of patients with culture-confirmed active TB disease.

Uncertainty of measurement

Not applicable

Interferences/limitation

Results from QFT-Plus testing must be used in conjunction with each individual's epidemiological history, current medical status, and other diagnostic evaluations.

Individuals with Nil values greater than 8.0 IU/ml are classed as "Indeterminate" because a 25% higher response to the TB antigens may be outside the assay measurement range.

Unreliable or indeterminate results may occur due to:

- Deviations from the procedure described in this package insert
- Excessive levels of circulating IFN- γ or presence of heterophile antibodies
- Longer than 16 hours between drawing the blood specimen and incubation at 37°C

Critical values

Not applicable

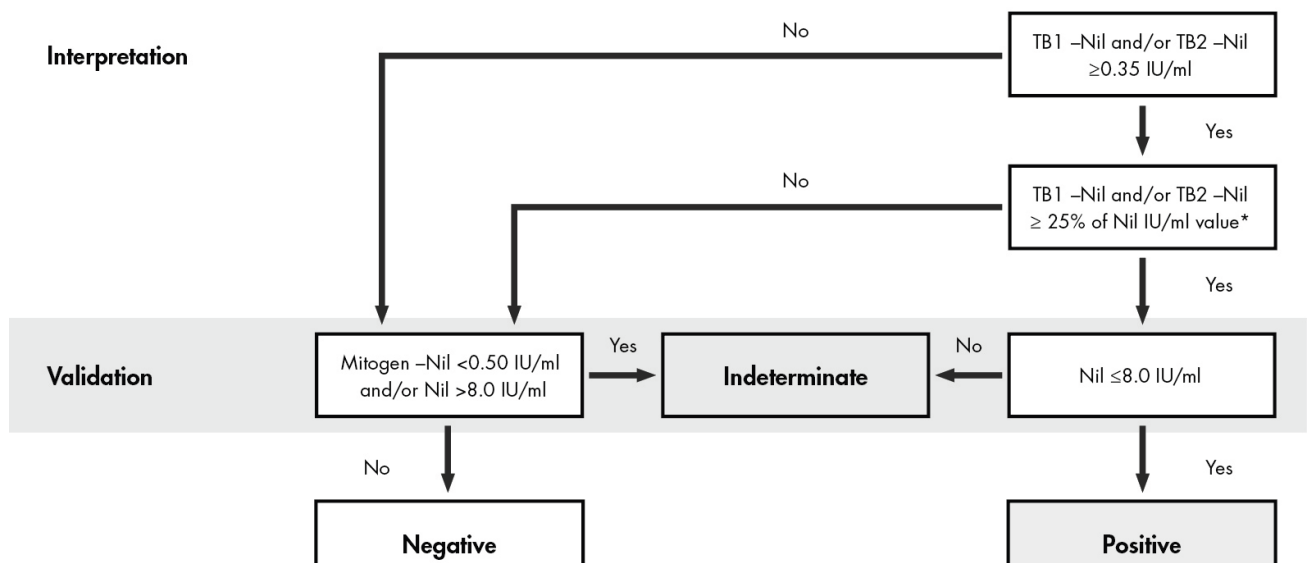
Result reporting

Add date, patient code and OD results into an appropriate excel sheet. Save on desktop with the date in the filename.

Note! Recheck OD-results, patient id and position of each Quantiferon tube after entering all the data. Print excel-file and store the hardcopy together with OD-results and protocols from the analysis.

Result Interpretation

QFT-Plus results are interpreted using the following criteria:



Biological reference interval

Not applicable

References

1. QuantiFERON-TB Gold Plus (QFT-Plus) ELISA Package Insert 02/2015
2. Bartalesi, F. et al. (2009) QuantiFERON-TB Gold and TST are both useful for latent TB screening in autoimmune diseases. *Eur. Respir. J.* **33**, 586.
3. Mackensen, F. et al. (2008) QuantiFERON TB-Gold - A new test strengthening long-suspected tuberculous involvement in serpiginous-like choroiditis. *Am. J. Ophthalmol.* **146**, 761.

7.2 Procedure for Quanti-FERON-TB Gold incubation of blood and harvesting of plasma

	OROMIA PUBLIC HEALTH RESERCH , CAPACITY BUILDING & QUALITY ASSURANCE LABORATORY ADAMA ,ETHIOPIA	
	Title: QuantiFERON-TB Gold incubation of blood and harvesting of plasma	Version: 1
	Document ID :	Effective Date:16/08/2009 E.C
	Section: Surveillance	

	Name	Position	Signature:	Date:
Written	Mr. Jafer Kezali	Lab Feild Epidemiologist		
Reviewed	Mr. Daba Muleta	Quality manager		
Authorized	Mr. Wake Abebe	Referral process owner		

Purpose

This procedure provides instructions for incubation of blood and harvesting of plasma specimens for latent Tuberculosis detection.

Scope

This procedure is used in Surveillance section of OPHRCBQAL when QuantiFERON specimen sends from health facilities.

Responsibility

Focal person of surveillance section is responsible for ensuring effective implementation of this procedure.

Principle

The QFT-Plus assay uses specialized blood collection tubes, which are used to collect whole blood. Incubation of the blood occurs in the tubes for 16 to 24 hours, after which, plasma is harvested and tested for the presence of IFN- γ produced in response to the peptide antigens. These specimens should be collected, stabilized, and transported according to exact specifications to ensure valid results.

Reagent and supplies (Materials)

- Lithium- Heparin anti-coagulated test tubes,
- four QFT tubes (Nil, TB1, TB2, Mitogen tubes)
- Nunk tube
- Micro-pipettes (10 μ l to 1000 μ l with disposable tips)

Equipment

- Incubator at 35-37°C
- Centrifuge
- refrigerator

Specimens

Whole Blood

Environmental and Safety Precautions

QuantiFERON Conjugate

Contains boric acid which is Danger! This can damage fertility or the unborn child. Dispose of contents/container to an approved waste disposal plant. IF exposed or concerned: Get medical advice/attention. Obtain special instructions before use. Store locked up. Wear protective gloves/protective clothing/eye protection/face protection.

Obtain special instructions before use. Wear protective gloves/protective clothing/eye protection/face protection. IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. **IF IN EYES:** Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If exposed or concerned: Get medical advice/attention. Immediately call a POISON CENTER or doctor/physician. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. Store locked up. Dispose of contents/container to an approved waste disposal plant.

Calibration

Not applicable

Quality control

Not applicable

Procedure

- Clearly label all Quantiferon tubes that will be used with patient code
- Check that all blood samples have been labeled with time and date of venipuncture as well as patient code.
- Fill in "Quantiferon patient and incubation protocol" with patient code, date and time of venipuncture.
- Use Ethiopian dates and time
- Gently mix the blood in the Lithium-Heparin tube by inversion

- Remove caps from Quantiferon tubes and add 1 ml of lithium-heparin blood to each tubes. Put caps back on the tubes.
- Inverse tubes at least ten times so that the entire inner surface of the tube is coated with blood.
- Inverse all tubes an additional ten times just before incubation.
- Incubate tubes upright in a 37°C incubator for 16-24 hours.
- Fill in "Quantiferon patient and incubation protocol" with time of incubation and calculate and fill in the time between venipuncture and incubation

Note! Quantiferon tubes should be incubated as soon as possible. Preferably within 8 hours of venipuncture but absolutely no later than 16 hours after venipuncture.

Note! It is of utmost importance that the time of venipuncture as well as time of incubation (including date) is noted so that the time between venipuncture and incubation can be calculated.

Note! Samples with more than 16 hours between venipuncture and incubation are discarded

Note! If no time is written on the lithium-heparin tube try contacting HC for clarification. If the time cannot be ascertained – discard sample.

- After incubation – centrifuge the tubes for 15 minutes at 2000 x *g*. Use the Centurion Scientific centrifuge (C2 series). Check that the display shows RCF (g) and not RPM. Check that the gel plug separates the cells from the plasma. If not, recentrifuge.
- Store aliquots of incubated plasma samples in freezers according to instructions in "Storage of incubated QFT-plasma samples"

Calculation

Not applicable

Performance characteristics

As there is no definitive standard test for Latent TB Infection, an estimate of sensitivity and specificity for QFT-Plus cannot be practically evaluated. Specificity of QFT-Plus was

approximated by evaluating false-positive rates in the persons with low risk (no known risk factors) of tuberculosis infection. Sensitivity was approximated by evaluating groups of patients with culture-confirmed active TB disease.

Uncertainty of measurement

Not applicable

Interferences/limitation

Inappropriate sample collection and labeling

Critical values

Not applicable

Result reporting

NA

Result Interpretation

NA

Biological reference interval

Not applicable

References

1. QuantiFERON-TB Gold Plus (QFT-Plus) ELISA Package Insert 02/2015
2. Bartalesi, F. et al. (2009) QuantiFERON-TB Gold and TST are both useful for latent TB screening in autoimmune diseases. *Eur. Respir. J.* **33**, 586.
3. Mackensen, F. et al. (2008) QuantiFERON TB-Gold - A new test strengthening long-suspected tuberculous involvement in serpiginous-like choroiditis. *Am. J. Ophthalmol.* **146**, 761.

Chapter VIII: Laboratory Manual

8.1 Laboratory quality manual for Mojo Hospital, East Shewa Zone, Oromia, Ethiopia.

	MOJO HOSPITAL LABORATORY MOJO, EAST SHEWA, ETHIOPIA	
	Title: Quality manual	Version:
	Document ID :	Effective Date:
	Section: Laboratory	Page 168 of 264

Foreword

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

Thus to provide reliable and quality assured laboratory services, a quality management system is key and has significance role in health care providing. Mojo Hospital Laboratory (MHL) as a hospital laboratory and center of diagnostic service, a capacity building of health center laboratory (microscopic centers), quality management system based on ISO 15189:2012. MHL overall goal is to set international standards in laboratory diagnosis and get recognized through accreditation.

Finally, I believe that this Quality manual will help to standardize the laboratory service and improve the quality of care in the health care delivery as well as yielding greater customer satisfaction outcome and it defines what MHL look likes.

Mr. Jafer Kezali

Introduction

Mojo hospital Laboratory was established by Oromia regional health bureau to conduct diagnostic service for patient who visits the hospital.

The provision of good laboratory service is highly dependent on the implementation of Laboratory quality management system in all level of Laboratories. Development and implementation of quality management system in MHL started since 2008 EFY. Since then, the laboratory is working hard to improve the service and satisfy customer needs.

The Quality Manual outlines the policies of Mojo Hospital Laboratory as it relates to its commitment to the implementation of the laboratory quality management system (QMS) in line with ISO 15189: 2012 in order to meet accreditation standards.

This Manual serves as a reference for laboratory personnel on all quality system matters, providing direction to general policies, processes and responsibilities that authorize and govern the creation of subsidiary quality-related documentation and activities. Many of these documents can be found within other reference materials that are indicated within different sections. All staff are trained in the use and application of the quality manual policies and be advised of any changes. It also provides comprehensive evidence to all customers, stakeholders and staff that the laboratory is committed to establishing and maintaining acceptable levels of measurable quality in its services.

Ethiopia uses Julian calendar which is seven/eight years behind the Gregorian calendar and which has 13 months in a year, the first month being September and the 13th month coming after August and before September. The 13th month has 5 to 6 days depending on the year. MHL uses Julian calendar in its quality management system. However a calendar is available to convert to Gregorian system if needed.

Scope

Mojo hospital laboratory quality management system covers all the activities performed in the laboratory which are:

- A. **Reception:** specimen collection, receiving, accessioning, enter of test information using manual labeling method according to the sample and tests requested and , monitoring of turn-around time (TAT).
- B. **Bacteriology:** Smear microscopy(ZN/FM)

- C. Clinical Chemistry tests, Serology and Haematology:** GPT, GOT, Urea, Creatinine, Triglyceride, ALP, Cholesterol, and Glucose. bilirubin (Total & direct), complete blood cell count (CBC). Blood morphology, blood grouping, widal O & H Ag tests, weilflex tests Using OX 19 proteus Ag. syphilis test using RPR carbon test or syphilis check strip. H. pylori test, HBsAg test, ASO, HCV test, rheumatoid factor test, HIV test
- D. Urinalysis and parasitology section:-** blood parasite, stool wet mount microscopy, urine chemical tests, urine microscopy, urine HCG

Vision, Mission and Value statement

Vision statement

Mission statement

To protect and promote the health of the people of surrounding by addressing priority public health problems through advanced diagnostic service, capacity building, implement and maintaining quality management system (QMS) according to ISO 15189:2012.

Values

- We value collaboration
- Excellence.
- We accept responsibility for the performance of our laboratories
- Customer satisfaction and community first
- Cost effective and efficient resource utilization
- committed to respect code of ethics
- Transparency and accountability
- Quality service
- Staff Motivation and trust

Management requirements

Organization and management responsibility

Organization

General

MHL is committed to meet requirements of ISO 15189:2012 while performing work at its permanent facility.

Legal identity

MHL is legally mandated by Oromia regional health bureau to operate as investigation patient's sample of Mojo hospital under the license number/reference letter -----

Ethical conduct

Mojo Hospital Laboratory has put in place an ethical conduct declaration form (MHL- 4.1-F 001) to ensure that staffs do not:

- fabricate or falsify laboratory results or get involved in any unethical activities that may result in clients to lose trust on the laboratory's competence, impartiality, judgment or operational integrity;
- get influenced by commercial, financial, political and other pressure that may adversely affect quality of their work;
- get involved in business or any activity that compete with activities the same with MHL
- analyze patient samples for investigations not requested by authorized clinician;
- Use patient samples to carry out research which is not cleared by ethics committee of Oromia regional health bureau.
- Disclose patient confidential information to any unauthorized person for any reason.

Laboratory head

MHL is lead by a competent person whose overall responsibilities includes but not limited to administrative, professional and scientific advisor to Mojo Hospital on laboratory diagnostic issues. The detailed roles and responsibilities of the laboratory head are found in job description (JD 01).

Management responsibility

Management commitment

The management of Mojo Hospital is committed to development, implementation, maintenance and continual improvement of the quality management system by ensuring that:

- Weekly laboratory staff meetings are done where staff informed on the importance of meeting needs and requirement of patients, Clinician as well as requirements of Mojo Hospital
- quality policy statement is established;
- quality objectives are established and a plan is developed to achieve them;
- staff responsibilities and authorities are defined in their respective job description;
- interrelationship between staff and management is defined in the organizational chart;
- internal and external communication processes are established;

- a quality officer is appointed by laboratory head and approved by Hospital Medical director
- all staff are assessed for competency in their assigned tasks annually and bi annually for new staffs
- adequate resources needed to conduct pre-examination, examination and post-examination activities are available;
- All staffs are trained quality management system.

Needs of users

Mojo Hospital laboratory ensures that services offered including advisory services continuously meet needs and requirements of patients and Clinician by addressing both negative and positive feedback received.

Quality policy

Mojo Hospital Laboratory provides diagnostic services in the disciplines of HIV antibody screening test, Hematology, clinical chemistry, AFB (Zeil Neilson/FM)for TB diagnosis, Parasitology, Urinalysis and different serology test. MHL also participate in EQA.

Mojo Hospital laboratory Staff perform their work in the most professional and ethical way committed to good laboratory and clinical practice as well as to requirement of ISO 15189:2012. The laboratory implements established evaluation and audit processes as well as thrives to meet its quality objectives and reviews them to ensure that the developed quality management system is continuously improved and remains appropriate to the purpose of organization.

All staff of MHL understands the quality policy as well as all policies and procedures of the quality management system and is committed to implementing them while carrying out their assigned duties.

This quality policy is reviewed annually to ensure its continued suitability.

Quality objectives and planning

Mojo Hospital laboratory sets and reviews measurable quality objectives annually during management reviews after collecting suggestions from staff. A plan which includes key activities for achieving the objectives is developed on form in the same annual management review.

