ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCE

SCHOOL OF PUBLIC HEALTH

ETHIOPIAN FIELD EPIDEMIOLOGY AND LABORATORY TRAINING PROGRAM (EFETP)

Compiled Body of Works in Field Epidemiology

By Achamyeleh Mulugeta

Submitted to Addis Ababa University School of Public Health in Partial Fulfillment for the degree of Master of Public Health in Field Epidemiology

January 2021

Addis Ababa, Ethiopia

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Advisors:

Professor Alemayehu Worku

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Approval by Examining Board

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Acknowledgments

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I also want to sincerely appreciate the contributions made during outbreak investigation, health profile, and surveillance system evaluation by Ethiopian Public Health Institute, Regional Health Bureaus and District Health Offices staff and the community members.

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Abbreviations

AAU	Addis Ababa University
AMR	Antimicrobial resistance
ANC	Anti-natal care
ART	Anti-Retroviral Therapy
AST	Antibiotic Susceptibility Testing
AURTI	Acute Respiratory Tract Infection
AWD	Acute Watery Diarrhea
BF	Blood Film
CBC	Complete Blood Count
CDC	Center for Disease Control
DENV	Dengue virus
EC	Ethiopian Calendar
EFY	Ethiopian Fiscal Year
EPHI	Ethiopian Public Health Institute
EQA	External Quality Assurance
FETP	Filed Epidemiology Training Program
FIND	Foundation for Innovative New Diagnostics
FMHACA	Food, Medicine and Health Administration and Control Authority
FMOH	Federal Ministry of Health
FNAC	Fine Needle Aspirate
GLASS	The Global Antimicrobial Resistance Surveillance System (WHO)
HCT	Hematocrit
HEENT	Head Eye Ear Nose and Throat
HEP	Health Extension Program
HEWs	Health Extension workers
HGB	Hemoglobin
HIV	Human Immunodeficiency Virus
HRP2	Horsidne Reach Protein 2
ILI	Influenza Like Illness
IMCI	Integrated Management of Childhood Illness
IPD	Inpatient Department
IUCD	Intra Uterine Contraceptive Device
LLINS	Long Lasting Impregnated Nets

MIC	Minimum inhibitory concentration
MMWR	Morbidity and Mortality Weekly Report
MOH	Ministry of Health
NGO	Non - Governmental Organization
NMSP	National Malaria Strategic Plan
OPD	Out Patient Department
OTP	Outpatient therapeutic program
PCR	Polymerase chain reaction
PHEM	Public Health Emergency Management
PITC	Provider Initiative Test and Counseling
pLDH	Parasite lactate dehydrogenase
PLT	Platelet
PLWHIV	People Living with HIV
PMTCT	Prevention from Mother to Child Transmission
PNC	Post-natal Care
RDT	Rapid Diagnostic Test
RRT	Rapid Response Team
rRT-PCR	Real Time Reverse Transcriptase Polymerase Chain Reaction
SARI	Severe Acute Respiratory Illness
SNNPR	Southern Nations Nationalities and Peoples Region
TB	Tuberculosis
VCT	Volunteer counselling and Testing
WBC	White Blood Cell
WHO	World Health Organization

Executive Summary

The Ethiopia Field Epidemiology and Training program (EFETP) is a two years in-service training program in field epidemiology adapted from the United States Centers for Disease Control and Prevention (CDC). The program is designed to assist the Ministry of Health in building or strengthening health systems by recruiting promising health workers and building their competencies through on-the-job mentorship and training. The program has two main components: a classroom-teaching component (25%) and practical attachment or field placement component (75%). Completion of the above mentioned two components of the residency culminates in a final output of works, which is equivalent to a thesis for the graduate school of public health for partial fulfillment of a master degree in Field Epidemiology.

These out puts of work have eight chapters, which includes report of outbreak investigations, surveillance data analysis, evaluation of a surveillance system, description of a health profile, scientific manuscripts for a peer review journal, abstracts for scientific presentation, proposal for epidemiological research project and another additional output report.

To complete these outputs of work different methods were used. In chapter one two outbreaks were investigated one is Epidemiological description of unknown skin lesion outbreak in Jimma town, Ethiopia December 2019 and the other is Dengue Fever Outbreak Investigation in Millie Woreda, Zone one, Afar Region, Ethiopia, January 2020. In chapter two, three and four. Influenza Surveillance Data Analysis: Magnitude and distribution of Severe Acute Respiratory Illness (SARI) at Yekatit 12 Hospital Medical College 2009-2019, Addis Ababa, Evaluation of National Laboratory based Antimicrobial Resistance Surveillance System and Health Profile Description of Bahirdar Zuria Woreda, Amhara Regional State, Ethiopia 2019 included respectively.

In chapter five and six one Manuscript titled with Hospital based epidemiology of influenza in Ethiopia: Descriptive analysis of Severe Acute Respiratory Illness (SARI) 2009-2019, Addis Ababa, Ethiopia: and three abstracts is done respectively. In chapter seven research work on Performance of Laboratory Professionals working on Malaria Microscopy at public and privet Health facilities of malaria elimination districts North Shewa Zone Amhara Region, and finally, in chapter eight additional output report on Rapid Assessment report on Malaria epidemic affected Woredas of Tigray region January 2020 included.

Chapter One- Outbreak Investigation

1.1 Epidemiological description of unknown skin lesion outbreak in Jimma town, Ethiopia December 2019

Abstract

Introduction: Skin diseases are the most common disease in resource limited countries. We described epidemiology and clinical feature of the unknown skin disease outbreak.

Methods: Unknown source of skin infection rumor was received from the Jimma town on 12 October 2019. From 82 cases that were line listed from October 20 - December 2, 2019, 30 cases were investigated thoroughly. This study was carried out from November 20 – December 2nd, 2019 at private and public hospitals including health centers found at Jimma town. Results were displayed using texts, pictures, tables and graphs.

Result. From total 82 cases line listed age ranges from 3 month to 70 years with the median age 21 years and Males account 52.4 %. The lesion affected all age groups with increased number of cases seen in age group 25_44 followed by age group 5_14 which accounts 61.0% and 23.2% respectively. Most of the lesions are circular with symmetric shape, color and regular border, in average measured to be from 5 – 15 mm in diameter. The lesions appear similar areas of the body predominantly on the face and extremities, even though some cases were seen on the flank and shoulder. All patients had stable vital sign.

Conclusion: The clinical presentation with the stages observed in different cases and different antibiotics were not haltering or treating the lesion, suggested viral infection similar to Ecthyma *contagiousum* and Cowpox illnesses. But identification of the causative agent and other further study should be done to identify the risk factors of the outbreak,

Key word: unknown skin disease, Outbreak, Jimma

Introduction

Skin diseases are the most common disease in resource limited countries. Study on Global Skin Disease Morbidity and Mortality show that, skin conditions contributed 1.79% to the global burden of disease measured in 2013. Individual skin diseases varied in size, from this viral skin diseases and fungal skin diseases accounts 0.16% and 0.15% respectively (1). Dermatologic diseases represent one of the most common causes of morbidity in developing countries such as Ethiopia (2). Retrospective study conducted in Ethiopian, Tigray on Epidemiology of Skin Disorders Children and Adolescents show that Infections and infestations were the most common category, accounting for 47% of the disorders seen. Dermatitis constituted the second most common diagnostic category (24.7%). Together these accounted for 71.4%of the total diagnoses. From infectious diseases, fungal infections were the most common (44.1%), followed by bacterial and parasitic diseases (3). The prevalence of skin disease in two different rural communities in southwestern Ethiopia was determined using descriptive epidemiologic techniques indicated that, the commonest complaints were parasitic (scabies, pediculosis, and onchocerciasis) infestations (46% of diagnoses), followed by bacterial and fungal infections (33%); other conditions included endemic non-filarial elephantiasis. Overcrowding was the main risk factor for infection (4).

Unknown source skin infection rumor was received from the Jimma town on 12 October 2019 and verified by the Rapid Response Team deployed from town health office October 31, 2019. The rumor was reported by Jimma town health office to Ethiopian Public Health Institute on 17 November 2019. After receiving the report EPHI had deployed Investigation team composed of an Epidemiologist, a Medical Doctor, Veterinarian and Field epidemiologist resident on 20 November 2019 for further investigation and interventions. This investigation was done to provide a brief description about outbreak and indicate clinical feature and presentation of the illness

Objective of the investigation

General objective

- To describe epidemiological distribution of skin lesion outbreak in Jimma town

Specific objective

- To describe the distribution of skin lesion by person, place and time.
- To describe the clinical feature and presentation of the illness.

Material and methods

Study area and Study Design

Jimma town is one of the oldest cities in Ethiopia, located in Oromia region, Jimma zone, 325 km from Addis Ababa. It has relatively cool climate under tropical monsoon climate, with average daily temperature of 20 – 25 ^{o}c year-round. It has a population size of 210,908, of which 106,044 are males and 104,864 females. The age distribution of Jimma town is 12,043 are under the age of 2 years, 34,654 under 5 years, 65,381 between the age of 5 and 14, 100, 244 between the age of 15 and 59.

There are 17 kebeles, 4 rural and 13 urbans. Under governmental health service delivering facilities, there are 4 health centers, 1 general hospital and 1 referral and teaching hospital. There are 1 private general hospital 24 lower and middle private clinics.

Descriptive study was carried out from November 20 – December 2nd, 2019 at private and public hospitals including health centers found at Jimma town.

Data collection and Activities done

Investigation team composition: a team of experts from zoonotic disease, human medicine, field epidemiology and laboratory were deployed to work with Jimma town PHEM officers.

Coordination: after the team arrived at Jimma town, we have conducted meeting between the rapid response team and town health bureau workers. In the meeting a grasp of the outbreak date, clinical presentation of cases, the affected kebeles were identified and action plan were prepared to facilitate the coordination. A task force with multisectoral department heads and towns mayor were formed. For the support of laboratory, material, human resource and knowledge support Jimma hospital university, Jimma school of agriculture and veterinary, owners of private clinics and dermatology specialists were contacted.

Surveillance and laboratory: to facilitate the case identification and management, Jimma town health center was selected as treatment center based on case flow, proximity to affected kebeles, availability of trained human resource, laboratory investigation and medication. A questioner and line list for detailed epidemiological and clinical evaluation of the patients were prepared, commented with the dermatologists with which cases were properly documented. Active case search was conducted in affected kebeles with the investigation team, town RRT, Jimma university epidemiology students and

health extension workers. With good collaboration of private clinics and Jimma hospital university laboratory samples for CBC, gram stain, culture and sensitivity were taken.

Case management: reviews on case management protocols for identified top differential were done. With the helpful discussion with dermatologists, a common management decision was reached.

Health education: community mobilization and meetings were conducted to share concerns of the society. With this society were educated on commonest skin infection prevention and control methods. Orientation on case management protocol including essential dermatologic history taking, physical examination, prevention and control mechanisms were given to health officers, nurses, rapid response team members of the town health bureau, heath extension workers from different health centers.

Data Collection Tools and Procedures

The following procedures and tools were applied to collect data during the investigation.

A. Document review- We reviewed the outpatient medical logbooks and medical record of cases

at Jimma Health center and Private health facilities.

B. Interviewing Cases: Using a structured and semi structured questionnaire, cases were interviewed by investigation teams deployed by EPHI

Data analysis and presentation

The data was entered and analyzed by using Excel 2010. Descriptive statistics were used to determine the frequency of different variables. Rates, ratios and proportions were calculated.

Ethical considerations

Written letter was submitted to Ethiopian Public Health Institute, Public Health Emergency Management Center and permission to investigate the outbreak was obtained both in EPHI and Jimma town health administration. Approval of the health facilities administration was obtained before approaching the patients. After oral consent was given to patient, each case was interviewed at the hospital, their houses were visited.

Dissemination of the result

The finding was submitted to Jimma town health office /PHEM department, Ethiopian public health institute/PHEM department, Addis Ababa university school of public health the finding also will be published journals.

Result

After receiving the report EPHI had deployed Investigation team composed of an Epidemiologist, a Medical Doctor, Veterinarian and Field epidemiologist resident on 20 November 2019 for further investigation and interventions. Up to the end of the investigation on December 2nd 2019 there were 82 cases registered. The disease was first seen at Mentina kebele of the town that then involved 7 other kebeles.

Descriptive epidemiology

From 82 cases that were line listed from October 20- December 2, 2019, 30 cases were investigated thoroughly up on the deployment of the investigation team. From total 82 cases line listed age ranges from 3 month to 70 years with the median age 21 years and Males account 52.4 %. The lesion affected all age groups with increased number of cases seen in age group 15 - 44 followed by age group 5- 14 which accounts 61.0% and 23.2% respectively (table 1).

Table 1: Distribution of skin lesion cases by age groups and sex in Jimma town, Oromia region, December, 2019

Age group	Total Cases		Male		Female	
	Number	Percent	Number	Percent	Number	Percent
Less than 5	7	8.5 %	4	4.9%	3	3.7%
5_14	19	23.2%	12	14.6%	7	8.5%
15_44	50	61.0%	26	31.7%	24	29.3%
45_64	2	2.4%	-		2	2.4%
above 65	4	4.9%	1	1.2%	3	3.7%
Total	82	100%	43	52.4%	39	47.6%

The highest number of cases reported per day are 9 cases, which was on November 5 and 6, 2019 followed by 8 cases on November 26, 2019. (Figure 1).

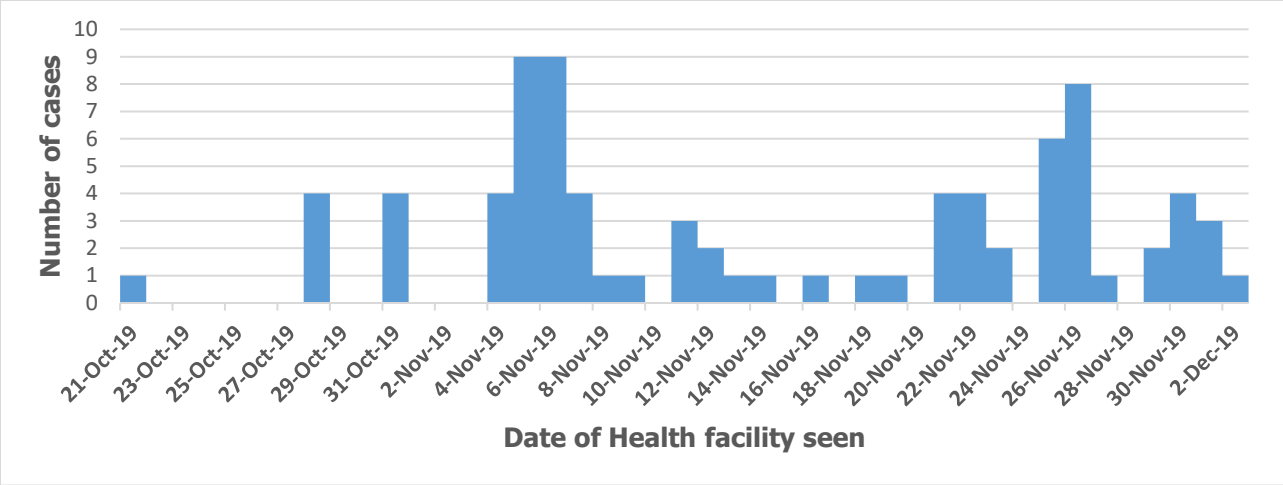

Figure 1:Skin lesion cases seen at health facilities in Jimma town, Oromia region, December, 2019

As the first case was seen at Mentina kebele, 46.3% cases were reported in this kebele followed by Bosa Kito and Bochu Bore 9.8 % each. (table 2)

Table 2: Distribution of skin lesion cases in Jimma town, Oromia region, December, 2019

Name of Kebele	**Cases**	
	Number	**Percent**
Aweto	5	6.1 %
Bochu bore	8	9.8 %
Bosa Addis	2	2.4 %
Bosa kito	11	13.4 %
Ginjo	8	9.8 %
Hirmata	6	7.3 %
Jimma University area	4	4.9 %
Mentiina	38	46.3 %
Total	82	100 %

Clinical feature

From the 10 cases observation with consultation to dermatologists, most of the cases progress in a manner of different stages. Most of the lesions are circular with symmetric shape, color and regular border, in average measured to be from 5 – 15 mm in diameter. Patients came to health facility with a lesion as fast as 4 days and with longest of 2 months complain.

The lesions have different stages. It starts as a small papule. The papule then grows in to vesicle that enlarges to be a more of a nodule/ plaque with broad base. Then the lesion will form an eschar with which stage the surrounding edema starts to subside and lastly forms a punched-out scar when it heals. The lesions appear similar areas of the body predominantly on the face and extremities, even though some cases were seen on the flank and shoulder. In the vesicular and nodular stage of the lesion, it appears to be a pustular, but when scrapped of have no discharge which can be explained by collection of cellular infiltrates. The lesion was characterized by depressed erosion or slightly elevated black nodule. When the lesions are scrapped of the underlying lesion is fleshy with yellowish dry crest. The different stages of the illness are shown below on figure 2.

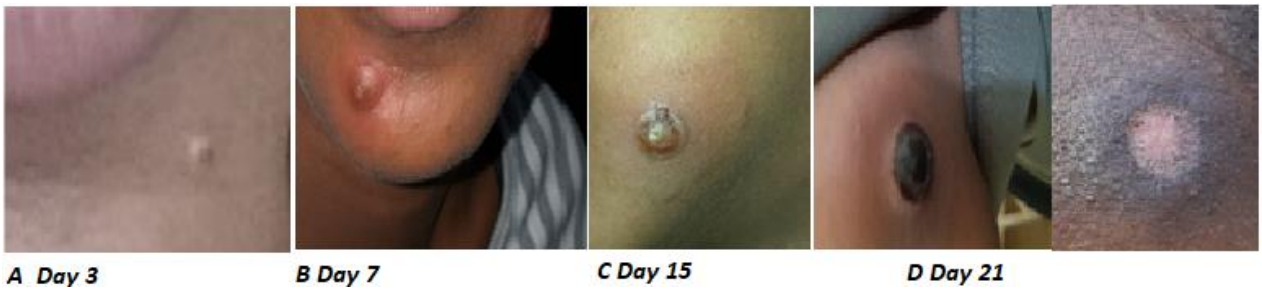

Figure 2:Image showing different stages of the skin lesion in days

All patients had stable vital sign. The lesion seems to be sever associated with reactive cellulitis when it appears on the face. Similar lesions on the extremities have smaller swelling, redness or tenderness. Most of the lesions doesn't have associated systemic complaint other than pain and pruritus. But when appearing on the face, patients complain of headache. Lypmhadenopathy is also common. The most common complaint and symptoms of the evaluated 30 patients are shown in the table 3.

Table 3: Common complaints and symptoms of patients with skin lesion in Jimma town, Oromia region, December, 2019

Complaints	cases	
	Number	**Percentage**
Fever		
Yes	7	23.3 %
No	23	76.7 %
Headache		
Yes	7	23.3 %
No	23	76.7 %
Itching		
Yes	19	63.3 %
No	11	36.7 %
Sever Pain		
Yes	26	86.7 %
No	4	13.3 %
Swelling		
Yes	22	73.3 %
No	8	26.7 %
Lesion		
Yes	24	80.0 %
No	6	20.0 %

Case series

Case 1

A 5 years old male child from *Hirmata* kebele, he lives with his 5 members of family. He came to Jimma Health center on 25 November 2019. He presented with a complaint of skin lesion of 15 days' duration. He was relatively healthy 2 weeks ago at which time a small papule erupted on the left side of his face below his eyes. After few days there was also another lesion on the right arm with similar feature. The papule was pruritic that later started to grow gradually. They went to nearby clinic from which they were given unspecified syrup for allergy. But after few days of being on medication the lesion on his face started to darken and become swollen while the lesion on his arm stayed the same. Associated with this, he had redness of the swollen area, headache, low grade fever. He developed intermittent nonproductive cough that is exacerbated during night two days prior to his current visit to the health center. Otherwise no discharge or bleeding. He has no known history of contact with patients with the same illness. Takes shower weekly. The family uses water from well. No contact with animals.

Physical examination: Pulse rate was 96, temperature 36.1 ^{O}c , pertinent finding was on HEENT and integumentary system. There was a 15 cm diameter nodular lesion with surrounding erythematous skin and swelling involving the left facial area. The lesion was punched out dark/ hyper pigmented lesion with circular regular border and symmetric shape and color. there was none tender on palpation, hot to touch, with crested top with no discharge. There was another circular nodular lesion on the lateral distal arm, with regular border, symmetric shape, crested top with slight hyper pigmentation. No inflammation signs on the surrounding tissue, non-tender, and no discharge.

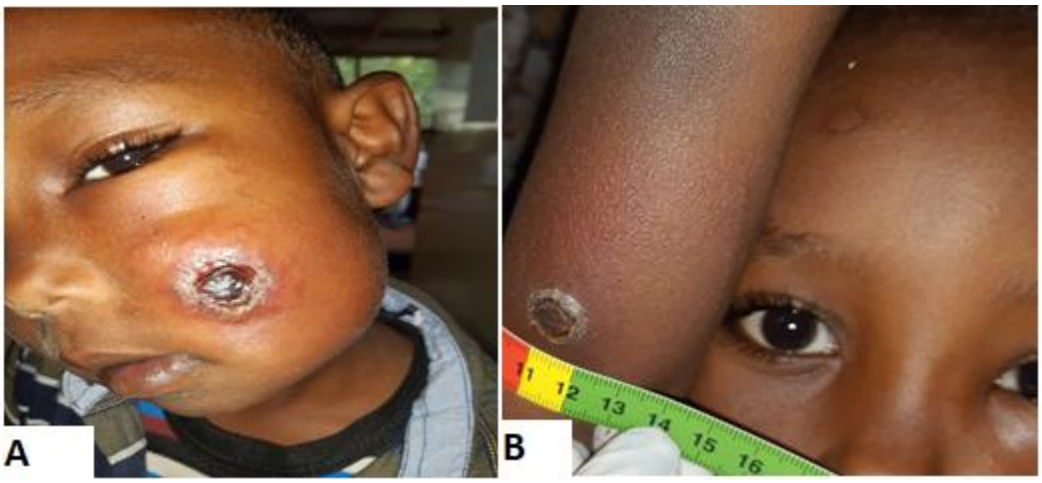

Figure 3: A 5 year old male child with fascial (image A) and left arm (image B)skin lesion of 2 weeks duration

Case 2

A 14 years old female student from Ginjo kebele. She came private clinic on November 20, 2019. She presented with a skin lesion of one-week duration on her face. The lesion started as a small papule described as a small acne like lesion on the left chin area. Then on the third day of appearance similar lesion started to erupt on the opposite side of her chin and on the nasal bridge between her eyes. The papule then started to itch and get enlarged to a nodule with hard bottom. She complained of a headache and sore throat. But no history of cough, swelling or bleeding. She has no contact with patients with the same illness or animals.

She was well looking with Pulse rate of 82 and temperature of 36.6 ^{O}c. she had three circular lesions on her face with average diameter of 8 mm on the left and right chin and nasal bridge. She had also bilateral mobile tender mandibular lymphadenopathy.

On her follow up on the fifth day of her presentation to the clinic, the patient came to the clinic with significant edema surrounding the lesion that made her unable to open her eyes and masticate properly. She was on Cephalexin 500 mg po taken every 6 hours for 7 days, Fusidic acid to be applied twice daily and wound care with salted water twice daily. Despite the adherence of her medication the patient came with exacerbation of symptoms. With reassurance and further extension of the antibiotic for ten days the patient came to follow up on the 21st day. The lesion started to form an eschar and edema was subsiding. She didn't complain of other symptoms. The progress of the lesion on her chin in this patient is shown in *figure 2 c* and *figure 4* shows lesion on nasal bridge.

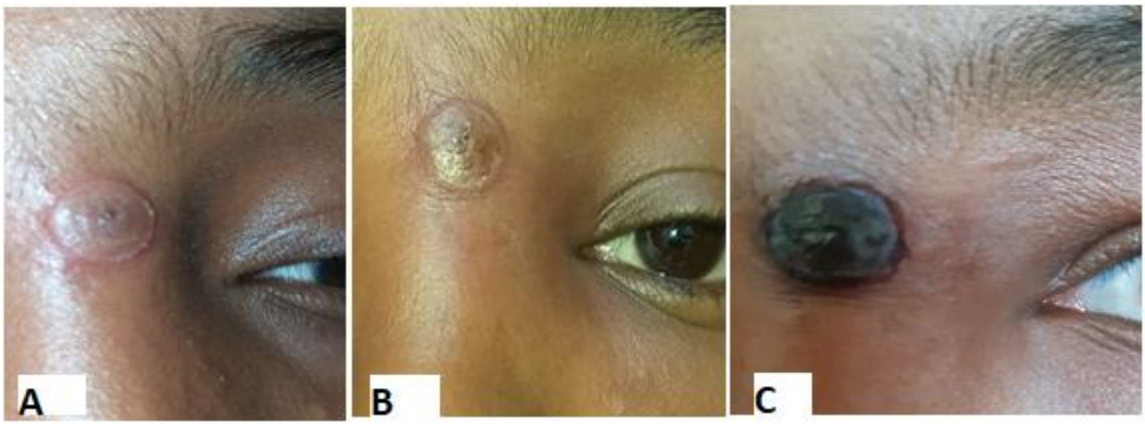

Figure 4: Image showing progress on lesion in a 14 years old patient located on the nasal bridge

Case 3

A 21 years old male patient came to private clinic. He was a daily laborer from *Bosa kito* kebele. He presented with a black skin lesion of 3 weeks duration on his left later forehead. He was relatively healthy before 3 weeks at which time he had small papule erupted on the forehead. He topped of the papule thinking it is an acne. There was no bleeding or discharge from the site. Another lesion also erupted 3 days after the initial lesion on middle forehead above the eyebrows. Both skin lesion started to grow and enlarge to form a nodule. On his 10 days of the lesion, the surrounding skin started to swell. The swelling started to decrease recently after the lesion started to get dark and form a wound. He lives with 3 of his roommates. Him being the first one having the lesion all are having the disease. Prior to that he has no history of contact with patients or animals with the same illness. He has no history of headache, itching or medication intake.

Vital signs were stable. There are 8 and 10 mm swelling on the lateral left forehead bordering the hairline and on the middle forehead respectively. Both have formed depressed eschar with regular borders. There is no tenderness or hotness. *(figure 5)*

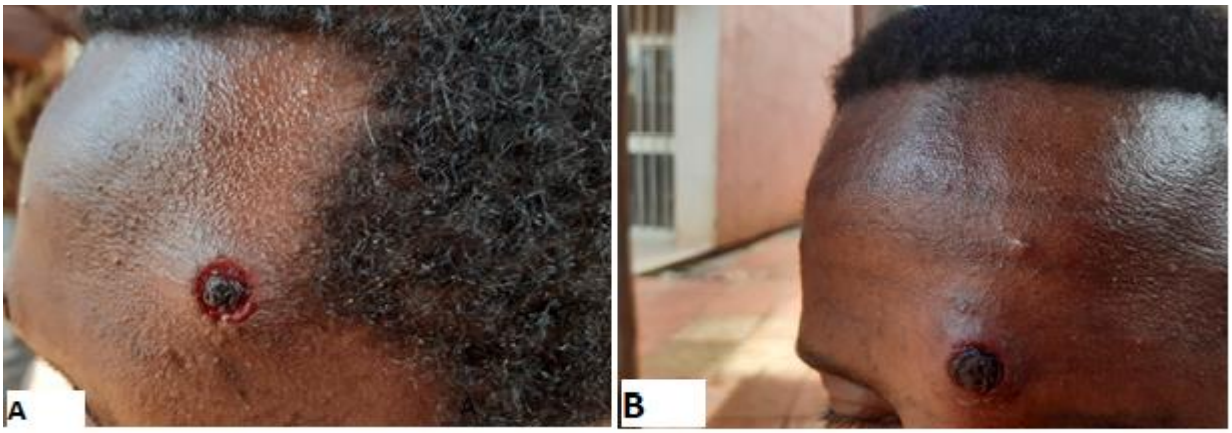

Figure 5:Image showing skin lesion in 21 years old male on his left later forehead (image A) and middle forehead (image B) above the eyebrows on his 21st day presentation

Laboratory Investigations

Serum and swab samples were collected for PCR investigation to be send to abroad for further investigations, the result is still pending. Other supportive laboratory tests like CBC, FNAC, Gram stain and culture for bacterial investigations were done to support physical examinations, and presented below,

Complete Blood Count: CBC done for three patients; the finding was in normal range as shown below.

Parameters	**Patient A**	**Patient B**	**Patient C**
WBC	6.9*103	7.6*103	7.9*103
LYMPHOCYTE	21.5%	20.9%	31.9%
NEUTROPHIL	60%	69%	59.2%
MID	18.5%	10%	8.9%
HGB	16.2 g/dl	20.7 g/dl	11.3 g/dl
HCT	45.7%	60%	32.1%
PLT	213*106	202*106	431*104

FNAC: Two FNAC were done. ***Result one:*** Hemorrhagic background containing mixed inflammatory cells mainly neutrophils. ***Result two:*** Smear shows mixed inflammatory cells with hemorrhagic background

Gram stain: Grams stain was done for 8 patients from which 50% are due to gram positive staphylococcus and the other half due to gram positive streptococcus.

Culture: Six swab samples were collected from the lesion. Only one didn't have any growth while the other five had growth for coagulase negative staphylococcus. The finding shows growth of bacteria that is part of normal flora of the skin.

Discussion

The skin disease affects all age groups and age ranges from 3 month to 70 years. The lesion affected all age groups with increased number of cases (84.2%) seen in age group < 44 years. The lesion occurred in different part of the body and n the most common sites of were hands and face but other sites of the body were affected rarely. This is the same to the study conducted on Investigation and analysis of a human Orf outbreak among people living on the same farm in Turkey (6).

The lesion seems to be sever associated with reactive cellulitis when it appears on the face. Similar lesions on the extremities have smaller swelling, redness or tenderness. Most of the lesions doesn't have associated systemic complaint other than pain and pruritus. But when appearing on the face, patients complain of headache. Lypmhadenopathy is also common. Regarding the complaint and symptoms, sever pain and lesion were the most common complian and syptoms but fever and headache were occurred rarely.

Even if the definite diagnosis is reached after proper investigation, the clinical presentation of the lesion has helped to narrow differential diagnosis. Two viral infections namely *Ecthyma contagiousum* and cowpox were the top differentials. Ecthyma contagiousum is a viral zoonotic infection. It is a disease caused by parapoxvirus commonly affecting goat and sheep with occasional transmission to human. Human to human transmission is rare. When occurring in humans it can appear as single or multiple, small papule that develops to hemorrhagic pustule/ bulla which contains central crest and bleeds easily. It then develops to nodule with thin crest then to firm crest. Mild lymphadenopathy and low-grade fever can occur. The lesions heal spontaneously within 3 to 6 weeks (7) (8). Cowpox is a zoonotic dermatitis affecting, caused by Orthopoxviruses. Despite its name, mainly cats and humans. it is not highly infective for humans and usually produces a localized lesion mainly on fingers, hands, or face (9). After an incubation period of 7–12 days after direct skin contact with cats, which are the main source of infections in people, patients develop a necrotizing nodule with consecutive scar formation, accompanied by malaise, raised temperature, and long-lasting, pronounced, and painful regional lymphadenopathy (10).

Viral infection was highly suspected because of the clinical feature, inconclusive laboratory results, response to antibiotic and similarity between stage of progress. In bacterial skin infections the skin lesion tends to be irregular with extensive inflammation and pus discharge from the site. In our cases we had seen that, the lesions were localized with regular circular border. Despite the hypo pigmented

and vesicular presentation of the lesion, most of the patients reported that despite topping of the lesion expecting a discharge there were none. This can be explained by accumulation of cellular infiltrate which is the commonest feature of viral infection.

The inconclusive laboratory results are another evidence to suspect a viral infection. As explained before, most bacterial infections cause septicemia causing elevated white cell count with neutrophil predominance which is not seen in these patients. Another is the cellular infiltrate that is seen with hemorrhagic background on the FNAC supports viral infection. Even though the gram stain shows staphylococcus and streptococcus bacteria, the culture showed normal flora of the skin which make us doubt the presence of contamination during sample collection.

Despite trying a wide range of antibiotics, the lesion seems to show no response to it. In case 2 we have seen that the patient was adherent to medication but still the lesion progressed to have a reactive cellulitis then form an eschar. While on case 3 we have seen that the lesion progressed the same manner as the patients taking antibiotics even when the patients are not taking medication. This has made us wonder that the antibiotics are not haltering the lesion nor treating it hence suggesting a viral infection.

Study limitations

Unable to identify the causative agent by different laboratory techniques in the country makes difficult to made to predict the management, prevention and control mechanism. Self-treated cases were common in the community, due to this, factors such as non-fatality of the case made it hard to identify the exact number of cases in the community.

Conclusions

The clinical presentation and the stages observed in different cases and different antibiotics were not haltering or treating the lesion, the investigation team suggests that, it may be a viral infection similar to *Ecthyma contagious a*nd cowpox illnesses.

