Addis Ababa University, College of Health Sciences,

School of Public Health

Ethiopia Field Epidemiology Training Program (EFETP)

Compiled Body of Works in Field Epidemiology

By:

Yirdaw Emiru (BSc)

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

June 2015

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Approval by Examining Board

_____ _____

Chairman, School Graduate Committee

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Advisor

_____ _____

Examiner

_____ _____

Examiner

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List of Acronyms

ADA	Amhara Development Association
AFI	Acute Febrile Illness
AFP	Acute Flaccid paralysis
AFRO	World Health Organization Regional Office for Africa
AHI	Avian Human Influenza
AIDS	Acquired Immune Deficiency Syndrome
ANC	Ante Natal Care
ANDM	Amhara National Democratic Movement
ANGT	Adult Naso Gastric Tube
AOR	Adjusted Odds Ratio
AR	Attack Rate
ART	Anti-Retroviral Therapy
ASA	Acetyl Salicylic Acid
AWD	Acute Watery Diarrhea
BPR	Business Process Reengineering
CAF	Chloramphenicol
Caps	Capsules
CAR	Contraceptive Acceptance Rate
CBR	Crude Birth Rate
CDC	Center for Disease prevention and control
CDR	Crude Death Rate
CI	Confidence Interval
CMC	Confirmed Malaria Cases
CRF	Case Fatality Rate
CRS	Congenital Rubella Syndrome
CSA	Central Statistics Agency
CTC	Cholera Treatment Center
DDT	Dichlorodipheny ltrichloroethane
DPPC	Disaster Prevention and Preparedness Coordination Office

List of Acronyms cont; d

DRC	Democratic Republic of Congo
EDHS	Ethiopian Demographic and Health Survey
EFETP	Ethiopian Field Epidemiology Training Program
EIS	Epidemic Intelligence Service
EPHA	Ethiopian Public Health Association
EPHI	Ethiopian Public Health Institute
EPI	Expanded Program on Immunization
EPPC	Emergency Prevention and Preparedness Committee
EPRDF	Ethiopian People's Revolutionary Democratic Front
EPRP	Emergency Preparedness and Response Plan
GDP	Gross Domestic Product
HAART	Highly Active Anti-Retroviral Therapy
HC	Health Center
HEW	Health Extension Worker
HFs	Health Facilities
HH	House Holds
HIV	Human Immune Deficiency Virus
H1N1	Homophiles Influenza
HP	Health Post
HWs	Health Workers
IDSR	Integrated Disease Surveillance and Response
IgM	Immunoglobulin M
IMR	Infant Mortality Rate
IPCC	Intergovernmental Panel on Climate Change
IRS	Indoor Residual Spray
IV	Intra Venous
LBRF	Louse Borne Relapsing Fever

List of Acronyms cont; d

L-10K	Last 10 Kilometers
LLINs	Long Lasting Impregnated Nets
LP	Lumbar Puncture
MCH	Maternal and Child Care
MDG	Millennium Development Goal
MDR	Multidrug Resistance
MMR	Maternal Mortality Rate
MOH	Minstry of Health
MR	Mortality Rate
NGO	Non Governmental Organization
NNT	Neonatal Tetanus
NS	Normal Saline
ODF	Open Defecation Free
OR	Odds Ratio
ORS	Oral Rehydration Salts
PCs	Pieces
PF	Plasmodium Falciparum
PFSA	Pharmaceutical Fund and Supply Agency
PHCU	Primary Health Care Unit
PHEM	Public Health Emergency Management
PHSC	Potential Health Service Coverage
PMTCT	Prevention of Mother to Child Transmission of HIV
PNGT	Pediatric Naso Gastric Tube
PPE	Personal Protective Equipment
PPS	Probability Proportional to Size
PSU	Primary Sampling Unit
PVP	Predictive Value Positive
PV	Plasmodium Vivax
RDT	Rapid Diagnostic Test
RF	Rain Fall
RHB	Regional Health Bureau

List of Acronyms cont; d

RH	Relative Humidity
RL	Ringers Lactate
SAM	Severe Acute Malnutrition
SARS	Serious Acute Respiratory Syndrome
SD	Standard Deviation
SFP	Supply Food Program
SIAs	Supplementary Immunization Activities
SPSS	Statistical Software Package for Social Sciences
Spps.	Suppositories
TB	Tuberculosis
TFP	Therapeutic Food Program
TI	Trance Isolate
TTBA	Trained Traditional Birth Attendant
UNICEF	United Nations Children's Fund
URTI	Upper Respiratory Tract Infection
USAID	United States Agency for International Development
VCT	Voluntary Counseling and Testing
VHF	Viral Hemorrhagic Fever
WASH	Water Sanitation and Hygiene
WHO	World Health Organization
WHO/AFRO	World Health Organization Regional Office for Africa
WoHO	Woreda Health Office
ZHD	Zonal Health Department

Preface

The Ethiopia Field Epidemiology Training Program (EFETP) is a two years competency based masters program adapted from the United States Centers for Disease Control and Prevention (CDC) Epidemic Intelligence Service (EIS) Program. The School of Public Health/Addis Ababa University, the Federal Ministry of Health of Ethiopia/Ethiopian Public Health Institute (EPHI), the Ethiopian Public Health Association (EPHA), and CDC Ethiopia are running the Program jointly. The field work comprises of 75% of the Program which is called residency; learning by working in public health emergency and other health related priority issues. The Program is designed to assist the Ministry of Health in building or strengthening health systems by recruiting promising health workers and building their competencies through on-the-job mentorship and training.

Ethiopia adopted the Field Epidemiology Training Program to help improve leadership within Public Health Emergency Management. The Ethiopian Field Epidemiology Training Program (EFETP) provides residents a Master of Public Health Degree in Field Epidemiology after they complete two years of supervised work in applied or Field Epidemiology.

This compiled body of works has nine main sections or chapters accomplished during the residency time of the Program. The first eight sections are expected outputs during the residency time; comprising of outbreak investigation, surveillance data analysis, evaluation of the surveillance system, health profile description report, writing of finalized scientific manuscript for peer review journals, abstracts submitted to scientific conferences, writing protocol/proposal of epidemiologic research project, summary of disaster situation visited/risk assessment and other additional works.

The overall outputs of the two years Field Residency Program are presented in a summarized way; in the outbreak investigations chapter or section, two outbreaks were investigated and documented. Those included measles outbreak in Bure Zuria District, West Gojjam Zone, Amhara Region, April 2015 and unmatched case control outbreak investigation of relapsing fever in Debre Markos Town, Amhara Region, Ethiopia, December 2014.

Health profile description report was done in Bure Zuria District in March 2014 and Surveillance system evaluation was also done in Bure Town & Bure Zuria Districts, Amhara Region, in July 2014. One finalized scientific manuscript was prepared for peer reviewed journal. Two abstracts were also prepared for scientific conferences. A report on need assessment (risk assessment) on prioritized Districts of Amhara Regional State was also conducted with other team members from food security center, WHO, UNICEF and EPHI.

Under other additional works/outputs section (last chapter) activities like provision of training for public health emergency management (PHEM) officers working at different levels (regional to health facility level) in the Amhara Regional Health Bureau were also undertaken.

Chapter I – Outbreak/Epidemic Investigations

1.1: Measles outbreak investigation in Burie Zuria District, West Gojjam zone, Amhara Region, Ethiopia, April 2015

Abstract

Background: Measles is one of the most contagious diseases known to man and often occurs in explosive epidemics. Worldwide, it is estimated that measles kills some 880,000 children annually, a toll more than any other vaccine preventable disease. Measles is one of the communicable diseases still causing preventable mortality and morbidity in Ethiopia. There has been a recent occurrence of measles outbreak in Bure Zuria District. Hence, this investigation was conducted to assess the magnitude of the problem and identify risk factors contributing to measles infection.

Methods: Unmatched case-control study was conducted from 13-23 March2015, in Bure Zuria District. Cases were identified using WHO case definition. The outbreak was confirmed by laboratory (five blood serum samples were sent to national polio and measles laboratory and three of them were positive for measles IgM) and others were epidemiologically linked to confirmed cases. Data collection instrument was prepared. Attack rate was calculated. Bivariate and multivariate analyses were conducted using SPSS and odd ratio with 95% confidence interval (CI).

Results: A total of 50 cases (over all AR 40.4/100,000 cases) and no deaths were identified. Of the 50 cases, 20 (40%) were less than 5 years of age. The 2013/14 and 2014/15 (for 6 months) vaccination coverage were 73.6% and 50.4% respectively. Being unvaccinated (OR 12.6, 95% CI 3.8-42.6), lack of vitamin A (OR 8.6, 95% CI 2.8-26.2), age group <5 years (OR 11.5, 95% CI 2.5-52.9) were statistically significant.

Conclusions and Recommendations: Less than 5 years of age were primarily affected by the outbreak. Malnutrition, low community awareness and low vaccination coverage likely contributed to the outbreak. Undertaking supplementary immunization activities, strengthening routine vaccination, increasing community awareness can reduce measles outbreak.

Keywords: measles outbreak, Bure Zuria, Amhara, 2015, Case control, Risk factors.

Introduction

Measles is a contagious disease caused by measles virus. Measles virus is paramyxoviruses of a single serological type. The disease is highly communicable with an incubation period of about 10 days (with a range of 7-18 days). The disease is characterized by prodromal fever, conjunctivitis, coryza, cough, and presence of Koplik spots. A characteristic maculopapular rash appears on the third to seventh day beginning on the face and gets more generalized. Man is the only source of measles virus (1). Measles infected person is contagious from four days before to four days after the rash appears (2) and when a pregnant woman becomes infected, particularly during the first trimester, serious consequences can occur, including a constellation of birth defects known as congenital rubella syndrome (CRS) (3).

Although national immunization programs globally prevent over 80 million cases of measles and 4.5 million deaths annually, it is estimated that over 30 million cases and 875,000 deaths still occur every year (4). This represents 50-60% of the estimated 1.6 million deaths caused annually by childhood vaccine-preventable diseases. Measles is one of the most contagious human diseases and large outbreaks continue to occur in countries despite high vaccination coverage using a single dose of vaccination (4).

Since the introduction of effective measles vaccines, the epidemiology of measles has changed in both developed and developing countries (5). As vaccine coverage has increased, there has been a marked reduction in measles incidence, and with decreased measles virus circulation, the average age at which infection occurs has increased (6).

The measles outbreaks pose a serious challenge to the regional elimination efforts and signal where national health systems and routine immunization programmes need strengthening. Resuming progress in reducing measles cases and deaths means strengthening health systems so that they can provide effective immunization services and laboratory-supported surveillance for vaccine-preventable diseases to all children.

