Addis Ababa University, College of Health Sciences,
School of Public Health

Ethiopian Field Epidemiology and Laboratory Training Program (EFELTP)

Compiled Body of Works in Field Epidemiology in Ethiopia

By

Zayeda Beyene

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

February, 2011
Addis Ababa

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List of Abbreviations/Acronyms

AAU	Addis Ababa university
AFP	Acute Flaccid Paralysis
AWD	Acute Watery Diarrhoea
AIDS	Acquired immune deficiency Syndrome
ARI	Acute Respiratory Infection
ALRI	Acute Lower Respiratory Infection
AURI	Acute Upper Respiratory Infection
CDC	Centre for Disease Prevention and Control
CHA	Community Health Agent
CI	Confidence Interval
DHS	Demographic Health Survey
DRMFSS	Disaster Risk Management and Food Security Sector
EPI	Expanded Program on Immunization
EPHI	Ethiopian Public Health Institution
FELTP	Field Epidemiology and Laboratory Training Program
FMOH	Federal Ministry of Health
H.C	Health Centre
HIV	Human Immuno-deficiency Virus
H1N1	Pandemic Influenza A
IDSR	Integrated Disease Surveillance and Response
IMCI	Integrated Management of Childhood Illness
IMNCI	Integrated Management of Neonate and Childhood illness
IMR	Infant Mortality Rate
MDG	Millennium Development Goal
MUAC	Mid Upper Arm Circumference
MOH	Ministry of Health
NNT	Neonatal Tetanus
OTP	Out Patient Therapeutic Program
OPD /IPD	Outpatient Department/Inpatient Department

PA	Pyrolizidine Alkaloid
PHEM	Public Health Emergency Management
PHC	Primary Health Care
RHB	Regional Health Bureau
RRT	Rapid Response Team
RUTF	Ready to Use Therapeutic Feeding
RDT	Rapid Diagnostic Test
SARS	Sever Acute Respiratory Syndrome
SNNPR	Southern Nations Nationalities and Peoples Region
S.C	Supplementary Centre
SAM	Sever Acute Malnutrition
SD	Standard Deviation
TEPHINET	Training Programs in Epidemiology and Public Health Interventions Network
USA	United Nations of America
U5	Under five years old
U5MR	Under five year's mortality Rate
ULD	Unidentified Liver Disease
UNICEF	United Nations Children's Fund
WHO	World Health Organization
WHO/AFRO	World Health Organization Regional Office for Africa

Preface

This body of work contains of two outbreak investigations. The first investigated outbreak was malaria in Tigray region, central zone, Kola Tembiene district, May, 2009. The team contains of me and surveillance officer from Ministry of Health (MOH)/ Public Health Emergency Management (PHEM) was deployed to the region and data was analyzed. The second investigated outbreak was shigellosis in Addis Ababa University technology campus, March, 2010. Different professionals and sectors including Field Epidemiology and Laboratory Training Program (FELTP) coordinators and three FELTP residents were participated in this investigation. Abstract of this outbreak investigation was accepted and presented to the Ethiopian Public Health Association conference, 2010, Tigray, Mekele and to the Training programs in Epidemiology and public health interventions Network (TEPHINET) conference 2010 that was held in South Africa, Cape Town. This paper is also submitted to the Ethiopian Medical Journal for publication.

National malaria data of July,2004 –September,2008 G.C that was collected from Ministry of Health was analyzed and described in March, 2009G.C as primary individual work .

Evaluation of Public health surveillance system in two selected districts of the region using structured questionnaire was done in my sponsor/work region Tigray. Health profile of Tigray region, Endereta district (Eastern zone) was also described and reported.

Belg and Meher season nutritional need assessment is biannually organized by the Disaster and Risk Management for Food and Security Sector (DRMFSS).Ministry of health and other responsible sectors and nongovernmental organization are participant sectors. I was one of the participants in 2001E.C (2008/2009G.C) Belg season assessment as member of the team. Narrative summary of this assessment is an output that was performed and included in this body of work.

A Protocol/proposal namely "Assessment on Risk Factors of Pneumonia in Under Five Children; Tigray Region, Mekele Town: A Case-Control" Study was also developed as one of output for Accomplishment of this masters program.

Unidentified Liver Disease(ULD) is an outbreak that is reported by Tigray Health Bureau for the first time in Ethiopia since 2001G.C.It is a chronic illness ,human and livestock are reservoirs of the disease manifested as epigastric pain/abdominal pain, nasal bleeding, peripheral oedema and abdominal swelling progressing to ascites; Yet cause of this infection is not identified .National planning and coordinating committee for ULD has hand over the responsibility to investigate and intervene this outbreak and coordinate all activities that are taken by different stakeholders . I was member of the team to help on surveillance activities and data was analyzed/described and included in this body of work. This abstract was submitted and accepted to TEFNET conference, South Africa, Cape Town.

Measles outbreak was reported in Tigray region, Wolekiate, and Tsegede districts in October, 2011 and Secondary data of this outbreak was described as body of work.

Chapter I – Outbreak/Epidemic Investigations

1.1. Malaria outbreak investigation of Tigray region, Kola Tembiene woreda, May, 2009

Zayeda Beyene

Abstract

Background: Malaria is a major cause of mortality and morbidity in Ethiopia. The disease is distributed in most parts of the country including Tigray. In April 2009 surveillance information and notification to the Regional Health Bureau suggested an increase in the number of malaria cases in one district. An investigation was conducted to describe the epidemiology of the outbreak and develop recommendations and guidance to improve control efforts.

Methods: Secondary data was collected from logbooks in the district health office and health centre, entered into an electronic database and analyzed was using Excel.

Results: 1775 suspected malaria cases and 1 death were identified between April 22 and May 11. Cases were reported from 8 villages; 930 (52.3%) were male, 685 (39%) were between 15 and 44 years of age. Rapid diagnostic tests were performed on 854 blood samples; 543 (64%) were positive for *Plasmodium falciparum.* The highest attack rate (AR) occurred in the villages of Asteleke (AR 47.4%; 609/1285) and Tseberek (AR 33.6%; 390/1160). Mass febrile treatment with Co-Artem was undertaken in the district. Distribution of insecticide treated nets (ITNs) had last occurred in 2005.

Conclusion: A large outbreak of *Plasmodium falciparum* was confirmed; however, there was an extended delay in response and investigation activities. ITNs were not in use and increased frequency of distribution is necessary. Notification procedures must be improved to decrease delays in notification and facilitate earlier response activities.

Keywords: malaria outbreaks, Ethiopia

1.1.1 Introduction

Each year Malaria affects over 100 million persons worldwide, with an annual cost in human life exceeding one million deaths (1).Malaria is major public health problem in Ethiopia (2). The disease is distributed in most parts of the country with varying degrees of intensities from place to place depending on local epidemiological factors. It is estimated about 75% of the land is malaria's and 65% of the population living in this area (3). Malaria affects mainly children in highly endemic areas where adults have partial immunity to the disease (4).The nature of malaria in Ethiopia is mostly unstable (3). In areas with unstable transmission, setting up systems for epidemic early warning has become essential (4).

The most notable epidemic of malaria in Ethiopia occurred in 1958. This was a devastating epidemic as there were an estimated three million cases out of which 150,000 people died. Most of the epidemic-affected areas are highlands or highland fringe areas where the population lacked immunity to malaria and thus all age groups are frequently affected. (5) Large-scale periodic epidemics have been associated with increase in temperature, abnormally high rainfall as well as unusually prolonged dry seasons. (5)

Kola Tembiene district is located in Central Zone, Tigray Region. Guya is one among 27 Kebeles in Kola Tembiene. It is one of endemic area for malaria.

The outbreak was detected in Guya Kebele; guya health centre on April 22, 2009 G.C. The detection was made as the number of cases doubled from the previous month number of malaria cases. Without delay when the outbreak notification was made 61 samples were taken from febrile patients who came to the health centre. 37/61 (61%) blood samples were positive for plasmodium falciparum malaria by Rapid Diagnostic Test (RDT); the next day on April 23,2009G.C 36/52 (69%) were positive. On 24/04/09 the health centre notify kola tembiene district health office and to the Regional health bureau on same day by telephone.

The Objective of this investigation was to verify the presence and extent of malaria Outbreak and to know the conditions leading or contributing to increase of cases or outbreak.

1.1.2 Methods

Kola Tembiene District is located in Tigray Region, Central Zone about 110KM from the capital of Tigray (Mekele) with a population of 144,591 in 2009 G.C by projection. Its climate is hot, and is one of endemic area for malaria in the region. There are 27 kebeles in kola Tembiene District. Guya is one among these 27 kebeles. Guya is 35KM in west of Tembiene; has 4 villages and 1 health centre.

During the arrival of team the outbreak was contained. Secondary data of the outbreak was collected from District health office surveillance unit and surveillance focal person of guya health centre.

Interview with key informants was made with District health office and Guya health centre officials.

House to house visit was made to determine utilization of impregnated bed net and inspection of possible breading areas of mosquito.

Environmental inspection for possible breeding sites of mosquito at house hold level and community level like accumulated water in a container, stagnant water, irrigations

Data was analyzed using micro soft excel.

1.1.3 Results

A total number of 1775 suspected malaria patients were seen during 22/04/2009 to 10/05/2009.Main symptoms of malaria patients which were reported during the outbreak are fever, chills, vomiting & joint pain. 854 blood samples were taken for RDT (a type of test that diagnose only Plasmodium falciparum) from 1775 suspected febrile malaria patients; 543/854 (64%) were positive for *Plasmodium falciparum*. Mass febrile treatment was initiated on 30/04/2009 with Co-artem for all malaria suspected cases that were febrile during house to house visit.

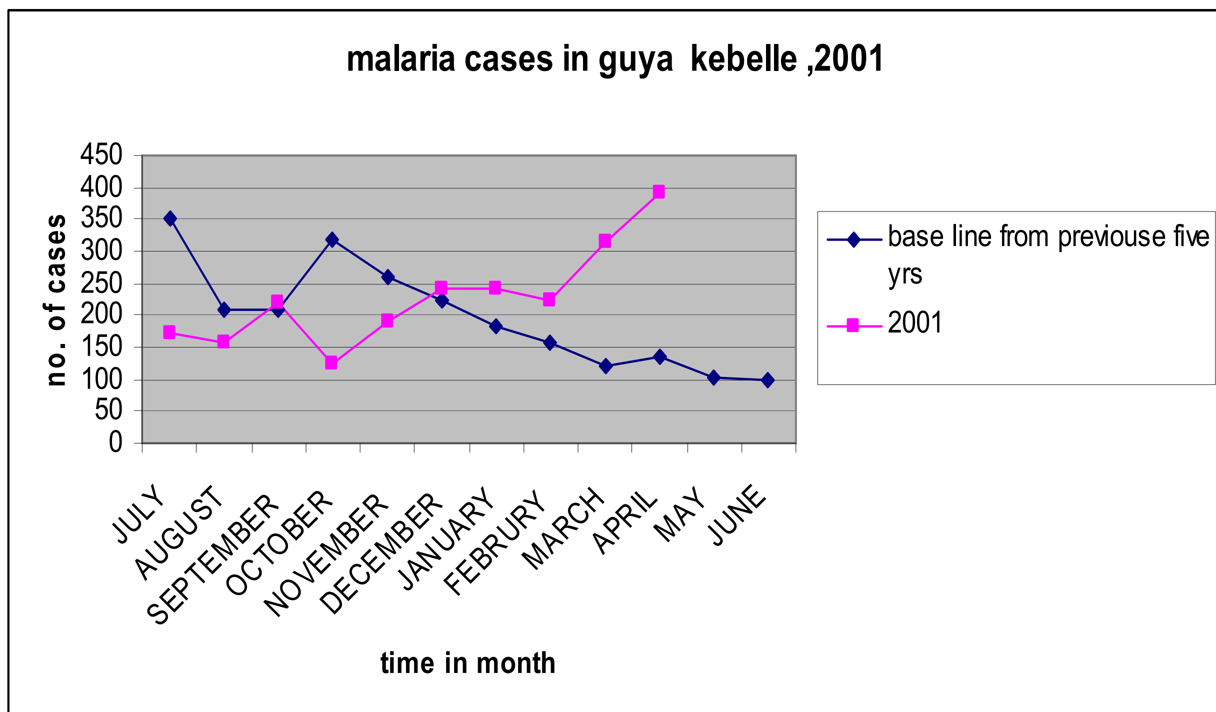

Figure1.1.1 Malaria cases of guya Kebele in relation with second largest number of previous five years.

N.B in the above graph the Number of patients who are seen in the health facility during the outbreak is not included.

There are different types of setting thresholds for malaria .Third quartile is one among them. In this outbreak we take five years data of the area and took the second largest number and take as base line to decide of the outbreak. So as we can see from graph 1.1.1 2001 E.C

(2008/2009G.C) crosses the base line data starting from January but the health centre has detected the outbreak lately in April.

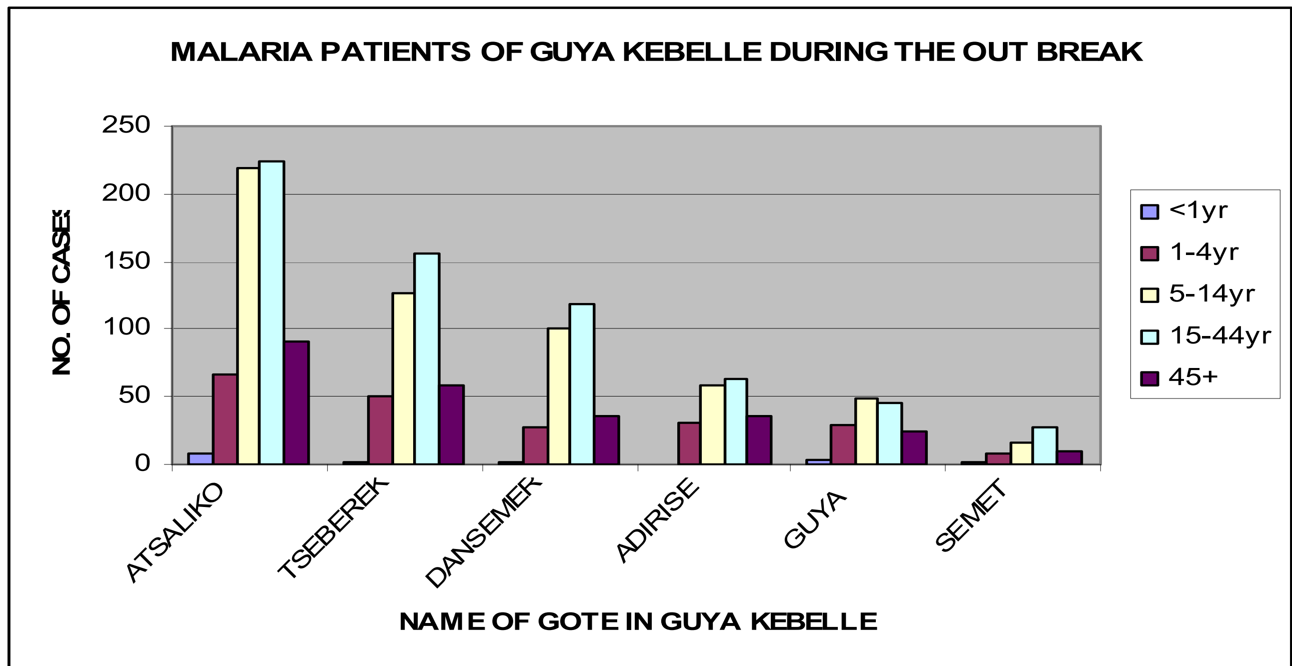

Figure 1.1.2 Distribution of Age group and Malaria cases in different villages of guya Kebele

Among 1775; 52.3% (930/1775) were male and 47.4% (842/1775) were female. There was one death who is less than 5 yrs old. Eight villages (4 kebeles) were involved in this out break and guya Kebele is one among and in this Kebele contains 4 villages but the most involved villages were 2 of them namely Asteleke with attack rate of 47.4%(609/1285) and Tseberek with attack rate of 33.6%(390/1160) .

There was high number of suspected malaria cases in age group of 5-15 and 15-44 years old in relation with other age groups almost in all villages that have reported malaria cases.

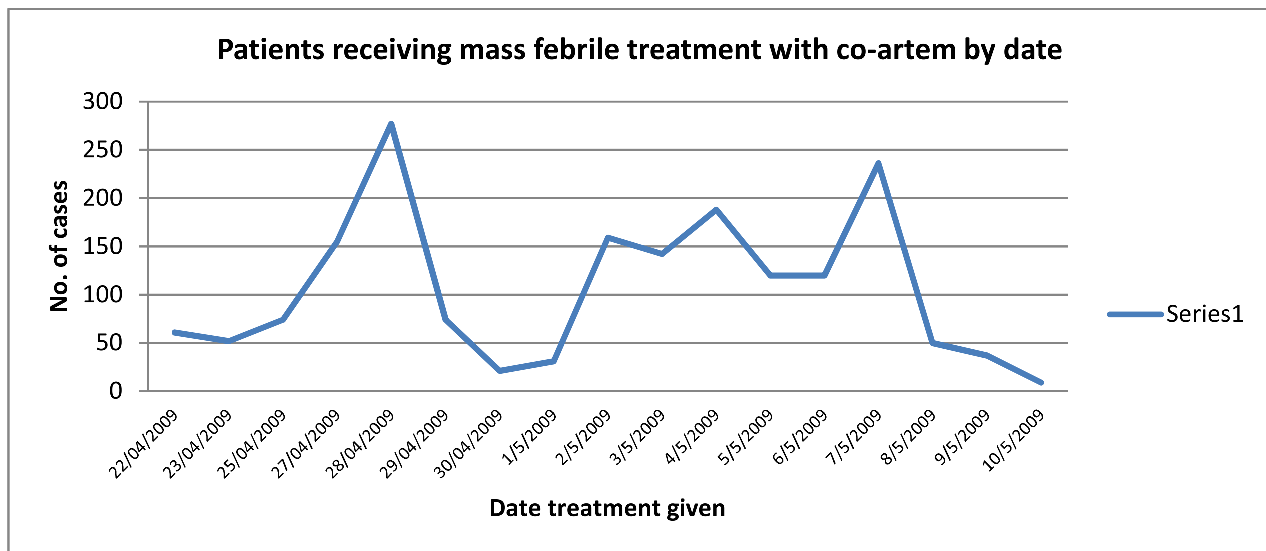

Figure 1.1.3 shows number of cases seen by date of treatment given during the outbreak.

It was difficult to get line list of cases or date of onset of all cases during the arrival of the team so we couldn't made an Epi-curve of the outbreak but the above figure shows date the cases receive mass treatment.

Environmental and House to House Survey Finding

- In guya Kebele there is a major river called diza which passes especially through Atseliko. This river dries during dry season but some stagnant water is left in different places of the river making a good breeding area of mosquito.
- There was 3 days heavy rain standing from 12-21 March, 2009 which precedes the outbreak and may have contributed to increased mosquito population.
- ITN were distributed to the community in 1998 E.C (4 years back).They were torn in different places & even it is difficult to darn. Additionally there was improper use of ITN.
- There are traditional gold miners, they dig a hole & they let it as it is with water might play role.

Figure 1.1.4 Shows Environmental inspection of Mosquito breeding sites

Responses given

- Mass febrile treatment for all febrile cases by house to house visit and those who came to health facilities was treated with co-artem
- Drainage, fill up of pits and health education was given to the community about proper usage of ITN, medications & preventive methods
- Discussion with local leaders about their responsibility on prevention & control of the out break & even post out break.
- Spray of DDT is on the way.

1.1.4 Discussion

Malaria epidemics due to *Plasmodium falciparum* are reported frequently in the East African highlands (6) majority of Suspected cases tested for malaria by RDT was positive for *Plasmodium falciparum* .Two villages of guya Kebele namely Asteleke with attack rate of 47.4 %(609/1285) and Tseberek with attack rate of 33.6 %(390/1160) were the most involved villages. There is a river that passes through Atseliko and this village is nearer to Guya health centre.

Age group of 5-15 and 15-44 years old are highly affected in relation with other age group almost in all villages that have reported malaria cases.

Mass treatment started on 30/04/2009 that was late because >30/50 was positive for *Plasmodium falciparum* with RDT on 22/04/2009 that was the first date of outbreak detection and the Distributed ITN in the district lasts about 4 years that is the ability of ITN to prevent malaria chemically is over and additionally in some of visited houses they did not utilize ITN appropriately.

There are different places with stagnant water in Guya Kebele that couldn't be drained or filled because the community uses for their cattle to drink .

Data is very sensitive indicator of outbreak detection but guya health centre was very late to detect the outbreak because they did not analyze or they didn't follow weekly report appropriately.

Recommendation

- ITNs should be distributed to the woreda with in short period of time & distribution should be according to family size.
- There are different places with stagnant water that couldn't be drained or filled because the community uses for their cattle to drink. So frequent disturbance of the water to discontinue the life cycle of the mosquito and use other possible opportunities.
- Continues training and update on how to detect outbreak of epidemic prone diseases and when and how to treat cases.
- Health sector, administrator, & other stakeholders should collaborate to prevent & control the disease.

Gaps mentioned by the woreda health office

- There is a shortage of all type of drugs of choice for malaria (Quinine, Co-artem, Chloroqiune) at Heath Centre, District, and Regional level.
- There is no ITN at all level and Spare part for DDT sprayer that is becoming an obstacle for DDT spray.
- There is no temephos that could treat surface of rivers

Acknowledgement

We would like to thank Ato Tekleabe and Ato Goitome at Regional Health Bureau who gave us an opportunity to investigate the outbreak and work with them and gave us data .We need to appreciate Ato Abreha fisseha for his commitment who work with us until we finish our investigation and gave us all data of the outbreak in Kola Tembiene District Health Office & Ato G/medihine Hadush at guya health for all his help.

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1.2. Shigellosis Outbreak Investigation in Technology Campus, Addis Ababa University; March- April 2010

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Abstract:

Background: Addis Ababa had average rate of 204 cases of diarrhoea with blood /100,000 population / year from 2005 to 2008. Cluster of cases of diarrhoea were reported from Technology Campus of Addis Ababa University in March 2010. We investigated to identify the causative agent, identify the source, control the outbreak and to recommend on prevention of future occurrences.

Methods: We conducted descriptive with matched case-control study, and laboratory and environmental investigations. Using structured questionnaire, we collected data regarding risk factors since the preceding 5 days prior to onset of the outbreak. Data were analyzed using Epi-info version 3.3.2 statistical software and excel sheet.

Results: There were a total of 104 patients, with overall attack rate of 6.8%. Stool culture [45% (5/11)] grew *Shigella flexneri* species. Shortage of water (Odd Ratio OR: 2.65 and 95% confidence interval, CI: 0.987-7.108), lack of habit of hand washing with soap or detergent after using the toilet (OR: 2.4 and CI: 0.872-6.604) increased the risk of being ill; moreover, with the foods served on 26Friday, Mar.2010 lunch time and on 27Saturday Mar.2010 dinner (OR: 3.59, CI: 1.011- 12.731 and OR: 2.89 CI: 1.021- 8.173) were also associated. The hygiene and sanitary conditions in the cafeteria, kitchen, living area was poor; and the stored water was fecal contaminated (fecal coliform count >161 Mpn /100ml)

Conclusion and Recommendations: regular supervision of the food facilities and food hygiene and sanitation; correcting the water shortage and the latrine facility with promotion of hand washing and provision of safe water could reduce further outbreak.

Key words: Shigellosis, ***Shigella flexneri,*** Addis Ababa University

1.2.1 Background

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ϒ AAU medical faculty, Black Lion specialized Referral Hospital, Emergency department

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Diarrhoeal disease continues to be a leading cause of morbidity and mortality worldwide, and is ranked fourth as a cause of death (1) and second as a cause of years of productive life lost due to premature mortality and disability (2).Several of the common gastrointestinal infections characterized by diarrhoea are diseases like cholera, shigellosis, salemonelosis, campylobacter enteritis, Escherichia coli infections, yarsenosis, gardiasis, cryptosporosis, and viral gastroenteropathy (3).

Diarrhoeal disease outbreaks are common in the overcrowded communities and in poor hygiene and sanitary conditions of the environment. The common causes of such outbreaks are food and water borne diseases which are transmitted by feco –oral route. In developing countries, poor sanitation and substandard living conditions create an environment in which diarrhoeal pathogens exact a terrible toll, especially among children. The acquisition of diarrhoeal pathogens through the food supply is a major problem both in the developing world and in the United States, where 400-600 documented food-borne outbreaks and millions of cases are estimated to occur each year (4).

Bloody diarrhoea is wide spread globally and occurs in outbreaks. Shigellosis is the most common cause of outbreak of bloody diarrhoea worldwide with high rate of secondary infection as high as 40% in the household (3) and case fatality rate up to 15-20% (3,5). Outbreaks are most common in overcrowded, impoverished areas with poor sanitation, inadequate hygiene practices, and unsafe water supplies. Refugees and internally displaced persons are at especially high risk. As seen in Africa, South Asia, and Central America in the

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4. Wilson WR, Lawrence W, Drew N K, Henry MA, Sande DA, Relman JM, Steckelberg JL. Current Diagnosis & Treatment in Infectious Diseases, 1st edition. Gerberding Publisher: McGraw-Hill/Appleton & Lange, June 22, 2001

5 World Health Organization. Guidelines for the control of shigellosis, including epidemics due to Shigella dysenteriae,1.2005.

recent past(5) killing as high as 20,000 people in one month alone among Rwandan refugees in Zaire in 1994 due to *Shigella dysenteriae* type 1(Sd1) (5).

Shigella has very low infectious dose as low as 10- 200 viable bacteria (3, 5) with incubation period of 12-96 hours (3). It usually manifests as diarrhoea with blood and mucus in the stools. Patients may, however, present only with acute watery diarrhoea without visible blood or mucus, and without the other symptoms described above, especially at the beginning of their illness (5) .The bacteria transmitted by ingestion of contaminated food or water, or through person-to-person contact. Flies can breed in infected feces and then contaminate food; vegetables can become contaminated if they are harvested from a field with sewage in it (3, 5). Shigella bacteria are present in the stools of infected persons while they are sick and for up to a week or two afterwards Most Shigella infections are passed through the fecal-oral route (3).

The annual number of Shigella episodes throughout the world was estimated to be 164.7 million, of which 163.2 million were in developing countries (with 1.1 million deaths) and 1.5 million in industrialized countries. The estimated annual number of cases of shigellosis among persons aged above 5yrs living in developing countries is roughly 50.0 million cases per year (5). The median percentages of isolates of S. flexneri, S. sonnei, S. boydii, and S. dysenteriae were, respectively, 60%, 15%, 6%, and 6% (30% of S. dysenteriae cases were type 1) in developing countries including Ethiopia6.(7,8). Shigella flexneri is the dominant serogroup in developing countries (9,10).

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10. Khan AM, Curlin GT, Huq I. Epidemiology of Shigella dysenteriae type 1 in Dhaka urban area. Trop Geog Med. 1979, 31: 213-23.

In Ethiopia, as in other developing countries, there is limitation of data (6, 7, 8), but taking ***diarrhoea- with blood*** as proxy-indicator, the national figure from the year 2005/06 to 2007/08 was on average 75,531 cases per year at the outpatient (about 98 cases per 100,000 population per year); and average number of admission was 1901patients and 72 deaths per year. And Addis Ababa took the major share with average rate of 204 cases per 100,000 population per year in this period (11,12,13). There was a report of epidemic in 2005/06 in Southern Nations Nationalities Peoples Region (SNNPR) with a total of 209 cases and 1 death(11); and in December 2008, a total of 566 cases of shigellosis were seen in Jimma City outbreak (14). In Ethiopia, from the limited data available, *S. flexneri* and *S. dysenteriae* comprise over 80 % of total Shigella isolates (6), and the prevalence of S. flexneri alone from isolates has been reported to be between 50% (6) and 70% (7,15) and as high as 99%(16).

On 23 March 2009, a report came from the AAU technology campus students' clinic as unusual increased number of patients- students complaining of diarrhoea, fever and abdominal cramp with generalized weakness and some are referred to hospital for inpatient care. This is very unusual to the campus in its long history. As preface, in the past few years, the campus's intake of students has tripled and quadrupled, without expansion of student services facilities; with an overcrowded and unhygienic living condition. Conversely, diarrhoeal diseases occurred in the campus occasionally and in few students but with unknown incidence, and

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11 Federal Ministry of Health, Ethiopia; Health and Health Indicators, 2005/2006

12 Federal Ministry of Health, Ethiopia; Health and Health Indicators, 2006/2007

13 Federal Ministry of Health, Ethiopia; Health and Health Indicators, 2007/2008

14 Fessehaye A. and et al. Investigation of Dysentery outbreak and its causes, Jimma city, Southwest Ethiopia. Ethiopian J Health Sciences. 2009, 19:147- 154.

15 Moges T. Sero diversity and Antimicrobial Resistance pattern of Shigella isolates at Gondar University Teaching Hospital, Northwest Ethiopia (2006- 2008).Jpn. J. Infect. Dis. 2009. 62, 93-97.

16 Belay R. and et al. Antimicrobial Susceptiblity Pattern of *Shigella* Isoltes in Awassa, (1997-1998). Ethiop J Health Dev.2000, 14(2): 149-154.

were managed by the Campus Clinic (17).We investigated this cluster of cases to identify the causative agent, identify the source, control the outbreak and propose recommendations to prevent future occurrences.

1.2.2 Methods

We conducted descriptive epidemiology, laboratory investigation, case-control study, and environmental investigations.

Study population:

The study was in a source population of 1554, including the technology campus students in AAU and the student cafeteria workers- like the food handlers and cooks.

Descriptive Epidemiology:

We collected the surveillance data using the epidemic line listing formats of the PHEM from the time of outbreak onwards. We defined the suspected case of Acute Diarrhoeal Disease Syndrome as any person who has sudden onset of abdominal cramp, diarrhoea (with or without vomiting), fever, joint and muscle pain, OR Diarrhoea with any of the above symptoms since Sunday, March 28, 2010. After we prepared the case definition, we notified the campus community to report early to the campus clinic by posting it on the notice board of the campus. We interviewed the suspected case patients and reviewed medical records to collect information regarding identification, sign and symptoms, and laboratory investigation and the outcome.