Recommendation

Identification of the causative agent and other further study should be done to identify the risk factors for implementing disease prevention measures and control the disease transmission. Different dermatology related trainings should be conducted for clinicians and other health workers on the disease and its prevention and control mechanism.

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1.2 Dengue Fever Outbreak Investigation in Millie Woreda, Zone one, Afar Region, Ethiopia, January 2020

Abstract

Introduction: Dengue is a mosquito-borne viral disease that has rapidly spread in all regions of WHO in recent years. Dengue virus is transmitted by female mosquitoes mainly of the species *Aedes aegypti*. In Ethiopia, confirmed cases of Dengue fever were reported in 2013 with serotypes circulating strain of DEN-2 and Aedes aegypti was identified vector. We determined factors associated with Dengue fever outbreak

Methods: An unmatched case-control study design was used to investigate the outbreak from January 27- February 3, 2020. Epidemiological data were collected through face to face interview using structured questionnaire. Results were displayed using texts, tables and graphs and statistical significance was interpreted using Odds ratio with 95% confidence interval and P value <0.05 after logistic regression was performed. Serological test was done for Sixteen serum samples

Result: We enrolled 105 participants (35 cases and 70 controls) in the study. From these males accounted for 74.3% of cases and of 64.3% for controls. The median age of participants was 30 years (range from 8 to 60). In a multivariable analysis, failure to use long lasting impregnated net while sleeping (Adjusted odds ratio sleeping (AOR= 5.314: 95% CI: 1.682-16.790 and P= 0.004) and availability of opened water holding container (AOR= 6.702: 95% CI: 2.141-20.976) and P= 0.001) were remain significant risk factors to dengue fever. From 16 samples tested, 14 (87.5%) were confirmed positive.

Conclusions: Individuals who live with Dengue fever patient, do not use bed nets and availability opened water holding container around their homes are at high risk of contracting the disease. Health education on Dengue Fever prevention was given and mosquito breeding sites were drained. Strong vector prevention strategies are recommended by enhancing the existing malaria prevention and control program.

Keywords: Dengue fever, Afar, Mille, Outbreak, Risk factors

Introduction

Dengue is a mosquito-borne viral disease that has rapidly spread in all regions of WHO in recent years. Dengue virus is transmitted by female mosquitoes mainly of the species *Aedes aegypti* and, to a lesser extent, *Ae. albopictus* [1]. Dengue virus (DEN) is a small single-stranded RNA virus comprising four distinct serotypes (DEN-1 to -4). These closely related serotypes of the dengue virus belong to the genus Flavivirus, family Flaviviridae [2]. Following an infection with one DENV serotype, the antibodies induced are type-specific and also cross-reactive with other DENV serotypes. After human inoculation via the bite of an infected female mosquito, the virus replicates in local dendritic cells [3]. Currently, there is no effective antiviral treatment for dengue infection and no licensed vaccine against dengue infection is available. The main method of controlling Dengue fever transmission is through the active monitoring and surveillance of vectors [3] [4].

Humans are the main amplifying host of the virus. Dengue fever is characterized by a sudden onset of high-grade fever with nonspecific constitutional symptoms, and most cases resolve without specific treatment [5].

The last 50 years have seen an unprecedented rise in the incidence of dengue with outbreaks of increasing frequency and magnitude. About 3.9 billion people, in 128 countries, are at risk of infection with dengue viruses[3]. According to recent estimates, 390 million dengue infections occur annually (95% confidence interval [CI]: 284–528 million), of which 96 million (95% CI: 67–136 million) manifest clinically (with any severity of disease) [4]. In Africa, the first reported dengue fever outbreaks occurred in Zanzibar in 1823 and 1870. Several other African countries including Burkina-Faso, Egypt, South Africa and Senegal, reported unconfirmed outbreaks of dengue fever in early 1900s. Although many outbreaks aren't ever officially reported, between 1960 and 2017, more than 20 laboratory-confirmed dengue epidemics were reported in more than 20 African countries [6].

In Ethiopia, confirmed cases of Dengue fever were reported in 2013 with serotypes circulating strain of DEN-2 and Aedes aegypti was identified vector for both at indoor and outdoor levels in Diredawa administration city with a total of 11,409 cases [7].

Afar regional state of Ethiopia experienced different dengue fever outbreaks. This outbreak was notified by the regional Public health emergency management department to the national public health

emergency management on January 18, 2020.The team from EPHI was deployed to Afar regional state for the outbreak investigation and response on January 26, 2020. After the team had arrived to the area different activities were done. Active case search, case management at hospital and private clinics, Coordination and Collaboration activities with different stakeholders, facilitate social mobilization, identifying mosquito breeding sites and awareness creation for community, were the major activities done,

This investigation was done to provide a brief overview about the outbreak and possible risk factors of Dengue fever in Mille woreda of Afar region.

Objectives

General objective

- To describe and determine risk factors associated with Dengue fever outbreak in Millie woreda, Zone one, Afar regional state, Ethiopia.

Specific Objectives

- To confirm and describe the epidemiology Dengue fever outbreak in Millie woreda, Afar regional state, Ethiopia
- To identify potential risk factors associated with the occurrence of Dengue fever outbreak in Millie woreda, Afar regional state, Ethiopia

Methods and Materials

Study Area

The Investigation was conducted in Afar Region, Administrative Zone one (Awsi Rasu), Millie woreda, Millie kebele 01 which located 567 K.M from the capital city Addis Ababa. Based on the information we got from the local authority; the district has 116,481 total population, from which are 64, 065 were males and Females account 52, 416. The woreda has a total of 12 kebeles, 5 health centers and 10 health posts which delivery health care service to the community.

Figure 6: Map of Ethiopia Showing Mille woreda, Afar Regional State, January 2020

Study Design and Period

We applied a descriptive analysis of the collected line list of cases followed by unmatched case control study with a case to control ratio of 1:2, in order to identify the possible risk factors of the outbreak from January 27- February 3, 2020

Sampling Method and sample size

We included all reported 35 cases during the investigation period and using a 1:2 case to control ratio and we selected 70 controls randomly from the same village where cases are identified making total participants 105.

Source population

All residents of Mille woreda who were attending the health facility.

Study Population

Subset of source population who fulfil the inclusion criteria for dengue fever disease

Inclusion and Exclusion criteria

Inclusion criteria

Cases were either confirmed or epidemiologically linked dengue Fever cases while controls were all people without Suspected Dengue fever symptoms. All confirmed or epidemiologically linked cases of dengue fever found in Health facilities from January 17-27, 2020 were included in the study. For the Controls, resident of Mille woreda who was a neighbor to a case and who did not develop signs and symptoms of Dengue fever were included in health facility was enrolled.

Exclusion criteria

Suspected Dengue fever patients who were critically ill and controls who were not a permanent resident of Mille woreda were excluded from the study.

Variables

Dependent variable

Dengue fever status of participants during the study period.

Independent variable

Gender, Age, Occupation, Educational level, Marital Status, Bed net utilization, traveling history to the affected sites, house hold spraying in the last six months, presence of open water container, Close Contact with Ill Person in the Last 2 weeks, type of cloths,

Case Definition and Selection of Cases and Controls

Case Definition: Patient with sudden onset of fever and the presence of one or more signs and symptoms of Dengue fever: nausea, vomiting, rash, aches/ headache, retro-orbital pain, joint pain, myalgia, arthralgia, Tourniquet test positive, leukopenia (a total white blood cell count of <5,000/mm3), or any warning sign for severe dengue: abdominal pain or tenderness, persistent vomiting, extra-vascular fluid accumulation (pleural or pericardial effusion), mucosal bleeding at any site, liver enlargement >2 centimeters, increasing hematocrit concurrent with rapid decrease in platelet count.

Suspected: Any patient with fever and one or more of Dengue fever signs and symptoms that having epidemiologic linkage.

Probable: Any patient with fever and one or more of Dengue fever signs and symptoms and detection of anti-DV IgM in serum sample.

Confirmatory: Detection of Dengue virus nucleic acid in serum, plasma, blood, cerebrospinal fluid, other body fluid or tissue by validated laboratory test method such as reverse PCR reaction, immune fluorescence or immunoassay to detect seroconversion of anti-DV IgM or anti-DV IgG.

Epidemiologic Link: Travel to a dengue endemic area or presence at location with ongoing outbreak within previous two weeks of onset of an acute febrile illness or dengue or association in time and place (e.g., household member, family member, classmate, or neighbor) with a confirmed or probable dengue case.

Cases- Are individuals, which fulfils the above criteria and all reported cases were included in the study

Controls- Are individuals, who does not fulfill the above criteria and selected from similar village where cases were identified.

Data Collection

We reviewed medical record of cases at Millie health center and the laboratory findings of cases at the National reference laboratory. Epidemiological data were collected through face to face interview using structured questionnaire prepared in English with the help of local guides and translators and laboratory specimen was collected by the investigator. The questionnaire was divided in to three main areas covering demographic information, clinical information, laboratory specimen information, knowledge assessment and exposure information of the disease. For verifying consistency, the questionnaire was pre-tested a day before the actual data collection.

Laboratory Investigation

Serum samples were collected and transported according to the recommended cold chain to identify the cause of the unusual febrile illness. Sixteen serum samples were received by the national arbovirus laboratory (which is based in the national influenza laboratory) before the national investigation team was dispatched to the area of outbreak. Laboratory tests were performed for Dengue fever Virus for all 16 serum samples using Real Time Reverse Transcriptase Polymerase Chain Reaction (rRT-PCR) technique to identify the etiology of the existing febrile illness.

Data Analysis

The data were checked for completeness and consistency and analyzed using SPSS version 21 software. Descriptive data analysis was performed by time, person and place using Microsoft office excel sheet. Attack rate was calculated by dividing the number of cases to the population obtained from Millie Woreda Health Office. Logistic regression was also applied to determine the factors associated with Dengue fever disease outbreak. Results were displayed using texts, tables and graphs and statistical significance was interpreted using Odds ratio with 95% confidence interval and P value <0.05.

Ethical issues

Support letter was written to Afar Regional health Bureau to get permission and facilitate the investigation process. Serum samples were collected only aiming to investigate the causative agent of the unusual febrile illness and to guide appropriate outbreak control interventions. Verbal informed consent was obtained from all identified cases that were greater than 18 years of age. Confidentiality

of patient information was kept by using code number and accessed by only principal and co-investigators.

Dissemination Plan

This study report was submitted to Ethiopian Public Health Institute and Addis Ababa University, School of Public Health. The manuscript of the report can be published in peer- reviewed journals to reach the scientific community

Result

Descriptive data analysis

A total of 99 cases were reported from Mille woreda kebele 01 within the outbreak period from January 17 to February 8, 2020. From the total registered cases 70 (70.7%) were males with the mean age of the cases were 30 years with range of 3 years to 55 years. All cases were treated as an outpatient and there was no death on this dengue fever outbreak. Among 12 kebeles in the district, dengue fever was detected on only one kebele with a total population of 29, 143 and male accounts 15, 737 and female 13, 406. The overall crude attack rate was 0.3%, estimating 3 cases per 1,000 populations. The sex specific attack rate for this outbreak were 4 dengue fever cases per 1,000 population for males and 2 dengue fever cases per 1,000 population for females.

The majority of case 85 (85.9%) were age group 15 to 45 years, followed by age greater than 45 years cases 9 (9.1%) and age group 5 to 14 cases 4 (4.0%) and the rest only one case were age less than 5 years old. (Table 4)

Table 4: Dengue fever case distribution by sex and age group in Mille woreda, Afar region January *2020*

Characteristics	Grouping	Number	Percentage
Sex	Male	70	70.7%
	Female	29	29.3%
	Total	99	100
Age group	Less than 5 years	1	1.0%
	5-14	4	4.0%
	15-45	85	85.9%
	Greater than 45	9	9.1%
	Total	99	100

An index male case was 54 years old truck driver who presented with sudden onset of acute fever and joint pain on January 17, 2020. He had no a travel history to Dengue affected area. The highest cases were reported form January 23-29, 2020, while the case reduced from January 30, 2020 as indicated on figure 7.

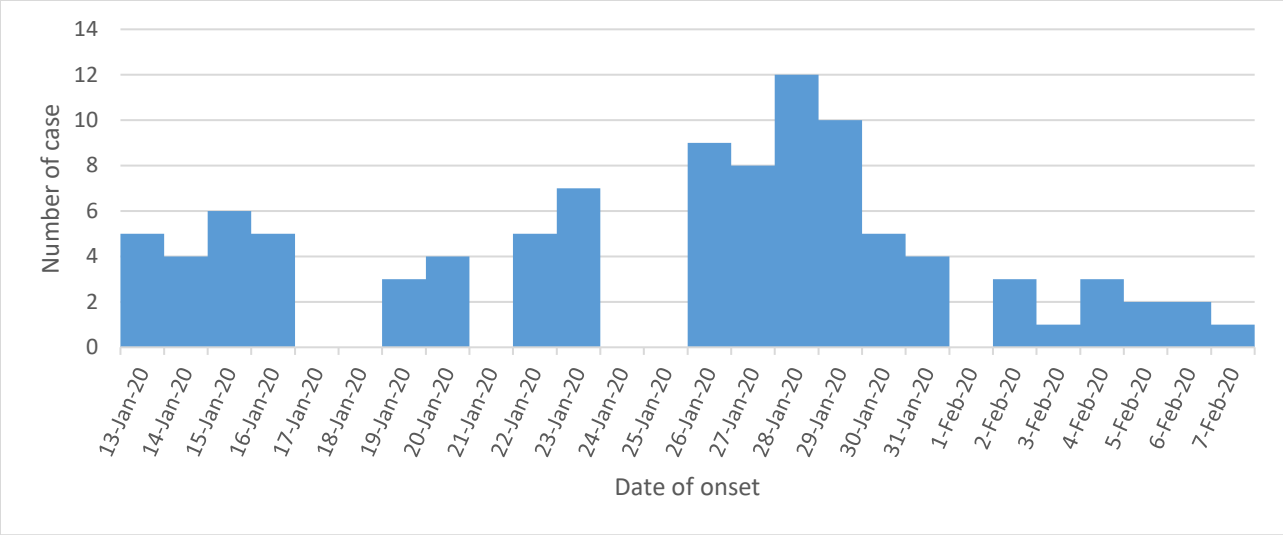

Figure 7: Epi curve of Dengue fever outbreak in Mille woreda, Afar region January 2020

Among the total dengue cases, all of them developed fever, headache and joint pain and also 31(31.3 %) of cases were developed back pain, 10 (10.1%) of the cases developed vomiting and non-of them have develop nasal Bleeding. (Table 5)

Table 5: Dengue fever sign and symptoms in Mille woreda, Afar region January 2020

S.N	Sign and symptoms	Number of cases	Percentage
1.	Fever	99	100%
2.	Headache	99	100%
3.	Joint pain	99	100%
4.	Back pain	31	31.3%
5.	Nasal Bleeding	-	-
6.	Vomiting	10	10.1%

Laboratory Result

Sixteen serum samples were collected for confirmation, of those 14 were IGM positive for dengue fever (positivity rate of 87.5%). The rest of the cases were epidemiologically linked by person, place and time with the cases.

Socio demographic characteristics study participants

A total of 105 individuals (35 cases and 70 controls) were interviewed. Response rate of the study was 100%. From the total respondents, 71(67.6%) were males and 34 (32.4%) were females. The median age of participants was 30 years (range from 8 to 60). Out of the 35 cases, 26 (74.3%) and 9 (25.7%) were males and females respectively and similarly for controls, males account 45 (64.3%) and females 25 (35.7%). The median age of cases was 36.5 years (range from 8 to 55 years) and 28 years (9-60 years) was for controls. From the total cases,13(37.1%) were singles and 22 (62.9%) were married and similarly, 28 (40.0%) of the controls were single, and 42 (60.0%) were married. More than half of the cases, 19 (54.3%) could not read and write, 10 (28.6%) have, completed primary education, 3 (8.6%) have completed secondary school and 3 (8.6%) completed college. Whereas among the controls, 24(34.3%) could not read and write, 21 (30.0%) have completed primary education, 18 (25.7%) have completed secondary school and 7(10.0%) have completed college/university. Regarding occupation of the cases, 8 (22.9%) were no occupation, 24 (68.6%) had run privet business and 3(8.6%) were government employees. Among the controls, 25 (35.9%) were no occupation, 29 (41.4%) had run privet business and 16 (22.9%) were government employees. (Table 6)

Table 6 : Demographic characteristics of Dengue Fever Cases and Controls, Mille woreda, Afar region January 2020

Characteristics	Cases n=35	Controls n= 70	Total n= 105
Sex			
Male	26 (74.3%)	45 (64.3%)	71(67.6%)
Female	9 (25.7%)	25 (35.7%)	34(32.4%)
Age group			
< 5	0	0	0
5-14	1 (2.9%)	4 (5.7%)	5(4.8%)
15-44	29 (82.9%)	61 (87.1%)	90 (85.7%)
>44	5 (14.3%)	5 (7.1%)	10 (9.5%)
Marital status			
single	13 (37.1%)	28 (40.0%)	41(39.0%)
Married	22 (62.9%)	42 (60.0%)	64 (61.0%)

Education status			
Illiterate	19 (54.3%)	24 (34.3%)	43(41.0%)
Primary	10 (28.6%)	21 (30.0%)	31(29.5%)
Secondary	3 (8.6%)	18 (25.7%)	21(20.0%)
College	3 (8.6%)	7 (10.0%)	10(9.5%)
Occupation			
No occupation	8 (22.9%)	25 (35.7%)	33(31.4%)
Privet Business	24 (68.6%)	29 (41.4%)	53(50.5%)
Gov't Employee	3 (8.6%)	16 (22.9%)	19(18.1%)

Knowledge towards dengue fever for cases and controls

The interviewees were also asked knowledge questions towards Dengue fever and out of the total cases, 14 (40.0%) of them heard about Dengue fever, while 47 (67.1%) of the controls had heard about the disease. Only 5 (14.3%) of the cases and 9 (12.9%) of the controls stated virus as the cause for Dengue Fever. Regarding mode of transmission, only 4 (11.4%) of the cases and 10 (14.3%) of the controls knew the mode of transmission. Additionally, 31 (88.6%) of the cases and 61 (87.1%) of the controls had no knowledge on the time of mosquito bites. Respondents were also asked about symptoms of the disease and it was found that 21 (60.0%) of the cases and 49 (70.0%) of controls knew symptoms of the disease. (Table 7).

Table 7:Knowledge on Dengue Fever cases and controls, Mille woreda, Afar region January 2020

Characteristics	Cases n=35	Controls n= 70	COR (95% CI)	P-Value
Heard About Dengue				
Yes	14 (40%)	23 (32.9%)	0.734 (0.317-1.701)	0.471
No	21(60.0%)	47(67.1%)		
Cause of Dengue				
Know	5 (14.3%)	9 (12.9%)	0.885 (0.273-2.873)	0.839
Don't Know	30 (85.7%)	61 (87.1%)		
Mode of transmission				
Know	4 (11.4%)	10 (14.3%)	1.292 (0.375-4.454)	0.685
Don't Know	31 (88.6%)	60 (85.7%)		
Time of Mosquito bites				
Know	4 (11.4%)	9 (12.9%)	1.143(0.326-4.010)	0.834
Don't Know	31(88.6%)	61 (87.1%)		
Water required for breeding				
Know	13 (37.1%)	17 (24.3%)	0.543(0.226-1.304)	0.172
Don't Know	22 (62.9 %)	53 (75.7%)		
Knew Symptoms				
Yes	14 (40.0%)	21 (30.0%)	0.643(.275-1.501)	0.307
No	21 (60.0%)	49 (70.0%)		

Risk factors towards dengue fever among the study participants

The availability and use of Long-Lasting Insecticidal Nets were assessed and it was found that 17 (48.6%) of the cases had LLINS whereas 57 (81.4%) of the controls had access to LLINs. Among those who have LLINs, 10 (28.6%) of the cases and 48 (68.6%) of the controls use it while sleeping. All respondents had water holding containers in their houses and 25 (71.4%) and 24 (34.3%) were open containers of the cases and controls respectively. There was no stagnant water in that area. Moreover, none of the respondents' house was sprayed in the last three months. In terms of close contact, 18 (51.4 %) of the cases had close contact with a person of the same complaint, while only 14 (20.0%) of the controls had similar exposure None of the cases use repellant on their skins while 3

(4.7%) of the controls use. Among the cases, 28.6% wear long sleeved clothes and 68.7% of the controls wear long sleeved clothes.

Bivariate and Multivariate analysis was performed to determine the strength of association of potential risk factors for Dengue fever. Statistically significant variables on bivariate analysis were availability of LLINs (COR: 4.141; 95% CI: 1.691-10.142; P: 0.002), Utilization of LLINs while sleeping (COR: 5.455 ; 95% CI: 2.240-13.285; P: 0.000) availability of opened water holding container (COR: 4.791; 95% CI: 1.980-11.598; P: 0.001) and type of cloth they wear during day time (COR: 2.909; 95% CI: 1.258-6.727; P: 0.013). After multivariable analysis performed, two variables remained significant risk factors: utilization of LLINs while sleeping (AOR= 5.314: 95% CI: 1.682-16.790 and P= 0.004) and availability of opened water holding container (AOR= 6.702: 95% CI: 2.141-20.976) and P= 0.001). (Table 9)

Table 8: Bivariate and Multivariant analysis Logistic Regression Analysis of Risk factors towards Dengue Fever cases and controls, Mille woreda, Afar region January 2020

Characteristics	Cases n=35	Controls n= 70	Bivariate analysis		Multivariate analysis	
			COR (95% CI)	P-Value	AOR (95%CI)	P-Value
Availability of LLINs						
Yes	17 (48.6%)	57 (81.4%)	4.141 (1.691-10.142)	**0.002**	1.903 (0.592- 6.120)	0.280
No	18 (51.4%)	13 (18.6%)				
Utilization of LLINs while sleeping						
Yes	10 (28.6%)	48 (68.6%)	5.455(2.240-13.285)	**0.000**	5.314 (1.682-16.790)	**0.004**
No	25 (71.4%)	22 (31.4%)				
Status of Water Holding Container						
Open	25 (71.4%)	24 (34.3%)	4.791(1.980-11.598)	**0.001**	6.702 (2.141-20.976)	**0.001**
Closed	10 (28.6%)	46 (65.7%)				
Close Contact with Ill Person in the Last 2 weeks						
Yes	18 (51.4%)	14 (20.0%)	0.485(0.211-1.116)	0.089	2.642 (0.841-8.298)	0.096
No	17 (48.6%)	86 (80.0%)				
Type of cloths wear during day time						
Short Sleeved	20 (57.1%)	22 (31.4%)	2.909 (1.258-6.727)	**0.013**	2.019 (0.399-12.727)	**0.201**
Long sleeved	15 (42.9%)	48 (68.6%)				

Discussion

The result of this study revealed that Dengue Fever in Mille woreda males were more affected than female residents this may be due to the reason that males were spent most of their time outside of house and due to the nature of the Aedes aegypti mosquito, which is active and bite human beings on the day time [8]. Similarly, study conducted in Somali Regional sate, Ethiopia revealed, the majority of cases (68.3%) were males [9]. However, the study conducted in North-East Brazil indicated that females (65%) were more affected than Male [10].

This study shows that median age of cases was 36.5 years and there were no cases among under five children. The highest proportion of cases were among the age group 15-44 years old (82.9%).This is result was consistent with study conducted in Diredawa city administration and Somali regional state, Ethiopia age group 15-44 accounts 81.4 % 79.2 % respectively [11] [9]. This could be related to differences in lifestyle, time spent outdoors near vectors, sleeping without mosquito nets or other aspects of inadequate disease prevention practices.

The knowledge of the study participants regarding Dengue fever was assessed and it was found that only 35.2% of participants have heard about dengue previously and 33.3% of them have knew about sign and symptoms. Similar study in Diredawa administration city showed that relatively similar result, which is 41 %of the participants have knowledge about Dengue fever [11]. Whereas, in the study conducted in D.I.Khan district Pakistan showed that the overall knowledge towards Dengue forever was 60 % [12] and the study in Yemen local urban communities in Taiz Governorate showed that more than 90.0 % of respondent household heads had correct knowledge about common signs and symptoms of dengue fever[13]. This difference may be due to the repeated occurrence of Dengue fever in Pakistan and Yemen. The awareness of the people in the study decreased may be due the disease is not common in our country and mostly undetected by the health facilities.

In this study, there is an association found between the utilization of LLINs while sleeping and Dengue fever showing that people who do not use LLINs were 5.3 times more likely to get infected than those who use. There is also similar study conducted in Luanda, Angola also showed that having used a bed net in the past 30 days were significantly associated with protection from recent Dengue infection (p

= 0.05) [14]. However, in the study conducted in Lahore, Pakistan showed that, there was no association was found between dengue infection and people not using nets during sleeping[15].

Additionally, the study showed that the risk factors of Dengue Fever in Afar region Millie woreda were the availability of opened water holding container and the non-use of LLINs. Those who have opened water holding container around their houses were 6.7 times more at risk to have the disease than who have closed water holding containers. This is consistent with similar study conducted in locally and internationally revealed that the availability of stagnant water around the house like ponds, lakes or open sewers had contributed to the higher rates of morbidity [10] [11][16]. This may be due to the fact that, Aedes aegypti breeds on household containers such as those used for domestic water storage and for decorative plants, as well as in a multiplicity of rain-filled habitats – including used tyres, discarded food and beverage containers, blocked gutters and buildings under construction [2].

Conclusion

In this study males were more affected than female residents of Mille woreda and the highest proportion of cases were among the age group 15-44 years old. Failure to use impregnated bed nets while sleeping and presence of opened water container around home were significantly associated with the disease in multivariable analysis.

Recommendation

- Provision of mosquito bed net distribution and utilization for the risky community members.
- Covering, emptying of domestic water storage containers regularly
- using of personal household protection measures, long-sleeved clothes, repellents and insecticide treated materials in the community
- Monitoring and Strengthen the surveillance system that can detect the unusual number of cases and disease
- Health education for communities on the disease transmission, sign and symptom and prevention.

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Chapter Two- Surveillance Data analysis

Influenza Surveillance Data Analysis: Magnitude and distribution of Severe Acute Respiratory Illness (SARI) at Yekatit 12 Hospital Medical College 2009-2019, Addis Ababa

Abstract

Introduction: Influenza is an acute viral respiratory tract disease classified as influenza types A, B and C. type A viruses of subtype the H1N1, H2N2, and H3N2 been associated with widespread epidemics in humans. The world's most recent pandemic due to subtype A (H1N1) was during 2009 and it was characterized as being highly transmissible with rapid spread. The index case of influenza A (H1N1) pdm2009 was detected in Ethiopia in June 2009. We determined influenza positivity rate and distribution of SARI cases at Yekatit 12 Hospital medical college.

Method: This descriptive data analysis was employed for Yekatit 12 medical college Hospital. Influenza surveillance data compiled at National Public Health emergency management from January 2009 to December 2019. The Hospital identified cases using Ethiopian Influenza Sentinel Surveillance Implementation Guideline. Written permission was obtained from the public health emergency management.

Result: A total of 986 cases were found registered on national case-based database from January 2009 to end December 2019 with age range from 1 month to 47 years with the median age 1 year and 54.5 % of male cases. Among 835 (85 %) SARI cases tested for influenza 30 (3.6%) cases were positive for Influenza and 25 (83.3%) yielded influenza A virus and 5 (16.7%) were attributed to influenza B virus. From the total 25 Influenza A cases, 16 (64%) of them were A(H1N1) pdm2009 the rest 9 (36%) were detected A/H3N2 type. Among the total Influenza positive cases of SARI, 17(56.6 %) were among <2 years, followed by age group 5–14 years and 15–49 years by 5 (16.7%) and 3 (10%) respectively. The positivity rate of female cases and male case were 3.6% and 3.5% respectively.

Conclusion: Seasonal Influenza A (H3N2), and (H1N1) pdm2009 and Influenza B are circulating in at Yekatit 12 Medical college Hospital from 2009-2019 surveillance period. Additionally, both influenza positivity rate and number of SARI cases were predominantly observed among age less than 5 years old and occur in all months of the year. Increasing the number of influenza sentinel surveillance sites for SARI in Addis Ababa will be more representative and important to determine burden of respiratory infections for effective intervention.

Background

Influenza is an acute viral respiratory tract disease characterized by the sudden onset of fever, chills, headache, myalgia and extreme fatigue [1]. The viruses are classified as influenza types A, B and C. Influenza type A and B viruses can cause epidemic disease in humans, and type C viruses usually cause a mild, cold-like illness [2]. Influenza A infects multiple species, including humans, other mammals, and wild and domestic birds Influenza A viruses can be subtyped according to the antigenic and genetic nature of their surface glycoproteins; 15 hemagglutinin (HA) and 9 neuraminidase (NA) subtypes have been identified to date but only viruses of the H1N1, H2N2, and H3N2 subtypes have been associated with widespread epidemics in humans . [2][3] . Different subtypes have not been identified among influenza B viruses [4].

Three pandemic influenza outbreaks occurred in the 20th century and they occurred differently with respect to etiologic agents, distribution and disease severity [5]. They did not occur at regular intervals; in 1918 “Spanish flue”, was the most severe, causing an estimated 20–40 million or more deaths worldwide and Less severe pandemics occurred in 1957 “Asian flu” and in 1968 “Hong Kong flu” [6][7]. The world’s most recent pandemic was happened in 2009 influenza A (H1N1) pdm09 [8], which was known as highly transmissible with rapid spread to worldwide resulted in a lower mortality than for previous known pandemics, with between 123 000 and 203 000 deaths occurred. In contrast, the infamous 1918 “Spanish influenza” pandemic spread more slowly but caused an estimated 20–40 million deaths [9].

In Africa, the impact of influenza infection is not yet fully determined comparing to other developed continents, this may be due to inconsistent and unavailability of data but studies in different African countries indicates that influenza viruses have been circulating and cause morbidity and mortality in different populations [10]. For example, in a study of mortality amongst patients with influenza-associated SARI in Soweto, South Africa, the estimated incidence of influenza-associated SARI deaths per 100,000 population was highest in children <1 year (20.1, 95%CI 12.1-31.3) and adults aged 45–64 years (10.4, 95%CI 8.4–12.9) [11] . In study conducted in two-long term refugee camps in Kenya, influenza associated-SARI hospitalizations were 4.8/1000 in <5 years old and 11.1/1000 in <1 year old with positivity rate influenza A, 9.7%; and influenza B, 2.6% [12]. After the occurrence of avian influenza outbreak in 2006 and influenza H1N1 pandemic in 2009 have developed influenza

laboratory diagnostic capacity using WHO minimum standards recommendation in 34 countries out of 47 in the WHO African region [13]. According to 2018 the world report on Progress in influenza surveillance in Africa, 30 countries have been implementing sentinel surveillance for Influenza-Like Illness and/or Severe Acute Respiratory Infection [14].

The index case of influenza A (H1N1) pdm2009 was detected in Ethiopia in June 2009 [15]. A study conducted on Epidemiology of influenza in Ethiopia from 2009–2015 indicates that seasonal Influenza A (H3N2), Influenza A (H1N1) pdm2009 and Influenza B are circulating in the country. In the seven years data a total positivity rate was 20.6 % of the ILI and SARI cases. Among the SARI patients the proportion of influenza positivity was 3.1% and the majority of influenza positive cases of the SARI surveillance were identified among under-five children [16].

In November 2008, Ethiopia launched influenza sentinel surveillance program and has been implementing in eight sentinel sites (three ILI and Five SARI sites). The first influenza sentinel site in Ethiopia was Yekatit 12 medical college hospital, located in Addis Ababa, which was launched November 2008, 2009. The influenza sentinel sites were progressively expanded to four administrative regions (Addis Ababa, Amhara, Tigray, Oromia and Southern Nations, Nationalities and Peoples' (SNNP) regions). Before the implementation of surveillance system, convenience and feasibly of the sites were objectively assessed. The criteria for the selection of sentinel sites includes, availability of spaces, willingness of the hospital management, availability of willing clinical staffs to be focal person, regular reporting procedures, sample transportation procedures, population size of the catchment hospital. The influenza surveillance sites collect data of ILI from outpatient visit and SARI from patients admitted in the respective sentinel hospitals.