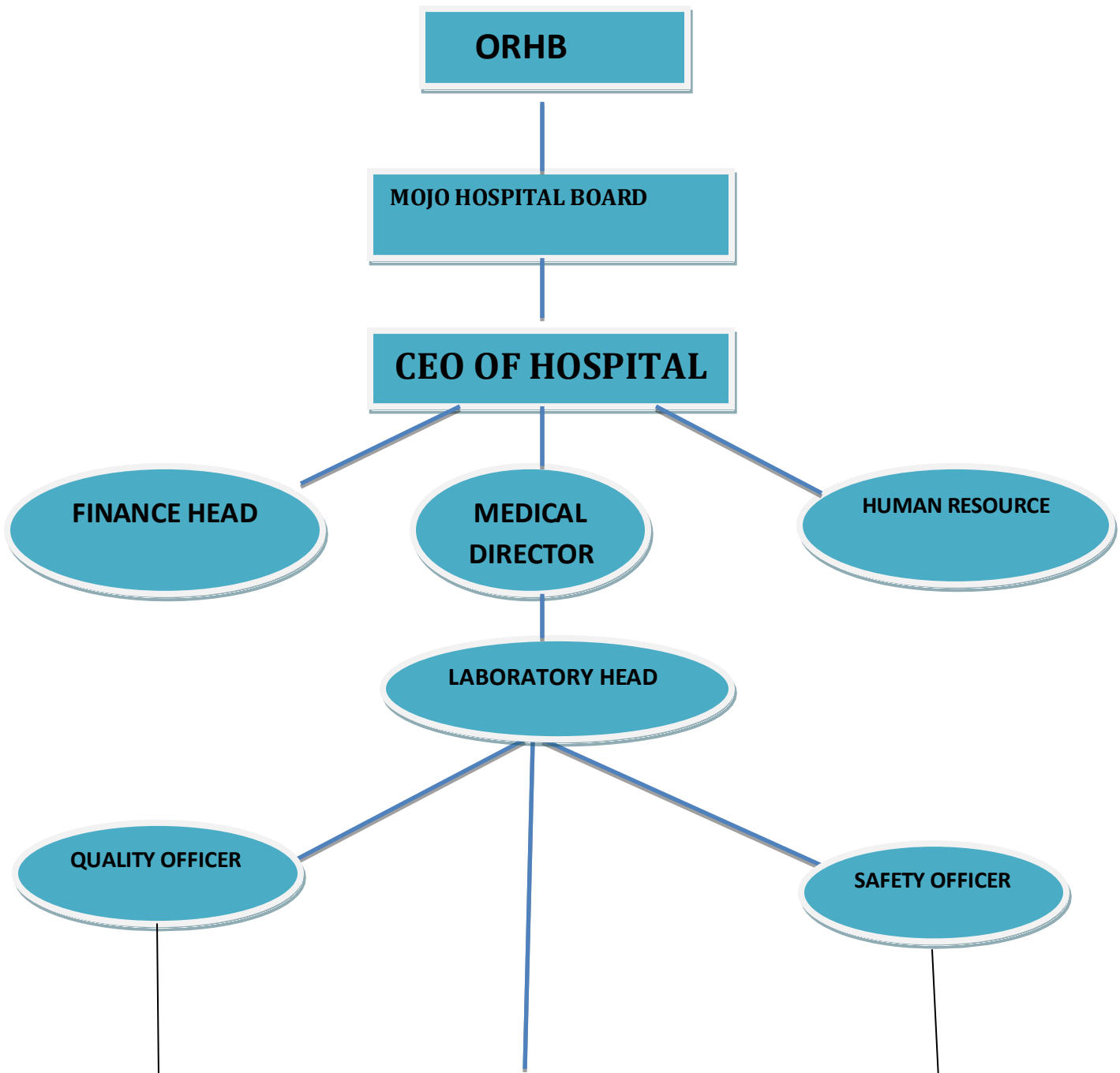
The management ensures that the integrity of the quality management system is maintained when changes are being planned and implemented.

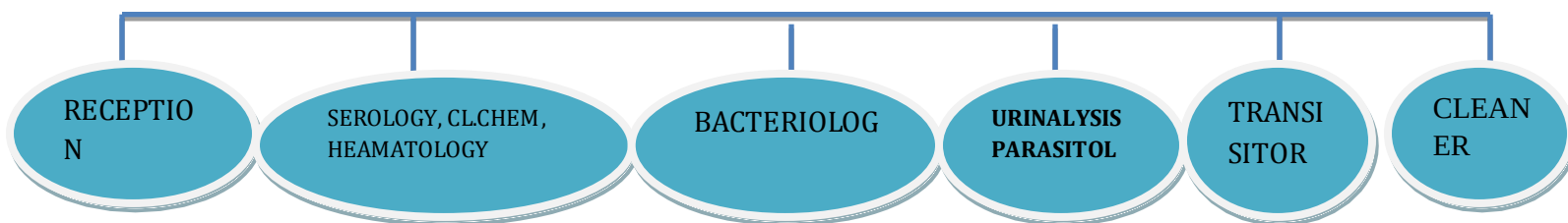
Responsibility, authority and interrelationship

Mojo Hospital laboratory has defined responsibilities and authorities of staff in their respective job descriptions. The staff read and acknowledge by signing the job descriptions witnessed by the Human resource manager before they are filed in individual personnel files.

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

Mojo Hospital Laboratory Organo-Gram





Communication

The laboratory holds weekly staff meeting where effectiveness of pre-examination, examination and post-examination processes and implementation of laboratory quality management system are discussed. Minutes of these meetings is maintained by quality Officer in MHL-4.1-F-003. The laboratory head participate on Hospital management meeting monthly about laboratory and other hospital issues. This minute capture on MHL-4.1-F-003. Staff also communicate through verbally, telephone and posting memos MHL-4.1-F-004 on notice board.

External communication with regional laboratory, Oromiya regional health bureau, zonal health department annually during review meeting. This minute capture on MHL-4.1-F-003.

Laboratory head

Laboratory head is the leader of the hospital laboratory. S/he is appointed by the hospital medical director. S/he is member of Hospital management team. S/he is report to Hospital Medical Director. S/he represents the laboratory in different team meeting and responsible for external relation with different units. The detailed responsibilities of laboratory head are stated in the job description (JD 01).

Quality officer

The laboratory Head has nominate a quality Officer to Hospital Medical Director for approval. Who reports to the laboratory head and whose overall responsibilities are to ensure that processes needed for the quality management system are established, implemented and maintained as well as to promote awareness of needs and requirements of patients and health facilities in the laboratory. The detailed responsibilities of quality officer are stated in the job description (JD 02).

Safety officer

Safety officer nominate by laboratory head and approved by Medical director. He report to laboratory head. He is well trained in infection prevention. Ensures the safety of laboratory according to ISO 15190. The detailed responsibilities of safety officer are stated in the job description (JD03)

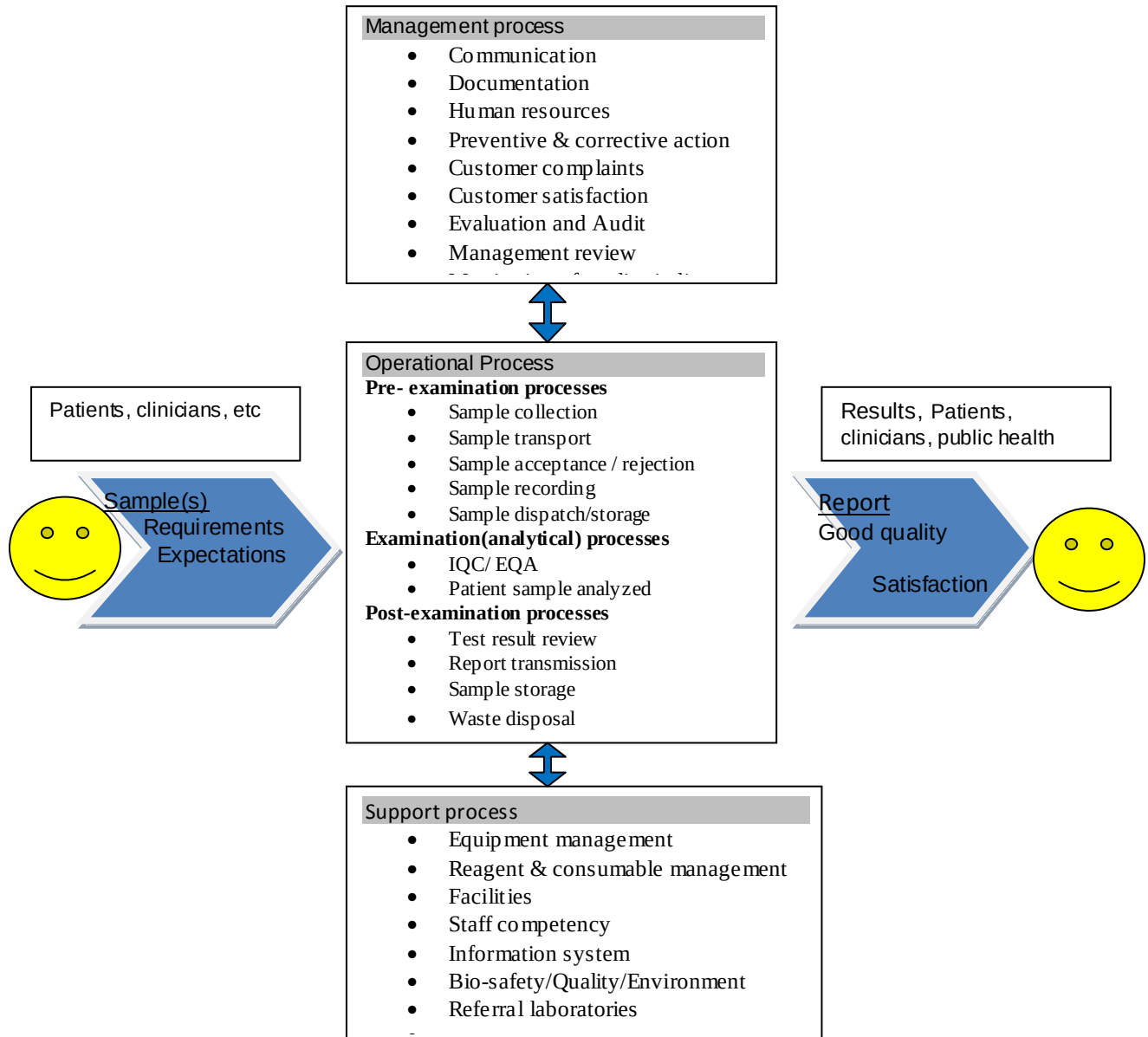
Supporting documents

- registration license_
- ethical conduct declaration form_ MHL-4.1-F-001
- Laboratory head job description_ JD 01
- Objectives planning form_ MHL-4.1-F-002
- Staff job descriptions
- Memos template _ MHL-4.1-F-004
- Meeting minutes template _ MHL-4.1-F-003
- Quality officer job description_ JD 02
- Safety officer job description _JD 03

Quality management system

General requirements

MHL has established document, implement and maintain a quality management system and continually improving its effectiveness in accordance with the requirements of ISO 15189:2012. The quality management system is composed of different processes that interact with each other to convert inputs (customer requirements) to output (customer satisfaction) as illustrated in diagram below:



The management processes constitute some of the monitoring and evaluation processes needed to ensure continual improvement of the quality management system while the support processes indicate the resources needed to support the quality management system.

Documentation requirements

General

MHL has established documents needed for its quality management system that include:

- Statement of quality policy and quality objectives
- Quality manual
- Procedures and records required by ISO 15189:2012
- Supporting documents of the quality manual
- Copies of international, national and regional regulation documents such as ISO 15189:2012, Bio-safety regulation, ENAO documents, civil servant and good governance regulations

Quality manual

MHL quality manual is composed of:

- policy statement
- a description of the scope of quality management system
- organizational chart
- Job descriptions which define roles and responsibilities of all staffs including laboratory Head ,Quality officer, safety officer
- description of the documentation structure used in quality management system
- policies addressing all requirements of ISO 15189:2012 and their supporting documents

Documentation structure

MHL quality management system documents fall in to a three-tier structure which comprises of policies in first level, procedures/job aid in second level, and forms , records, reference books , equipment manuals and other external documents in third level as illustrated in pyramid below.

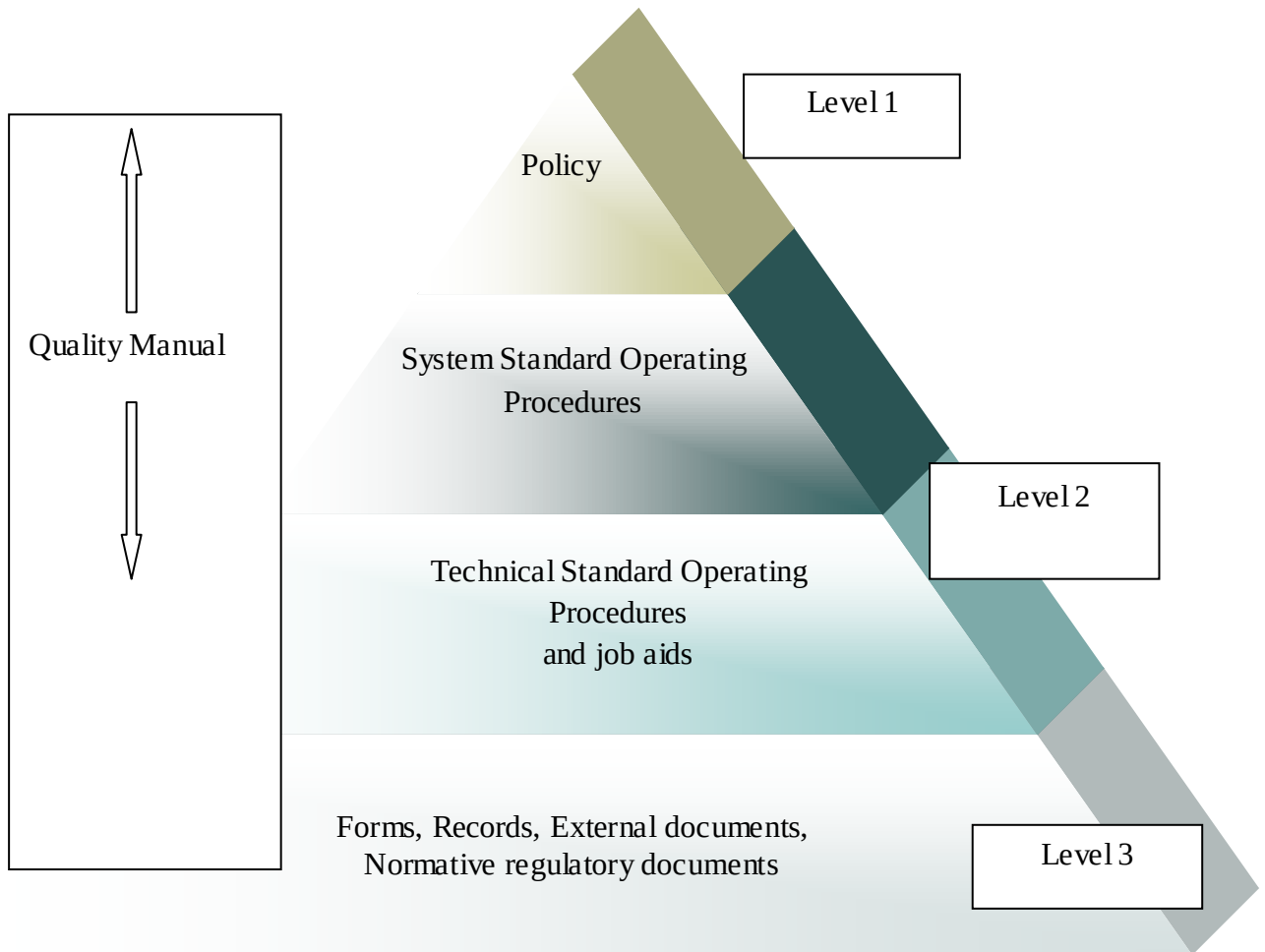
Policy: describes the organization goals and intentions “what is done and why”

Procedures/Job aids : provide step by step instruction “how to do it”

Form: capture information and results generated as the process procedures

Records: result from captured information on a form

External documents : documents of external origin adopted into the system to support policies



The quality officer distributes copies of quality manual and supporting documents to each stake holders so that staff can have easy access. All staffs are trained on the use of quality manual and supporting documents.

Document control

The quality Officer of MHL ensures that all documents required by the quality management system are controlled to prevent unintended use of any obsolete documents. This is achieved by use of master list of documents(MHL-4.3-F-001) during distribution of approved current documents and retrieval and destruction of obsolete documents.