Laboratory investigations:

The first 11 cases of the outbreak were sent to Black Lion Hospital. Blood, and stool specimens were collected for culture. All 54 student cafeteria workers were also sent to the regional Laboratory, Zewuditu Memorial Hospital, and Yekatit 12 Hospital to be evaluated and give stool samples for culture.

Case- Control study:

We conducted a matched case control study involving suspected case patients in the first 4 days of the outbreak. We tried to include most of suspected cases in the first 4 days of the outbreak with a total of 34 cases; we compared each with one other control recruited from the same living room (dormitory), selected at convenience. These students are of similar age

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17 Briefing was given for the investigation team on arrival by Dr/Engineer Shimelese Admasu (AAU, Technology Faculty Student Dean).

group and sex and share the same room services. We designed structured questionnaire and collect information regarding demography, drinking water information, latrine and hygiene, contact history with a suspected case, food menu served over the past 5 days; after we got oral consent from the subjects. Data were entered, cleaned and analyzed using Epi-info version 3.3.2 statistical software and excel sheet.

Environmental Investigation:

A team was moved to inspect and collect information regarding the overall conditions, hygiene and sanitation of the living areas, the water supply, kitchen (structure, food preparation, handling and storage), and the cafeteria and interviewed the cooks and the administrators. And sample of poorly stored meet and water served in the cafeteria (from the pipe and collection tank in the cafeteria) were collected for laboratory investigation.

Operational Definition:

Working case definition: after analysis of the collective sign and symptoms from the patient medical records, we defined the case as:

> Probable case as: Any person who has sudden onset of abdominal cramp, diarrhoea (with or without vomiting), fever, joint and muscle pain, OR Diarrhoea with any of the above symptoms since Sunday, March 28, 2010.

1.2.3 Results

Descriptive Epidemiology

The first cases of acute diarrhoeal disease syndrome were reported to the campus clinic on 29 March, 2010. And the first date of onset of symptoms was on 28 March, 2010. The majority of patients presented with the symptoms of diarrhoea, abdominal cramp, and fever (table 1.2.1).Total number of patients' was 104(over a period of two weeks) with median age of 20 yrs and age ranging 17-30 yrs. Among them 95% (99/104) were males. The overall attack rate is 6.8%. Six percent of cases came for second time for they did not improve, 11.5% (12/104) of patients were referred to the hospital for inpatient care, and there was no death.

All these cases are from different departments in this campus, different years of study and different living buildings. But all of them have cafeteria and water source in common. All case patients ate at the cafeteria nearly the whole 5 days prior to the onset of the outbreak.

The overall time pattern of the epidemic showed that significant number of cases presented in the first 4 days based on onset of symptoms (figure 1.2.1).

Table1.2.1 Clinical Presentations of Cases of Acute Diarrhoeal Disease in the Technology Campus (n=80), AAU, Addis Ababa; Mar- April 2010.

symptom	Percent n= 80
Diarrhoea	94%
Abdominal cramp	72%
Fever	41%
Chills	25%
joint pain	16%
Vomiting	5%

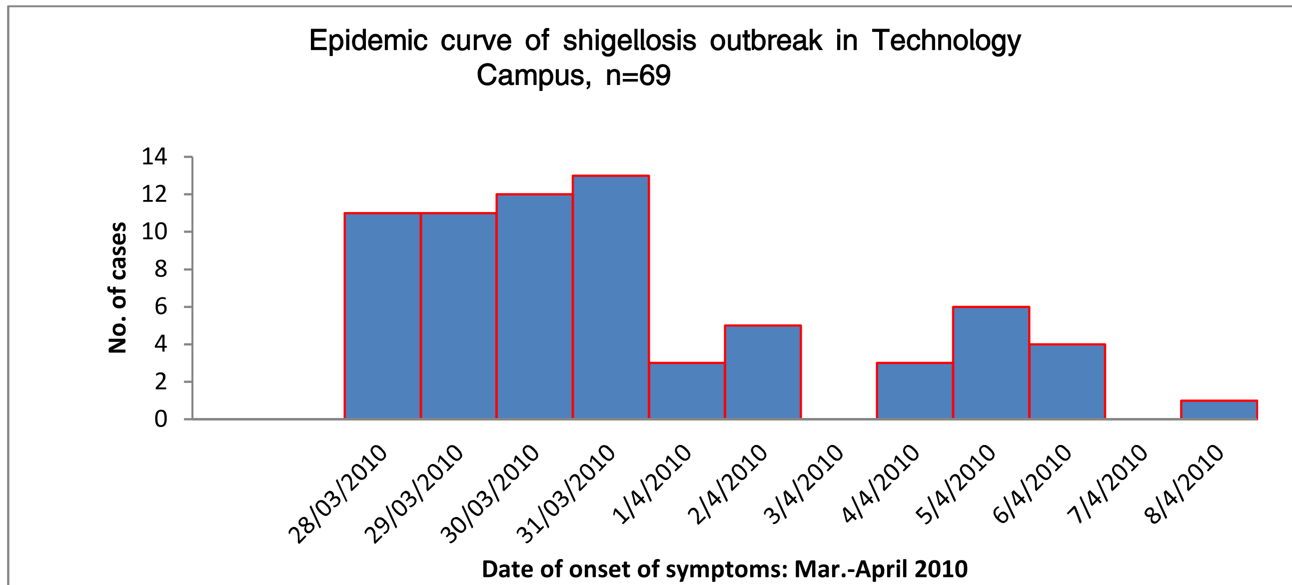

Figure 1.2.1 Epidemic curve of shigellosis outbreak in Technology Campus, AAU; March - April, 2010

Based on the distribution of cases over time and their common points are the cafeteria and the water sources, and their overcrowded living condition, common point epidemic is suspected; and we generated the hypothesis that the epidemic could be due to polluted water, contaminated food, or person-to-person contact.

Laboratory Investigation:

From the medical records, 21 stool samples were collected for direct microscopic evaluation revealed inflammatory diarrhoea in 47.6 %(table 1.2.2); and 45% (5/11) of stool samples collected for culture in Black Lion Hospital grew Shigella flexneri species. And nothing found from the blood specimens.

Table 1.2.2 Direct Microscopy examination Results of Stool samples collected from Case-Patients of ADD Outbreak, AAU Technology Campus, Addis Ababa, March- April 2010. n=21

Direct Microscopic stool Examination Result	Percent (number) %(n)
RBcs and/ or Pus cells	47.6 (10)
E. histoletica	14.3 (3)
E. histoletica with RBCs and Pus cells	4.8 (1)
G. lamblia	4.8 (1)
H.nana	4.8 (1)
Ascaris lambricoids	4.8 (1)
Strongloid stercoralis	4.8 (1)
Tricuris tricuria	4.8 (1)
No ova or Parasites	9.5 (2)

Case Control Study:

We recruited 34 suspected cases (median age: 20 years) and 34 controls (median age: 19 years, P=0.11) for the case-control study. The major risk factors or vehicles for such ADD outbreak like contaminated water, food and /or direct contact from person to person or factors related to the basic hygiene and sanitation were assessed.

Overall, 66.2% (45/68) of the respondents pointed that there is no functional hand washing facility in the latrine area and even 39% of respondents with functional tabs do not always wash their hands with soap or other detergent after using the toilet. There was close contacts with the patients in 60.3% (41/68) of respondents living in the same room, attending the patient, sharing utensils, or eating together. 81.5 % (53/65) of the respondents were served up in the campus cafeteria, and 89.7% (61/68) drank nothing outside the campus during the study periods (since five days before the outbreak).

Suspected cases were more likely than controls to experience from shortage of water (Odd Ratio OR: 2.65 and 95% confidence interval, CI: 0.987-7.108), lack of habit of hand washing with soap or detergent after using the toilet (OR: 2.4 and CI: 0.872-6.604); moreover, the analysis of the menu served over 5 days prior to the onset of the outbreak showed that the odds of being ill was associated with the foods served on 26Friday, Mar.2010 lunch time and on

27Saturday Mar.2010 dinner (OR:3.59, CI: 1.011- 12.731 and OR: 2.89 CI: 1.021- 8.173) (table 1.2.3). These were foods served for both the fasting and non-fasting students.

Table 1.2.3 Risk factors Analysis for possible association with Acute Diarrhoeal Disease Outbreak in Technology campus, AAU, Mar- April,2010

Risk factors (as assessed since 5 days prior to the onset of the outbreak)	Cases(N=34) No. (%)	Controls (N=34) No. (%)	Odds Ratio (95% Confidence interval)	p-value
Food served on:				
• 26/03/10-Friday lunch, Misir Key wot	30(88.2%)	23(67.6%)	3.59(1.011-12.731)	0.0406
• 27/03/10- Saturday dinner Alcha keke wot	26(76.5%)	18(52.9%)	2.89(1.021-8.173)	0.0423
Eating outside the campus(anything)	5(15.2%)	7(21.9%)	0.638(0.179-2.267)	0.2535
Drinking outside the campus (anything)	4(11.8%)	3(8.8%)	1.378(0.28- 6.68)	0.5000
Contact history with the patient	19(55.9%)	22(64.7%)	0.69(0.26- 1.83)	0.4570
Latrines with malfunctioning water tabs	23(67.6%)	22(64.7%)	1.141(0.321-2.396)	0.2020
Shortage of water in the campus	19(55.9%)	11(32.4%)	2.649(0.987-7.108)	0.0507
Soap or detergent use after latrine use	16(50%)	10(29.4%)	2.4(0.872-6.604)	0.0871

Further multivariate analysis of the risk factors with p value of less than 0.1 showed no significant difference from the bivariet analysis (table 1.2.4). And the risk factors still associated with are the food items and the shortage of water.

Table 1.2.4 multivariate Analysis of risk factors (with p-value <0.1) of shigellosis Outbreak in Technology campus, AAU, Mar- April,2010

Risk factors (as assessed since 5 days prior to the onset of the outbreak)	Odds Ratio (95% Confidence interval)	p-value
Food served on:		
• 26/03/10-Friday lunch, Misir Key wot	3.12 (0.701- 13.89)	0.135
• 27/03/10- Saturday dinner Alcha keke wot	2. 95 (0.84 – 10.35)	0.0915
Shortage of water in the campus	3.03 (0.963 – 9.54)	0.058
Lack of Soap or detergent use after latrine use	1.92 (0.628 - 5.87)	0.253

Environmental Survey Findings

Food Hygiene: almost all students, who were sick, had eaten food in the student cafeteria for at least for 5 days prior to the occurrence of the outbreak. The cafeteria was found to be lacking in basic hygiene. The store and kitchen are not properly handled (floors were dark, not well cleaned,) and lacking shelves, no proper monitoring of the refrigerators. There did even smell meet from the deep freezer.

Water Source: Students' water source is the pipe water. But the water served in the cafeteria with meal is stored in the barrel and the caps were not well washed. It was found grossly contaminated with visible oily film in the caps. There is lack of water in the campus even for hand washing. There was shortage of running water in the food preparation and service rooms.
Latrine and Latrine Use: the Latrines are all water carriage systems; but the lack of water makes cleaning very difficult. The hand washing facilities are not functional and dirty. This makes the latrines unsafe.

Housing: the living room is very substandard with overcrowding and poor in basic hygiene and sanitation; about 15 students per room.

Hygiene and sanitation: refuse disposal was poor with dispersed rubbish particularly around the kitchen, which is potential site for breeding of flies. The cafeteria workers were complaining about shortage of soap and detergent in their working areas and the latrine.

There was no regular medical check up or training of the food handlers and cafeteria workers. The laboratory results of stool samples collected from all 54 Cafeteria workers showed no growth (negative); water specimens collected from the pipeline was potable (fecal coliform count <1 Mpn(18)/100ml which is considered as not detected) but the sample collected from the collection tank(barrel) was positive for coliforms (fecal coliform count >161 Mpn /100ml) and commented as not potable. Samples which were taken from the meat (both the Christian and Muslim) showed coliform count 3.2x106 cfu(19)/gm and 2.4x106cfu/gm respectively and too many colonies of staphylococcus spp. in both.

1.2.4 Discussion

Bloody diarrhoea has been ranked among the top 10 causes of morbidity in under five children in Ethiopia. Its occurrence is widespread throughout Ethiopia and is associated with outbreaks (20). Shigella infections are not usually fully reported to the health facilities, only less than 1% is expected to be reported (5,21). But despite this limitation in the surveillance system, the Ethiopian Public Health Emergency guideline put the threshold for epidemic detection and action as a cluster of acute bloody diarrhoea cases in the same settlement in one week (22). And hence, detection of a cluster of more than 30 cases of shigellosis in 3 days (with total of 104 patients in 2 weeks) in the campus was declared as outbreak. Further investigation of this outbreak pointed out as common source epidemic: first the pick of the epidemic curve at or near the beginning of the outbreak and the sudden fall down within the first few days (4-5 days) of the outbreak (which is about 1 incubation period or extended exposure in one incubation period), and second the low attack rate suggested the epidemic was from common

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18 Mpn: Most probable number
19 Cfu: colony forming unit
20 The Ethiopian Journal of Health and Development, 1995, vol. 9)
21 Chompook P, Samosornsuk S, Seidlein L, Jitsanguansuk S, Sirima N, Sudjai S and et al. Estimating the burden of shigellosis in Thailand: 36-month population-based surveillance study. Bulletin of the World Health Organization . October 2005, 83 (10)

source with minimal person-to-person contact transmission. The attack rate of 6.8% was not as such significant in such closed, overcrowded community where secondary attack rate can be as high as 40% at the house hold level (3, 5). This may be due to the accessibility of the health facility with prompt case management, awareness created to the campus community and factors related to the etiologic agent. The most virulent and epidemic prone serogroup of shigella is S.dysenteriae type 1(sd1), (3, 4, 5) but S. flexneri (in 45.5% (5/11) culture result) was proved to be the cause of the epidemic like the epidemic in Jimma, Ethiopia, Dec.2008. Though the sample taken from the meat showed contamination with staphylococci, the absence of characteristic short incubation period (minutes to hours) of staphylococci with abrupt onset of intoxication (not infection), no isolates from the clinical samples and there was no meat served raw helped us to exclude this differential diagnosis.

The cases were from different living blocks, different study area, and years of study with only limited common points like the cafeteria, and their indoor interaction; suggesting these were the potential sources of the outbreak. The assessment of these common points revealed that the hand washing practice and hand washing facilities were very poor worsen by the shortage of water and soap for both the students and the cafeteria workers (22). The association of the odds of being ill with both the shortage of water and the menu served further strengthens that the foods and utensils may be under washed or washed with stored water in the tank which was with fecal contamination (fecal coliform count >161 Mpn /100ml). Infections may be acquired from eating contaminated food, although contaminated food usually looks and smells normal. Food may become contaminated by infected food handlers who don't wash their hands with soap after using the bathroom. Vegetables can become contaminated if they are harvested from a field with sewage in it (5). Water may become contaminated with Shigella bacteria if sewage goes into it or if someone with shigellosis swims in or plays or come in contact with the water (especially in splash tables, untreated wading pools, or shallow play fountains used by day care centres). Shigella infections can then be acquired by drinking, swimming in or playing with the contaminated water (3, 5).

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22 John T, and et al. Epidemiology of Sporadic Bloody Diarrhoea in Rural Western Kenya. Am. J. Trop. Med. Hyg. 2003, 68(6), pp. 671–677

Significant numbers of cases were also found infested with intestinal parasites, and with the current hygiene and sanitation situation the risk of transmission to susceptible hosts is very high and needs further evaluation and a sort of deworming campaign and regular checkups, for the students and the cooks and suppliers.

The limitations of this study were due to the late notification of the outbreak and early leaving of the students from the campus. Investigation began 2 days after start of outbreak making difficult to find the real index case and to further study exposure; to find leftover food for laboratory investigation; to control recall bias to do the 'dose – response' evaluation of the risk factors; and early leaving of the students from the campus for Easter Holiday, limiting the sample size.

Measures to control the outbreak were started side by side with the investigation and the case management. The investigation team recommended immediate corrective measures to the students services office and notifies to the campus community about the disease and early treatment and control measures. But there were significant delay in the environmental sample laboratory results.

In general, the investigation team conclude that current outbreak was due to the contamination of water and food items (particularly the Friday lunch and the Saturday dinner); but the team could not conclusively determine what source and how the infection was introduced to the campus. But there hygiene and sanitation, and the living condition were/ are good fertile grounds for this and other food borne outbreak in the future.

Recommendation

The investigation team recommended the need of change of the water tank and the water supply to cafeteria should be direct from pipe line with limited use of stored water. Water storage barrel need to be narrow mouthed, closed and with faucet and regular cleaning and regular check up for chlorine residual. The campus latrine and latrine facilities should be urgently corrected and improved with water supply and hand washing after defecation should be promoted. Monitoring and regular supervision of the food preparation, storage condition,

washing and drying facilities of the utensils of the food establishments of the suppliers and the student cafeteria should be ritual. Regular medical checkups of the food handlers and suppliers, with regular training on food hygiene and safety should be mandatory. The student services and the crowded living conditions should be improved.
Additionally, the burden of intestinal parasites in the campus community needs to be studied further.

Acknowledgement

We would like to thank Dr/Engineer shimelese Admasu (Students' Dean, AAU- technology faculty) ;S/r Genet Ligaba(Head Nurse, AAU- Technology Campus Clinic); the response and assessment team of the Addis Ababa Health bureau and Regional Laboratory(Sebelework Taddesse, Enderiase Aleganehe, Mekonene G/selassie, Ethiopia Alemu);
We would also like to thank Estehiwot Zemelake(MOH,PHEM); Zewuditu Memorial and Yekatit 12 Hospitals; and students and all the participants in the study for their active and valuable participation.

Chapter II – Surveillance Data Analysis Report

2. Epidemiological Description of National Malaria Report (July, 2004-September, 2008)

Zayeda Beyene

2.1 Introduction

Malaria in Ethiopia ranks among the most important causes of mortality and morbidity (1, 2). It has been consistently reported as one of the three leading causes of morbidity and mortality in the past years (2).The disease is distributed in most parts of the country with varying degrees of intensities from place to place depending on local epidemiological factors .It is estimated about 75% of the land is malaria's and 65% of the population living in this area (1). *P. falciparum* and *P. vivax* are the two dominant parasite species with relative frequency of 60% and 40%, respectively. This proportion varies from place to place and from season to season (2).

The malaria transmission pattern in Ethiopia is highly seasonal and unstable. Because of this unstable transmission and infrequent exposure to infection, immunity is generally under developed and all age groups are at risk of malarial disease. Although pregnant mothers and children under five years of age are the most vulnerable, the population age five and older is also at high risk, and adult deaths from malaria during epidemics are relatively high(3). Malaria case numbers are influenced by factors intrinsic to malaria such as infectivity, immunity, and susceptibility of vectors and humans, and extrinsic, environmental factors such as rainfall (4).

The malaria transmission season runs from September to December, following the major rainy season from June to August, with a minor transmission season from April to May in areas that receive rains during the short rainy season from February to March(3).

The occurrence of malaria epidemics has been more frequent and wide spread in recent years. Although rain fall associated breeding of the major vector anopheles arabiensis is the main cause of seasonal malaria epidemics in Ethiopia, abnormal climatic changes have often given rise to major epidemics in the past. These epidemics have usually inflicted high incidence of mortality upon the non immune population. Most of the epidemic affected areas are high lands

or highland fringe areas where the population lacked immunity to malaria and thus all age groups are frequently affected(5).

The Objective of this Epidemiological Description of national malaria data from year 2004 to 2008 G.C was to see the time trend of malaria year to year, to describe Attack rate of malaria in different regions of Ethiopia and to visualize national malaria data in terms of Age.

2.2 Methods

Secondary monthly out patient, inpatient malaria cases and death secondary to malaria with age category of less than 5 years and greater than and equal to 5years of both sex (male/Female) was collected from Ministry of Health department of malaria and other vector borne disease. A total of five years data from July, 2004 to September, 2008 G.C of nine regions and two city administrations was collected.

Both suspected and laboratory confirmed malaria cases were also collected in both age categories of all regions and city administration.

Data was analyzed using micro soft Excel.

2.3 Results

Data analysis focused on the trend of outpatient malaria cases from year to year, the difference of malaria cases from region to region and the distribution of malaria species at national level.

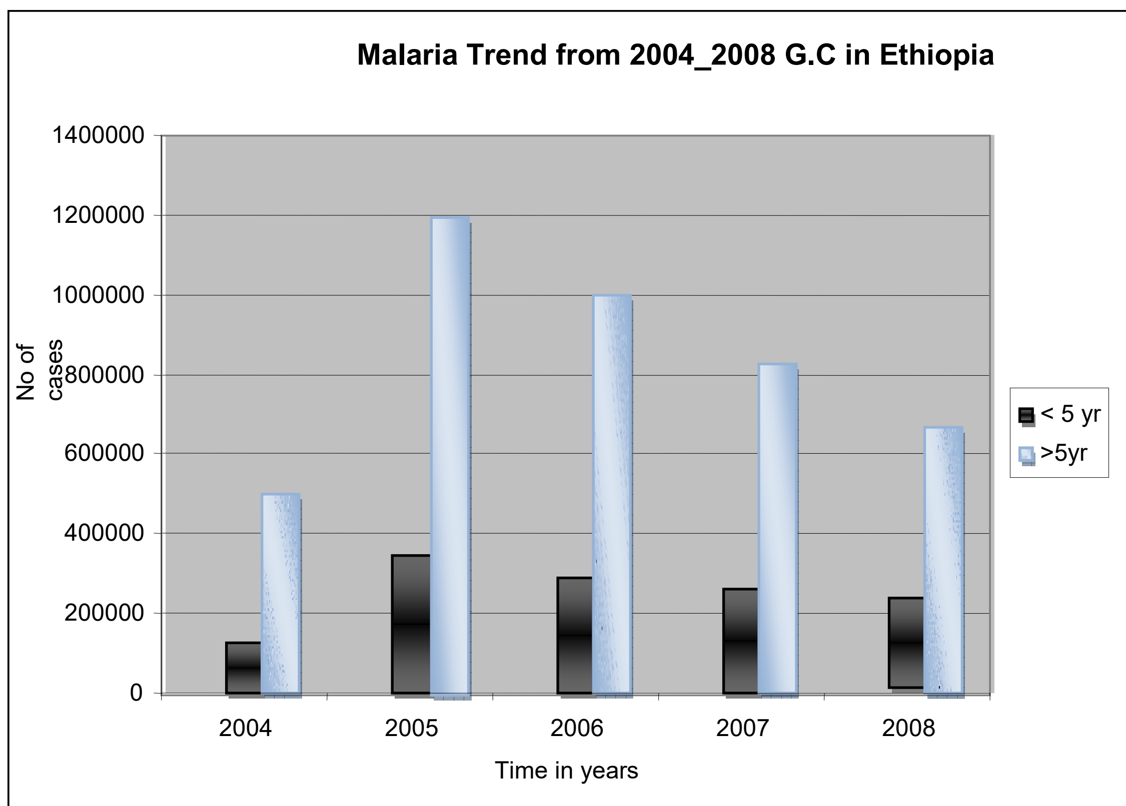

Figure 2.1 Number of National outpatient malaria cases in <5 yrs & >5 yrs old from 2004 _2008 G.C

The above figure demonstrate trend of outpatient malaria cases in Ethiopia from July, 2004 to September, 2008 G.C because the data base of the Malaria and other vector borne disease department starts in July,2004.Even though it is difficult to say anything about the previous years But there was an increment in number of malaria cases in 2005 from 2004 G.C in Ethiopia .There was pick number of malaria cases in 2005 G.C but from 2006 it was decreasing from year to year in consecutive four years in both age groups .

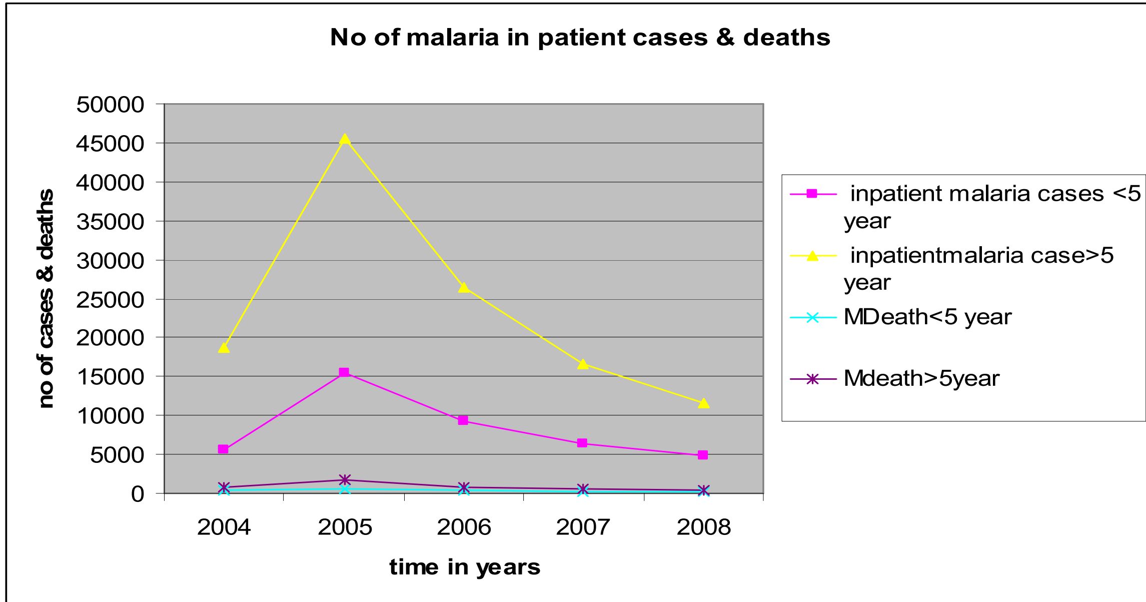

Figure 2.2 Number of National inpatient malaria cases & number of deaths, 2004 - 2008G.C

Figure 2.2 illustrate the number of inpatient malaria cases in 2005 was pick which is similarly with outpatient cases but then it was declined from year to year till 2008 and the same story has happened in number of deaths secondary to malaria in Ethiopia. Trend of malaria cases in afar is different from the trend of national level and other regions, so there is pick number of malaria cases in year of 2007 G.C. (see figure 2.3)

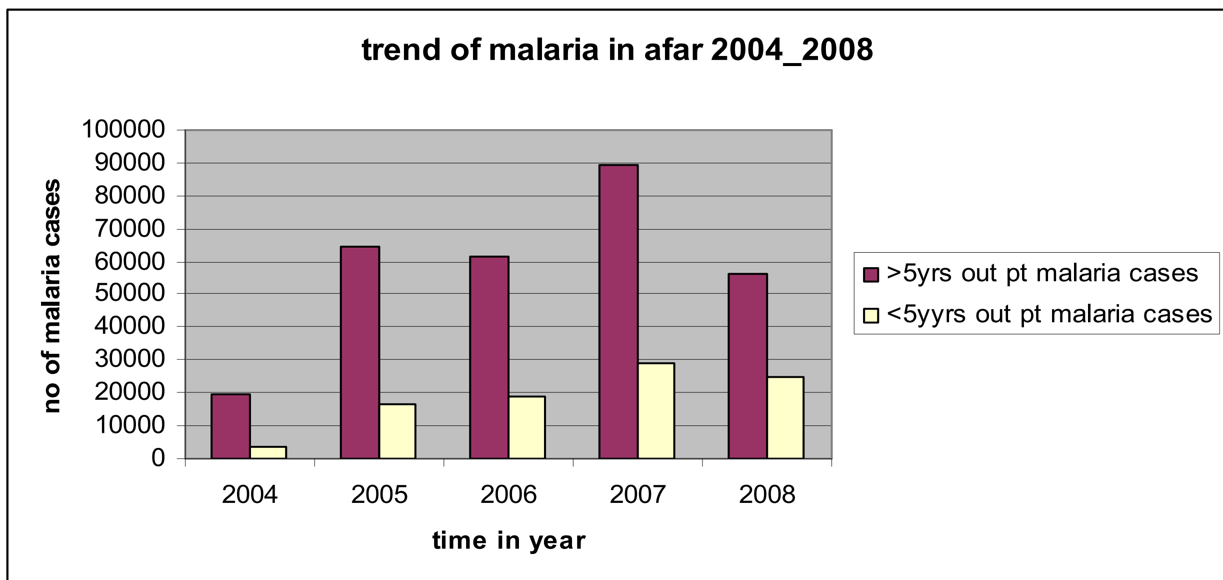

Figure2. 3 Trend of malaria outpatient cases in Afar region, 2004-2008 G.C

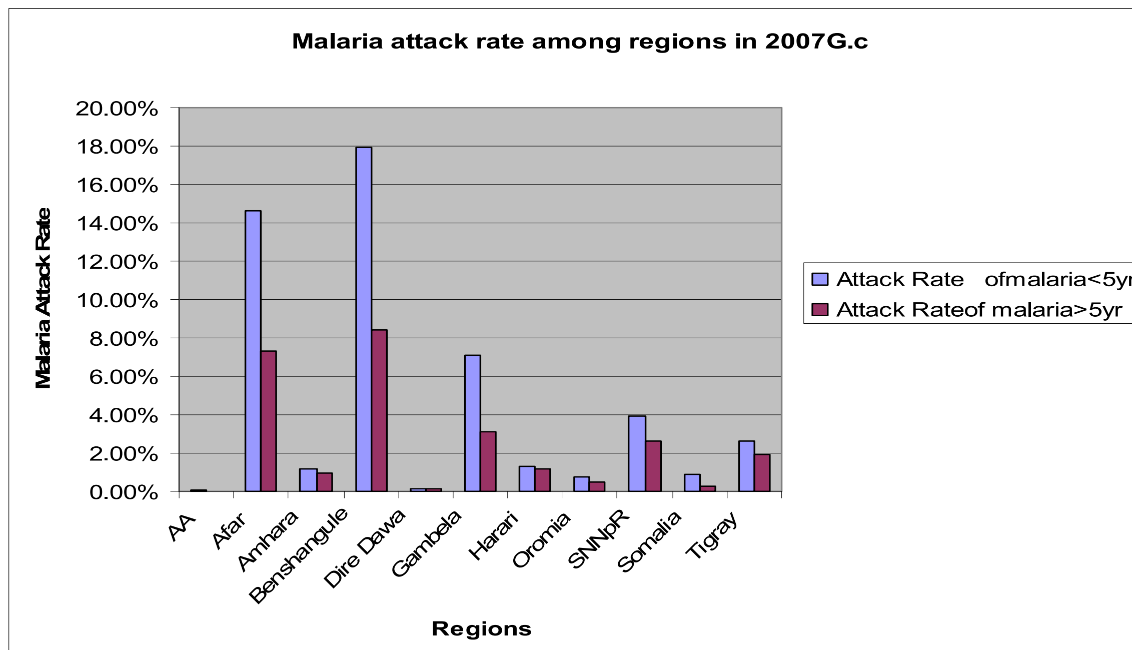

Figure 2.4 Malaria outpatient attack rate (AR) of 9 regions and 2 administrative cities of Ethiopia of 2007 G.C

There are 9 regions & 2 administrative cities in Ethiopia. Figure2.4 explain malaria attack rate (AR) by regions in 2007 G.C that shows 3 regions have high attack rate relatively with other regions namely Benshangule, Afar, Gambella. In all regions children <5 yrs old had high Attack rate of malaria.