The outbreaks also indicate the need to ensure that parents are fully aware of the benefits of immunization and the risks associated with not vaccinating children (7).

In 2001, countries in the World Health Organization (WHO) African Region started implementation of the regional measles mortality reduction strategies with a goal to reduce the estimated number of measles deaths in 2005 to half of the estimate for 1999 (8). This goal was achieved, and a new goal was established to reduce measles mortality in 2009 to 90%. The measles mortality reduction strategy adopted by the African Region includes improving routine measles vaccination coverage, providing a second opportunity for measles vaccination through supplementary immunization activities (SIAs), monitoring the impact of vaccination activities through case-based measles surveillance, and improving measles case management (6).So the aim of this assessment was to investigate the occurrence of measles**,** identify the risk factors associated with the outbreak and suggest practical control measures to alleviate the disease burden in the community in the District.

Statement of the problem

Worldwide, it is estimated that measles kills some 880,000 children annually, a toll more than any other vaccine preventable disease. The global plan established by the World Health Organization (WHO) and United Nations Children's Fund (UNICEF) is to cut this burden by two thirds between 2000 and 2005, and therefore to prevent 600,000 measles fatalities annually. Half of the total deaths are concentrated in three African countries (Congo, Ethiopia and Nigeria) and one Asian country (India) (9).

Measles remains the leading cause of childhood morbidity and mortality in the world. Globally, more than 20 million cases are reported yearly and 345,000 deaths were recorded in 2005. Fifty to sixty percent of 1.6 million global deaths attributed to vaccine preventable diseases are attributed to measles (10). Despite progress in controlling measles since 2000, the disease remains endemic in many countries and killed over 164 000 children worldwide in 2008 (11).

Measles is one of the communicable diseases still causing preventable mortality and morbidity in Ethiopia (12).

Literature Review

Globally, a disproportionate number of measles cases and deaths occur in low-income countries with weak health infrastructures. In Sub-Saharan Africa, many countries have not yet introduced a second dose of measles containing vaccine (MCV) into routine immunization programs. For children in these countries, the current World Health Organization (WHO) and United Nations Children's Fund (UNICEF) strategy is to deliver the first dose of MCV during routine vaccination programs and the second through regular supplementary immunization activities (SIAs) (13).

In developing countries with low vaccination coverage, epidemics often occur every two to three years and usually last between two and three months, although their duration varies according to population size, crowding, and the population's immune status. Outbreaks last longer where family size, and hence the number of household contacts, is large. In the absence of measles vaccination, virtually all children will have been infected with measles by the time they are 10 years old(14)

Measles outbreaks pose a continuing public health problem in Africa and other developing nations of the world (15). Since 2008, large outbreaks of measles in WHO African countries (AFR) have stalled progress toward regional measles control and elimination targets (16). During 2011, large measles outbreaks were reported by DRC (134,042 cases), Nigeria (18,843), Somalia (17,298), Zambia (13,324), Chad (8,650), Sudan (5,616), Uganda (3,312), Ethiopia (3,255) (16).

General objective

- To assess the existence of the measles outbreak through conducting appropriate investigation measures in Bure Zuria District from April 13-23/2015.

Specific objectives

- To assess the existence of the outbreak
- To describe the outbreak by person, place and time
- To determine factors contributing to the outbreak
- To identify the etiologic agent

Material and Methods

Study area and population

This study was conducted in Bure Zuria wereda which is one of the weredas in West Gojam Zone, Amhara Regional State. Bure is located at a distance of 165 kms from the Regional Town (Bahir Dar) and 410 kms from Addis Ababa. The District shares boundaries with Sekela Woreda and Awi Zone in the north, Oromia Region in the south, Jabi Tehnan Woreda in the east, Womberma Woreda in the west and Dembecha Woreda & East Gojam Zone in the south east. The catchment area of the District is about 587.95 square kilometers. According to the 2007 CSA report the projected total population of the District was 123,690. The ethnic composition of the District was 96% Amhara & 4% Oromo, and regarding the religious composition more than 99% were followers of Orthodox Christian and 1% were Protestant (17). The District has 20 kebeles, 19 health posts and 4 health centers which are currently giving service. The physical health service coverage of the District was 100%.

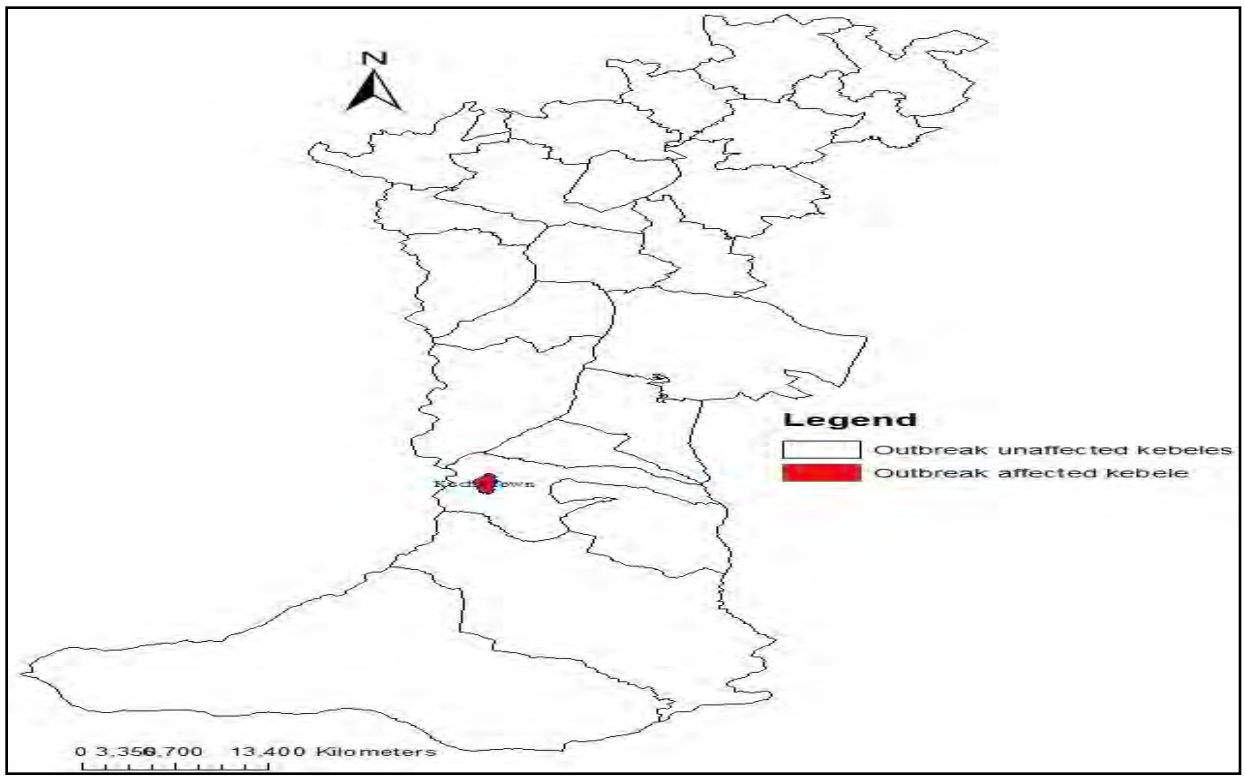

Fig.1.1.1: Map of Bure Zuria Woreda and Kuch Kebele, W/Gojjam Zone, Amhara Region, Ethiopia, April 2014.

Study period

The study was conducted from 13-23March 2015.

Study design

Unmatched case control study design was used to identify risk factors for the occurrences of the measles outbreak.

Data collection

Surveillance reports and patient registrations were reviewed. Active cases were searched house to house using structured questionnaire.

Line list and daily epidemic reporting formats were used. Suspected measles cases were identified using WHO cases definition in Bure Zuria District of W/Gojjam zone. Immunization coverage and other health related data were collected from the Woreda Health Office. Cold chain monitoring charts were assessed. Discussions were made with Woreda Health Office and Kuch Health center staff which is the outbreak kebele and over all response activities were evaluated. National measles surveillance guideline was used.

Data processing and analysis

The data were entered and analyzed using Microsoft excel, Arc GIS and SPSS version 16.0. Results were presented using graph, and tables. Attack rate was also calculated.

Case Definition:

Suspected measles case: Any person with fever and maculopapular (non-vesicular) generalized rash and cough, coryza or conjunctivitis (red eyes) OR any person in whom a clinician suspects measles.

Confirmed measles case: A suspected case with laboratory confirmation (positive IgM antibody) or epidemiologically linked to confirmed cases in an outbreak.

Measles outbreak: Five suspected measles cases in one month OR 3 confirmed measles cases in one month.

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

Data collection procedure:

Active cases were searched house to house. Line list and daily epidemic reporting formats were used. Immunization coverage and other health related data were collected from Woreda Health Office. Discussions were made with Woreda Health Office and Kuch Health center staff which is the outbreak kebele and over all response activities were evaluated. National measles surveillance guideline was used.

Laboratory investigation: Prior to the investigation period five blood serum samples were collected and sent to national measles and polio laboratory and three were positive for measles IgM. Other cases were epidemiologically linked with laboratory confirmed cases.

Data analyses: Data were entered in to SPSS version 16.0 and Excel sheet. Descriptive analysis was done to describe the epidemic by place, person and time and clearly presented by graphs and tables.

Ethical consideration

Official permission was obtained from RHB/PHEM, Bure Zuria Health Office and Kuch Health Center. Verbal consent of each respondent was obtained before the data collection.

Results

Descriptive Epidemiology

A total of 50 cases and no deaths were identified. Out of the 50 cases 39 (78%) were females and 11 (22%) were males. The mean age of the cases was 8 years with a range of 8 months to 30 years. The overall attack rate (AR) was 40.4 per 100,000 populations. The attack rate was high in females (31.5 cases per 100.000 populations) than males (8.8 cases per 100,000 populations). Eight (16%) of the cases and 75 (75%) of the controls were vaccinated for measles. Almost all the cases and controls did not know the mode of transmission of measles infection. The most affected age group was <5 years which was 20 (40%) (Attack rate of 137/100,000) (Fig.1.1.2).The first suspected case came from Kuch Kebele on 01/03/2015. In Kuch kebele vaccination coverage for the year 2013/14 and 2014/15 (for 6 months) were 73.6% and 50.4% respectively. This low vaccination coverage of the District may have contributed to the outbreak. All vaccinated children received only one dose of measles vaccine. Among the suspected cases five blood samples were taken to identify the etiologic agent and three samples were positive for measles IgM.