MHL has developed a procedure for document control (MHL-MSOP-01) which gives more detail on document control from creation to destruction.

All documents are uniquely identified with laboratory name & logo, document title; document ID, effective date of current version, version number, and page number to total number of pages and authority for issue.

The Hospital Medical Director approves Quality Manual, Safety manual, laboratory hand book while the Laboratory Head Procedures. The quality officer reviews all documents to ensure that they are standardized and fulfill all requirements of ISO 15189:2012 before they are approved.

Supporting documents

- Master list _ MHL-4.3-F-001
- Procedure for document control _MHL-MSOP-01
- Process maps/tables

Service agreements

Establishing of service agreements

MHL has developed a procedure for establishing and review of agreements (MHL-MSOP-02) for providing medical laboratory services.

MHL considers individual requests for examination brought in by patient as agreement.

The laboratory Head and the Hospital Medical Director sign agreements on behalf of MHL with

The service agreements take consideration of the following conditions:

- requirements of customers such as turn-around time, reporting formats , testing algorithm;
- requirements of service provider (MHL) such as sample collection requirements including sample volume and type of container; use of request form, transportation and handling of samples ;
- the capability and resources available to meet the requirements;
- availability of expertise to perform requested examinations;
- availability of suitable examination procedures (equipment) needed to perform requested examinations;
- any work that is referred to another laboratory will be identified by the name of the laboratory;
- Notifying customers (health facilities and patients) any deviation from the agreement that may impact on examination results.

The Laboratory head notifies Customer through telephone of any deviation in agreement such as service interruption that may result in delayed turn-around times or temporary interruption of services. The communication with customers is recorded on communication log (MHL-4.4-F-001).

Review of service agreements

The customers initiate the review process stating the need to continue with service agreement. The conditions agreed upon in the initial agreement are reviewed and if there are any changes to any of the conditions, all parties agree before signing the new agreement.

When amendments need to be done after laboratory services already commenced, the conditions are reviewed by both parties before an agreement can be reached. The laboratory Head or Hospital Medical Director communicates all conditions and amendments to all MHL staff.

Supporting documents

- Procedure for service agreement_ MHL-MSOP-02
- Communication log_ MHL-4.4-F-001

Examination by referral laboratories

Selecting and evaluating referral laboratories and consultants

MHL select referral laboratories by using checklist MHL-4.5-F-001 and list selected referral laboratory on MHL-4.5-F-002.

Referral of samples may occur under any of the following temporary circumstances:

- equipment breakdown;
- reagents stock-out;
- test not performed routinely by the laboratory;

MHL uses criteria defined in procedure for referral laboratories (MHL-MSOP-03) to select referral laboratories and maintains a list of the approved ones (MHL-4.5-F-002). The same procedure also gives guidelines on monitoring performance of referral laboratories which is done once a year, coordinated by the Quality officer.

Provision of examination result

MHL is responsible for all test results from referral laboratories to ensure they reach the customer within at agreed turn-around time. The laboratory uses referred samples log (MHL-4.5-F-003) to track samples and results from referral laboratories.

MHL does not edit or put additional remarks to reports from referral laboratories but forwards it to customer as received, keeping a copy in respective section for a period as defined in the document and record retention times (MHL-4.5-F-004).

In cases where correct interpretation or clarification of results is required, MHL collaborates with referral laboratories without any extra charge to the patient.

Supporting document

- List of approved laboratories_ MHL-4.5-F-002
- Procedure for referral laboratories_ MHL-MSOP-03

- Referral samples log_ MHL-4.5-F-003
- Documents and records retention times_ MHL-4.5-F-004

External services and supplies

MHL has procedure for selection and evaluation of external services and suppliers (MHL-MSOP-04).

MHL acquires all of its reagents and consumables and some of its equipment from PFSA and Biftu Adugna S.C the laboratory head ensures that performance of PFSA and Biftu Adugna S.C is monitored annually using checklist (MHL-4.6-F-001).

MHL receives equipment as donations from partners, OPHRCBQAL, EPHI and ORHB

MHL also acquires some of its equipment from private supplies through tendering system. The private suppliers are selected based on stated criteria and specific equipment specification. These are, not limited to the following listed criteria:

- Cost
- post-delivery support (training, installation & spares)
- warranty period
- availability (reagents and consumables)
- Registration of the provider
- CE marked, FMHACA registered
- Validation
- System interface
- Capacity/test through put per day& user friendly

MHL ensures that all received reagent, consumable and equipment meet expected standards and are suitable for intended use in accordance with checklist for receiving equipment(MHL-4.6-F-002), reagent and consumable(MHL-4.6-F-003).

Supporting document

- Evaluation of supplier checklist_ MHL-4.6-F-001
- Procedure for selection and evaluation of external service and supplies_ MHL-MSOP-04
- Checklist for receiving of equipment _MHL-4.6-F-002
- Checklist for receiving reagents and consumable_ MHL-4.6-F-003

Advisory service

MHL staffs are has authorized through their job descriptions to provide advice to customers on:

- sample collection, sample type and volume, type of container including preservatives , handling and transportation;
- choice of examinations and effective use of laboratory;

- correct interpretation of examination results;
- limitations of examination procedures;
- individual clinical cases;
- Sample integrity and their effect on examination result.

A laboratory hand book containing the above information in more detail is distributed to all health units.

Table below gives the summary of advisory services and staff who authorize to give the services.

Advisory services matrix

	Sample requirements (volume , type of container)	Completing request forms	Safe handling and Transportation of samples	Choice of tests	Interpretation of results	Promoting use of laboratory services
Laboratory Head	√	√	√	√	√	√
Quality Officer	√	√	√	√	√	√
Safety officer	√	√	√		✓	√
Laboratory staffs	√	√	√	√	√	√
Transistor						✓

Resolution of complaints

MHL has a procedure for resolution of complaints (MHL-MSOP-05) which is followed when resolving complaints from patients, Clinician and other customer/stakeholders as well as internal complaints from staff. The laboratory Head has overall responsibility of ensuring that all complaints are resolved while the quality Officer maintains the records thereof. Customer complaints are obtained through bi-annual customer satisfaction survey, suggestion book,

Suggestion box and via telephone or directly forward to any of laboratory staff. During staff meetings, Staffs are informed to raise their complaints any time by way of filling in complaint form (MHL-4.8-F-001) anonymously and submitting it to quality officer and address in Hospital management meeting. Complaints are addressed by hospital management during their monthly meetings and feedback is given to staff during weekly meetings or to individual who raised the complain.

Supporting document

- Procedure for resolution of complaint_ MHL-MSOP-05
- Complaint form _ MHL-4.8-F-001

Identification and control of non-conformities

MHL has a procedure to identify and manage non-conformities (MHL-MSOP-06)raise in any aspect of its quality management system including pre-examination, examination and post-examination processes .A non-conformity form(MHL-4.9-F-001) is used to capture details of the non-conformity, the root cause as well as corrective action taken. Quality Officer has overall responsibility of ensuring that non-conformities are identified and effectively addressed. In cases of major non-conformity which has direct impact on examination results, the laboratory head is responsible for stopping work in the affected area and ensuring that effective corrective action is taken before work can be resumed. Affected result is recalled, re-analyzed and corrected results re-issued. The laboratory Head is responsible of informing affected customers of the impact of the non-conformity on the examination result. Quality officer maintains register (MHL-4.9-F-002) of all non-conformities raised and uses the information for trend analysis which is reported in annual management review.

When it is determined that non-conformities in any of the aspect of quality management system including pre-examination, examination and post-examination processes could recur or that there is doubt about the laboratory compliance with its own procedures, MHL takes action to identify, document and eliminate the root cause(s), records of all corrective action taken are documented on non-conformity form (MHL-4.9-F-001) and maintained by Quality officer.

Supporting document

- Procedure of identification and manage nonconformities_ MHL-MSOP-06
- Non-conformity form_ MHL-4.9-F-001
- Non-conformity register_ MHL-4.9-F-002

Corrective action

MHL follows the procedure for corrective action (MHL-MSOP-07) to address all non-conformities identified in the system. Record of root cause analysis and corrective action are captured on non-conformity form (MHL-4.9-F-001). Effectiveness of corrective action taken is reviewed by internal auditor in case of internal audits or by the quality officer before any of the same people can close the non-conformity.

Supporting documents

- Procedure for corrective action_ MHL-MSOP-07
- Non-conformity form_ MHL-4.9-F-001

Preventive action

MHL has established actions to be taken to prevent potential non-conformities. These pro-active actions include:

- daily monitoring of environmental temperature by laboratory staffs;
- daily running of internal quality controls by laboratory experts;
- daily, weekly and/or monthly maintenance of equipment by laboratory staffs;
- quarterly performance in external quality assurance in all sections;
- Annual review of all documents of the quality management system by quality officer and laboratory head.

The laboratory staffs are responsible for reviewing data on a daily basis including trend analysis while the quality officer reviews the data on a monthly basis.

Potential non-conformities are identified through trend analysis and preventive actions are developed and implemented accordingly.

A procedure for preventive action (MHL-MSOP-08) has been developed.

Supporting document

- Procedure for preventive action_ MHL-MSOP-08

Continual improvement

MHL has established mechanisms to continually improve effectiveness of its quality management system including pre-examination, examination and post-examination processes. These include but not limited to:

- annual management reviews;
- corrective and preventive actions;
- review of quality policy and quality objectives;
- implementation of quality indicators;
- risk assessment;

- Customer feedback.

The laboratory Head ensures that action plans for the above activities are developed, documented on respective action plan and implemented within agreed timelines. The quality officer ensures that annual internal audit is conducted with an objective to review effectiveness of continual improvement actions.

When the continual improvement activities identifying opportunities for improvement, MHL ensures that they are addressed regardless of where they occur. The laboratory head communicates any improvement plans and related goals during weekly staff meetings.

Supporting document

- Action plans

Control of records

MHL has a procedure for control of records (MHL-MSOP-09) which defines how quality and technical records are identified, collected, indexed, accessed, stored, maintained, amended and safely disposed.

MHL ensures that staffs create record the same time of performing each activity that affect the quality of examination. MHL allows amendment of records by hand. This is done in blue or black ink by striking through wrong entry with one neat line and entering the correct entry next/above the wrong entry, signing or initialing and putting the date and time of amendment. Use of correction fluid is strictly not allowed.

MHL has defined periods of retaining quality and technical records generated through implementing quality management system in the document and records retention times (MHL-4.5-F-004).

MHL facilities allow for safe storage of records to prevent their damage by fire, mites or water. The facility is also safe guarded from unauthorized persons gaining access to records. All quality and technical records are available for discussion in management reviews.

Supporting documents

- Procedure for record control_ MHL-MSOP-09
- Documents and records retention times_ MHL-4.5-F-004

Evaluation and audits

General

The quality officer of MHL plans the evaluation and audit activities at the beginning of each Ethiopian physical year and documents them on a quality plan (MHL-4.14-F-001) to ensure that:

- all processes including pre-examination, examination and post-examination are conducted in a manner that meets the needs and requirement of patients and Clinician;
- the laboratory complies with its quality management system;

- Effectiveness of the quality management system is continually improved.

All results of evaluation and audit activities are discussed in the management review.

Periodic review of requests, and suitability of procedures and sample requirements

The staffs of MHL compile annual report of all examination requests received in their respective section indicating what test were done and what was not done and stating the reasons . This information is discussed in management review with intention of either expanding scope of services according to need or considering customer need which are not cost effective to run. The staffs also review sample volume, collection devices and preservative requirements needed for appropriate in accordance with available examination procedures.

Assessment of user feedback

MHL seeks both positive and negative feedback from its patients, Clinicians and other customers through bi-annual customer satisfaction survey, suggestion book and Suggestion box. The quality officer is responsible for summarizing the feedback into report that are shared with Hospital management and maintaining the records of all action taken. Names of patients and Clinician are not included in summary report for confidential information.

Staff suggestions

MHL encourages its staff to raise suggestions for improvement in their respective responsibilities in staff suggestion form (MHL-4.14-F-002). Suggestions can be submitted to Quality officer or hospital management member. The suggestions are discussed during monthly Hospital management meetings and an action agreed is implemented and communicated to staff during weekly meetings. The quality Officer maintains records of staff suggestions and action taken.

Internal audit

The quality Officer schedules internal audit in the annual quality plan (MHL-4.14-F-001).All activities including pre-examination, examination and post-examination are audited once a year to ensure that they conform to requirement of ISO 15189:2012 and to the laboratory quality management system as well as to ensure effective implementation and maintenance of the system.

Trained personnel conduct audit of both management and technical requirements at the same time maintaining objectivity by ensuring that they do not audit their own activities.

The quality Officer in collaboration with internal auditors plan the audit activities which includes defining objectives, scope, criteria, methods and assigning auditors to different sections and stating the actual audit dates. The planning is done at least two weeks before the audit on internal audit plan template (MHL-4.14-F-003) and distributed to all staff concerned. Internal auditors verify effectiveness of corrective action for previous audit before undertaking the new one.

The team leader of the internal auditors compiles final audit report (MHL-4.14-F-004) drawing conclusion on whether objectives were met and presents it in Hospital meetings. Every staff is responsible for doing corrective actions within time frame agreed with internal auditor.

A procedure for internal audit (MHL-MSOP-10) has been developed which defines responsibilities and planning of audit as well as reporting results and maintain records.

Risk management

MHL evaluates impact of work processes and potential failures on examination results as they affect patient safety and come up with the action plans to prevent, reduce or eliminate the identified risks. The evaluation and action plans are documented on the risk assessment form (MHL-4.14-F-00). A procedure (MHL-MSOP-11) has been developed defining evaluation processes as well as coming up with improvement plan.

Quality indicators

Mojo Hospital management establishes and reviews quality indicators during annual management review to monitor and evaluate performance of its activities of QMS including pre-examination, examination and post-examination process. The management agrees on the objectives, methodology, interpretations, target limits, action plan and duration of measurement of quality indicators during the management review. The quality Officer ensures that process of monthly monitoring of quality indicators are planned on work sheet (MHL-4.14-F006). Quality officer monitor monthly quality indicator data on form (MHL-4.14-F-007) and present in management review.

MHL establishes turn-around time for each of examination in consultation with Clinicians. Turn-around time is monitored monthly by Quality Officer.

Review by external organizations

MHL follows its procedure for corrective action to address all non-conformities identified by external organizations such as OPHRCBQAL, ORHB and partners. The Quality Officer maintains records generated thereof.

Supporting documents

- Annual quality plan_ MHL-4.14-F-001
- Staff suggestions from _ MHL-4.14-F-002
- Internal audit plan template_ MHL-4.14-F-003
- Internal audit report form _ MHL-4.14-F-004
- Procedure for internal audit _ MHL-MSOP-10
- Risk assessment form_ MHL-4.14-F-005
- Procedure for risk management _ MHL-MSOP-11

- quality indicator planning work sheet_ MHL-4.14-F-006
- Monthly sectional quality indicatory form _MHL-4.14-F-007
- Procedure for corrective action _ MHL-MSOP-07

Management review

General

Mojo Hospital management reviews the effectiveness, continued suitability and adequacy of its quality management system in support of patient care annually as scheduled in the annual quality plan (MHL-4.14-F-001).

Review in put

The minimum agenda of the management reviews is as follows:

- a) the periodic review of requests, and suitability of procedures and sample requirements;
- b) assessment of user feedback;
- c) staff suggestions;
- d) internal audits;
- e) risk management;
- f) use of quality indicators;
- g) reviews by external organizations;
- h) results of participation in inter-laboratory comparison programs (PT/EQA);
- i) monitoring and resolution of complaints;
- j) performance of suppliers;
- k) identification and control of nonconformities;
- l) results of continual improvement including current status of corrective actions and preventive actions;
- m) follow-up actions from previous management reviews;
- n) changes in the volume and scope of work, personnel, and premises that could affect the quality management system;
- o) recommendations for improvement, including technical requirements;
- p) Review of quality policy and quality objectives for continued suitability.

Review Annual activities

The quality Officer prepares the annual report preparation form (MHL-4.15-F-001) at least two weeks before the management review defining reports needed for discussion and people responsible for preparing reports. As much as practical the reports are prepared showing trends over time for easy interpretation and following patterns.