Table 2.1 Distribution of outpatient malaria cases as plasmodium falciparum & plasmodium vivax.

year	<5yr lab. confirmed malaria cases			<5yr Total no of malaria cases (lab confirmed & suspected)	>5yr lab. confirmed malaria cases			>5yr Total no of malaria cases (lab confirmed & suspected)
	P.V malaria	P.F malaria	Total (p.f+p.v)		P.V malaria	P.F malaria	Total (p.f+p.v)	
2004	16223	32612	48835 (38.7%)	126140	55252	117724	172976 (34%)	501592
2005	38058	86885	124943 (36.4%)	343179	108206	285827	394033 (33%)	1197280
2006	35209	60087	95296 (32.8%)	290565	100519	193466	295985 (30%)	997756
2007	36403	56519	92922 (35.6%)	260400	90097	158123	248220 (30%)	824197
2008	28010	40053	68063 (30.5%)	223007	75524	108106	183630 (28%)	665497

Plasmodium falciparum & plasmodium vivax are common type of species in Ethiopia and plasmodium falciparum is the predominant type. The above table Shows proportion of plasmodium falciparum is still dominant species than plasmodium vivax however, among laboratory Confirmed cases the number and proportion of plasmodium vivax is increasing from year to year especially in <5yrs children that is 33%,30%,37%,39%,41% in five consecutive years of 2004 to 2008 G.C.

Malaria diagnosis based on clinical sign and symptoms alone is not specific and usually leads to excessive use of anti-malarial drugs. (2)On the other side the table also illustrate the proportion of malaria cases that are confirmed with laboratory examination were 38% in 2004G.C and 30% in 2008G.C in <5yrs children & 34% in 2004 G.C and 28% in 2008G.C in >5yrs old, so we can see most of the cases are suspected.

2.4 Discussion

Malaria was treated with Sulphadoxine -Pyrimethamine (Fansider) starting from 2000G.C so that the outpatient ,inpatient &death of malaria were low during 2001-2002G.C however ,short lived as there was significant increase in malaria out patient, inpatient & death during 2003-2004 G.C but then that is probably because of high resistance of sulpphadoxin-pyrimetamine (Fansider) which resulted to drug policy change to ACT(arthemether-lumefentrin) in 2004G.C but full deployment of the ACT was in 2005G.C and also LLINs distributions, IRS &coordination(6).

Trend of outpatient and inpatient malaria cases and death secondary to malaria in Ethiopia decreased from year to year from 2005G.C to 2008 G.C. The decline was consistent in almost all regions except Afar region. These results signify that the anti malarial interventions resulted in the reduction of malaria morbidity

There might be an epidemic in afar region in 2007 G.C because of climatic change, expansion of developmental activities such as irrigation. Regions with high attack rate like afar, benshangule, & gambella that are potential areas of malaria with low altitude. Children's of <5 yrs old attack rate is high comparing with >5yrs old because they are susceptible & has no immunity against malaria.

The proportion of plasmodium vivax cases is increasing from time to time that needs further assessment and investigation. Children of <5 years old are at high risk than other age group that needs priority. The numbers of malaria cases that are confirmed using laboratory examination are lower than cases that are diagnosed by symptom and sign.

Recommendation

- Interventions which are going in all parts of the country should be strengthen to have sustained result & especially in regions with highest attack rate and also regions that have tendency of epidemic (Afar) needs close follow up.

- Strengthen laboratory capacities at all levels to get laboratory confirmed malaria cases than suspected cases that might have other differential Diagnosis.

- Since proportion of plasmodium vivax malaria cases is increasing from year to year so further assessment and study is mandatory.

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Chapter III – Evaluation of Surveillance System

3. Evaluation of Epidemiological Diseases Surveillance System in Tigray, Ethiopia, 2010

Zayeda Beyene, Ghiday G/libanos, Beyene Kidu

3.1 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 (1) and it is essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know"(2). Public health surveillance is an essential component of evidence-based decision making practices (3). It includes case detection and registration, case confirmation, data reporting, data analysis, outbreak investigation, response and preparedness activities, feedback, and communication (4).

A public health surveillance system is dependent on a clear case definition for the health-related event under surveillance. The case definition of a health-related event can include clinical manifestations, laboratory results, epidemiologic information and/or specified behaviors, as well as levels of certainty (e.g., confirmed/definite, probable/presumptive, or possible/suspected). The use of a standard case definition increases the specificity of reporting and improves the comparability of the health-related event reported from different sources of data, including geographic areas (5).

Effective Communicable diseases control relies on effective surveillance and response system that promote better coordination and integration of surveillance function. In Africa, where infectious diseases continue to be a major health problem, many of the national surveillance systems ensure neither timely detection nor an effective response to them (6). To address this issue, in 1998 the World Health Organization Regional Office for Africa approved the Integrated Disease Surveillance and Response (IDSR) strategy for strengthening infectious disease surveillance and response capacity among its 46 Member States and requested that Member States conduct assessments of their IDSR systems (7), the findings of which would act as a baseline for reform plans.

Integrated disease Surveillance and response is aimed to assist health workers to detect and respond to diseases of epidemic potential, of public health importance and those targeted for eradication and elimination. The information collected through this strategy will help district health teams to respond quickly to outbreaks, set priorities, plan interventions, and mobilize and allocate resources. The Integrated Disease Surveillance and Response strategy links community, health facility, district, regional and national levels with the overall objective of providing epidemiological evidence for use in making decisions and implementing public health interventions for the control and prevention of communicable diseases(7).

Surveillance is essential for the early detection of emerging (new) or re-emerging (resurgent) infectious diseases. In the absence of surveillance, disease may spread unrecognized by those responsible for health care or public health agencies. By the time the outbreak is recognized, it may be too late for intervention measures. Continuous monitoring is essential for detecting the 'early signals' of outbreak of any epidemic of a new or resurgent disease. For disease surveillance to prevent emerging epidemics, the time taken for effective action should be short (4).

In 1996, as part of the response to the growing public health problem with communicable diseases, Ethiopia introduced an integrated disease surveillance and response (IDSR) strategy focusing on 17 priority diseases. Ethiopia adopted the world health organization's IDSR strategy in 1998, and in October 1999, the Ministry of Health (MOH) of Ethiopia and its development partners assessed the country's surveillance system and used the results to adapt a five-year national plan (8).

Since 2009 Ethiopia has introduced a new approach i.e. the public health emergency management (PHEM) to guide the prevention and control of any public health emergency problems within the country. Public health surveillance is part and parcel of the Public Health Emergency Management that helps to provide advance information of an incoming threat in order to facilitate the adoption of measures to reduce its potential health impact. Currently, the Federal Ministry of Health identified 20 diseases and health events to be reported immediately (Acute Flaccid Paralysis (AFP), Anthrax, Avian Human Influenza, Cholera, Dracunculiasis,

Measles Neonatal Tetanus (NNT), Pandemic Influenza A (H1N1), Rabies, Small pox, Severe Acute Respiratory Syndrome (SARS), Viral Hemorrhagic Fever, Yellow Fever) and Weekly (Dysentery, Malaria, Meningitis, Relapsing Fever, Typhoid Fever, Typhus, Malnutrition) at national level (9).

Information flow in Public Health Surveillance System:

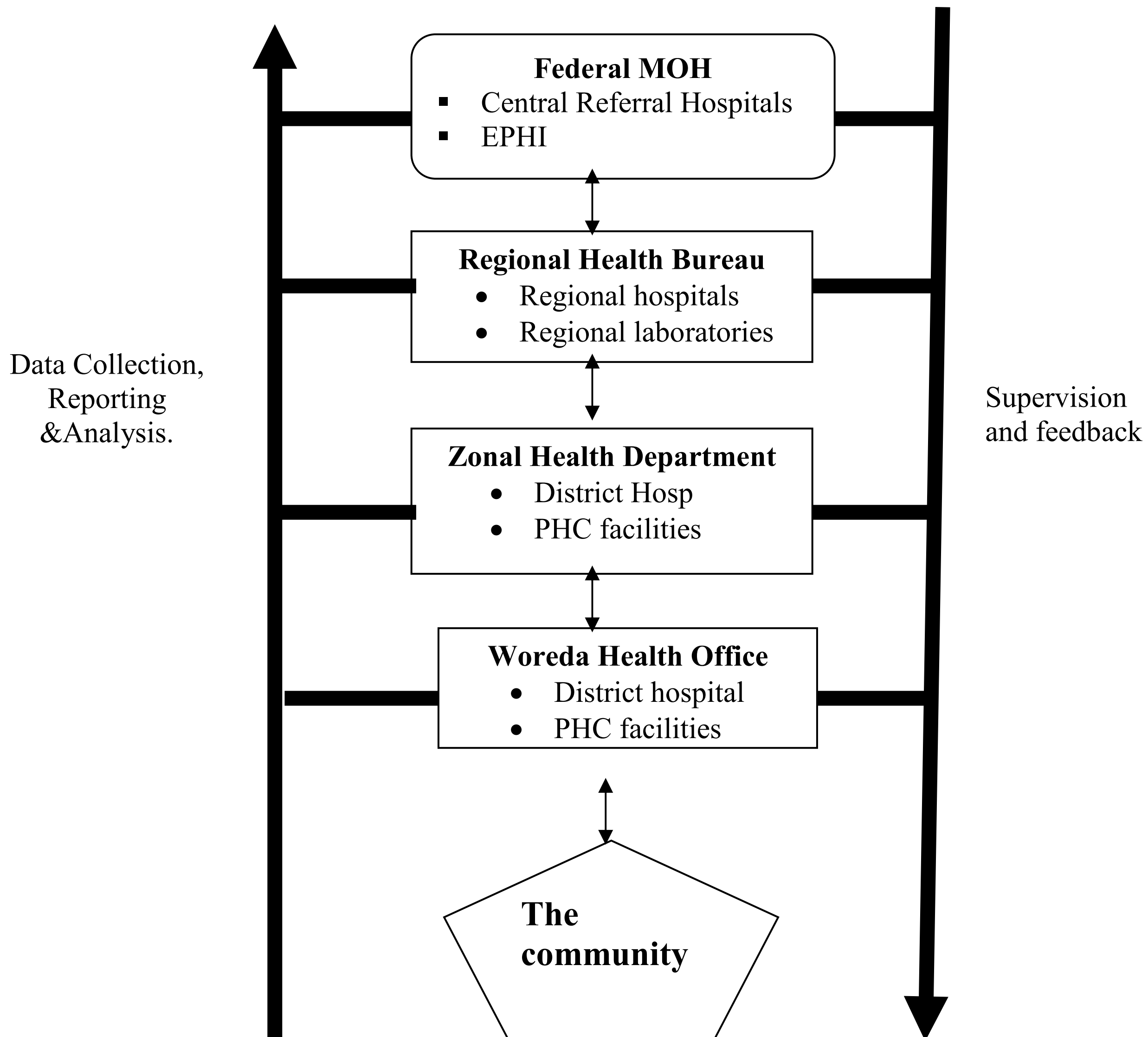

Figure 3.1 Data and information flow of IDSR indicating varying cycles at each level.

Source: Federal Democratic Republic of Ethiopia, National Technical Guideline Integrated Disease Surveillance and Response (IDSR), 2002

The purpose of evaluating public health surveillance systems is to ensure that problems of public health importance are being monitored efficiently and effectively. Public health surveillance systems should be evaluated periodically, and the evaluation should include recommendations for improving quality, efficiency, and usefulness. Evaluation of a public health surveillance system focuses on how well the system operates to meet its purpose and objectives. This evaluation will be conducted with the purpose of describing the state of communicable disease surveillance in the region indicating how well the system is working to meet its purpose and objectives.

Objective

General objective:

Evaluation of Epidemiological Diseases Surveillance System in Selected District in Tigray regional state, 2010

Specific objectives:

- Assess the surveillance core functions with regard to case detection and registration, confirmation, reporting, data analysis, epidemic preparedness and response, and feedback on selected priority diseases in the selected district,
- Assess the status of surveillance support functions in relation to standards and guidelines, training, supervision, communication, and resources
- Review attributes of surveillance system with regard to timeliness, completeness, usefulness, data quality, simplicity, and acceptability

3.2 Methods

Study area:

This surveillance system evaluation was conducted in Tigray Regional State. The region is located in the northern part of Ethiopia. According to the projection from the national 2007 census the region has an estimated population of 4.6 million people in the year 2009/10. Administratively the region is divided into 7 zones and 46 districts. The region comprises of 12 governmental Hospitals, 52 Health centres and 529 health posts. (10).

Study period: the evaluation was carried out from November 20, 2010 through November 28, 2010.

Study population: The study population of this evaluation includes all governmental health facilities performing surveillance activities, and district health offices of Mekele and South eastern zones, and the regional health bureau.

Sampling procedure: The evaluation was carried out at Regional Health Bureau, district health offices, health centres, and health posts. Two zones; namely Mekele zone and south eastern zones surrounding the Mekele capital of the region were purposely selected. The reason for selecting of zones on purposive basis is because of time and resource constraint. 1 district from each zone, 1 health centre, and 1 health post from 1 district were included in the Assessment. So Mekele city health office including Mekele and Quha health centres and Endereta district health office including semeha health centre and Haweseba health post were selected.

Data collection:

The evaluation comprised 1 weekly and 1 immediately reportable disease under surveillance that is measles and malaria.

The evaluation examined the performance of the surveillance **core Functions** (case detection and registration, confirmation, reporting, data analysis/interpretation, epidemic preparedness, and response, feedback), **supportive functions** (standards and guidelines, training, supervision, communication, resources, coordination), and **attributes** (Timeliness, completeness, usefulness, reliability/data quality, simplicity, and acceptability) of surveillance system.

The assessment tool for the core activities and support functions of surveillance system is adapted from the assessment protocol for national communicable disease surveillance system, and epidemic preparedness and response, which was developed by the World Health Organization-Regional Office for Africa (WHO/AFRO) and for the attributes of surveillance system is based on an established framework developed by the Centres for Disease Control and Prevention (CDC), Atlanta, USA. These tools are reviewed and modified accordingly to suit the local context.

Data was gathered through structured questionnaires, record review, interviews with key informants, and certain observations at facility, district, and regional health levels.

A structured questionnaire was administered to surveillance focal person at health facility, district, and regional level.

Records reviewed

Facility: case registers, laboratory registers, and, Copies of weekly reports of the previous 1month period

District: immediately and Weekly surveillance reports

Region: immediately and Weekly surveillance reports submitted by districts, outbreak investigation reports

Observation

Standard case definitions, data management, routine data analysis, use of case based weekly report forms, availability of case investigation forms, availability of surveillance guideline

Data entry and analysis

Data collection was made using structured Questionnaire by the principal investigators i.e. FELTP residents. Collected from interview and observation was analyzed using Microsoft Excel and manually.

3.3 Results

Case-detection and Registration

Health workers and community require adequate training on clinical diagnosis; be equipped with appropriate case definitions in order to detect cases of priority diseases and there should be means to capture information from any source. All of the assessed institutions have surveillance focal person but only four (66.7%) have documented plan for objectives of surveillance system activities. Regional health bureau and Mekele city health office try to capture community sourced information at occasional times conversely Endereta health office and all health centres used to get information at all times This was mainly through health extension workers, community health workers and volunteers (Abo 30 locally called). Regional health bureau, all districts, and health facilities have case definition of malaria and measles which was posted in Adult outpatient department and under five year's department. Data validation was done in regional health bureau and two districts. This was done mainly through telephone calls especially on reports which may seem to be doubtful in there correctness.

Case Confirmation and Data reporting

Regional health bureau, districts and all health facilities have capacity to transport specimen for malaria and measles case confirmation; Except Regional health bureau that claimed shortage of malaria RDTs All others are equipped with malaria diagnostic reagents but none of districts and health facilities perform external quality assurance for malaria even the health workers don't have knowledge about when, how much sample and where to send for quality assurance.

In all the responding institutions there was no malaria outbreak in last year but there was measles outbreak in Mekele city, wolekiate, and Tsegede districts.

Only regional health bureau is using E-mail to report to federal level but districts and health facilities are using hard copies and telephone calls to report to the next higher level. Regional health bureau, district health offices, and health facilities sent and received reports to and from their immediate levels. During the assessment a three months report was reviewed, all of them have sent and received 12 times (based on a weekly reporting form for malaria) and all

reported measles cases was on case based reporting form. All the respondents had standard weekly, case based; line listing and epidemic reporting forms in the last three months period.

Data Analysis and outbreak investigation

Public health surveillance is the ongoing, systematic collection, analysis, interpretation, and dissemination of data for use in public health action. The assessment found that regional health bureau has clearly defined epidemic threshold for measles. However, Health facilities and districts neither analyze their data nor know standard, clear, and defined threshold for both malaria and measles. The only thing we have seen during the visit ten top diseases were posted in semeha health centre.

Measles outbreak of wolekiate and Tsegede was investigated by regional health bureau but Mekele city administration did not try to investigate same type of outbreak. There was no reported malaria or measles outbreak in those visited health centres other than Mekele health centre and health post since 2009 G.C but there was confirmed relapsing fever outbreak in Mekele health centre but the only thing they have done is directly intervene for what they thought needs to be done.

Epidemic Preparedness and response

All responded health facilities have a rapid response team but not functionally active and works with a trend of reactivation after the occurrence of an epidemic; and any of them doesn't have epidemic preparedness plan and budget line for epidemic response. Nevertheless, they have emergency stocks of drugs and supplies for malaria and measles but difficult to say adequate or not. Even though our assessment focus on measles and malaria but Mekele health centre had report of Relapsing fever and they told there was shortage of drug especially doxyciclline for case treatment and prophylaxis. Cross border communication during outbreaks is practiced with the surrounding facilities, districts, and regions. Yet districts and health facilities don't practice notification of epidemics within 30 minutes. Conversely regional health bureau starts to notify epidemics within 2 hour.

Feed back

Feed back is one of core functions of surveillance system to be effective and is an assurance that what they are doing is appropriate and is being continuously monitored. Receiving and giving feedback is not practiced at regional and district level and Two of health centres (66.7%) said they have feedback mechanism that is received from immediate higher level but none of them could offer written document.

Assessment of support functions of surveillance system

Supervision

The regional health bureau did not conduct any planned supervision to district and health facilities and the region itself was not supervised in the last one year. Mekele health office planned a periodic supervision but didn't implement accordingly where as Endereta district planned and conducted supervision as planned even though it was without supervisory checklist. Only one health centre told there was 2supervision per year conducted by district health office but still no documentation was found. Unfortunately two of the health centres selected for this assessment was from Mekele city where, there is no health post to be supervised within their catchments.

Standards, guideline, and training

The assessment found that all regional health bureau, districts, and health centres had national epidemiological disease surveillance guidelines and two (33.3%) of the health centres had standard case management protocol and guideline for investigation of malaria and measles.

Surveillance focal persons for the regional health bureau, all districts, and two among three health centres were trained in surveillance and basic epidemiology. A focal person working in one (Semeha) health centre did not get any formal training but is performing surveillance activities based on simple orientations given by a colleague. Proportion of health workers working in health facilities trained with surveillance and basic epidemiology ranges from 5% to 42%.

Table 3.1 Distribution of resources indicated in each visited health centres and other levels during the assessment

No	Type of resources	Name of health centre						
		Semeha H.C	Mekele H.C	Kuha H.C	Mekele H.O	Endereta H.O	Regional health bureau	% of facilities with Electricity
1	Electricity	2	1	1	1	1	1	82%
2	Motor cycle	2	2	2	2	1	2	17%
3	Vehicle	2	2	2	2	1	2	17%
4	Adequate Stationery	1	1	1	1	1	1	100%
5	Calculator	1	2	1	1	1	1	82%
6	Computer	2	2	2	2	1	1	33.3%
7	Printer	2	2	2	2	1	1	33.3%
8	Telephone service	1	1	1	1	1	1	100%
9	Fax	2	2	2	2	2	2	0%
10	Radio call	2	2	2	2	2	1	17%
11	Posters	1	1	1	1	1	1	100%
12	Megaphone	2	2	2	1	1	2	33.3%
13	Flipcharts or image box	2	1	2	1	1	1	66.7%
14	Generator	2	2	2	2	2	1	17%

Present – 1 Absent – 2

The above table shows all (3) of health centres are not access with motor cycle, vehicle, computer, printer, fax, Radio call, megaphone, and generator for emergency situation. One of the health centres is not access with electricity.

Assessment of surveillance attributes

Timeliness

All interviewed respondents expressed that reports are sent and received on time. Nonetheless, except for the regional health bureau, the assessing team did not find any mechanism on how reports are being monitored for timely arrival. Thus it is difficult to calculate the timeliness for each institution or facility. Means in use by each institution is a simple verbal response based on a look at the weekly reports produced as per the scheduled time, but which doesn't tell anything about the time when the report is received.

Completeness

Regional health bureau, districts, and all health facilities sent reports 100% completely looking the last 3 months reports but completeness in terms of all variables that should be filled in the reporting format is stated in the table.

Table 3.2 Completeness of reports sent and received from health facilities of the last one month in the assessed health facilities

S.No.	Institution	% Malaria reports received last 1month (September 2010)	%Malaria reports received with no missing of information	%total expected surveillance reports reported to next level	%malaria reports sent with no missing of information
1	Regional health bureau	93.2%	93.2%	100%	100%
2	Endereta health office	87%	100%	100%	100%
3	Mekele health office	?	?	100%	100%
4	Semeha health centre	N/A	N/A	100%	100%
5	Mekele health centre	N/A	N/A	100%	0%
6	Kuha health centre	N/A	N/A	100%	100%

Usefulness

Surveillance data is used for planning, implementing, and evaluating public health interventions and programs. Though the assessment team couldn't find evidence for utilization of the data, the regional health bureau and Mekele health office verbally explained on utilizing surveillance data for planning, priority setting, and intervention purposes, conversely, Enderta and all visited health centres did not use their malaria and measles data for their own consumption other than just reporting it to the immediate next level.

Simplicity

In terms of simplicity of case definition and data collection for malaria and measles all interviewed respondents during the assessment thought that measles and malaria case definition is simple to understand including community case definition but surveillance focal person in Mekele health centre answered that case definition for malaria is very long and not simple to understand. Data Analysis is a problem (remaining impractical) at all levels, and even the meaning of which is not well understood especially in the health facilities.

Acceptability

Acceptability is largely subjective attribute that encompasses the willingness of persons on whom the system depends to provide accurate, consistent, complete, and timely data. Six surveillance focal persons were assessed by the team and five (83.3%) replied that they are interested in working with the surveillance unit and assured its acceptability by other staff (health workers) in the facility. But one (health centre) focal person gave a response that the system is not accepted as do other activities in the facility (HIV/AIDS) and he personally is not satisfied being a focal person for the less attention given to surveillance.

Reliability/data quality

Reliability is the degree to which the results obtained by a measurement/ procedure can be replicated. The team was not able to compare the data among the districts and health facilities upon observation because there were two different ways of reporting in the two visited districts. Here, one district did not compile reports of health facilities rather sent it directly to the regional health bureau; on the contrary, the other district compiles the reports of health

facilities and transfers it to the region. For health facilities the team counted and compared the reported malaria cases with case and laboratory registration log books for the previous one month (see table 3.3). Fortunately there was no reported measles case in all visited health centres.

Table 3.3 Comparison of malaria cases registered and reported to district/city health office

Name of Health centre					
Semeha H.centre		Mekele H.centre		Kuha H.centre	
No. of malaria cases in Register	No. of malaria cases in Facility reports	No. of malaria cases in Register	No. of malaria cases in Facility reports	No. of malaria cases in Register	No. of malaria cases in Facility reports
1	1	9	9	3	2
1	1	17	17	5	4
1	1	4	10	0	0
4	4	5	16	1	1

As shown in Table3.3 above, the registered and reported cases of malaria in Semeha health centre is comparable and consistent in the assessed four weeks. As opposed to this, in Quha and Mekele health centres (which are near to the regional health bureau and Mekele city health office) there is inconsistence and mismatch in the same time period. Here Mekele health centre has shown a difference of 6(150%) and 11(220%) malaria cases in third and fourth weeks respectively. Similarly, Quha health centre gave a difference of -1(-33.3%) and -1(-20%) malaria cases in the first and second weeks respectively

3.4 Discussion

Even though all interviewed institutions/facilities have surveillance focal person, many of them fail to have a clearly stated documented objectives which should have been reflected in either the general plan and/or as a separate for the unit so that it can guide on appropriate public health actions. A good opportunity of the region; there is a means of capturing information from the community through locally called Abo 30(that means community voluntaries get

involved in health activities including disease surveillance in 30 households assigned to them by the local government of the village).With regard to capacity of collection and transportation of malaria and measles specimen for confirmation. It is not a problem in the assessed institution/health facilities. But all did not perform external quality assurance for malaria so that currently it is difficult to evaluate the status of laboratories of those health facilities.

Unless data is analyzed, it is unable to get evidence based information for important public health action and data should be analyzed at any level. None of the visited institutions/health facilities analyze their data by time, place, and person to use for action so that it is clear that yet they did not use the surveillance data for any public health action. Epidemic preparedness and response and Outbreak investigation is not a common practice in the region that needs great emphasis.

Giving feedback and conducting supervision are the ways to motivate staff and is an assurance that what they are doing is appropriate and helps to know the gaps of the institution and monitor regular activities but the visited institutions/health facilities weren't supervised regularly and did not supervise the others as planned and no feedback mechanism seen that support to monitor activities and motivate staff.

Even though few of visited health centres did not have case management protocol guideline encouraging thing is all institutions/health facilities visited have PHEM guideline but still it needs to use and read those guidelines.

Reliability is among the attributes that was assessed in all visited health facilities. In one of the health centres there were cases of malaria that have been registered but not all reported (under reporting) and in another health centre the opposite holds true (over reporting). Generally there were number of cases not found on the reviewed registrations.

Recommendation

The goal of strengthening notifiable disease reporting at each level of the health care system is to produce a system that values information for its role in guiding decision making. Therefore the following are recommended based on the findings:

- All health facilities and health institutions need to have clearly stated and documented objectives in their annual plan.

- Health facilities should send specimen for all applicable diseases for external quality assurance based on the standard to the referral laboratory.
- Unless data is analyzed it is not useful so Data should be analyzed at least in reference to person, place, and time to utilize for planning, priority setting and intervention ;next levels should give emphasis, monitor, and support to be practical.
- There are opportunities at the regional level for epidemic preparedness and response like having RRT, cross border communication and to some extent emergency drug stocks, epidemic preparedness plan (In the terms of drugs, reagents, medical supplies, budget and other resources) but is very important to use scientific prediction methods.
- But for there is supervision and feed back at any system it is difficult to see the status of the health facilities and health institution and to know how the system is going so supervision and feedback should be regular, continuous, and supportive.
- Especially at health facility level health workers don't take surveillance focal person responsibility as primary work so it would be better to train all health workers in basic surveillance and epidemiology and trainings should be focus and practical and applied.
- There should be log book (containing of name of health facility/district that is reporting, date and time of arrival, week no., report sent /received etc...) that will help to monitor timeliness and completeness of reports.
- Surveillance focal persons (the one who is responsible on surveillance reports) should look all registration of cases in different departments (adult and child outpatient and inpatient or emergency)for reporting to avoid over and under reporting.
- Evaluation of disease surveillance system should be done regularly at regional level in order to improve the system and motivate staff.

Acknowledgement

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Chapter IV – Health Profile Description Report

4. Health profile assessment of Enderta district of the year 2009/2010

Background Information

Enderta district is found at South Eastern Zone of Tigray. The capital of the district is based at Quiha town and located at 12 km East of Mekele, the regional capital. The district is bordered with Abiala, a district of the Afar regional state in the East, Degua temben in the west, Wukro kilte awila-elo and Atsibi-wemberta in the south and Hintalo Wajirat and Samre seharti in the North. Administratively the district is divided in to 17 kebeles and was inhabited by 123,063 population in the year 2002 E.C. The estimated population growth rate is 2.5% per annual. Primary health service coverage accounts 85%.

Objective

To assess and describe health related issues about health status, health indicators and to identify problems for priority setting.

Methodology

1. Available data in Endrta health office is reviewed including of health institutions
2. Health profile of the Regional Health Bureau was assessed
3. Concerned health office heads, experts, health professionals of multi-disciplinary character and experts of other sectoral offices (Education and Water) are interviewed
4. Observation of charts posted on the walls of the office for a list on top causes of morbidity, organizational structure (organogram) and others were evaluated

District Health System (DHS)

A District Health System includes the interrelated elements in the district that contribute to health in homes, educational institutions, workplaces, public places and communities, as well as in the physical and psychosocial environment. A District Health System based on Primary Health Care (PHC) is a self-contained segment of the national health system. It includes all the relevant health care activities in the area, whether governmental or otherwise.