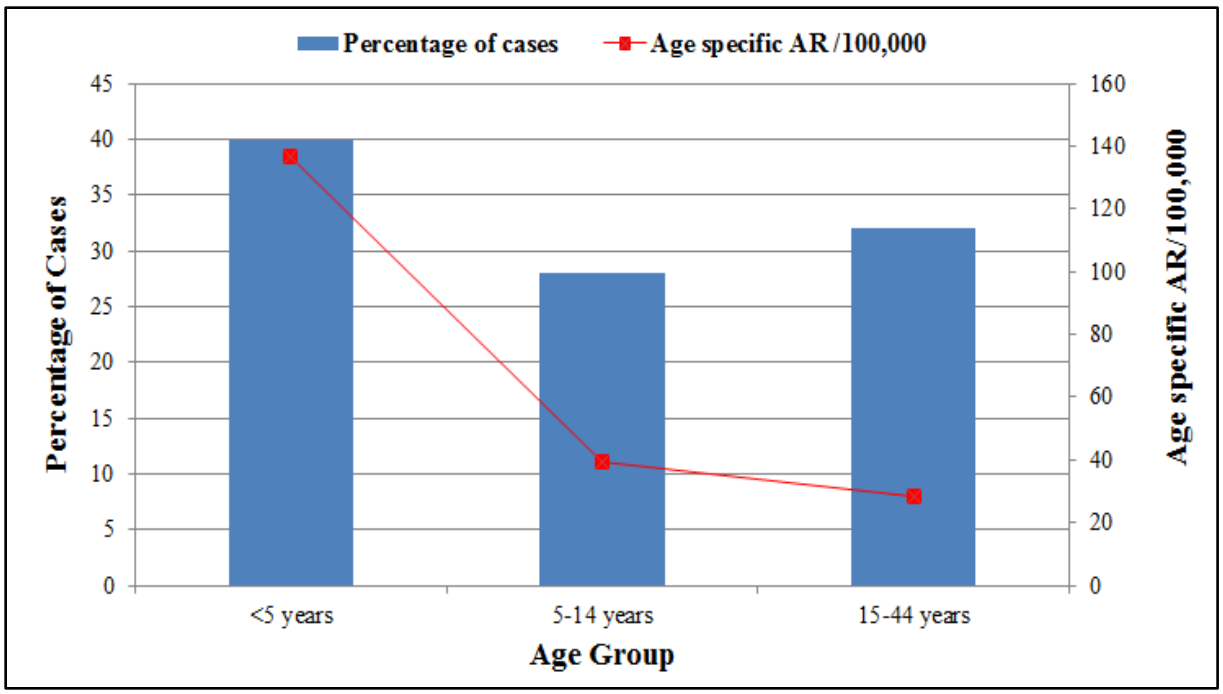

Figure 1.1.2: Measles age specific AR in Bure Zuria District, Amhara Region, Ethiopia, April 2015.

As to the vaccination status 8 (16%) of the cases were not vaccinated for measles. About 14 (28%) of the cases in the age group of 15-44 years are not vaccinated whereas 6 (12%) of the cases in the same age group did not know their vaccination status (Table 1.1.1).

Table 1.1.1: Vaccination status of measles cases in Bure Zuria District, Amhara Region, Ethiopia, April 2015.

Age Group	Percentage & number of Cases by age group (N=50)			
	Vaccinated	Unvaccinated	Unknown	Total
<5 years	5 (10%)	12 (24%)	0 (0)	17
5-14 years	3 (6%)	10 (20%)	0 (0)	13
15-44 years	0 (0)	14 (28%)	6 (12%)	20
Total	8 (16%)	36 (72%)	6 (12%)	50

The onset date of rash of the first case was recorded on March 01, 2015. The highest cases were registered on March 17, 2015.

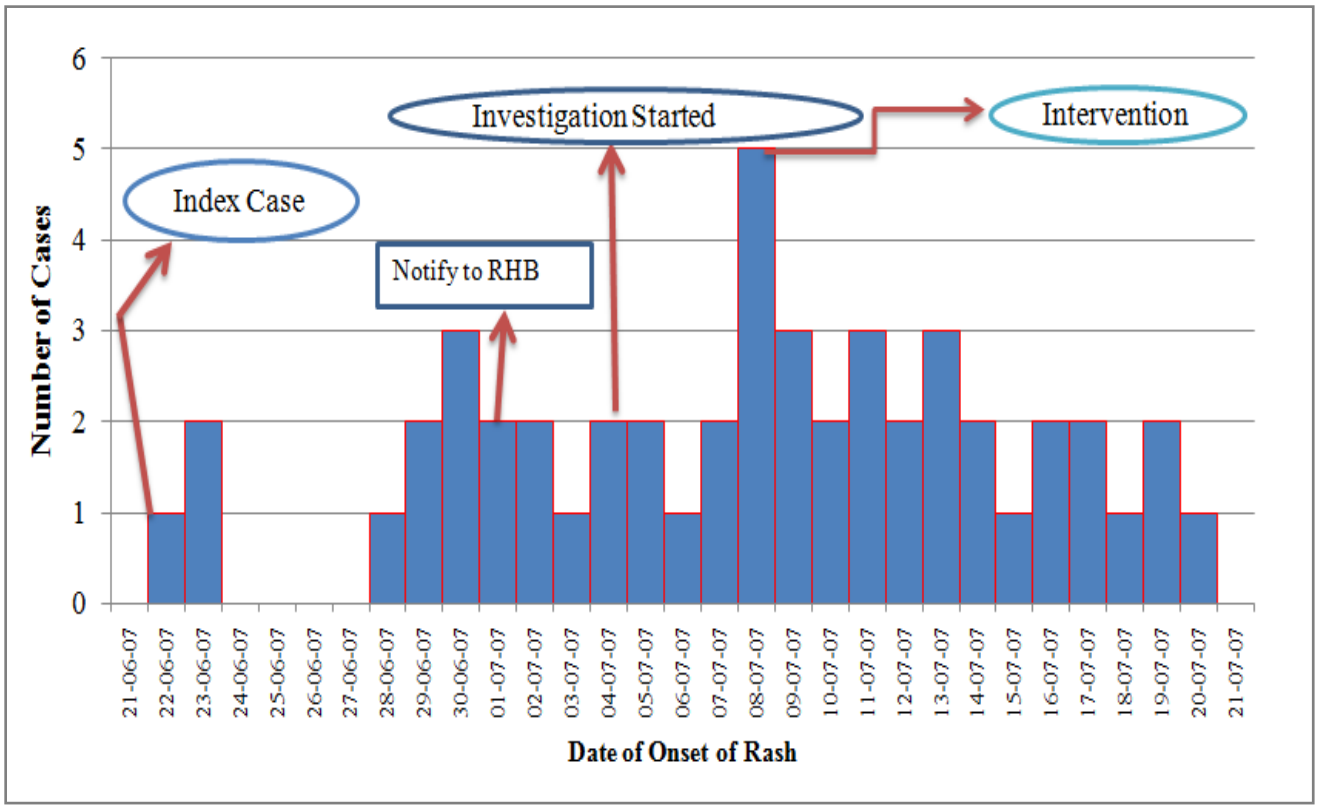

Figure 1.1.3: Epi curve of measles outbreak, Bure Zuria Woreda, W/Gojjam, Amhara, Ethiopia, April 2015.

Analytic Epidemiology

We compared 50 measles cases with 100 community controls matched by sex and age. On bivariate logistic regression analysis the statistically significant variables were absence of vaccination (OR 12.6, 95% CI 3.8-42.6), not receiving vitamin A within 6 months of onset of illness (OR 8.6, 95% CI 2.8-26.2). All interviewed measles cases had rash (Fig. 1.1.4) and fever, 49(98%) had conjectivitus, 47 (94%) had coryza. 20 (40%) had cough and 10 (20%) had diarrhea.

Fig. 1.1.4: Maculopapular rash in patients with measles in Bure Zuria Woreda, W/Gojjam Zone, Amhara, Ethiopia, April 2015

On multivariate logistic regression analysis the statistically significant variables were absence of vaccination (OR 57.6, 95% CI 15.0-221.8) and Age group less than five years (OR 11.5, 95% CI 2.5-52.9) (Table 1.1.2).

Table 1.1.2: Bivariate and multivariate logistic regression analysis of measles outbreak in Bure Zuria District, Amhara Region, Ethiopia, April 2015.

Variable	Case (n=50)	OR	95% CI
Vit. A	No Vit. "A" wthin 6 months of infection	8.6	2.8-26.2
Vaccination status	Unvaccinated	57.6	15.0-221.8
Age Group	<5 year	11.5	2.5-52.9

Intervention undertaken

Technical assistance was given for health workers on case management, recording and reporting situation. Cases were treated to prevent further spread; and reduce morbidity and mortality attributed to measles. The outbreak was closely followed at each level on a daily bases. Discussion was made with the Woreda Health Office PHEM focal person and Kuch HC staff about strengthening the surveillance system and health education issues because of the misconception on measles in the community. At the discussion we reached consumes to search cases actively mobilizing the health center staff and health extension workers. Besides health education will be given at public gatherings and at OPD every morning.

Discussion

This study identified several factors that were associated with contracting measles in Bure Zuria District. Measles immunizations were significantly lower in the children who had measles compared to those who had not, suggesting that poor immunization coverage plays a crucial role in measles outbreaks. This is consistent with findings conducted in Laos about factors associated with a measles outbreak in children admitted at Mahosot Hospital, Vientiane, Laos (18).

In addition not taking vitamin A supplementation within 6 months of infection was also found to be a risk factor for contracting measles. Low Vitamin A supplementation may lead to increased risk of contracting measles and its complications. This is consistent with findings of measles outbreak investigation in Zaka, Masvingo Province, Zimbabwe, 2010. Vitamin A supplementation has been shown to increase measles specific antibody formation if it is administered simultaneously with the measles vaccine (10).

Three of the five samples were confirmed as measles IgM positive. All other cases were epidemiologically linked. Several factors contributed to the occurrence of this measles outbreak. The Majority of measles affected children had not received measles vaccination which is comparable in a study conducted in Abaya of Oromia Region in which 61% of the affected children had not received any dose of measles (6).

In this study most of the cases (40%) of measles were in the age group of <5 years which is similar to other studies. The attack rate was also high in the same age group. There was no measles related death in present outbreak.

A study done in Chandigarh Outbreak of measles amongst vaccinated children in a slum of Chandigarh revealed similar results. Low attack rates and no mortality may be due to early detection and follow up of the cases (19).

Conclusion

Unvaccinated children less than 5 years of age were primarily affected by the outbreak. There was no death during the outbreak. The woreda routine measles vaccination coverage was less than the expected for national target for the year 2015. Low vaccination coverage, low community awareness likely contributed for the occurrence of this measles outbreak.