Review output

The output of the management review includes minutes of discussions made and action plans for improvement of quality management system activities, improving services to Customer and identification of resource needs and allocations. All staffs are informed of discussions made in management review including action taken in weekly staff meetings. The laboratory head makes quarterly follow ups implementation of action agreed in management review.

Supporting documents

- Annual quality plan_ MHL-4.14-F-001
- Annual report preparation form_ MHL-4.15-F-001

TECHNICAL REQUIREMENTS

Personnel

General

MHL has a procedure for personnel management (MHL-MSOP-12) which is followed when managing personnel from the point of recruiting up to retirement. The laboratory head maintains personnel files with technical record while hospital human resource manager maintains the administrative records.

Personnel qualification

Mojo Hospital management has documented personnel qualifications for each position which also reflect the education, training, experience, and skills needed for the position.

All technical staff performing examination procedures and releasing patient result have diploma in laboratory technology at a minimum.

Job description

MHL has a job description for all positions that describe responsibility and authority for personnel.

Personnel introduction to the organizational environment

Medical director ensures that all new staffs joining the laboratory are introduced to the different sections, staff facilities, health and safety requirement, terms and conditions of employment and occupational health services during the first month of employment using orientation check list (MHL-5.1-F-001).

Training

MHL provide training for all personnel which include:

- a) quality management system coordinated by quality Officer annually;

- b) assigned work processes and procedure by laboratory head/quality officer before staff start working in the section;
- c) health and safety by safety officer annually;
- d) ethics by hospital human resource manager once before starting work;
- e) Confidentiality of patient information by laboratory Head/ Hospital human resource manager.

Personnel undergoing training are supervised by laboratory head/quality Officer until competency assessment is done.

The effectiveness of the training program is reviewed by use of training feedback from the trained staff, competency assessment and/or practical evaluation implementation of the training conducted.

Competency assessment

Following training in their respective sections, laboratory professional are assessed for technical competency by their assigned competent certified staff. Competency assessment is done annually for senior staffs and bi annually for newly hired staffs. Anyone who fails is offered more internal (on job) and external training. The criteria for competency assessment are defined in the procedure of personnel management (MHL-MSOP-12).Records for technical competency assessment is captured on form (MHL-5.1-F-002).

Reviews of staff performance

Mojo Hospital uses a government compressive 360⁰evaluation tool (ED-01) for staff performance evaluation bi-annually by Evaluation committee. The medical director and human resource approves the evaluation process.

Continuing education and professional development

Mojo Hospital provides continuous education opportunities in collaboration with regional health bureau according to their performance and service year.

Mojo Hospital laboratory head plan training for staff (MHL-5.1-F-003) and participate in service trainings as part of continuous professional development organized by OPHRCBQAL and EPHI and all staff are required to participate.

Personnel records

Records of the relevant educational, professional qualifications, training, experience and competence of all personnel are maintained by laboratory Head.

Supporting documents

- Procedure for personnel management _ MHL-MSOP-12
- Staff orientation check list _ MHL-5.1-F-001
- Technical competency assessment form _ MHL-5.1-F-002

- Comprehensive 360° evaluation tool_ ED-01
- Staff training plan _ MHL-5.1-F-003

Accommodation and Environmental Conditions

General

MHL has space to perform its work without compromising quality, safety and efficacy of the services provided to patients and health facilities as well as ensuring health and safety of laboratory staff, patients. Laboratory Head evaluates and determines the sufficiency and adequacy of the space whenever there is need to expand scope of services and/or new equipment is to be brought in. Similar provision made for sample when sample collected at ward and when we perform POC testing like random blood sugar testing, HIV testing

Laboratory and office facility

- Technical sections are equipped with enough electricity, light, ventilation and water supply to allow for the correct performance of examination procedure.
- Waste disposal bins and sharps containers are also available for safe disposal of solid waste while designated drainage system is used for disposing liquid waste (refer to safety manual and health and safety guideline for public health laboratories in Ethiopia_(ED-02).
- The laboratory is safe environment for staff by having firefighting equipment which is serviced annually by external contractors, first aid kit, and spill kit in common which is checked for functioning monthly by Safety Officer.

Storage facilities

Mojo Hospital laboratory has enough storage facilities for reagents, consumables, samples, equipments, records and documents. Samples and reagents are kept in different refrigerators to avoid cross contamination.

Staff facilities

Mojo Hospital laboratory has enough washrooms, clean supply of drinking water and storage facilities for personal protective clothing and equipment.

Patient sample collection facilities

Mojo Hospital laboratory has a separate patient waiting area and sample collection room where patients are served one at a time for privacy and confidentiality. Toilets are also available for patients. Sample collection room is equipped with sample collection materials. A first aid kit which is checked for functioning by Safety Officer is available in the sample collection room for use on staff and patient.

Facility maintenance and environmental conditions

Environmental temperatures are monitored daily and benches are decontaminated daily by laboratory staffs in respective sections. Floors are cleaned once daily by janitors. Additional cleaning is done between run if it is necessary.

Different examination procedures are done in separate rooms to avoid cross contamination.

Supporting document

- Safety manual_ MHL-SM-03
- health and safety guideline for public health laboratories in Ethiopia_ ED-O2
- Temperature monitoring charts_ MHL-5.2-F-001
- Eye wash station maintenance chart_ MHL-5.2-F-002
- Emergency shower maintenance chart_ MHL-5.2-F-003
- First aid kit monitoring chart_ MHL-5.2-F-004
- Spill kit monitoring chart_ MHL-5.2-F-005

Laboratory equipment, reagents, and consumables

Equipment

General

Mojo Hospital laboratory has a procedure (MHL-MSOP-13) for equipment management which gives details on the selection, purchasing and management of equipment. MHL furnished with all equipment needed for the provision of services in its scope including for sample collection, sample preparation and sample processing. MHL does not use equipment outside its permanent control.

Equipment acceptance testing

Bio-medical engineers from the supplying company perform installation of new equipment and generate all necessary records proving that installation passed. After successful installation, staffs are trained on operating and maintaining the equipment.

Trained staff analyzes known samples on the equipment to ensure proper functioning of equipment. Laboratory head is responsible for ensuring operator qualification is done

Studies to verify that the equipment performs as intended by the manufacturer and as expected by MHL are done. Quality officer is responsible for ensuring performance qualification is done. All equipments are uniquely identified by their serial numbers and laboratory generated ID numbers.

Accept equipment by checking and record equipment acceptance criteria checklist_ MHL-5.3-F-001

Equipment instructions for use

MHL has authorized its trained staff to perform examination procedures including use of equipment. Equipment manuals are readily accessible to staff. Procedure for equipment management (MHL-MSOP-13) gives guidelines and makes reference to equipment manuals on safe handling, transportation and storage of equipments to prevent its contamination or deterioration.

Equipment calibration and metrological traceability

MHL outsource calibration service of its ancillary equipment such as thermometers, micropipettes, centrifuges from National metrology institute of Ethiopia.

Assay calibration of analyzers is done as per operator manual.

Equipment maintenance and repair

MHL has preventive maintenance program for its equipment which is developed based on manufacturer recommendations as given in equipment manual. Annual and/or bi-annual service of equipment by engineers is organized by EPHI who enter in to service agreement with the vendors.

Defective equipments are decontaminated and clearly labeled as “**do not use**” and date when equipment broke down. The engineer is shown record of equipment decontamination (MHL-5.3-F-002) and provided with personnel protective equipments before performing any repairs or service. After service or repair, equipment is checked for proper function by analyzing calibration and control materials and obtaining expected results.

Laboratory head is responsible for assessing results released from the equipment before it broke down and any affected samples are reanalyzed, affected results recalled and corrected result reissued.

When any equipment is taken out of the laboratory for services /repairs, laboratory head /quality officer ensure its proper function by calibrating and running controls upon its return.

Equipment adverse incident reporting

Any adverse incidents and accidents that can be attributed directly to equipment are investigated by laboratory personnel and reported to laboratory head and the laboratory head report to Medical director who in turn reports in writing to , ORHB or directly to the vendors. And record on equipment adverse incidence report (MHL-5.3-F-003)

Equipment records

Laboratory head maintain equipment records on equipment inventory form (MHL-5.3-F-004) and in book of life. Equipment records are retained for periods defined in documents and record retention time (MHL-4.5-F-004).

Reagents and consumables

General

MHL has a procedure (MHL-MSOP-14) for reagents and consumables management which defines how reagents and consumables are received, accepted, stored and inventory controlled.

Reagents and consumables – Reception and storage

A laboratory head is responsible for receiving and ensuring proper storage of reagents and consumables according to manufacturer recommendations. Reagents are received according to criteria in checklist MHL-5.3-F-005.

Reagents and consumables – Acceptance testing

Quality control is done for each shipment of reagents received and records are maintained by laboratory staffs. Where quality control cannot be done immediately after receipt, the reagents are clearly labeled as “waiting for QC”. The label is removed after QC performed.

Reagents and consumables – Inventory management

The mini store room of MHL has bin card (ED-03) for monitoring consumption of reagents and consumables that includes stock level, expire date, lot number and balance. Laboratory staff update the reagent daily consumption log (MHL-5.3-F-006). Physical inventory of reagents and consumables is done quarterly by Store man on form number MHL-5.3-F-007.

Reagents and consumables – Instructions for use

Laboratory staff maintain leaflet for reagents and consumables in their respective sections for making reference when required. A file of Material Safety Data Sheet (MSDS) ED-07 is kept in mini store room.

Reagents and consumables – Adverse incident reporting

Any adverse incidents and accidents that can be attributed directly to reagents and consumables are investigated by staffs and reported to laboratory head and the laboratory head report to Pharmacy unit who in turn reports in writing to OPHRCBQAL, Zonal health department , and PFSA or directly to the vendors.

Reagents and consumables – Records

Reagent receiving checklist, bin card, quarterly physical Inventory and reagent daily consumption log are used together to ensure records for reagents and consumables are maintained.

Supporting documents

- Procedure for equipment management _ MHL-MSOP- 13
- Procedure for reagent and consumable management _ MHL-MSOP- 14
- Check list for receiving reagents and consumables _ MHL-5.3-F-005
- Bin Card _ ED-03
- Equipment decontamination form _ MHL-5.3-F-002
- Equipment inventory form _ MHL-5.3-F-004
- Document and record retention time form _MHL-4.5-F-004
- Reagents daily consumption log _ MHL-5.3-F-006
- Physical inventory count form _ MHL-5.3-F-007
- Checklist for receiving equipment_MHL-5.3-F-001

Pre examination processes

General

MHL has procedure for collection, handling, packaging and transportation of specimen (MHL-MSOP-15) to ensure the validity of the test result of examination

Information for patient and users

MHL has a developed a laboratory hand book (MHL-LHB-02) giving details on information for pre-examination processes to be used by patient, clinician and customer.

The laboratory hand book (MHL-LHB-02) includes:-

- The location of the laboratory
- Type of clinical service offered by the laboratory
- Opening hours of the laboratory
- Primary sample volume, special precautions
- Turnaround time
- Instruction for completion of request form
- Instruction of preparation of patient
- Instruction for patient collected samples
- Instruction for transportation sample
- Accepting and rejection criteria
- Preservative used
- Patient information confidentiality
- Laboratory complaint procedure

Request form information

MHL uses ministry of health request form for ART monitoring (ED-04), for HIV DNA-PCR (ED-05), for TB request form (ED-06), and for other tests use internally developed request form.

Request forms used in MHL contain the listed information but not limited

Patient identification include sex, date of birth/age, location, contact details of the patient and MRN

Name and signature of requesting clinician

Type of primary sample

Examination requested

Clinical relevant information

Date and time of primary sample collection

MHL accept verbal request on sample already submitted to the laboratory however, the requesting clinician is required to send the signed request form before the result can be released. Procedure for verbal request (MHL-MSOP-16) is available to be followed by staff.

MHL has enough, secure storage facilities for samples to ensure they do not deteriorate during pre-examination activities, handling and preparation. Time limits for additional request are defined in the Laboratory hand book.

Primary sample collection and handling

MHL has a procedure (MHL-MSOP-15) which gives clear instruction for sample collection and handling.

Sample transportation

MHL has a procedure (MHL-MSOP-15) which gives clear instruction for sample transportation

Supporting document

- laboratory hand book_ MHL-LHB-02
- HIV1 DNA-PCR request form _ED-05
- ART monitoring request form _ED-04
- TB request form_ ED-06
- Procedure for verbal request _ MHL-MSOP-16

Examination Processes

Selection, verification and validation of examination procedures

General

MHL uses well known examination methods which are well referenced from literature and equipment that is validated by their manufacturers for intended use. Laboratory experts performing examination activities are identified by their initials in request paper.

Verification of examination procedures

MHL uses the examination methods and equipments as acquired from manufactures without any modifications. Studies to verify that these methods perform as intended are done before they are put into use or when major parts like mother board of equipment are replaced. Verification studies take into account performance claims by manufactures as well as expectations of laboratory as acceptability criteria for approving method for use. A procedure for verification of examination method (MHL-MSOP-17) has been developed which defines the different studies to be considered when verifying both quantitative and qualitative methods. A verification protocol is developed by Quality officer, reviewed and approved by Laboratory head. The protocol defines objective, method and materials, result analysis, interpretation, acceptability criteria and responsibilities of performing study. Review and approval of verification result is done by quality officer and laboratory head.

Validation of examination procedure

MHL does not use any non standard methods, nor does not design, developed or modify any methods. Therefore MHL does not perform any validation of methods.

Measurement uncertainty of measured quantity values

MHL has determined uncertainty of measurement values (MHL-5.5-F-001) of its quantitative methods to be used when helping clinicians to interpret patient results, and to determine the inherent error in the system. MHL has defined expected values of measurement uncertainty of each quantitative method and these are compared with values obtained from annual estimates. A procedure for uncertainty of measurement (MHL-MSOP-18) has been developed to guide staff in estimating uncertainty of values. When clinicians or other stake holders request uncertainty of measurement of values BHL cooperates.

Biological reference intervals or clinical decision values

MHL has adopted biological references from kit inserts and this has been communicated to health facilities through the Laboratory hand book. Critical values have been established in consultation with local clinicians and are also communicated to patient and clinician through

Laboratory hand book. Whenever examination procedures are changed such that reference ranges and critical values are different, the laboratory hand book is updated and clinicians are informed by laboratory.

Documentation of examination procedures

MHL has documented all examination procedures used in its different sections and available at each work station. Job aids used for quick reference at some work stations have ID numbers which correspond to a documented procedure. All examination procedures and job aids are controlled according to document control procedure (MHL-MSOP-01).

All examination procedures are written in standard format as defined in document control procedure which complies with the requirements of ISO 15189:2012.

If BHL intends to change any examination procedures such that results or their interpretations could be significantly different, the implications are explained to clinicians and patient before putting new procedure in service.

Supporting documents

- procedure for verification of methods _ MHL-MSOP-17
- uncertainty of measurement values form _ MHL-5.5-F-001
- procedure for uncertainty of measurement _ MHL-MSOP-18
- procedure for document control _ MHL-MSOP-01

Ensuring Quality of Examination Results

General

MHL is implementing quality management system to ensure that examinations performed are standardized. All staffs have declared in the ethical conduct form (MHL-4.1-F-001) that they will not fabricate any results.

Quality control

General

MHL has defined frequency and type of internal quality control procedures in each technical standard operating procedure that verify the attainment of the intended quality of results.

Quality control materials

MHL uses commercial and/or in-house internal quality control materials that react to the examining system in a manner as close as possible to clinical sample. The frequency of examining quality control materials is defined in each technical standard operating procedure and is based on stability of the procedure and risk of harm to the patients from erroneous results.

Quality control data

Procedure for review of quality control data (MHL-MSOP-19) has been developed to guide staff on reviewing and interpretation of quality control results which prevents release of patient results in event of quality control fail. When quality control chart and multi rule systems detect any random or systematic errors, preventive actions are put in place. Laboratory staffs review quality control data on a daily bases while Quality Officer review the data monthly.