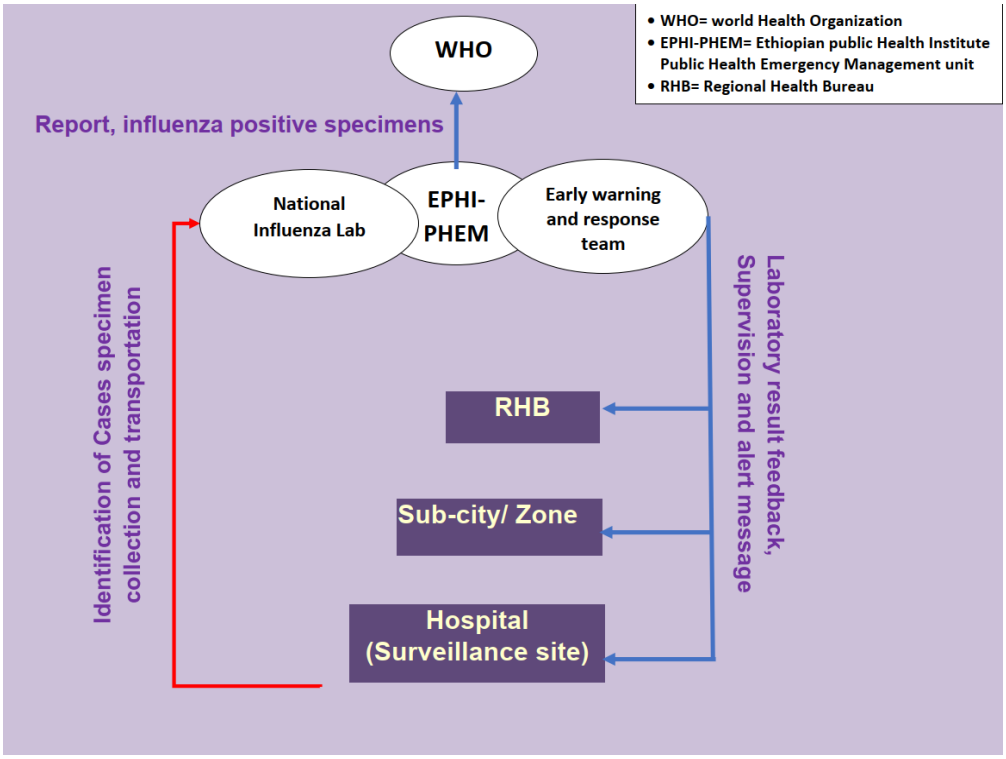

Figure 8: Ethiopian Influenza Sentinel surveillance Information Flow

Rationale of the data analysis

The differences in the severity of influenza pandemics emphasizes that, pandemics are unpredictable events. It is not easy to make assumptions about where the next influenza virus with pandemic potential will emerge, or what its characteristics will be, including its severity [9]. These highlights, standardized and coordinated surveillance information is crucial for the management of the pandemic at global and national levels. However, detail sentinel surveillance specific site data analysis was not conducted to figure out the positivity rate, magnitude and distribution of SARI, so as to guide the decision makers to take appropriate control and intervention measures at different levels. This analysis was determined the positivity rate, magnitude and distribution of SARI cases at Yekatit 12 hospital medical college in Addis Ababa. The analysis also identifying the surveillance gaps if any so as to implement corrective actions.

Objectives

General Objective

- To determine the positivity rate, type and sub type of influenza and distribution of SARI cases at Yekatit 12 hospital medical college in Addis Ababa from January 2009 to December 2019.

Specific objectives

- To describe SARI surveillance system in the hospital
- To describe the distribution of SARI cases in terms of place, person and time
- To determine influenza positivity rate among sampled for SARI patients.
- To provide information on the type and sub type of influenza virus circulating in the country

Methods and Materials

Study area and period

Descriptive data analysis was employed for Yekatit 12 Medical College Hospital Influenza Surveillance site. Yekatit 12 Medical College Hospital is the only SARI sentinel site for Addis Ababa city administration. This data analysis was conducted from January 10-20, 2020.

Case definition for SARI

In influenza surveillance cases were identified through the use of Ethiopian Influenza Sentinel Surveillance Implementation Guideline, 2012 which is adapted from standardized case definitions developed by the WHO African Region and CDC (Technical Guidelines for Integrated Disease Surveillance and Response in the African Region, October 2010) [15]. SARI case is defined as; Any severely ill person presenting with manifestations of acute lower respiratory infection with: history of fever or measured fever (>38ºC) AND Cough or sore throat AND Shortness of breath, or difficulty of breathing with or without Clinical or radiographic findings of pneumonia OR any person who died of an unexplained respiratory illness.

Identification of Cases

Patients who fulfilled the case definition for SARI and admitted to hospital were enrolled in the surveillance program and throat swab samples were collected from patients. Additionally, clinical and demographic information of each patient (symptom, Place of residency, age, sex) were recorded on public health emergency management standard reporting format.

Sample collection and Laboratory methods

Specimen were collected within seven days after the first onset of symptoms. Throat swab were placed in to cryovial with viral transport medium (VTM) and immediately refrigerated at 2-8 ^{O}C. Specimens packed with triple packaging system and transported to the National Influenza Reference Laboratory (NIRL) at Ethiopian Public Health Institute (EPHI) within 72 hrs of collection.

Laboratory test for influenza virus was done at National Influenza Reference laboratory. Samples were extracted for viral RNA from throat swabs using the QIAamp Viral RNA kit in accordance with the manufacturer's instructions. A one-step reverse-transcription polymerase chain reaction (PCR) assay was first performed for influenza A and B viruses, followed by further sub-typing and characterization

of influenza A-positive specimens were done according to CDC real-time reverse transcription PCR protocol [17].

Data source and Analysis

We used secondary data extracted from national data base of Public Health Management Center of Ethiopian Public Health Institute collected from Yekatit 12 Medical college Hospital sentinel surveillance site from January 2009 to December 2019. Data cleaning had been done from the initial secondary data stored in Microsoft Excel. We categorized the data by sex, age group, place and laboratory test result. The statistical data analysis was conducted using Microsoft Excel 2013.

Ethical consideration

Permission was obtained from the center of public health emergency management at Ethiopian Public Health Institute to conduct this study. Patient information confidentiality and privacy was protected using code number.

Results

Description of Hospital influenza surveillance system

Yekatit 12 medical college hospital is the only sentinel site for SARI case in Addis Ababa city administration to cover all the residents of the city. The Hospital have dedicated room for SARI and assigned trained focal person to facilitate the surveillance system. The sentinel surveillance SARI focal person identifies eligible cases, collect throat swab samples with case-based reporting format and transport the sample twice a week to NIL. Laboratory feedbacks including test result has been provided irregularly by the national influenza laboratory to sentinel sites and respective regional PHEM

Among the total of 986 registered cases only 16 (1.6%) and 27 (2.7%) cases have missed age and specific location of cases but from the total SARI cases, throat swab was collected from 986 cases and RT-PCR test was done for 835 (85%) of cases.

Sociodemographic Characteristics of SARI cases

Among the total SARI registered on national data base age range from 1 month to 47 years with the median age 1 year and 54.5 % of male cases. Among all register cases of SARI 802 (81.3%) were < 5 years. There was no death registered on the case-based format.

From 451 male cases tested for influenza 13 (2.9%) were positive for influenza type A, positive for influenza B were 3 (0.7%) and from 384 Female cases tested 12 (3.1%) were positive for influenza type A and positive for influenza B were 2 (0.5%). The positivity rate of female cases and male case were 3.6% and 3.5% respectively. Among the total Influenza positive cases of SARI, 17 (56.6 %) were among under 2 years, followed by age group 5–14 years and 15–49 years by 5 (16.7%) and 3 (10%) respectively. (table 9)

Table 9: Socio-demographic characteristics and influenza positivity, types and subtypes among SARI cases seen at Yekatit 12 Medical college sentinel surveillance site in Addis Ababa, Ethiopia 2009–2019

Characteristic	Sample Collected	Sample Tested	Influenza Positivity	Influenza type and subtypes			
				Influenza A	Pandemic Influenza A (H1N1) pdm2009	Seasonal A(H3N2)	Influenza B
	N	N (%)[a]	N (%)[b]	N (%)[C]	N	N	N (%)[C]
ALL CASES	986	835 (85)	30 (3.6)	25 (83.3)	16	9	5 (16.7)
SEX							
FEMALE	449	384 (86)	14 (3.6)	12 (40)	8	4	2 (6.7)
MALE	537	451 (84)	16 (3.5)	13 (43.3)	8	5	3 (10)
AGE GROUP *							
< 2	640	534 (83)	17(3.2)	14 (46.7)	7	7	3 (10)
2_4	162	133 (82)	3(2.3)	2(6.7)	1	1	1 (3.3)
5_14	150	135 (90)	5(3.7)	5(16.7)	4	1	-
15_49	14	13 (93)	3(23.1)	3(10)	3		-
> 65	4	4 (100)	1(25.0)		-		1 (3.3)
missed	16	16 (100)	1(6.3)	1(3.3)	1		-

* Age grouping used from recommendation of Global Epidemiological Surveillance Standards for Influenza (GESSI)

a: denominator is sample collected

b: denominator is sample tested

c: denominator is tested positive

Distribution of SARI cases and proportion of influenza positivity by place of residence

Regarding place of residence, 830 (84.2%) of the cases were from Addis Ababa City administration and followed by 132 (13.2%) were from Oromia region and the rest 14 (1.4%) and 10 (1.0%) residents were from in other parts of the country and residence area were not recorded on the case- based format respectively.

From the total 30 influenza positive cases 24 (80%) cases were from Addis Ababa city administration and followed by cases from Oromia region 5 (16.7%). The overall influenza positivity rate of the Addis Ababa city administration was 24 (3.4%) among all tested cases living in Addis Ababa.

Table 10: Influenza positivity, types and subtypes among SARI cases residency area seen at Yekatit 12 Medical college sentinel surveillance site in Addis Ababa, Ethiopia 2009–2019

Resident Area	Sample collected	Sample tested	Positive for Influenza	Influenza types and subtypes			
				Influenza A	Pandemic influenza A (H1N1) pdm2009	Seasonal influenza A (H3N2)	Influenza B
	N	N (%)[a]	N (%)[b]	N(%)[C]	N(%)[C]	N	N(%)[C]
Addis Ababa (All Cases)	830	711 (86)	24(3.4)	19 (63.3)	11	8	5 (16.7)
Sub City Of Addis Ababa							
Addis Ketema	76	65 (86)	1(1.5)	1(3.3)	-	1	-
Akaki Kaliti	20	18 (90)	-		-	-	-
Arada	111	91 (82)	4(4.4)	3(10)	1	2	1 (3.3)
Bole	64	53 (83)	4(7.5)	2(6.7)	2	--	2 (6.7)
Gullele	164	142 (87)	5(3.5)	4(13.3)	1	3	1 (3.3)
Kirkos	25	23 (92)	1(4.3)	1(3.3)	1	-	-
Kolfe Keranio	112	100 (89)	2(2.0)	2(6.7)	2	-	-
Lideta	18	14 (78)	-		-	-	-
Nifas Silk Lafto	30	28 (93)	2(7.1)	2(6.7)	1	1	-
Yeka	193	164 (85)	5(3.0)	4(13.3)	3	1	1 (3.3)
Missed	17	13 (76)	-		-	-	-
Out of Addis Ababa							
Oromia Region	132	103 (78)	5(4.9)	5(16.7)	4	1	-
Other Regions	14	13 (93)	1(7.7)	1(3.3)	1	-	
Missed	10	8 (80)	-		-	-	

a: denominator is sample collected
b: denominator is sample tested
c: denominator is tested positive

The frequency distribution and proportion of influenza positivity among SARI cases by time

Among 835 (85 %) SARI cases tested for influenza 30 (3.6%) cases were positive for Influenza and 25 (83.3%) yielded influenza A virus and 5 (16.7%) were attributed to influenza B virus from 2009-2019. From the total 25 Influenza A cases, 16 (64%) of them were A(H1N1) pdm2009 the rest 9 (36%) were detected A/H3N2 type. The highest number of SARI cases were registered in 2014 followed by 2019 with proportion of 20.0% and 14.7 % respectively.

Table 11: Total influenza positivity, types and subtypes among SARI cases by time seen at Yekatit 12 Medical college sentinel surveillance site in Addis Ababa, Ethiopia 2009–2019

Characteristic	Sample Collected	Sample Tested	Influenza Positivity	Influenza type and subtypes			
				Influenza A	Pandemic Influenza A (H1N1) pdm2009	Seasonal A(H3N2)	Influenza B
	N	N (%)[a]	N (%)[b]	N (%)[C]	N	N	N (%)[C]
ALL CASES	986	835 (85)	30 (3.6)	25 (83.3)	16	9	5 (16.7)
YEAR							
2009	141	51 (36)	3(5.9)	3(10)	-	3	-
2010	74	74 (100)	2(2.7)	2(6.7)	2	-	-
2011	55	55 (100)	1(1.8)	1(3.3)	-	1	-
2012	61	61 (100)	-	-	-	-	-
2013	30	15 (50)	1(6.7)	-	-	-	1 (3.3)
2014	198	197 (99)	7(3.6)	6(20)	3	3	1 (3.3)
2015	83	82 (99)	2(2.4	2(6.7)	2	-	-
2016	130	130 (100)	5(3.8)	4(13.3)	3	1	1 (3.3)
2017	41	41 (100)	2(4.9)	2(6.7)	1	1	-
2018	28	25 (89)	3(12.0)	1(3.3)	1	-	2 (6.7)
2019	145	104 (72)	4(3.8)	4(13.3)	4	-	-

a: denominator is sample collected

b: denominator is sample tested

c: denominator is tested positive

Influenza positivity of SARI cases per sample tested observed with variation in each month. The highest positivity rate was observed in February (7.0%) followed by October (6.5%), November (5.4%), May (5.3%), December (5.0%). In each month at least one Influenza positive cases were identified. Influenza A subtype (H1N1) pdm2009 showed a relative increase in October followed by November and December. (Table 12)

*Table 12**:** Total influenza positivity, types and subtypes among SARI cases by month seen at Yekatit 12 medical college sentinel surveillance site in Addis Ababa, Ethiopia 2009–2019*

Month	***total tested (N= 835)***	***Influenza Positivity*** *N (%)**	***Influenza type and subtype***		
			A (H1N1) pdm2009 N	**A(H3N2)** N	**Influenza B** N
January	46	2 (4.3)	2		
February	43	3 (7.0)	2	1	
March	50	2 (4.0)	1		1
April	54	1 (1.9)			1
May	98	4 (4.1)		4	
June	91	1 (1.1)	1		
July	80	1(1.3)			1
August	54	1(1.9)			1
September	74	1 (1.4)		1	
October	92	6 (6.5)	4	2	
November	93	5 (5.4)	3	1	1
December	60	3 (5.0)	3		

** denominator is sample tested*

Discussion

We described 11 years (2009-2019) of virological and epidemiological data from influenza sentinel surveillance data of Yekatit 12 medical college hospital. During this time 986 samples collected from SARI cases. A total of 30 influenza positive samples were found from the total of 835 (85 %) tested samples with influenza positivity rate of 3.6%. This result is comparative to the seven year (2009-2015) of epidemiology of influenza conducted in all four SARI sentinel surveillance site of Ethiopia including Yekatit 12 Hospital medical college [16] but it was low compared to other studies conducted in Kenya, South Africa and, China which reported 14.6%, 8%, and 6% respectively[18] [11][19]. The low influenza positivity rate in SARI cases, it may indicate that, low awareness and misunderstandings of influenza by health professionals regarding case identification and improper specimen collection techniques could have potentially led to many missed cases and false negative test results. The other reason contribution for low positivity rate may be from the total SARI cases who had specimen collected for testing, 15% of cases test was not done. The majority of samples 90 (59.6%), which were not tested, obtained at the beginning of surveillance (2009) due to lack of reagents [20].

Majority of the SARI cases were in the less than 5year age group. This is similar findings were reported in a description of influenza surveillance in 15 African countries, including Ethiopia, from 2006–2010 [21]. This is also not different from the result of Kenyan study of on sentinel surveillance data analysis from July 2007–June 2013 [18].

The majority of influenza positive cases 13 (81.2%) were in children aged less than five years. This is consistent with the study conducted on Epidemiology of influenza in West Africa after the 2009 influenza A(H1N1) pandemic, 2010–2012 [22].

According to this analysis, SARI cases recorded all year round with some peaks during April, May and July this find is different from most studies conducted in different African countries like Nigeria [23] and Tanzania[24], This may be the number of SARI cases and our study was focused on only one sentinel surveillance site of influenza found in the capital city.

Conclusion

This data analysis revealed that the influenza viruses have been circulating in Yekatit 12 Medical college Hospital which affected both males and females. Additionally, both influenza positivity rate and number of SARI cases were predominantly observed among age less than 5 years old and occur in all months of the year.

Recommendation

Continuous influenza surveillance will provide a frame work for detecting and following future influenza outbreaks and pandemics. If all the swabbed samples are tested for other respiratory pathogens, especially on influenza negative samples to determine the proportion of other respiratory pathogens causing SARI and which can contribute for having a clear image to predict national, regional and global burden of influenza. Increasing the number of influenza sentinel surveillance sites for SARI in Addis Ababa will be more representative and important to determine burden of respiratory infections for effective intervention.

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Chapter Three- Evaluation of Surveillance System

Evaluation of Ethiopian Laboratory based Antimicrobial Resistance Surveillance System November 2020

Abstract

Background: Public health surveillance is the ongoing, systematic collection, analysis, interpretation, and dissemination of data about a health-related event for use in public health action to reduce morbidity and mortality and to improve health through evaluating public health policies and practices. The purpose of evaluating public health surveillance systems is to ensure that problems of public health importance are being monitored efficiently and effective.

Method: A cross-sectional descriptive study will be conducted from October 20- November 5, 2020 at the first three Sub group implementation AMR sites. Primary data was collected using structured questionnaire based on CDC updated surveillance guideline and interview with AMR surveillance focal persons, regional health bureau PHEM officers and national PHEM officers. Case based reports of AMR was reviewed and secondary data was collected from Ethiopian public Health institute National reference laboratory.

Result: The AMR surveillance system have no clearly defined case definitions for AMR cases
The surveillance data on AMR priority pathogens and specimens reported on monthly basis to EPHI National reference laboratory. The 2019 annual reporting rate of Amhara Public Health institute Dessie branch and Tikur Anbesa Specialized Hospital surveillance site were 91.6 % (11/12) and 100% (12/12) respectively but the 2020 report for the expected 9 months shows that 33.3 % (3/9) and 77.7 % (7/9) of two sentinel sites respectively. AMR testing was interrupted for 6 months at one of surveillance site. The system has above 95 % average three years data completeness on sex and age variables in all three surveillance sites and the three years data on patient location (department) at Tikur Anbesa Specialized Hospital showed that 95.3 % but in Amhara Public Health Institute Dessie branch and EPHI/ National Referral Laboratory very low which accounts 0.7% and 37.3 % respectively.

Conclusion and recommendations: The Laboratory-based AMR surveillance system has proven in providing evidence-based information on specific types of bacterial strains on selected specimen types but it lacked standard case definitions for AMR cases. The surveillance system is simple, acceptable, but not integrated with other surveillance systems in the country. The surveillance system should increase the number of priority surveillance microorganisms and type of sample to get more representative information and integrated to other surveillance systems in the country.

Introduction

Antimicrobial resistance is a complex global public health challenge, and there is no simple way to be enough to fully hold the emergence and stop spread of infectious organisms that become resistant to the existing antimicrobial drugs. New AMR mechanisms are emerging and spreading globally, threatening the ability to treat infectious diseases, resulting in prolonged illness, disability, and death, and increasing the cost of health care. [1]

The 68th World Health Assembly adopted the Global Action Plan on AMR, which outline five objectives. One of the five strategic objectives of the global action plan is to strengthen the evidence base through enhanced global surveillance and research. AMR surveillance is the foundation for assessing the burden of AMR and for providing the necessary information for action in support of local, national and global strategies.[2]

Based on the Global action plan, Ethiopian Food and Drug Authority the then Ethiopian Food, Medicine and Healthcare Administration and Control Authority in collaboration with multi-sector partners and stakeholders published second edition of five years strategic plan (2015-2020) for the Prevention and Containment of Antimicrobial Resistance. In this edition priority was given on promotion of optimal use of antimicrobials in human and animal health through effective stewardship practices, and strengthening the knowledge and evidence on antimicrobial use and resistance through One Health surveillance and research.[3]

By April 2017, Ethiopia had developed and approved the National AMR Surveillance Plan. The objective of the plan was to establish a national surveillance network capable of detecting priority AMR pathogens, analyzing and reporting data, characterizing resistance and generating evidence to inform the implementation of targeted prevention and control programs. The plan summaries the activities needed to implement a national AMR surveillance system, the approach for data management and reporting, and the roles and responsibilities of clinical and laboratory stakeholders.[8]

The principal uses of the information gained from surveillance are to optimize the use of antimicrobials and assist in the prevention, control and containment of antimicrobial resistance at the local, regional and national levels by updating treatment guidelines, identifying necessary drug supply needs, to

enhance the implementation of infection control measures and monitoring the impact of interventions to improve antimicrobial use and control the spread of infection.[4]

Public health surveillance is the ongoing, systematic collection, analysis, interpretation, and dissemination of data about a health-related event for use in public health action to reduce morbidity and mortality and to improve health through evaluating public health policies and practices. A communicable disease surveillance system serves two key functions; early warning of potential threats to public health and program monitoring functions which may be disease specific or multi-disease in nature.[5]

The evaluation of a surveillance system helps use of data collection resources and assures that the established systems operate effectively and also it allows to define whether a specific system is useful for a particular public health initiative and is achieving the overarching goals of the public health program and the data collection objectives. [6]

The purpose of evaluating public health surveillance systems is to ensure that problems of public health importance are being monitored efficiently and effective. Evaluation findings should yield specific recommendations for improving surveillance quality, efficiency, and usefulness.[7]

Description of Laboratory based AMR Surveillance system in Ethiopia

Ethiopian public Health Institute (EPHI), the technical arm of Federal ministry of Health in collaboration in with CDC – Atlanta, the American Society for Microbiology, Ohio State University's Global One Health initiative and World Health Organization's Global AMR Surveillance System (US CDC and WHO) developed laboratory based AMR surveillance system in March 2017 which have been implemented from 2017 to 2020. [8] This plan describes objectives of the surveillance, detail activities required to implement a national AMR surveillance system, methods for data management and reporting mechanisms, and the roles and responsibilities of laboratories and stockholders involved in the surveillance system. Ethiopia's AMR surveillance system is planned to connect sentinel surveillance sites to the national reference laboratory of EPHI. Each surveillance site includes a laboratory that is either hospital laboratory or standalone laboratory (regional laboratory) affiliated to hospital.

For the implementation of surveillance system, assessment of laboratories was done across the country for their capacity to provide microbiological testing services. Based on the findings 35 laboratories were identified and categorized in three levels

- Level one: Laboratory site has microbiologic capability (isolation and identification); Antibiotic Susceptibility Testing (AST) and External Quality Assurance (EQA) participation with enhanced specimen collection and patient clinical data capture.
- Level two: Laboratory site has microbiologic capability and is regularly performing testing according to established national testing requirements
- Level three: Laboratory site has limited microbiologic capability and is not regularly performing AST on patient samples.

From those assessed laboratories a total of 16 laboratories found in different parts of the country was identified as level one and grouped in three subgroups for the initial implementation (Table 1). In the first phase of implementation 4 sites started since August 2017 and 5 laboratories started since April 2018 and 16 sites have been targeted to enroll in the surveillance system. The ultimate goal of the plan was to enroll all labs into the surveillance network by 2020.

Table 13: Laboratory based AMR Surveillance Implementation laboratories Sub-Groups.

Implementation Sub-groups	Sites
Sub-group I	EPHI (National Bacteriology Reference Laboratory)
	Tikur Anbessa Specialized Hospital
	Ayder Referral University Hospital
	Dessie Referral Hospital/Dessie Regional Laboratory
Sub-group II	Yekatit12 Hospital
	Gondar Referral University Hospital
	FelegeHiwot Referral Hospital/BD Regional Laboratory
	Hawassa Referral University Hospital
	Jimma Referral University Hospital
	Adama Referral Hospital/Adama Regional Laboratory
Sub-group III	Alert Hospital
	HiwotFana Hospital/Harari Regional Laboratory
	Zewditu Hospital/Addis Ababa Regional Laboratory
	Nekemte Hospital
	St. Paul Referral Hospital
	Metu Karl Hospital

A. Priority Organisms and Antibiotic Sensitivity Testing in the Surveillance System

The national AMR surveillance system prioritize organisms and corresponding antimicrobial agents based on WHO- Global Antimicrobial Resistance Surveillance System (GLASS) recommendations, prevalence of the pathogens and capacity of microbiology laboratories in the country (Table 14). Antibiotic sensitivity testing done based on the standard operating procedure adopted from Clinical and Laboratory Standard Institute (CLSI) guidelines. Based on the strength and progress of the surveillance system, specimen types, priority pathogen list and corresponding antimicrobial agents revised.

Table 14: Priority surveillance pathogens by specimen for inclusion in Ethiopia AMR surveillance

Specimen type	Basic Laboratory Case Definition	Priority Pathogens
urine	Basic Laboratory Case Definition	• Escherichia coli • K. pneumoniae
Wound (pus)	Isolation of pathogen in the presence of pus (Gram smear shows presence of pus with associated organism)	• Staphylococcus aureus
All other specimens	Significant growth	Carbapenem resistant: • Acinetobacter spp • Pseudomonas aeruginosa • Enterobactericeae spp

B. Surveillance approach

Clinical specimens collected from sites (hospital OPD/IPD) transported to the sentinel site laboratories for routine culture and antibiotic susceptibility testing (Figure 1). For culture positive priority organism(s), AST will be performed. Patient information and laboratory result including measurement of the zone of inhibition will be collected using a standardized form and entered into a computerized database (WHONET software) at the site level and also saved as hard copy. Collected data and all isolates will be transported to National Reference Laboratory (NRL) for confirmatory testing. (Figure 9). At EPHI, the data on pathogen prevalence and susceptibility will be analyzed by using WHONET software, published and shared annual AMR report to the sentinel surveillance sites and annual aggregated data for international stakeholders

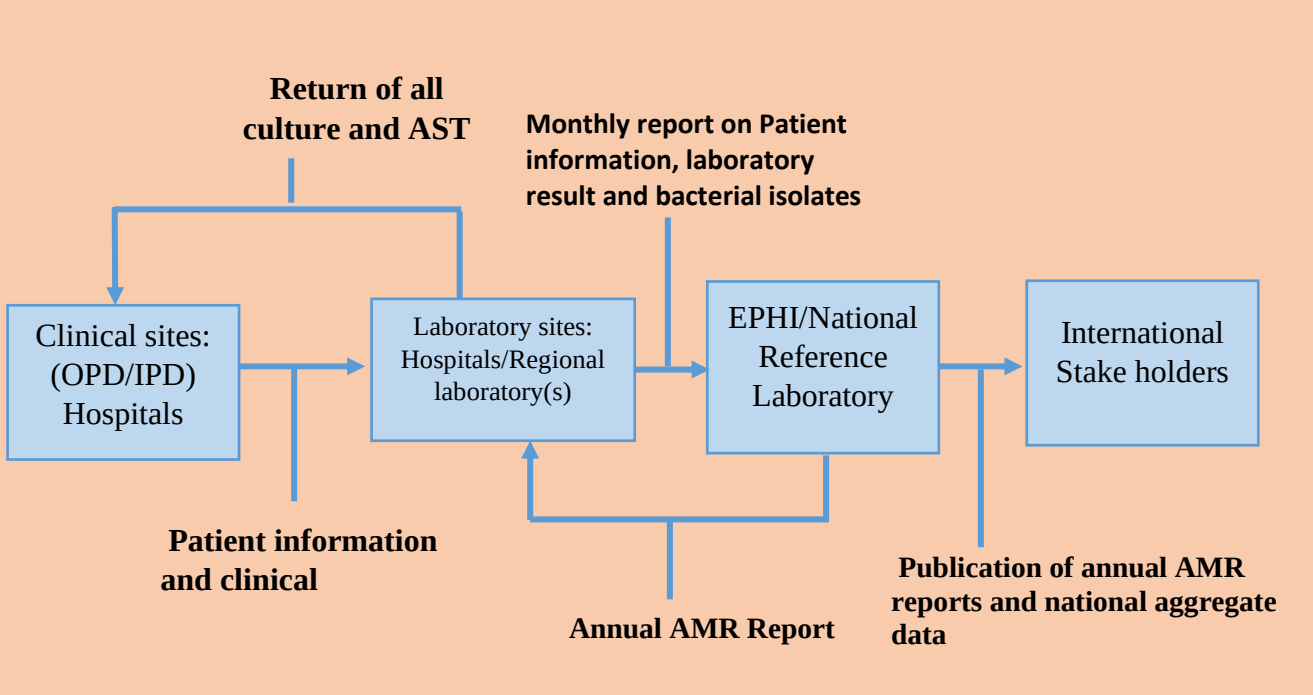

Figure 9: Diagram of Laboratory based AMR surveillance data flow within the Ethiopia National Antimicrobial Resistance Surveillance System.

(Source Ethiopia Antimicrobial Resistance Surveillance Plan 2016-2020)

C. AMR Surveillance Standards

I. Laboratory Standards

Laboratory surveillance sites must meet the basic requirements. To identify priority organisms and perform AST by using disc diffusion, semi-automated, or manual testing for minimum inhibitory concentration and gradient diffusion in accordance with WHO and CLSI standards. Perform regular internal quality control (IQC) and IQC data records (e.g., testing of batch/lot of media, reagents, discs) should be kept and available for review. The laboratory must participate in a recognized international EQA programs and score more than 80% in the program.

II. Clinical Specimen Submission Standards

Clinicians at surveillance hospitals will send specimens for culture and AST from patients with suspected infection to the laboratory. The hospital or regional referral laboratory director will ensure that physicians and other healthcare workers are provided with specimen collection SOPs and a laboratory requisition form which is to be submitted to the hospital or regional diagnostic laboratory with each specimen.

III. Pathogen Isolations, Identification, and AST\

Surveillance laboratories must have the capacity to identify priority organisms and perform AST. Sampling, culturing, and species identification according to good clinical laboratory practice (GCLP) as described in current CLSI manuals. For AST, the disc diffusion methods recommended by CLSI, semi-automated or manual testing for minimum inhibitory concentration (MIC), and gradient diffusion can be used. All AST methods must conform to ISO (International Organization for Standardization) standards, which are compatible with CLSI standards. In addition to susceptible (S), intermediate (I), and resistant (R) classifications, MIC (if available) and inhibition zone diameter will be recorded by participating laboratories. When a new antibiotic is introduced into clinical practice, laboratories should routinely test susceptibility to the drug in order to identify emerging resistance.

IV. Clinical Isolates Transportation of Standards

Clinical isolates will be transported to NRL based on the requirements for isolate transportation, bimonthly by using the excising postal system.

V. Laboratory Supply, Procurement, and Equipment Maintenance

Surveillance site laboratories participating in the Ethiopia AMR Surveillance system are responsible for ensuring appropriate inventory management and required to request their annual need of all necessary reagents and supplies that are mandatory for isolation, identification, and AST of priority pathogens. Reagents and supply procurements will be coordinated with NRL and RRL. Additionally, the NRL will coordinate procurement and supply of American Type Culture Collection (ATCC) Strains form approved supplier for respective priority organisms.

VI. Clinical and Regional Laboratory Reporting system

All sentinel sites send AMR raw data to the NRL on monthly bases through email. NRL aggregates and analyzes the data and send report to the sites quarterly.' who.net' software will be used for AMR data management.

Rationale of the Evaluation

Public health surveillance systems should be evaluated periodically to determine how well they operate to meet their stated purposes and objectives.[7] The Ethiopian AMR surveillance plan also put periodic evaluation of Laboratory based AMR surveillance after initial implementation of the surveillance system. [9]

However, since the start of surveillance system, a complete evaluation of the system at national level is not found except one that was done for one year implementation experiences and lessons learned [10]and annual review reports were done by the institute[8] Therefore this study will help to identify the progress of the surveillance implementation, identify major challenges in overall attributes of the surveillance, which in turn assists in expanding to proposed sites which will be enrolled in the AMR surveillance system of the country.

Objectives of the Evaluation Study

General objective

- To evaluate Ethiopian Laboratory based Antimicrobial Resistance surveillance system.

Specific objectives

- To describe the overall implementation of Ethiopian Laboratory based AMR surveillance system
- To evaluate the attributes of Ethiopian Laboratory based AMR surveillance

Methods of the Evaluation

Study Design and Area

Evaluation study was conducted from October 20- November 5, 2020 in three the first Sub group implementation AMR sites in Ethiopia; these are, EPHI (National Bacteriology Reference Laboratory), Tikur Anbessa Specialized Hospital, and Amhara Public Health Institute Dessie branch.

Data collection methods and Instruments

Primary data and secondary data were collected about the functions and attributes of surveillance system using checklist adopted from revised CDC`s surveillance Evaluation Guideline, MMWR July 27, 2001; 50(No. RR-13) and WHO surveillance Evaluation Guideline 2006. Case based reports of AMR will be reviewed. Data was collected by principal investigator.

Surveillance Attributes and their Measurements to be used

- **Acceptability**: reflects the willingness of persons and organizations to participate in the surveillance system.
- **Completeness**: proportion of all expected data reports that were actually submitted to the public health surveillance system.
- **Data Quality**: reflects the completeness and validity of the data recorded in the public health surveillance system.
- **Flexibility:** is the ability of the system to adapt to changing needs with little additional time, persons or allocated funds.
- **Representativeness**: is the ability of the system to describe health events accurately in terms of time, place and person.
- **Sensitivity**: in this report, sensitivity refers to the ability to detect outbreaks, including the ability to monitor changes in the number of cases over time.
- **Simplicity**: refers to both its structure and ease of operation.
- **Timeliness**: in this report reflects the time of reporting data and bacterial isolates from the site to NRL
- **Usefulness:** How helpful the system is to public health staff in taking actions as a result of interpreting and analyzing its data.