Recommendation

- Strengthen measles routine vaccination coverage.
- The Woreda Health Office and Kuch Health Center should give emphasis for health education to increase community awareness on measles.
- Provide supplementary vaccination campaign.

Acknowledgement

I would like to express my deepest thanks to Mr. Minichil for his continuous assistance and support throughout the investigation period. My sincere appreciation goes to the study community, health workers at Kuch health Center of Bure Zuria Woreda in West Gojjam zone. Many thanks to my colleague, Mr. Getachew Abebe, for his valid support throughout the investigation.

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Annex 1.1.1: Questionnaires for Case control study on Measles outbreak at Community Level.

Region_____ Zone_____Woreda_____Name of health facility_____

Patient Name_____ date of Data collection_____

Date seen at health facility_____

Total population_____Male_____Female_____

When did the rumor reported from the site _____ (time/date/month/year.)

Date of verification from district: _____ (time/date/month/year.)

Index case name_____sex_____age_____Time of infection_____place_____ out come_____

I. Socio-demographic Characteristics

S. No	Questions	Alternatives
1	Patient ID	----------
1	Sex	1.Male 2.Female
2	Age	_____ (in Months/years)
3	Occupation	1. Farmer 2. House wife 3. Student 4. Unemployed 5. Daily labourer 6. Merchant 7. Gov't / NGO employee 8. Other (specify)_____
4	Educational level	1. Illiterate 2. Read and write 3. Elementary 4. Secondary 5. Above secondary
5	Marital status	1. Single 2. Married 3. Divorced 4. Widowed 5. Separated 6. Not Applicable
6	Family size	_____
7	Is there any sick person with rash, fever, running nose/conductivities (illness)?	1. Yes 2. No
8	If yes, number of sick person	_____
9	Date of Onset	_____

II. Clinical History of Diseases Date of Onset:

10	What was the symptom?	1. Fever 2.cough, 3.coryza (runny nose), 4. conjunctivitis (red eyes 5.Rash 6.Diarrhea 7.Ear discharge 8.Other
11	Did you (he/she) take treatment?	1.Yes 2.No
12	If yes, treatment taken	1.ORS 2.Antibiotics 3.Vitamin A 4.Supplementary food 5.Others given_____
13	Did you recover after the treatment?	1.Yes 2.No

III. Vaccination History

14	Have you ever been vaccinated for measles? (Card and/or History)	1.Yes 2.No 3.Unknow 4.Not applicable
15	If yes date and Number of vaccine doses received	1.Age of child at first Vaccination _____ 2.Age of child at recent Vaccination_____
16	Have he/she/you ever been sick with such diseases?	1. Yes 2. No If yes specify when _____

IV. Risk Factors

16	Did you have any travel history 7-18 days before onset of symptoms?	1.Yes 2.No
	If Yes to question 6, place of travel	1.School, 2.Neighbor 3.Market 4.Other_____
17	Had your child received vitamin A supplementation within 6 months?	1.yes 2.No 3.Unknow 4.Not applicable
18	Had your child received deworming within 6 months?	1.yes 2.No 3.Unknow 4.Not applicable
19	How long did you feed breast milk only for your child	_____
20	When did you start supplementary food for the Child?	_____
21	List the addition food given for child	
22	Do you know modes of transmission for measles?	1.Yes 2.No 3. If yes specify_____
23	Did you ever have measles infection?	1.Yes 2.No

V. About Laboratory Issue

24	Is sample taken	1.Yes 2.No
25	Date of collection sample_____ Date of specimen received by referal lab_____ Did result reported_____ If yes ,specify the result_____	

1.2: Relapsing fever outbreak investigation in Debre Markos City, Amhara Region, Ethiopia, December 18-29/2014.

Abstract:

Introduction: Ethiopia is the main endemic focus of louse relapsing fever. *Borrelia recurrentis* is the etiologic agent for louse-borne relapsing fever and occurs as epidemic under conditions of poor socio economic status, overcrowding, poverty, draught and famine.

Objective: To verify the outbreak, identify the risk factors and suggest practical control measures to alleviate the outbreak.

Methods: Descriptive cross sectional and unmatched case control investigations were conducted. All patients from December 17-27/2014 were included. Thirty seven patients matched with 74 controls that had no previous history of relapsing fever living in the same village. Study was conducted in households with individuals who go to work on a daily basis and data were analyzed using Microsoft Excel and SPSS version 16.0.

Results: Among all confirmed cases 37 (100%), 31 (83.8%), 27 (72.9%), 26 (70.3%), 17(45.9%) presented with fever, headache, chills, Arthralgia and vomiting respectively.

There was no death during the outbreak. Mean age of respondents was 24 years. Statistically significant associations was observed between 9 (24.3%) patients and 55 (74.3%) controls who did not wash their clothes at least weekly (AOR = 9.9, 95% CI 3.8-26.0).

Conclusion: Poor personal hygiene contributed to the outbreak. The outbreak was contained due to prompt interventions taken and strong measures were recommended to prevent further spread to the community.

Keywords: *Borrelia recurrent*is, Relapsing Fever, Outbreak, case control, Ethiopia.

Introduction

Relapsing fevers are a group of acute infections caused by arthropod born spirochetes of the genus Borrelia(1). There are two epidemiological forms, louse borne RF and tick borne RF. Louse borne relapsing fever is transmitted only between humans, by the body louse, pediculus humanus corporis, whereas tick borne relapsing fever is a zoonosis, maintained in nature between ticks and its natural hosts, often wild rodents (2).

Relapsing fever presents with recurrence characteristic febrile periods lasting for days alternating with afebrile periods. The main manifestation is a recurring fever which coincides with massive numbers of bacteria in the blood and severity ranges from asymptomatic to fatal (3). Among twenty-seven borrelia species, fifteen are known to be associated with RF. For the louse-borne B. recurrentis, fever is accompanied in more than 90% of patients by tachycardia, headache, myalgia, and arthralgia and is less frequently accompanied by hepatosplenomegaly, epistaxis, petechial rash, and jaundice. For the tick-borne B. crocidurae, the disease is characterized by a fever, asthenia, and vomiting in some patients. Most infected patients experience 1 to 2 relapses; however, up to eight relapses have been observed. The clinical signs and density of Borrelia are not affected by the age or sex of the patient (4).

Borrelia recurrentis is the etiologic agent for louse-borne relapsing fever and occurs as epidemic under conditions of overcrowding, poverty, draught and famine. The pathogen multiplies in the gut of the louse and is transmitted when an infected louse is crashed or scratched while feeding on the human host (5).The diagnosis of louse-borne relapsing fever in Ethiopia is commonly made by a Giemsa-stained thin blood smear (6).

Statement of the Problem

Although relapsing fever is a worldwide problem, it is most common in Africa where it is one of the most prevalent bacterial diseases. In the past, LBRF had also occurred in large outbreaks in Eritrea, Sudan and Somalia (7).Louse-borne borreliosis due to *B. recurrentis* is largely restricted to the northeastern parts of Africa, especially Ethiopia, where an estimated 10,000 cases occur annually(6).

Dramatic epidemics of louse-borne relapsing fever (LBRF) responsible for several millions of cases and a high fatality rate occurred throughout Africa after World Wars I and II when French and British colonial soldiers infected in Europe or North Africa returned to their countries (8). More recently, several epidemics occurred in Sudan and LBRF still persists in the mountains of Ethiopia where it is endemic and can account for up to 27% of hospital admissions (9).

Louse-borne relapsing fever has been restricted to countries with poor socio economic status, the most important foci being Burundi, Rwanda and Ethiopia (10).

Ethiopia is the main endemic focus of louse borne relapsing fever. It was reported as seven of top ten leading causes of admission and death among adults in the country, in 2002/03. More than 9,000 cases were reported to the Minstry of Health in the same year (3).

Literature Review

The endemicity of louse-borne relapsing fever in Ethiopia had been reported by Italian investigators as early as 1915 and several thousands of cases were reported annually to the MOH between 1981 and 1990 with the largest number in 1983 (43,727) when an epidemic occurred in Wolayta Region. Currently, the disease is found only in Ethiopia and neighboring countries (11).

LBRF is now an important disease in the highlands of Ethiopia where an estimated 10,000 cases occur annually and affects mostly homeless people living in crowded and unhygienic conditions, especially during rainy seasons. It is within the top ten causes of hospital admissions, associated

with significant morbidity and mortality (12). For instance, in southern Ethiopia (Hosanna Hospital), LBRF admissions comprised of 27% of total admissions (12).

Moreover, in south west Ethiopia, 6% of mortality rate was documented. In 2010, it also occurred as an epidemic in Bahir Dar City and 2–3 patients on average were admitted at Felege Hiwot Referral Hospital per day (12).

Some of the risk factors are overcrowding like in military camps, prisons, street children sleeping areas, civilian population disrupted by war and other disasters. In spite of having the disease in these risk populations, yet there is paucity of information on prevalence and risk factors of the high risk populations about the disease in Ethiopia (3).

The aim of the assessment was to investigate the occurrence of relapsing fever**,** identify the risk factors associated with the outbreak and suggest practical control measures to alleviate the disease burden in the community in Debre Markos Town.

Objectives

General objective

- To assess the existence of the LBRF outbreak through conducting appropriate investigation measures in Debre Markos Town from December 17-27/2014.

Specific objectives

- To assess the existence of an outbreak
- To describe the outbreak by person, place and time
- To determine factors contributing to the outbreak
- To identify the etiologic agent

Methods

Study Area

The study was conducted in Debre Markos Town. Debre Markos Town is situated in the west central part of Ethiopia at about 300 km and 262 kms away from Addis Ababa and Bahir Dar respectively. The town is situated at latitude of 10.33^0 North and longitude of 37.71^0 East and an elevation of 2,450 meters above sea level. According to the Central Statistical Agency (CSA) in 2007 the town has a projected total population of 101,582 in 2014/2015**.** Debre Markos Town is administratively divided in to seven kebeles (smallest administrative unit). There is one Referral Hospital, three health centers seven health posts and 10 private and two NGO clinics in Debre Markos. There were eight rural and 24 urban health extension workers (32 HEWs) and 94 other health professionals working in the Town with potential health service coverage of 100%.

Figure 1.2.1: Map of Debre Markos Town, E/Gojjam Zone, Amhara Region, Ethiopia, December 2014.

Study Design

Descriptive cross sectional and unmatched case control investigations were conducted in thirty seven cases matched with seventy four controls that had no previous history of relapsing fever, but living in the same village as the cases. Line list of cases was taken and followed daily within the study period, cases and controls were interviewed using semi-structured questionnaire, their sleeping spaces were observed and all information hypothesized as risk factors for the relapsing fever outbreak was collected.

Study Period

Study was undertaken in all patients from December 17-27/2014.