Inter-laboratory comparisons

Participation

MHL participates in external quality assessment (EQA) for all its examination methods on a quarterly and biannual provided by OPHRCBQAL and Three times a year provided by one world accuracy. The Quality Officer and laboratory staffs performing EQA samples monitor results and implement corrective actions when results are unacceptable. Procedure for participation in EQA (MHL-MSOP-20) has been developed which defines instructions for participation and review of the performance. The EQA programs are adequate to check the entire examination process including pre-examination and post-examination process in a manner that resembles as close as possible to patient samples.

Analysis of inter-laboratory comparison samples

MHL ensures that EQA samples are integrated into routine work flow in a manner that resembles handling of patient samples. The EQA samples are analyzed by laboratory staffs who analysis routine patient samples using the same examination procedures. Laboratory staffs are not allowed to communicate with other participating laboratories about EQA sample data until after results are submitted. EQA samples are not referred to other laboratory for confirmatory tests nor are staffs advice sought. Staffs are bound by ethical conduct declaration (MHL-4.1-F-001) to abide by this regulation.

Evaluation of laboratory performance

Quality Officer and laboratory staffs of involved in analyzing EQA samples are responsible for review of performance and implementing corrective actions when results are not acceptable. Laboratory staff monitors the effectiveness of corrective action taken through daily internal quality control and subsequent EQA. Quality officer compile annual report on performance in EQA which is used as preventive actions to detect trends. The reports are presented and discussed in management reviews.

Comparability of examination results

MHL conduct annual comparison studies on equipment or examination methods performing the same tests in order to have confidence in using methods parallel to each other. Any differences in comparability and their effect to patient samples are discussed with clinicians during annual review meetings. Laboratory staff persons maintain comparability records and any actions taken as a result of problem identified.

Supporting documents

- procedure for review of internal quality control results _ MHL-MSOP-19
- Procedure for participation in EQA _ MHL-MSOP-20
- ethical conduct declaration form_ MHL-4.1-F-001

Post- Examination Processes

Review of results

MHL has procedures (MHL-MSOP-21) to ensure results are reviewed and released by authorized laboratory personnel. The review process takes into account results of internal quality control and clinical history of the patient.

Storage, retention and disposal of clinical samples

MHL has a procedure (BHL-MSOP-22) for sample management which defines identification, collection, retention, indexing, access, storage, maintenance and safe disposal of clinical samples.

The period of sample retention is defined in sample retention schedule (MHL-5.7-F-001).

Samples are safely disposed in accordance with health and safety guideline for public health laboratories in Ethiopia (ED-02).

Supporting document

- procedure for reporting and releasing result _MHL-MSOP-21
- procedure for sample management_ MHL-MSOP-22
- sample retention schedule_ MHL-5.7-F-001
- Health and safety guideline for public laboratory in Ethiopia_ED-02

Reporting of Result

General

MHL report results by writing on request paper manually which ensures accuracy, clarity, unambiguously in accordance to procedure for reporting and releasing of results (MHL-MSOP-21) and as per examination procedures. Result review process ensures checking of transcription or transmitting errors before results are released by authorized laboratory

personnel. Reports are released with reference ranges, in SI unit, with clinic history of patient and accompanied by any relevant comments on integrity of sample. This ensures correct interpretation of laboratory results. Transistor of MHL will give OPD results to respective units.

Report attribute

Laboratory personnel authorized to report results ensure that where relevant:

- Comments on sample quality that might compromise examination results are made;
- Comments on regarding sample suitability with respect to acceptance/rejection criteria are made;
- Critical results are timorously communicated through as fast as possible verbally or telephone on the report:
- Interpretive comments are made.

Report content

MHL report content Include but not limited

- identification of the examination
- the identification of the laboratory that issued the report;
- identification of all examinations that have been performed by a referral laboratory;
- patient identification and patient location
- name and signature of the requester
- date of primary sample collection (and time, when available and relevant to patient care);
- type of primary sample;
- examination results reported in SI units, units traceable to SI units, or other applicable units;
- biological reference intervals, clinical decision values
- interpretation of results
- comments which may have compromised the result
- identification of the person(s) reviewing the results and authorizing the release of the report
- date of the report, and time of release (if not contained in the report, readily available when needed);
- page number to total number of pages

Supporting document

- Procedure reporting and releasing result_ MHL-MSOP-21
- Acceptance and rejection criteria_ laboratory. Hand book

Release of Results

General

MHL has a procedure for reporting and releasing of results (MHL-MSOP-21) which guide authorized laboratory personnel on how to release results and to whom. BHL does not issue results of infectious diseases (HIV screening test) directly to patients. Such results are communicated to requesting clinicians

Staffs ensure that when suitability of primary sample was compromised, it is indicated in the report. Laboratory personnel are responsible for communicating critical results to clinicians through laboratory transitor or by verbally with the clinicians or nurses and ensuring that the report gets to the units in the shortest possible time. When interim reports are issued pending confirmatory test, laboratory personnel ensure the final report is issued in the shortest possible time. When results are communicated through telephone, the laboratory personnel ask the identity of the received person to ensure that results reach only authorized personnel. Such communications are captured in communication log (MHL-4.4-F-001).

Automated selection and reporting of results

MHL does not operate a system which automatically selects and report results. All results are verified manually by authorized personnel before releasing.

Revised report

Procedure for reporting and releasing of results (MHL-MSOP-21) gives instructions on how to revise original reports. Laboratory staffs authorized to revise reports ensure that:

- the revised report is clearly identified as revised and makes reference to the date and patients identity in the original report;
- the requesting clinician is made aware of the revision and original report is recalled by laboratory head and revised report is re-issued;
- the revised report shows date and time of the change and name of person responsible for the change;
- the original report entries remain in the records when revisions are made;

- The responsible person maintains records of revised reports.

Supporting documents

- Procedure for reporting and releasing of results_ MHL-MSOP-21
- communication log _MHL-4.4-F-001

Laboratory information management

General

MHL staffs have access to data and information needed to provide service which meets the needs and requirement of patients. Procedure for ensuring confidentiality of patient information (MHL-MSOP-23) is available and staff have also signed ethical conduct declaration (MHL-4.1-F-001) preventing them from disclosing patient confidential information from unauthorized persons.

Authorities and responsibilities

Mojo Hospital laboratory staffs are authorized through their job descriptions to perform one or all of the following:

- access patient data and information;
- enter patient data and examination results;
- change patient data or examination result;
- release examination result and report

Information system management

Mojo hospital has 24 hour security. All staffs are issued with ID card to enter in to the compound and to the laboratory. This ensures the Laboratory information system is protected from unauthorized persons as well as from tempering or loss.

Supporting documents

- Procedure for ensuring confidentiality of patient information_ MHL-MSOP-23
- procedure for the operation and maintenance of Laboratory information system_ MHL-MSOP-24

References

- ISO 15189:2012 – Medical Laboratories – Particular requirements for quality and competence

- QMS02-A6, Quality management system: development and management of laboratory documents; approved guideline- six edition. February 2013

Chapter IX: Research

9.1 Determinants of pulmonary tuberculosis in public health facilities of Dire Dawa town, Eastern Ethiopia, case control study 2017.

Abstract

Background: The World Health Organization global reports on Tuberculosis showed that Ethiopia is among the ten top high burden countries in terms of prevalence or incidence. According to Federal Ministry of Health Annual performance report in 2014/15 there was high Tuberculosis case notification in Dire Dawa Town in 2014/15 which was 400/100,000 cases were reported. Therefore, the aim of this study was to identify the determinants of pulmonary tuberculosis among individuals aged above 15 years old in public health facilities of Dire Dawa city Administration

Methods: Unmatched case–control study design was implemented in public health facilities of Dire Dawa town from October to December 2017. The study population included 285 subjects (95 cases and 190 controls in a ratio of 1:2). The data was entered into Epi-Info 7, then cleared and analyzed with SPSS version 20. A binary logistic analysis was used to measure the association between the dependent variable and independent variables using an OR and 95% CI and Statistical significance was set at $\alpha \leq 0.05$.

Result: The mean age was 32.46 ± 12.72 years and 32.66 ± 12.54 years for cases and controls respectively. Multivariable logistic regression showed that patients who had no formal education (AOR: 7.6; 95% CI, 3.7–15.4), Male patients (AOR: 2.9; 95% CI: 1.5-5.5), having no income and earning low income (AOR: 3.9; 95%CI: 1.4-10.7) and (AOR: 2.8; 95%CI: 1.2-6.5) respectively, housing affordability (Rented) (AOR: 4.9; 95%CI: 2.6-9.4), HIV Positive (AOR: 3.3; 95%CI: 1.2-9.4), contact history (AOR: 8.6; 95% CI: 3.9–19.3), Low Body Mass Index (AOR: 19.8; 95%CI: 8.7-45.5), cigarette smoking (AOR: 7.7; 95%CI: 2.7-21.8) and having separated kitchen (AOR: 0.25; 95%CI: 0.13-0.48) were significantly associated with pulmonary TB status.

Conclusion: This study showed Gender, Educational status, Monthly income, Smoking cigarette, Contact history, Low Body Mass Index, Being HIV positive and having separated kitchen were significantly associated with being infected with Pulmonary TB. Efforts to reduce Pulmonary TB infection among HIV patients should be strengthened by health professionals especially at ART department.

Introduction

Background

Tuberculosis (TB) is an infectious disease caused by the bacillus *Mycobacterium tuberculosis*. It typically affects the lungs (pulmonary TB) but can affect other sites as well (extra pulmonary TB)(1). The disease is spread in the air when people who are sick with pulmonary TB expel bacteria, for example by coughing. In general, a relatively small proportion of people infected with *Mycobacterium tuberculosis* will go on to develop TB disease; however, the probability of developing TB is much higher among people infected with the human immune deficiency virus (HIV)(2). TB is also more common among men than women, and affects mostly adults in the economically productive age groups; around two-thirds of cases are estimated to occur among people aged 15–59 years (1).

The most common method for diagnosing TB worldwide is sputum smear microscopy (developed more than 100 years ago), in which bacteria are observed in sputum samples examined under a microscope. In countries with more developed laboratory capacity, cases of TB may also be diagnosed via culture methods (the current gold standard) or, increasingly, using rapid molecular tests (1). There are also tests for TB that is resistant to first and second-line anti TB drugs. They include Xpert MTB/RIF, which simultaneously tests for TB and resistance to rifampicin (the most effective first-line anti-TB drug); rapid line probe assays (LPAs) that test for resistance to rifampicin and isoniazid (referred to as first-line LPAs); a rapid LPA that tests for resistance to fluoroquinolones and injectable anti-TB drugs (referred to as a second-line LPA); and sequencing technologies. First-line LPAs were first recommended by World Health Organization in 2008; the second-line LPA was first recommended in May 2016. Culture-based methods currently remain the reference standard for drug susceptibility testing (3).

TB is a multi-factorial disease in which environmental and individual factors contribute to the disease process (4). An individual with acquired immune deficiency syndrome (AIDS) is 110–170 times more likely to develop TB than a person with no known risk factors, and an individual with HIV has a risk of 50–110 times greater than a person with no known risk factors (5). Individuals with HIV have deficient immune systems for immunologic containment. Globally, TB is the leading cause of mortality of people with HIV.

Statement of the problem

Tuberculosis (TB), one of the most wide spread infectious disease, is ranked as the first leading cause of death from an infectious disease worldwide, in 2014, TB killed 1.5 million people (1.1 million HIV-negative and 0.4 million HIV-positive) (6). The toll comprised 890,000 men, 480,000 women and 140,000 children. Worldwide, 9.6 million people are estimated to have fallen ill with TB in 2014; 5.4 million men, 3.2 million women and 1.0 million children. Globally, 12% of the 9.6 million new TB cases in 2014 were HIV-positive (6).

In 2014, a marked increase in global TB notifications for the first time since 2007 was measured. The annual total of new TB cases, which had been about 5.7 million until 2013, rose to slightly more than 6 million in 2014 (an increase of 6%) whereas In 2015, 6.1 million new TB cases were notified to national authorities and reported to WHO. This was mostly due to a 29% and 34% increase in notifications in India in respective years, which followed the introduction of a policy of mandatory notification in May 2012, creation of a national web-based reporting system in June 2012 and intensified efforts to engage the private health sector. India accounted for 27% of global TB notifications in 2014. The African Region had 28% of the world's cases in 2014, but the most severe burden relative to population: 281 cases for every 100,000 people, more than double the global average of 133 (3,6).

Despite the availability of efficacious anti-TB treatments for decades, TB remains a major global health problem (2). The emergence of multidrug resistance tuberculosis (MDRTB) and the pandemic of human immunodeficiency virus/ acquired immunodeficiency syndrome (HIV/AIDS) worsen the burden of TB in Africa including Ethiopia (7).

African countries in the Sub-Sahara including Ethiopia are highly affected by TB. The World Health Organization (WHO) global reports on TB showed that Ethiopia is among the ten top high burden countries in terms of prevalence or incidence cases of TB (3,6). TB affects mostly adults in the economically productive age groups; around two-thirds of cases are estimated to occur among people aged 15–59 years and also more common among men than women (1). According to (WHO) global report, a total of 135,951 new and relapse TB case were notified in 2015. Among which 70% were Pulmonary TB. The estimated incidence and mortality during this year was 191 and 29 per 100.000 populations respectively (3).

According to Federal Ministry of Health (FMOH) Annual performance report in 2014/15 there was very high TB case notification in Dire Dawa Town in 2014/15 which was 400/100,000 TB case were reported (8).

Risk factors for TB identified in other parts of the world include intensive immigration from high prevalence to low prevalence countries, contact with a TB patient, poor socio-demographic factors, tobacco smoking, alcohol abuse, HIV infection and institutionalization (9–13).

However, the Risk factors associated with Pulmonary TB (PTB) in our study area were not known. Therefore, the purpose of this study is to determine the risk factors associated with pulmonary tuberculosis among individuals aged 15 years and above attending in government public health facilities of Dire Dawa city Administration.

Rationale for the study

Since Dire Dawa Town reports the highest TB case in Ethiopia in 2014/15, the finding from this study will be beneficial to Dire Dawa City Administration Health Office and other stakeholders that offer TB diagnosis and treatment because Identifying the determinant risk factors will helpful to improve, programmatic importance implication, Reduction of chain of transmission and It can also be used as stepping board for those who will do further study on this area.

Literature Review

Socio-demographic and socio-economic related factors

Gender:- A facility-based unmatched case-control study which was done at Ambo Hospital from 01 December 2011 to 29 March 2012, western Ethiopia showed Being male in Gender was significantly associated with Pulmonary Tuberculosis (14). Similar study which was conducted in Guinea, Guinea Bissau, and Gambia, from January 1999 to March 2001 showed that male in Gender was significantly associated with pulmonary tuberculosis (15). However similar study which were conducted at Metema District Hospital, North-West Ethiopia and at hospitals of Pakistan showed that Gender was not associated with pulmonary TB (16) (17).

Educational status: - A case-control study which was conducted from March 12 to April 5, 2013 in Metema District Hospital, North-West Ethiopia showed that being illiterate was significantly associated with pulmonary Tuberculosis(16). Similar studies which were conducted at St John's Medical College Hospital, Bangalore, India, from October 2001 to October 2003 and in Croatia from 2006-2008 showed that low educational level was significantly associated with pulmonary tuberculosis(13)(18). However studies which were conducted at Malawi from September 2001 to November 2002 and at hospitals of Pakistan educational status was not associated with pulmonary Tuberculosis(19)(17).

Occupation:- A facility based case-control study which was conducted at the health centers in Semarang District, Indonesia from 2012 January to 2013 October showed that being a farmer was significantly associated with pulmonary Tuberculosis (20). However studies which were conducted at Malawi and at hospitals of Pakistan Occupation was not associated with pulmonary Tuberculosis(19)(17).

Marital status: - A facility-based unmatched case-control study which was done at Ambo Hospital from 01 December 2011 to 29 March 2012, western Ethiopia showed that being single was significantly associated with pulmonary Tuberculosis(14). Similar study which was conducted at West Africa in Guinée, Guinea Bissau, and The Gambia, from January 1999 to March 2001 showed that being single was significantly associated with pulmonary Tuberculosis(15). However studies which were conducted at Malawi and at hospitals of Pakistan Marital status was not associated with pulmonary Tuberculosis(19)(17).