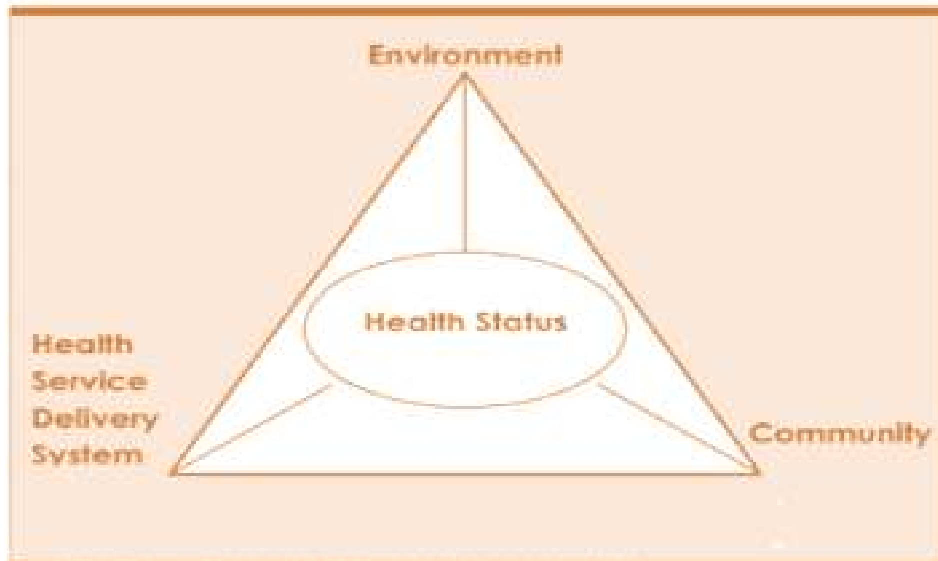

Figure4.1 Interdependence of elements operating in a district health system

It includes self care and all health care personnel and facilities, whether governmental or non-governmental, up to and including the hospital at the first referral level and the appropriate support services (laboratory, diagnostic and logistic support). As the decentralized part of the national health system, the DHS represents a manageable unit, which can integrate health programs by allowing top-down and bottom-up planning and is capable of coordinating government and private sector efforts.

Following are the three main criteria for defining a District Health System unit:

- A clearly defined area with local administration and representation of different sectors;
- An area which can serve as a unit for decentralized intersectoral planning of health care; and
- A network of health facilities with referral support. The district is the basic administrative unit. The presence of district managers and supervisors led by the District health office head (DHOH) offers the opportunity to function as an effective team with

support from the representatives of other sectors, Non-Government Organizations (NGOs), private sector, as well as the community. In any health system, there are three important elements that are highly interdependent, namely: the community, the health service delivery system, and the environment where the first two elements operate. Figure 4.1 above illustrates the interdependence of these elements.

Environment

This, for example, could be the context in which the health service delivery system operates. The contextual environment could be the political system, health-care policies and development policies. It could also include the socio-economic status or the physical environment, e.g. climatic conditions. All these elements have a bearing on the health status of the individual and the community, as well as the functioning of the health service delivery system.

Health Service Delivery System

This depicts how health facilities are distributed in the community, which could also have a bearing on coverage. Similarly, health services could be viewed in terms of their affordability and responsiveness to equity which contribute to the health status of the community.

Community

The characteristics of the society, such as culture, gender, beliefs and health-seeking behaviour, together with the environment and health service delivery system, determine the health status. It is worth mentioning that information included in district health profiles takes into account the broader perspective of district health system.

Table4.1 Demographic information of Enderta district in 2002 EFY, Tigray region

Demographic data	Number/Percentage/Rate
Total population • Female • Male	123,063 61,178 61,885
Annual population growth rate	2.5%
Average household size	4.4
Total households	27,969
Children <1 year	4,366
Children < 3 years	8.36%(10,288)
Children < 5 years	14.6%(17,967)
<15 years	43.7%(53,779)
Women in child bearing(15-49 years)	23.5% (28,920)
Pregnant women	3.8%(4,676)
Non-pregnant women	19.7% (24,243)

As shown in the table above, the population of Enderta district is composed of about 50% female.3.5% of the population is children with age of less than one year old.

Table4.2 Population of Enderta District by Kebele in 2002 EFY, Tigray region

Kebele	Total population
Arato	9,864
Chelekot	5,811
Dergajen	10,211
May-alem	5,208
Meseret	8,752
Maygenet	5,100
Maytsedo	7,489
May-anbesa	6,501
Bebri	7,716
Didba	7,421
Felegemayat	4,656

Felegeselam	6,652
Shibta	10,455
Lemlem	8,489
Mahibere-genet	7,134
Mariamdehan	5,871
Mesebo	5,733
Total	**123,063**

As depicted in the table above the population distribution by Kebele ranges from 3.8% in Felegemayat to 8.5% in Shibta. The average population distribution accounts about 5.9%.

Table4.3 Total malarious kebeles and population living in malarious areas in Enderta district

S.no	Kebele	Population
1	Chelekot	5,811
2	May-alem	5,208
3	Meseret	8,752
4	Maygenet	5,100
5	Didba	7,421
6	Felegemayat	4,656
7	Lemlem	8,489
8	Mahibere genet	7,134
9	Mariamdehan	5,871
	Total	**58,442**

Here 47.5% of the total district population lives in areas where malaria is endemic and out of this **8%** belongs to Felegemayat and 15% to Meseret.

District health system

The district health department is headed by a district health office head who is the manager of the district health system which comprises four case teams located in the health office running various programs. All are accountable to the head of the district health office. A health center management committee exists in each health center, the location of which is within the same setting. It has a health centre head who manages three case teams some of which also have sub units managed under them.

Organogram

The organizational structure of district health office is given below:

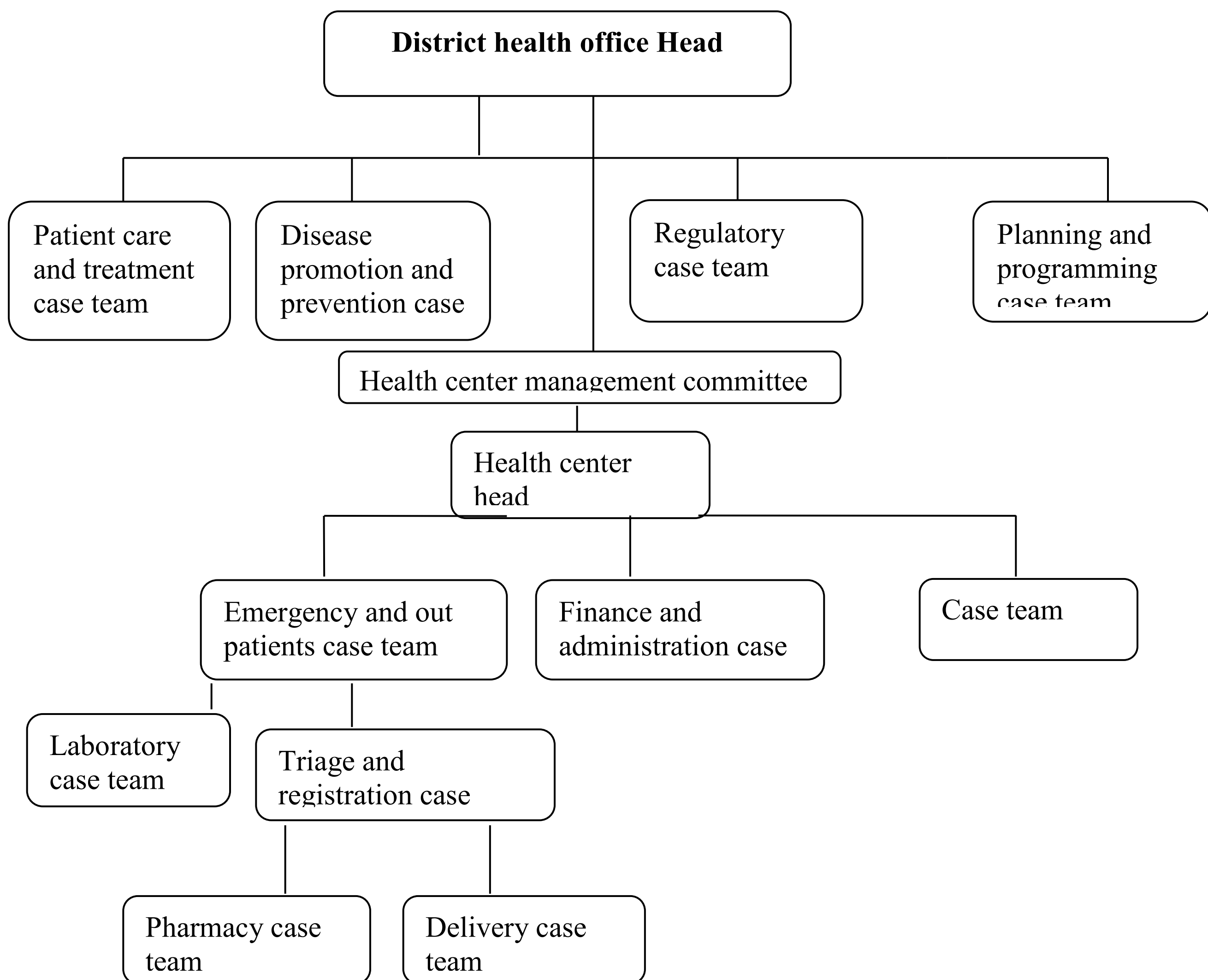

Figure 4.2 Organizational structure of District health system, Tigray region.

Health facilities

There is no Hospital owned by either government, private or non-governmental organizations within Endereta district catchments. On Average Each Health centres serves for a total of 20,511 populations.

Table 4.4The number of health facilities in Endereta district in 2002 EFY

Type of health facility	Number		
	Gov	Private	NGO
Hospital	0	0	0
Health center	6	0	0
Clinic	0	0	0
Health post	13	0	0
Pharmacy	0	0	0
Drug shop	0	0	0
Rural drug vendor	0	1	0

From the above table we can understand that except for a rural drug vendor which is owned by a private sector none of the health facilities (Health Centre and health post) is owned by private or non-governmental organizations.

Table4.5 Human resource under Enderta district health office in 2002 EFY

Profession	Number
Midwife nurse	2
Clinical nurse	31
Lab technician/technologist	4
Pharmacy technician/pharmacist	4
Health officer	7
Environmental technician/officer	4
Health extension workers	36
CHAs	384
Data clerk/manager	1

The human resource distribution of Enderta district is composed of multi disciplinary professionals as shown in the table above which ranges from **3.8%** for mid wife nurses to **59.6%** for clinical nurses working in health centres (excluding Health extension workers, Community Health Agents and data clerks/managers) found within the district setting.

Table4.6 Health staff to population ratio in Enderta district in 2002EFY

Doctor to population	**0:123,063**
Health officer to population	**1:20,511**
Nurse to population	**1:4558**
Health extension workers to population	**1:3418**

From this table we can understand that the health extension workers to population ratio look to be somewhat satisfactory when compared to other professionals and especially for a medical Doctor whereby none is present in such a huge number of population.

Table4.7 Health institutions to population ratio in Enderta district in 2002 EFY

Hospital to population	**0:123,063**
Health centre to population	**1:20,510**
Health post to population	**1:9466.4**

As to the standard set in the four tiers system one health post provides services, to 5000 people within its catchment. Here the population served by a health post is almost twice of what is expected and may demand two health posts for the intended services to continue smoothly.

Maternal and child health

Here as we go on from BCG vaccinated children up to measles and fully immunized eligible's, the coverage is dropped down. In this regard a drop of **6.3%** is observed between measles and fully immunized children alone. (See table 4.8)

Table4.8 Number of immunization delivering sites, children targeted for immunization and Childhood immunization coverage in Enderta district in 2002

No HF	Static	Outreach	Live births	BCG		Surviving infants	Measles		Penta3		Fully immunized	
				Ach	%		Ach	%	Ach	%	Ach	%
19	6	10	4678	4086	87.3	4366	3050	69.8	4026	92	2775	63.5

We can also understand that children may not get BCG vaccine at birth when we compare this to the coverage achieved by penta-valent3 vaccination that is given later than BCG vaccine.

Table 4.9 Maternal health services delivered in Enderta district in 2002 EFY

Description	Number/percent
Antenatal care coverage by skilled health personnel's	24%
Antenatal care coverage by HEWs	33%
Proportion of deliveries attended by skilled health personnel's	4%
Deliveries attended by HEWs	202
Postnatal care coverage by skilled health personnel's	12%
Postnatal care coverage by HEWs	34%
Family planning • Contraceptive acceptance rate	79.5%
TT2 pregnant	46%
TT2 non-pregnant	77%

Here, we can see that delivery services at a health facility environment (health centres) are very much underserved and very low.

Table4.10 Top ten causes of outpatients morbidity in Enderta district in 2002 EFY

Rank	Disease	Case	%
1	URTI	316	13
2	Diarrhoeal diseases	289	12
3	Conjunctivitis	269	11
4	Intestinal parasitosis	227	10
5	Other abdominal diseases	192	8
6	Common cold	164	7
7	Malaria	140	6
8	Gastritis	107	5
9	Skin diseases	95	4
10	Other skin diseases	76	3
	Total	**1,875**	

The common cause of morbidity in the district is URTI, Diarrhoeal disease and Conjunctivitis that account greater than 10 % of ten top cause of morbidity.

Table4.11 Water and sanitation facilities in Enderta district in 2002 EFY

Description	Number/percent
Number of households with latrine	19,941
Number of households without latrine	3,900
Latrine coverage	88%
Number of kebeles accessed to safe water supply	14
Number of kebeles not accessed to safe water supply	03
Safe water supply coverage	79.8%

Table4.12 Malaria prevention and control activities of Enderta district in 2002 EFY

Description	Number/percent
Total number of households with at least two ITNs	**100%**
Total number of kebeles covered with residual insecticide chemical spray	**9**
Total number of unit structures sprayed with residual insecticide chemical spray	**17,160**
Number of people living in sprayed houses	**44,924**

Total number of people living in malaria endemic area accounts **58,442 and** out of this **77% (44,924)** live in residual insecticide sprayed houses.

Table4.13 HIV/AIDS services in Enderta district in 2002 EFY

Description	Number
Total number of health facilities	19
Total number of health facilities providing VCT service	6HCs and 7HPs
Total number of health facilities providing PMTCT service	6HCs
Total number of health facilities providing ART	0
Number of persons tested for HIV	34,536
Persons tested +ve	245
Number of PLWHA ever enrolled for ART	0
Number of PLWHA ever started on ART	0
Number of PLWHA ever currently on ART	0
Pregnant women tested for HIV	963
Pregnant women tested +ve	15
Number of HIV positive women receiving ARV prophylaxis	0
Number of HIV positive babies receiving ARV prophylaxis	0

From the above table we noticed that **0.71% (245)** of HIV positive people do not get anti-retroviral therapy (ART) in the health centres of this district, as no services are yet provided in any one of health facilities. This is an indication, where people (requiring the service) may be forced go to other places in seeking of such services which can easily be delivered in their surroundings.

Table 4.14Tuberculosis prevention and control performance in Enderta district in 2002 EFY

Description	Number/percent/rate
Number of patients registered	132
Case detection rate	78.6
Treatment success rate	15(no)
Treatment completion rate	102(no)
Cure rate	15(no)
Defaulter rate	1
Died	3
Failure	0

Socio-economic indicators

Table4.15 Health facilities with Infrastructure in Enderta district in 2002 EFY

Health facility/office	Number of health facilities with infrastructure						Remark
	Road		Electricity		Telephone		
	Yes	No	Yes	No	Yes	No	
Health center	6	0	5	0	6	0	
Health posts	13	0	3	10	13		
Health office	1	0	1	0	1	0	

Education

Table4.16 Type and number of schools and number of teachers in Enderta district in 2002 EFY

Type of school	Number of schools	Number of teachers
Primary	65	786
Secondary	1	12
Tertiary	0	0
Vocational	0	0
Nursing school	0	0

Table4.17 Name of Development and implementing partners collaborating with health sector in Enderta district, 2002 EFY

International	local
UNICEF	REST
Save the children	Catholic
FAO	Red cross

Table4.18 Budget allocated for specific program/salary in Enderta district in 2002 EFY

Item	Amount in birr
Overall district health sector budget	2,498,699.47
Recurrent budget	
Salary	1,585,048.02
Malaria prevention and control	41,771
EPI	
HIV/AIDS prevention and control	
TB/Leprosy	
Hygiene and sanitation	
Malnutrition	
Drug supply	125,000
Capital budget	518,250

In this regard it should first be noted that allocation of budget for all government sectors existing in a district is made by the local administration (government). As shown in the table above, we could observe that, of a total recurrent budget allotted to the health services by the local government of the district, only **6.3%** is spent for drug supply consumption.

Priorities identified

Maternal and child health services are among the most components of a health delivery system especially, in developing countries like Ethiopia. Attending delivery at health facilities by skilled attendants is not as anticipated in the district assessed as indicated in the previous sections.

Vaccinating children at the right age and especially with the vaccines given in earlier ages (BCG) is not such a common practice which needs much emphasis

Health care services such as provision of therapy on anti retroviral to HIV positive patients within the vicinity of their surrounding is among the very important health aspects requiring attention and commitment at all levels of the health system.

Budget allocated for drug consumption is very low as evaluated from the findings and one of the priority areas for our assessment.

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Chapter V – Scientific Manuscripts for Peer reviewed Journals

5. Shigellosis Outbreak in Addis Ababa University

Key words: Shigellosis, *Shigella flexneri,* Addis Ababa University

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Shigellosis Outbreak at Addis Ababa University, March-April 2010

Abstract

Background: Although data are limited, the rate of diarrhoea with blood in Ethiopia has been reported as 98/100,000 persons per year. In Addis Ababa a mean annual rate of 204 cases/ 100,000 persons was reported from 2006 to 2008. In March 2010, cluster of cases of diarrhoea were reported from the Technology Campus of Addis Ababa University. Investigation was done to identify the causative agent, identify the source, and to control and prevent future occurrences.

Materials and Methods: Active case finding and review of medical records were undertaken to characterize the outbreak. The investigation consisted of a matched case-control study with laboratory testing and environmental assessment. A structured questionnaire was used to collect data. Data were analyzed using Epi-info (v3.3.2) and Microsoft Excel.

Results: A total of 104 suspected cases were identified with an attack rate of 6.8%. Stool culture confirmed *Shigella flexneri* species in 5/11 (45%) of specimens tested. Risk factors associated with illness included eating specific foods at specific meal times. Food items served on Friday, March 26, at lunch time (OR: 3.59, CI: 1.0- 12.7, p=0.04) and on Saturday March 27, during dinner (OR: 2.89 CI: 1.0- 8.2, p=0.04) were significantly associated with increased odds of illness. Water stored in a tank in the cafeteria had evidence of fecal contamination (fecal coliform count >161 Mpn /100ml) and the hygiene and sanitary conditions in the cafeteria, kitchen, living area were unsatisfactory.

Conclusion and Recommendations: Food-borne transmission and water contamination were suspected as the sources of infection. Regular supervision and inspection of the campus' food handling facilities and practices were recommended to improve food hygiene and sanitation. Improved water storage, correcting periodic water shortages in the latrine facility and promotion of hand washing could reduce potential future outbreaks.

Background

Diarrhoeal disease continues as a leading cause of morbidity and mortality worldwide, and is ranked fourth as a cause of death and second as a cause of years of productive life lost due to premature mortality and disability. Several of the common gastrointestinal infections characterized by diarrhoea include cholera, shigellosis, salmonellosis, campylobacter enteritis, Escherichia coli infections, yersenosis, gardiasis, cryptosporosis, and viral gastroenteropathy. (1, 2, 3)

Diarrhoeal disease outbreaks are common in overcrowded communities and in developing countries where poor hygiene, unsanitary conditions, and unsafe water supplies are present and such living conditions create an environment in which diarrhoeal pathogens are easily transmitted, Refugees, internally displaced persons, and children are at especially high risk. The common transmission causes of such outbreaks are food and water-borne transmission via the fecal–oral route. The transmission of diarrhoeal pathogens through the food supply is a major problem both in the developing world and in the United States, where 400-600 documented food-borne outbreaks and millions of cases are estimated to occur each year. (4)

Shigellosis is the most common cause of outbreak of bloody diarrhoea worldwide with secondary infection rates as high as 40% in the household and case fatality rate of 15-20%. Outbreaks may result in large scale mortality as occurred when an outbreak of *Shigella dysenteriae* type 1(Sd1) caused 20,000 in one month among Rwandan refugees in Zaire in 1994. Shigella has very low infectious dose; ingestion of as few as 10- 200 viable bacteria resulting in clinical disease after an incubation period of 12-96 hours. Patients may, however, present only with acute watery diarrhoea without visible blood or mucus, and without the other symptoms described above, especially at the beginning of their illness. The bacteria can be transmitted by ingestion of contaminated food or water, or through person-to-person contact. Flies can breed in infected feces and then contaminate food; vegetables can become contaminated if they are harvested from a field irrigated with untreated sewage. Shigellae bacteria are present in the stools of infected persons while they are sick and for 1-2 weeks after resolution of symptoms. A majority of Shigella infections are transmitted via the fecal-oral route (2, 4, and 5).

Globally the annual number of Shigella cases is estimated to be 164.7 million, of which 163.2 million were in developing countries (with 1.1 million deaths) and 1.5 million in industrialized countries. The median percentages of isolates of S. flexneri, S. sonnei, S. boydii, and S. dysenteriae were, respectively, 60%, 15%, 6%, and 6% (30% of S. dysenteriae cases were type 1). In developing countries including Ethiopia Shigella flexneri is the dominant serogroup (4, 6 - 10).

Comprehensive surveillance data on laboratory confirmed cases of Shigella is limited in Ethiopia (5, 6). However, bloody diarrhoea can be used as an indicator of shigellosis cases. From the year 2006 to 2008 a mean of 75,531 outpatient cases of bloody diarrhoea were reported per year (approximately 98/100,000 persons per year); the mean number of admission was 1901 patients and 72 deaths per year by the surveillance system of the government. Addis Ababa reported the highest mean rate of 204 cases/100,000 population per year in this period (11-13). There are also some reports of shegella outbreaks in the country. In 2005/06, there was a report of a bloody diarrhoea outbreak in Southern Nations Nationalities Peoples Region (SNNPR) with a total of 209 cases and 1 death (9). In December 2008, 566 suspected and confirmed cases of shigellosis were reported in an outbreak in Jimma City (14). From the limited data available, *S. flexneri* and *S. dysenteriae* comprise over 80 % of total Shigella isolates, and the prevalence of S. flexneri alone from isolates has been reported to be vary from 50% to 70% and in some studies as high as 99% (5, 15, 16).

On 29 March 2010, the AAU technology campus students' health clinic reported an unusual increase in the number of students complaining of diarrhoea, fever and abdominal cramp with generalized weakness. Some students were referred to local a hospital for inpatient care. In recent years, the campus's intake of students has expanded massively without increasing student housing or facilities leading to overcrowded and unhygienic living condition. Clusters of diarrhoeal illnesses were reported to occur on the campus previously in limited number with unknown incidence, and were managed by the health clinic (17). A team of residents from the Ethiopian Field Epidemiology and Laboratory Training Program, staff from Addis Ababa Health Bureau, Black Lion Hospital, and Addis Ababa University School of Public Health investigated this cluster of cases to identify the causative agent, identify the source, control the outbreak and propose recommendations to prevent future occurrences.

Materials and Methods

Descriptive epidemiology, Case Control Study with clinical laboratory and environmental investigations were done.

Study population

The study was in a source population of 1554, including the technology campus students in AAU and the student cafeteria workers- like the food handlers and cooks.

Descriptive Epidemiology

Data was collected using the Ministry of Health Public Health Emergency Management (MOH/PHEM) epidemic line listing format from the time we were involved in the investigation. For the purpose of identifying suspected cases related to the outbreak a definition of acute diarrhoeal disease syndrome was created. Any person (from AAU Technology campus community) with sudden onset of abdominal cramp, diarrhoea (with or without vomiting), fever, joint and muscle pain, or Diarrhoea with any of the above symptoms since Sunday, March 28, 2010 was considered to be associated with the outbreak. To encourage those affected to present at the student health clinic, notices were posted on notice boards around the campus with information regarding the situation and where treatment was available. Investigators interviewed each of the suspected case patients who presented at the student health clinic. Medical records were also reviewed to identify cases who had presented at the clinic prior to the start of the investigation.

Laboratory investigations

Blood and stool specimens were collected for culture from initial cases in the outbreak after admission as in patients at Black Lion Hospital. All 54 student cafeteria workers were also sent to the regional Laboratory, Zewuditu Memorial Hospital, and Yekatit 12 Hospital to be evaluated and give stool samples for culture.

Case- Control study

A 1:1 Case-Control study was conducted by finding suspected individuals who had visited the clinic in the first 4 days of the outbreak with a total of 34 suspected case patients. A convenience sample of controls was recruited from students in the same living room (dormitory). These students were similar in age and gender and utilized the same living and

cafeteria services. A structured questionnaire was designed to collect data regarding demographic characteristics, drinking water, latrine and hygiene, contact history with a suspected case, food items consumed over the past 5 days. Data were entered into an electronic spreadsheet, cleaned and analyzed using Epi-info version 3.3.2 statistical software, and Excel.

Environmental Investigation

A team of investigators inspected the hygiene and sanitation of the student living areas, their water supply, the student cafeteria kitchen including its equipment, food storage, handling, and preparation, and water system. Cooks, cafeteria workers and school administrators were interviewed. Water samples from the pipe and the collection tank as well as food samples of stored meat were collected for laboratory testing.

Results

Descriptive Epidemiology

In the first day, 11 cases of acute diarrhoea were reported to the campus clinic (Figure 1). And the first date of onset of symptoms was on 28 March, 2010. Total number of patients was 104 from 29 March to 16 April 2010, with median age of 20 yrs and age ranging 17-30 yrs.

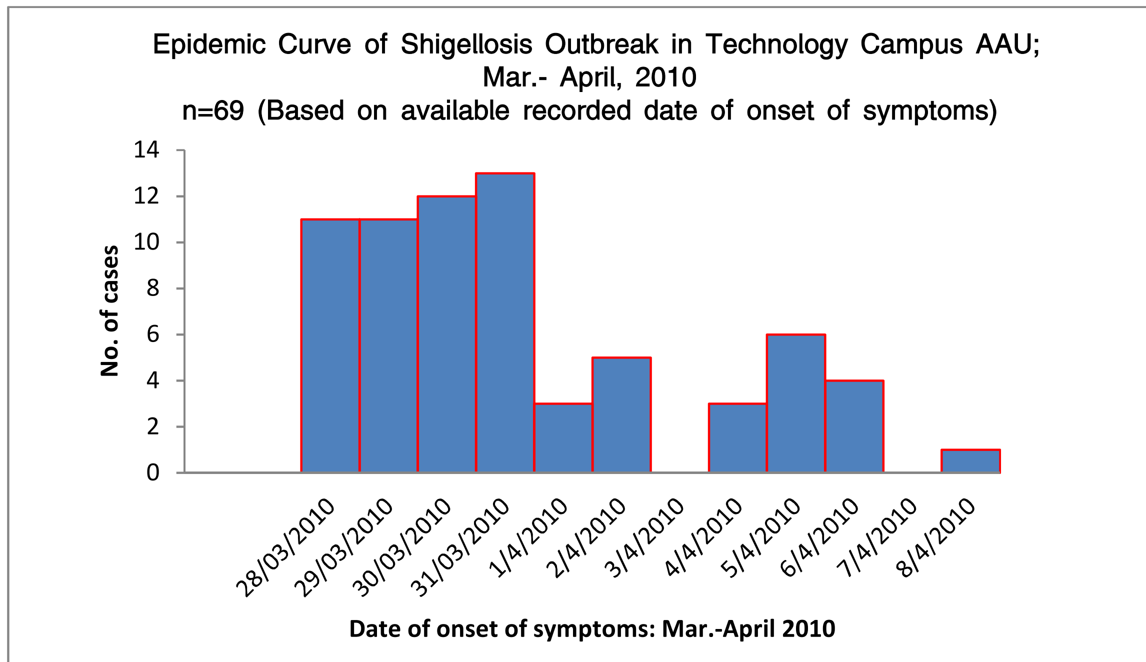

Figure 1 Epidemic Curve of Shigellosis Outbreak in Technology Campus, Addis Ababa University , March-April, 2010 (n=69)

The majority of patients presented with the symptoms of diarrhoea (94%), abdominal cramp (72%), and fever (41%) (Table 1). Among cases 95% (99/104) were males. The overall attack rate was 6.8%. Six percent of cases came for second time for they did not improve, 11.5% (12/104) of patients were referred to the hospital for inpatient care, and there was no death.

Table 1 Clinical Symptoms of Cases of Acute Diarrhoeal Disease in the Technology Campus AAU, Addis Ababa; March- April 2010.

Symptom (Reviewed from fully recorded individuals' Medical Cards)	Percent (n= 80)
Diarrhoea	94%
Abdominal cramp	72%
Fever	41%
Chills	25%
joint pain	16%
Vomiting	5%

All cases were students, and they were from different departments, years of study and living areas (blocks) in the campus. The overall time pattern of the epidemic showed that significant number of cases presented in the first 4 days based on recorded onset of symptoms (Figure 1).

Laboratory Investigation

Of 21 stool samples collected for direct microscopic evaluation, evidence of inflammatory diarrhoea was present in 10 (47.6 %) (Table 2); 45% (5/11) of stool samples collected for microbiological culture were positive for *Shigella flexneri; and* blood culture showed no growth using the standard laboratory method. The laboratory results of stool samples collected from all 54 Cafeteria workers showed no growth (negative); water specimens collected from the pipeline was potable (fecal coliform count <1 Mpn /100ml; Mpn: Most probable number).

Table 2 Direct Microscopy examination Results of Stool samples collected from Case-Patients of Shigellosis, AAU Technology Campus, Addis Ababa, March - April 2010. (n=21)

Microscopy findings	Percent %
RBcs and/ or Pus cells	47.6 (10)
E. histoletica	14.3 (3)
E. histoletica with RBCs and Pus cells	4.8 (1)
G. lamblia	4.8 (1)
H.nana	4.8 (1)
Ascaris lambricoids	4.8 (1)
Strongloid stercoralis	4.8 (1)
Tricuris tricuria	4.8 (1)
No ova or Parasites	9.6 (2)

The water sample collected from the kitchen collection tank was positive for coliforms (fecal coliform count >161 Mpn /100ml) and commented as not potable. Samples of meat (both the Christian and Muslim students menu) taken from refrigerated storage had fecal coli form count $1.6x10^6$ cfu /gm and $2.4 x10^5$cfu/gm respectively and too many colonies of staphylococcus spp. in both (Cfu: colony forming unit).

Case Control Study

The median age of suspected cases was 20 years and 19 years for controls. A majority of cases and controls 81.5 % (53/65) ate all their meals in the campus cafeteria, and 89.7% (61/68) drank nothing outside the campus during the study periods (since five days before the outbreak).