Data collection

The patients sleeping spaces were observed and all information hypothesized as risk factors for the RF outbreak was collected.

Data analysis

Data were entered in to a computer from a hard copy which was used to collect the raw data. Then, the data were cleaned and analyzed using Micro Soft excels, SPSS version 16.0and Arc GIS. Bivariate and multivariate analyses were done.

Case definitions

Suspected case: Any person presented with an abrupt onset of rigors with fever usually remittent, headache, altralgia, myalgia, dry cough and epistaxis.

Confirmed case: A suspected case with demonstration of *borrelia species* in peripheral blood film.

RF Outbreak: Unusual increase of the cases OR Doubling of cases on subsequent weeks.

Ethical issue

Official permission was obtained from RHB/PHEM and Debremarkos Town Administration Health Office and each patient was asked for oral consent for interview.

Results

All the cases were males. The median age of the cases was 23 years (SD 8.8) with range of 7 to 35 years. All of the interviewed cases were daily laborers. From a total of thirty seven cases seen, the overall attack rate (AR) was 36.2 per 100,000 populations. The attack rate was high in the age group of 25-34 years which was 70/100,000 population and low in the age group of 15-24 years which was 26 per 100,000 population (Figure 1.2.2). There was no death during the outbreak. Among the cases 7(18.9%) were <15 years, 10 (27.0%) were between 15 & 24 years, 12 (32.4%) were between 25-34 years and 8 (21.6%) were 35 and above years. From total confirmed cases 37 (100%), 31 (83.8%), 27 (75.7%), 26 (70.3%), 17 (45.9%) and 1 (2.7%) presented with fever, headache, chills, altralgia, vomiting and epistaxis respectively. The cases were those who presented themselves to Debre Markos Hospital.

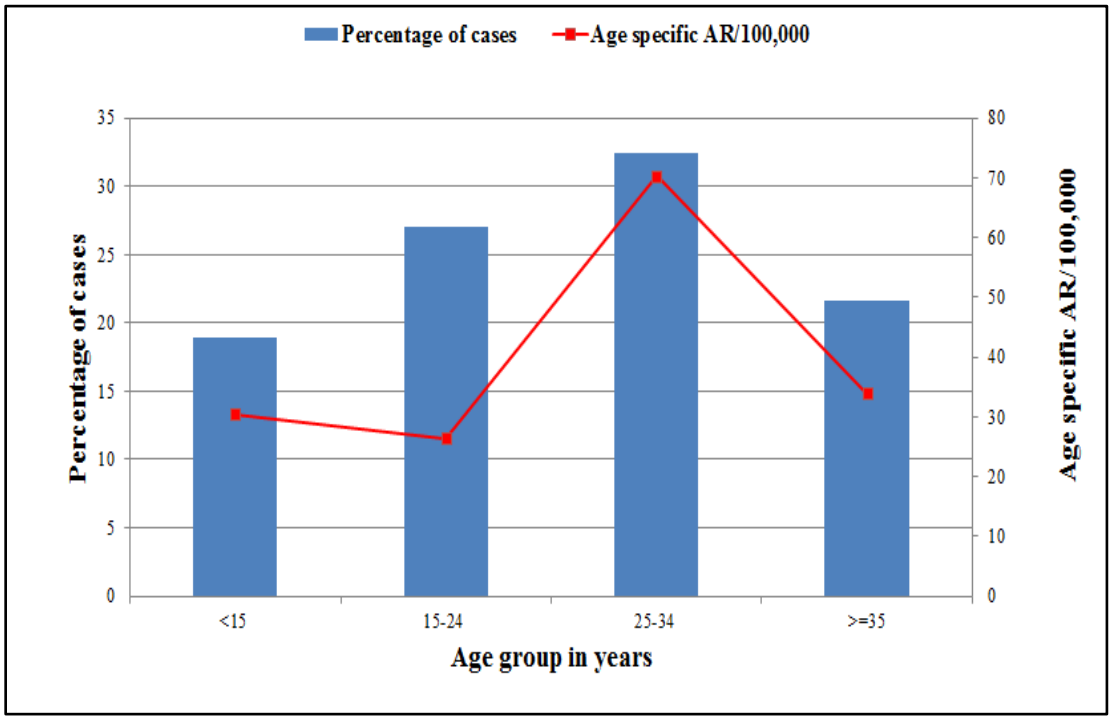

Figure 1.2.2: Relapsing Fever Cases AR, Debre Markos, Amhara Region, Ethiopia, December 18-29/2014.

The onset date of the first case was recorded on December 10, 2014. The highest cases were registered on December 20, 2014.

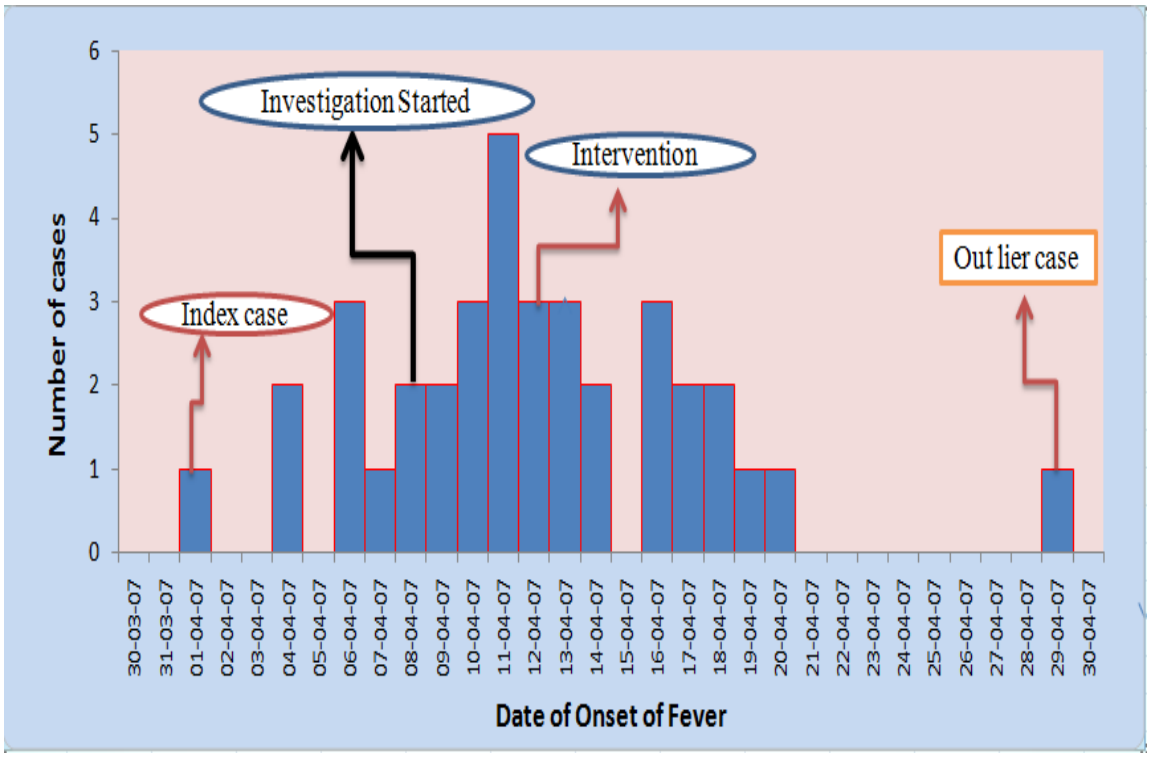

Figure 1.2.3: Epi Curve of Relapsing Fever Outbreak in Debre Markos, Amhara Region, Ethiopia, December 18-29/2014.

All the cases and controls` were Amhara by ethnicity and orthodox Christian by religion. Sixteen (43.2%) of the cases and 34 (45.9%) of the controls were illiterate, 18 (48.6%) cases and 37 (50.0 %) controls were grades1-4, 3 (8.1%) of cases and 3 (4.0 %) controls were grades 5-8 in education status. When we observe the situation of the daily laborers there were more than 50 people who were sleeping in a small room. All daily laborers were using the same cloth for the day and night and there was shortage of water for personal hygiene.

Bivariate logistic regression analysis of respondents of the study showed 28 (75.7%) patients and 19 (25.7%) controls have not used to wash their clothes at least weekly (OR = 9.0, 95% CI [3.6-22.5] and p–value 0.001) (Table 1.2.1). Multivariate analysis of not washing clothes at least weekly (AOR = 9.9, 95% CI [3.8-26.0 was statistically significant (Table 1.2.1).

Table 1.2.1: Bivariate and multivariate logistic regression analysis of relapsing fever. Debre Markos Town, Amhara Region. Ethiopia, December 18-29/2014.

Variables		Cases (n=37)	Controls (n=74)	Crude OR, 95% CI	Adjusted OR, 95% CI
Sex	Male	37 (100%)	74 (100%)	0.6,0.2-2.0	0.6,0.2-2.5
Age Group	<15 years	10 (27.0%)	20 (27.0%)	0.5,0.1-1.7	0.4,0.1-1.4
	15-24 years	7 (18.9%)	25 (33.8%)	0.2,0.08-1.0	1.2,0.4-4.0
	25-34 years	12 (32.4%)	21 (28.4%)	0.6,0.2-1.9	1.2,0.3-5.2
	>= 35 years	8 (21.6%)	8 (18.8%)	1	NI
Educational status	Illiterate	16 (43.2%)	34 (45.9%)	0.5,0.08-2.6	1.6,0.5-5.1
	Grade 1-4	18 (48.6%)	37 (50.0%)	0.5,0.09-2.7	5.4,0.6-51.0
	Grade 5-8	3 (8.1%)	3 (4.0%)		NI
Taking bath at least weekly	Yes	7 (18.9%)	26 (35.1%)	1	NI
	No	30 (81.1%)	48 (64.9%)	2.3,0.8-6.0	1.7,0.6-5.1
Washing clothes at least weekly	Yes	9 (24.3%)	55 (74.3%)	1	NI
	No	28 (75.7%)	19 (25.7%)	9.0,3.6-22.5	9.9,3.8-26.0

***NI = Not Included**

No statistical significant association was found in age, sex, ethnicity and educational status compared in both cases and controls. 17 (45.9%) of the cases and 73 (98.6%) controls had soap. There was shortage of water for personal hygiene in both cases and controls. All the patients were treated with Procaine penicillin stat dose and Doxycycline 100 mg for three days and Intra Venous (IV) fluids. All cases completely recovered from their illness.

All cases had fever, 31 (83.8%) had headache, 31 (75.7%) had chills, 26 (70.3%) had arthralgia, 17 (45.9 %) of cases had vomiting and 1 (2.7%) case had epistaxisis (Table 1.2.2).