Data Analysis

Descriptive data analysis was employed as necessary. Data was entered and analyzed by Excel 2013.

Data quality assurance

Questionnaires was developed and reviewed based on CDC Surveillance evaluation guideline and interviews with the key informants was conducted in the same manner using a questionnaire and all questionnaires was administered by trained data collectors to keep the consistency of administering the questions.

Ethical Considerations

Letter of permission was written by the EPHI to the participating facilities. Ethical clearance was not necessary for this study, because there is no direct contact with patients and community.

Dissemination Plan

The result of this evaluation will be disseminated as a written report for Ethiopian Public Health Institute and participant facilities. The report will be also be presented on different scientific and performance review meetings and published on scientific journals.

Result

Functions of Surveillance

Case Detection and Registration

The AMR surveillance system have no clearly defined case definitions for AMR cases but in Antimicrobial resistance surveillance plan published on March 2017 indicated that limited set of AMR priority specimens and pathogens are targeted for the surveillance. Urine specimen for *Escherichia coli* and *K. pneumoniae*, for wound specimen *Staphylococcus aureus* and other any specimen for Carbapenem resistant *Acinetobacter species*, *Pseudomonas aeruginosa* and *Enterobactericeae* spp. The surveillance system captures case from referral hospitals sent by physician for routine laboratory diagnosis. The number of patients sent for laboratory diagnosis mainly depending on the willingness and knowledge of physicians on utilization and availability of microbiology culture test.

Reporting

The surveillance data on AMR priority pathogens and specimens reported on monthly basis to EPHI National reference laboratory. The 2019 annual reporting rate of Amhara Public Health institute Dessie branch and Tikur Anbesa Specialized Hospital surveillance site were 91.6 % (11/12) and 100% (12/12) respectively but the 2020 report for the expected 9 months shows that 33.3 % (3/9) and 77.7 % (7/9) of two sentinel sites respectively.

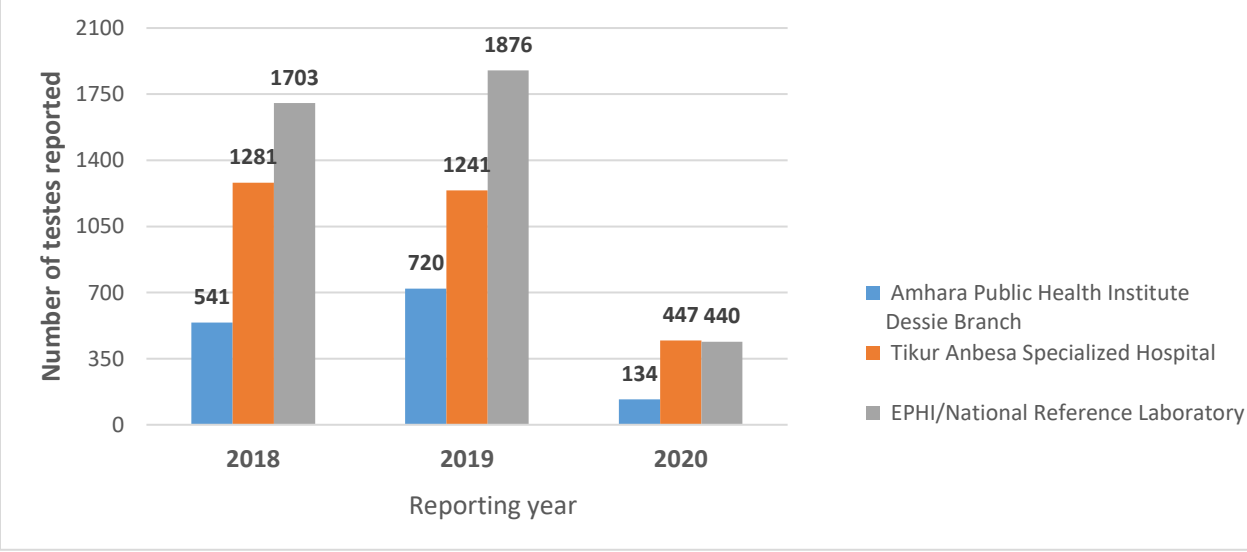

Figure 10: Number of laboratory test reported in laboratory Based AMR surveillance sites for 2018-2020 Addis Ababa, Ethiopia

None of the sentinel sites have been reporting AMR surveillance data to their next higher level or to National or Regional Public health Emergency management departments who are managing Integrated diseases repostpones and surveillance.

There was no shortage of reporting forms in all visited sentinel sites since it is also available in electronic copies. All of the visited sites have functional computer and they used WHO. net software database to for capturing data, reporting results and feedbacks.

Data Analysis and Interpretation

All surveillance sites have computers and knowledge how to use database for AMR. Data management and analyses were done using WHO.net software. At NRL of EPHI site-specific analyses, including hospital-level patterns of resistance and antibiograms, were done completed and reported to surveillance sites.

Feedback and Supervision

Supervision and provision of feedback were assessed at National level. This assessment found that monthly supervision was done at each site except for Amhara Public health institute Dessie branch. AMR testing at Amhara Public health institute Dessie branch was interrupted for the last 6 months due to COVID pandemic. Two annual review meeting was conducted and reports were generated.

Training

Different capacity building trainings was given to sentinel sites from EPHI National reference laboratory in collaboration with American Society of Microbiology. Regular on job trainings and mentorship have been given to microbiology laboratories participated in surveillance and routine laboratory testing activities

Surveillance System Attributes

Usefulness

Before the beginning of AMR surveillance different reports have been generated in different health care setups in unorganized way. This is therefore, this surveillance helps to organize and centrally monitor the occurrence of AMR strains circulating in the population and also estimate the extent and

burden of priority AMR pathogens. Currently the surveillance generated data by type of bacteria isolated with different drugs resistance pattern for prompt response in health care facilities.

Simplicity

Participating in the surveillance sites were well aware of the objectives of the system. Collection of specimen and filling reporting format in the WHO. net data base was found to be taking only 5-15 minutes. Reporting format is clear and easy to use by all level professionals. All sentinel sites focal persons agree or strongly agree that the system was simple to use and they were satisfied with reporting formats easy flow of reports directly to national EPHI National reference laboratory.

Flexibility

AMR surveillance system is managed centrally by EPHI National Reference laboratory and supporting partners. The surveillance started its implementation on limited AMR priority pathogens and specimen types due to data collection and capacity of testing laboratories. The surveillance system is not easily flexible to add additional pathogens and specimen types and also additional sentinel sites with little additional time, personnel, or allocated funds. It requires well-functioning microbiology testing laboratories and continues supply of regents and materials. The WHO net software also not flexible and it needs central configuration to add Unable to add additional data fields and variables by sentinel sites.

Data Quality and Completeness

Data quality reflects the completeness and validity of the data recorded in the public health surveillance system. Percentage of completed variables was assessed on three sentinel sites including National reference laboratories from 2018 - 2020 since implementation of WHOnet database. Majority of important variables like sex, age of patient, type of specimens was complete and above the standard. In contrast patient location, which is important to know which department in the health care facility sending sample for testing was not complete in National Reference Laboratory and Amhara Public Health Institute Dess branch laboratory. The percentage of the variables was indicated in the following table.

Table 15: Percent of variables completed during implementing influenza sentinel surveillance in Ethiopia, 2018-2020

Variables	**Amhara Public Health Institute Dessie Branch**			**Tikur Anbesa Specialized Hospital**			**EPHI/National Reference Laboratory**		
	2018	**2019**	**2020**	**2018**	**2019**	**2020**	**2018**	**2019**	**2020**
Sex	99	99.6	100	99	98	99	98	100	100
Age	94	87	90	99	98	98	97	98	99
Patient location (Department)*	2	0	0	98	94	94	48	28	36

***** ***Patient location (Department)*** *= this is a department who sent sample for diagnosis*

Acceptability

All level of personnel who were participating in the surveillance system were strongly agreed on the importance AMR surveillance for public health interventions. Physicians who were main stockholders of the AMR surveillance system in the Hospital have underutilization of microbiology laboratories. The laboratory workers in National Reference laboratory as well as the sentinel site laboratory workers have been using the current and appropriate reporting mechanism and SOPs to implement the AMR surveillance system in the country.

Sensitivity

Sensitivity refers to the ability to detect outbreaks, including the ability to monitor changes in the number of cases over time. In this AMR surveillance system, there was no detected outbreaks throughout the implementation period; but in the WHOnet database software they were trying to monitor the number oof resistant strains over time.

In this evaluation the denominator was not available to calculate sensitivity of the surveillance system. However, beside testing of cases at sentinel laboratories confirmatory test also done for those bacterial isolates at National Reference laboratories sent from sentinel laboratories.

Representativeness

Even if, the initial AMR surveillance sites implementation were limited in two regions and one city administration, Addis Ababa. Even though the sites were selected to for initial implementation and currently expanded to additional two regions in the country but still it doesn't represent all regions of

the population in the country. Also, the system currently captures data on patients presenting to the existing sentinel laboratory sites hospitals. Patients attending private facilities or smaller healthcare facilities will not be represented in the data. Because of this, it may be still difficult to generalize to the whole population.

Timeliness

Timeliness in this report reflects the time of reporting data and bacterial isolates from the site to NRL. In this regard, the data and isolates reported monthly which is exactly in line with the time indicated in the AMR surveillance implementation plan. Bacterial isolates were transported by Ethiopian postal service in monthly bases with appropriate triple packaging sample transportation mechanisms.

Stability

The AMR surveillance system was stable and not interrupted in two sentinel sites National reference laboratory and Tikur Anbesa Specialized Hospital since its implementation but one of the surveillance site Amhara Public Health Institute Dessie branches was interrupted for the 6 months due to the laboratory was used for COVID- 19 testing activities.

Discussion

The Surveillance system have been functioning on limited set of AMR priority specimens and pathogens. From the selected specimen types, urine specimen for *Escherichia coli* and *K. pneumoniae*, for wound specimen *Staphylococcus aureus* and other any specimen for Carbapenem resistant *Acinetobacter species, Pseudomonas aeruginosa* and *Enterobactericeae* spp. Prioritized specimen types and pathogens was considering public health importance of pathogens, testing capacity of laboratories, current Ethiopian Standard Treatment Guidelines, availability of antibiotic and other national and international standards [9].

The surveillance system captures case from referral hospitals sent by physician for routine laboratory diagnosis. Those patients attending from privet health facilities and lower level health facilities may not be covered in the surveillance system. The number of patients sent for laboratory diagnosis also mainly depending on he willingness and knowledge of physicians on utilization and availability of microbiology culture test. This will be having impact to generate representative data for the whole population

Regarding the functions of surveillance system, there were gaps in regular reporting and data quality. Even if, the surveillance sites have been using WHOnet database for capturing data there was irregularity on reporting surveillance data to EPHI / National Reference Laboratory data management unit. The WHOnet database software was not web based and the sites used personal email to send data to EPHI / National reference laboratory data management unit. This may be the reason for irregularity of reporting monthly data. There was also interruption of testing service for the last six months at Amhara Public Health Institute Dessie branch. The cause of interruption was due to one of the laboratory room used for microbiological testing service was given to COVID 19 testing activities. The surveillance system did not solve this problem to stat the surveillance.

The system has above 95 % average three years data completeness on sex and age variables in all three surveillance sites and the three years data on patient location (department) at Tikur Anbesa Specialized Hospital showed that 95.3 % but in Amhara Public Health Institute Dessie branch and EPHI/ National

Referral Laboratory very low which accounts 0.7% and 37.3 % respectively. These two laboratories are standalone referral laboratories and receive sample from different health facilities; this may have difficulties to identify patient location (department) in the hospital.

As stated in the implementation plan, EPHI/ National Reference laboratory have a mandate to lead and coordinate the implementation of the AMR surveillance in the country, monthly supportive supervision, mentorship and provision of essential supplies was provided to the sites as indicated in the implementation plan.

The sentinel surveillance was very simple; those laboratory personnel participating in the AMR surveillance sites have knowledge and skills on objectives and importance of the surveillance system. The surveillance sites do not represent the whole population. Even the catchment population was not clearly defined. A lack of integration with existing integrated disease surveillance systems in the country and week communication with Public health emergency management, who lead the National Integrated disease surveillance, may affect the sustainability of laboratory- based AMR surveillance system.

Limitations of the evaluation

Even if this laboratory-based AMR surveillance evaluation focuses on among the first four Laboratory based AMR surveillance implementation site, unfortunately Ayder hospital laboratory was not included in this evaluation study due to unable to collect data because of the current coincidence happened in the Tigray region.

Conclusion

The Laboratory-based AMR surveillance system has proven in providing evidence-based information on specific types of bacterial strains on selected specimen types but it lacked standard case definitions for AMR cases. The surveillance system is simple and acceptable, and the staff members using the system were satisfied with the forms, software and procedures involved, but not all sites are reporting regularly to EPHI National reference laboratory and some important variables were missed.

The laboratory-based AMR surveillance only focus on limited number of microorganisms and specimen types and there was no guideline to detect outbreaks for proper response and control mechanisms.

Furthermore, the Laboratory based AMR surveillance system have not integrated with other surveillance systems in the country and there was no any link or ways of communication between the National or regional Public Health Emergency management center who leads the country integrated disease response and surveillance system.

Recommendation

Awareness creation or trainings should be given for sentinel site focal persons on reporting, data use and advantages of a complete data.

The surveillance system should increase the number of priority surveillance microorganisms and type of sample to get more representative information.

The surveillance system should prepare AMR surveillance implementation guideline to define threshold of AMR outbreaks and to indicate how to take proper response and control measures.

The Laboratory based surveillance system should be integrated to other surveillance systems in the country and ensure ways of communication or link to national and regional public health emergency management centers.

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Chapter Four- Health Profile Discerption Report

Health Profile Description of Bahirdar Zuria Woreda, Amhara Regional State, Ethiopia 2019

Abstract

Introduction: Health profile description is a system of collecting, organizing and summarizing health and others health related events that comprises demographic, socio-economic, vital statistics, political, economic, cultural and others aspect of a particular geographic areas of interest. The objective of this study is to assess and describe health related issues, health indicators and to identify problems in Bahir Dar Zuria Woreda.

Methods: Descriptive cross-sectional study design was applied to develop the health profile description. Standard questionnaires were used and secondary data was reviewed. Data were obtained from Health, Education, Water, finance and economy, Agriculture, Culture and tourism and other sector offices. Descriptive statistics calculated and result was presented by graph table and narration.

Result. In 2010 EFY total population of district were 224190, of total 52.7% were male. The potential health service coverage of the Woreda is 100%. Acute upper respiratory infection (AURI) followed by acute febrile illness accounted for adult morbidity 25.3% and 13.0% respectively. Whereas diarrhea none bloody and AURI with 26.2% and 22.6% respectively were the leading cause morbidity for under five children. Antenatal care (ANC) at least one visit and four visits for this woreda was greater than 100% and 94% respectively. Detection rate for all forms of TB was 61.4 % and the cure rate was 89.7%. There were no deaths due to TB recorded in the year. Deliveries which were attended by skilled birth personnel was 75%. There was no maternal death and still birth reported in the 2010 EFY. The woreda had experienced acute watery diarrhea (AWD) outbreak, 642 cases were identified and 13 cases death was recorded.

Conclusion and recommendation: Acute upper respiratory tract infection were the leading cause of adult morbidity. Immunization and ANC coverage of the woreda is more than the planned. TB and HIV are still public health burdens in the woreda. The woreda is experienced AWD outbreak. The Woreda should strive to improve coverage of sustainable/ 24 hour /electric power, piped water supply to health facilities and schools.

Key word: Ethiopia, Bahirdar Zuria, health profile assessment.

Introduction

Health profile description is a system of collecting, organizing and summarizing health and others health related events. This includes, demographic, socio-economic, vital statistics, political, economic, cultural and others aspect of a particular geographic areas of interest. (1) It helps in prioritizing health and others health related condition occurred within the communities. The information obtained from the description will help public health officials prioritize their health planning. It is used for planning, implementation and evaluation of public health programs. The preparation of profiles provides a lively, scientifically and evidence-based account of health in the Administrative; it can encourage public interest and political commitment; and it can identify targets for the future and monitor progress towards them. (2) The purpose of this project is to assess and describe Bahirdar Zuria Woreda health profile which will help in identifying the woreda's health and health related events to use it for health programs planning and intervention.

Rationale of the Description

Health profile generates data which can be used at community level. Describing health profile of Bahirdar Zuria woreda has enormous advantages to briefly illustrate current gaps in the area of public health and management of man power. Using this description as a baseline, decision makers of the woreda and the region at large may focus on addressing gaps in stepwise manner or think to research on the general health problem otherwise. It may also be used as an indication for setting priority health problems, understand other aspects of the community such as, demographic, social and economic. The finding of this health profile description will be disseminated to the Bahirdar Zuria Woreda health office officers after finalization of the description report.

Objective

General objective

- To assess and describe Woreda health and health related condition in general and to identify health problems

Specific Objectives

- To describe social, demographic and geographical status of the woreda
- To describe existing health and health related information of the woreda
- To assess human resources under the health facilities found in the Woreda
- To identify priority health problems and operational challenges

Methods and Materials

Study Area:

Bahiradr Zuria Woreda is one of the woreda in west Gojam Zone of Amhara regional state, located in around the capital city of the region called Bahirdar. It shares boundaries with North Gonder to the north, Yilmana Densa to the south, South Gonder to the East and Mecha woreda to the west.

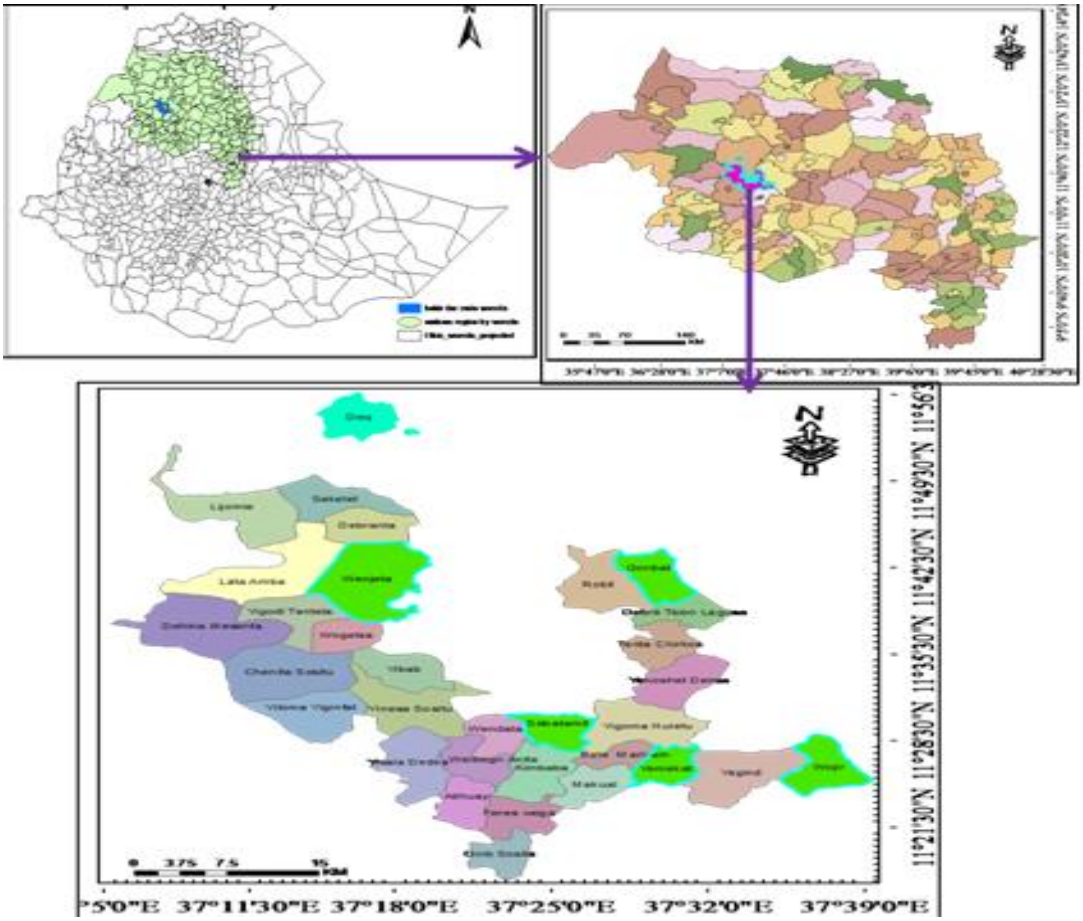

Figure 11 :Map of Bahirdar Zuria Woreda, West Gojam Zone, Amhara region, Ethiopia.

Study Design

A retrospective review of data was applied to develop this profile description

Study Period

This study was conducted in Bahirdar Zuria Woreda, from April 5-20, 2019

Data collection

The information was collected from Woreda Health office, Education office, and Bahirdar Zuria health center. The data was collected by questionnaire, face to face interviewing and reviewing available records.

Data Analysis

The collected data was analyzed using percentages, ratios, sums and ranges by Microsoft-Excel 2010 software.

Ethical considerations

Formal letter was written to all available sector offices and institution to obtain the needed data. As this study use secondary data consent and other ethical measures are not applicable.

Dissemination of the Results

The study result will be disseminated to stakeholders using a report and can also be presented in different review meetings.

Result

Geographic and Climatic Conditions

Bahir Dar Zuria (English "near to Lake Area") is one of the woreda in the Amhara regional state and part of the Mirab Gojam Zone, this woreda is bordered on the south by Yilmana Densa woreda, on east South Gonder and on the west by Mecha woreda. Bahir Dar Zuria includes the forested Zege Peninsula, known for its numerous medieval churches, of which the best known is Ura Kidane Mehret, and associated monasteries. Other points of interest include the Tis Issat falls, and Dilde, better known as the Portuguese Bridge, over the Abay at Alata, about half a mile below the falls. A survey of the land in this woreda shows that 21% is arable or cultivable, 9% pasture, 8% forest or shrubland, 36% covered with water, and the remaining 26% is considered degraded or other. Teff, corn, sorghum, and sesame are important cash crops.

It covers an area of 1282.9 km2 or 12, 8290 hectares. It lies at an elevation of 2025 meters and, located at latitude of 11^0 14' 60.00'' N and longitude of 37^0 09' 60.00'' E. Annual average temperature and rain fall of the Woreda is 10-32 ^{0}c and 820-1210 mm respectively. All of the woreda area can be classified within subtropics (*woina-dega*) climate zone.

Demographic Information

Bahirdar Zuria Woreda had a total estimated population 224,190, from this Male 118,323 and Female 105, 858 in 2010 EFY. Male to Female sex ratio is 1.12 to 1. From the total population, under five years constitutes 30,661 (13.7%), less than 15 years old 96,147(42.8%), women of child bearing age 51,290 (22.8%) and pregnant women were 7,674(3.4%). The annual growth rate is considered to be 2.1% per year, average fertility rate was 2.8 children per women in life during the reproductive ages and average house hold size was 4.32 per house hold. The largest ethnic group reported in Bahir Dar Zuria was the Amhara (100%). Amharic is spoken as a first language (100%). The majority of the inhabitants practiced Ethiopian Orthodox Christianity, with 99.9% reporting that as their religion, while 0.01% were Muslim. There were no urban inhabitants reported in the woreda

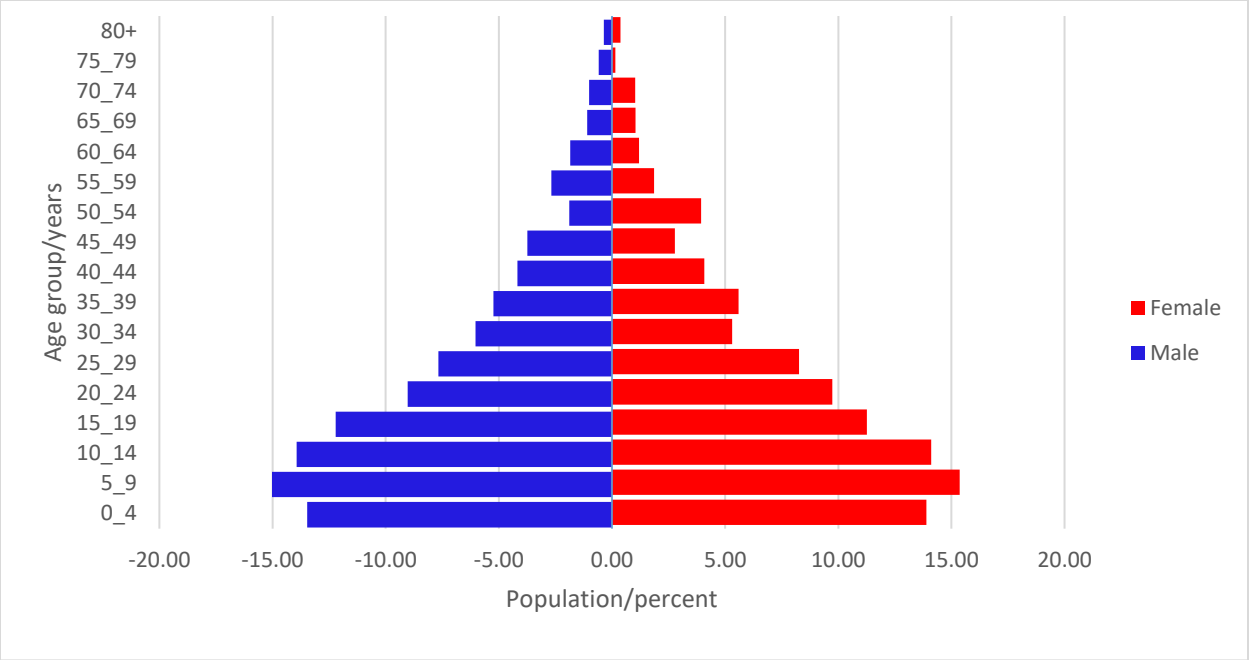

Figure 12:Population Pyramid by Sex & Age Category in Bahirdar Zuria Woreda, Amhara region 2010 EFY

Administrative and political structure

According to the Amhara region administration, woreda is the lowest level of administration but the woreda has its own localities called *kebele*, each having 5000 households on average.

Kebeles have a skeletal administrative structure of elected officials who are supposed to represent ordinary citizens. Kebeles are not budgetary units; they do not receive financing from woredas. This *Kebeles* are designed for the purpose of health extension workers' activity in the health posts. This woreda comprises 32 Kebeles.

Table 16: Estimated Population Size per House Hold by "Kebele" In Bahir Dar Zuria Woreda 2010 EFY

Sr. No	Name of Kebele	Male	Female	total
1	Robit	5,659	5,061	10,720
2	Gonbat	3,611	3,230	6,841
3	Tenta laguna	2,074	1,854	3,928
4	Tenta cherkose	3,431	3,068	6,499
5	Ymoshet	3,333	2,980	6,313
6	Wojere	3,071	2,747	5,818
7	Yeginde	2,856	2,554	5,410
8	Ymekat	2,333	2,086	4,419
9	Betemaryam	1,755	1,569	3,324
10	Andasa	5,412	4,840	10,252
11	Sebatmit	4,067	3,638	7,705
12	Wondata	2,323	2,078	4,401
13	Wyebygne	2,986	2,671	5,657
14	kinbaba	4,004	3,581	7,585
15	Makual	3,676	3,287	6,963
16	Genbe	3,799	3,398	7,197
17	Fresewega	3,743	3,347	7,090
18	Aluhaye	3,317	2,967	6,284
19	Esala	5,524	4,940	10,464
20	Yenesa	5,392	4,823	10,215
21	Yeloma	3,384	3,027	6,411
22	Yebabe	3,017	2,698	5,715
23	Chenta	4,999	4,471	9,470
24	Woglesa	3,039	2,718	5,757
25	Wongeta	5,963	5,332	11,295
26	Lata	6,077	5,434	11,511
27	Yegodi	2,489	2,226	4,715
28	Denamariyam	5,335	4,805	10,140
29	Lijomae	4,786	4,281	9,067
30	Seklte	1,849	1,653	3,502
31	Debranta	1,908	1,707	3,615
32	Deke	3,118	2,789	5,907
	total	118,332	105,858	224,190

Woreda Health System

The woreda health office structure is organized in to two main arms. One arm lead by Head of the woreda health office and the other arm lead by deputy head of woreda health office. Under the leadership of the head; Public Health Emergency Management, Pharmaticulas and logistic supplies, planning and monitoring, and Health and Health related activity case teams are included. Under the other arm which is led by Deputy Health office head includes Nutrition, Malaria, HIV TB/Leprosy Health Extension, and curative services case teams. The others supporting departments like human resource and finance are under the Woreda civil service office.

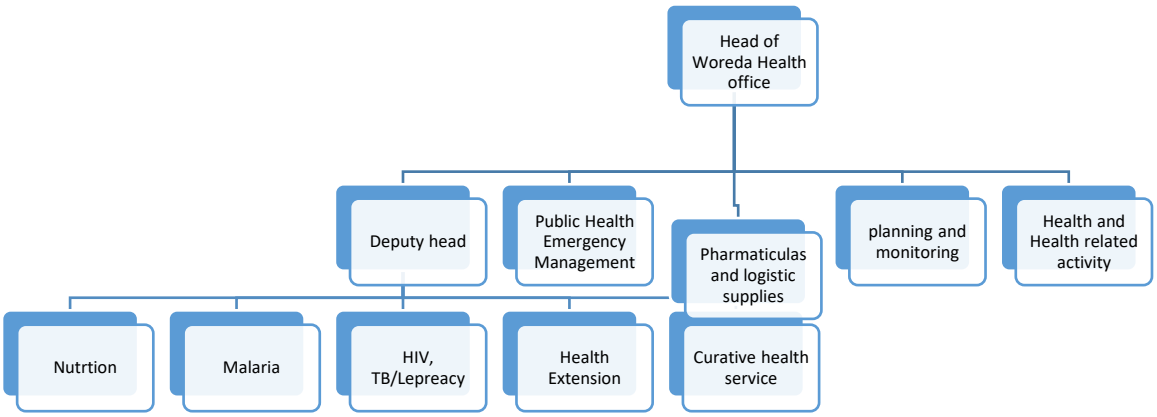

Figure 13: Organo gram of Bahir Dar Zuria Woreda Health office 2010 EFY

In the Woreda there are 9 health centers and 32 health posts but there is no government hospital. The population ratio to health center is 1:24,910. There are also 10 privet clinics and 1 rural drug vender.

Table 17: Health facility professional to population Ratio, Bahir Dar Zuria woreda, 2010 EFY

S. No	Profession	Number	Ratio to Population
1	Physician	0	0
2	Health officer	21	1:10,676
3	Laboratory technician/technologist	11	1:20,381
4	Pharmacy technician/Pharmacist	18	1:12,455
5	Nurses	114	1:1,967
6	Midwife	16	1:14,012
7	X-Ray technician	0	0
8	ENHS	2	1:112,095
9	HEWs	83	1:2,701
10	Others (MPH)	4	1:56,048

Top causes of morbidity and mortality 2010 EFY

In 2010 EFY, a total of 68,242 adults and 10,521 under five clients, totally 78,763 visited woreda health facilities. The top ten leading causes of morbidity for adult ages were Acute upper respiratory infections (25.3%), Acute febrile illness (13.0%), Other unspecified disease of the eye and adnexa (11.4%) and the rest indicated in the following table;

Table 18: Top ten leading causes of adult OPD visit (morbidity) Bahirdar Zuria Woreda 2010 EFY

No	**Type of Disease**	**Number of Cases**	**Percent of cases**
1	Acute upper respiratory infection	5,902	25.3
2	Acute febrile Illness (AFI)	3,024	13.0
3	Other unspecified disease of the eye and adnexa	2,661	11.4
4	Trauma (injury, fracture etc)	2,421	10.4
5	Pneumonia	2,314	9.9
6	Dyspepsia	2,100	9.0
7	Urinary tract infection	1,824	7.8
8	Diseases of the musculoskeletal system and connective tissue	1,285	5.5
9	Diarrhea (non-bloody)	965	4.1
10	Infections of the skin and subcutaneous tissue	796	3.4
Total		23,292	100.0

The top ten leading causes of morbidity for under 5 years were indicated in the following table;

Table 19: Top ten leading causes of under 5 years OPD visit (morbidity) Bahirdar Zuria Woreda 2010 EFY

No	Type of Disease	Number of Cases	Percent of cases
1	Diarrhea non bloody	1,103	26.2
2	Acute Upper Respiratory Infection	951	22.6
3	Pneumonia	816	19.4
4	Acute Febrile Illness	429	10.2
5	Other unspecified disease of the eye and adnexa	261	6.2
6	Diarrhea with dehydration	202	4.8
7	Intestinal parasitosis	164	3.9
8	Infections of skin and	109	2.6
9	Malaria confirmed	88	2.1
10	Diarrhea with bloody	84	2.0
		4209	100.0

Immunization coverage for children and women

As part of preventing and control vaccine-preventable diseases the woreda health system delivers vaccination activities for surviving children. In 2010 EFY full immunization coverage of the woreda was 98.8%.