Suspected cases were more likely to experience from shortage of water (Odd Ratio OR: 2.65 and 95% confidence interval, CI: 0.987-7.108), this may be due to some of the students store water with 5- 10 lt *Jerikans* in their dormitories. Lack of habit of hand washing with soap or detergent after using the toilet (OR: 2.4 and CI: 0.872-6.604)was also another risk factor; moreover, the analysis of the menu served over 5 days prior to the onset of the outbreak showed that the odds of being ill was associated with food items *Misir Key wot with injera* served on 26Friday, Mar.2010 lunch time (OR:3.59, CI: 1.011- 12.731) and *Alcha keke wot*

served on 27Saturday Mar.2010 dinner (OR: 2.89 CI: 1.021- 8.173) (Table 3). These were foods served for both the fasting and non-fasting students.

Table 3 Risk factors Analysis for possible association with Acute Diarrhoeal Disease Outbreak in Technology campus, AAU, March - April, 2010

Risk factors (as assessed since 5 days prior to the onset of the outbreak)	Cases(N=34) No. (%)	Controls (N=34) No. (%)	Odds Ratio (95% Confidence interval)	p-value
Food served on:				
• 26/03/10-Friday lunch, Misir Key wot	30(88.2%)	23(67.6%)	3.59(1.011- 12.731)	0.0406
• 27/03/10- Saturday dinner Alcha keke wot	26(76.5%)	18(52.9%)	2.89(1.021- 8.173)	0.0423
Eating outside the campus(anything)	5(15.2%)	7(21.9%)	0.638(0.179- 2.267)	0.2535
Drinking outside the campus (anything)	4(11.8%)	3(8.8%)	1.378(0.28- 6.68)	0.5000
Contact history with the patient	19(55.9%)	22(64.7%)	0.69(0.26- 1.83)	0.4570
Latrines with malfunctioning water tabs	23(67.6%)	22(64.7%)	1.141(0.321- 2.396)	0.2020
Shortage of water in the campus	19(55.9%)	11(32.4%)	2.649(0.987-7.108)	0.0507
Lack of soap or detergent use after latrine use	16(50%)	10(29.4%)	2.4(0.872-6.604)	0.0871

Environmental Survey Findings

Food Hygiene: The kitchen facilities in the student cafeteria were found to be substandard. Equipment was old and not well cleaned, food handling and storage techniques were inadequate and refuse disposal practices were poor; workers reported a shortage of soap and detergent in their working areas and the latrine. Running water was not always available in the food preparation areas. Refrigerators and freezers did not have temperature monitors and there was no regular medical check up or training of the food handlers and cafeteria workers on standards of hygiene and sanitation.

Water Source: Water served in the cafeteria was found to be stored in a big plastic barrel and the caps used for drinking in the cafeteria were not well washed. It was found grossly contaminated with visible oily film in the caps. There is lack of water in the in the cafeteria, in the dormitories even for hand washing.

Latrine: the latrines in the cafeteria, dormitories are all water carriage systems; but the lack of water makes cleaning very difficult. The hand washing facilities are not functional and dirty. This makes the latrines unsafe. Overall, of the interviewed students in the case control study, 66.2% (45/68) reported that there is no functional hand washing facility in the latrine area in the dormitories. Besides, 39% (27/68) of them do not always wash their hands with soap or other detergent after using the toilet even when hand washing facilities are functional.

Discussion

Bloody diarrhoea occurs widespread throughout Ethiopia and is associated with outbreaks. Shigella infections are not usually fully reported to the health facilities, with less than 1% typically reported (4, 18). The MOH/PHEM guideline sets the threshold for epidemic detection and action as a cluster of acute bloody diarrhoea cases in the same settlement in one week (19). Therefore, detection of a cluster of more than 30 cases of shigellosis in 3 days (with total of 104 patients in 2 weeks) in the campus was declared an outbreak. Infections may be acquired from eating contaminated food, although contaminated food usually looks and smells normal. Food may become contaminated by infected food handlers who don't wash their hands with soap after using the bathroom. Vegetables can become contaminated if they are harvested from a field with sewage in it (4). Shigella infections can then be acquired by drinking, swimming in or playing with the contaminated water (2, 4).

Investigation of this outbreak suggested a common source outbreak. The cases were from different living blocks, different fields of study, and years of study with limited shared exposure points such as the cafeteria, and their indoor interaction suggesting these were the potential common sources of the outbreak. Additionally, the peak of the epidemic curve occurred near the beginning of the outbreak and rapidly declined within 4-5 days of the first cases and comparatively low attack rate of 6.8% suggested minimal person-to-person contact transmission; considering that attack rates can be as high as 40% in some overcrowding situations-refugee camps (2, 4). Furthermore, the identification of specific foods eaten at specific meals identified as having significant associations with illness implicates food contamination as a likely source of the outbreak. The majority (85%) of ill students had eaten all their meals in the student cafeteria for at least for 5 days prior to the occurrence of the outbreak. Fecal coliform contamination of meat samples taken from the refrigerator confirms that hygiene was poor and consistent with transmission of Shigella. Poor hand washing practices and inadequate hand washing facilities with shortages of water and soap for the both the students and the cafeteria workers (20) may have also contributed to contamination of food items. The association of illness with the shortage of water might mean that kitchen utensils were under-washed or washed with contaminated water stored in the kitchen tank.

The comparatively low attack rate in this outbreak may be attributed to the accessibility of the student health facility, prompt case management and referral, and heightened awareness around the campus community after information about the outbreak was posted and circulated. Additionally, most students departed the campus for a holiday weekend shortly after the outbreak started

As an anecdotal finding several cases were also found to have intestinal parasites, needs further evaluation of students, the cooks and suppliers.

There were several limitations to the investigation. Due to a 2 day delay in notification of the outbreak it was not possible to identify the index case, to obtain samples of food items consumed in the cafeteria for laboratory testing, and to determine if there was a dose – response relationship between food items consumed. Additionally many students had left the campus for a holiday weekend limiting the number of student-cases and control who could be interviewed.

In summary, the investigation team concluded that this shigellosis outbreak was due to fecal contamination of a water storage tank in the campus' student cafeteria and 2 food items served at 2 particular meals, however, it was not possible to conclusively determine which the primary source of exposure was and how the infection was introduced to the campus.

Recommendations

Measures to control the outbreak were initiated concurrently with the investigation and case treatment. The investigation team recommended immediate corrective measures to the students' services office and notified the campus community about the disease and early treatment and control measures. The team recommended the university change the water tank in the kitchen and the water supply to cafeteria should be directly from a water supply pipeline with limited use of stored water. Any water storage barrel should be narrow mouthed, closed and with faucet and regular cleaning and regular check up for chlorine residual. Latrine facilities should be made operational with functional water supply and hand washing after defecation should be promoted. Monitoring and regular supervision of the food preparation, storage condition, washing and drying facilities of the utensils of the food establishments of the suppliers and the student cafeteria should be strengthened. Regular medical checkups of the

food handlers and basic training on food hygiene and safety should be mandatory. Additionally, the burden of intestinal parasites in the campus community warrants further investigation.

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Chapter VI – Abstracts for Scientific Presentation

6.1. Shigellosis Outbreak at Addis Ababa University, March-April 2010, Presented on the Ethiopian Public Health Association conference in Mekele, Tigray, 2010

Background: Addis Ababa had average rate of 204 cases of diarrhoea with blood /100,000 population / year from 2005 to 2008. Cluster of cases of diarrhoea were reported from Technology Campus of Addis Ababa University in March 2010. We investigated to identify the causative agent, identify the source, control the outbreak and to recommend on prevention of future occurrences.

Methods: We conducted descriptive with matched case-control study, and laboratory and environmental investigations. Using structured questionnaire, we collected data regarding risk factors since the preceding 5 days prior to onset of the outbreak. Data were analyzed using Epi-info version 3.3.2 statistical software and excel sheet.

Results: There were a total of 104 patients, with overall attack rate was 6.8%. Stool culture [45% (5/11)] grew *Shigella flexneri* species. Shortage of water (Odd Ratio OR: 2.65 and 95% confidence interval, CI: 0.987-7.108), lack of habit of hand washing with soap or detergent after using the toilet (OR: 2.4 and CI: 0.872-6.604) increased the risk of being ill; moreover, with the foods served on 26Friday, Mar.2010 lunch time and on 27Saturday Mar.2010 dinner (OR: 3.59, CI: 1.011- 12.731 and OR: 2.89 CI: 1.021- 8.173) were also associated. The hygiene and sanitary conditions in the cafeteria, kitchen, living area was poor; and the stored water was fecal contaminated (fecal coliform count >161 Mpn /100ml)

Conclusion and Recommendations: regular supervision of the food facilities and food hygiene and sanitation; correcting the water shortage and the latrine facility with promotion of hand washing and provision of safe water could reduce further outbreak.

Key words: Shigellosis, ***S****higella flexneri,* Addis Ababa University

6.2. Unidentified liver disease in districts of North Western Zone, Tigray, Ethiopia, 2002-2010, accepted by TEFENET, Cape Town, South Africa, 2010

Zayeda Beyene, Ghidey Gebrelibanos

Abstract

Background

A liver disease of unknown etiology which is characterized by epigastric pain, febrile syndrome, jaundice, nasal bleeding, peripheral edema, and abdominal swelling progressing to ascites with high morbidity and mortality reported among humans in six district*s* of the North-Western Zone of Tigray, Ethiopia since April 2001- 2010. This surveillance data analysis and outbreak investigation is aimed at describing the distribution of unidentified liver disease in terms of time, place and person and recommend possible curative and preventive intervention strategies of the disease.

Methods

Study is conducted in North Western Zone, Tigray region, Ethiopia. A line list and case register log books of the districts were reviewed. Case definition was set based on the symptoms and signs of the disease to identify cases. Surveillance secondary data of all six districts of the Zone was collected from a line list, reviewed, entered, and analyzed in excel.

Results

A total of 736 cases and 247 deaths were reported from January 2002, with an attack rate of 0.1% and case fatality rate of 33.5%. The mean age of cases is 26 years old with a range of 80 years. Age group of 15-44 is highly affected as compared to others. Sixty percent of total cases and 63% of deaths are male. Out of a total of 124 kebeles in these six districts 39 (31%) reported cases of unidentified liver disease to date.

Conclusion and Recommendation

Majority of cases affected by the disease were in the age group of 15- 44, and with a higher proportion of male cases than females. Further research has to be employed in the area and improvement of case management is highly recommended for reducing the case fatality rate.

Key words: Unidentified liver disease, North Western Zone, Tigray

Chapter VII – Narrative Summary of Disaster Situation Visited

7. Southern Nations Nationality and Peoples Region Belg Season Health & Nutrition Need Assessment June, 2009

Zayeda Beyene

7.1 Back ground

Southern nations nationality and peoples regional (SNNPR)state is the third highly populated region in Ethiopia with an estimated population of 15,745,000 as of 2009G.C.The regional state is divided in to 13 administrative zones (containing of 125 district),8 special district ,22 city administration and a total of 155 district .

SNNPR faces a number of hazards which affect lives and livelihood. These include cycles of drought, famine, flooding, epidemics, and conflicts. Disasters in SNNPR are often chronic and move to becoming acute, as was seen in the recent drought of 2007/8 and the recent AWD out breaks. Disaster may result in food insecurity, poor nutrition, lack of water availability, increased morbidity or mortality .However, disaster prevention preparedness, and response have largely been focused on institutions and activities related to emergency food management.

The burden of disease in SNNPR, measured by morbidity and mortality, comes from primarily preventable causes and is dominated by communicable diseases. The leading causes of morbidity in the region are mostly attributed to malaria, lack of clean drinking water, poor sanitation, low public awareness of environmental health and personal hygiene practices and malnutrition.

Communicable diseases, particularly meningitis, acute diarrhoea, malaria, and measles occur repeatedly in the region as an outbreak and cause considerable morbidity and mortality.

Due to failure of Belg rain in all Belg growing areas of SNNPR the prevalence of malnutrition is expected to increase from mid July to September 2009G.C in the region

Objective

1. To assess the types and extent of human epidemics, conflict, floods, etc and to identify the most vulnerable populations for Health and Nutrition .

2. To assess the existing capacity of the health services to address health & nutrition emergencies.

3. To determine the shortcoming (gap) in the capacity of the existing health services to address health and nutrition emergencies.

7.2 Methods

The study was conducted in SNNPR, 18 districts from 10 zones and 5 special districts from a period of 10 to 22, June 2009G.C. Briefing (At the beginning of the assessment) on the objective of the assessment was conducted at regional, zonal and woreda level and debriefing (At the end of the assessment) was given on the findings by the deployed team at all levels. The study districts were selected after thorough discussion with the regional health bureau and adjustments were made at the zonal level. The criteria that were used to select the districts were:

- History of frequent outbreak
- High prevalence (case load) of malnutrition due to failure of belg rain
- Past history of drought prone areas
- District which are frequently affected by complex emergency
- Accessibility of the district

Final decision was based on the above criteria made by the zonal health bureau. Four teams contains of different professionals were deployed to different zones to collect data. (See table 7.1)

A semi structured questionnaires were used to collect secondary data both at the regional and district health bureau level. Records and reports have been reviewed to collect data on epidemic prone diseases, nutrition, current emergency drug stocks, medical supplies, leading causes of morbidities and immunization coverage. Formal interviews and group discussion was made with Regional Health Bureau officials, District officials and health professionals to obtain in-depth understanding about major health problems, occurrence, distribution, duration of outbreaks, current malnutrition situation, Epidemic preparedness, and capacities.

The data collectors were health professionals from FMOH, RHB, WHO and UNICEF. Data analysis was made using micro soft excel and manually.

Table 7.1 List of Sample district included in the belg assessment of health and nutrition in SNNPR, from 10 to 22 June, 2009G.C

Team Number	Study Area (name of zone)	District (name of district)
1	Sidama Zone	Boricha ,Lokko Abaya, Alata Wondo, Hawassa Zuriya
	Gedio Zone	Dilla Zuriya, Kochera, Wonago, Yirgachefa
	Kambata Tanbarro	Tambarro, Kadida Gamella ,Kacha Beira, Hadero Tonto
	Halaba Special District	Halaba Special District
2	Dawro Zone	Loma ,Genna Bossa
	Wolayita Zone	Sodo Zuriya, Humbo Gamot Weida, Bolloso Sora, Bolloso Bombe
	Gamo Gofa Zone	Mihrab Abaya, Arba Minch Zuriya, Kucha
3	Silta	Lamfro, Sankura, Dalocha
	Hadiya	Mihrab Badawacho, Misrak Badawacho, Shashago, Soro
	Guraga	Marako,Maskane, Abshege, Kebena
4	Debub Omo Zone	Dasanech,Hammer,Debub Ari
	Derasha Special District	Derasha Special District
	Konsso Special District	Konsso Special District
	Amaro Special District	Amaro Special District
	Burji Special District	Burji Special District

7.3 Results

A total of 23 district and Regional Health Bureau were visited during the assessment. In 22/23 (95.5%) visited District, Rapid Response Team (RRT) has been established but only functional during outbreak. On the other side only 2/23(8.7%) of visited district namely look abaya in sidama zone and Lanfuro district in silita zone have emergency preparedness plan and additionally, visited district were not having adequate stock of drugs & medical supplies for major epidemic prone diseases like malaria, AWD, measles, dysentery and relapsing fever. Moreover, most of districts have no enough amount of money allocated for drug annually because health centers have revolving fund so that it is considered as no need to allocate budget for drug though there are trained health personnel's in adequate amount.

Table 7.2 Major epidemics since 2008 and the ongoing epidemic in the visited district and Zones with the respective population, June, 2009

Zones	District	Population	Major epidemic Since 2008	Ongoing epidemic During the assessment	No. of cases During the outbreak	EPI coverage of measles	Time of the outbreak
Wolayita	Sodo Zuriya	173,403	Malaria	No			2008
	Bolosso Bombe	95,555	Malaria	No			For Consecutive two years
	Damot Woeida	115,836	Malaria Measles	No		100.8 %	In 2009 including high land areas
	Humbo	149,549	AWD	No			In 2008
	Bolosso Sora	208, 176	Meningitis Malaria AWD	No			for consecutive two years
**Gamo Gofa	Arba Minch Zuriya	173,360	No	*No			
	Mihrab Abaya	78,693	No	No			
	Kucha	157,420	No	No			
Dawro	Loma	97,676	Malaria	No			For consecutive three years
	Genna Bossa	95,641	Malaria Bloody Diarrhoea	Malaria Bloody Diarrhoea			***Needs Serious Attention

	Konsso		AWD	AWD	447 (16 kebelles)		In April 2009
Burji special district	Burji special district		Typhoid fever Malaria	No			In 2008 In may 2009
Gedeyo Zone	Dilla zureaya	103,486	Measles	No		97%	April 2008
	Kocheria	139,097	Measles Conjunctivitis	No	30 2500 (16kebells)	70.3%	October 2008 February 2008
Sidama zone	Hawassa zureya	152,147	Measles Typhoid fever	No	2392 157	71%	January 2009 May 2009
	Borecha	250,437	Measles	No	1000	90%	December 2008
	Look abaya	93,729	AWD	No			October 2008
	Aleta wonedo	194,835	Meningitis	No			
Hadya zone	East Badwatcho district		AWD	No	130(10 kebelles)		October 2008

Generally there was report of outbreak in 15 district of the region since 2008G.C to June 2009G.C.Common outbreaks seen in these district was AWD, meningitis, Measles, Typhoid fever, Bloody diarrhoea ,Malaria and Conjunctivitis

As seen in table 7.2 Damot Woeida, dilla zureya, and borecha are district that report measles outbreak but on contrary EPI (expanded program on immunization) coverage of all these districts were greater than 90% in 2008 G.C. The reasons given by district health office were there is weak cold chain system in health posts because of technical error in refrigerators and low electrical supplies that might contribute to poor potency of vaccines and malnutrition. The epidemic of AWD in konsso special district is an ongoing epidemic. A total of 447 cases were reported from 16 kebeles. First case of AWD was reported from busso Kebele of this district in April 2009.

There was disagreement in declaring diseases as an outbreak in zonal health office and district health office one of the example seen during the assessment was hadya, East badwatcho, West badwatcho and soro district told as there is an ongoing malaria epidemics but the Zonal health office officials reject the report and say outbreak is not declared at zonal level and similarly in

kembata tembaro zone, tembaro and hadero district there was report of outbreak at district level but at zonal health office there is no registered outbreak.

The most common cause of morbidity in all selected and assessed district was malaria, respiratory tract infection, diarrhoeal disease, dysentery, and intestinal parasites but in burji special district typhoid fever is among ten top diseases and is sixth cause of morbidity differently from other woreds that are assessed.

Look abaya in sidama zone, kebina in guragia zone, sodo zuriya in wolayta zone had greater than 100% coverage of EPI, and on the other hand konsso special district, kocheria district in gedeyo zone and kucha and mehrab abaya in gamo gofa zone have EPI coverage of less than 70% the rest district in the assessment had greater than 80 % in 2008G.C

Table7.3 Number of new SAM children reported from December to May 2009 of assessed zones and district.

Zone	District	Number Of SAM children in OTP by month					
		Dec.	January	February	March	April	May
	Derashe	37	31	21	26	34	-
Konso special district	Konso special district	400	77	107	185	209	173
	Burji	138	138	139	99	40	NA
Gedeyo zone	Dillazureya	111	254	149	250	480	Not reported
	Yeregachefie	OTP service starts on march			333	133	269
	Wonago	422	422	No report	316	No report	Not reported
	Kocheria	2032	384	No report	No report	No report	210
Sidama zone	Hawassa zuriya	Not started	42	24	39	116	169
	Borecha	51	84	100	277	366	No report

	Look abaya	132	136	275	200	NO report	No report
	Aleta wonedo	At the time of interview the report was not accessible					
Kembata tembaro	Kedida gamilla	18	20	19	82	102	103
	Kacha bira	236	244	243	274	355	324
	Hadero tunato	417	492	634	718	689	856
	Tembaro	No report	116	132	360	453	
Halaba special district	Halaba special district	No report	77	166	303	268	454
Guragia zone	Mareko	171	132	128	153	210	179
	Meskan	130	140	174	233	277	311
Hadya zone	East Badawatcho	284	269	182	560	740	967
	West Badawatcho	321	151	161	451	558	627
	Soro	100	396	341	206	663	54
	Shashago	326	339	301	457	522	446
Silitia zone	Lanfuro	329	338	400	468	534	602
	Dalocha	97	83	96	134	113	133
	Sankura	163	159	196	180	284	417
Wolayita zone	Sodo zureya	38	88	43	123	220	403
	Boloso bomba	360	421	380	405	458	No report
	Damot district	113	195	123	427	601	822
	Humbo	142	100	96	42	No report	55
	Boloso sora	987	588	653	896	1040	1888
Gamo Gofa	Arba mench zureya	148	132	96	147	195	No report

Table 7.3 shows the number of SAM children is decreasing in Derasha, Konsso special district ,Burji, South omo zone ,Amaro special district ,Gedeyo zone(all assessed district) ,Humbo district (wolayita zone); on the other hand sidama zone ,kembata tembaro zone ,hallaba special district ,guragia zone ,hadeya zone ,silitia zone ,wolayita zone especially boloso sora district is increasing from month to month. In Butajira Hospital there were admissions coming from nearby district like mareko and meskan in Gurage and Dalocha district of Silte zone, during the assessment there were 8 SAM admitted and there were 4 death in January, 1 in February and 4 in April 2009 and in hallaba district there is 19 SAM admissions in hallaba health centre but only 9 of them are in side tent.

In kucha for the last six months a total of 148 admission, 109 cases with<70MUAC,29oedema,one death,38cured,with total discharge of 55 and no defaulter reported .it was very difficult to find the monthly report and in mehrab abaya even though there is 4 OTP and 1 S.C sites there is no report of SAM cases.

Training on management of SAM has been done in all study areas which has got OTP or SC sites. These sites have got adequate therapeutic supplies (RUTF) but there is problem of supplementary food for children with mild malnutrition that might lead them to sever malnutrition and problem of transportation to deliver plumpy nut to district. Nutritional assessment has been conducted in most of the assessed district except silitia district.

7.4 Conclusion

Most of visited districts have RR team (containing different health professionals) but this team is active when there is outbreak in the district but we could not find any minute of the team even though there are reports of outbreak in the outbreak .

We can conclude that very few of assessed districts have epidemic preparedness plan and allocation of budget for this epidemic preparedness plan and visited district justify that during outbreaks most of the time they ask support from zonal health and Regional Health Bureau almost for all outbreaks because of insecure budget for outbreak.

There is different understanding at different level of health sectors on outbreak decision that was seen during the assessment that needs uniform understanding and training at all level. There was documentation problem in some of visited district.

Recommendation

- Emphasis should be given to out break /epidemic preparedness and response so that allocation of budget is vital
- RR team shouldn't be for formality needs to be active at any time and there should be minute/documentation for every meeting and activities
- The stabilization centre needs construction of additional room to accommodate SAM cases who inside the tent especially in hallaba special district.
- Supplementary food should be available to mild malnourished children and to malnourished pregnant and lactating mothers
- Documentation and reporting system should be strengthen at all levels.

Chapter VIII – Protocol/Proposal for Epidemiologic Research Project

8. Assessment on Risk Factors of Pneumonia in Under Five Children; Tigray Region, Mekele Town: A Case-Control Study

Summary

Background: Every year, almost 11 million children under the age of five in developing countries die from preventable and treatable illnesses. Childhood ARI mainly pneumonia is the leading single cause of death. The incidence of ARI in under five yrs old children is estimated to be 0.29 episodes per child-year in developing and 0.05 episodes per child-year in developed countries. Prevalence of ARI in Ethiopia ranges from a high of 14 percent among children under five living in Tigray, Oromiya, and SNNP to a low of 2 percent in Dire Dawa and 28 % of death in under five children is due to pneumonia. The risk factors of ARI among children in developing countries are the following: indoor air pollution, failure to breast-feed, malnutrition, low birth weight, and socio demographic factors such as large family size, short birth interval, low income, and low level of parental education, poor housing, and inappropriate child care practices, Passive Smoking, young age, Male gender, sharing bed room with other children. In this study risk factors will be determined and seen in our context and identification of significant risk factors will be done so that recommendation will be given for priority intervention.

Objective: Describe determinants of acute respiratory tract infections/pneumonia in children under five years attending selected health facilities in Mekele town, Tigray region.

Methods: The study design is facility based; 1:1 unmatched case-control study in 4 randomly selected health facilities of Mekele town and the study population are children under five yrs old with pneumonia and non pneumonia cases that will come for visiting to those selected health facilities.

Time Table and Budget: The research project started in July, 2010 by submitting first draft of proposal and will continue until June/July, 2011 for result finalization and submission. Budget proposed for this project is **29,210.00ETB**.

8.1 Background

8.1.1 Introduction

Every year, almost 11 million children under the age of five in developing countries die from preventable and treatable illnesses such as diarrhoeal dehydration, acute respiratory infections (ARI), measles, and malaria(1).

Pneumonia is an infection of one or both lungs which is usually caused by bacteria, viruses, or fungi (2). However most of these infections Caused by Virus but do not result in fatal sever disease; they are mild and self limited illnesses(3).While Bacterial pulmonary infections are common in developing countries associated with a greater risk of death(2). Acute respiratory infection (ARI) that leads to pneumonia was one of the commonest causes of death of children in developing countries (4).

Childhood pneumonia is the leading single cause of mortality (5-8).The incidence of ARI in this age group is estimated to be 0.29 episodes per child-year in developing and 0.05 episodes per child-year in developed countries. Of all community cases, 7–13% is severe enough to be life-threatening and require hospitalization. Although based on limited available evidence, recent studies have identified *Streptococcus pneumonia*, *Haemophilus influenza,* and *respiratory syncytial* virus as the main pathogens associated with childhood pneumonia (9).

In Ethiopia 28% of deaths in under five children is due to pneumonia, 25% due to neonatal conditions (e.g. sepsis and asphyxia), 20% due to Malaria, 20% due to diarrhoea, 4% due to measles, and 1% due to AIDS According to Ethiopian demographic health survey (DHS) and Federal Ministry of Health (FMOH) data. Malnutrition is also a major Underlying cause of death in approximately 57% and HIV/AIDS underlies 11% of other deaths particularly those due to pneumonia (10).Tigray health profile of 2008/2009 shows first line cause of hospital admission and death in children under five years old is pneumonia.

8.1.2 Statements of the problem

ARI occurs more frequently than any other acute illness, including diarrhoea and other tropical diseases (2). Acute respiratory tract infection (ARI) is considered as one of the major public health problems and is the most common cause of morbidity and mortality

during infancy and childhood in developing countries(11)and the magnitude of the problem could be acknowledged from the fact that about 20% of infant born in developing countries failed to reach their fifth birth days and that one fourth to one third of the child morbidity was attributable to pneumonia alone as an underlying cause (4).Ethiopian DHS of 2005 shows that Prevalence of ARI ranges from a high of 14 percent among children under five living in Tigray, Oromiya, and SNNP to a low of 2 percent among children in Dire Dawa.

Epidemiology of ARI/pneumonia is needed both to develop preventive program and to identify high-risk groups in order to target more effectively case-management interventions. Among the factors that have been postulate to increase the risk of ARI among children in developing countries are the following: indoor air pollution, failure to breast-feed, malnutrition, low birth weight, and socio demographic factors such as large family size, short birth interval, low income, and low level of parental education, poor housing, and inappropriate child care practices (12), Passive Smoking, young age, Male gender, sharing bed room with other children (13).

8.1.3 Rationale of the study

Health and health related indicator of Ethiopia 2000 shows that number of health facilities that provide IMNCI service at national level has increased from 303 to 548 but the number of ARI cases is increasing from time to time and is still leading cause of death. Even though there are many studies done in different countries including our country to identify risk factors of pneumonia in under five children but the problem persists as leading cause of death and public health problem.

The purpose of this study is to attain useful data that will allow identification of risk factors of pneumonia among cases in comparison to controls and thus strengthen preventive measures, improve diagnostic Skills and get better prognosis.

8.1.4 Expected outcome

The expected outcome of this research project is to determine risk factors of acute respiratory infection/pneumonia and identify risk factors that are significantly associated among cases and controls and recommendation for priority intervention will be given.

8.2 Literature Review

Pneumonia is an inflammation of the lung that is most often caused by infection with bacteria, viruses, or other organisms. Occasionally, inhaled chemicals that irritate the lungs can cause pneumonia.Definitions of pneumonia vary widely; some require only the presence of infiltrates on a chest radiograph, where as others require only certain respiratory symptoms or signs. The World Health Organization has defined pneumonia solely on the basis of clinical findings obtained by visual inspection and timing of the respiratory rate. Definitions are a particular problem in the case of small infants, since pneumonia and bronchiolitis are both common in this age group, and the features of these two diseases often overlap (14).

The incidence of pneumonia in children under five years of age is estimated to be 0.29 episodes per child-year in developing countries and 0.05 episodes per child-year in developed countries(9). These figures translate into about 156 million new episodes each year worldwide, of which 151 million are in the developing countries (9).A prospective weekly home surveillance study was undertaken to determine morbidity patterns of under five children within the Butajira Rural Health project in central Ethiopia shows, Acute respiratory infections (ARI) (prevalence 2.8%) and acute diarrhoea (2.4%) were the commonest conditions (15).

A study done in selected countries of America shows the frequency of pneumonia is associated to a great extent with airborne transmission of germs that produce them, both viruses and bacteria, and with the fact that children under five spend most of their time in enclosed spaces accompanied by adults or other children, which fosters the transmission of respiratory infections. Most frequently associated factors of respiratory infections, or their severity, are air pollutants in the home particularly smoke from cigarettes or from kitchens or stoves that use solid fuels for combustion (16).And another study done in North India shows that indoor environmental pollution (use of cooking-fuel) and nutritional factors (lack of breast-feeding, severe malnutrition) are major risk factors for severe pneumonia (17).

A study done in domingo-Savio (Dominican Republic) suggest the incidences of ALRI in children from charcoal-using households were 1.58 (95% confidence interval (CI): 1.29, 1.96) and 1.49 (95% CI: 1.21, 1.84) times higher, respectively, than those in children from households using gas. Similarly, for the overall exposure classification, the crude incidence of ALRI increased with higher levels of charcoal exposure. (18)Another study done here in Ethiopia/Butajira suggests unfavorable housing and environmental conditions, like living in traditional Tukuls or homes without windows, poor latrines, crowding and cooking fires in the house were represented by the "no window" indicator, which affected infants more than children, especially for ARI (15).