Table 1.2.2: Clinical presentation of cases of relapsing fever, Debre Markos Town, Amhara Region, Ethiopia, Dec. 18-29/2014.

Signs & Symptoms	Frequency	Percentage
Fever	37	100
Headache	31	83.8
Chills	28	75.7
Altralgia	26	70.3
Vomiting	17	45.9
Epistaxisis	1	2.7

Actions Taken

Health education was given to the patients to control the outbreak and prevent further spread to the community. The patient's cloths were deloused with DDT and their hair shaved. Mass sleeping houses were sprayed with 70% DDT.

Discussion

The onset date of the first case was on December 10, 2014 but the investigation was conducted from December 17-27/2014 (figur1.2.3). Among the cases 7 (18.9%) were <15 years, 10 (27.0%) were between 15 & 24 years, 12 (32.4%) were between 25-34 years and 8 (21.6%) were 35 and above years .The age ranges from 7 to 35 years. The reason for the outbreak might be poor personal hygiene due to lack of knowledge, overcrowding and lack of alternative clothes because of low level of socio-economic status all of which may predispose the daily laborers at risk of contracting relapsing fever. There was no death in this outbreak.

The result of this study showed that the overall attack rate (AR) was 36.2 per 100,000 populations. This is lower than the relapsing fever outbreak investigation done in Bahir Dar. This could be due to early case detection and good management of the cases (23).

Our study revealed that personal hygiene of study participants had significant association with relapsing fever. The likelihood of acquiring relapsing fever for those not washing clothes at least weekly was about ten times with OR 9.9 & CI 3.8-26.0. This is similar with a study done in Bahir Dar (22).

No significant association was observed in the study participant's level education compared cases to controls which is consistent with a study conducted in Bahir Dar about Prevalence and risk factors of louse- borne relapsing fever in high risk populations in Bahir Dar city Northwest, Ethiopia (22).

Conclusion

The attack rate (AR) was 36.2 per 100,000 populations and there was no death. Not washing clothes weekly were risk factors for relapsing fever. Poor personal hygiene due to lack of knowledge, overcrowding and lack of alternative clothes because of low level of socio-economic status may be the reasons for the outbreak.

Recommendation

- Daily laborers must be informed to wash cloths and take bath at least weekly.
- Strengthen the surveillance system.

Acknowledgement

I would like to express my deepest thanks to East Gojjam Zonal Health Department and Debre Markos Health Office for continuous assistance and support throughout the investigation period. My sincere appreciation goes to the study community.

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Annex 1.2.1: Relapsing fever outbreak investigations questionnaire for daily laborers in Debre Markos.

A) Identifying/demographic information:

1. Full Name: _____ _____

2. Age: _____

3. Sex: M / F

4. Address_____

5. Occupation_____

6. Education status_____

7. Religion A. Orthodox B. Protestant C. Catholic D. Muslim E.

Others (specify)_____

8. Ethnicity A. Amhara B. Oromo C. Tigre D. Other(specify)_____

B) Clinical picture/illness information:

8 Did you have illness of RF? A. Yes B. No

If No for Question No 8 Skip to--17

9. Date of onset of symptoms _____/_____/_____

10. Duration of illness before visiting treatment site _____days / hours

11. Symptoms of the disease;

11.1. Head ache Yes / No

11.2. Vomiting Yes / No

11.3. Fever: Yes/No

11.4 Chills Yes / No

11.5 Jaundice Yes/No

11.6 Epitasis Yes/No

11.7 Other (specify) ----------

12. Blood sample collected for laboratory diagnosis Yes / No

13. If yes for the Q12 the result is A. Positive B. Negative

14. Treatment given/taken A. Yes B. No

15. Did you recover completely: A. Yes B. No

16. If yes; Date _____/_____/_____

C/ Hygiene and Sanitation

17-Howmany day workers live in this dorm? ----------

18. How is Condition of wall A/ wooden B/ Plastered with mud C/ Plastered with cement D/Other

19. Do you have jerican or other material to collect water? Yes/ No

20. Do you have soap to take bath and wash hand and cloth? Yes/ No

21. Frequency of taking bath. A. one times/week B.Two times/ week C. one times/month D. 2 times/ month E. others (Specify)_____

22. Frequency of washing cloth A. one times/week B. Two times/ week C. one times/month D. Two times/ month E. others (Specify) _____

23. Is water supply enough for taking bath and washing cloth? Yes/NO

24. Daily supply of water for drinking. A. 0ne litter B. 2litter C. Three litter D. four and above litter

25. Daily supply of water for personal hygiene. A. ≤5 litter B. 10 litter C. 20. litter D. 30 and above litter

D) Knowledge

26. Do you know about communicable disease? Yes/ No

27. If yes from where you got information? A. Radio B. School C. Health institution D. Other (specify) ----------

28. By whom health education given? A. Health committee B. Town health professional D. FETP resident E. Other (specify) ----------

29. Do you know the causes of RF: Yes/No if Yes

30. What it is? A. Body louse B. Tick C. Mosquito D. Flies E. Others (Specify)_____

31. Do you know the method of prevention of RF: Yes/No if Yes?

32. What are they?

A. Personal hygiene B. Environmental sanitation C. Spray insecticide

D .Others (Specify)_____

E) Attitude

33. Do you think personal hygiene and environmental sanitation are important to prevent major epidemics? Yes/No

F) Practice

34. Did you shave your hair before outbreak? Yes/No

35. Did you shave your hair after outbreak? Yes/No

36. Did you delouse your cloth? Yes/No

Chapter II- Surveillance Data Analysis Report

2.1: Impact of Climate Variability on the Transmission of Malaria in Yilmana Densa District, Amhara Region, Ethiopia, 2004-2013.

Abstract

Background: Malaria is seasonal and unstable in Ethiopia causing frequent epidemics. It usually occurs at altitudes <2000m above sea level. For transmission of malaria parasite climatic variables are important determinants. There is scarcity of information on the correlation between climatic variability and malaria transmission risk in Ethiopia in general and in the study area in particular. Therefore we compared rainfall, temperature and relative humidity patterns with confirmed malaria cases for developing forcasting and early warning system.

Methods: We analyzed climate and malaria data from January 2004-December 2013 in Yilmana Densa District of Ethiopia. We compared monthly rainfall, humidity and temperature data with the number of confirmed malaria cases using Micro Soft Excel 2007.

Results: Over the last decade a total of 51,793 microscopically confirmed malaria cases were reported in the District. A fluctuating trend of malaria cases through the years 2004-2013 was observed. There was a reduction of malaria cases from 2004-2008 and there was an increase of cases from 2009-2013, but a remarkable increase was observed in 2013. A high fluctuation of malaria cases was also observed by species. Malaria transmission was high during the major transmission season (September to November).

An association between monthly confirmed malaria cases and meteorological variables (rainfall and relative humidity) was observed in the District. Average monthly rainfall was 86.6-316.3mm and 6 months average monthly relative humidity was 50-78%.Average temperature throughout the ten years ranged from 14^0c to 29.4^0c, so temperature was probably not a limiting factor for malaria transmission in the District.

Conclusions: Malaria still constitutes a serious public health problem in Yilmana Densa District of Ethiopia. Rainfall and relative humidity were related with increased malaria transmission rates in the District, and temperature was not a limiting factor for malaria transmission. We recommend the continued development of climate prediction to help forecast and control malaria outbreaks in the District.

Key words- Climate variability, Confirmed malaria cases, Yilmana Densa District.

Background

Vector-borne diseases are among the diseases that have been linked with climate change. Malaria is probably the deadliest and climate sensitive vector-borne disease (1). Malaria is an important disease that has a global distribution and significant health burden. The spatial limits of its distribution and seasonal activity are sensitive to climate factors, as well as the local capacity to control the disease (2).

More than half of the world's population is at risk of acquiring malaria, and the proportion increases each year because of deteriorating health systems, growing drug and insecticide resistance, climate change and natural disasters(3). The disease remains one of the most important causes of human morbidity and mortality with enormous medical, economic and emotional impact in the world (4). Over 86% of the global burden and 90% of the global deaths occur in sub-Saharan Africa (5).

Malaria is the highest cause of morbidity and mortality in the world, with 50% of the world's population, representing about 3.3 billion people, at risk of contracting malaria (6). Malaria is caused by five species of plasmodium parasites and transmitted by the bite of infected female mosquitoes of the genus Anopheles. Transmission is associated with changes in temperature, rainfall, humidity as well as level of immunity. Changes in climate affect potential geographical distribution and transmission of vector-borne infectious diseases such as malaria (7).

Globally, an estimated 3.4 billion people are at risk of malaria. WHO estimates that 207 million cases of malaria occurred globally in 2012 (uncertainty range 135–287 million) and 627 000 deaths (uncertainty range 473 000–789 000). Most cases (80%) and deaths (90%) occurred in Africa and most deaths (77%) were in children under 5 years of age (8).

Malaria remains a major public health threat to the African continent and its control is critical to achieving the Millennium Development Goals in this Region (9). It is estimated that more than 110 million Africans live in areas prone to epidemics of malaria (10).

Populations in these areas are infrequently challenged by malaria and, therefore, do not fully develop acquired immunity. As a result, the disease remains life threatening to all age groups (11). Malaria costs Africa more than US$12 million annually and slows economic growth by 1.3% a year, thus trapping malaria vulnerable countries into poverty (12).

In 2004, malaria killed around 1.3 million people, 90% of them children under the age of five. According to the 2011World Malaria Report, of the 216 million cases of malaria in 2010, most of the deaths occurred among children in Africa where a child dies of malaria every minute and the disease accounted for approximately 22% of all childhood deaths (6).

In Ethiopia, malaria is the leading cause of morbidity and mortality. About 70% of the population (Approximately 52 million people) is estimated to be at risk for malaria infection each year. Health facilities in the country report over five million malaria cases and thousands of deaths across all age groups. Rates of morbidity and mortality dramatically increase (5–6 fold) during epidemic years that recur at irregular intervals of 5–7 years. Transmission usually occurs in about three-quarters of the country, below 2000 m altitude (but sometimes up to 2500 m) (9).

It is estimated that about 75% of the total area of the country and 65% of the population is at risk of infection. *P.falciparum* and *P.vivax* are the main species accounting for 60% and 40% of malaria cases respectively. *Anopheles arabiensis* is the major malaria vector followed by *Anopheles pharoensis* and other secondary vectors including *Anopheles funestus* and *Anopheles nili*. Like all other mosquitoes, these breed in water, each species having its preferred breeding grounds, feeding patterns and resting places (10). Malaria is mainly seasonal with unstable transmission in highland fringe areas, while transmission in lowland areas, river basins and valleys has a relatively longer duration (13).