Income:- A facility based case–control study which was conducted at the health centers in Semarang District, Indonesia from 2012 January to 2013 October showed that having low income was significantly associated with pulmonary Tuberculosis (20). However a study which was conducted at St John’s Medical College Hospital, Bangalore, India, from October 2001 to October 2003 showed that Income was not associated with pulmonary Tuberculosis(13).

Housing affordability:- A facility-based unmatched case-control study which was done at Ambo Hospital from 01 December 2011 to 29 March 2012, western Ethiopia (14); study which was conducted at West Africa in Guinée, Guinea Bissau, and The Gambia, from January 1999 to March 2001 (15) and A case–control study which was done in 3 major tertiary hospitals of Pakistan from September 2002 to November 2003 (17) showed that poor housing affordability was significantly associated with pulmonary Tuberculosis.

Behavioral and health related factors

Contact with TB patient:- A case-control study which was conducted from March 12 to April 5, 2013 in Metema District Hospital, North-West Ethiopia showed that having contact with TB patient was significantly associated with pulmonary Tuberculosis(16). In addition to this a case-control study which were conducted at Malawi from September 2001 to November 2002 (19); A facility based case–control study which was conducted at the health centers in Semarang District, Indonesia from 2012 January to 2013 (20); A case–control study which was done in 3 major tertiary hospitals of Pakistan from September 2002 to November 2003 (17) and in Croatia from 2006-2008 (18) showed that having contact with TB patient was significantly associated with pulmonary tuberculosis.

HIV status:- A facility-based unmatched case-control study which was done at Ambo Hospital from 01 December 2011 to 29 March 2012, western Ethiopia (14); a case-control study which were conducted at Malawi from September 2001 to November 2002 (19) and a study which was conducted at West Africa in Guinée, Guinea Bissau, and The Gambia, from January 1999 to March 2001 (15) showed that being HIV positive was significantly associated with pulmonary tuberculosis.

Diabetes status:- Case-control studies which were conducted at St John’s Medical College Hospital, Bangalore, India, from October 2001 to October 2003(13) and in Croatia from 2006-2008 (18) showed that being diabetic was significantly associated with pulmonary tuberculosis.

Body Mass Index:- Case-control studies which was done at Ambo Hospital from 01 December 2011 to 29 March 2012, western Ethiopia (14) and in Croatia from 2006-2008 (18) showed that being under weight was significantly associated with pulmonary tuberculosis. However a study which was conducted at St John's Medical College Hospital, Bangalore, India, from October 2001 to October 2003 showed that being under weight was not associated with pulmonary Tuberculosis(13).

Alcohol drinking:- A case-control study which was conducted at West Africa in Guinée, Guinea Bissau, and The Gambia, from January 1999 to March 2001 showed that being alcoholic drinker was significantly associated with pulmonary tuberculosis(15). However a study which was conducted at St John's Medical College Hospital, Bangalore, India, from October 2001 to October 2003 showed that being alcoholic drinker was not associated with pulmonary Tuberculosis(13).

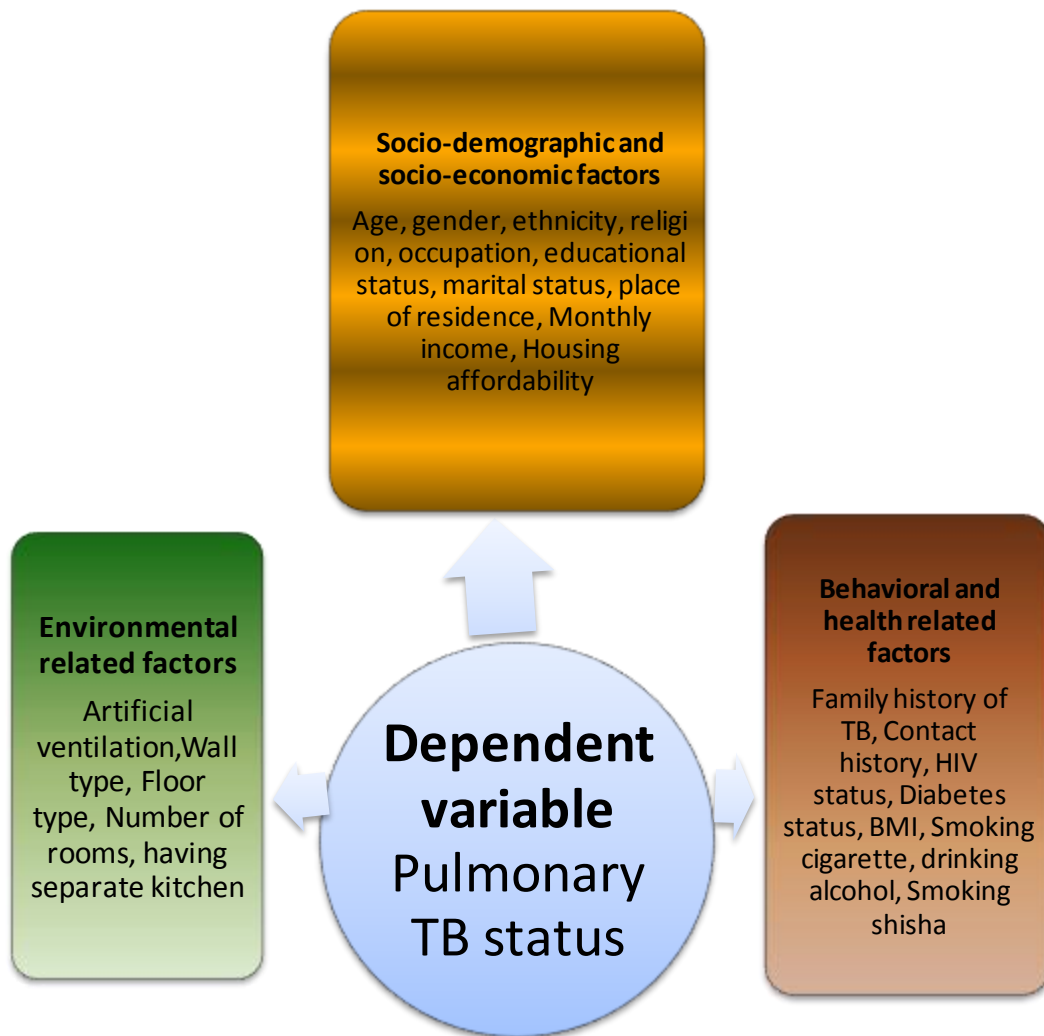
Smoking cigarette:- Case-control studies which was done at Ambo Hospital from 01 December 2011 to 29 March 2012, western Ethiopia (14); which was conducted at West Africa in Guinée, Guinea Bissau, and The Gambia, from January 1999 to March 2001(15); which was conducted at the health centers in Semarang District, Indonesia from 2012 January to 2013 (20) and in Croatia from 2006-2008 (18) showed that being cigarette smoker was significantly associated with pulmonary tuberculosis. However studies which were conducted at Malawi from September 2001 to November 2002 (19) at 3 major tertiary hospitals of Pakistan from September 2002 to November 2003 (17) showed that being cigarette smoker was not associated with pulmonary Tuberculosis.

Environmental related factors

Artificial Ventilation:- A facility based case-control study which was conducted at the health centers in Semarang District, Indonesia from 2012 January to 2013 showed that lack of artificial ventilation was significantly associated with pulmonary tuberculosis (20). However a case-control study which was conducted from March 12 to April 5, 2013 in Metema District Hospital, North-West Ethiopia showed that lack of artificial ventilation was not associated with pulmonary Tuberculosis(16).

Separate kitchen:- A case-control study which was conducted from March 12 to April 5, 2013 in Metema District Hospital, North-West Ethiopia showed that lack of separate kitchen was significantly associated with pulmonary Tuberculosis(16). In addition to this a study which was conducted at St John's Medical College Hospital, Bangalore, India, from October 2001 to October 2003 showed that lack of separate kitchen significantly associated with pulmonary Tuberculosis(13).

Conceptual Framework



Developed by reviewing Literatures

Objectives

General Objective

- The objective is to determine the determinants of Pulmonary Tuberculosis In public health facilities of Dire Dawa town in 2017.

Specific Objectives

- To identify socio-demographic and socio-economic factors associated with PTB.
- To determine Behavioral and health related factors associated with PTB.
- To analyze Environmental related factors associated with PTB.

Methods

Study Area and Period

The study was conducted in Dire Dawa City Administration, which is located in eastern part of Ethiopia - 515 kilometers away from Addis Ababa and to the northwest of Harar. It is precisely located between 9° 28.1'N and 9° 49.1'N latitude and between 41° 38.1'E and 42° 19.1'E longitude. The town has a total population of 466,000 which is estimated by CSA in 2017; out of which, Males are 234,000(50.2%) and females are 232,000(49.8%). There are 2 hospitals (Dilchora referral hospital and Sabian primary hospital) and 8 health centers (Addis ketema, Dechatu, Gende gerada, Gende kore, Goro, Dire dawa, Melka jebdu and Legehare Health center) in Dire Dawa town. The study was conducted from October to December 2017.

Study Design

Facility based unmatched Case-control study was conducted from October to December 2017.

Source population

All patients who visited the public health facilities (2 Hospitals and 8 Health centers) of Dire Dawa Town from October to December 2017 were the source population.

Study population

Patients at TB department and at Outpatient Department of two Hospitals and Eight Health centers of Dire Dawa Town from October to December 2017 were the study population.

Study Unit

Patients who registered as pulmonary TB at the TB clinic of the health facility and aged above 15 years old were selected as Cases and patients at OPD with no productive cough for at least 2 weeks previously and any sign and symptoms of PTB and aged above 15 years old were selected as Controls.

Sample size

Table 24:- sample size determination using Epi-info statcalc software.

Variables	CI (%)	Power (%)	Ratio (unexposed: exposed)	% outcome in unexposed grp	Odds ratio	% outcome in exposed grp	Sample size	Source
Family history of TB	95	80	2	5.8	4.4	21.3	186	(14)
Gender	95	80	2	45.2	3.16	72.3	132	(14)
BMI	95	80	2	41.8	2.1	60.1	285	(14)

Using Body Mass Index (BMI) from previous study

Power= 80%

Confidence interval (CI) = 95%

Sample ratio of controls to cases= 2:1

Proportion of Body Mass Index < 18.5 among controls= 41.8%

Odds ratio (OR) of Body Mass Index < 18.5 from previous studies in Ambo Hospital (14)= 2.1

With the Fleiss continuity correction, the sample size was set at 95 cases and 190 controls with a total sample size of 285.

Sampling technique and procedure

Cases were selected consecutively to the study until the required sample size was filled. Whereas Controls were selected using Simple Random Sampling Technique from the selected Outpatient Department of the ten health facilities. All active PTB patients aged above 15 years old in TB

department of the hospitals during the study period were selected as cases. Active PTB were diagnosed by bacteriological, radiological or clinical methods. The first two OPD attendees were free from active PTB and aged above 15 years old following each case were approached to serve as a control in the study. If these individuals refused participation, the next eligible OPD attendee was approached.

Study variables

Dependent variable is Pulmonary TB status where as Independent variables are Age, Gender, Occupation, Educational status, Marital status, Place of residence, Patient history of TB, Family history of TB, Human immunodeficiency virus (HIV) infection, Smoking cigarette, Alcohol intake, Khat chewing, Smoking shisha, Employment, Monthly income, Diabetes, Number of families living in the household (HH), Person per room, Housing condition, Wall type, Floor type, Presence or absence of windows.

Operational definitions

Cases – patients who will be registered as pulmonary TB at the health facility and aged above 15 years old.

Controls – patients at OPD with no productive cough for at least 2 weeks previously and any sign and symptoms of PTB.

Average monthly income: Low income < 1000 ETB, Middle income= 1000-3000 ETB and High income > 3000 ETB.

Number of person per room: No crowded ≤ 2 person/room and overcrowded if > 2 person/room.

No formal education: those who didn't entered school including person who can Wright and read.

Formal education: those who entered school.

Data collection method

A structured questionnaire with local languages was developed by reviewing different literatures, after it had been pretested in 5% of the total sample at three private hospitals of Dire Dawa town,

it was found that it was easily understandable then the actual data was collected from the patients at the government public health facilities of Dire Dawa town (Annex). The data collectors were physicians/nurses in TB department and OPD of the health facilities. A beam balance scale with height measuring scale was used to calculate the body mass index of the patients.

Data analysis

The data were entered into Epi-Info software (version 7), then cleared and analyzed with SPSS version 20. A binary logistic analysis was used to measure the association between the dependent variable and independent variables using an OR and 95% CI. Statistical significance was set at $\alpha \leq 0.05$. In an attempt to identify the relative effects of explanatory variables on the outcome variable, multivariable analyses was applied. Independent predictor variables with a P -value ≤ 0.1 in Bivariate analysis was entered into the final multiple logistic regression model, based on the likelihood ratio for further analysis in different models.

Data quality control

A properly designed and pre-tested questionnaire was used. The data collection was through face-to-face interview approach. One day Training was given for the data collectors and also close supervision during data collection was implemented as quality control measures.

Ethical considerations

Ethical approval and clearance for this study was obtained from the Institutional Research Ethics Review Board of St. Paul's Hospital Millennium Medical College. At all levels, officials were contacted and permission from administrators was secured. All the necessary explanation about the purpose of the study and its procedures was explained with the assurance of confidentiality. Written and verbal consent from the study participants was also secured.

Result

Socio-demographic characteristics of the study participant

A total of 285 subjects with 95 cases and 190 controls in 1: 2 ratios were participated in the study. The mean age was 32.46 ± 12.72 years and 32.66 ± 12.54 years for cases and controls respectively. The productive age group (15-44) comprised 78 (82.1%) of the total cases. Furthermore, 57 (60%) of cases and 88 (46.3%) of controls were male in gender; 52 (54.7%) of cases and 33 (17.4%) of controls had no formal education; 46 (48.4 %) of the cases and 115 (60.5%) of the controls were currently married. Majority of cases 59 (62.1%) had a monthly income less than 1000 ETB whereas majority of controls 136 (71.6%) had a monthly income greater than 1000 ETB. Bivariate logistic regression identified that Gender, Educational status, Occupation, Marital status, Monthly income, Housing affordability and Number of person per room had a P-Value less than or equal to 0.1 (Table 2).

Table 25:-Bivariate analysis of socio-demographic factors of pulmonary tuberculosis in Dire Dawa City administration, Eastern Ethiopia, 2017.

Variables	Pulmonary TB status		COR(95%CI)	P-value
	Case n (%)	Control n (%)		
Age				0.97
15-24	30(31.6)	55(28.9)	1.12(0.54-2.33)	0.756
25-34	31(32.6)	66(34.7)	0.967(0.47-1.98)	0.927
35-44	17(17.9)	34(17.9)	1.03(0.45-2.34)	0.94
≥ 45	17(17.9)	35(18.4)	1	
Residence				0.187
Urban	78(82.1)	167(87.9)	0.632(0.32-1.25)	
Rural	17(17.9)	23(12.1)	1	
Gender				0.03
Male	57(60)	88(46.3)	1.739(1.05-2.86)	
Female	38(40)	102(53.7)	1	

Educational status				
No formal education	52(54.7)	33(17.4)	5.75(3.315-9.98)	<0.001
Formal education	43(45.3)	157(82.6)	1	
Occupation				0.001
Daily laborer	35(36.8)	34(17.9)	0.515(0.045-5.94)	0.59
Housewife	20(21.1)	44(23.2)	0.227(0.019-2.655)	0.237
Merchant	19(20)	31(16.3)	0.306(0.026-3.614)	0.348
Student	7(7.4)	19(10)	0.184(0.014-2.364)	0.194
Farmer	6(6.3)	9(4.7)	0.33(0.02-4.55)	0.41
Government	6(6.3)	52(27.4)	0.058(0.005-0.73)	0.028
Other	2(2.1)	1(0.5)	1	
Ethnicity				0.25
Oromo	41(43.2)	88(46.3)	1.1(0.45-2.74)	0.827
Somali	16(16.8)	17(8.9)	2.23(0.76-6.53)	0.141
Amhara	30(31.6)	66(34.7)	1.08(0.425-2.74)	0.87
Other	8(8.4)	19(10)	1	
Marital status				0.07
Widowed/divorced	21(22.1)	24(12.6)	2.19(1.1-4.3)	0.024
Single	28(29.5)	51(26.8)	1.37(0.77-2.44)	0.28
Married	46(48.4)	115(60.5)	1	
Monthly income				0.000
No income	15(15.8)	21(11.1)	3.33(1.4-7.9)	0.006
< 1000 ETB	44(46.3)	33(17.4)	6.2(3.04-12.75)	0.000

1000- 3000 ETB	21(22.1)	66(34.7)	1.48(0.71-3.12)	0.247
>3000 ETB	15(15.8)	70(36.8)	1	
Housing affordability				
Rent	57(60)	52(28)	3.86(2.3-6.5)	<0.001
Owned	38(40)	134(72)	1	
Number of person per room				
≤ 2	17(17.9)	60(31.6)	0.47(0.26-0.87)	0.015
>2	78(82.1)	130(68.4)	1	

Behavioral and Health related factors

The majority of cases 79(83.2%) were underweight (BMI <18.5) whereas only 29(15.3%) of Controls were underweight. Patient history of TB was higher amongst cases 23(24.2%) than amongst controls 8(4.2%). Family history of TB was also higher in cases 51(53.7%) than in controls 32(16.8%). Smoking cigarette was more common amongst cases 31(32.6%) than amongst controls 19(10%). Contact history was more common in cases 78(82.1%) than in controls 41(21.6%). HIV infection was higher in cases 37(38.9%) than in controls 12(6.3%). Bivariate logistic regression identified that Family history of PTB, Patient history of PTB, Contact history of the patient, HIV status, Body Mass Index, Drinking alcohol, Khat chewing, Smoking Shisha and Smoking Cigarette had a P-Value less than or equal to 0.1 (Table 3).