A study that was done in Philippine also shows incidence of ARI was significantly associated with nutritional status as expressed by weight-for-age measures. Malnourished children with Z-scores of $-3 < Z < -2$ and $-2 < Z < -1$ SD had a modestly increased risk for acquiring ARI: 1.24(95%C I = 1.14, 1.34) and 1.14 (95% CI = 1.08, 1.19) times higher than the risk for healthy children, respectively (19).

Large family size, increasing birth order, and crowding are environmental factors that promote the transmission of respiratory pathogens and increase the size of the infecting inoculums. Settings with inadequate water supplies and sanitation systems predispose to poor personal hygiene and can further enhance transmission. These risk factors also predispose children to frequent and recurrent infections that impair tissue recovery and lead to more-severe disease (3).

Both mothers' and fathers' level of education was negatively associated with occurrence of severe acute lower respiratory tract infection. There were significantly higher numbers of illiterate mothers (34.8%) in ALRTI group as compared to controls (19.6%) ($p<0.000$) Similarly, significantly more fathers were illiterate in ALRTI group (17.4%) as compared to control group (6.1%) (17).

IMCI which is upgraded to IMNCI Addresses the most common childhood conditions it was Introduced in 1995 (WHO & UNICEF) and currently adopted by over 100 countries including Ethiopia, that is Recommended for all countries with IMR > 40/1000 Lbs. It

encompasses both preventive and curative interventions & responds to the felt needs of the population according ministry of health report.

Other than primary prevention, early detection and seek treatment on time is one among preventive measures of death secondary to pneumonia And experience shows early detection of pneumonia cases will reduce severity of cases and mortality due to pneumonia(20) so According to disease control and prevention program those were launched at WHO joint statement 1985 ,mothers should have knowledge about pneumonia and its management to decrease morbidity and mortality due to pneumonia in children under five years of Age (21) but Yet awareness of mothers, fathers or guardians towards risk factors ,severity of pneumonia and fast progress from pneumonia to sever pneumonia or very sever disease and then death looks poor that needs assessment Among cases and controls.

There are many studies done in different countries at different time to identify risk factors of pneumonia However, in developing countries evidence on the association between these factors and pneumonia in children is scarce(12) Including Ethiopia; it still continues to be leading cause of death in under five years children of developing countries than developed ones. Ethiopia has agreed on MDG (Millennium development goals) to decrease child mortality by two third (2/3) 0n 2015 and this can only be achieved through intensified efforts to reduce the major causes of death in children under the age of five years (22).

IMNCI guideline of WHO included the preventive and curative interventions .Ethiopia has adopted since 2002/2003 and DHS report of 2005 shows health facilities that give IMCI service increased from 303 to 548 According Ethiopian health and health related indicators of 2000.

In this research project a case- control study will be carried out to elucidate the major risk factors for childhood pneumonia incidence and severity among under five years' children that will help to strengthen WHO IMNCI strategy as well to look different strategies to be successful of MDG by 2015.

Conceptual frame work

This conceptual Frame work Shows that Individual, Environmental risk factors that lead to ARI /pneumonia which can be caused by viral or bacterial microbes in children under the age of five. And Socio-demographic differences among cases and controls is also another factor for occurrence of ARI/pneumonia

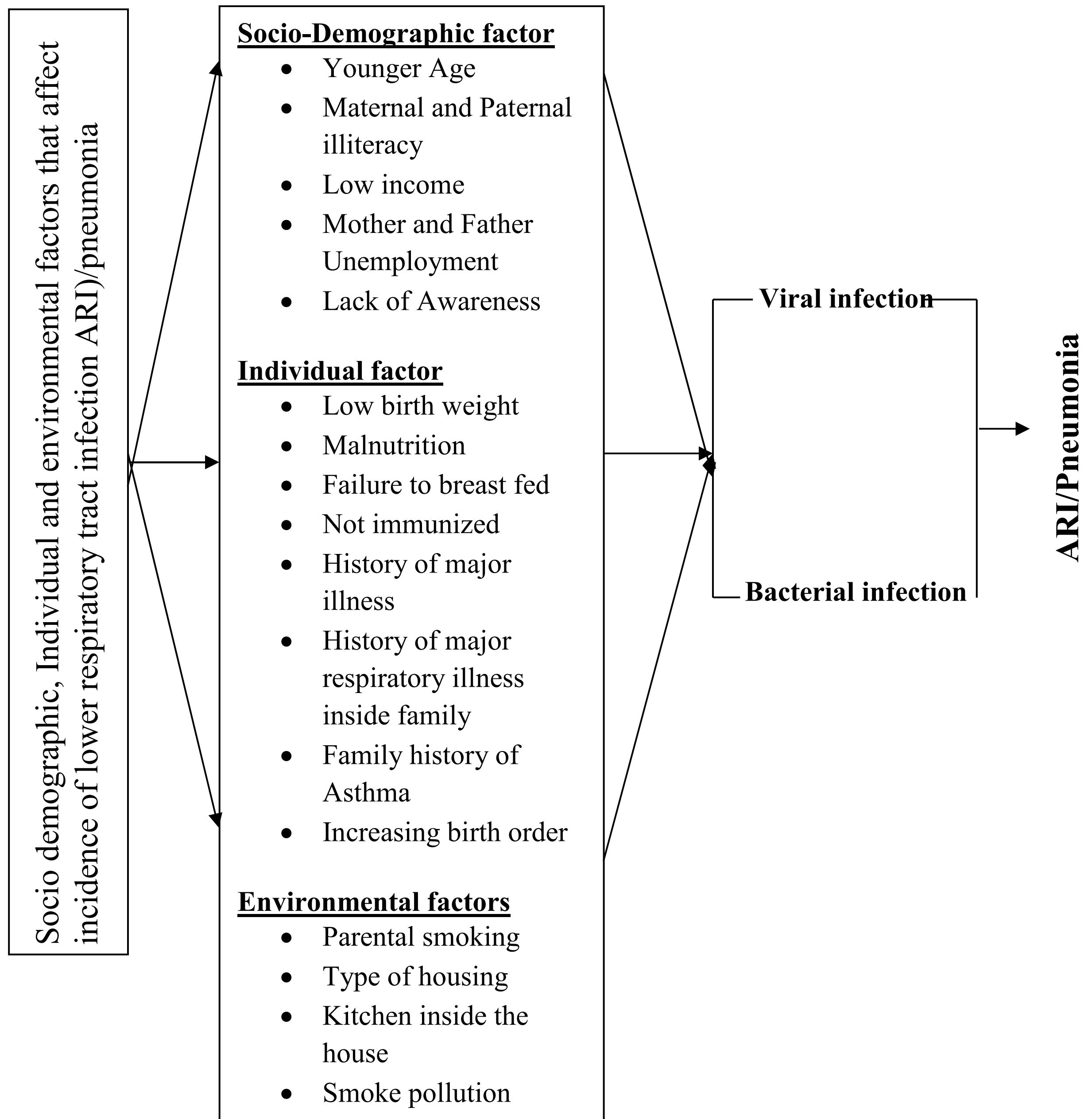

Figure 8.1 Conceptual frame work of Factors that determine ARI/Pneumonia in under Age of five years (Source: Berman S, 1991 (3))

8.3 Objective

8.3.1 General objective

To describe determinants of acute respiratory tract infection/pneumonia in children under five years of age attending selected health facilities of Mekele town, Tigray region.

8.3.2 Specific objective

1. Identify individual risk factors of pneumonia in under five children by comparing cases and non cases of pneumonia

2. Identify Environmental risk factors of pneumonia in under five children by comparing cases and non cases of pneumonia

3. Describe knowledge of mothers or guardians of cases and non cases towards severity of pneumonia in under five children

8.4 Methods

8.4.1 Study area

The study area is Mekele town, Tigray regional state. Tigray is located in northern part of the country, has total of 7 zones and population of 4,683,617.Mekele is capital city of the region; one among 7 zones and is 776KMs distant from Addis Ababa. Mekele town has a total population of 232,119 and 33,940 are under five years old that is projected by 2.5% growth rate of 2007 G.C. census report(23).

Mekele has 3 Governmental hospitals and 8 Governmental H.Cs (Health Centres). All of them are giving IMNCI service according to regional health bureau report. This study will be conducted in 1 Governmental hospital and 3 Governmental health centres of Mekele town which are selected randomly. Participant subjects will be equally distributed to all Study area.

8.4.2 Study design

The study is facility based unmatched, 1:1 case-control study. Patients that fulfill WHO criteria AND/OR suggestive Radiological examination for pneumonia, severe pneumonia, and very severe disease will be considered as cases, where as controls/non cases are those who don't fulfill WHO criteria for pneumonia who will come to health facility for different purpose will be interviewed Using same structured questionnaire for both cases and controls on risk factors of pneumonia such as socio demographic factor, environmental factor, individual factor and nutritional factor .

8.4.3 Source population

The source population is children under the age of five years who will be visiting selected health facilities for one or another care during the study period.

8.4.4 Study population

The study population will be all children under five years old who fulfil WHO criteria for pneumonia and children under five years old doesn't fulfil WHO criteria but can be healthy children or children under five years with any illness other than pneumonia

8.4.5 Sample size

A sample size determination formula is for 1:1, unmatched Case-control study with **95%** confidence interval and **80%** power. Sample size determination is using listed below Formula or Epi-info stat calc. Evidence for sample size calculation is taken from a study conducted in India, Calcutta (17). **History of Asthma in parents** has greater sample size than other exposures/risk factors (see table 8.1below). The required sample size will be total of **332** including 10% non response rate that is 166 cases and 166 controls.

$$n_1 = \frac{(Z_{\alpha/2} + Z_{1-\beta})^2 \bar{p}\bar{q}(r+1)}{r(p_1 - p_2)^2} \quad \bar{q} = 1 - \bar{p} \qquad p_1 = \frac{p_2(OR)}{1 + [p_2(OR-1)]}$$

$$\bar{p} = \frac{p_1 + rp_2}{r+1} \qquad n_2 = rn_1 \qquad p_1 = p_2(RR)$$

Where

n_1 =Sample size for cases

n_2= Sample size for controls

$Z_{\alpha}/2$= Value of the standard normal distribution corresponding to a significance level of α (1.96 for a 2-sided test at the 0.05 level)

r = ratio of unexposed to exposed (1:1)

p1 = proportion of cases with exposure and $q_1 = 1-p_1$ (using the above formula it is **22%**)

p2 = proportion of controls with exposure (considered exposure is History of Asthma in parents that is **9.63%** and **OR** of **2.65**.

Table8.1 Sample size determination for Assessment of risk factors of pneumonia in under five children in Tigray region, Mekele town: A case-control study, August, 2010.Using different risk factors which was done in India, Calcutta

Sample size determination depending on a study done in India ,Calcutta					
Exposure	Exposure Among controls (%)	Exposure Among cases (%)	Odds Ratio(OR)	Calculated sample size	Plus 10% non response rate
Low family income	46.70	72.44	3.00	126	139
Mothers illiterate	22.00				
Uses coal for fuel	25.93	48.59	2.70	158	174
Uses wood for fuel	23.70	59.65	4.76	68	75
History of Asthma in the child	8.89	40.96	7.11	66	73
History of Asthma in the parents	9.63	22.02	2.65	302	**332**

8.4.6 Sampling procedures

Average number of daily pneumonia patient (July to march data of health facilities taken from regional health bureau) is ***one*** pneumonia patient per day in Mekele Hospital, ***six*** Per day in Mekele H.C, ***four*** per day in Kasich H.C and ***Eleven*** *per* day in Semen H.C. But it doesn't mean all of those cases were diagnosed using WHO guideline; however this study will critically consider the WHO guideline.

According to WHO guideline to diagnose Pneumonia, severe Pneumonia and very severe disease in children under the age of five years (24).

A Pneumonia case is defined as fast breathing.

Severe pneumonia or **Very severe disease** is defined as any general danger sign, chest in drawing or Stridor in calm child.

OR

A suggestive radiographic examination for pneumonia at hospital level will be considered as case.

All cases that will visit to those selected health facilities for care or any other service during study period will be considered as study cases.

Non pneumonia case/Control is defined as children under the age of five years who will be visiting selected health facilities in under the age of five clinics for any type of care other than pneumonia.

Obviously there will be more than one under five children with in a day so, any child under the age of five that is considered as control will be selected randomly for each day to be included as study participant.

8.4.7 Data collection procedures

Mothers/guardians/care givers of pneumonia cases and non pneumonia cases who will come to selected health facilities will be interviewed using structured questionnaire.

Data collectors will be Nurses who are currently work as clinical nurse and Supervisors will be nurses who have been working in under the age of five years clinic and who had training on IMCI.

Training will be given to data collectors and supervisors using lecture, Video show, and case study methods. Training will focus on diagnostic methods of pneumonia/severe pneumonia/very severe disease using WHO IMNCI guideline and introduction of tools and will be given for two days. Each data collector is expected to interview four questionnaires per day. Weight, height, and MUAC will be measured at the beginning of the interview by data collectors (clinical nurses).

8.4.8 Study variables

The variables to be included in this questionnaire are both independent and dependent variables for which an association is going to be assessed in this study:

A. Independent variables

Socio-demographic back ground of study participants and their parents which can possibly contribute to pneumonia infection will be assessed. nutritional status, housing condition, the presence of chronic respiratory and any other illness, reproductive status of mother, birth order of the child, type of fuel used for cooking will be also assessed and compared among cases and controls.

B. Dependent variables

Odds of exposure factors to develop the disease among cases and controls will be evaluated.

8.4.9 Operational definitions

A. IMNCI: - integrated management of neonate and children illness is a strategy to provide comprehensive and continuous care to a sick child that improves quality of care and reduces mortality among under five years of children. It targets major killer diseases including pneumonia

B. ARI: - Acute lower respiratory infections (ALRI) are defined as those infections that affect the airways below the epiglottis. These include acute manifestations of laryngitis, tracheitis, bronchitis, bronchiolitis, lung infections, any combination of these, or any of these along with upper respiratory infections, including influenza.

C. Under 5:-is children whose age is since birth till 5 years old

D. Chest in drawing:-defined as the inward movement of the bony structure of the chest wall with inspiration, is a useful indicator of sever pneumonia. It is more specific than "intercostals in drawing" which concerns the soft tissue between the ribs without involvement of the chest wall. Chest in drawing should only be considered present if it is consistently present in a calm child. Agitation, a blocked nose or breast feeding can all cause temporary chest in drawing.

E. Stridor:-is a harsh noise made when the child inhales or breaths in.

F. Danger signs:-are unable to drink or breast feed, vomiting, convulsion and look at lethargic or unconsciousness and convulsion during observation

G. Fast breathing is defined as:-

- for children under the age of 2 months, 60 breaths per minute or more (it should be counted full minute breath)
- For children in the age interval of 2 months to 11 months, 50 breaths per minute or more (it should be counted full minute breath)
- For children in the age interval of 12 months up to 5 years, 40 breaths per minute or more (it should be counted full minute breath)

8.4.10 Data quality management

Questionnaire will be pretested in Mekele health centre a week before the start of the study. Depending on findings correction, rearrangement and adjustment will be made for the questionnaire to make clear and understandable. Data collector will verify the diagnosis of cases using the case definition before starting interview if any doubt will consult supervisor. And after interview data collector will also check questionnaire for completeness before thanking and let the interviewee go.

Supervisor will check all the questionnaires that are going to fill up per day so that any mistake or missing will be discussed and corrected afterward.

8.4.11 Data processing Analysis

Data will be entered using Epi-info version 3.4.1 public health statistical software; Data will be cleaned during template formation by providing good skipping pattern and after data entry by looking consistency, outliers, simple frequency, and listing. Analyzed data will be presented by frequency tables, graphs, pie charts for Descriptive

statistics/epidemiology. P value of less than 5 %(0.05),and confidence interval of 95% will be accepted as statistically significant test for analysis of findings and odds ratio greater than 1 will be also considered as likelihood to cause or association of risk factors among cases and controls. Logistic (multiple) Regression analysis will be considered for those risk factors with p-value of <0.02.

8.4.12 Ethical consideration

Ethical clearance will be secured from institution review board (IRB), Medical Faculty, Addis Ababa University. After having the ethical clearance of the university, it will be presented to the regional health bureau, zone administration health office and finally to each health facilities to get permission and support letter to carry out the study. An oral consent will be prepared and explained to mothers/guardians/care givers of study participant with all the right to participate or not. For those study subject who will agree to participate will continue as study participant. Confidentiality and privacy will be maintained by assigning data collector nurses other than their working health facility and study participants will be interviewed in a separate room with in the health facility. Those that are not voluntary to participate in the study will be respected by their decision.

8.4.13 Dissemination of results

After data collection, analysis and result writing; Result will be disseminated to all respected stack holders which is Mekele zone health office, Tigray regional health bureau, ministry of health and publications of scientific journals to be considered for strategies of pneumonia prevention and appropriate treatment and also learning of others who are interested on this area.

Work plan

Table8.2 Time table of Assessment of risk factors of pneumonia in under five children in Tigray region, Mekele town: A case-control study, August, 2010

No.	Activities	Month								
		July(2010)	Aug.	Mar.	Apr.	May	June	July		
1	Topic selection									
2	Submission of first draft of proposal for comment									
3	Submission of last draft of proposal									
4	Ethical clearance and secure budget									
5	Support letter and standardization of questionnaire									
6	Data collection									
7	Data entry, Analysis and interpretation									
8	Report writing and submission									
9	Dissemination of reports and defense							?		

Budget

Table8.3. Budget Break down for Assessment of risk factors of pneumonia in under the Age of five years children in Tigray region, Mekele town: A case-control study, August, 2010

Personnel Costs					
Title	Qualification	Quantity	Rate	Duration Of data collection	Total
Data collector	Diploma nurses	4	150.00ETB	25days	15,000.00ETB
Supervisor	Diploma/BSC nurses	1	180.00ETB	25 days	4500.00ETB
Principal investigator	BSC(public health)	1	180.00	29 days	5220.00ETB
Subtotal					24,720.00ETB
Equipment and supplies	Name of item	Measurement of unit	Quantity of each	Unit price	Total price
Stationary	A-4 80 Paper	Pack	3	100.00ETB	300.00ETB
	pencil and eraser	Each	5&5	3.00ETB	30.00ETB
soft copy back up	Rewritable CD - Rome	Each	1	10.00ETB	10.00ETB
Print (photo copy)	• Questionnaire • Report	• Each • pcs	• 350 • 6	• 4.00ETB • 50.00ETB	1,700.00ETB
Data collectors material	• Hard binder • hand bag	Each	• 5 • 1	• 30.00ETB • 500.00ETB	150.00ETB 500.00ETB
Subtotal					2690.00ETB
Transportation					1,800.00ETB
Total					29,210.00ETB

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Chapter IX – Other Additional Output Reports

9.1 Unidentified liver diseases in north western zone of Tigray Region, Ethiopia: surveillance Report

Zayeda Beyene, Ghiday G/libanos

9.1.1 Introduction

Pyrolizidine alkaloid-containing plants are widely distributed in many geographical regions in the world. It has been reported that about 3% of the world flowering plants contain toxic Pyrolizidine Alkaloids (PAs) (1). Many Pyrolizidine alkaloids are highly toxic and there have been almost 400 PAs identified in over 6,000 plants within numerous plant families to date. Most toxicity seems to result from three main families of plants: *Boraginaceae*, *Compositae*, and *Leguminosae*. (1)Multiple PAs have been found to possess a wide variety of adverse effects that can range in severity, depending on the agent and the dose of the exposure (2). The dose and duration of exposure to heliotrine required to produce liver damage in humans has been previously estimated as 4–10 mg/kg per day for 3–7 weeks. WHO has indicated that the lowest intake causing disease may be 1 mg total PAs per day for a 70 kg adult , and German regulations for herbal remedies establish a maximum oral intake of 1 microgram per day(3).

Plants containing PAs are likely to grow as weeds among staple food crops and pastures, especially following drought, and consumption of such crops can cause large scale outbreaks of toxic disease in both man and farm animals(4).

Consumption of contaminated grain or the use of PA-containing plants as herbal medicines, beverages, or food by man, or grazing on contaminated pastures by animals, may cause acute or chronic disease (4).Although all age groups are affected, children are particularly vulnerable to the effects of PAs. The symptoms, which are generally acute in onset, are characterized by upper abdominal discomfort that develops rapidly and progresses to swelling of the abdomen resulting in increased girth, sometimes accompanied by a reduction in the quantity of urine excreted and swelling of the feet(4). The classical symptoms and signs of human PA toxicosis are abdominal pain and rapidly developing ascites. Lassitude, anorexia, nausea, vomiting, diarrhoea, edema, emaciation, hepatomegaly, splenomegaly, and mild jaundice also occur. The condition may present as

an acute toxicity but is more often the late manifestation of hepatic failure or circulatory obstruction resulting from chronic pathological changes which have been developing in the liver over previous weeks or months due to a low level intake of the alkaloids(5).

Livestock are poisoned by grazing on plants containing Pyrolizidine alkaloids, causing livestock loss due to liver and pulmonary lesions. It is now well recognized that a large variety of animal species are susceptible to Pyrolizidine alkaloid toxicity (1).

The first recorded human disease caused by PA-containing plants was reported in 1920 in South Africa where multiple cases of cirrhosis occurred following consumption of bread from flour contaminated mainly with the plant Senecio burchellii (5).

9.1.2 Background

A Liver disease of unknown etiological origin with significant morbidity and mortality was first reported in the village of Tseada Amba, Kelakil Kebele, Tahtay Koraro district of Tigray region in 2001/2002(6) But reports of regional health bureau and other partners shows there were number of cases reported before 2001.The outbreak in Medebay Zana district which is adjacent district was also reportedly recognized in April 2005 with the first case from Tirkakia village, Kiberto kebelle. Similar type of outbreak was reported from Asgede Tsembla district. Recently as of October 2009 similar type of outbreak was reported from other three additional districts *i.e.,* Laelay Adiabo, Tahtay Adiabo and Tselemti district. Yet there is no reported case from sheraro and shire indaselassie districts of north western zone (7).

The disease in human is manifested as epigastric pain/abdominal pain, nasal bleeding, peripheral edema and abdominal swelling progressing to ascites in some patients. It has a high mortality rate in some affected persons particularly in children, dying within weeks or months of first developing symptoms while other patients have lived for over six years with the disease. The disease also affects livestock such as chickens, sheep, goats and cattle, of which goats are reported to be the most affected animals. Reported symptoms in animals were almost similar to that of human cases, that include enlarged abdomen, depression, nasal bleeding, unusual screaming (goats), and blotting(6).

The north western zone is a mixed farming area with both crop production and livestock rearing activities. Agriculture activities are entirely dependent on the *Kiremeti* rains from June to September (7).Major agricultural crops in Kibrito locality are millet, *teff*, sesame, sorghum, maize, and goadeya (leqwa). Animal products consumed are milk, meat, egg, honey, and chicken and the most abundant noxious weed found in the affected village: *Ageratum Sp*. (*Hageye feto or Chena Aregiate locally called*). It is found distributed widely surrounding houses, drinking water sources, agricultural and grazing fields even along walking tracks (6).

The source of water for most of inhabitant is mainly rely on stream/river though at times open well dug at households and well fitted by a hand pump are used by the community(7). Although other possible causative factors for the health problem cannot be entirely excluded, Pyrolizidine alkaloid (PA) toxicity of the liver, possibly from contamination of *Ageratum* weed, is suspected as the etiological agent besides other risk factors contributing to the development of the disease in north western zone of Tigray. However, this is a working hypothesis and further investigation and action are necessary (6).The objective of this investigation was to describe cases of unidentified liver disease of north western zone of Tigray region, Ethiopia

9.1.3 Methods

Study area:-is Tigray region, north western zone and is about 300 K.M from capital of Tigray region (Mekele). North western zone has 8 districts and total population of 737,509 but currently only 6 districts are reporting ULD cases and about 85% of the population is living in rural area and their most source of income is crop.

Descriptive epidemiology:-secondary data was collected using line list which was prepared by multi- disciplinary team of shire stationed experts. Surveillance data of all six districts of the zone is collected from focal person of regional health bureau since 2001/2002 G.C. to describe the distribution in terms of place, person, and time.

This map shows districts of north western zone of Tigray region that are reporting ULD cases.

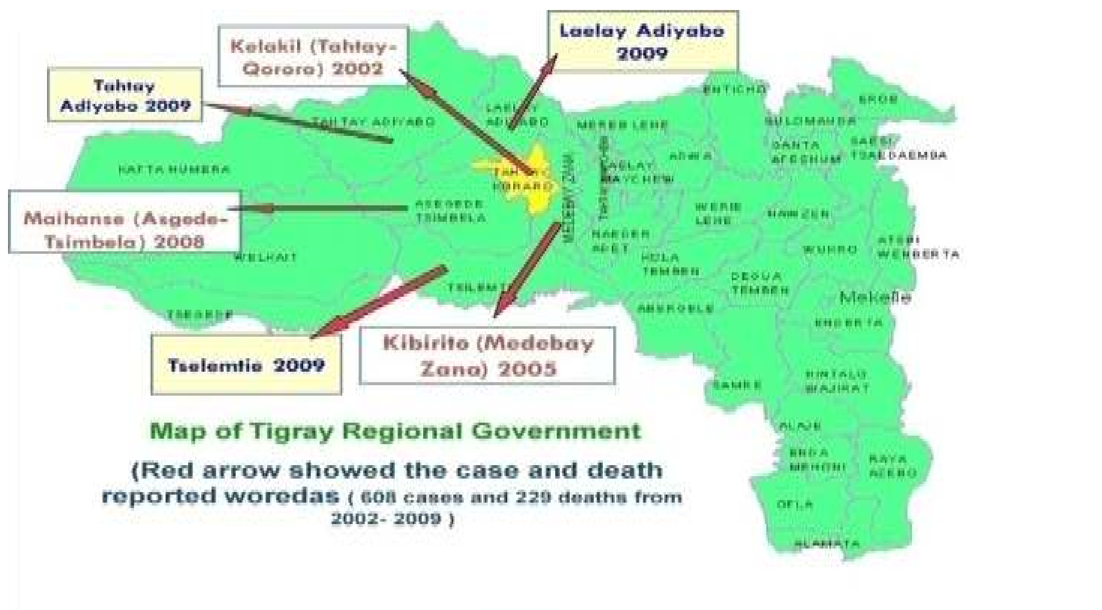

Figure 9.1.1 Map of North Western Zone, Tigray region that shows districts reporting ULD cases

Operational Case definition of ULD (unidentified liver disease)

1. **Suspect case**: -Is developed for use in the community when the patient first comes into contact with a Community Health Agent (CHA) or HE

- **A suspect case**:- is defined as a person with abdominal distension **AND** either a household member sick with similar symptoms **OR** abdominal cramps/pain for at least two weeks

2. **Probable case**: - Is developed for use in the health centre when the patient is being evaluated by a nurse or health officer

- **Probable case**:-A possible case is defined as a person who meets the suspect case definition **AND** has hepatomegaly or splenomegaly.

3. **Possible case**: - Is intended for use in the hospital

- **A probable case:-** is defined as a person who meets the possible case definition **AND** has a serum alkaline phosphates (ALP) greater than or equal to twice the upper limit of normal

9.1.4 Results

Descriptive Epidemiology

As Tigray regional health bureau Report indicates the first case of unidentified liver disease was reported on January 2002G.C from North Western zone, Tahetay koraro district, Kelakil Kebele, Emba tsehdi village but the first date of onset from the line list collected by Tigray regional health bureau and other partners was 1986/87 G.C. which is 16/17 years back. Till June 2010 G.C. Total number of 736 patients reported from 6 districts of North Western zone of the region with attack rate of 0.1%(736/674,091). Among these 736 patients 476 are under clinical follow up in health facilities of the districts; 247 are died (33.5% case fatality rate).There are total of 124 kebeles in these 6 districts but only 39 of them have reported ULD cases.

The mean age of cases is 26yrs old and range is 80 years old. And age group of 15-44 is highly affected relatively with other age groups. Sixty (63) % of total cases and 63% of deaths are male.

Even though it is difficult to put symptoms and signs of cases of unidentified liver disease in figure(percentage) but the common manifestations of cases is epigastric pain/abdominal cramp, Fever, jaundice (yellow discoloration of eye), nasal bleeding, peripheral edema, and abdominal swelling progressing to ascites and cause death.

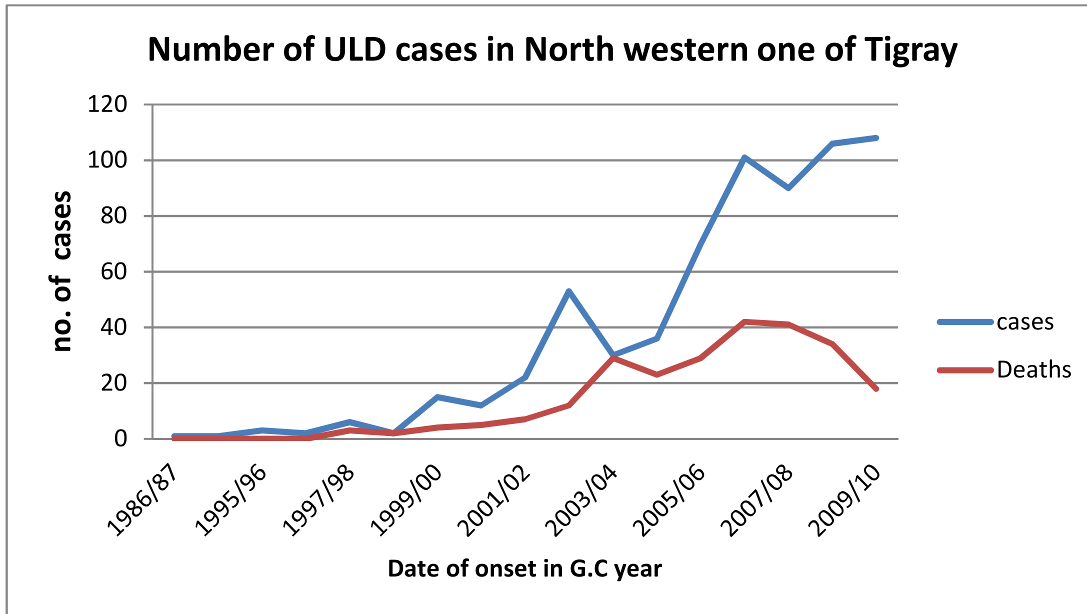

Figure 9.1.2 Reports of Unidentified Liver disease cases and deaths in year since the detection of outbreak

The number of reporting ULD cases by their date of onset (that is collected from governmental health facilities and oasis foundation at the beginning) is increasing since 1986/87.The number of deaths was also increasing from year to year but then since 2007/08 G.C even though the number of ULD cases is increasing from year to year; the number deaths is decreasing.