Maternal Health Service

There were 7,674 estimated pregnant women in 2010 EFY. Among these eligible women a total of 8,835 (>100%) pregnant women attended first antenatal care visit (ANC1) while 8,325 (>100%) of them attended the fourth visit. Deliveries which are attended by skilled birth personnel (Nurses and Midwifes) was 5,775(75%). There was no maternal death and still birth reported in the 2010 EFY. From the total deliveries 5,605 (97%) of women who delivered got early post-natal care.

Table 20: Maternal Health Service Coverage of Bahirdar Zuria Woreda 2010 EFY

Sr.no	Description	Plan	Achievement	Percentage
1	ANC 1 coverage	7,674	8,835	145
2	ANC 2 coverage	7,674		76
3	Institutional (skilled) delivery coverage	7,674	5,775	75
	Still Birth	-	0	0
	Live Birth	-	5,775	100
4	PNC coverage	7,674	5,605	73
5	PMTCT	1,215	1,674	138

There were estimated 51,290 (22.8%) women in reproductive age group in 2010 EFY in the woreda. From these women 48,636 (94.8%) use different modern contraceptive methods; of which 37,450 (77%) use injectable, 836(12%) used implant, 4,864(10%) used oral contraceptives, and 5, 486(1%) used IUCD.

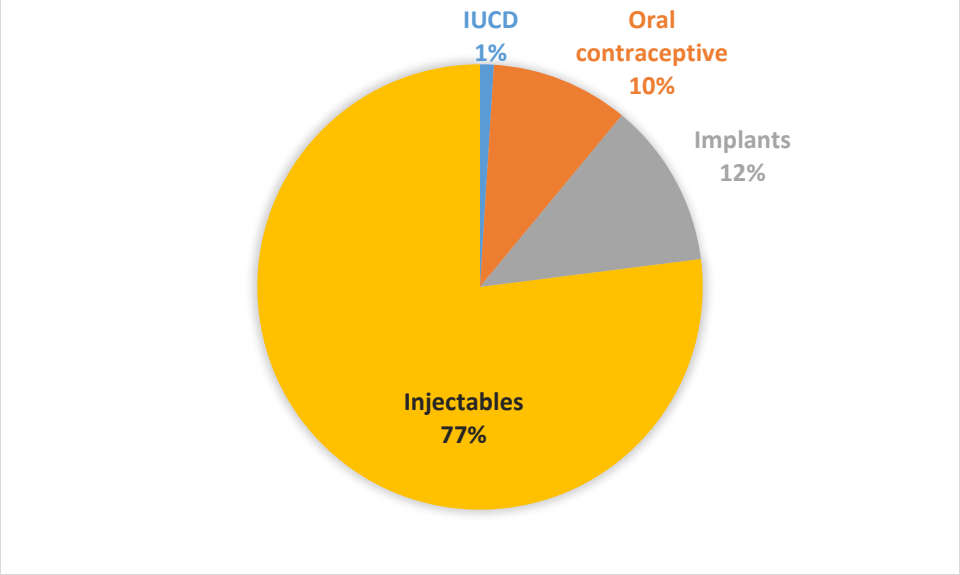

Figure 14: Contraceptive users of Bahirdar Zuria Woreda 2010 EFY

Environmental Sanitation and Availability of Safe Drinking Water 2010 EFY

In the Woreda have a total of 45,690 household, from this 35, 582(77.8%) households have latrine. The woreda latrine utilization coverage was 94.35 % Safe water supply coverage of the woreda was 84% and number of kebeles accessed to safe water was 30 (84%).

Endemic Diseases

Malaria

In 2010 EFY the woreda identified at total of 386 malaria cases was identified and from this 56 (14.5%) and 330 (85.5) were in under five children and above five years old cases respectively.

Concerning on prevention and treatment of malaria, Insecticide Treated Nets coverage has improved up to 89.6 % in the woreda for the year of 2010EFY. Environmental management, case treatment and

indoor residual spraying are the major activities of the Woreda to prevent and control malaria transitions.

Tuberculosis

In 2010 EFY, there were a total of 194 TB cases, in woreda which accounts TB prevalence of 0.09%. In the indicated year, All TB patients were screened for HIV and 2 (1.03%) of them were turned positive. Among the TB cases, 60.8% were Extra PTB in the year. Detection rate for all forms of TB was 61.4 % and the cure rate was 89.3%.There were no deaths due to TB recorded in the year.

Table 21: Prevalence of TB/Leprosy: Bahir Dar Zuria Woreda 2010 EFY

Sr. No	Description		Number	percentage
1	Prevalence of TB		194	0.09
2	Pulmonary TB	Smear positive	33	17
		Smear negative	43	22.2
3	Extra PTB		118	60.8
	Retreatment		-	
4	TB detection rate all form		194	61.4
5	TB Rx completion rate		188	97
6	TB cure rate		168	89.3
7	TB defaulter rate		6	3%
8	Death on TB Rx		-	
9	Total TB patients screened for HIV		194	100
10	HIV prevalence rate among TB cases		2	1.03
11	Prevalence of Leprosy		0	

HIV/AIDS

In Bahir Dar Zuria Woreda, there are 420 peoples living with HIV/AIDS since 2010 EFY; from these 100 males and 320 female and among the total HIV/AIDS cases 76 of them enrolled on ART. In 2010 EFY, 29,334 clients were screened for HIV in VCT, PITC and PMTCT departments, of these 12,727 (43.4%) males and 16, 607 (56.6%) were female. In the same year, 14 new HIV cases were detected, from these 5 were male and the rest 9 were female. HIV prevalence was 0.006% with incidence of 47.7 cases of HIV per 100,000 populations per year. Currently 76 PLWHIV are receiving antiretroviral therapy.

Table 22: HIV/AIDS in Bahir Dar Zuria Woreda, 2010 EFY

Sr. No	Activities	Total		
		M	F	total
1	Total people screened for HIV	12,727	16,607	29,334
2	VCT	2,212	1,805	4,017
3	PICT	10,515	14,802	25,317
5	New HIV Positive cases	5	9	14
6	Total PLWHIV	100	320	420
7	On ART	20	56	76
8	No. of pregnant mothers on ART	NA	6	6
9	No. of pregnant mothers on Pre ART	NA0	0	0

Education

Bahir Dar Zuria Woreda has a total of 81 schools, of which 64 of theme primary, 4 of them Secondary and the rest 13 are kindergarten. In 2010 EFY a total of 61,542 students were enrolled in formal education in these schools. There were total 390 dropouts. There was no compiled data for the dropout specific to gender of students. According to the interview made with the woreda Education Office Head during data collection, only 17 (20.9%) schools are equipped with water supply and functional latrine. In addition to the formal education, there are HIV club and other Health clubs in all schools.

Table 23: Education in Bahir Dar Zuria Woreda, 2010 EFY

Sr. no	Type of School	Number of schools	Number of Teachers			Number of Students			Student School Drop Out
			male	Female	total	male	female	Total	
1	Primary								
	1-4	17	135	198	333	17,102	14,794	31,896	140
	5-8	47	520	302	822	8,992	8,106	17,098	172
2	Secondary								
	9-10	3	55	20	75	1,498	1,424	2,922	76
	11-12	1	8	5	13	460	415	875	2
3	Kindergarten	13	2	35	37	4,525	4,226	8,751	0
	Total	81	720	560	1,280	32,577	28,965	61,542	390

Communication and Infrastructure

In the Woreda at total of 31,204 residents, male 29,387 and female 8,844 and only 19.5 % Health centers and health posts have accessed form cable based and mobile phone communication. From total of 32 Kebeles in the woreda 29 of them have access to road. A total of 14 (43.7 %) Kebeles have

access to electric city. In the woreda there are a total of 9 health centers and 32 health posts, different infrastructure coverage of the health facilities indicated in the following table

Table 24: Number of health facilities with different infrastructure coverage at Bahir Dar Zuria Woreda, Amhara region, Ethiopia 2010 EFY

No	Type of infrastructure	Number of health centers	Number of health posts
1	with sustainable/ 24 hour /electric power	8	0
2	with telephone service (cable based/mobile)	9	32
3	with safe water supply	9	11
4	No of HC which have vehicle (ambulance)	3	0

Productivity and income

Agriculture remains the main source of income in the woreda. The farming system of woreda is characterized by crop-livestock mixed farming. Farmer households depend mainly on crops both for food and cash income. The areas are more suitable for cereals, pulses, horticultural crops and oil crops and to a lesser extent to spices. Teff, sorghum, maize, wheat and barley, among cereals; chick pea, grass pea and lentil, among pulses; Niger seed and safflower among oil crops; potato, pepper, tomato, shallot and garlic among annual horticultural crops are commonly grown in the area. Growing a diverse group of crops helps farmers to minimize potential risks of crop failure and helps them to fulfill their household requirements. The productivity of the land per hectare was 55 quintals for cereals, 51.6 quintal for pulses, and 11.2 quintal for spices.

Health sector expenditure and financing

During data collection time there was no data available to indicate Health sector expenditure and financing of the woreda health sector.

Nutrition and Early Warning

The district has 32 OTP and CBN sites for nutrition. In 2010 EFY a total of 30,822 under-five children and 7,674 pregnant women were screened for malnutrition and none of them received therapeutic food. The district, CBN program working towards improving nutritional status especially in fewer than five children, pregnancy and lactating women. Regarding to disaster, the woreda had experienced to scabies and acute watery diarrhea (AWD) outbreak. In the scabies outbreak a total of 3,235 cases were identified and there was no death reported among them. For the AWD outbreak 642 cases was identified and 13 cases death was recorded. But no natural or manmade disaster in the previous three years in the woreda.

Discussion

Health service coverage was 100 according to the federal ministry of health system organization population ratio, which means 1 primary hospital to 60,000-100000, 1 health center to 15,000 - 25,000 population and 1 health post to 3000-5000 population (3). Health professional population ratio of nurses and health officers in the area was 5.1 and 0.93 per 10, 000 population, higher than national professional population ratio of nurses and health officers of 4.3 and 0.77 per 10,000 populations respectively In the district 90.6% and 43.7% of Kebeles were accessible for transportation and electricity respectively. In the woreda households with latrine and distribution of health facilities with safe water supply were 77.8% and 62.5% respectively, this is higher than as compared with the national targeted program of 43.4% and 55.1% respectively. (4)
Acute respiratory tract infection was the leading cause of morbidity in the woreda, accounting 28.3% in adult this was higher than the national prevalence of OPD visit reported in 2007 EFY as 9.21 %. In under five children OPD visits diarrhea non-bloody was the leading cause OPD visits followed by acute respiratory tract infection 26.2% and 22.6%, this was higher than the national prevalence of OPD visit reported in 2007 EFY as 24.88% and 13.70% respectively (4). This might be due to the poor environmental sanitation which exposed them to easily prevented communicable disease.

TB detection is a tool that plays a great role to decrease TB prevalence by increasing early initiation of TB treatment and that enables us to decrease TB transmission. Among the new all forms TB cases estimated in the woreda, TB detection rate was 61.4% and higher than the Amhara Region which was 52.4 % but lower than the national TB detection rate which was 67.3% in the Health and Health Related Indicator, EFY 2007 report (4). This is an area which needs improvement. Among new TB smear positive cases in the woreda TB treatment completeness and TB cure rate were 96.9% and 89.6% respectively. There were 6 TB defaulter cases In 2010 EFY. There was no died patient who was on anti-TB treatment in the same year. All TB case were tested for HIV, of this 2 of them were positive and all of them were linked to ART service.
As part of preventing and control vaccine-preventable diseases the woreda health system delivers vaccination activities for surviving children. In 2010 EFY full immunization coverage of the woreda was 98.8% which is higher than the Amhara regional state and National fully immunization coverage 87.6% and 86.4% respectively. (4)

In the woreda first ante natal care (ANC1) and PMTCT were 145%, and 138%, respectively; higher than the national target of 90% and 77% these may be problem on planning. Institutional (skilled)

delivery coverage was 50% which was comparable to Amhara region 48.4% but low compared to the national 60.7%. (4)

The HIV prevalence of the woreda based on the health facility data such as from VCT, PMTCT, and PITC was 0.006% which gave a total of 420 PLWHA in 2010 EFY but very far low number as compared to the national projected prevalence that is 1.2%(5).

In 2010 EFY there was AWD and scabies outbreak. There was 642 AWD case were identified 13 cases death was recorded. Drinking of springs and holy water, Open defecation in holy water areas could be the reason for the occurrence of AWD. In the scabies outbreak a total of 3,235 cases were identified and there was no death reported among them. Sharing clothes, sleeping with scabies case could be the reason for the outbreak.

Absence of man-made disaster and very low number of severe malnutrition therapy provided in the woreda is good unless under reporting is masking the situation.

According to the woreda health officials, the main problems of the district are limited regular budget, shortage of medical supplies, and restriction of the most allocated budgets to programmatic activities which are not flexible and other used for other demanding activities.

Challenges and Limitations

This analysis did not represent data about private health sectors due to unavailability of document, and so it is focused on government health facilities. Occupational characteristics, vital statistics, income source and other information is not documented. Moreover, there was also difficulty to find the Woreda Health sector expenditure and financing information.

Conclusion

This Woreda Health profile includes multiple issues including health care service, nutrition and education. Acute upper respiratory tract infection is the leading cause of morbidity. There is no any dropout student from school at secondary level. Immunization and ANC coverage of the woreda is more than the planned number in both children and women. TB and HIV are still public health burdens in the woreda. No man-made disaster is recorded in the last three years in the woreda.

Recommendation

Important health indicators like infant mortality, crude death rate and child mortality should also be registered and documented.

The Woreda should work hard to increase coverage of sustainable/ 24 hour /electric power, piped water supply to health facilities and schools.

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Chapter Five- Scientific Manuscript

Hospital based epidemiology of Influenza in Ethiopia: Descriptive analysis of sever Acute Respiratory Illness (SARI) 2009-2019, Addis Ababa, Ethiopia

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Abstract

Background: Influenza is an acute viral respiratory tract disease classified as influenza types A, B and C. Subtypes of influenza A viruses H1N1, H2N2, and H3N2 have been associated with widespread epidemics in humans. In Ethiopia the index case of influenza A (H1N1) pdm2009 was detected in 2009. We determined influenza virus positivity rate and distribution of sever acute respiratory illness cases at Yekatit 12 Hospital medical college.

Method: Descriptive data analysis was employed for Yekatit 12 medical college Hospital influenza surveillance data from January 2009-December 2019.

Result: A total of 986 cases were registered on case-based database from January 2009-December 2019 and 835(85%) of them were tested for influenza. Among them 30(3.6%) cases were positive for influenza and of which 25(83.3%) were influenza A and 5(16.7%) were influenza B virus. From total 25 influenza A cases, 16(64%) of them were influenza A(H1N1)pdm2009 the rest 9(36%) were seasonal influenza A(H3N2) type. Among the total Influenza positive cases, 17(56.6%) were <2 years, followed by age group 5-14 years and 15-49 years by 5(16.7%) and 3(10%) respectively.

Conclusion: Seasonal influenza A (H3N2), (H1N1) pdm2009 and influenza B were found at Yekatit 12 medical college hospital from 2009-2019 surveillance period. Influenza positivity rate and number of sever acute respiratory illness cases were predominantly observed among age <5 years and occur in all months of the year. Increasing the number of influenza surveillance sites in Addis Ababa will be more representative and important to determine burden of respiratory infections for effective intervention.

Key words: Influenza, Surveillance, Ethiopia

Background

Influenza is an acute viral respiratory tract disease characterized by the sudden onset of fever, chills, headache, myalgia and extreme fatigue [1]. The viruses are classified as influenza types A, B and C. Influenza type A and B viruses can cause epidemic disease in humans, and type C viruses usually cause a mild, cold-like illness [2]. Influenza A infects multiple species, including humans, other mammals, and wild and domestic birds Influenza A viruses can be subtyped according to the antigenic and genetic nature of their surface glycoproteins; 15 hemagglutinin (HA) and 9 neuraminidase (NA) subtypes have been identified to date but only viruses of the H1N1, H2N2, and H3N2 subtypes have been associated with widespread epidemics in humans [2][3] . Different subtypes have not been identified among influenza B viruses [4].

Three pandemic influenza outbreaks occurred in the 20th century and they occurred differently with respect to etiologic agents, distribution and disease severity [5]. They did not occur at regular intervals; in 1918 “Spanish flue”, was the most severe, causing an estimated 20–40 million or more deaths worldwide and Less severe pandemics occurred in 1957 “Asian flu” and in 1968 “Hong Kong flu” [6][7]. The world’s most recent pandemic was happened in 2009 influenza A (H1N1) pdm09 [8], which was known as highly transmissible with rapid spread to worldwide resulted in a lower mortality than for previous known pandemics, with between 123 000 and 203 000 deaths occurred. In contrast, the infamous 1918 “Spanish influenza” pandemic spread more slowly but caused an estimated 20–40 million deaths [9].

In Africa, the impact of influenza infection is not yet fully determined comparing to other developed continents, this may be due to inconsistent and unavailability of data but studies in different African countries indicates that influenza viruses have been circulating and cause morbidity and mortality in different populations [10]. For example, in a study of mortality amongst patients with influenza-associated SARI in Soweto, South Africa, the estimated incidence of influenza-associated SARI deaths per 100,000 population was highest in children <1 year (20.1, 95%CI 12.1-31.3) and adults aged 45–64 years (10.4, 95%CI 8.4–12.9) [11] . In study conducted in two-long term refugee camps in Kenya, influenza associated-SARI hospitalizations were 4.8/1000 in <5 years old and 11.1/1000 in <1 year old with positivity rate influenza A, 9.7%; and influenza B, 2.6% [12]. After the occurrence of avian influenza outbreak in 2006 and influenza H1N1 pandemic in 2009 have developed influenza

laboratory diagnostic capacity using WHO minimum standards recommendation in 34 countries out of 47 in the WHO African region [13]. According to 2018 the world report on Progress in influenza surveillance in Africa, 30 countries have been implementing sentinel surveillance for Influenza-Like Illness (ILI) and/or Severe Acute Respiratory Illness (SARI) [14].

The index case of influenza A (H1N1) pdm2009 was detected in Ethiopia in June 2009 [15]. A study conducted on Epidemiology of influenza in Ethiopia from 2009–2015 indicates that seasonal Influenza A (H3N2), Influenza A (H1N1) pdm2009 and Influenza B are circulating in the country. In the seven years data a total positivity rate was 20.6 % of the ILI and SARI cases. Among the SARI patients the proportion of influenza positivity was 3.1% and the majority of influenza positive cases of the SARI surveillance were identified among under-five children [16]. In November 2008, Ethiopia launched influenza sentinel surveillance program and has been implementing in eight sentinel sites (three ILI and Five SARI sites). The first influenza sentinel site in Ethiopia was Yekatit 12 medical college hospital, located in Addis Ababa, which was launched November 2008, 2009. The influenza sentinel sites were progressively expanded to four administrative regions (Addis Ababa, Amhara, Tigray, Oromia and Southern Nations, Nationalities and Peoples' (SNNP) regions). Before the implementation of surveillance system, convenience and feasibly of the sites were objectively assessed. The criteria for the selection of sentinel sites includes, availability of spaces, willingness of the hospital management, availability of willing clinical staffs to be focal person, regular reporting procedures, sample transportation procedures, population size of the catchment hospital. The influenza surveillance sites collect data of ILI from outpatient visit and SARI from patients admitted in the respective sentinel hospitals.

Standardized and coordinated surveillance information is crucial for the management of the pandemic at global and national levels. However, detail sentinel surveillance specific site data analysis was not conducted to figure out the positivity rate, magnitude and distribution of influenza viruses among SARI cases, as to guide the decision makers to take appropriate control and intervention measures at different levels. The objective of this study was to determine the positivity rate, type and sub type of influenza and distribution of SARI cases at Yekatit 12 hospital medical college in Addis Ababa from January 2009 – December 2019.

Methods and Materials

Study Design

Descriptive surveillance data analysis was employed and described SARI surveillance by time, place and persons.

Study area and period

The study was conducted in Yekatit 12 medical college hospital which is the primary SARI sentinel surveillance site in Addis Ababa. The surveillance data analysis was conducted during January 10-20, 2020.

Case definition for SARI

Cases were defined through the use of Ethiopian Influenza Sentinel Surveillance Implementation Guideline, 2012 which was adapted from standardized case definitions developed by the WHO African Region and CDC (Technical Guidelines for Integrated Disease Surveillance and Response in the African Region, October 2010) [15]. SARI case is defined as; Any severely ill person presenting with manifestations of acute lower respiratory infection with: history of fever or measured fever (>38ºC) AND Cough or sore throat AND Shortness of breath, or difficulty of breathing with or without Clinical or radiographic findings of pneumonia OR any person who died of an unexplained respiratory illness.

Identification of Cases

The sever acute respiratory infection (SARI) surveillance has been collected on weekly basis. We obtained weekly numbers of hospitalization from the national influenza laboratory. Respiratory specimens from sentinel sites has been routinely collected and submitted to the national influenza laboratory (NIL) for laboratory conformation. Patients who fulfilled the case definition for SARI and admitted to hospital were enrolled in the surveillance program and throat swab samples were collected from patients. Additionally, clinical and demographic information of each patient (symptom, Place of residency, age, sex) were recorded on public health emergency management standard reporting format.

Sample collection and Laboratory methods

Specimen were collected within seven days after the first onset of symptoms. Throat swab were placed in to cryovial with viral transport medium (VTM) and immediately refrigerated at 2-8 ^{O}C. Specimens packed with triple packaging system and transported to the National Influenza Reference Laboratory (NIRL) at Ethiopian Public Health Institute (EPHI) within 72 hrs of collection.

Laboratory test for influenza virus was done at National Influenza Reference laboratory. Samples were extracted for viral RNA from throat swabs using the QIAamp Viral RNA kit in accordance with the manufacturer's instructions. A one-step reverse-transcription polymerase chain reaction (PCR) assay was first performed for influenza A and B viruses, followed by further sub-typing and characterization of influenza A-positive specimens were done according to CDC real-time reverse transcription PCR protocol [17].

Data source and Analysis

We used secondary data extracted from national data base of Public Health Management Center of Ethiopian Public Health Institute collected from Yekatit 12 Medical college Hospital sentinel surveillance site from January 2009 to December 2019. Data cleaning had been done from the initial secondary data stored in Microsoft Excel. We categorized the data by sex, age group, place and laboratory test result. The statistical data analysis was conducted using Microsoft Excel 2013.

Ethical consideration

Permission was obtained from the center of public health emergency management at Ethiopian Public Health Institute to conduct this study. Patient information confidentiality and privacy was protected using code number.

Results

Description of hospital influenza surveillance system

The Ethiopian public health institute implementing influenza surveillance activities and monitoring influenza-like-illness and Severe acute respiratory infections among influenza sentinel sites. Sentinel surveillance for illnesses and deaths that meet the case definition for SARI is implemented in sentinel hospital. Yekatit 12 medical college hospital is the only sentinel site for SARI case in Addis Ababa city administration to cover all SARI surveillance activities in the city. The hospital assigned public health emergency management (PHEM) focal persons and dedicated working room for the implementation of surveillance activities. The sentinel surveillance focal person is responsible of identifying eligible SARI cases, collection of throat swab samples using case-based reporting format and transport the sample twice a week to national influenza laboratory (NIL). The sentinel site, has been receiving laboratory test results and performance feedbacks from the national influenza

laboratory. The hospital PHEM focal person was also monitor the functioning of the sentinel surveillance site and receive feed backs and laboratory results from sub-city/regional PHEM focal persons and National PHEM team. (figure one)

Characteristics of SARI cases

Based on the descriptive results of the total 986 SARI cases registered in the surveillance data base, 16 (1.6%) had missing variable age and 27 (2.7%) of cases had missing information about address of cases. Throat swab was collected from 986 cases and RT-PCR test was conducted for 835 (85%). Over all positivity rate for influenza was 30 (3.6%). There was no death registered on the case-based format. The Age of cases range from 1 month to 47 years with the median age 1 year. Majority of cases 802 (81.3%) were age less than five years and 537 (54.5%) were males.

From 451 male cases tested for influenza 13 (2.9%) were positive for influenza type A and 3 (0.7%) were positive for influenza type B. A total of 384 females were tested for influenza and 12 (3.1%) were positive for influenza type A, followed by influenza type B which were 2 (0.5%). The positivity rate of female cases and male case were 3.6% and 3.5% respectively. Among the total Influenza positive cases of SARI, 17 (56.6 %) were among under 2 years, followed by age group 5–14 years and 15–49 years by 5 (16.7%) and 3 (10%) respectively. (Table 1)

SARI cases and influenza positivity by place of residence

Regarding place of residence, 830 (84.2%) of the cases were from Addis Ababa City administration and followed by 132 (13.2%) were from Oromia region and the rest 14 (1.4%) and 10 (1.0%) residents were from in other parts of the country and residence area were not recorded on the case-based format respectively.

From the total 30 influenza positive cases 24 (80%) cases were from Addis Ababa city administration and followed by cases from Oromia region 5 (16.7%). The overall influenza positivity rate of the Addis Ababa city administration was 24 (3.4%) among all tested cases living in Addis Ababa. (Table 2)

Total influenza positivity among SARI cases by time

Among 835 (85 %) SARI cases tested for influenza 30 (3.6%) cases were positive for Influenza and 25 (83.3%) yielded influenza A virus and 5 (16.7%) were attributed to influenza B virus from 2009-2019. From the total 25 Influenza A cases, 16 (64%) of them were A(H1N1) pdm2009 the rest 9 (36%) were detected A/H3N2 type. The highest number of SARI cases were registered in 2014 followed by 2019 with proportion of 20.0% and 14.7 % respectively. (Table 3)

Influenza positivity of SARI cases per sample tested observed with variation in each month. The highest positivity rate was observed in February (7.0%) followed by October (6.5%), November (5.4%), May (5.3%), December (5.0%). In each month at least one Influenza positive cases were identified. Influenza A subtype (H1N1) pdm2009 showed a relative increase in October followed by November and December. (Table 4)

Discussion

We described 11 years (2009-2019) of virological and epidemiological data from influenza sentinel surveillance data of Yekatit 12 medical college hospital. During this time 986 samples collected from SARI cases. A total of 30 influenza positive samples were found from the total of 835 (85 %) tested samples with influenza positivity rate of 3.6%. This result is comparative to the seven year (2009-2015) of epidemiology of influenza conducted in all four SARI sentinel surveillance site of Ethiopia including Yekatit 12 Hospital medical college [16] but it was low compared to other studies conducted in Kenya, South Africa and, China which reported 14.6%, 8%, and 6% respectively[18] [11][19]. The low influenza positivity rate in SARI cases, it may indicate that, low awareness and misunderstandings of influenza by health professionals regarding case identification and improper specimen collection techniques could have potentially led to many missed cases and false negative test results. The other reason contribution for low positivity rate may be from the total SARI cases who had specimen collected for testing, 15% of cases test was not done. The majority of samples 90 (59.6%), which were not tested, obtained at the beginning of surveillance (2009) due to lack of reagents [20].

Majority of the SARI cases were in the less than 5year age group. This is similar findings were reported in a description of influenza surveillance in 15 African countries, including Ethiopia, from

2006–2010 [21]. This is also not different from the result of Kenyan study of on sentinel surveillance data analysis from July 2007–June 2013 [18].

The majority of influenza positive cases 13 (81.2%) were in children aged less than five years. This is consistent with the study conducted on Epidemiology of influenza in West Africa after the 2009 influenza A(H1N1) pandemic, 2010–2012 [22].

According to this analysis, SARI cases recorded all year round with some peaks during April, May and July this find is different from most studies conducted in different African countries like Nigeria [23] and Tanzania[24], This may be the number of SARI cases and our study was focused on only one sentinel surveillance site of influenza found in the capital city.

Conclusion and Recommendation

This data analysis revealed that the influenza viruses have been circulating in Ethiopia which affected both males and females. Additionally, both influenza positivity rate and number of SARI cases were predominantly observed among age less than 5 years old and occur in all months of the year.

Continuous influenza surveillance will provide a frame work for detecting and following future influenza outbreaks and pandemics. If all the swabbed samples are tested for other respiratory pathogens, especially on influenza negative samples to determine the proportion of other respiratory pathogens causing SARI and which can contribute for having a clear image to predict national, regional and global burden of influenza. Increasing the number of influenza sentinel surveillance sites for SARI in Addis Ababa will be more representative and important to determine burden of respiratory infections for effective intervention.

What is already known on this topic

- Influenza is contagious and highly mutating virus which can cause a devastating pandemic.
- Influenza is indistinguishable from other respiratory viral diseases without laboratory confirmation.

- Influenza virus have different types and sub types which infects multiple species, including humans, other mammals, and birds

What this study adds

- Description of Hospital surveillance for sever acute respiratory infection
- Epidemiological distribution of sever acute respiratory infection cases in sentinel surveillance site.
- Influenza virus positivity rate among Sever acute respiratory infection cases during 2009- 2019 surveillance period.
- Determination of types and sub types of influenza viruses circulating in the hospital causing sever acute respiratory infections.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

AMY, the corresponding author, was the major contributor in preparing the manuscript. AAH and DAB contributed significantly in the design of the study and revision of the final manuscript for ensuring for publication. DBT and HAH supported in the analysis and interpretation of the data. ATM contributed in designing the study and lead surveillance activities. All authors have approved the final manuscript.

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Table: 1. Socio-demographic characteristics and influenza positivity, types and subtypes among SARI cases at Yekatit 12 medical college sentinel surveillance site in Addis Ababa, Ethiopia 2009–2019

Characteristic	Sample Collected N	Sample Tested N (%)[a]	Influenza Positivity N (%)[b]	Influenza type and subtypes			
				Influenza A N (%)[C]	Pandemic Influenza A (H1N1) pdm2009 N	Seasonal A(H3N2) N	Influenza B N (%)[C]
ALL CASES	986	835 (85)	30 (3.6)	25 (83.3)	16	9	5 (16.7)
SEX							
FEMALE	449	384 (86)	14 (3.6)	12 (40)	8	4	2 (6.7)
MALE	537	451 (84)	16 (3.5)	13 (43.3)	8	5	3 (10)
AGE GROUP *							
< 2	640	534 (83)	17(3.2)	14 (46.7)	7	7	3 (10)
2_4	162	133 (82)	3(2.3)	2(6.7)	1	1	1 (3.3)
5_14	150	135 (90)	5(3.7)	5(16.7)	4	1	-
15_49	14	13 (93)	3(23.1)	3(10)	3		-
50_65	-	-	-	-	-	-	-
> 65	4	4 (100)	1(25.0)	-	-	-	1 (3.3)
missed	16	16 (100)	1(6.3)	1(3.3)	1	-	-

***** *Age grouping used from recommendation of Global Epidemiological Surveillance Standards for Influenza (GESSI)*

A: denominator is sample collected

B: denominator is sample tested

C: denominator is tested positive

Table 2: Influenza positivity, types and subtypes among SARI cases by residency area seen at Yekatit 12 Medical college sentinel surveillance site in Addis Ababa, Ethiopia 2009–2019

Resident area	Sample collected	Sample tested	Positive for influenza	Influenza types and subtypes			
				Influenza A	Pandemic influenza A (H1N1) pdm2009	Seasonal influenza A (H3N2)	Influenza B
	N	N (%)[a]	N (%)[b]	N (%)[C]	N(%)[C]	N	N (%)[C]
Addis Ababa (All Cases)	830	711 (86)	24(3.4)	19 (63.3)	11	8	5 (16.7)
Sub City of Addis Ababa							
Addis Ketema	76	65 (86)	1(1.5)	1(3.3)	-	1	-
Akaki Kaliti	20	18 (90)	-		-	-	-
Arada	111	91 (82)	4(4.4)	3(10)	1	2	1 (3.3)
Bole	64	53 (83)	4(7.5)	2(6.7)	2	--	2 (6.7)
Gullele	164	142 (87)	5(3.5)	4(13.3)	1	3	1 (3.3)
Kirkos	25	23 (92)	1(4.3)	1(3.3)	1	-	-
Kolfe Keranio	112	100 (89)	2(2.0)	2(6.7)	2	-	-
Lideta	18	14 (78)	-		-	-	-
Nifas Silk Lafto	30	28 (93)	2(7.1)	2(6.7)	1	1	-
Yeka	193	164 (85)	5(3.0)	4(13.3)	3	1	1 (3.3)
Missed	17	13 (76)	-		-	-	-
Out of Addis Ababa							
Oromia Region	132	103 (78)	5(4.9)	5(16.7)	4	1	-
Other Regions	14	13 (93)	1(7.7)	1(3.3)	1	-	
Missed	10	8 (80)	-		-	-	

a: denominator is sample collected

b: denominator is sample tested

c: denominator is tested positive

able 3: Total influenza positivity, types and subtypes among SARI cases by Year seen at Yekatit 12 medical college sentinel surveillance site in Addis Ababa, Ethiopia 2009–2019

Characteristic	Sample Collected N	Sample Tested N (%)[a]	Influenza Positivity N (%)[b]	Influenza type and subtypes			
				Influenza A N (%)[C]	Pandemic Influenza A (H1N1) pdm2009 N	Seasonal A(H3N2) N	Influenza B N (%)[C]
ALL CASES	986	835 (85)	30 (3.6)	25 (83.3)	16	9	5 (16.7)
YEAR							
2009	141	51 (36)	3(5.9)	3(10)	-	3	-
2010	74	74 (100)	2(2.7)	2(6.7)	2	-	-
2011	55	55 (100)	1(1.8)	1(3.3)	-	1	-
2012	61	61 (100)	-	-	-	-	-
2013	30	15 (50)	1(6.7)	-	-	-	1 (3.3)
2014	198	197 (99)	7(3.6)	6(20)	3	3	1 (3.3)
2015	83	82 (99)	2(2.4	2(6.7)	2	-	-
2016	130	130 (100)	5(3.8)	4(13.3)	3	1	1 (3.3)
2017	41	41 (100)	2(4.9)	2(6.7)	1	1	-
2018	28	25 (89)	3(12.0)	1(3.3)	1	-	2 (6.7)
2019	145	104 (72)	4(3.8)	4(13.3)	4	-	-

a: denominator is sample collected

b: denominator is sample tested

c: denominator is tested positive

Table 4: Total influenza positivity, types and subtypes among SARI cases by month seen at Yekatit 12 medical college sentinel surveillance site in Addis Ababa, Ethiopia 2009–2019

Month	total tested (N= 835)	Influenza Positivity N (%)*	Influenza type and subtype		
			A (H1N1) pdm2009 N	A(H3N2) N	Influenza B N
January	46	2 (4.3)	2		
February	43	3 (7.0)	2	1	
March	50	2 (4.0)	1		1
April	54	1 (1.9)			1
May	98	4 (4.1)		4	
June	91	1 (1.1)	1		
July	80	1(1.3)			1
August	54	1(1.9)			1
September	74	1 (1.4)		1	
October	92	6 (6.5)	4	2	
November	93	5 (5.4)	3	1	1
December	60	3 (5.0)	3		

** denominator is sample tested*

Chapter Six – Scientific Abstract

6.1 Dengue Fever Outbreak Investigation in Millie district, Zone one, Afar Region, Ethiopia, 2020

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Introduction: Dengue is a mosquito-borne viral disease that has rapidly spread in all regions of WHO in recent years. Dengue virus is transmitted by female mosquitoes mainly of the species *Aedes aegypti*. In Ethiopia, confirmed cases of Dengue fever were reported in 2013 with serotypes circulating strain of DEN-2 and Aedes aegypti was identified vector. We determined factors associated with Dengue fever outbreak

Methods: An unmatched case-control study design was used to investigate the outbreak from January 27- February 3, 2020. Epidemiological data were collected through face to face interview using structured questionnaire. Results were displayed using texts, tables and graphs and statistical significance was interpreted using Odds ratio with 95% confidence interval and P value <0.05 after logistic regression was performed. Serological test was done for Sixteen serum samples

Result: We enrolled 105 participants (35 cases and 70 controls) in the study. From these males accounted for 74.3% of cases and of 64.3% for controls. The median age of participants was 30 years (range from 8 to 60). In a multivariable analysis, failure to use long lasting impregnated net while sleeping (Adjusted odds ratio sleeping (AOR= 5.314: 95% CI: 1.682-16.790 and P= 0.004) and availability of opened water holding container (AOR= 6.702: 95% CI: 2.141-20.976) and P= 0.001) were remain significant risk factors to dengue fever. From 16 samples tested, 14 (87.5%) were confirmed positive.