Table 26:- Bivariate analysis of Behavioral and health related factors of Pulmonary TB in Dire Dawa city administration, Eastern Ethiopia, 2017.

Variables	Pulmonary TB status		COR (95%CI)	P-Value
	Case n (%)	Control n (%)		
Family History of PTB				
Yes	51(53.7)	32(16.8)	5.72(3.3-9.96)	<0.001
No	44(46.3)	158(83.2)	1	
Patient history of PTB				
Yes	23(24.2)	8(4.2)	7.27(3.1-16.9)	<0.001
No	72(75.8)	182(95.8)	1	
Contact history of the patient				
Yes	78(82.1)	41(21.6)	16.7(8.9-31.2)	<0.001
No	17(17.9)	149(78.4)	1	
HIV status				
Positive	37(38.9)	12(6.3)	9.5(4.6-19.3)	<0.001
Negative	58(61.1)	178(93.7)	1	
Diabetic status				
Diabetic	8(8.4)	19(10)	0.83(0.35-1.96)	0.668
Not diabetic	87(91.6)	171(90)	1	
Body Mass Index				
<18.5	79(84)	29(15.3)	27.4(14.0-53.4)	<0.001
≥ 18.5	16(16.8)	161(84.7)	1	
Alcohol drinking				
Yes	31(32.6)	35(18.4)	2.14(1.2-3.7)	0.008

No	64(67.4)	155(81.6)	1	
Khat chewing				
Yes	75(78.9)	88(46.3)	4.34(2.46-7.68)	<0.001
No	20(21.1)	102(53.7)	1	
Shisha smoking				
Yes	24(25.3)	17(8.9)	3.4(1.7-6.7)	<0.001
No	71(74.7)	173(91.1)	1	
Smoking cigarette				
Yes	31(32.6)	19(10)	4.3(2.3-8.2)	<0.001
No	64(67.4)	171(90)	1	

Environmental related factors

Majority of cases 57(60%) lived in a compound which had more than two households whereas 69(36.3%) of controls lived in a compound which had more than two households. Majority of cases 61(64.2%) had no separated kitchen whereas majority of controls 155(81.6) had separated kitchen. The wall type of the patients house which was made of mud was more common among cases 71(74.7%) than among controls 40(21.1%). Bivariate logistic regression identified that Number of households, Presence of window, having separated kitchen, having artificial ventilation and Wall type had a P-Value less than or equal to 0.1 (Table 4).

Table 27:-Bivariate analysis of environmental related factors of Pulmonary TB in Dire Dawa City administration, Eastern Ethiopia, 2017.

Variables	Pulmonary TB status		COR (95%CI)	P-Value
	Case n (%)	Control n (%)		
Number of HH in the compound				
≤ 2	38(40)	121(63.7)	0.38(0.23-0.63)	<0.001
>2	57(60)	69(36.3)	1	
Is there a window?				
Yes	64(67.4)	177(93.2)	0.15(0.075-0.3)	<0.001
No	31(32.6)	13(6.8)	1	
Is there separated kitchen?				
Yes	34(35.8)	155(81.6)	0.126(0.072-0.22)	<0.001
No	61(64.2)	35(18.4)	1	
Is there artificial ventilation?				
Yes	16(16.8)	105(55.3)	0.16(0.09-0.3)	<0.001
No	79(83.2)	85(44.7)	1	
Wall Type				
Cement	24(25.3)	150(78.9)	0.09(0.05-0.16)	<0.001
Mud	71(74.7)	40(21.1)	1	

Whereas Multivariable logistic regression identified that Gender (AOR: 2.9; 95%CI: 1.5-5.5), Educational status (AOR: 7.6; 95%CI: 3.7-15.4), Monthly income; (No income (AOR: 3.9; 95%CI: 1.4-10.7), less than 1000 ETB (AOR: 2.8; 95%CI: 1.2-6.5)) Housing affordability (AOR: 4.9; 95%CI: 2.6-9.4), Contact history of the patient (AOR: 8.6; 95%CI: 3.9-19.3), HIV status (AOR: 3.3; 95%CI: 1.2-9.4), Body Mass Index (AOR: 19.8; 95%CI: 8.7-45.5), Smoking Cigarette (AOR: 7.7; 95%CI: 2.7-21.8) and having separated kitchen (AOR: 0.25; 95%CI: 0.13-

0.48) had a significant association with being infected with Pulmonary TB among patients aged 15 years or older in all governmental public health facilities of Dire Dawa city administration, Eastern Ethiopia (Table 5).

Table 28:-Multivariable analysis of combined determinant factors of Pulmonary TB in Dire Dawa City administration, Eastern Ethiopia, 2017.

Variables	Case n (%)	Control n (%)	COR(95%CI)	AOR (95%CI)	Adjusted P-Value
Gender					
Male	57(60)	88(46.3)	1.739(1.05-2.86)	2.9(1.5-5.5)	0.002*
Female	38(40)	102(53.7)	1	1	
Educational status					
No formal education	52(54.7)	33(17.4)	5.75(3.315-9.98)	7.6(3.7-15.4)	<0.001*
Formal education	43(45.3)	157(82.6)	1	1	
Occupation					0.065
Daily laborer	35(36.8)	34(17.9)	0.515(0.045-5.94)	0.75(0.01-52.8)	0.89
Housewife	20(21.1)	44(23.2)	0.227(0.019-2.655)	0.56(0.008-39.3)	0.79
Merchant	19(20)	31(16.3)	0.306(0.026-3.614)	0.92(0.013-65.38)	0.97
Student	7(7.4)	19(10)	0.184(0.014-2.364)	0.25(0.003-18.88)	0.527
Farmer	6(6.3)	9(4.7)	0.33(0.02-4.55)	0.19(0.002-16.9)	0.472
Government	6(6.3)	52(27.4)	0.058(0.005-0.73)	0.16(0.002-12.1)	0.405
Other	2(2.1)	1(0.5)	1	1	
Marital status					0.726
Widowed/divorced	21(22.1)	24(12.6)	2.19(1.1-4.3)	1.45(0.55-3.83)	0.457
Single	28(29.5)	51(26.8)	1.37(0.77-2.44)	1.26(0.52-3.05)	0.612

Married	46(48.4)	115(60.5)	1	1	
Monthly income					0.002*
No income	15(15.8)	21(11.1)	3.33(1.4-7.9)	3.9(1.4-10.7)	0.008*
< 1000 ETB	44(46.3)	33(17.4)	6.2(3.04-12.75)	2.8(1.2-6.5)	0.015*
1000- 3000 ETB	21(22.1)	66(34.7)	1.48(0.71-3.12)	0.9(0.4-2.2)	0.84
>3000 ETB	15(15.8)	70(36.8)	1	1	
Housing affordability					
Rent	57(60)	52(28)	3.86(2.3-6.5)	4.9(2.6-9.4)	<0.001*
Owned	38(40)	134(72)	1	1	
Number of person per room					
≤ 2	17(17.9)	60(31.6)	0.47(0.26-0.87)	0.34(0.09-1.32)	0.12
>2	78(82.1)	130(68.4)	1	1	
Family History of PTB					
Yes	51(53.7)	32(16.8)	5.72(3.3-9.96)	1.57(0.55-4.5)	0.4
No	44(46.3)	158(83.2)	1	1	
Patient history of PTB					
Yes	23(24.2)	8(4.2)	7.27(3.1-16.9)	1.58(0.38-6.6)	0.53
No	72(75.8)	182(95.8)	1	1	
Contact history of the patient					
Yes	78(82.1)	41(21.6)	16.7(8.9-31.2)	8.6(3.9-19.3)	<0.001*
No	17(17.9)	149(78.4)	1	1	
HIV status					
Positive	37(38.9)	12(6.3)	9.5(4.6-19.3)	3.3(1.2-9.4)	0.0025*

Negative	58(61.1)	178(93.7)	1	1	
Body Mass Index					
<18.5	79(84)	29(15.3)	27.4(14.0-53.4)	19.8(8.7-45.5)	<0.001*
≥ 18.5	16(16.8)	161(84.7)	1	1	
Alcohol drinking					
Yes	31(32.6)	35(18.4)	2.14(1.2-3.7)	1.96(0.7-5.36)	0.189
No	64(67.4)	155(81.6)	1	1	
Khat chewing					
Yes	75(78.9)	88(46.3)	4.34(2.46-7.68)	1.7(0.67-4.3)	0.26
No	20(21.1)	102(53.7)		1	
Shisha smoking					
Yes	24(25.3)	17(8.9)	3.4(1.7-6.7)	0.896(0.27-2.95)	0.85
No	71(74.7)	173(91.1)	1	1	
Smoking cigarette					
Yes	31(32.6)	19(10)	4.3(2.3-8.2)	7.7(2.7-21.8)	<0.001*
No	64(67.4)	171(90)	1	1	
Number of HH in the compound					
≤ 2	38(40)	121(63.7)	0.38(0.23-0.63)	0.55(0.29-1.04)	0.067
>2	57(60)	69(36.3)	1	1	
Is there a window?					
Yes	64(67.4)	177(93.2)	0.15(0.075-0.3)	0.46(0.19-1.1)	0.082
No	31(32.6)	13(6.8)	1	1	
Is there separated kitchen?					

Yes	34(35.8)	155(81.6)	0.126(0.072-0.22)	0.25(0.13-0.48)	<0.001
No	61(64.2)	35(18.4)	1	1	
Is there artificial ventilation?					
Yes	16(16.8)	105(55.3)	0.16(0.09-0.3)	0.66(0.3-1.5)	0.309
No	79(83.2)	85(44.7)	1	1	
Wall Type					
Cement	24(25.3)	150(78.9)	0.09(0.05-0.16)	0.493(0.168-1.45)	0.198
Mud	71(74.7)	40(21.1)	1	1	

Discussion

This study showed among socio-demographic variables, Gender, Educational status, Monthly income and Housing affordability were significantly associated with being infected with Pulmonary TB. Among Behavioral and other Health related variables, Smoking cigarette, Contact history, Body Mass Index and HIV status were significantly associated with the occurrence of Pulmonary TB. Among Environmental related variables having separated kitchen were significantly associated with being infected with Pulmonary TB among individuals aged 15 years or older in Dire Dawa city administration.

Our findings showed that patients who had no formal education were eight times more likely to develop Pulmonary TB than those who had a formal education. Other studies performed in Metema, North-west Ethiopia, Bangalore south India, and Croatia have also reported that people who had no formal education are more likely to develop the disease than those with higher education(13) (16) (18). This might be because people who had no formal education weren't well informed about the disease relative to those who had formal education, and this may increase the probability of developing the disease. Being male in gender was three times more likely to develop Pulmonary TB than being female. This finding was in line with previous studies elsewhere in Ambo, Western Ethiopia and in West African countries, in which a similar association between being male and PTB was reported (14) (15) .

Having no income and a monthly income less than 1 thousand birr had four times and three times more likely to develop pulmonary TB than those who earned a monthly income greater than three thousands Ethiopian birr respectively. This finding was in line with previous study which was conducted at the health centers in Semarang District, Indonesia from 2012 January to 2013 October showed that having low income was significantly associated with pulmonary Tuberculosis (20). This might be because people having a better income have a better quality of life relative to those who get low income, and this may decrease the risk of developing the disease among those had a better income.

This study showed that lack of home ownership was found to be an independent risk factor for pulmonary TB in which those who rented house were five times more likely to develop pulmonary TB than those who owned the house. This finding was in line with previous studies elsewhere in Ambo, Western Ethiopia, in West African countries and in three major tertiary

hospitals of Pakistan in which a similar association between poor housing affordability and Pulmonary TB was reported (14) (15) (17).

In this study, HIV infection was a significant independent risk factor for Pulmonary TB in which people living with HIV were 3.3 times more likely to develop pulmonary TB than people who were free from HIV/AIDS, which is consistent with previous studies conducted at Ambo Hospital, western Ethiopia (14); a case-control study which were conducted at Malawi from September 2001 to November 2002 (19) and a study which was conducted at West Africa in Guinée, Guinea Bissau, and The Gambia, from January 1999 to March 2001 (15) showed that being HIV positive was significantly associated with pulmonary tuberculosis. This might be due to decreased immunity in HIV infected persons will prone to be infected by pulmonary TB and will increased risk of reactivation of latent TB.

Having contact history with pulmonary TB patient was identified as independent risk factors for pulmonary TB among individuals aged 15 years or older in which people who had a history of contact with TB patients had 8.6 times increased risk of contracting TB than those with no contact history, which is consistent with previous studies conducted at Metema District Hospital, North-West Ethiopia(16), at Malawi from September 2001 to November 2002 (19); A facility based case–control study which was conducted at the health centers in Semarang District, Indonesia from 2012 January to 2013 (20); A case–control study which was done in 3 major tertiary hospitals of Pakistan from September 2002 to November 2003 (17) and in Croatia from 2006-2008 (18) showed that having contact with TB patient was significantly associated with pulmonary tuberculosis.

This study showed that under-weight ($BMI < 18.5$) was an independent determinant factor for Pulmonary TB, in which a person who had a body mass index less than 18.5 were twenty times more likely to develop pulmonary TB than those who had BMI greater than 18.5. which is consistent with previous studies conducted at Ambo Hospital, western Ethiopia (14) and Croatia (18).

In this study Cigarette smoking was independently associated with Pulmonary TB, in which patients who smoke cigarette were 7.7 times more likely to develop pulmonary TB than those who didn't smoke cigarette. This is in line with other studies which was conducted at Ambo Hospital, western Ethiopia (14); West Africa (15); which was conducted at the health centers in

Semarang District, Indonesia (20) and in Croatia (18) showed that being cigarette smoker was significantly associated with pulmonary tuberculosis.

This study showed that the odds of being infected by pulmonary TB were decreased by seventy five percent for those families who had separated kitchen, this is in line with other studies which were conducted at Metema District Hospital, North-West Ethiopia(16) and at St John's Medical College Hospital, Bangalore, India, showed that lack of separate kitchen significantly associated with pulmonary Tuberculosis(13).

Limitation of the study

This study has all the weakness associated with a case-control study design. The first weakness is that recall bias is inbuilt to case-control studies. Recall can be contradictory with cases being more likely to remember exposures as compared with controls. However, in this study cases and controls were patients in the same health facility, therefore, it is likely to reduce this effect. The other main limitation was that the Controls were not tested using laboratory procedures with the same as cases to establish their pulmonary TB status, they were recruited only by history of cough, and however we excluded patients with any respiratory disease to minimize selection bias.