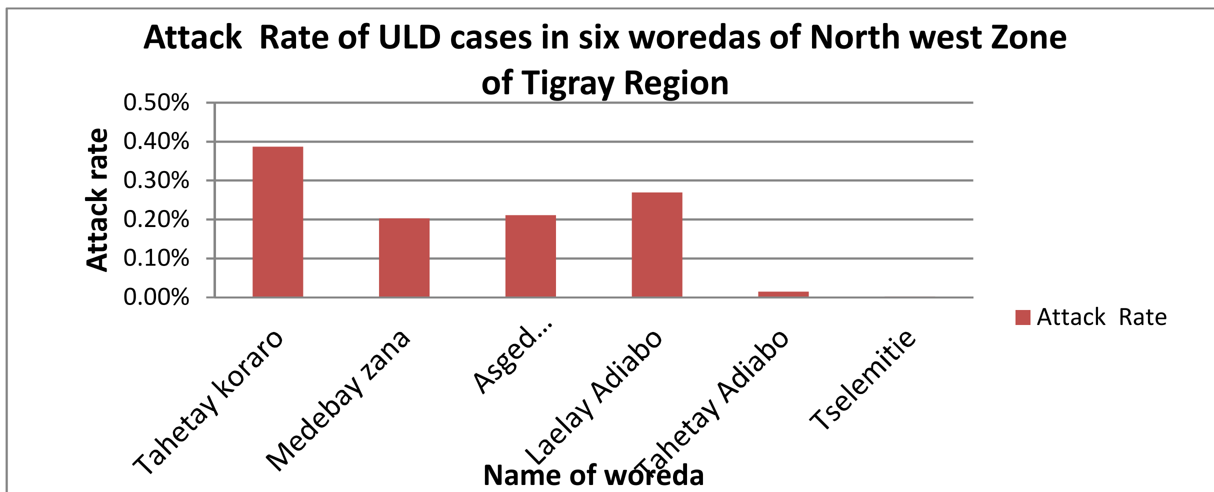

Figure 9.1.3 Attack rate of Unidentified Liver disease cases in six districts of north western zone of Tigray since 2001 G.C

From the above figure two districts have high attack rate namely Tahtay koraro (a district that report the first ULD case) with attack rate of 0.39% and laelay Adiabo with 0.29% attack rate this analysis is done since the beginning of the cases till June, 2010 but report of cases continues after.

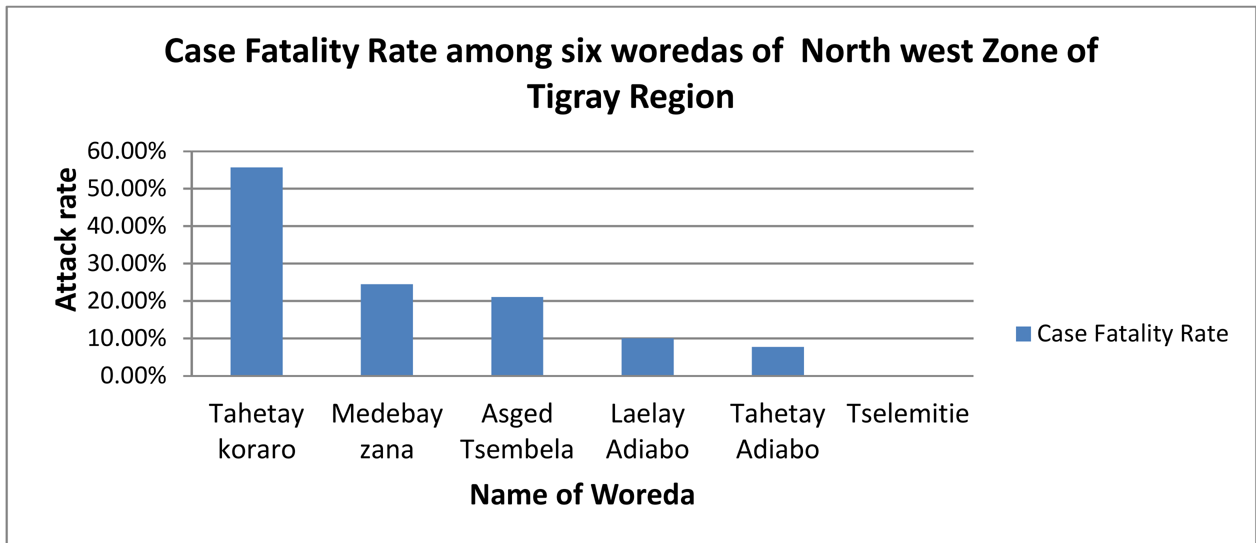

Figure 9.1.4 Case fatality of Unidentified Liver disease cases in six districts of north western zone of Tigray since 2001 G.C

Over all case fatality of ULD cases is 33.6%.Tahtay koraro has highest case fatality rate which is 55.7% and medebay zana is 24.6% case fatality rate.

9.1.5 Discussion

Unidentified liver disease is yet a disease with unknown etiology but different investigations are going on by national planning and coordinating committee composed of different stakeholders and international partners including CDC. The reported health problem may possibly have resulted from prolonged PA exposure; this could be justified by the detection of Pyrolizidine alkaloid (PA) in some grain samples (*tela*, millet, and *teff*) collected from affected villages. The most abundant noxious weed found in the affected village: *Ageratum Sp*. (*Hag eye feto in* Tigrigna) containing PA. It is found distributed widely surrounding houses, drinking water sources, Agricultural, and grazing fields even along walking tracks. This ULD case is 5 0r 6 years old disease in Ethiopian history that has started in Tahtay koraro district and then continues to other boarders of the district. There was also similar outbreak report in Afghanistan and South Africa repeatedly long time ago.

Treatment and other medical care given to the cases include vitamins, spirnolactone, antibiotics, and paracentesis. Soya, barley, and sugar are given as nutrition supplement. Psychological support is also given for those who have lost their family members and to avoid stigmatization by non-affected community.

The number of cases that are reported from health facilities is increasing from time to time but it needs more investigation to say is the disease disseminating to other districts of the zone or is the surveillance system detects cases after awareness rising of health workers and community which weren't reported previously. Only 31.5% of kebeles of those 6 districts is reporting ULD cases. Males are more affected than females and age group of 15 to 44 years old takes greater proportion than others.

Tahtay koraro and laelay Adiabo is districts with high attack rate than other 4 districts that are reporting ULD cases and on the other side Tahtay koraro and medebay zana has high case fatality rate. Over all case fatality rate (33.5%) of Tigray ULD case is high relatively with Afghanistan similar outbreak which is 25% in 2001G.C.

Recommendation

- Continues and extensive investigation to know the possible cause of the disease or to prove the hypothesis that has formulated by different investigation
- Since this chronic illness affects human beings of all age group and livestock so collaborated and integrated work needs to be strength
- Surveillance system of human health and livestock is very vital to be sensitive and to detect cases and to follow the trend of the cases

Acknowledgement

We express our great full thanks to National Planning and Coordination Committee of unidentified liver disease in Tigray and Ethiopian nutrition and health research institute (Ethiopian public health Institute)for letting as part of the team.

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Our thanks goes to Dr Zegeye H/Miriam, Dr Daddi Jima, Dr. Richard Luce, and Dr Adamu Addisie for their help through our field attachment and write up.

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9.2 Descriptive Epidemiology of Measles Outbreak in Welkait and Tsegede districts Tigray, Ethiopia, August – October 2010

Zayeda Beyene, Ghiday G/libanos, Beyene kidu

Abstract

Background. Measles is a highly infectious viral disease that causes high morbidity and mortality in many developing countries. In Africa and Asia more than 20 million measles cases are reported annually. Ethiopia introduced measles vaccination as part of the expanded program on immunization (EPI) in 1980; however, measles outbreaks continue to occur frequently in the country.

Methods. Outbreak data was obtained from the regional health bureau and was analyzed using micro soft Excel.

Results. The first case was reported from Wolekiate district with onset of rash on August 13, 2010. There were 169 suspected measles cases reported from both Wolekiate and Tsegedia districts. A majority of the cases (55%) were from Wolekiate district; 56.2% of cases were male; 10.7% were infants and 44.4% were under five years of age. Cases in Wolekiate were slightly older (median age of 8.5 years) compared with those in Tsegedia district (median age of 5 years). The fatality rate was 5.3% (9/169). A majority of cases (60.4%) were not vaccinated for measles; 22.4% cases reported at least one dose of measles vaccination. Serum samples were obtained from both districts for laboratory confirmation; 9/10 were IgM positive.

Conclusion. The majority of cases occurred in children under five years of age and among those that were not vaccinated suggesting vaccination coverage is low in these districts. Improved routine vaccination as well supplementary immunization is needed. As assessment of the cold chain system is also needed to evaluate vaccine efficacy.

Key words. Measles outbreaks, Wolekiate and Tsegedia, Tigray, Ethiopia

9.2.1 Introduction

Measles is a highly infectious viral disease caused by a Morbillivirus and for which humans are the only reservoirs. It includes prodromal symptoms of fever, malaise, cough, coryza (runny nose), and conjunctivitis. Within 2 - 4 days of the prodromal symptoms, a rash made up of large, blotchy red spots (maculo-papular rash) appears behind the ears and on the face. The rash spreads to the trunk and extremities and typically lasts 3-7 days. Individuals with measles are infectious 4 days before through 4 days after rash onset. Incubation period is about 10 to 12 days with a range of 7-18 days. Transmission is by respiratory droplets or direct contact. When the measles virus is introduced into a non-immune population, nearly 100% of individuals will become infected and develop a clinical illness. In areas with tropical climate, most cases of measles occur during the dry season and in areas with temperate climate the peak is during the late winter and early spring (1).

Unimmunized under five years of age, and especially infants, are at highest risk for measles and its complications, including death. Common complications include severe diarrhoea, Pneumonia, inflammation of middle ear and Encephalitis. Complicated measles is likely in poorly nourished children, especially those who do not receive sufficient vitamin A, who live in crowded conditions, and whose immune systems have been weakened by HIV/AIDS or other diseases. Measles is a major cause of blindness among children in Africa and other areas of the world with endemic measles (2).

Although a vaccine has been available since 1959 (3), measles remains an important cause of morbidity and mortality in children, particularly in developing countries where more than 95% of measles-associated deaths occur (4-6).

Natural measles infection tends to induce higher antibody levels than does measles vaccination. Depending upon the titer of passively acquired maternal antibodies, young infants are usually protected against measles for several months. Maternal antibody protection decays by six to nine months of age, leaving infants increasingly susceptible to measles (7).

Measles is prevented by immunization with measles vaccine. To reduce the risk of infection in hospitals, all children between the ages of six and nine months who have not received measles vaccine and who are admitted to a hospital should be immunized against measles. If the children's parents do not know whether they have received measles vaccine, the child should still be immunized. If a child has received measles vaccine before nine months of age, a second dose should be administered at nine months or as soon as possible after nine months (2).

In 1980, Ethiopia introduced measles vaccination as part of the Expanded Program on Immunization (EPI). One dose of measles vaccine is recommended at 9 months of age. In view of the disease burden, the Ministry of Health (MOH) of the Federal Democratic Republic of Ethiopia in collaboration with the Regional Health Bureaus (RHBs) and partners started implementing the accelerated measles control strategy in 1998. Measles control Strategies for sustained measles morbidity and mortality reductions in Ethiopia include, Strong routine immunization of > 90% of children aged 9 to 11 months; provide a second opportunity for measles vaccination; Case-based measles surveillance and improved case management (8).

Detection of an outbreak relies on the ability of the responsible authority to recognize an increase in measles cases significantly above the number normally expected. This recognition is simpler if a routine surveillance system collects either summary or case-based information on clinical and confirmed cases of measles. In the absence of an effective surveillance system it may be difficult to detect small or limited outbreaks (9).

Measles vaccination coverage of welkait is 66.9% and Tsegede is 80.7%. In both districts measles vaccination coverage is increasing as Tigray regional health bureau stated. The objective of this study is to describe the outbreak in terms of time, place, and person.

9.2.2 Methods

Study Area:-Welkait and Tsegede districts are located in Ethiopia, Tigray region, western zone. Welkait has Population of 150,764 and Tsegede has 112,013.

Study design:-Descriptive epidemiology: Tigray regional health bureau collected the surveillance data using epidemic line listing formats of the PHEM from the time of outbreak onwards.

Case definition of measles

Suspected measles case: - A person who presented with Rash, fever and cough, runny nose or conjunctivitis or if A clinician suspects measles

Confirmed measles case: - A person who presented with Rash, fever and cough, runny nose or conjunctivitis and positive for IgM from central laboratory

A single measles case detected is considered as the beginning of an outbreak (alert) and 5 suspected measles in a district per month is considered as outbreak in the region.

9.2.3 Results

A total number of 169 measles cases were reported from both Welkait and Tsegede districts. Fifty five percent (93/169) from the total measles cases is reported from Welkait.56.2% of cases were male; 10.7% & 44.6% were infants and under five years old children consecutively. Median age of all cases is 6 years old but median age of Welkait district cases is younger (5 years) than Tsegede (8.5 years) and age ranges from 3 months to 50 years old. 60.4% of cases weren't vaccinated for measles at all but 22.4% cases had at least one dose of measles vaccination.

Attack rate is almost the same in both districts that is 0.24 % in Welkait and 0.2% in Tsegede district. Case fatality is 5.3 %(9/169). Among 50 kebeles in both districts about 19 kebeles report measles cases. The first measles case (index case) was reported from Welkait district, Adi gaba Kebele but their farming area is in Embagala Keble bordering Keble's of North Gondar and the date of onset of rash was on 24/08/2010 that was reported by the community. Nine (9) blood serum samples were collected in both districts from different Keble's and all was confirmed for Measles in the central laboratory.

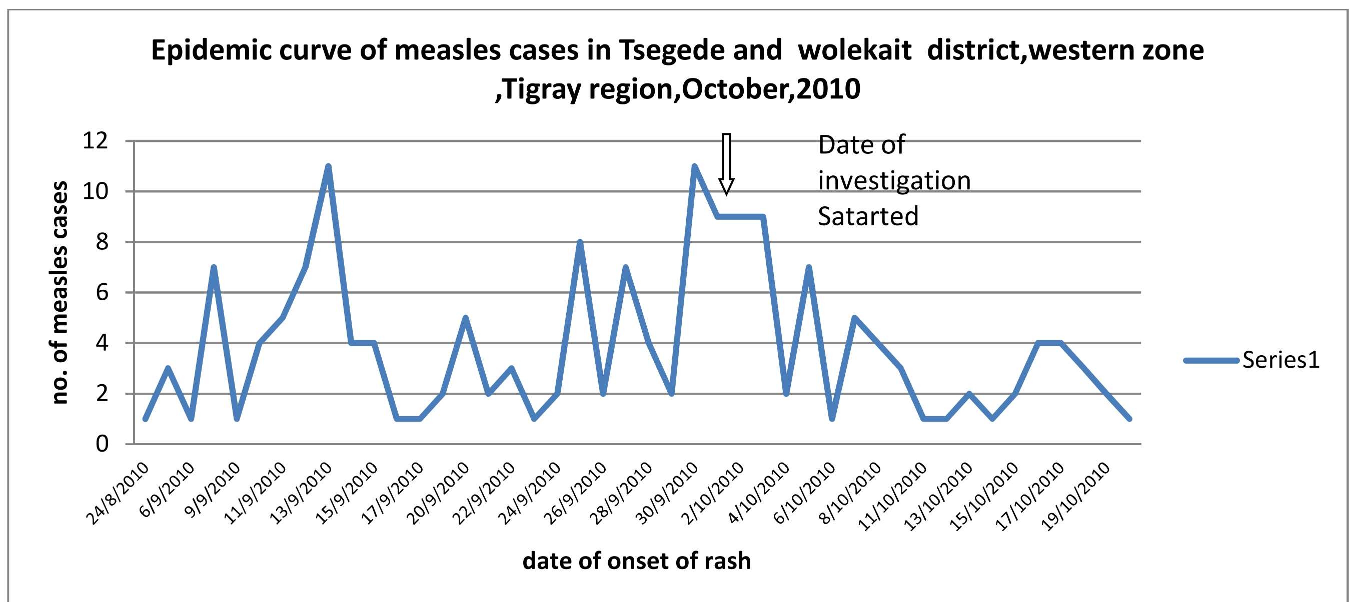

Figure9.2.1.Epidemic curve of measles cases in Welkait and Tsegede district, western zone, Tigray region, October, 2010

An Epi-curve show outbreak duration was from 24/08/2010 through 20/10/2010.There was two peaks that is in the beginning of September and beginning of October and there were days with zero report.

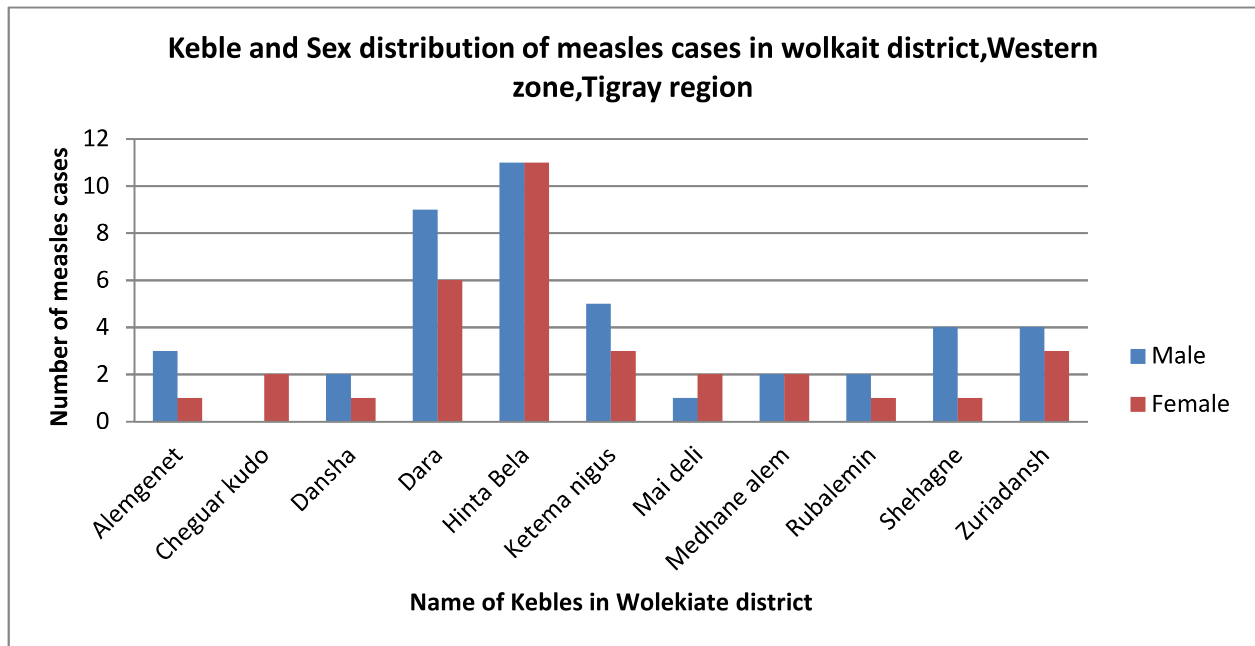

Figure 9.2.2 Keble and Sex distribution of measles cases in wolkiat district, Western zone, Tigray region

Figure 9.2.2 demonstrate 11 kebeles that report measles cases in the district, so depending on the figure Dara and Hinta bela are kebeles that reported high number (39.8%) of measles cases in wolkiat district and in 9 of 11 kebeles the number of male cases is greater than the number of female cases

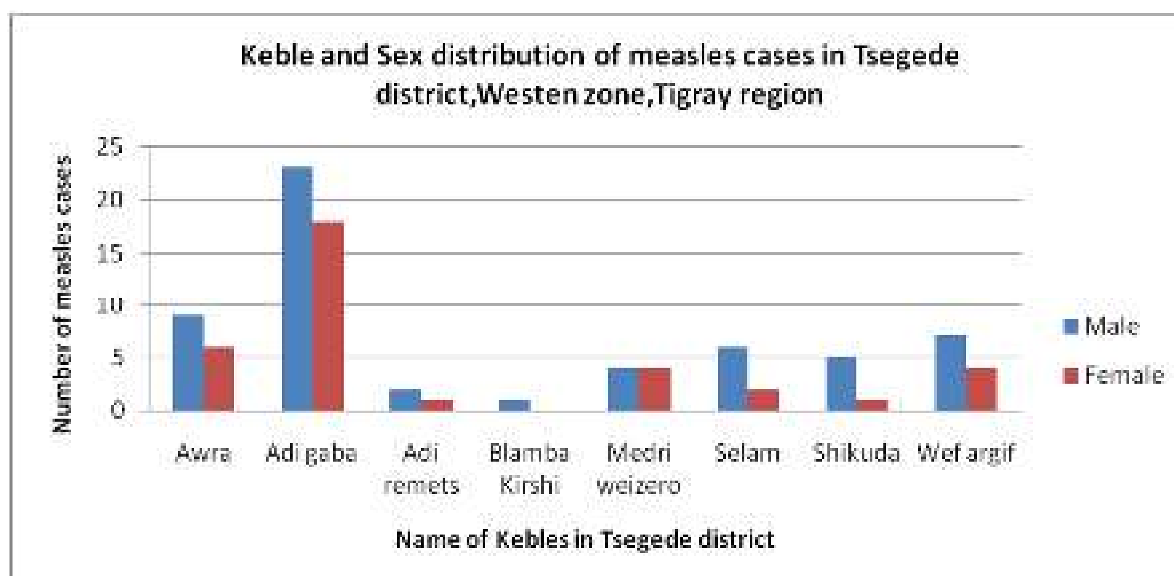

Figure 9.2.3 Keble and Sex distribution of measles cases in Tsegede district, Western zone, Tigray region October, 2010

Adi gaba Keble of Tsegede district is relatively report high number of measles cases followed by Awra Keble and as it is seen in Tsegede district male is dominant in number of cases.

Table 9.2.1 vaccination status of measles cases in all age group of Western zone, Tigray region October, 2010

Age	Vaccination status of all cases			
	0(unvaccinated)	1(One valid dose of measles vaccine)	2(two valid dose of measles vaccine)	99(unknown status)
<1 year	18(100%)	0	0	0
1-5 years	29(42.3%)	22(32.8%)	9(13.4%)	7(10.5 %)
>5 years	55(65.5%)	6(7.1%)	1(1.2%)	22(26.2%)

As seen in table 9.2.1 all infants with the age of less than one year measles cases are unvaccinated and also 42.6% in the age group of less than 5 years and greater than 1 year age children are unvaccinated and 65.5% of greater than five years are also unvaccinated. But on the other hand 44.2% of cases of 1-5 years old have at least one dose of measles vaccination.

9.2.4 Discussion

Generally under five years old children are highly affected relatively with other age groups by this outbreak. And the number of male cases is higher than female to some extent in both districts .The first measles case (index case) was notified in welkait district. Case fatality rate was 5.38 and 5.3 in welkait and Tsegede districts respectively that is higher than national case fatality rate (4%, National guideline for measles guideline and outbreak Investigation, FMOH 2007) of measles case in both districts. This shows that either there is delayed health seeking behavior by the cases or parents of the cases or else there was poor case management. Most of measles cases are not vaccinated especially under one year old children but still there are significant number of cases in both districts who are vaccinated at least one dose measles vaccination so the cold chain system might contribute to potency of vaccine.

Dara & Hinta bela Kebeles from welkait district and Adi gaba from Tsegede reported high number of measles cases relatively to other affected Keble's.

Conclusion and Recommendation

Children are highly affected by this outbreak and there is high case fatality rate that needs special attention in case management. Vaccination status of both districts is less than 90% that is a strategy for reduction of measles morbidity and mortality.

- Increase routine vaccination coverage and Supplementary measles (SIAs) of both districts to reduce measles morbidity and mortality in infants
- Case based management needs to follow the recommended management protocol by the ministry of health
- Since there are significant number of cases who has at least one valid measles vaccination that needs to assess the cold chain system of the districts

Acknowledgement

We express our great full thanks to Tigray Regional health bureau and especially Ato Tekleab G/selassie for providing the outbreak data of both districts. Again our thanks goes to Dr. Richard Luce for his review and comments on the abstract upon its submission to Epidemic Intelligence Services (EIS).

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Annex

Annex 1. Evaluation of Epidemiological Diseases Surveillance System in Tigray, Ethiopia, 2010 .A Questionnaire for Region

Region surveillance system questionnaire

General information

Name of interviewer____________________Date___________________

Name of interviewee ________________________Profession/position ______________________

Number of health facilities: Gov.Hospital ___ Gov. H.centre ___ Gov.Health post______
Private Hospital ___ Private Clinic____

Telephone no. of interviewee (land line and/or cell phone) ___________________

Is there any written documentation of the objectives of disease surveillance system in the region? (**Observe**)

Yes No I do not know

Is there legal mechanism to enforce surveillance for priority diseases?

Yes No I do not know

Case-detection and Registration

Does your region have any means / mechanism to capture information of unusual event from the community or other informal sources?

Yes No I do not know

If yes, what type of means do you have?_______________________________________

Does your region have standard case definitions for all notifiable diseases? (**Observe**)

Yes No I do not know

Proportion of HF with Standard Case Definition of all notifiable diseases_____________

Does your Region have standard registers for notifiable disease? (**Observe**)

Yes No I do not know

Proportion of health facilities with standardized registers______________

Is data validation routinely done?

Yes No I do not know

Proportion of health facilities correctly filling the registers_____________

Case Confirmation

Are laboratory diagnostic reagents present and maintained in your region?

Yes No I do not know

Are supplies for specimen collection and transportation present and maintained in your region?
Yes No I do not know

Proportion of out breaks that are lab. Confirmed within a year (**specify**)_________

What proportion of health facilities (HF) Performing external quality assurance?________
What proportions of health facilities have the capacity to transport specimens to a higher level lab?___________

What proportions of health facilities have guidelines for specimen collection, handling, and transportation to the next level?___________

Data Reporting

What type of communication facility do you use for reporting to central level?
hard copy report E-mail Fax Radio Electronic
Other

Proportion of cases of diseases under surveillance that were reported to central level using case based reporting forms in the previous 3 months_______

Proportion of epidemics detected in previous 3 months that were notified to the central level within 2 hours surpassing the epidemic threshold___________

For weekly:_________ /12 times reports

Number of reports received at regional level in the previous 3 months

For immediately___________/

For weekly:_________ /12 times reports

Does your region reported each reporting period to the next higher level during the previous 3 months
Yes No I do not know

Does your region have appropriate surveillance forms at any times during the past 3 months? (**Observe**)

Weekly report form	Yes	No	I don't know
Case based report form	Yes	No	I don't know
Line listing	Yes	No	I don't know
Epidemic report form	Yes	No	I don't know

Data Analysis

Does your region analyze surveillance data by (**Observe** for line graph?)
Time Yes No I do not know

Place Yes No I do not know

Person Yes No I do not know

If yes list the diseases that are analyzed____
____
____

Does your region have clear and defined epidemic threshold values for epidemic prone diseases?
Yes No I do not know
If yes list the diseases with threshold ____
____

Outbreak Investigation

Did you have any suspected outbreak in the past 1 year?
Yes No I do not know
If Yes, list them____

How many of the suspected outbreaks are investigated? ______________________

Number of outbreaks in which risk factors were looked for?__________________

Number of outbreaks in which findings were used for action? ________________

Epidemic Preparedness
Does your region have Rapid Response Team (RRT)?
Yes No I do not know

What Proportion of districts is with RRTs____________________?

Do you have any written report of epidemic preparedness plan? (**Observe**)
Yes No I do not know

Has the region had ____________________at all times in past 1 year?

Emergency stocks of drugs	Yes	No	I do not know
Vaccines	Yes	No	I do not know
Supplies	Yes	No	I do not know

Did your region had experienced shortage of drugs and supplies for the most recent outbreak within the previous 1 year
Yes No I do not know

If Yes, what were the outbreak and the shortage? ________________________________

Proportion of districts that experienced shortage of drugs and supplies for the most recent outbreak with the previous 1 year _____________

Does the region have budget line for epidemic response?
Yes No I do not know

Does the region have a regional rapid response team for epidemics response?
Yes No I do not know

Does your region have a functional epidemic management committee?
Yes No I do not know

Epidemic Response

Does epidemic management committee evaluate its preparedness and response activities during the past 1 year (Observe written report to confirm)?
Yes No I do not know

Did your region has experience of cross-border communication during outbreak
Yes No I do not know

Does your region have rapid response kits at various levels?
Yes No I do not know

Observe that regional level responded within 2 hours of notification of most recently reported outbreak within a year (from written reports with trend and intervention)
Yes No I do not know

Feedback

Do you get a periodic feedback from central level?
Yes No I do not know

How many feedbacks written reports did you receive from central during the last 1 year? **(Observe)** _________

Do you give a periodic feedback given to districts?
Yes No I do not know

How many feedbacks written reports did you produce during the last 1 year? **(Observe)**___________

Supervision

Do you conduct a planned supervision to your districts on a regular basis?
Yes No I do not know

Proportion of supervisions conducted according to plan (how many was planned and how many was implemented) ______________

Do you use supervisory check list
Yes No sometimes

Observe supervision report or any evidence of supervision in the previous 1 year

How many times have you been supervised in the previous 1 year?_______

Standards and guidelines
Does your region have standard guidelines for priority disease under surveillance?
Yes No I do not know

What Proportion of districts is with standard guidelines for priority disease under surveillance_____?

Does your region have guidelines for investigation of outbreaks?
Yes No I do not know

What Proportion of districts is with guidelines for investigation of outbreaks_________?

Does your region have standard case management protocol for priority diseases?
Yes No I do not know

If yes, for how many of diseases do you have?___________

What Proportion of districts is with standard case management protocol of priority diseases_____?