Conclusions: Individuals who live with Dengue fever patient, do not use bed nets and availability opened water holding container around their homes are at high risk of contracting the disease. Health education on Dengue Fever prevention was given and mosquito breeding sites were drained. Strong vector prevention strategies are recommended by enhancing the existing malaria prevention and control program.

Keywords: Dengue fever, Afar, Mille, Outbreak, Risk factors

6.2 Epidemiological description of unknown skin lesion outbreak in Jimma town, Ethiopia, 2019

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Abstract

Introduction: Skin diseases are the most common disease in resource limited countries. We described epidemiology and clinical feature of the unknown skin disease outbreak.

Methods: Unknown source of skin infection rumor was received from the Jimma town on 12 October 2019. From 82 cases that were line listed from October 20 - December 2, 2019, 30 cases were investigated thoroughly. This study was carried out from November 20 – December 2nd, 2019 at private and public hospitals including health centers found at Jimma town. Results were displayed using texts, pictures, tables and graphs.

Result. From total 82 cases line listed age ranges from 3 month to 70 years with the median age 21 years and Males account 52.4 %. The lesion affected all age groups with increased number of cases seen in age group 25_44 followed by age group 5_14 which accounts 61.0% and 23.2% respectively. Most of the lesions are circular with symmetric shape, color and regular border, in average measured to be from 5 – 15 mm in diameter. The lesions appear similar areas of the body predominantly on the face and extremities, even though some cases were seen on the flank and shoulder. All patients had stable vital sign.

Conclusion: The clinical presentation with the stages observed in different cases and different antibiotics were not haltering or treating the lesion, suggested viral infection similar to Ecthyma contagiousum and Cowpox illnesses. But identification of the causative agent and other further study should be done to identify the risk factors of the outbreak.

Key word: unknown skin disease, Outbreak, Jimma

Chapter Seven – Epidemiological Research Work

Performance of Laboratory Professionals working on Malaria Microscopy at government and private Health facilities of malaria elimination districts, North Shewa Zone, Amhara Region, Ethiopia 2020

Abstract

Back ground: Malaria elimination and treatment relies on confirmation of all suspected cases with quality-assured microscopy method. Confirmation requires the use of a test that demonstrates evidence of the malaria parasite in the blood of the patient and needs well qualified and competent professionals, hence, this study was assessed the proficiency of laboratory personnel working on Malaria diagnosis at health facilities.

Method: A cross-sectional descriptive study design was conducted from November 15 – 25, 2020 malaria elimination districts of North Shewa Zone, Amhara Region. A total of 18 health facilities at 9 districts (3 districts from each stratum) were selected based on number of populations at risk. In each selected districts one government health facility (health center), one private health facility which were found in the district town were included in the study. Structured questionnaires used for personal interview, and 10 Giemsa stained malaria slide panels was administered to each study participant for the performance assessment on malaria microscopy.
Result: Total of 38 laboratory professionals participated in the study, who were available in the facility during data collection with the mean age 29.7 (SD 6.2) years. A total 228 malaria positive & 76 negative slides administered to 38 participants, 57 slides (25%) reported as falsely negative & 6 (7.9%) reported falsely positive. The overall agreement on detection of malaria parasite between the study subjects and expert reader was 79.28 % (Kappa = 0.57) which is 'moderate agreement'. The overall agreement on species identification of malaria between the study subjects and expert reader was 54.6% (Kappa = 0.22) which is' Fair agreement. The agreement on malaria detection at private health facilities was lower than government health facilities, which is 73.6% (Kappa = 0.42 'Fair agreement') and 81.03% (kappa= 0.59 'Moderate agreement') respectively. Regarding agreement on species identification in private health facilities was lower than government health facilities, which is 58.19% (Kappa = 0.27 'Fair agreement') and 43.06 % (kappa= 0.06 'Slight agreement') respectively. Among the total distributed 76 slides for quantification, only 25 (32.9%) of all participants used the standard quantification system and agree with expert reading range.

Conclusion and Recommendation: The performance of participants was good in detection of malaria using microscopy their agreement with expert microscopists but identification of different malaria species and the quantification of parasite densities were very low. Participants from government health centers were found to have relatively high performances in detection and identification of malaria parasites than private health facilities. Therefore, all stakeholders working on malaria elimination in collaboration with regional health bureaus should conduct regular onsite mentorship, supportive supervision, and provide comprehensive in-service training for both government and private health facilities.

Key words: Malaria, Elimination, Microscopy,

Introduction

According to WHO, malaria elimination relies principally on a high-quality, comprehensive system for case-based surveillance and outreach, with systematic documentation of the absence of indigenous malaria over time and all cases of suspected malaria are tested and confirmed with quality-assured methods like RDTs or microscopy [1]. Not only malaria elimination treatment of malaria also need confirmation of the diagnosis of malaria in all suspected cases before administration of treatment [2]. Confirmation requires the use of a test that demonstrates evidence of the malaria parasite in the blood of the patient (e.g. actual parasite or parasite protein), hence the term "parasite-based" or "parasitological" diagnosis [3]. There are different malaria conformation; microscopic examination of blood slides and the use of rapid diagnostic tests (RDTs) are most commonly used methods. Conventional light microscopy is the established method for the laboratory confirmation of malaria. The careful examination by an expert Microscopists of a well prepared and well stained blood film remains currently the "gold standard" for detecting and identifying malaria parasites [4]. Even though the technology of microscopy is simple and straightforward, making and interpreting malaria smears requires adequate training and experience.[5]

The use of antigen detecting rapid diagnostic tests (RDTs) forms a vital part of this strategy, forming the backbone of expansion of access to malaria diagnosis as they provide parasite-based diagnosis in areas where good quality microscopy cannot be maintained. The number of RDTs available, and the scale of their use, has rapidly increased over the past few years [6]. Several types of antigen may be detected by commercialized RDTs. HRP2 is produced only by P. falciparum, while aldolase is produced by all four species and can therefore be used to identify all human malaria parasites. Parasite lactate dehydrogenase (pLDH) is also common to all four species and can be detected by antibody-binding antigen epitopes that are common to all species (pLDH-pan) or specific to the pLDH of a particular species [7].

The National Malaria Strategic Plan aims for robust coverage with high quality diagnostic and treatment services universally, especially at public sector health facilities in rural areas in order to diagnose 100 percent of suspected malaria cases within 24 hours of fever, and treat all confirmed cases according to the national guidelines. One of the major activities to enhance the capacity of malaria diagnosis was providing standardized training of trainers for university instructors as well as regional

laboratory professionals to train laboratory personnel working on malaria microcopy diagnosis in different levels of health facilities, which will improve the knowledge and competency of the microscopists and laboratory personnel as well as plays an important role in malaria elimination programs [8].

Rationale of the study

The main goals of the current malaria National Strategic Plan (NSP) 2014-2020 Ethiopia [8] are: 1) to achieve near zero malaria deaths (no more than 1 confirmed malaria death per 100,000 population at risk) in Ethiopia by 2020; 2) to reduce malaria cases by 75% from baseline of 2013 by 2020; 3) to eliminate malaria in selected low transmission areas by 2020. Successful malaria elimination requires rapid and accurate tracking of cases by competent professionals. Improved quality control is required for rapid diagnostic tests (RDTs) and microscopy, to ensure confidence in diagnosis for case management [9]. To achieve these goals, the country must strengthen the quality of confirmatory laboratory diagnosis of malaria. Improved quality in laboratory diagnosis of malaria mainly depend on the performance of the laboratory personnel working on malaria diagnosis.

However, since the start of malaria elimination program in the country, there is no study conducted in Amhara region, North Shewa Zone malaria elimination districts to assess the performance of laboratory professionals' workers working on malaria diagnosis. Therefore, this study will help to identify performance of laboratory professionals working on malaria microscopy diagnosis in different levels of health facility, which in turn assists to execute proper intervention plan and strategies for malaria elimination program.

Literature review

In South Africa retrospective study conducted from January 2000 to August 2002 showed that the mean percentage incorrect result rate was 13.8% (95% CI 11.3-16.9%), which is alarmingly high, with about 1 in 7 blood films being incorrectly interpreted. Most participants with incorrect blood film interpretations had acceptable Giemsa staining quality, indicating that there was less of a problem with staining technique than with blood film interpretation [10].

A cross sectional study conducted in Democratic Republic of the Congo between August and

September 2010 showed that from 174 participant laboratories; 59.2% of participants scored correct results and another 16.1% reported minor errors, all but one was errors in parasite density (reporting "+++" instead of the expected "++++" score. By contrast, for parasite-negative sample, 24 (16.7%) of participants reported the presence of Plasmodium parasites, mostly *P. falciparum* [11]

A cross sectional study was conducted from August to September, 2017 on Evaluation of malaria microscopy diagnostic performance at private health facilities showed that the measures of malaria diagnostic accuracy were high, i.e. the sensitivity and specificity of malaria parasite detection by microscopy in the health facilities were 84.3% (95% CI 77–90) and 90.8% (95% CI 83.3–95.7), respectively. There was substantial agreement in parasite detection with (Kappa value: 0.74 (95% 0.65–0.83). However, only 17.8% (24 of 134) of blood slides were interpreted correctly at the health facilities in terms of parasite density counts.[12]

A cross sectional study conducted in Hawassa Town, Ethiopia showed that from a total of 72 Participants, 14 (19.4%) of the participants correctly reported all the ten distributed slides, whereas 58(80.6%) missed at least one slide. Overall, the sensitivity and specificity of participants in detection of malaria parasites were 82% and 96.5% respectively. The overall agreement between participants and reference readers on detection of malaria parasite was 88% (Kappa = 0.76) while on identification of malaria species was 74.3% (kappa = 0.63). Lower agreement on detection and identification of slides with low parasitic density and mixed infection were observed. Agreement was relatively lower for government health centers (69%; kappa = 0.56). None of the participants reported parasitic load per micro liter method [13].

The study conducted In Ethiopia three regions Tigray, Oromia, SNNPR Dire Dawa and Harari of malaria elimination districts showed that, the participants achieved “good” grade [Agreement(A): 84.6%, Kappa(K): 0.6] on parasite detection and “Poor” agreement (A: 43.8%; K: 0.11) on species Identification. The agreement is lower in PCs (Detection A: 77.8%; Identification A: 37.2%), followed by HCs (Detection A: 84.14%; Identification A: 41.64%) and hospitals (Detection A: 86.7%; Identification A: 48.1%). No or slight agreement seen on differentiation of P. falciparum from other species (A: 28.41%; K:0.29). Above 95% of participants, (201/237), did not count or used only plus system of parasite count which is unacceptable per the current WHO guideline[14].

Significance of the study

The finding of the study will generate evidence to guide malaria detection capacity (different stages and species of malaria) of laboratory professional working in health facilities. The evidence helps to guide formulation of training materials, development of EQA strategies for malaria smear microscopy.

Objectives

General objective

- To assess the proficiency of laboratory professional working on malaria microscopy at malaria elimination districts of North Shewa Zone, Amhara region.

Specific objectives

- To assess the performance of laboratory personnel on parasite detection working at government and privet health facility.
- To assess the performance of laboratory personnel on species identification working at government and privet health facility.
- To assess the performance of laboratory personnel on parasite quantification working at government and privet health facility.

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Materials and methods

Study area & period

This study was conducted from November 15 – 25, 2020 in Amhara region, North Shewa Zone selected districts targeted for malaria elimination in Ethiopia. According to the current malaria National Strategic Plan of Ethiopia (NSP: 2017–2020), the stratified the country's malaria situation on the basis of transmission intensity (Annual parasite incidence; API) per 1000 population at risk [8]. Amhara Region North Shewa Zone is one of the selected areas for malaria elimination program and the zone have a total of 24 districts with different malaria transmission intensity. From the total 24 districts, 8 districts malaria free, 10 districts for low malaria transmission intensity and 6 moderate malaria transmission intensity and no high malaria transmission intensity in the zone.

Study design

A cross-sectional descriptive study design was used in the selected districts among government and private health facilities.

Study subjects

Laboratory personnel working on Malaria smear microscopy in government and privet health facilities of the selected districts during the study period was included.

Sample procedure

From all North Shewa Zone districts for malaria elimination, 9 districts (3 districts from each stratum (free, low and moderate)) were selected based on number of populations at risk. In each selected districts one government health facility (health center) and one private health facility found in the district town was included in the study. A total of 15 (9 government laboratories, 6 private laboratories).

Sample size

All laboratory personnel working on Malaria microscopy at each selected health facilities. A total of 38 laboratory personnel were included in the study, which were volunteer to participate in the study and available during data collection.

Study Variables

Dependent Variables

- Ability to detect plasmodium parasite
- Ability to identify plasmodium species
- Ability to Quantify plasmodium parasite

Independent variables

- Facility type
- Educational status (Level)
- Training

Exclusion criteria:

Professionals not available during data collection due to annual leave, sickness and maternal cases, and those who were not willing to give informed consent was excluded from the study.

Data collection process

Standardized pre-validated slide panels from National malaria slide bank of Ethiopian Public Health Institute [15] were used for the evaluation of proficiency of the study participants. Each blood film had both thick and thin smears on the same slide, the thin blood film fixed with absolute methanol and stained with 3% Giemsa stain working solution.

Panel slide distribution for laboratory personnel working on malaria microscopy

Based on WHO recommendation, 10 slides used for assessment of presence/absence of parasites, species, and, and quantification of parasite density. Quantification results of participants which were between 25% + the mean calculated from result of expert readers was considered as correct quantification result. A total of 100 minutes (10 minutes per slides) were allocated for those 10 BF slides [16]. Based on the number of staffs and workload, a total of one day were given for each laboratory to examine those slides and then the data collector retrieved the slides after each participant completed the tests. (Table 26)

Table 25: Slides used for assessment of presence/absence of parasites and species identification

Serial No	**Composition of Gimsa stained blood film slides**	Number of slides
1	*P.falciparum* of low densities	**01**
2	*P.falciparum* of high densities	**01**
3	*P.vivax* of low densities	**01**
4	*P.vivax* of high densities	**01**
5	Mixed (*P f+ Pv*) of low densities	**01**
6	Mixed (*P f+ Pv*) of high densities	**01**
7	Negative BF Slides	**02**
8	P. falciparum with a parasite density of 1891 P/µL (with the range of 1419-2363 parasites/µL)	**01**
9	*P. falciparum* with a parasite density of 50,659 P/µL (with the range of 37990-63323 parasites/µL)	**01**
	Total number of slides	**10**

Questionnaire

A structured and standardized questionnaire was distributed which was used to address information about participating facilities and study participants. The data was collected by principal investigator and one trained laboratory personnel who had good experience on Malaria Microscopy diagnosis.

Data Management and Quality Assurance

The questionnaires were prepared in clear and understandable way, training was given for data collector and pre- testing of each questionnaire type was done. The clarity, understandability and flow of each question were assessed properly. Intensive supervision was done during data collection. The quality of the blood film slides was properly checked against WHO standard before provided to malaria microscopists for reading and the results was critically seen for completeness.

Statistical analysis

Data was entered and analyzed using software Microsoft Excel. Level of performance in detections, species identification and quantification of malaria parasites was compared with independent

variables. Sensitivity, specificity, percent agreement, and kappa score were calculated to assess laboratory professionals' performance in detecting and identification of Plasmodium species using light microscopy. Based on WHO recommendations, participants were classified as: "In training"- when the agreement with the reference reader in detection of malaria parasite was less than 70%; "Competent"- when the agreement was greater than or equal to 70% but less than 80; "Reference"- when the agreement was greater than or equal to 80% but less 90%; and "Expert" -when the agreement was greater than or equal to 90% [16].

Kappa Value was calculated to see the strength of an agreement. Based on the calculation the strength was classified as: < 0.20 Slight agreement, 0.21– 0.40 Fair agreement, 0.41–0.60 Moderate agreement, 0.61–0.80 Substantial agreement, 0.81–0.99 Almost perfect agreement [17].

Ethical Consideration

Official permission letters were written by Ethiopian Public Health Institute and the Amhara Public Health Institute Dessie branch to North Shewa Zone health office. Further, written consent was obtained from all study participants. Unique study identifier number was used in the entire process and the names or any identifier of study participants and Health facilities were not used.

Result

Total of 38 laboratory professionals participated in the study, who were available in the facility during data collection with the mean age 29.7 (SD 6.2) years and 30 (78.9%) were males. Most of the

Participants were in the age group of 20–30 years. Educational status of study participants were 27(71%) diploma holders and 11 (29%) were bachelor degree holders. Working experience of study participants in the laboratory were 6(15.8%) less than 2 years, 17 (44.7%) from 2-5 years and 15(39.5%) were greater than 5 years working experience. From the total study participants who involved in an external quality assurance (EQA) program accounted for 25(65.8%). (Table 27)

Table 26: Socio demographic characteristics of laboratory personnel at malaria elimination districts of North Shewa zone Amhara region, Ethiopia, 2020

Characteristics	Category	Total (n= 38)	Percent
Age	20-30	22	57.9
	31-40	12	31.6
	>40	4	10.5
Sex	Male	30	78.9
	Female	8	21.1
Educational level	Diploma	27	71.1
	Bachelor Degree	11	28.9
Place of work	Government	25	65.8
	Private	13	34.2
In-service training	Yes	13	34.2
	No	25	65.8
Frequency of training	Once	11	84.6
	More than one	2	15.4
Participation in External Quality Assessment programs	Yes	25	65.8
	No	13	34.2
Work experience	>2 Year	7	18.4
	2-5 Years	15	39.5
	> 5 years	16	42.1

Performance of laboratory personnel in malaria parasite detection and Species identification

In this study the overall performance of study participants in detection of malaria parasites revealed that, from the total 228 malaria positive & 76 negative slides administered to 38 participants, 57 slides (25%) reported as falsely negative & 6 (7.9%) reported falsely positive. (Table 28)

Overall, the sensitivity and specificity of study participants in detection of malaria parasites were 75.0 % and 92.1%, respectively. The overall agreement on detection of malaria parasite between the study subjects and expert reader was 79.28 % (Kappa = 0.57) which is 'moderate agreement'. (Table 28)

Table 27: Over all sensitivity, specificity and agreement of participants in detecting of malaria parasite based on the total number of observations at malaria elimination districts of North Shewa zone Amhara region, Ethiopia, 2020

Participant reading		Reference reading			Sensitivity	Specificity	Agreement	kappa
		Positive	Negative	total				
Parasite detection	Positive	171	6	177	75.00	92.11	79.28	0.55
	Negative	57	70	127				
	Total	228	76	304				

The performance of participants on species identification showed that 63.1% of slides with P. *falciparum*, 46.1% of slides with P.*vivax*, and 17.1 % of slides with mixed infections were identified correctly.

Overall, the sensitivity and specificity of participants in species identification of malaria parasites were 42.1% and 92.1%, respectively. The overall agreement on species identification of malaria between the study subjects and expert reader was 54.6% (Kappa = 0.22) which is' Fair agreement. (Table 28)

Table 28: Over all sensitivity, specificity and agreement of participants in Species identification of malaria parasite based on *the total number of observations at malaria elimination districts of North Shewa zone Amhara region, Ethiopia, 2020*

Participant reading		Reference reading			Sensitivity	Specificity	Agreement	kappa
		Expected Correct Species	Negative	total				
Species Identification	Reported Species	96	6	102	42.11	92.11	54.61	0.22
	Not correctly reported Species	132	70	202				
	Total	228	76	304				

Overall performance of laboratory personnel on malaria parasite detection and quantification against health facility type, work experience and in-service training

The agreement on malaria detection at private health facilities was lower than government health facilities, which is 73.6% (Kappa = 0.42 'Fair agreement') and 81.03% (kappa= 0.59 'Moderate agreement') respectively. Regarding agreement on species identification in private health facilities was lower than government health facilities, which is 58.19% (Kappa = 0.27 'Fair agreement') and 43.06 % (kappa= 0.06 'Slight agreement') respectively. (Table 30)

Regarding working experience, participants who have less than two years' experience had low malaria detection (A= 71.43 K= 0.38) and species identification (A= 42.86% , k= 0.06) agreement comparing to those participants have 2-5 years' experience (A= 80.83 K= 0.58 for detection and A= 60.00, K= 0.28 for species identification) and greater than 5 years' experience (A= 81.25 K= 0.59 for detection, and A= 54.69 K= 0.24 for specification); but there was no major difference on detection and specie identification on those participants who had experience 2-5 years and greater than 5 years. (Table 30)

Additionally, those participants took in-service training had higher malaria detection agreement 84.6% (Kappa= 0.66 substantial agreement) than those did not taken in-service training agreement 76.5% (Kappa= 0.49 moderate agreement). Similarly, on species identification also those participants took in-service training had higher agreement than those did not taken in-service training which is 59.6% (Kappa = 0.3 'Fair agreement') and 52.0 % (kappa= 0.18'Slight agreement') respectively. (Table 30)

Regarding parasite counting system, none of study part pants used standard malaria parasite quantification system for their routine test for the patient; rather they used parasite count in 1+, 2+, 3+ screening system of quantification. For this study among the total distributed 76 slides, only 25 (32.9%) of all participants used the standard quantification system and agree with expert reading range.

Table 29: Overall sensitivity, specificity and agreement of participants in detecting malaria parasite and species identification against different demographic characteristics at North Shewa zone, Amhara region, 2020

Variable	**Category**	**Participant reading**	**Reference reading**			**Agreement b/n participant & expert**	
			Parasite detection	**Species Identification**	**Negative**	**Parasite detection**	**Species Identification**
Type of Health facility	Government	Positive	132	79	2	A= 81.03, K= 0.59	A=58.19 k=0.27
		Negative	42	95	56		
	Private	Positive	39	17	4	A= 73.61, K= 0.40	A= 43.06, K= 0.06
		Negative	15	37	14		
Level of education	Diploma	Positive	120	67	5	A= 78.24 K= 0.53	A= 53.7 K= 0.21
		Negative	42	95	49		
	Degree	Positive	51	29	1	A= 81.82 K= 0.60	A= 56.82 K= 0.25
		Negative	15	37	21		
Work experience	<2 yrs	Positive	29	13	3	A= 71.43 K= 0.38	A= 42.86 K= 0.06
		Negative	13	29	11		
	2-5 yrs	Positive	69	44	2	A= 80.83 K= 0.58	A= 60.00 K= 0.28
		Negative	21	46	28		
	> 5yrs	Positive	73	39	1	A= 81.25 K= 0.59	A= 54.69 K= 0.24
		Negative	23	57	31		
In-service Training	Yes	Positive	62	36	0	A= 84.6 k= 0.66	A= 59.62 k= 0.30
		Negative	16	42	26		
	No	Positive	109	60	6	A= 76.5 k=0.49	A= 52.0 k =0.18
		Negative	41	90	44		

Discussion

In this study, the overall sensitivity and specificity of study participants on malaria detection was 80.2% and 92.1%, respectively and which was lower than study conducted in Southern part of Ethiopia, Hawassa town (Sensitivity= 82% , Specificity 92.6%) and Northern west part of Ethiopia, Bahirdar town (Sensitivity 83% , Specificity 97%) [18] [19]. The reason for lower sensitivity in detection of malaria parasites shows that, there were reporting of high false negative results, which may suggest high misdiagnosis of true infections and also the reason for high specificity (low false positive rate) is probably related to the small number of true negative samples in the study. The possible reasons for this variation may be due to lack of regular in-service training and exposure on malaria diagnosis due to less malaria endemicity in the area.

The agreement between expert readers and participants in the detection of malaria parasites and agreement on malaria species identification which is 79.28 % (Kappa = 0.55) which is 'moderate agreement' and 54.6% (Kappa = 0.22) which is 'Fair agreement 'respectively, which is relatively lower when compared to findings of similar studies conducted in Ethiopia where an agreement was 88% (kappa = 0.76) and 74.3% (kappa = 0.63) study conducted Hawassa town [18] and 88.5% (Kappa = 0.78) and 72% (kappa = 0.47) study conducted in Bahirdar town [19]. The agreement in malaria detection and species identification of this study was relatively higher than the study conducted at Defense health facilities in Addis Ababa and its surrounding areas, Ethiopia which was 71.4% (kappa = 0.4) and 51.1% (kappa=0.04) respectively [20].

Failure rate in identification of slides with P. falciparum and with P. vivax in this study was 28 (36.85%) and 51 (67.1%) respectively. The number of participants who failed to correctly report P. *vivax* was higher than P. *falciparum* , which is higher than the study conducted in malaria elimination districts of Ethiopia and Bahirdar [21][19]. Failure to identify positive malaria slides (false Negative) can cause in delayed treatment and development of serious complications or espousing to unnecessary treatment. In the other hand, the false positivity rate (negative slides reported as positive among all positive reports) was 2.6% which was consistent to the study conducted in malaria elimination districts of Ethiopia [14] but lower than the finding of a study conducted in Hawassa town , Ethiopia where the rate was 6.9% [18], and 19% report in Democratic Republic of Congo [11], but higher than the finding of a study conducted in Ethiopia where the rate was 0.8% [22]. False positive results could

cause to unnecessary treatment with anti-malarial drug or a delayed diagnosis of the true cause of illness which misleading the physicians from other causes of fever and disease.

In this study about 20 (26.3%) of the participants used + + system for quantification of parasite density, which is less accurate and non-recommended method per the current WHO guideline. Those who used parasite density estimation by parasite per microliter against white blood cells on thick blood film and agree with the expert reading range was 25 (32.9%). Those use unrecompensed method for quantification of parasite density in this study lower than the study conducted in Ethiopia [22] and in Democratic Republic of Congo where 68.6% [11]. Using +++ parasite quantification method may be due to lack of awareness on the importance of the method on treatment and follow up of the patient or may be due to commitment to follow the standard operating procedures.

Study participants who were taken refresher malaria training had higher performance on malaria detection and spices identification comparing to those participants not taken in service trainings. Standardized refresher training courses in the field of malaria microscopy can have a considerable impact on the knowledge and competency of the microscopists and laboratory personnel as well as plays an important role in malaria elimination programs. Finding from study in Uganda, refresher training programmed could significantly improve the knowledge of health facilities staff in the field of practical malaria microscopy [23].

It is also observed in this study that low sensitivity, specificity and degree of agreement on malaria parasite detection and species identification in the private health facilities than the government facilities. This finding was also consistent with other similar study conducted in Ethiopia six regions of malaria elimination districts [21]. This might be due to limited exposure to malaria diagnosis techniques, poor optical condition of microscopes, and lack of availability of in-service trainings.

Limitations of the study

This study brought evidence on performance of malaria microscopists in selected malaria elimination districts of North Shewa zone of Amhara region, however, could not include all malaria microscopists in the study sites; only those who were available during the time of data collection and only volunteers to participate in the study were evaluated. And also, performance of laboratory professionals' in smearing preparation, preparation of working solution, staining of blood films, and drying conditions for malaria diagnosis were not done.

Conclusion and Recommendations

Even though the performance of participants was good in detection of malaria using microscopy their agreement with expert microscopists but identification of different malaria species and the quantification of parasite densities were very low. Participants from government health centers were found to have relatively high performances in detection and identification of malaria parasites than private health facilities. Those who had taken in service training have high performances in detection and identification of malaria parasites than those who did not taken in service trainings. Therefore, all stakeholders working on malaria elimination in collaboration with regional health bureaus should conduct regular onsite mentorship, supportive supervision, and provide comprehensive in-service training for both government and private health facilities. This study was not covering all malaria elimination districts of North Shewa zone. So, we recommend future studies to be conducted to cover the districts found in the Zone.

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Chapter Eight – Other Additional output report

Malaria Rapid assessment feedback Report - Tigray region January 2020

Background

According to the latest World malaria report, released in December 2019, there were 228 million cases of malaria in 2018 compared to 231 million cases in 2017. The estimated number of malaria deaths was 405 000 in 2018, compared with 416 000 deaths in 2017. The WHO African Region continues to carry a disproportionately high share of the global malaria burden. In 2018, the region was home to 93% of malaria cases and 94% of malaria deaths [1].

In Ethiopia, malaria is highly seasonal in many communities, but may have nearly constant transmission in some other areas; at the district level, malaria outpatient caseloads may vary several-fold from year to year in an "unstable" epidemic-prone transmission pattern [2][3].

Tigray region was one the region with high prevalence of malaria in different Woredas [4][5] According to the national Public health emergency management malaria monitoring dashboard there was malaria outbreak in 2019 and different response measures were taken at Federal and regional level. This assessment was part of the rapid response activities.

This report covers two woredas (Tanqua Abergele and Saherti samre) selected by the regional Health bureau Public Health Emergency Management center and malaria team with the assessment team. The woredas were selected based on their malaria prevalence and proximity to the capital city of the region.

Objective of the assessment

General Objective

- To assess and provide feedback on malaria Surveillance, case management, vector control programs, laboratory diagnosis and logistics activities of Tigray region January 2020

Specific Objectives

- To assess current malaria epidemic situations of Tigray region,
- To identify on main challenges/gaps encountered in malaria Surveillance, case management, vector control programs laboratory diagnosis and logistics at regional and Woreda level.
- To provide feedbacks on identified gaps and challenges.

Methods and Materials

Assessment area and period

The assessment was done at Tigray regional health bureau PHEM department, Tanqua Abergele and Saherti samre woreda. In each woreda; woreda health office, one Primary Hospital, one Health Center and one Health post was the assessed areas. Tanquea Abergelle is one of the woreda found in the central zone of Tigray region. It is bounded on south and west by Amhara Region, on north Kola Temben woreda, on east Deguea Temben woreda and in the southeast Southeastern zone of the region. Saherti samre in also one of the woreda in the Southestern zone of the Tigray region and burderd on the south by the Amhara region, on the west and north by the centeral Zone, on the southeast by Southern zone of the region. The assessment was done from December 25, 2019 - January 5, 2020.