Conclusion

According to this study, the risk of developing pulmonary tuberculosis was high among patients who had no formal education, Among male patients, Having low income, Not being the owner of a house, Being HIV positive, Being cigarette smoker, Having contact history with pulmonary TB patient, Being underweight and Not having a separated kitchen were significantly associated with being infected with Pulmonary TB among patients aged 15 years or older in all governmental public health facilities of Dire Dawa City Administration, Eastern Ethiopia.

Recommendations

- Health education on pulmonary TB should be given exhaustively by Dire Dawa health office through health extension workers for the community especially who had no formal education.
- Ceasing smoking should be actively encouraged through Mass media and health education at all health facilities.
- New Pulmonary TB patients should be educated exhaustively by the health professionals and health extension workers on how to reduce contact with healthy individuals in their family and community just to reduce the transfer of disease.
- Efforts to reduce Pulmonary TB infection among HIV patients by health professionals especially at ART department should be strengthened.
- Further prospective cohort studies should be conducted to clearly identify other determinant factors, as the current study could not identify the temporal relationships between predictor variables and outcome variables.

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Annex 4: Questionnaire for Determinant Factors of Pulmonary TB

8.1. English version of participant information sheet, consent and questionnaire

Participant information sheet

Title:

First of all, I would like to say thanks in advance to your cooperation and consent in participating in this study. More over; I will request you politely to read or to listen attentively in order to provide relevant information about the study and if there is any confusable information or question which isn't clear regarding the study please don't hesitate to ask freely.

Background information

Tuberculosis (TB) is an airborne bacterial disease which remains a deadly infectious disease, affecting millions of people worldwide. In the lungs, the bacterium is taken up and if it is not contained by the immune system, it is able to grow uncontrollably, resulting in the subsequent development of TB.

Objective: To Determine the Factors associated with Pulmonary Tuberculosis In public health facilities of Dire Dawa city Administration in 2017.

Benefits for participants

Study participants will not have any financial incentives or other inducements in being participated in this study. However, this study will provide a basic information or data for Dire Dawa city administration health office as well as for nationwide to develop health programs and health policy and pave a strategic means of prevention for pulmonary TB infection.

Confidentiality: In order to maintain the confidentiality of participants' information, their name will not be given and the samples will be coded. Participants can stop or withdraw at any time from the study.

Assurance of Principal Investigator

I will put my signature below to confirm you that I take over the responsibility for the scientific ethical and technical conduct of the research project and for provision of progress reports for all stakeholders of the research project.

Jafer Kezali (PI)

Signature: _____ Date: _____

Note: If you have any questions about this study, you should feel free to ask now or at any time throughout the study by contacting:

PI Address: Jafer Kezali, St. Paul's Hospital Millennium Medical College, School of Public Health, Addis Ababa, Ethiopia.

Email: jaferkezali2@gmail.com, Tel: +251912377291

Informed consent:

I, (Full Name)

Here by voluntarily authorize the researcher to interview me and consent to him in order to obtain information that is relevant to his research topic on “Determinants of active pulmonary Tuberculosis in Public Health Facilities of Dire Dawa Town, Ethiopia, 2017”. I understand that as a participant, my privacy was maintained and the information obtained in this research was used in a manner that protects with guaranteed confidentiality, respect and personal rights.

I am aware that participating in this study is voluntary and I haven't obligated to answer every question asked for me and that I may withdraw my consent at any time without disadvantage to myself or others. I am informed that information collected in this study was strictly confidential and for this study only.

Signature of Participant Date.....

Signature of data collector..... Date.....

PART I: Socio-demographic and socioeconomic characteristics Direction: Fill or use ✓ mark on box for response categories

S.NO	Questions	Response of categories
1.	ID of the patient	_____
2.	Name of the Health Facility	_____
3.	Age (in years)	_____
4.	Residence	Urban ☐ Rural ☐
5.	Kebele	_____
6.	Gender	Male ☐ Female ☐
7.	What is your educational status?	1. Illiterate ☐ 2. 1-8 ☐ 3. 9-12 ☐ 4. Diploma ☐ 5. University degree & above ☐
8.	What is your occupation?	1. Employed ☐ 2. House wife ☐ 3. Daily laborer ☐ 4. Merchant ☐ 5. Student ☐ 6. other[specify] _____

9.	Ethnicity	1.Oromo ☐ 2.Amhara ☐ 3.Somali ☐ 4.Gurage ☐ 5.Adere ☐ 6.Tigre ☐ 7.other [specify] _____
10.	Marital Status	1. Married ☐ 2. Widowed ☐ 3.Divorced ☐ 4. Single ☐
11.	Religion:	1. Muslim ☐ 2. Orthodox ☐ 3. Protestant ☐ 4. Catholic ☐ 5. Other specify_____
12.	Average monthly income	_____
13.	Housing Affordability	1.Rented 2.Owned
14.	Number of family in the Household	_____

Part –II Knowledge Question, Direction: Fill or use ✓ mark on box for response categories

15.	What is Pulmonary Tuberculosis?	1.Air borne disease ☐ 2.Sexually transmitted disease ☐ 3.Don't know ☐ 4.Other specify_____
16.	How do you think PTB is transmitted?	1. Inhalation ☐ 2.Sexual intercourse ☐ 3.Don't know ☐ 4.Other specify_____
17.	How do you think PTB is prevented?	1. Treating the patient ☐ 2. Stigmatizing the patient ☐ 3. Don't know ☐ 4.Other specifi_____

Part-III Personal behavior and Health related Information, Direction: Fill or use ✓ mark on box for response categories

18.	Pulmonary TB status of the patient,	Infected ☐ Not infected ☐
19.	Family history of TB	1.Yes ☐ 2.No ☐
20.	Patient History of TB	1.Yes ☐ 2.No ☐

21.	Did you contact with TB patient?	1.Yes ☐ 2.No ☐
22.	HIV Status:	1. Positive ☐ 2. Negative ☐
23.	Diabetes status?	1. Diabetic ☐ 2. Non-Diabetic ☐
24.	Body mass index (BMI, kg/m2)	_____
25.	Do you drink Alcohol?	1.Yes ☐ 2.No ☐
26.	Do you chew Khat?	1.Yes ☐ 2.No ☐
27.	Do you smoke “shisha”?	1.Yes ☐ 2.No ☐
28.	Do you smoke cigarette?	1.Yes ☐ 2.No ☐

Part-IV Environmental related factors, Direction: Fill or use ✓ mark on box for response categories

29.	Floor type	1, Cement ☐ 2, Earth(non-cement) ☐
30.	Number of Household in the compound	_____
31.	Number of rooms of the House	_____
32.	Is there windows?	1.Yes ☐ 2.No ☐
33.	If Yes for Q38, Number of windows of the House?	_____
34.	Do you have a separate kitchen?	1, Yes ☐ 2, No ☐
35.	Do you have artificial ventilation:	1, Yes ☐ 2, No ☐
36.	Wall type	1, Cement ☐ 2, Mud ☐

8.2. Amharic version of informed consent and questioner

የጥናቱ መረጃና መግለጫ ቅጽ

የጥናቱ አላማ

የዚህ ጥናት አላማ መሰረት ያደረገው በድሬዳዋ ከተማ ባለ የመንግስት ጤና ተቋማት ውስጥ ለቲቢ በሽታ የሚያጋልጡ መንስኤዎችን ለማወቅ ነው፡፡

በጥናቱ ስለመሳተፍ

በዚህ ጥናት መሳተፍ በሙሉ ፈቃደኝነት ላይ የተመሠረተ ነው፡፡ ስለሆነም በመጀመሪያ በጥናቱ እንዲሳተፉ ፈቃደኝነታቸውን በትህትና እንጠይቃለን፡፡ በዚህ ጥናት ለመሳተፍ ከፈቀዱ ለግማሽ ሰዓት ያህል ለጥያቄዎች ምላሽ ይሰጡናል፡፡

በጥናቱ በመሳተፍ የሚገኝ ጥቅም

በዚህ ጥናት ላይ በመሳተፍ የሚገኝ የግል ጥቅም ባይኖርም ከጥናቱ የሚገኘው መረጃ ግን የቲቢን በሽታ መከላከል ላይ ለሚሰሩ ድርጅቶች እንደግብዓት ይረዳል፡፡

ምስጢርን ስለመጠበቅ

በጥናቱ ውስጥ የተሰበሰቡ ማናቸውም ግላዊ መረጃዎች ሚስጥራዊነታቸው የተጠበቀ ይሆናል፡፡ ከማንነትዎ ጋር በቀጥታ ተያያዥነት ያላቸው መረጃዎች በሙሉ በዋና ተመራማሪው ሚስጥራዊ በሆነ የመረጃ ጥንቅር ዘዴ ከተቀየሩ በኋላ ብቻ ለምርምር ሂደቱ የሚውል ይሆናል፡፡

ከጥናቱ ስለመውጣትና ስለማቋረጥ

ይህ ጥናት በፈቃደኝነት ላይ የተመሰረተ እንደመሆኑ መጠን በማናቸውም ወቅት በፈቃደኛ ከጥናቱ መውጣት ይችላሉ፡፡ ከጥናቱ ጋር በተያያዘ ማናቸውም ጥያቄ ቢኖርዎ በሚከተለው አድራሻ ጥያቄዎን ማቅረብ ይችላሉ፡፡

ዋና ተመራማሪ፡-ጃፈር ከሣሊ

አድራሻ፡ ቅዱስ ጳውሎስ ሆስፒታል ሚሊንየም ህክምና ኮሌጅ ህብረተሰብ ጤና ትምህርት ክፍል

ስልክ፡+251912377291

ኢ.ሜ.ይል :jaferkezali2@gmail.com

አዲስ አበባ ኢትዮጵያ

ስለስምምነቱ ማረጋገጫ ቅፅ

እኔ ስሜ ከታች የተገለፀው የጥናቱ ተሳታፊ ለመሆን ስወስን የጥናቱን አላማዎች አሰራሮችና ቅድመ ሁኔታዎች በግልጽ በመረዳትና ከጥናቱ ተሳታፊነት ፈቃደኝነቴን በማንኛውም ደረጃ የማንሳት መብቴን በማረጋገጥ ነው፡፡

ስም -----

ፊርማ-----

ቀን -----

የጠያቂዉ ቃል:-ይህንን መጠየቂያ በላዩ ላይ በተጻፈዉ መመሪያና ጥያቄ እንድሁም በተሰጠኝ ስልጠና መሰረት ሞልቻለሁ፡፡በላዩም ላይ የሰፈረዉ ሀሳብ ትክክለኛ መሆኑን እቀበላለሁ፡፡

የጠያቂው ስም _____

ፊርማ _____

ቀን _____

PART I: Socio-demographic and socioeconomic characteristics Direction: Fill or use ✓ mark on box for response categories

ተ.ቁ	ጥያቄዎች	ምላሾች
1.	የታካሚው መለያ ቁጥር	_____
2.	የጤና ተቋሙ ስም	_____
3.	ዕድሜ (በአመት)	_____
4.	የመኖሪያ ስፍራዎ የት ነው	1. ከተማ ☐ 2. ገጠር ☐
5.	ቀበሌ	_____
6.	ጾታ	1. ወንድ ☐ 2. ሴት ☐
7.	የትምህርት ደረጃ	1.ያልተማረ ☐ 2. 1-8 ☐ 3. 9-12 ☐ 4.ዲፕሎማ ☐ 5.ዲግሪ እና ከዛ በላይ ☐
8.	የስራ አይነት	1. የመንግስት ሰራተኛ ☐ 2. የቤት እመቤት ☐ 3. የቀን ሰራተኛ ☐

		4. ነጋዴ ☐ 5. ተማሪ ☐ 6. ሌላ _____
9.	ብሄር	1. አሮሞ ☐ 2. አማራ ☐ 3. ሶማሌ ☐ 4. ጉራጌ ☐ 5. ኢደሬ ☐ 6. ትግሬ ☐ 7. ሌላ _____
10.	የጋብቻ ሁኔታ	1. ያገባ ☐ 2. ባለ/ሚስቱ የሞተበት ☐ 3. ጋብቻ የፈታ/ች ☐ 4. ያላገባ ☐
11.	እምነት	1. ሙስሊም ☐ 2. ኦርቶዶክስ ☐ 3. ፕሮቴስታንት ☐ 4. ካቶሊክ ☐ 5. ሌላ _____
12.	አማካኝ የወር ገቢ	_____
13.	የመጠለያ ሁኔታ	1. በቤት ኪራይ 2. በግል ቤት
14.	የቤተሰብ ብዛት	_____

Part –II Knowledge Question, Direction: Fill or use ✓ mark on box for response categories

15.	የቲቢ በሽታ ምንድን ነው?	1.አየር ወለድ በሽታ ነው ☐ 2.በግብረ ስጋ ግንኙነት የሚመጣ በሽታ ነው ☐ 3.አላውቀውም ☐ 4.ሌላ _____
16.	የቲቢ በሽታ እንዴት ይተላለፋል?	1. የተበከለ አየር ወደ ውስጥ በመሳብ ☐ 2. በግብረስጋ ግንኙነት ☐ 3. አላውቀውም ☐ 4.ሌላ _____
17.	የቲቢ በሽታን እንዴት መከላከል ይቻላል?	1. የቲቢ በሽተኛን በማሳከም ☐ 2. የቲቢ በሽተኛን በማግለል ☐ 3. አላውቀውም ☐ 4.ሌላ _____

Part-III Personal behavior and Health related Information, Direction: Fill or use ✓ mark on box for response categories

18.	የታካሚዎች የቲቢ በሽታ ሁኔታ	የተያዘ ☐ ያልተያዘ ☐
19.	ቤተሰብ ውስጥ ከዚህ በፊት በቲቢ በሽታ የተያዘ አለ?	1.አለ ☐ 2.የለም ☐

20.	ታካሚው ከዚህ በፊት በቲቢ በሽታ ተይዘዋል?	1.አዎ ☐ 2.አይደለም ☐
21.	ታካሚው ከቲቢ ህመምተኛ ጋር ንክኪ ነበረው?	1. አዎ ☐ 2.የለም ☐
22.	ታካሚው በHIV ተይዘዋል?	1. አዎ ☐ 2. አልተያዘም ☐
23.	ታካሚው በስኳር በሽታ ተይዘዋል?	1. አዎ ☐ 2. አልተያዘም ☐
24.	የሰውነት መጠነ ልኬት (BMI, kg/m2)	_____
25.	ታካሚው አልኮል ይጠጣሉ?	1. አዎ ☐ 2. አልጠጣም ☐
26.	ታካሚው ጫት ይቅማሉ?	1. አዎ ☐ 2. አልቅምም ☐
27.	ታካሚው ሺሻ ያጨሳሉ?	1. አዎ ☐ 2. አላጨሰም ☐
28.	ታካሚው ሲጋራ ያጨሳሉ?	1. አዎ ☐ 2. አላጨሰም ☐

Part-IV Environmental related factors, Direction: Fill or use ✓ mark on box for response categories

29.	የቤቱ ወለል አይነት	1, ሲሚንት ☐ 2, አፈር ☐
30.	በገቢ ውስጥ ያሉ ያባወራ ብዛት	_____
31.	ቤተሰቡ ምን ያህል የመኖሪያ ክፍሎች አሉት?	_____
32.	መኖሪያ ቤቱ መስኮት አለው?	1, አዎ ☐ 2, የለውም ☐
33.	ለጥያቄ ቁ.38 አዎ ከሆነ መልሱ ምን ያህል መስኮት?	_____
34.	ከመኖሪያ ቤቱ የተለየ ኩሽና አሎት?	1, አዎ ☐ 2, የለም ☐
35.	ሰው ሰራሽ ማናፈሻ አሎት?	1, አዎ ☐ 2, የለም ☐
36.	የቤቱ ግርግዳ ከምን የተሰራ ነው?	1, ሲሚንት ☐ 2, ጭቃ ☐

BIOGRAPHY

My name is Jafer Kezali Hassen, I was born on March 21, 1989 G.C in Dire Dawa town. I was attended my primary education at Addis Ketema primary school and high school at Birsate Gabriel school. I joined university of Gondar in 2008/09 and I graduated with BSc in Medical Laboratory in 2011/12. I was worked at Wardher zonal Hospital, Wardher, Somali region as a Laboratory head and quality officer from 2012 up to 2014. Then I started a postgraduate studies in Field epidemiology training program at saint pauls hospital millennium medical college.