Does your region using guidelines for infection control?
Yes No I do not know

Does your region have SOP's for laboratory units (priority diseases under surveillance)?
Yes No I do not know

What Proportion of laboratory units is with SOP's? ______________________________
Training
Do you have training on disease surveillance /IDSR?
Yes No

If yes, when was the training?_________________________

What proportions of health workers have surveillance training in the region currently?__________

Does your region have surveillance training plan?
Yes No

Did you conduct the training according to the plan?
Yes No
If no, what was the reason?____

Does your region have surveillance training manual?
Yes No

Resources
Are the following resources indicated in the table below available in your region? (Mark **X** where appropriate)

No	Type of resources	Present	Absent	Remarks
1	Electricity			
2	Motor cycle			
3	Vehicle			
4	Adequate Stationery			
5	Calculator			
6	Computer			
7	Printer			
8	Telephone service			
9	Fax			
10	Radio call			
11	Posters			
12	Megaphone			
13	Flipcharts or image box			
14	TV set			
15	Generator			
16	Internet access			

Timeliness
Proportion of districts submitted weekly reports to the region on time in the previous 3 months_________________

Proportion of expected immediately surveillance reports received on time from districts in the previous 3 months_________________

Proportion of expected weekly surveillance reports received on time from districts in the previous 3 months_________________

Proportion of outbreaks notified to the central level within 1 hour of detection since last year___

Proportion of outbreaks with verification process initiated within 2 hour of detection_____
____

Completeness

Proportion of total expected weekly surveillance reports that were received within previous 3 months at regional level regardless of timeliness(**observe**)________

Proportion of any reports received with no missing of the required information (variables) within previous 3 months at regional level (**observe**) _____

Proportion of total expected surveillance reports that were reported to central level within previous 3 months regardless of the timeliness of reporting (**observe**)___________

Proportion of reports sent with no missing of the required information (variables) within previous 3 months to central level (**observe**) ______

Usefulness

Do you use surveillance data /information for?

Planning	Yes	No	I do not know
Priority setting	Yes	No	I do not know
Intervention?	Yes	No	I do not know

Others (specify) ____

Observe for any sample that is planned for priority setting and intervention using the available data

Yes No I do not know

If yes what disease data was useful (specify)_______

Simplicity

Do you think that the surveillance system is simple to understand with regard to:

Data collection?	Yes	No	Not much
Data transmission?	Yes	No	Not much
Data analysis?	Yes	No	Not much
Case definition?	Yes	No	Not much

If case definition is No, which disease is difficult to understand?_______________

Acceptability

Do you think that surveillance system is acceptable at regional level?

Yes No not much

Proportion of Users/Implementers Who thinks the surveillance system is acceptable________

Reliability

Do you think that surveillance reports with reported cases corresponding (with an acceptable error margin) to the records in the register over the same time period and observe

Yes No not sure

Weekly report reliability (region to central level report)

Disease conditions	Number of cases recorded		Number of deaths recorded	
	District report	Region report	District report	Region report

Annex 2. Evaluation of Epidemiological Diseases Surveillance System in Tigray, Ethiopia, 2010 .A Questionnaire for District

A Questionnaire for Evaluation of Surveillance System at District Level

General information

District name ________________________
Name of interviewer____________________Date___________________
Name of interviewee ____________________Profession/position ___________
Number of health facilities: Hospital___ Health centre ___ Health post______
Telephone no. of interviewee (land line or cell phone) _______________________

Is there any written documentation of the objectives of a surveillance system available? (**Observe**)
yes No I do not know

Is there legal mechanism to enforce surveillance for priority diseases?
Yes No I do not know

Case-detection and Registration

Do you have any means / mechanism to capture information from the community / or other informal sources
yes No I do not know

If yes, what type of means do you have?________________

Do you have standard case definition for malaria and/or measles? (**Observe**)
yes No I do not know

Proportion of health facilities with Standard Case Definition for malaria and/or measles__
____

Is data validation routinely done?
Yes No I do not know

Case Confirmation

Are laboratory diagnostic reagents for malaria and /or measles present and maintained in your district?
Yes No I do not know

Are there malaria and/or measles outbreaks that are lab confirmed in the last 1 year?
yes No I do not know not applicable

Proportion of malaria and/or measles out breaks that are lab. Confirmed within last year__
____

Are supplies for specimen collection and transportation present and maintained in your district?
Yes No I do not know

Proportion of health facilities that have the capacity to transport specimens for malaria and/or measles to a higher level lab?_______
Do you have a documented list of referral laboratories for confirmation of malaria and/or measles?
yes No I do not know

Proportion of health facilities performing external quality assurance for malaria?________
____

Data Reporting

What type of communication facility do you use for reporting to next level?
Hard copy report Radio Telephone Mail Fax Other

Proportion of measles cases that were reported to regional level using case based reporting forms in the previous 1year________

Proportion of malaria and measles epidemics detected in previous 1 year that were notified to the regional level within 1 hour surpassing the epidemic threshold___________

Number of reports received at district level in the last 3 months? (**Observe**)
For measles________
For malaria:________ /12 reports

Does your district have appropriate surveillance forms at any times during the past 3 months? (**Observe**)

Weekly report form	Yes	No	I don't know
Case based report form	Yes	No	I don't know
Line listing	Yes	No	I don't know
Epidemic report form	Yes	No	I don't know

Numbers of reports send to region during the last 3 months? (**Observe**)
For measles ________
For malaria_______________ /12reports

Data Analysis

Do you analyze malaria and measles data at your district by (**observe**)

Time?	yes	No	I do not know
Place?	yes	No	I do not know
Person?	yes	No	I do not know

Does your district has clear and defined epidemic threshold values for epidemic prone diseases

yes No I do not know

If yes, what is the threshold ____

Outbreak Investigation

Did you have any suspected outbreak in the last year?

yes No I do not know

How many of the suspected outbreaks were investigated?

yes No I do not know

Did you look for any risk factor during investigation?

yes No I do not know

Did you use the data for action?

yes No I do not know

Epidemic Preparedness

Does the district have a rapid response team for epidemics?

yes No I do not know

Proportion of health facilities with RRTs____________________?

Do you have any written report of epidemic preparedness plan? **(Observe)**

yes No I do not know

Does your district have budget line for epidemic response?

Yes No I do not know

Did your district experience shortage of drugs and supplies for the most recent malaria and/or measles outbreak within last 1 year?

yes No I do not know Not applicable

If yes, what were the outbreak and the shortage? ___________________________________

Proportion of districts that experienced shortage of drugs and supplies for the most recent outbreak with the previous 1 year ______________

Are emergency stocks of drugs and supplies for malaria and/or measles available at district level?

yes No I do not know

Does your district has a functional epidemic management committee (**Observe**)

yes No I do not know

Epidemic Response

Does epidemic management committee evaluate its preparedness and response activities during the past 1 year (Observe written report to confirm)?
Yes No I do not know

Did your district has experience of cross-border communication during outbreak
Yes No I do not know

Observe that district level responded within1 hours of notification of most recently reported outbreak within a year (from written reports with trend and intervention)
Yes No I do not know

Feedback

Do you get a periodic feedback from regional level?
Yes No I do not know

How many written feedback reports did you receive from region during the last 1 year? (**Observe**) _________

Do you give a periodic feedback to health facilities?
Yes No I do not know

How many written feedback reports did you produce during the last 1 year? (**Observe**)___________

Supervision

Do you conduct a planned supervision to health facilities on a regular basis?
Yes No I do not know

Proportion of supervisions conducted according to plan (how many was planned and how many was implemented) ______________

Do you use supervisory check list during supervision?
Yes No sometimes

Observe supervision report or any evidence of supervision in the previous 1 year

How many times have you been supervised in the previous 1 year?_______

Standards and guidelines

Is there a national surveillance manual/guideline at your district?
yes No I do not know

What Proportion of health facilities is with standard guidelines for malaria and/or measles _____?

Does your district have standard case management protocol for malaria and/or measles?
yes No I do not know

What Proportion of health facilities is with standard case management protocol malaria and measles _____?

Does your district of surveillance units with guidelines for investigation of outbreaks
yes No I do not know

What Proportion of health facilities is with guidelines for investigation of outbreaks_________?

Does your district of laboratory units with SOP's for collection, packaging, and referral of specimens of malaria and/or measles
yes No I do not know

Does your district use guidelines for infection control?
Yes No I do not know

Training

Did you get training in surveillance and basic epidemiology?
yes No
What proportions of the health workers have surveillance training?_____________

Does your district has surveillance training manuals at hand (**Observe**)
yes No

Does your district have surveillance training plan for this fiscal year?
Yes No

Did you conduct the training according to the plan?
Yes No
If no, what was the reason? ____

Resources
Are the following resources indicated in the table below available in your district? (Mark **X** where appropriate)

No	Type of resources	Present	Absent	Remarks
1	Electricity			
2	Motor cycle			
3	Vehicle			
4	Adequate Stationery			
5	Calculator			
6	Computer			
7	Printer			
8	Telephone service			
9	Fax			
10	Radio call			
11	Posters			
12	Megaphone			
13	Flipcharts or image box			
14	Generator			
15	Movie projector with screen			

Timeliness
Proportion of health facilities submitted weekly malaria reports to the district on time in the previous 3 months_________________

Proportion of expected immediately measles reports to the districts on time in the previous 3 months_________________

Proportion of outbreaks notified to the regional level within 1 hour of detection since last year_________

Proportion of outbreaks with verification process initiated within 1 hour of detection_____ ______________

Completeness
Proportion of total expected weekly malaria surveillance reports that were received within previous 3 months at district level regardless of timeliness(**observe**)_________

Proportion of malaria and/or measles reports received with no missing of the required information (variables) within previous 3 months at district level (**observe**) _____

Proportion of total expected surveillance reports that were reported to regional level within previous 3 months regardless of the timeliness of reporting (**observe**)___________

Proportion of reports sent with no missing of the required information (variables) within previous 3 months to central level (**observe**) ______

Usefulness

Do you use surveillance data /information for?

Planning,	yes	No	do not know
Priority setting	yes	No	do not know
Interventions	yes	No	do not know
Monitoring and evaluation of programs	yes	No	do not know

Observe for any sample that is planned for priority setting and intervention using the available data

Yes No do not know

Simplicity

Do you think that the surveillance system is simple to understand?

Case definition	Yes	No	not much
Data collection	Yes	No	not much
Data analysis	Yes	No	not much

If the answer for case definition is no, of which disease is it_____________

Acceptability

Do you think that surveillance system is acceptable at district level?

Yes No not much

Are you satisfied working in the existing surveillance system?

yes No

Reliability

Do you think that surveillance reports with reported cases corresponding (with an acceptable error margin) to the records in the register over the same time period

Yes No not sure

Weekly report accuracy (district to region)

Annex 3. Evaluation of Epidemiological Diseases Surveillance System in Tigray, Ethiopia, 2010 .A Questionnaire for Health facility

A Questionnaire for Evaluation of surveillance system at Health facility level

General information

Hospital /Health centre /Health post
District name ______________________
Health facility name___________________
Name of interviewer____________________Date__________________
Name interviewee ____________________Profession/position __________________
Telephone no. of interviewee (land line or cell phone) ______________________

Does your health facility have surveillance focal person?
yes No not applicable

Is there any written documentation of the objectives of a surveillance system available? (**Observe**)
yes No I do not know

Case-detection and Registration

Do you have any means / mechanism to capture information from the community / or other informal sources
yes No I do not know

If yes, what type of means do you have?_______________

Do you have standard case definitions for malaria and/or measles?
yes No I do not know

If yes, are they posted (**Observe**)?
yes No

Case Confirmation

Do you have the capacity to collect specimen for case confirmation of malaria and/or measles?
yes No I do not know

Does your facility perform External quality assurance for malaria?
yes No I do not know

Are laboratory diagnostic reagents for malaria present and maintained in your health facility?
Yes No I do not know

Are supplies for malaria and/or measles specimen collection and transportation present and maintained in your health facility?
Yes No I do not know

Proportion of malaria and/or measles out breaks that are lab. Confirmed within last year (**specify**)___________

Data Reporting

What type of communication facility do you use for reporting to next level?

Hard copy report Mail Fax Radio telephone
Other

Number of measles reports sent to district previous 3 months___________

Number of malaria reports sent to district previous 3 months______ /12 reports

Did your health facility use case based reporting forms for measles in the past 1 year?
yes sometimes No I do not know

Proportion of outbreak of malaria and/or measles detected in previous 1 year that were notified to the next higher level within 30 minutes surpassing the epidemic threshold____
______

Data Analysis

Do you do malaria and/or measles surveillance data analysis at your facility/organization level? (**Observe**)
Time yes No I do not know

Place yes No I do not know

Person yes No I do not know

Does your health facility have clear and defined epidemic threshold values for malaria and/or measles?
yes No I do not know
If yes, do you monitor? (**Observe**)
yes No I do not know

Outbreak Investigation

Did you have any suspected malaria and/or measles outbreak in the last 1 year?
yes No I do not know

If yes, how many suspected outbreaks did you have in the last year? ___________

How many of the suspected outbreaks were investigated? __________________

Did you look for any risk factor during investigation?
yes No I do not know

Did you use the data for action?
yes No I do not know

Epidemic Preparedness

Do you have any written report of epidemic preparedness plan? (**Observe**)
yes No I do not know

Did your health facility experience shortage of drugs and supplies for the most recent malaria and/or measles outbreak within 3 months
yes No not applicable

If yes, what was the shortage? ____________________________________

Are emergency stocks of drugs and supplies available?
yes No I do not know

Do you have a budget line for epidemic response?
yes No I do not know

Epidemic Response

Does your facility/ organization have a rapid response team?
yes No I do not know

Did your facility/ organization implement prevention activities based on local malaria and/or measles data? (**Observe**)
yes No I do not know

How fast did you respond to epidemic reports in your locality?__________

Does your health facility have experience of cross-border communication during outbreaks?
yes No not applicable

Feedback

Is there any feedback mechanism that is received from the district?
yes No I do not know

How many written feedback reports did you receive from district during the last 1 year? (**Observe**) _____________

Supervision

How many times have you been supervised in the last 1 year? (**Observe**) _____________

How many supervisory visits were planned in the last 1 year? ______________

How many supervisory visits have you made in the last 1 year? (**Observe**) _____________

How many supervisory visits you made for each health posts? ___________

Do you use supervisory check list (**observe**)
yes No

Standards and guidelines

Is there a national guideline for surveillance at your health facility?
yes No I do not know

Does your health facility have standard case management protocol for malaria and/or measles?
yes No I do not know

Does your laboratory unit have SOP's for collection, packaging, and referral of specimen's malaria and/or measles?
yes No I do not know

Does your health facility have guidelines for investigation of malaria and/or measles outbreaks?
yes No I do not know

Training
Did you get training in surveillance and basic epidemiology?
yes No
If yes, when was the training?________________________

What proportions of the health workers have surveillance training?____________

Resources

Are the following resources indicated in the table below available in your facility/organization? (Mark **X** where appropriate)

No	Type of resources	Present	Absent	Remarks
1	Electricity			
2	Motor cycle			
3	Vehicle			
4	Adequate Stationery			
5	Calculator			
6	Computer			
7	Printer			
8	Telephone service			
9	Fax			
10	Radio call			
11	Posters			
12	Megaphone			
13	Flipcharts or image box			
14	Generator			

Timeliness

How many malaria weekly reports did you send to district during the last 3 months timely? ______

(Observe)

How many measles reports did you send to district immediately during the last 3 months? ______

(Observe)

Number of outbreaks initiated verification process within 30 minutes?__________

Completeness

How many malaria weekly reports did you send to the district within the last 3 months? (**Observe**)______

How many immediately measles reports did you send to the district within the last 3 months? (**Observe**)______

Does your health facility complete all the variables of the malaria and measles reporting formats? (**Observe**)

yes No do not know

Usefulness

Do you use malaria and/or measles surveillance data /information for?
Planning yes No do not know
Priority setting yes No do not know
Interventions yes No do not know
Others (**Specify**) ______________________________________

Simplicity

Do you think that the surveillance system is simple to understand?
Case definition yes No do not know
Data collection yes No do not know
Data analysis yes No do not know

If case definition is no, of which disease is difficult to understand the case definition_____ ____________

Acceptability
Do you think that surveillance system is acceptable by health workers?
Yes No not much

Are you satisfied working in the existing surveillance system?
yes No

Reliability

Do you think that surveillance reports with reported cases correspond (with an acceptable error margin) to the records in the register over the same time period?
Yes No not sure

Reports of previous 1 month

Disease conditions	Number of cases recorded		Number of deaths recorded	
	Register review	Facility reports	Register review	Facility reports

Annex4. Assessment on Risk Factors of Pneumonia in Under Five Children; Tigray Region, Mekele Town: A Case-Control Study. Questionnaire of English version

This Questionnaire is to assess risk factors of pneumonia in under five years' old children in Tigray region, Mekele town: A case-control study, August to January, 2010

Introducing person that collect data and the study

Hello, my name is ___________________. I am working as data collector in a study conducted by Addis Ababa University, School of Public Health, Field Epidemiology, and Laboratory program track to assess risk factors that leads to acquire pneumonia in children under the age of five years old. Childhood pneumonia is one of cause of morbidity and mortality in children especially under five years old. The purpose of this research project is to identify the cause of pneumonia in children under the age of five years old, So that depending on the finding of the project the region is able to set priorities and intervene to prevent childhood mortality to achieve the Millennium development goal.

Informed oral Consent Form:

Your being participant of this study by interview and every aspect of the study is completely voluntary. If you have any questions that you don't want to answer you can tell me to skip to other question, but I would really appreciate your cooperation. For any questions that needs clarification you can ask me to make clear at any time. All information that you provide for this study is kept completely confidential.

We would like to ask you to be honest for your responses and be sure the responses are real because your real response to this study is very important. You will be here with me for about 15 minutes .After we have finished the interview you can go to pharmacy to receive the ordered medications for your child .For any Questions or comments concerning this research project you can contact the principal investigator **Zayeda Beyene** Telephone number of **0911378960** you are very well came**.**

Do I have your agreement to participate?

If Yes _____________ Start interview.

If No ____________ Thank and let go.

Questionnaire

Interviewer Name________________________ Date____________

Questionnaire Number/Code of the Questionnaire ______

Instruction: The question is made of multiple choice questions so please circle exactly on the choice/answer of participant only to each question.

Part one: socio demographic

01. District/town ________________ **03.** Health institution ____________

02. Kebele/Tabia ________________

04	• How old is the child? • What is Date of Birth of the child?	In months _____________ DD____MM______YY________	**Code:_______**
05	Sex of the child?	1.male 2.female	**Code:_______**
06	• How old is father of the child? • What is Date of birth of father?	• In years ____________ • DD____MM____YY_________	
07	• How old is mother of the child? • What is Date of birth of mother?	• In years ____________ • DD____MM____YY_________	**Code:_______**
08	What is Mother's ethnicity?	1. Tigrawoie 2. Amhara 3. Oromo 4. Other, Specify____________	**Code:_______**
09	What is mother's Religion?	1. Christian orthodox 2. Catholic 3. Protestant 4. Muslim 5. Other 6. Specify______________	**Code:_______**
10	What is Marital status of Mother?	1. married 2. single/unmarried 3. divorced 4. widowed 5. separated	**Code:_______**
11	Place of residence?	1.urban 2.rural	**Code:_______**

12	How much Distant is the health facility from your residence?	1.<5kms 2.5-10kms 3.11-20kms 4.>21kms	**Code** _______
13	Has the mother ever attended formal school?	1.Yes 2.No Skip to Q. 15	**Code_**_______
14	If yes, what is the highest grade attended	Grade_______ 1.vocational school 2.diploma 3.Degree and above	**Code_**_______
15	Has the Father ever attended formal School?	1Yes 2.No Skip to Q.17	**Code**________
16	If yes, what is the highest grade attended	Grade_______ 1.vocational school 2.diploma 3.Degree and above	**Code_**_______
17	What is Mothers occupational status?	1.unemployed 2.daily laborer 3.govermental employee 4.non governmental employee 5.injera maker 6.tella seller 7.other	**Code_______**
18	What is Fathers occupational status?	1.unemployed 2.daily laborer 3.govermental employee 4.non governmental employee 5.carpenter 6.other	**Code_______**
19	Have you heard About pneumonia before?	1.yes 2.no	**Code_______**
20	Do you know what pneumonia mean(for mother)	1.yes 2.no	
21	If yes, how sever is it	1.very sever 2.sever 3.not much 4.donot know	**Code_______**

22	Is the child case or control?(which is filled by collector only not asked for interviewee)	1.case 2.control	**Code______**

Part two: signs and symptoms –This section is allowed for cases of pneumonia .If the child is non case skip to next section

Would you please tell me the symptoms of the child			
23	Cough	1.Yes 2.no	**Code**_______
24	Fever	1.Yes 2.no	**Code**_______
25	Wheeze	1.yes 2.no	**Code**_______
26	Fast breathing	1.yes 2.no	**Code**_______
27	Stridor	1.yes 2.no	**Code**_______
28	Difficulty of breathing	1.Yes 2.no	**Code**_______
29	Running nose	1.Yes 2.no	**Code**_______
30	Feeding difficulty	1.Yes 2.no	**Code**_______
31	Sleep disturbance	1.Yes 2.no	**Code**_______
32	Chest in drawing	1.Yes 2.no	**Code**_______
33	Unable to drink	1.Yes 2.no	**Code**_______
34	Vomiting	1.Yes 2.no	**Code**_______

35	Convulsion	1.Yes 2.no	**Code**________
36	Diagnosis of case	1.pnemonia 2.sever pneumonia 3.very sever disease	**Code**________
37	DX by signs and symptoms and respiratory count	1.Yes 2.no	**Code**_______
38	DX by Signs, symptoms and radiological examination	1.Yes 2.no	**Code**_______

Part Three: individual factor

39	Does the child have History of low birth weight	1.yes 2.no	**Code** ________
40	What Type of feeding had the child during the first 6 months of age	1. breast feeding only 2. bottle feeding only 3. both bottle and breast feeding (mixed)	**Code**_______
41	Immunization status of the child?	1. not immunized 2. partially immunized 3. fully immunized	**Code**________
42	Measure Wt, Ht, and MUAC to know Nutritional status	1. Wt in Kg __________ 2. Ht/length in cm ___________ 3. MUAC in cm___________	**Code**__________
43	Does the child have History of any major or chronic illness preceding 2 weeks?	1.yes 2.no	**Code**________
44	If yes, specify type of illness	_________________________	**Code**_________
45	Does the child have History of chronic respiratory problems among household members	1.yes 2.no 3.unknown	**Code**_________
46	Does the child have Family history of asthma?	1.yes 2.no 3.unknown	**Code**________
47	Children born to A mother	In number____________	**Code**________
48	Number of family living within the household	In number ____________	**Code**________

49	What is Birth order of the study participant child in number?	In number _________	**Code________**

Part four: Environmental factors

50	Is there any one among family member who smoke cigarette	1.yes 2.no	**Code________**
51	What is Housing condition?	1. Tikul with functional window 2. Tikul with no window 3. Corrugated iron sheet with function window 4. Corrugated iron sheet without window 5. Other, specify_____________	**Code________**
52	Number of persons sleeping in one room?	1.one 2. two 3.three 4.above three	**Code_________**
53	Do you have a separate room which is used as a Kitchen	1.yes 2.no	**Code_________**
54	What type of fuel does your household mainly use for cooking	1.Electricity 2.Natural gas 3.LPG 4.Biogas 5.Kerosene 6.Charcoal 7.wood 8.animal dung 9.straw/shrubs/Grass 10.Animal Dung 11.Other Specify	**Code_________**

Annex5. Assessment on Risk Factors of Pneumonia in Under Five Children; Tigray Region, Mekele Town: A Case-Control Study. Dummy tables

Dummy tables

Table 1: Socio demographic distribution of cases and controls

Age in months	Cases n (%)	Controls n (%)	Total n
>12months			
12-23months			
24-35months			
36-47months			
47-59months			
Total			
Sex			
Male			
Female			
Total			
Ethnic Group			
Tigrawoie			
Amhara			
Oromo			
Other			
Total			

Table2 Socio-demographic distribution of mothers and Fathers of cases and controls

Age of mother	Case n (%)	Control n(%)	Total n
18-24yrs			
25-34yrs **35-50yrs**			
Total **Age of Father**			
18-24yrs			
25-34yrs			
35-50yrs			
>50 yrs			
Total			
Maternal Educational Status			
No Education			
Primary			
Secondary and Above			
Paternal Educational Status			
No Education			
Primary			
Secondary and Above			
Family Religion			
Christian Orthodox			
Catholic			
Protestant			
Moslem			
Traditional **Other**			

Table 3. Bivariate Analysis of individual risk factor to develop pneumonia

Individual risk factor	Cases n(%)	Control n(%)	Odds ratio(OR)	Confidence interval (C.I)	p-value (<0.05)
History of low birth weight					
breast feeding only during first 6 month					
bottle feeding only					
both bottle and breast feeding (mixed)					
History of any major or Chronic illness.					
History of chronic respiratory problems					
Family history of asthma					
not immunized					
partially immunized					
fully immunized					

Table 4. Bivariate Analysis of environmental risk factor to develop pneumonia

Environmental risk factor	Cases n(%)	Control n(%)	Odds ratio(OR)	Confidence interval (C.I)	p-value (<0.05)
Electricity or gas for heating &cooking					
Kerosene					
Charcoal					
Wood					
Animal dung					
Kitchen inside the house					
Parental smoking					
Tikul with Functional window					
Tikul with no window					
Corrugated iron sheet with window					
Corrugated iron sheet without window					
Other					

Table 5. Multivariate Analysis of risk factors with P-value of <0.02 to develop pneumonia

Risk factor with p-value of <0.02	Odds ratio(OR)	Confidence interval (C.I)	p-value (<0.05)

Annexe 6 Curriculum vitae of Field Epidemology and Laboratory program Resident

PERSONAL INFORMATION

Name	**Zayeda Beyene Tsehaye**
Sex	Female
Date of Birth	April, 1976
Nationality	Ethiopian
Address	Tigray Regional Health Bureau P.O.Box Mekelle, Tigray
Telephone	**+251-911-378960**
E-mail	**zayeda93@yahoo.com** Zayedab239@gmail.com

EDUCATIONAL BACKGROUND

Dates (from – to)	September 1995 to October 1997
Name of organization/college/university providing education and training	Mekele school of nurse(now mekelle health institute)
subjects/skills covered	2 years Comprehensive nursing skills
Titleof qualification given	Diploma in clinical nurse

Dates (from – to)	February 2001 to July 2003
Name of organization/college/university providing education and training	Gondar college of medical science(now Gondar university)
subjects/skills covered	2 and half years public health study
Titleof qualification given	Bachelor degree in public health

Dates (from – to)	Feberury2009 to now
Name of organization/college/university providing education and training	Addis Ababa university
subjects/skills covered	Applied epidemiology/ outbreak investigation
Titleof qualification given	FELTP resident

ONJOB TRAINING TAKEN

Dates (from – to)	November27th to december2nd,2000
Name of organization/college/university providing education and training	Tigray regional health bureau
subjects/skills covered	Interpersonal communication and counseling skills
Title of qualification given	Certificate in interpersonal communication and counseling skills

Dates (from – to)	September 22nd,2003 to march 26th,2004
Name of organization/college/university providing education and training	Tigray regional health bureau in collaboration with medicines du monde(MDM)
subjects/skills covered	Emergency obstetric Surgery
Title of qualification given	Certificate in emergency surgery

Dates (from – to)	September 14 to October 5 2006
Name of organization/college/university providing education and training	Federal HAPCO in collaboration with Family health international Ethiopia(FHI)
subjects/skills covered	Training of trainers on VCT
Title of qualification given	Certificate in Voluntary HIV counseling and testing

Dates (from – to)	March19th to 31st,2007
Name of organization/college/university Providing education and training	Tigray regional health bureau in collaboration with WHO at mekele,Ethiopia
subjects/skills covered	ART and management of opportunistic infections
Title of qualification given	Certificate in antiretroviral Therapy and MGT of opportunistic infections

Dates (from – to)	June to June 2008
Name of organization/college/university providing education and training	Federal HAPCO in collaboration with Management of science for health (MSH)
subjects/skills covered	Training of trainers on ART
Title of qualification given	Certificate in Anti retro viral therapy

Dates (from – to)	October 30 to November1,2008
Name of organization/college/university providing education and training	Tigray regional health bureau in collaboration with Management of science for health (MSH)
subjects/skills covered	Rational use of drugs
Title of qualification given	Certificate in drug administration

Dates (from – to)	November 30 to December 5,2009
Name of organization/college/university providing education and training	Climate and health working group Ethiopia in collaboration with international research institute and society, Colombia university

subjects/skills covered	Training on climate and health
Title of qualification given	Certificate in climate and health

WORK EXPERIENCE

Dates (from – to)	October 1997 to December1999
Name of employer	Tigray regional health bureau
Type of sector	Dansha hospital
Occupation or position held	Working as clinical nurse in different departments of the hospital
Main activities and responsibilities	Department head, nursing care, Health education
Dates (from – to)	January2000 to January2001
Name of employer	Medebay Zana district administration
Type of sector	Selekeleka Health Center
Occupation or position held	Working as clinical nurse in MCH department
Main activities and responsibilities	MCH department head, under five clinic examination, delivery service, inpatient follow up
Dates (from – to)	August 2003 to September2006
Name of employer	Tanque Abergel District administration
Type of sector	Yechela health center
Occupation or position held	Head of health center and perform emergency cesarean section
Main activities and responsibilities	Manage the health center and health posts and health promotion
Dates (from – to)	October2006 to January2008
Name of employer	Shire city administration
Type of sector	Shire health center
Occupation or position held	Head of health center
Main activities and responsibilities	Manage the health center and health promotion activities, working in ART clinic and also VCT clinic
Language	Amharic Mother Tongue Tigrigna English
Computer knowledge	Good computer knowledge that is acquired through practice
Summary	Hard worker, feel responsible, sociable, patience, working for change
Reference	Ato Luel Alemsegede Shire District health office head Shire health office Tel no.+251-34-4440708

Haregewoine   keflome
Disease prevention and promotion
Ministry of health
Tel.no.+251-91- 0011963

Declaration

I, the undersigned, declare that this is my original work and has never been presented by another person in this or any other University and that all the source materials and references used for this thesis have been duly acknowledged.

Name: Zayeda Beyene

Signature: ______________________________

Place: Addis Ababa University

Date of Submission: March, 2011

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Name of advisor: ______________________________

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