Malaria is a preventable and curable disease. However, in order to be able to prevent or cure the disease in the context of malaria epidemics in Ethiopia, decision-makers need to be aware of the risk of outbreaks occurring,

- in space (which areas under their jurisdiction are most likely to suffer from malaria epidemic)
- in time (in which months/years are malaria epidemics most likely to occur) (14).

The Amhara Region is located 9°-14° N and 36°-40°E in Ethiopia's northwest. The Region is divided into three major climatic zones: highland (above 2,500 meters above sea level), semi-highland (1,500 to 2,500 meters above sea level) and lowland (below 1,500 meters above sea level), accounting for 20%, 44% and 28% respectively. This varied ecology lends itself well to diversified agriculture.

The Region's altitude ranges from a low of 500 meters to a high of 4,620 meters found at the peak of Ras Dashen. It covers a total area of 161,828.4 square kilometers. This is about 11 percent of Ethiopia's total area (15).

Many factors play a role in the distribution of malaria of which climate variability has been shown to be important in explaining its occurrence and considered major determinant. The impact of climate change and variability on human health has received increasing recognition since it was first mentioned in the First Assessment Report by the IPCC (Intergovernmental Panel on Climate Change).

Health and climate have been linked since antiquity and this is one of the reasons why the Second Assessment Report of the IPCC dedicated a chapter to health (1).Rainfall is largely responsible for creating the conditions which allow sufficient surface water for mosquito breeding sites and is, therefore, recognized as one of the major factors influencing malaria transmission. Humidity impacts the survival rate of the mosquito as well. Mosquitoes will generally not live long enough to complete their transmission cycle where and when the relative humidity is consistently less than 60 (16).

Temperature also plays an important role in the variability of malaria transmission by regulating development rate of mosquito larvae and influencing the survival rate of adult mosquitoes. The development of both the vector and parasite is temperature dependent.

Mosquitoes generally develop faster and feed earlier in their life cycle and at a higher frequency in warmer conditions. In addition, the Plasmodium parasite multiplies more rapidly in the mosquito in higher temperature. The optimum temperature range for parasite development in the female *Anopheles* (sporogony) is between 25°C and 30°C, and development ceases below 16°C. Above 35°C sporogony slows down considerably.

Extremely high temperatures are associated with the development of smaller and less fecund adult mosquitoes. Thermal death of mosquitoes occurs at 40°C to 42°C (16, 17). For *P. vivax*, the minimum temperature at which it can develop is between 14.5 and 15℃, and between 16 and 19℃ for *P. falciparum.* At temperatures beyond 32-34℃, the development rates of both *P. vivax* and *P. falciparum* begin to decrease (18).

Based on the temporal patterns across multiple highland areas, they concluded that temperature and rainfall play an important role in the inter-annual variability of malaria. Temperature is a major determinant of malaria risk. Temperature and rainfall are the most important factors for distribution and population dynamics of malaria, rainfall influences transmission by its role in the mosquito life cycle, while temperature acts as a regulatory force (6).

Therefore, this study aims to examine the relationship between climate variability and malaria transmission in Yilmana Densa District. Knowledge of the magnitude of these spatial variations is critical to understanding the transmission dynamics of the disease and the evaluation of the efficacy of malaria control measures.

Objective

General objective

- To explore the impact of climatic variables (rainfall, temperature& Humidity) on malaria prevalence in Yilmana Densa District, from January 2004-Decmber 2013.

Specific objectives

- To estimate the burden of malaria and determine its distribution by month and year.
- To verify the relation of climatic factors with malaria cases.
- To help develop malaria early warning system in the District.

Study design

A crossectional retrospective study was conducted with record review to determine the correlation between meteorological variables (Rainfall, Temperature and Relative humidity) and malaria case occurrence over the last decade in the study area.

Materials and Methods

Both climate and malaria data between January 2004 and December 2013 were used in this study. Climate parameters that were used included; monthly rainfall, temperature and relative Humidity. Monthly precipitation monthly temperature and monthly humidity data were obtained from the Regional Meteorology Office and malaria data from the District Health Office. Data were analyzed using Micro Soft Excel 2007. Climate suitability for malaria transmission was defined as the coincidence of the monthly rainfall greater than 80 mm, mean temperature between 18°C and 32°C, (Below 18°C the parasite development decreases significantly, while above 32°C the survival of the mosquito is compromised) and relative humidity greater than 60%. These are the thresholds that are intended to describe conditions suitable for both the development of the *Plasmodium falciparum* parasite and the life cycle of the mosquito vector. Therefore, both climate and malaria data were used in this study.

Study area, population and period

The study was conducted in Yilmana Densa District which is found at 37.5^0 East longitudes and 11.3^0North latitude. The altitude ranges from 1820-2080 meter above sea level. The mean annual rain fall was 1175.2 mm; and average monthly temperatures ranged from 14^0c to 29.4^0c. Gonji Kolela District borders it to the east, Mecha & Bahir Dar Zuria Districts to the west, South Gondar Zone to the north and Sekela & Quarit Districts to the south. The estimated population of the District was 238,830 and it is one of the known malaria endemic areas of the Region. The District malaria surveillance with climate data included from January 2004 to December 2013.

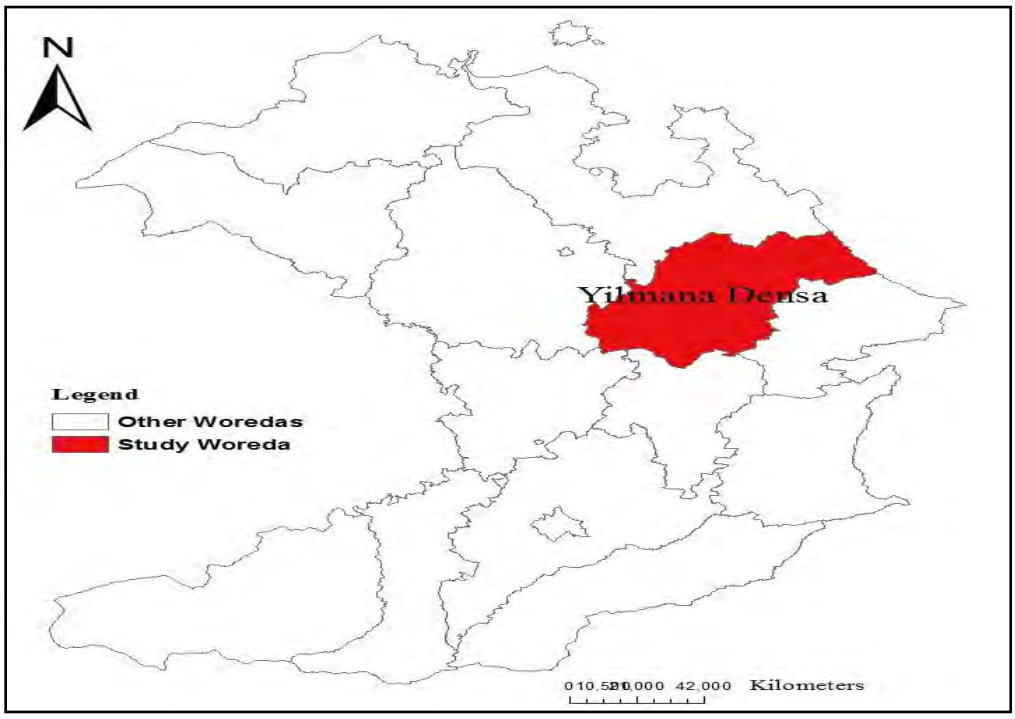

Figure 2.1.1: Map of Yilmana Densa District, W/Gojjam Zone, Amhara Region, Ethiopia, 2014.

Case definition

Any person with fever or history of fever with headache, rigor, back pain, sweating, myalgia, nausea and vomiting who was diagnosed as malaria. Malaria is diagnosed in Hospitals and Health Centers by microscopy and Health Posts by Rapid Diagnostic Tests (RDT).

Missing data handling

There were some values missed for both confirmed malaria cases and climate data. The missed malaria data were replaced with mean of same months of the year and climate values were replaced with the mean of the entire year.

Data analysis

The collected data were manually checked for completeness and cleaned of any inconsistencies for each variable and subsequently entered into a computer using Microsoft Excel sheet. Then, the pertinent findings of the analyses were presented in tables and figures.

Ethical issue

A letter was written from the Amhara Regional Health Bureau PHEM to Yilmana Densa District Health Office & Regional Meteorology Office for permission to use the data but there was no any ethical concern in both offices.

Results

Over the last one decade (2004-2013), a total of 51,793 microscopically confirmed malaria cases were reported in the District with the annual total cases of malaria ranging from 3,477 in 2005to 9,435 in 2013 with mean annual malaria cases of 5,179. A fluctuating trend of malaria cases reported through the years 2004-2013 was observed. There was a reduction of malaria cases from 2004-2008 and there was an increase of cases from 2009-2013 except, 2011 when there was slight reduction, but a remarkable increase was observed in 2013.

A high fluctuation of malaria cases was also observed by species. With the exception of 2013 a high predominance of *p. falciparum* over *p. vivax* was observed within the last decade, but, there was a significant variation in 2010. Thus, the remarkable increment was due to *P.falciparum* rather than *P.vivax*, except in the year 2013 when *P.vivax* was highly diagnosed in relation *p.falciparum* (Fig. 2.1.2).

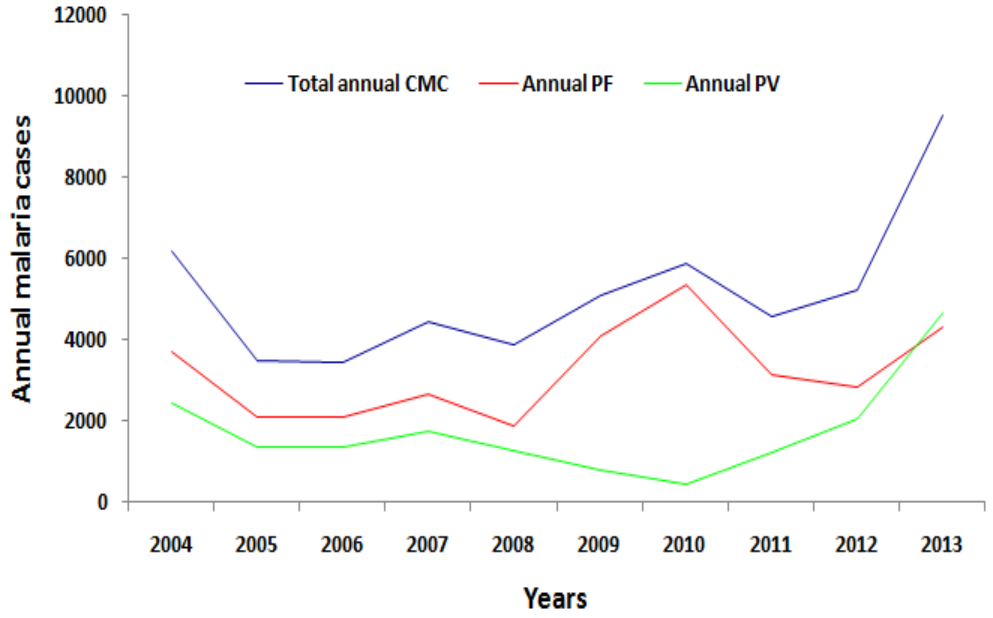

Figure 2.1.2: Relative annual trends of P. falciparum and P. vivax malaria in Yilmana Densa Woreda, W/Gojjam Zone, Amhara Region, Ethiopia, 2004-2013

Even though there were fluctuation of malaria trends in the study area, malaria cases occurred in every month of the year. Malaria transmission was generally high during the major transmission period in the District. The season with the highest malaria case occurrence was spring (September, October and November) and the least malaria case occurrence was summer (December, January and February).