Assessment team and coordination

Assessment team was established from different organizations including EPHI, Federal Ministry of Health, Ethiopian Pharmaceuticals supply Agency and supporting partners experts, Filed epidemiology with deferent types of expertise (Field epidemiologist(resident), Malaria expert, logistics officer and risk communication officer). After arrival of the team at Mekele town meeting was done with the regional Health bureau PHEM department and malaria team. During the assessment woredas were selected and on representative was given from the bureau to guide the team and facilitate the travel to woredas.

Data collection

The information was collected from Regional health bureau PHEM department and Malaria team, Woreda Health office, Primary hospital, Health center and Health post. The data was collected by checklist, face to face interviewing and reviewing available records.

Dissemination of the findings

The finding will be submitted to Tigray regional Health bureau PHEM department and Ethiopian public health institute.

Assessment findings and Feedbacks

I. Regional level

1. Findings and Feedback on Surveillance, case management and vector control

Comparison of raw data (week of 2018 1nd 2019) at regional level was conducted similarly data zonal and woreda level was conducted, thus woredas and zones with case increment were identified and actions taken accordingly by mobilizing teams to different areas. Even though this was encouraging using threshold data is preferred to simple raw data.

The team at regional level were composed of from EOC, communication, EPSA Hubs, malaria, PHEM and these teams were in the field for 20 days and the supervision was repeated for the 2nd and 3rd time to curtail the problem in the identified areas.

Daily follow ups of the supervisions were made to the supervision team and situation report was made to the national EOC and malaria program.

EOC was activated and RRT/EOC met regularly on daily basis at regional level but was not sensitive at woreda level as they are engaged in different activities like health insurance.

There is an established task force at regional level and the task force is for any public health emergency but there was no meeting conveyed for malaria response.

- Generally preventive actions made during the response were
    - field visit and larval source management
    - communicating woredas with case load and followed cluster and HF level case trend
    - completely avoided clinical diagnosis
    - report the progress to MOH and EOC
    - good LLIN coverage (100%) with about 64 % use and most build ups in areas where the age of LLIN is older, though still less than 3 years.

The cause of the epidemic was attached to the reduction of IRS due to chemical shortage; leading to emergency spray rather than regular spray.

Challenges /Gaps

- Vector control – absence of abate chemical, shortage of IRS chemicals and Some of LLIN (older) are not considered as live by the community.
- Drug interruption (beside shortage this has an implication on use when refilled since HWs considering its absence in their memory)
- community participation though the mobilization was so strong (malaria week for 8 weeks)
- lack of easy data management tool for epidemic visibility.
- lack of information and material exchange/hand over among HWS especially when they live the area.

2. **Feedback on emergency risk Communication**

Strength

- Messages haven disseminated through TV, Radio and face book pages.
- There is one person assigned to coordinate the risk communication activities in the EOC and in general outside the EOC. The health communication team is structured under health promotion and health extension department in the regional health bureau.
- Health communication materials for malaria were developed based on the consultation of the malaria and health communication team.
- There is a risk communication plan in the annual health communication plan.

Challenges

- Partners and media houses were mapped but not involved in this outbreak response.
- There is SBCCTWG but they were not involved in malaria outbreak response and Religious leaders were not also involved.
- The risk communication response on this malaria outbreak was not being done following the Ethiopian emergency public health emergency guide and materials were not prepositioned based on the 4 phases of emergency.
- The region has not trained any health education professionals on risk communication and they don't have a roster of previously trained professionals.
- Malaria materials were reprinted during the outbreak but no messages were developed after the rapid assessment.

- There are few to none partners working on malaria

II. Woreda level

A. Tanqua Abergele Woreda

1. Findings and Feedback on Surveillance, case management and vector control

1.1 Tanqua Abergele Woreda Office

Agregate data use did not show the problem as theyare using the previous year data by doubling the number of cases to monitor trends; thus, they claimed case build up but not epidemics. There was no attempt of using lower facility data especially HPs to verify the occurrence of epidemics. On top of this the woreda has doubt on the diagnosis capacity of health centers for considering the generated data for epidemic consideration; even though this year malaria was considered to be different from the previous years due to unusual and elongated rain in the area.

Stakeholders were not involved in the response to the case build up (only municipality was involved though not perceived epidemic by the HWs)

There is an established RRT team in the woreda but there was no planned and coordinated action for malaria. Using RRF was identified as a challenge by the woreda and considering capacity building in the area will benefit wise use of antimalarial commodities.

The woreda didn't have a mechanism to know the stock status as antimalarials are not stored in the woreda; it is in the HCs.

1.2 Seyemti Ruwa Health Post

Cases were decreasing for the last three years though there is no evidence to show this Monitoring chart is not in use currently and the last year data (2011) is done by doubling the 2010 years data though the HP is older than five years. we visited the HP based on the HCs recommendation, but cases were not as per the expectation and the cluster have to document data by satellite HPs to identify the most contributing ones in their catchment.

The reason given for the reduction for the indicated years was the presence of IRS in the Kebele (2/4 Kushet). Besides LLLIN utilization was 60-70% and environmental management is practiced in the kebele.

Total malaria cases in the registry book were not disaggregated to malaria parasite species in the weekly report, which may lead us to the conclusion that clinical treatment is prevailing tough the HEW told us that it is confirmed cases using RDT.

Weekly report exists but on a piece of paper.

There is no Artemether Lumefantrine for the last two months and when requested the cluster HC they were told that it is not procured. This is the prevailing challenge for HEWs as the community requesting treatment and get disappointed when they are told the absence of drug by saying "what are you going to do here?" as 7-8 cases were seen per week and most were *P.falciparum.*

1.3 Agibe Health center

The HC have interrupted malaria case management in its satellite health posts due to shortage of AL which we have also confirmed in one of the HPs (Seyemtiruwa HP); to maximize the use of the available drugs by using a more accurate diagnostic method (microscopy) at the health center, There was death reported in the last two quarters

There was functional laboratory in the hospital staffed with two laboratory personnel and performing malaria microscopy using Gimsa stain blood film.

They only perform thick blood film not thick and thin blood film, which is recommended and standard procedure for malaria microscopy diagnosis using Gimas stain. This may challenge them on species identification and quantification of the parasite load.

There was a documented evidence for performing internal quality control weekly and when they prepare new reagent (Gimas stain). They also store ten randomly selected Negative and positive slides, which will be send to rechecking laboratories for External quality Assessment (EQA) purpose,but they never received feedback form the laboratory on their performance

Shortage of man power (there are two laboratory professionals working in the laboratory and one working at day shift and the other in the night shift) , because of his, they couldn't handle the work

load during the day time and we recommend the to rearrange the shifting time and manage the workload happening during day time.

1.4 Yechila Hospital

They perceived case increment, they didn't know where it occurred as surveillance is generally poor though the service given mostly around the woreda and to be improved, on top of this there is no attempt to know the cause.

The laboratory personnel working in the lab was amazingly expert in identifying malaria parasite and prepared his own giemsa from the stock solution; however, samples sent for quality assurance were not et feedback from the higher level. There was death reported in the last two quarters.

At the time of assessment there was functional laboratory in the hospital performing malaria microscopy using Gimsa stain blood film. The laboratory was well organized for malaria diagnosis, there was standard operating procedures (SOPs), job aids, sufficient reagents and supplies. They perform thick and thin smear according to SOPs. There was a documented evidence for performing internal quality control weekly and when they prepare new reagent (Gimas stain). They also store ten randomly selected Negative and positive slides, which will be send to rechecking laboratories for External quality Assessment (EQA) purpose, but they never received feedback form the laboratory on their performance.

The laboratory have a competent and confident laboratory personnel for malaria diagnosis and the Wored as well as the Region can use this person as a role model to share his experience to other laboratory professionals. Shortage of manpower (the hospital have only two laboratory professionals)

2. Feedback on emergency risk Communication

Strength

Health education given at health facility and at community (by HEWs, at kebele, religious places, market days and any gathering places).

Malaria week was celebrated and social mobilization done in all kebleles by communication for health

There is a fixed health education officer, he leads three programs are health education, health extension program and hygiene and sanitation. The HE officer works under health promotion and disease prevention core process

Have microphones and leaflets but they do not have mobile vans and cars for mobilization (but they haven't done any mobilization with this) and Work together with woreda public relation and Tigray relief society.

They have to identify key influencers in the community but it is not an exhaustive list(religious leaders, kebele leaders, elderly people, sembete and WDA)

The community comes to health facility within a maximum of two days if they show symptoms of malaria.

Challenges

- Most of the health education is given by health professionals; community members are not sufficiently involving in the response.
- Brochures were not developed by the woreda but dissemination of brochures from partners like communication for health was done.
- No rapid assessment was done by woreda, affected groups were not disaggregated, analyzed and no customized health education given.
- No health communication plan for this malaria out break and no risk communication plan in the yearly plan.
- The HE officer did not have risk communication training and he hasn't provided any risk communication training for both HEWs and volunteers on this out break or any other.
- Facility education is not being given on malaria and also the health professionals do not provide proper counseling about malaria during diagnosis and treatment.
- The HEWs are not visiting homes and mobilizing the community frequently as previous times.
- No communication strategy developed to reach hard to reach communities.
- The health education and community mobilization efforts are not persistent.
- The health office is not mobilizing other sectors for malaria control activities

Gaps identified in the community

- There are little knowledge gap/problem but there is problem on the bed net utilization.
- Giving priority to adult males rather than pregnant and children.
- There are communities beliefs such as bed net will make you hot if you sleep in it, helps multiply "tuhan", bed net won't work if washed, The bed net has passed its usable period and

it doesn't prevent from malaria, The anti malaria drug doesn't work (both the oral and injection), there are wrong diagnosis and test results, Previously malaria occurs mostly during September but now it occurs almost all the time, the outbreak is high because there is no IRS in urban areas.

- Inadequate supply and Low utilization of bed nets. Using bed nets for other purposes if torn/sometimes even if not torn.
- Not accepting when health professional diagnoses someone with symptoms like malaria with other disease and going to pharmacy and buying the drugs by themselves.
- Poor larva source management.
- Not finishing the malarial drugs given to them.

Communication channels

Main sources of Information of the community about malaria are TV, radio, health facility, in the community, on safety network, from health professional, on meetings, on gatherings.

- Channel preferences are government meetings, religious places, throuth community mobilization, TV, radio, on equb, on government-initiated structures (set aderejajet, wetat aderejajet...), on safty net, on sanitation campaigns, WDA meetings, on community representative meetings, on schools.

Agreed Plan for Improvement in the upcoming quarter

B. Saherti samre Woreda

1. Findings and Feedback on Surveillance, case management and vector control

1.1 Saherti samre Woreda Office

The woreda was very organized and surveillance data is in use including lower level disaggregated data and they were able to detect the first incident of epidemics using the monitoring chart and actions initiated before the epidemic affects many kebeles. As part of this monitoring five kebeles were identified as the major contributors(epidemic areas).

The epidemic response was highly coordinated, and it was planned as a result of the effort they have seen the reward by reversing the epidemic and the trend of the case showed a continuous reduction since week.

Every activity was documented including meetings. There a very good lesson from the woreda; they have been exchanging anti-malaria drugs with other woredas and neighboring region (Afar region). House to house malaria diagnosis and treatment is being given.

1.2 Keyih Amba Health Post

There was real epidemic from week 13-20 EC and monitoring chart is used correctly and realized its significance in detecting unusual situations (epidemics) though doubling of the previous year was used for the threshold as the HP new.

The reason given for the epidemic for the current year was the absence of IRS in the Kebele and LLLIN utilization was low since the net is getting older (on its third year) though environmental management is practiced it couldn't bring the desired change.

The HP doesn't face drug stock out but the current stock available was low (only one box of RDT, AL, CQ) and one strip of PQ (even insufficient for the treatment of one *P. vivax* case)

1.3 Finarwa Health center

There was an epidemic which was perceived by health workers, the community and stakeholders and the number of cases were beyond the capacity of the HC. However, surveillance data was not compiled and analyzed for action, trend analysis is not evident; no monitoring chart. However, there was death reported in the last two quarters.

The reason given for the epidemic in the catchment area was the interruption of IRS in the Kebele and age of LLLIN and its associated low utilization and the water body developed for animals and the absence larval control in around the collected water body.

community mobilization activities contributed for the contentment of the epidemics, but it was too late.

1.4 Samre Primary Hospital Laboratory

In the Hospital there was functional laboratory in the hospital staffed with two laboratory personnel and performing malaria microscopy using Gimsa stain blood film.

They only perform thick blood film not thick and thin blood film, which is recommended and standard procedure for malaria microscopy diagnosis using Gimas stain. This may challenge them on species identification and quantification of the parasite load.

They used Medical registration number for slide labeling instead laboratory serial number and this making difficult to trace back the slides.

During assessment time, we identified skill gap on identification of malaria parasite species on previously labeled as positive slides

EQA slides collected and sent to rechecking laboratories but they never received feedback from the laboratory on their performance.

Shortage of manpower (the hospital have only two laboratory professionals) and Shortage of malaria microscopy supplies (Gimsa stain especially)

2. Feedback on emergency risk Communication

Strength

- There were weekly regular meetings, reporting template has been developed and report was being collected and reviewed. Professionals from woreda have been assigned to affected kebeles to follow activities.
- Community leaders and members have participated throughout the process.
- Assessment was done and Based on the gaps identified a plan has been developed and intensified health education and community mobilization has been done by health center staff, HEWs, kebele leaders, religious leaders, community volunteers...
- Any meetings in the government structure, WDA, schools, bus stations, market places, religious places, were used to disseminate messages.
- Messages have been published on the woreda news letter, used mobile audio vans and also disseminated leaflets.
- Facility malaria education and IPC during malaria treatment was strengthened.
- The kebele administration and health professionals are working together.

- There is an annual health education plan and risk communication activities are included.
- Hard to reach communities have been identified and addressed.

Challenges

- They are working with a temporary focal person and The HE focal works under health promotion and disease prevention core process.
- There is shortage of drugs and bed nets.

Gaps identified in the community

- The community has low awareness about bed net utilization, they think if it is a little torn and passed two years it doesn't prevent malaria.
- Some of the community members were not willing in participating on community mobilization.
- There are some members of the community that leave their kebles for grazing cattle and they are highly affected.
- The major misconception within the community is they think they will be fine within a day or two when they get sick.
- Based on the assessment bed net utilization was less than 50%, Health seeking behavior was not satisfactory but health education is being given to improve this issue.
- The community members believe outbreak is a result of mainly absence of indoor residual spray within the last two years. Even when there was spraying the chemical did not kill the mosquitoes and the kebele did not inform the community to get ready prior to the spraying.
- There are stagnant waters dug for the purpose of drinking water source for the cattle and it is becoming mosquito breeding site.

Communication Channels

- Main sources of Information of the community about malaria are health facility, in the community, WDA, religious places, on meetings, on gatherings.
- Channel preferences are government meetings, religious places, through community mobilization, on government initiated structures (set aderejajet, wetat aderejajet...), on safty net, on sanitation campaigns, WDA meetings, on community representative meetings, on schools, market places.

Recommendations

- We recommended the RHB to work closely with the MOH to seek solutions ASAP to provide drugs to the HPs to benefit the community in their vicinity; and the RHB and the MOH have solve the shortage of antimalaria commodities.
- Currently antimalarials especially drugs are requested by emergency order and the RRF system should be in place.
- woredas should have a regular platform to know the stock status of the HCs and contribute in accountability.
- the use of primaquine in the HFs is encouraging both for transmission control and radical cure but interruption of the drug should be critically monitored and managed.
- The collected water for animals in the Finarwa HC should be given attention and larval control should be initiated to prevent transmission of malaria in the area.
- The regional health bureau should give new attention to the unidentified febrile disease problem reported by the community and the required support should be requested from the MOH and partners.
- EQA feedback should not be delayed or interrupted for slides sent to rechecking hospitals because of par time payment; should be either included in the job description or funded for its realization.
- The public health emergency communication guide should be used to effectively respond to any out breaks at all levels.
- Rapid assessment should be conducted to effectively organize the risk communication efforts (in tankua abergele) and also risk communication activities should be modified based on the rapid assessment findings in case of regional health bureau.
- Real reasons behind low bed net utilizations and low communities desire to practice malaria prevention activities should be investigated and communicated accordingly.
- Health education at community and Facility level and community mobilization should be strengthened especially in Tanqua Abergele.
- Involve media houses, partners and stakeholders, SBCCTWG and religious leaders in the outbreak management.

- There should be emergency risk communication plan developed for this specific out break and the plan should be budgeted.
- Health communication responders should be trained in emergency risk communication at all levels and roster of trainees should be kept.
- Community believes such us bed net will make you hot when you sleep in it, bed net won't work if washed, helps multiply "tuhan, The bed net has passed its usable period, The anti malaria drug doesn't work, there are wrong diagnosis and test results and more if present should be addressed.

Other issues rose during the assessment

- HEWs are not doing their work due to events like this outbreak
- Shortage of staff as compared to BPR due to lack of budget in saharti samre
- Shortage of inpatient rooms, Shortage of health professionals, no backup generator, constraction of additional rooms were being done but stoped due to budget shortage(finerwa hc)
- X-ray has been provided to the hospital but because the transformer in town doesn't support the power needed for the X-ray it is not functional. But also the community have sent money to buy a transformer but the transformer hasn't been brought yet (Yechila primary hospital).

Assessment team Members

1. Achamyeleh Mulugeta EPHI
2. Gashu Fenta MOH
3. Agegnehu Nadew EPSA
4. Mihreteab Getachew MOH

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Annexes

Annex 1: History taking checklist for skin lesion outbreak investigation in Jimma town

Name: _____ Sex (M/F): _____

Age:_____(years)____ (months)

History

1. Duration _____
2. Site of onset _____
3. Shape

   ☐ Circular ☐ Ellipse ☐ Irregular other_____
4. Color

   ☐ The same as skin ☐ hypo pigmented ☐ hyper pigmented other _____

   Details of spread

   _____

   _____

   _____
5. Itch Yes ☐ No ☐
6. Burning Yes ☐ No ☐
7. Pain _____

   _____

   _____
8. Condition of lesion Wet ☐ Dry ☐ Blister ☐
9. Progress

   If multiple site mention sites

   _____

If progress from one form to another mention the signs

_____

_____

_____

10. Systemic symptoms

_____

_____

11. Previous history of illness

_____

_____

_____

12. Previous history of medication

_____

_____

_____

Physical examination

1. Vital sign

   BP____ HR____ T_____

2. Symmetry

   ☐ Asymmetric Symmetr☐

3. Border

   ☐ Regular/Well-defined ☐ irregular

4. Diameter (mm)

   _____

   _____

5. Are any of the following signs of Inflammation present? (Check all that apply)

   Hot ☐ Redness ☐ Swelli☐ Ten☐

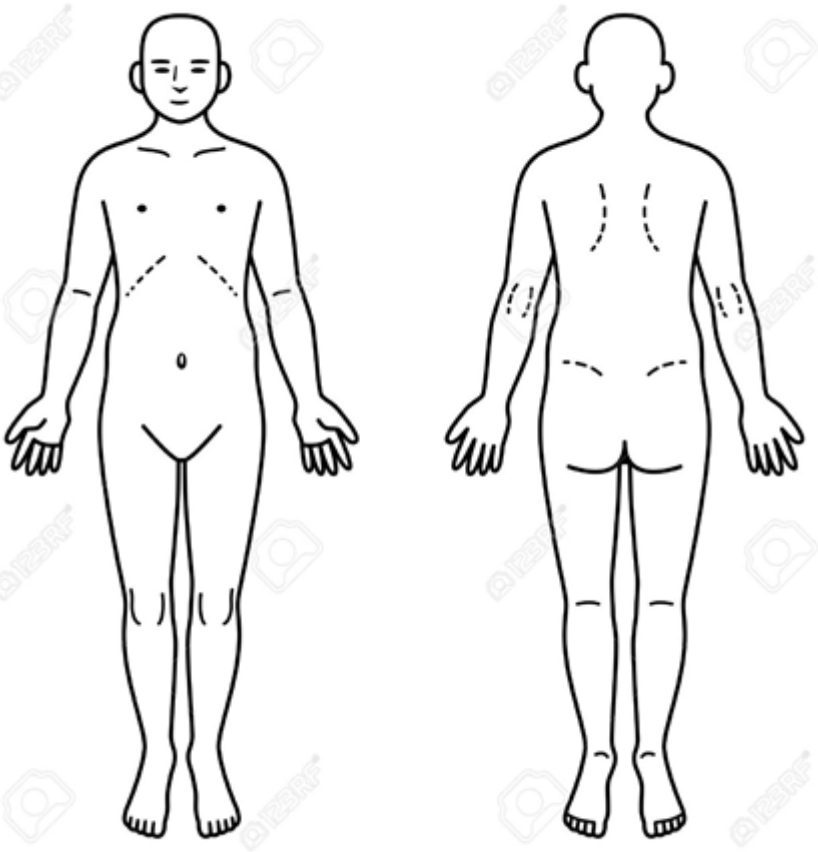
   Cresting ☐ Bleeding/ black ☐ Pus ☐ Colorless dischar☐

Laboratory Investigations

1. CBC ☐
2. FNAC ☐
3. Gram Stain ☐
4. Culture for bacterial identification ☐
5. PCR/ molecular testing ☐
6. Other test _____

Attach the laboratory investigations

Use the following picture for "location on body" question:



Annex 2: Checklist for investigation of skin lesion outbreak in Jimma town

S/No	Question	Coding Classification	Go To
1. Demographic Information			
1.1	Resident ID	_____	
1.2	Address	Kebele _____ Village _____	
1.3	Sex	1. Male 2. Female	
1.4	Age	_____ Year, _____ Month	
1.5	Marital status	1. Single 2. Married 3. Divorced	
1.6	Occupation	1. Student 2. Daily laborer 3. House wife 4. Merchant 5. Unemployed 6. Servant 7. Civil servant 8. Other (Specify) _____	
1.7	Level of education	1. Reading and writing 2. Primary school 3. Secondary school 4. Diploma 5. Degree and above	
1.8	Number of family members?	_____	
2. Clinical Information			
2.1	Respondent Classification	1. Case 2. Control	If control Skip to 4.1
2.2	Date of onset	dd/mm/yyyy _____	

2.3	Signs and symptoms (circle all that apply) ??	1. Fever 2. Headache 3. Sever pain 4. Itching 5. Swelling 6. Lesion 7. Others (Specify)_____	
2.4	Date seen at health facility	dd/mm/yyyy _____	
2.5	Treatment	_____ _____	
3. Laboratory Specimens taken (Only for cases)			
3.1	Blood	1. Yes 2. No	
3.2	Biopsy	1. Yes 2. No	
3.3	Lesion swab	1. Yes 2. No	
3.4	Whole blood	1. Yes 2. No	
3.5	Date of sample collection	Dd/mm/yyyy _____	
4. Exposure/ Risk factor			
4.1	Did you have infected previously?	1. Yes 2. No 3. I don't remember	
4.2	Is there other person diseased in your family?	1. Yes 2. No	If no, skip to 4.6
4.3	If Yes, hoe many family members become ill?	_____	
4.4	Has the person whom you are sleeping with developed similar lesions?	1. Yes 2. No 3. 3. I sleep alone	

4.5	Did you share clothes with diseased family members?	1. Yes 2. No	
4.6	How often you take shower?	1. Daily 2. Every 2-3 days 3. Every 4-6 days 4. Weekly 5. More than a week	
4.7	Do you wash your clothes?	1. Yes 2. No	
4.8	Is there any shortage of water to wash your body and clothes?	1. Yes 2. No	
4.9	What is the source of water for your washing body and clothes?	1. Pipe 2. Well 3. River 4. Rain water	
4.10	Do any animals in your home have skin lesions?	1. Yes 2. No	
4.11	If Yes what kind/ type of Animal (dead/ alive) _____ _____		

Annex 3: **Data collection tool for Dengue fever outbreak investigation**

3.1 Consent Form:

Hello, my name is_____. I am here on be behalf of the investigator

We would like to understand the factors associated with Dengue Fever Outbreak in Afar region Mille woreda. To get this information, we are caring out interviews, now I will ask you to complete this questionnaire about socio-demography, knowledge and exposure towards Dengue Fever. The results of this research will help to identify the factors associated with Dengue Fever and control the outbreak. The interview takes about 30 minutes. What you tell me will be kept strictly confidential and no one other than the researcher will find out the answers that you give. Your name and address or child's status will never appear on this study separately. Participation is voluntary and you may withdraw from the session at any time or refuse to answer any questions that makes you uncomfortable. Participation in this study will not affect your personal dignity. If you have further questions about the study, you can contact Achamyeleh Mulugeta via cell phone number +251-911-18-03-64 or e-mail achulabju@yahoo,com.

Are you willing to take part in the interview? Yes □ No □

Thank you for your participation. We are very grateful for your help.

Informed consent certified by:

Interviewer name_____ signature_____

Date of interview_____

Result of interview: 1. Completed □ 2. Completed □ partially 3. □ 4. Refused □

3.2 Questionnaire for Dengue Fever Outbreak investigation at Mille Woreda Afar Region January 2020

No.	Question	Coding Classification	Go To
1. Demographic Information Kebele _____ House No_____			
1.1	Respondent ID	_____	
1.2	Sex	1.Male 2.Female	
1.3	Age	_____Years	
1.4	Marital Status	1. Single 2. Married 3. Divorced 4. Widowed 5.NA	
1.5	Educational status	1. Illiterate 2.Primary school 3. Secondary 4. College And University	
1.6	Ethnicity	1. Afar 2. Amhara 3. Oromo 4. Tigre 5. Other(specify)	
1.7	Occupation	1. Student 2. Driver 3. House wife 4. Merchant 5.Farmer 6. Government employee 7. Daily laborer	
1.8	Number of family members?	_____	
2. Clinical Information			
2.1	Respondent Classification	1. Cases 2. Controls	If Control skip to 4.1
2.2	Date of Onset	dd/mm/yyyy _____	
2.3	Sign and symptoms	1.Fever 2. Headache 3. Chill 5. Nasal Bleeding/bleeding from any part of the body 6. severe muscle and joint pain 7. Rash 8. Restlessness/lethargy	

		9. Abdominal pain, Nausea/vomiting 10.Other(specify)	
2.4	Date seen at health Facility	dd/mm/yyyy _____	
2.5	Treatment	Antibiotics _____ Antiviral _____ Antipyretics_____ Ant malaria_____ Other supportive treatment	
3. Laboratory Specimens			
3.1	Is sample taken for dengue Fever?	1. Yes 2. No	
3.2	Date sample collected?	_____/_____/_____	
4. Knowledge towards Dengue fever			
4.1	Do you hear about Dengue fever?	1.Yes 2.No	
4.2	If yes, what do you think the cause of Dengue fever?	1.Virus 2.Bacteria 3.protozoa 4.other____ 5. Don't know	
4.3	Is Dengue fever Contagious?	1.yes 2.No 3. I Don't know	
4.4	If yes, how is it transmitted?	1.By mosquito 2. Air droplets 3.House fly 4.Other___ 5. Don't know	
4.5	At which time mosquito bites people?	1. Night 2. Day 3.Sunrise/sunset 4. I Don't know	
4.6	Does water required for mosquito to breed?	1.Yes 2.No 3. I Don't know	
4.7	Do you know symptoms of dengue fever?	1.Yes 2.No	
4.8	If yes what are the symptoms?	1.Fever 2. Headache 3. bleeding 4. Rash 5. Other(specify)_____	
5. Exposure			

5.1	Have you ever been infected by Dengue fever?	1.Yes 2.No	
5.2	If Yes, when?	_____ Year	
5.3	Do you have LLINs?	1.Yes 2.No	
5.4	If Yes, do you use LLINs while sleeping?	1.Yes 2.No	
5.5	When did you get the last LLINs?	_____ Year	
5.6	Who use LLINs always?	1.Children 2.Women 3. All use equally	
5.7	Is there any water holding container in/around the house?	1. Yes 2. No	
5.8	If yes, what is the type of the container? Multiple answer possible	☐Used pots ☐Jerry can ☐Garbage disposal that contain water ☐Flower pots/vases	☐Used tyres ☐Discarded food and beverage containers ☐Blocked gutters ☐Buildings under construction ☐Others (Specify)_____
5.9	Status of the Container (observe)	1. Closed 2. Opened	
5.10	Is there any stagnant water around your village?	1.Yes 2.No	
5.11	Is your house sprayed in the last three months?	1.Yes 2.No	
5.12	When was the last time that your house sprayed?	1.One month ago 2.Two months ago 3, Three months ago 4. More than three months	
5.13	Is there any river around your village?	1.Yes 2.No	
5.14	Is there any person diseased in your family?	1.Yes 2.No	
5.15	If Yes, how many family members become ill?	_____	
5.16	Did you have close contact with person with same complaint within the last 1 to 2 weeks?	1.Yes 2.No	
5.17	Did you have travel history within the last two weeks?	1. Yes 2. No	
5.18	If, yes to where?	_____	
5.19	Do you use mosquito repellents on your skin?	1.Yes 2.No	
5.20	Do you use mosquito repellant in your house?	1. Yes 2. No	

5.21	What kind of clothes you usually wear	1. Short and T-shirts 2. Trousers/ body full dress	

Thank you for your cooperation

Annex 4: **Data collection tool to evaluate Laboratory based AMR surveillance system**

Questionnaire

Introduction:

Thank you for taking time to speak with me today. My Name is Achamyeleh Mulugeta. I have been working in Ethiopian Public Health Institute and now I am Field Epidemiology Resident/student at Addis Ababa University School of public health. I am conducting evaluation of Laboratory based AMR surveillance system and want to speak with people who are engaged in this surveillance system. The aim of the evaluation is to evaluate how the system is functioning and whether the intended objectives are being met. Finally, recommendations will be forwarded to all concerned bodies to improve the system.

Part one: General Information

1.1.Interview Date _____

1.2. Name of Health Facility _____

1.3.Region _____ Zone_____ Woreda_____ City_____

1.4. Name of Respondent_____ Position _____

1.5.Date of start of implementing/participating in AMR surveillance system_____

Part two - Implementation Status

2.1. Do you send AMR surveillance data to the next higher level?

1. Yes 2.No

2.2 How do you send the data to the next level?

_____

_____

_____

2.3 When are you expected to send surveillance data to next higher level?

_____

_____

_____

2.4 What kind of communication facility do you have?

_____

_____

_____

2.5 Training

2.5.1 Did the staff working on AMR surveillance system taken training within the last year?

1. Yes 2. No

2.5.2 How many staff were trained?

_____

_____

_____

2.6 Data analysis and interpretation

2.6.1 Do you have computer?

1. Yes 2. No

2.6.2 If yes, is it functional?

1. Yes 2. No

2.6.3 Do you have computer skill?

1. Yes 2. No

2.6.4 Do you analyze AMR surveillance data?

1. Yes 2. No

2.6.5 Do you use computer to analyze AMR surveillance data?

1. Yes 2. No

2.6.6 If answer for 2.6.5 is yes, do you describe data by time place and person?

1. Yes 2. No

2.6.7 Do you notify the results of your analysis to the site?

1. Yes 2. No

2.6.7 If answer for 2.6.7 is yes, how often you notify the result?

_____

_____

2.7 Feedback

2.7.1 Do you provide Feedback to lower level?

1. Yes 2. No

2.7.2 How do you give your feedbacks?

_____

_____

_____

2.8 Supervision

2.8.1 Do you conduct regular supervision?

1. Yes 2. No

2.8.2 If answer for 2.8.1 is yes, how many times did you supervise

_____

2.8.3 Do you have supervision checklist?

1. Yes 2. No

Part Three – Attributes and Usefulness of the Surveillance

S.No	List of Attributes measures	Scale of Measurements				
		Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
1. Simplicity						
1.1	The data sources of AMR surveillance is easy and manageable					
1.2	AMR surveillance doesn't take much of my time or have no influence on my other activities					
1.3	Data analysis at laboratory level is easy and manageable					
1.4	the system is integrated with other surveillance systems					
1.5	To work in the system it doesn't need a high level training (can work just by orientations only)					
1.6	Sending report to the next level is easy and manageable					
1.7	Sending bacterial isolates to the next level is easy and					

	manageable					
1.8	Distributing the surveillance report is easy manageable					
2. Flexibility						
2.1	The AMR surveillance system adopts to the users improvement demands					
2.2	The AMR surveillance system is easy to add new variables					
2.3	The AMR surveillance system easy to integrate with other systems?					
3. Data quality						
3.1	Are all reported forms Complete?					
3.2	Percentage of unknown or blank responses to variables from the total reports of 2017-2019 report	Sex ___ Age_____ inpatient location _____ Place of residence_____ Pervious history of antibiotic taken_____ Type of bacteria isolate_____ zone size _____ minimum inhibitory concentration (MIC)				
3.3	Is the recorded data clear to read and understand?					
4. Acceptability						
4.1	The AMR surveillance is important for public health intervention?					
4.2	The all the stakeholders /laboratories /physicians accept and well engaged to AMR surveillance system					
4.3	If agree, how many active participants in your health facility are.					

4.4	If not agree, what is the reason for their poor participation in the surveillance activity					
4.5	All the reporting agents send their report using the current and appropriate surveillance reporting format?					
5. Sensitivity						
5.1	The AMR surveillance system have the ability detect cases and/or outbreaks					
5.2	If you don't agree why do you think the reasons for not detect cases and/or outbreaks					
6. Predictive Value Positive						
6.1	Proportion of suspected AMR cases confirmed by laboratory testing					
7. Representativeness						
7.1	All the community is represented by the AMR Surveillance system					
7.2	If not agree, which part of community not represented					
8. Timelines						
8.1	The AMR surveillance data/report arrive on time					
8.2	If you don't agree why do you think the reasons for not arriving on time					
8.3	The AMR bacterial isolates arrive on time					
8.4	If you don't agree why do you think the reasons for not arriving on time					
9. **Usefulness**						
9.1	The suspected AMR outbreaks detected early by the surveillance system					
9.2	The surveillance meet its objective					
9.3	The current system have an ability to show the progress and effect of preventive and control methods applied against					

	AMR					
9.4	The current system have an ability to indicate major causes of AMR in the health facility/community					
10. Stability						
10.1	How many times the surveillance system interrupted?					
10.2	If the system was interrupted, what was the reason for the interruption					
10.3	The resource for AMR surveillance is always available					

Annex 5: Data collection tools (Checklist) for Health profile description assessment

1. **Historical Aspects of the area (if available)**

   How and why the name ----------
   _____
   _____

   How was the district formed_____?

   Any other historical aspect_____

2. **Geographic and Climatic conditions**

   Total Area of the District _____

   Altitude _____

   Latitude_____

   Longitude _____

   Average Annual rain fall _____

   Average Annual temperature _____

   Boundaries North----------

   South----------

East----------

West----------

Climatic zone-dega--------% woynadega-------% kola------% bereha---------%

3. Socio Demographic information

3.1 Population

Total Population _____

Male_____

Female_____

Urban_____

Rural_____

Sex ratio (Male to Female) _____

Age structure: - percentage of children < 1yrs_____. <5yrs____< 15 years. Age 15-64years----

Percentage of old people >65 years_____

Women child bearing age (15-49) years_____

Percentage of pregnant women_____

Dependency ratio_____

Annual growth rate----------

3.2 Population size by religion

Orthodox_____

Catholic_____

Protestant_____

Muslim_____

Others_____

3.3 Ethnic composition (%)

a.

b.

c.

d.

3.4 Estimated Population size by Kebeles in 2010 EFY (2017/2018)

Sr.no	Name of the Kebeles	Population size	Distance from the district town(km)
1	Kebeles 1		
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			

4. Administrative setup

Total number of Kebeles (if it applies): _____

Urban_____

Supporting NGOs----------

5. Health status

5.1 Number of health facilities 2010 EFY (2017/2018)

Sr.no	Type of Health facility	Number
1	Hospital	
2	Health center	

3	Private clinic	
4	Pharmacy	
5	Drug store/Rural drug vender	
6	Diagnostic Laboratories	
8	Health posts	

5.2 Man power of Woreda health office and health facilities in 2010 EFY (2017/2018)

Sr. no	Type	Number		
		No		Remark
		Government	Private	
1	Physicians			
2	Health officers			
3	Laboratory technician/technologist			
4	Pharmacy technician/Pharmacist			
5	Nurses			
6	Midwife			
7	X-Ray technician			
8	ENHS			
9	HEWs			
10	TBA			
11	Others			

5.3 Ratio of health facility and professional to population 2010 EFY (2017/2018)

Sr.no	Description	Ratio
1	Hospital: population	
2	Health center: population	
3	Health post: population	

4 Physician; population

5 Health officer: population

6 Nurse: population

7 Midwife: population

8 HEW: population

5.4 Health service institutions and infrastructures

	Type of institution		No of institutions	Remark
1	Number of hospitals	With sustainable 24 hours electric power supply		
		without sustainable/ 24 hour /electric power		
		with telephone service(cable based/mobile)		
		without telephone service (cable based/mobile)		
		with piped water supply		
		Without piped water supply		
		No of hospitals which have vehicles		
2	Number of health centers	with sustainable/ 24 hour /electric power		
		without sustainable/ 24 hour /electric power		
		with telephone service (cable based/mobile)		
		without telephone service (cable based/mobile)		
		with piped water supply		
		Without piped water supply		
		No of HC which have vehicle		
3	Health posts	with sustainable/ 24 hour electric power		
		without sustainable/ 24 hour electric power		
		with telephone service (cable based/mobile)		
		Without telephone service (cable based/mobile)		
		with piped water supply		
		Without piped water supply		

		No of health posts which have vehicle		

5.5 Top causes of morbidity and mortality 2010 EFY (2017/2018)

A. Top ten leading causes of OPD visit (morbidity)

Sr.no	Adult	Pediatrics
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

B. Top ten causes of admissions

Sr.no	Adult	Pediatrics
1		
2		
3		

4		
5		
6		
7		
8		
9		
10		

C. Top ten causes of deaths (mortality).

Sr.no	Adult	Pediatrics
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

6. Vital statistics 2010 EFY (2017/2018)

CBR_____

CDR_____

NMR_____

PNMR_____

IMR_____

MMR_____

GR_____

7. MCH and EPI coverage of the district 2010 EFY (2017/2018)

Sr.no	Description	Coverage	Remark
1	ANC 1 coverage		
2	ANC 2 coverage		
3	Institutional (skilled) delivery coverage		
4	PNC coverage		
5	BCG coverage		
6	Measles vaccine		
7	OPV		
8	Penta1		
9	Penta3		
10	Full immunization coverage%		
11	Contraceptive acceptance rate		
12	TT2 coverage for pregnant		
13	TT2 coverage for non-pregnant		

8. Environmental sanitation and availability of safe drinking Water 2010 EFY (2017/2018)

Sr.no	Description	Number (%)
1	Latrine utilization coverage	
2	Number of house hold with latrine	
3	Safe water supply coverage	
4	Number of Kebeles accessed to safe water supply	

9. Endemic Diseases

9.1 Malaria prevention and control program of 2010 EFY (2017/2018)

Sr. no	Description	Number of population (%)	
1	Number of Malaria Kebeles		
2	Total no. of Malaria cases per year		
3	Malaria Health education coverage		
4	Percentage of Malaria laboratory tested		
5	Case treated clinically		
6	No of cases Malaria in pregnant mothers		
7	Malaria Case fatality rate	≤5 Years	>5Years
8	Cases treated based on lab finding		
9	Number of Vaccinated populations for influenza?		

List of major Malaria prevention and control activities----------
---

9.2 Prevalence of TB/Leprosy: 2010 EFY (2017/2018)

Sr. No	Description		Population no. (%)
1	Prevalence of TB		
2	Pulmonary TB	Smear positive	
		Smear negative	
3	Extra PTB		
4	TB detection rate		
5	TB Rx completion rate		
6	TB cure rate		

7	TB Rx success rate	
8	TB defaulter rate	
9	Death on TB Rx	
10	Total TB patients screened for HIV	
11	HIV prevalence rate among TB cases	HIV/TB &HIV=
12	Prevalence of Leprosy	

9.3 HIV/AIDS IN 2010 EFY (2017/2018)

Sr. No	Activities	Male	Female	Total	Remark
1	Total number of people screened for HIV				
2	VCT				
3	PICT				
4	PMTCT				
5	HIV Prevalence				
6	Total PLWHIV				
7	On ART				
10	Condom Distribution				
11	Health education coverage				
	Number of OVC				

10. Socio economic conditions 2010 EFY (2017/2018)

10.1 Education and school Health

Sr. no	Type of School	# schools	# teachers			# students			student school drop out	Female Student School Drop out
			M	F	total	M	F	total		

1	Primary									
	1-4									
	5-8									
	1-8									
2	Secondary									
	9-10									
	11-12									
	9-12									
3	Others (Take note)*									
	Total									

*Private Schools e.g. Nursery…

10.2 School health activities:

Schools with water supply_____

Schools with functional latrines _____

Schools with HIV/other Health clubs_____

Literacy ratio_____

Health education----------

10.3 Income

Main source of income _____

No. of the population committed in:

Urban Agriculture _____ _____

Government employee_____

Trade _____

Productivity of the land per hectare----------

Common products----------_

Husbandry _____ _____

Hotel and catering _____

Others (specify) _____ _____

Yearly income per house hold_____

GDP (during harvesting season/ meher) = ----------

GDP from irrigation=---------- quintal

Total GDP= ---------- quintal

Average income per capita _____

10.4 Social aspects

Number of youth clubs_____

Number of public libraries_____

Others_____

10.5 Communication and Utilities

How many of the health facilities and Kebeles have access to:

Transportation: Kebeles _____ (%)

Telecommunication: Kebeles _____ (%)

Health facility_____ (%)

Electric power: Kebeles _____ (%)

11. Health Sector Expenditure and Financing 2008-2010EFY

No	Source	2008EFY	2009 EFY	2010 EFY
1	Total Woreda Budget (Birr)			
2	Allocated to Health Sector (Birr)			
3	Total Per Capital Health Expenditure(Birr)			

*Name of NGOs which Support the health Sector:_____

11.1 Health sector Budget Distribution (2006- 2010 EFY)

Sr. no	Health institution	2008EFY		2009 EFY		2010 EFY	
		Salary (birr)	Recurrent (birr)	Salary (birr)	Recurrent (birr)	Salary (birr)	Recurrent (birr)
1							
2							
3							
4							
5							
6							
7							
8							

*Salary = Salary + Allowance

11.2 Health Care financing /HCF/ (_____to_____ EFY)

Sr. No	Name of the Health HFs	Budget Allocated (birr)			Budget Utilized (birr)			Remark
		2007 EFY	2008 EFY	2009 EFY	2007 EFY	2008 EFY	2009 EFY	
1								
2								
3								
4								
5								
6								
7								

12. Exempted Health services:

a/

b/

c/

d/

e/

f/

13. Disaster situation in the district 2008 and 2010EFY (2015/2016-2018)

Was there any disaster (natural or manmade) in the district in the last two years?

(specify) _____

Any recent disease outbreak/other public health emergency?

Yes (specify) _____ _____

No_____

If yes cases_____ and deaths_____

14. Nutrition intervention in the Woreda , 2009 and 2010 EFY (2016/2017-2018)

Sr.No	Type of food intervention program
1	OTP sites
2	TFU program
3	TSF program
4	CBN program
5	EOS program
6	Others

No. population screened for malnutrition = children----------pregnant----------

Received therapeutic food----------

15. What do you think are major Health problems of Woreda?

15.1 What do you think are solutions of the problems?

16. What are the main zoonotic diseases in the Woreda?

A.

B.

C.

D.

Annex 6: Data collection tools for Performance of Laboratory Professionals working on Malaria Microscopy

5.1 Consent Form for Malaria Microscopists

My name is Achamyeleh Mulugeta and I am MPH student in Filed epidemiology and Laboratory training program at Addis Ababa University. I am doing a study entitled "**Performance of Laboratory Professionals and Health Extension workers working on Malaria Microscopy and RDT at public and privet Health facilities at malaria elimination districts of North Shewa Zone, Amhara Region, Ethiopia**"**.**

The objective of the study is to assess the laboratory professional and Health extension workers working on malaria microscopy and RDT.

To assess the performance, I have 10 validated blood film slides which will be examined by volunteer participants. So if you are agree to participate in the study,10 blood film slides will be given for examination and 10 minutes will be allocated for each blood film slides, and you will be interviewed. All the data obtained will be kept strictly confidential by using only code numbers and locking the data, only study personnel will have access to the files. The result will not be identified by names, it will be coded.

Participant's response: I am free to decline to be in this study, or to withdraw from it at any point and also to jump a question that feels me discomfort. My decision as to whether or not to participate in this study will have no influence on my present or future Carrier. My signature below indicates that

I agree to participate in this study.

Signature of Person Obtaining Consent date of signature

_____ _____

Subject's signature date of signature

_____ _____

5.2 Questionnaire Performance of Laboratory Professionals working on Malaria Microscopy

Questionnaire Number:_____ Code of Health Facility: _____

Type of Health facility (put tick mark √) Government_____ Privet _____

A. Socio demographic data

No	Questions	Response Category	Remark
1.	Age in Years	_____	
2.	Sex	1. Male 2. Female	
3.	When did you Graduate?	1. Less than 1yr 2. 1-2 years 3. >2 years (_____yrs)	
4.	Which college did you graduate from?	1. Government 2. Private 3. Other_____	
5.	What is your qualification?	1. Diploma 2. Bachelor degree 3. Master's degree 4. other_____	

6.	Field of study/s:		
7.	What course did you take in your college concerning malaria diagnosis?	1. Theoretical only 2. Theoretical & Practical	
8.	How long have you worked as malaria microscopist?	_____	
9.	Have you taken In-service training on malaria microscopy?	1. Yes 2. No	
10.	If yes, when and how many times?	1. Once: 2. 2 times: 3. more than 2 times	
11.	When was your last training?	_____	
12.	Who did give you training?	1. Government:_____ 2. NGO:_____	
13.	Do you diagnose malaria detection?	1. Yes 2. No	
14.	Do you identify malaria species?	1. Yes 2. No	
15.	Do you identify all parasite life stages?	1. Yes 2. No	
16.	Do you perform parasitaemia count?	1. Yes 2. no	
17.	If yes, which count do you use?	1. +, ++, +++, ++++ 2. Parasite per micro liter/ WBC 3. Parasite per micro liter/ RBC	

B. Result reporting form for laboratory professionals

S.NO	**Slid ID**	**Result**				**Remark**
		Negative	**Positive**			
			Species	**Stage**	**Parasite load**	

1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Write the species as Pf = P. *falciparum*, Po= P. *ovale*, Pv= P. *vivax*, Pm P. *malrea*; Negative as Neg.

Signature of the lab technicians/technologist_____ Date: _____

Data collector name_____ Signature _____Date: _____

5.3 Questionnaire Performance of Health Extension workers working on Malaria RDT

Questionnaire Number:_____ Code of Health Post_____

A. Socio demographic data

No	Questions	Response Category	Remark
1.	Age in Years	_____	
2.	Sex	1. Male 2. Female	
3.	When did you Graduate?	1. Less than 1yr 2. 1-2 years 3. >2 years (_____yrs)	
4.	Which college did you graduate from?	1. Government 2. Private	

		3. Other_____	
5.	What is your qualification?	1. Diploma 2. Bachelor degree 3. Master's degree 4. other_____	
6.	Field of study/s:		
7.	What course did you take in your college concerning malaria diagnosis?	1. Theoretical only 2. Theoretical & Practical	
8.	How long have you worked malaria RDT?	_____	
9.	Have you taken In-service training on malaria RDT?	1. Yes 2. No	
10.	If yes, when and how many times?	1. Once: 2. 2 times: 3. more than 2 times	
11.	When was your last training?	_____	
12.	Who did give you training?	1. Government: _____ 2. NGO: _____	
13.	Do you diagnose malaria RDT currently?	1. Yes 2. No	

B. Working area assessment for HEWs professionals

Item		**Question**	**Yes**	**No**
		Space Requirements		
1	a	Adequate bench space for the performance of malaria RDT		
	b	Clean and tidy working benches		
2		**Standard Operating Procedures**		
	a	Are written SOPs for all test kits in use available in the Health post?		

	b	Do the testers adhere to the SOPs?		
	c	Are job aides placed on the wall?		
3		**Quality Control**		
	a	Are quality controls used?		
		If yes, how often?		
	b	If yes, where do they come from?		
	c	Are QC results recorded and records maintained?		
	d	What is the procedure if QC control tests fail?		
	e	Are SOPs available to perform QC?		
4		**Storage of Kits**		
	a	Are kits stored according to the manufacturer's instructions?		
	b	Are fridge and room temperatures recorded daily?		
	c	Are test kits used beyond the expiry date?		
5		**Stock Cards**		
	a	Does the health post have and use stock cards?		
	b	If yes, are the stock cards up to date?		
	c	Are written procedures in place for requisition of kits and supplies?		
6		**Kits and Supplies**		
	a	Has the testing site experienced any shortage of malaria RDT kits and/or supplies?		
	b	If yes, state reasons below		
	c	If the answer is Yes, state how long?		
	d	How are kits and supplies obtained?		
	e	List kits or supplies needed		
7		**Malaria RDT data collecting form**		
	a	Do you have malaria RDT data collecting forms?		
	b	Do you send monthly returns to district/Woreda health office?		
	c	If no, why not?		

	d	How do clients receive their results?		
	e	Are Malaria RDT results kept confidential**?**		
	f	How many tests on average does your health post perform monthly?		
8		**Safety and Infection Control**		
	a	Does the laboratory have safety guideline?		
	b	Are all testers wearing laboratory coats?		
	c	Are gloves worn when handling specimens?		
	d	Are gloves changed between patients?		
	e	Are blood lancets being used appropriately? (opening the lancet when it is about to be used)		
	f	Does the health post have appropriated sharp containers?		
	g	Is all health post waste generated from working with biohazards disposed properly (i.e. chemical disinfecting, and incineration)		
	h	Is disinfectant for use when handling blood spillages and other bloody containers, and for bench cleaning?		

C. Result recording format

Sample ID	**Result***	**Remark**

*** Write the species as Pf = P. *falciparum*, Po= P. *ovale*, Pv= P. *vivax*, Pm P. *malrea*; Negative as Neg.**

Signature of the HEW_____ Date: _____

Data collector name_____ Signature _____Date: _____

Annex 7: Regional and Zonal Level Malaria Epidemic Rapid Assessment

Date of Visit: _____

General Information

1. Region : _____Zone: _____ Woreda: _____
2. Respondent's Name: _____ Position: _____
3. Cell Phone: **_09-**_____ E-mail**: _____@_____.com**
4. Total Kebeles: _____, Kebeles at risk of malaria: _____
5. Total population of catchment: _____Malaria at Risk Pop. _____
6. Total number of households: _____Households at risk of malaria: _____

Current malaria situation

7. Malaria case period from: _____ to _____
8. How was the epidemic detected?

Epidemic call ☐ Rumors ☐ Health facility report ☐ other (specify)

9. How many cases were reported during the reported period?

_____

Coordination

10. How do you describe the coordination of the malaria epidemic in your Zone/Region?

_____

_____

._____

_____

11. Is EOC/ RRT activated _____, if yes, do they meet regularly? _____
12. Do you have TOR? _____
13. Is there an assigned Incident Manager (IM)? _____
14. Is there an established task force? _____, if yes do they meet regularly? _____
15. How do you describe the RRT? Who leads the RRT at Zonal/ regional level?
    _____
    ._____
    _____
16. Do you have a revised/current EPRP?
    _____
    _____
    _____
17. Do you have an allocated budget for malaria epidemic responses?
    _____
    _____
    _____.
18. How frequently do you meet and review action plan and share report?
    _____
    _____
    _____
19. Do you have an allocated budget for malaria epidemic responses?
    _____
    _____
20. How do you follow case trend? _____
21. Actions taken (What preventive and control measures were applied?)
    I. _____
    II. _____
    III. _____
    IV. _____

Anti-malarial Stock status

22. Do you have enough malaria commodities for the next two months? _____ if not why? _____

Drug	Current stock	The last month	Remarks
AL (Artemeter Lumefantrine) 6x1			
AL (Artemeter Lumefantrine) 6x2			
AL (Artemeter Lumefantrine) 6x3			
AL (Artemeter Lumefantrine) 6x4			
Chloroquine tab			
Chloroquine syrup			
Primaquine tabs			
Quinine tablets			
Quinine injection			
Artesunate injection			
Rectal Artesunate			
Functional Microscopes			
Lab. Reagents for MC			
Multi Species RDT			

23. Do you have regular communication and reporting platform with hubs? _____ if yes, how? _____

LLINS Distribution

24. What is the LLINs coverage at region level? _____
25. Do you have woredas without LLINs coverage? _____
26. Do you have woredas with case build up without LLINs coverage/replacement beyond three years) _____
    - If yes list name of woredas. _____
27. Do you have over left or undistributed LLINs in your store? _____ if yes quantity_____
28. What is the status of LLINs utilization in your region? _____

IRS Operation

29. Total number of kebeles targeted for IRS_____

30. Targeted/Planned and achieved unit structure _____

31. Is there kebele/Got IRS conducted with malaria case build up? If yes list names_____

32. Do you have reserved insecticide for emergency response? _____ if no what is your plan? _____

33. Any challenges/constraints regarding malaria prevention and control program_____

_____

Date Supervised: _____

Findings and agreed action plan

Region: _____ Zone: _____ Woreda/Town Administration: _____

S.NO	Key Area	Findings for Action/ Problems/	Agreed measures for action	By when? (Specific date)	Who (responsible)? (WorHO/ZHO/RHB/NMCEP)	Remark

Name **Job Position** **Signature & Date**

In-charge of Supervisory team: _____

In-charge of the Supervisee Head of Institute: _____

Health Centers and Hospitals Malaria Epidemic Rapid assessment

Date of Visit: _____

General Information

1. Region : _____ Zone : _____ Woreda: _____
2. Respondent's Name: _____ Respondent's Position: _____
3. Cell Phone: **_09-**_____ E-mail**:**_____**@_ _____.com**
4. Total Kebeles: _____ Kebeles at risk of malaria:_____
5. Total population of catchment: _____Population at risk of malaria:_____
6. Total number of households: _____ Households at risk of malaria: _____

Case management

1. Current malaria situation
   - Period from: _____ to _____
   - Potential cause for the Malaria case build up (Check the age distribution if necessary) _____
     _____
   - How did you get the information: _____
   -
   - Number of fever cases attended at OPD level: _____
   - Out of the total fever, how many blood film tested for malaria: _____,
     - Positive for malaria: _____
   - Cases: Pf.: _____ Pv.: _____ Mixed: _____ Clinically treated: _____
   - Number of admitted cases during this year _____
   - Number of current malaria admission _____
   - Number of registered deaths from malaria case: _____
   - What was the reason for deaths: _____
     _____
   - Actions taken (What preventive and control measures were applied?)
     V. _____
     VI. _____
2. Check for correct and proper utilization of available Epidemic Monitoring Chart: _____
4. What are your bases for the Malaria commodities request?
   _____
   _____
5. Check if the health facility has received the revised treatment protocol and is being utilized. If it is not available, why?
   _____
6. Have you ever used Primaquine for malaria cases? Yes: ☐, No ☐
7. If yes, how do you use for different species?
   _____

If no, why: _____

8. Do you have functional lab for Malaria cases? Yes ☐, No ☐
   If yes, please observe the laboratory set up. If not please explain why the lab, is not functional
   _____
9. Check prescription from dispensary and patient card to confirm weather malaria drugs are prescribed rationally
   _____

Logistics

Drug	**Current stock**	**The last month**	**Remarks**
AL (Artemeter Lumefantrine) 6x1			
AL (Artemeter Lumefantrine) 6x2			
AL (Artemeter Lumefantrine) 6x3			
AL (Artemeter Lumefantrine) 6x4			
Chloroquine tab			
Chloroquine syrup			
Primaquine tabs			
Quinine tablets			

Quinine injection			
Artesunate injection			
Rectal Artesunate			
Functional Microscopes			
Lab. Reagents for MC			
Multi Species RDT			

15. What are the main challenges/gaps encountered in malaria prevention and control response at your level?

Date Supervised: _____

Findings and agreed action plan

Region: _____ Zone: _____ Woreda/Town Administration: _____

S.NO	**Key Area**	**Findings for Action/ Problems/**	**Agreed measures for action**	**By when? (Specific date)**	**Who (responsible)? (WorHO/ZHO/RHB/NMCEP)**	**Remark**

Name **Job Position** **Signature & Date**

In-charge of Supervisory team: _____

In-charge of the Supervisee Head of Inistituete: _____

Annex 8: Different supporting letters

የኢትዮጵያ የሕብረተሰብ ጤና ኢንስቲትዩት
Ethiopian Public Health Institute
አዲስ አበባ-ኢትዮጵያ Addis Ababa, Ehiopia

ስልክ-Tel: +251 11 2133499, +251 11 2751522, ፋክስ Fax: +251 11 2758634,
የመ.ሳ.ቁ - P. O. BOX: 1242/5654 e-mail: ephi@ethionet.et
www.ephi.gov.et

ቁጥር/Ref. No ኢ.ሕ.ጤ.ኢ ወ/ፈ 139/27
ቀን/Date 19 ሀዳር 2012

ለ ሚ መ ለ ከ ተ ው ሁ ሉ

የኢትዮጵያ ህብረተሰብ ጤና ኢንስቲትዩት የህብረተሰብ ጤና አደጋዎች ቁጥጥር ማዕከል አቶ አቻምየለህ መሉጌታን ለoutbreak investigation ሥራ ከህዳር 21/2012 ዓ.ም ጀምሮ በኦሮሚያ ክልል በጅማ ናመና ለመሰብሰብ በተለያዩ ዞኖች ስለሚዘዋወሩ አስፈላጊውን ትብብር እንዲደረግላቸው እንጠይቃለን፡፡

ለጤናችን በጋራ እንሥራ!

መስፍን ወሰን
የበሽታዎችና የጤና ክስተቶች
ቅኝትና ምላሽ ዳ/ተ/ዳይሬክተር

ግልባጭ፤

ለም/ዋና ዳይሬክተር ጽ/ቤት /ህ.ጤ.አ.ቁ/
ለአቶ አቻምየለህ መሉጌታ
ኢ.ህ.ጤ.ኢ

የኢትዮጵያ የሕብረተሰብ ጤና ኢንስቲትዩት
Ethiopian Public Health Institute
አዲስ አበባ-ኢትዮጵያ Addis Ababa, Ehiopia

ስልክ-Tel: +251 11 2133499, +251 11 2751522, ፋክስ Fax: +251 11 2758634,
የመ.ሳ.ቁ-P. O. BOX: 1242/5654 e-mail: ephi@ethionet.et
www.ephi.gov.et

ቁጥር ኢ ሕ ጤ ኢ ና 5·44 /191
Ref. No
ቀን 15 ጥር 2012
Date

ለሚመለከተው ሁሉ

የኢንስቲትዩታችን ባለደረባ የሆኑት 1ኛ/ መላኩ ስዩም 2ኛ/ ህይወት አማረ እና 3ኛ/ አቻምየለህ ሙሉጌታ በአፋር ክልላዊ መንግሥት በተለያዩ ወረዳዎች ለጁንጉ ትኩሳት ወረርሽኝ ምላሽ ለመስጠት ከጥር 17/2012 ዓ.ም ጀምሮ አቶ ታጠቅ ተሾመ በሚያሽከረክሩት ኮድ. 4 ኢት. 4-14167 ስለሚዘዋወሩ አስፈላጊውን ትብብር እንዲደረግላቸው እየጠየቅን ለሚደረግልን ትብብር በቅድሚያ እናመሰግናለን።

ለጤናችን በጋራ እንሥራ!

መስፍን ወሰን
የበሽታዎችና የጤና ክስተቶች
ትንትና ምላሽ ዳሃ/ዳይሬክተር

ግልባጭ፡-
ለም/ዋና ዳይሬክተር ጽ/ቤት /ኢሕጤአቱማ/
ኢህጤኢ

በአማራ ብሔራዊ ክልላዊ መንግሥት
AMHARA NATIONAGIONAL STATE
የህብረተሰብ ጤና ኢንስቲትዩት
Puplic Health Institute

ቁጥር፡የህብ/ጤና/አደ/መክ/መቆ/5.05/6287
Ref.Np.....
ቀን 01/08/2011
Date ----------

ለባ/ዳር ዙሪያ ወረዳ ጤና ጥበቃ ጽ/ቤት

ባህር ዳር

"ጉዳዩ፡- ትብብር ስለመጠየቅ

የፊልድ ኢፒዲሞሎጂ ረዚደንት የሆኑት አቶ አቻምየለሁ ሙሉጌታ የ Public description ለመሥራት በባህር ዳር ዙሪያ ወረዳ ከሚያዚያ 01/2011 እስከ ሚያዚያ 15/2011 ዓ.ም ድረስ ስለሚቆዩ አስፈላጊውን ትብብር እንድታደርጉላቸው እንጠይቃለን፡፡

ከሠላምታ ጋር

አሸናፊ አያሌው ወር
Ashenafi Ayalew W
የህብረተሰብ ጤና አደጋዎች
መከላከልና መቆጣጠር
ዳይሬክቶሬት ዳይሬክተር

ግልባጭ

- ለአቶ አቻምየለሁ ሙሉጌታ
  ባ/ዳር

የኢትዮጵያ የሕብረተሰብ ጤና ኢንስቲትዩት
Ethiopian Public Health Institute
አዲስ አበባ-ኢትዮጵያ Addis Ababa, Ehiopia

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የመ.ሳ.ቁ - P. O. BOX: 1242/5654 e-mail: ephi@ethionet.et
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ቁጥር Ref. No ኢ ሕ ጤ ኢ 5.44/116
ቀን Date 06 ጥቅምት 2013

ለአማራ ሕብረተሰብ ጤና ኢንስቲትዩት ደሴ ቅርንጫፍ
ደሴ

ጉዳዩ፡- ትብብር ስለመጠየቅ

የኢንስቲትዩታችን ባልደረባ የሆኑት አቶ አቻምየለህ መሉጌታ የአዲስ አበባ ዩኒቨርስቲ በሁለተኛ ዲግሪ መርሃ ግብር በፊልድ ኢፒዲሚዎሎጂ ትምህርት ክፍል የሁለተኛ ዓመት ተማሪ ሲሆኑ የAntimicrobial Resistance (AMR) Surveillance ለመገምገም መረጃ ስለሚሰበስቡ በእናንተ በኩል አስፈላጊውን ትብብር እንድታደርጉላቸው እየጠየቅን፤ ለምታደርጉልን ቀና ትብብር በቅድሚያ እናመሰግናለን፡፡

ለውጤታማነት በጋራ እንሥራ!

The Federal Democratic Republic of Ethiopia Ethiopian Public Health Institute

ግልባጭ
ለም/ዋና ዳይሬክተር ጽ/ቤት (ሕጤአቱማ)
ኢሕጤኢ
ለአማራ ሕብረተሰብ ጤና ኢንስቲትዩት
ባህር ዳር

/ስ1

የኢትዮጵያ የሕብረተሰብ ጤና ኢንስቲትዩት
Ethiopian Public Health Institute
አዲስ አበባ-ኢትዮጵያ Addis Ababa, Ehiopia

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የመ.ሳ.ቁ - P. O. BOX: 1242/5654 e-mail: ephi@ethionet.et
www.ephi.gov.et

ቁጥር Ref. No ኢ ሕ ጤ ኢ 5-42/115
ቀን Date 06 ጥቅምት 2013

ለጥቁር አንበሳ ስፔሻላይዝድ ሆስፒታል

አዲስ አበባ

ጉዳዩ፡- ትብብርን ይመለከታል

የኢንስቲትዩታችን ባልደረባ የሆኑት አቻምየለህ ሙሉጌታ የአዲስ አበባ ዩቨርስቲ በሁለተኛ ዲግሪ መርሃ ግብር በፊልድ ኢፒዲሚዎሎጅይ ትምህርት ክፍል የሁለተኛ ዓመት ተማሪ ሲሆኑ የAntimicrobial Resistance (AMR) Surveillance ለመገምገም መረጃ ስለሚሰበስቡ በእናንተ በኩል አስፈላጊውን ትብብር እንድታደርጉላቸው እየጠየቅን ፤ ለምታደርጉልን ቀና ትብብር በቅድሚያ እናመሰግናለን፡፡

ለጤናችን በጋራ እንስራ !

The Federal Democratic Republic of Ethiopia Ethiopian Public Health Institute

ግልባጭ

- ለም/ዋና ዳይሬክተር ጽ/ቤት /ሕጤአቁማ/
  ኢሕጤኢ

የቢሮማስታወሻ
Inter Office Memorandum

ጥቅምት 6 ቀን 2013 ዓ.ም

ለባክቴሪያል ፓራሳይቲክ እና እንስሳት ነክ በሽታዎች ምርምር ዳይሬክቶሬት

ኢሕጤኢ

ጉዳዩ፡- ትብብርን ይመለከታል

የኢንስቲትዩታችን ባልደረባ የሆኑት አቻምየለህ ሙሉጌታ የአዲስ አበባ ዩኒቨርስቲ በሁለተኛ ዲግሪ መርሃ ግብር በፊልድ ኢፒዲሚዎሎጅይ ትምህርት ክፍል የሁለተኛ ዓመት ተማሪ ሲሆኑ የAntimicrobial Resistance (AMR) Surveillance ለመገምገም መረጃ ስለሚሰበስቡ በእናንተ በኩል አስፈላጊውን ትብብር እንድታደርጉላቸው እየጠየቅን ፤ ለምታደርጉልን ቀና ትብብር በቅድሚያ እናመሰግናለን፡፡

ከሰላምታ ጋር

ዘውዱ አለሙ አይሸ
የቅርጫ ማህበረሰብ መረጃ ምርምር
አስተዳደር ቢዝነስ ዳይሬክተር