An association between monthly malaria cases and meteorological variables was observed in the study area.

It has been observed that rainfall is responsible for creating conditions which allow sufficient surface water for mosquito breeding sites which influences malaria transmission. In our study there was an association between rainfall and malaria in Yilmana Densa District.

4-6 months average monthly rainfall was between 90-313mm in the year with the onset month May and cessation month was October/November (Fig. 2.1.3).

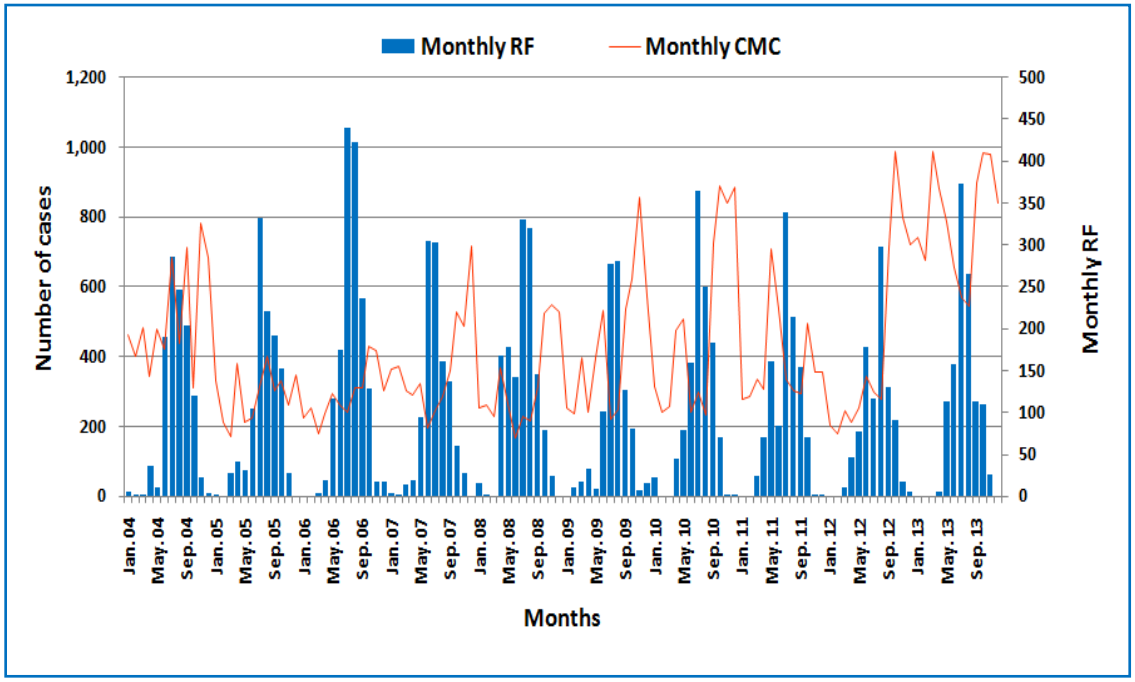

Figure 2.1.3: Monthly malaria and monthly rainfall, Yilmana Densa Woreda, W/Gojjam Zone, Amhara Region, Ethiopia, 2004-2013.

Humidity impacts the survival rate of the mosquito so that they will generally not live long enough to complete their transmission cycle where and when the relative humidity is less than 60%. So there was a relationship between malaria cases and relative humidity in the study area (Fig. 2.1.4).

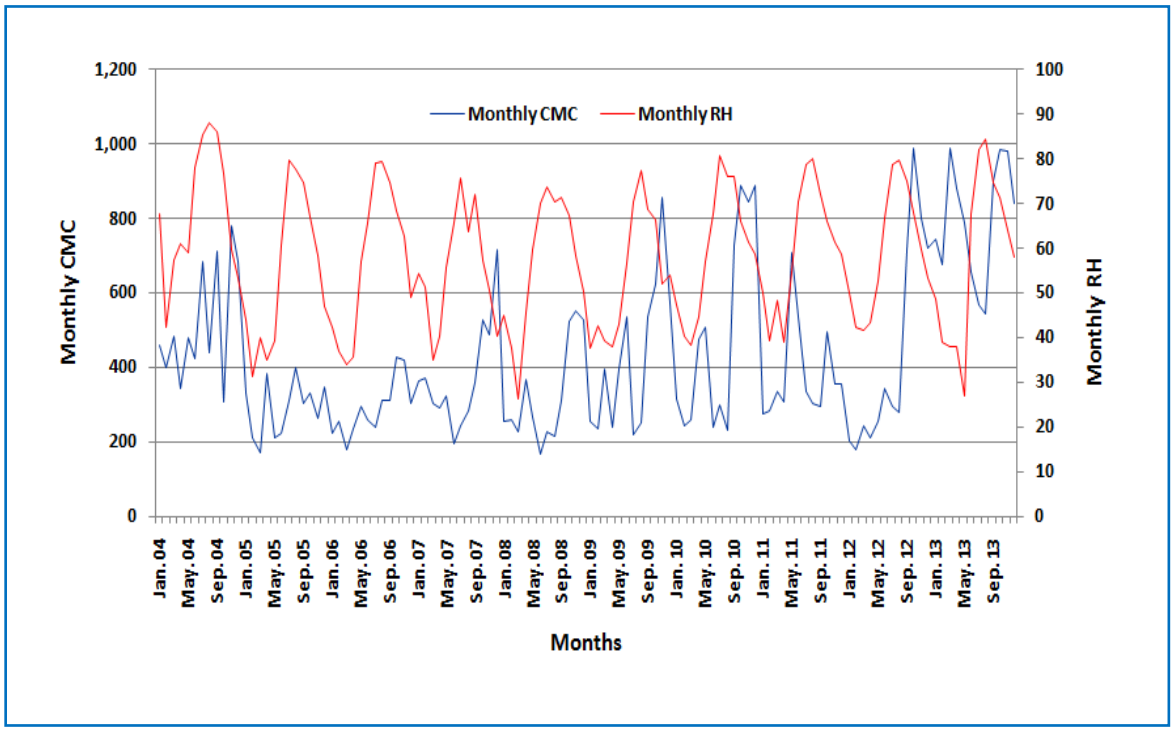

Figure 2.1.4: Monthly malaria with monthly RH, Yilmana Densa District, W/Gojjam Zone, Amhara Region, Ethiopia, 2004-2013.

Though temperature plays an important role by regulating development rate of mosquito larvae and influencing the survival rate of adult mosquitoes, probably it was not a limiting factor for malaria transmission in the District (Fig. 2.1.5).

Temperature throughout the nine years ranges from 16^0C to 25^0C except December 2005 and August 2007 where the temperature was 15.4^0C and 14^0C respectively).

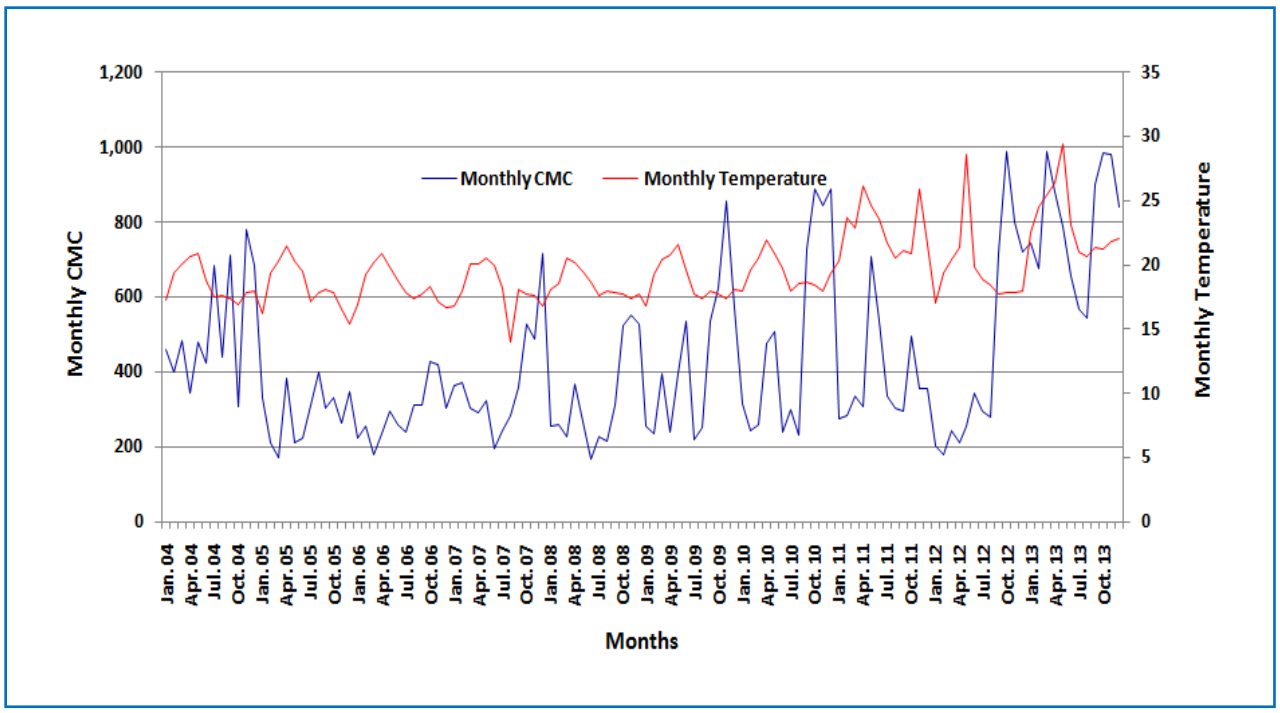

Figure 2.1.5: Monthly malaria cases with monthly temperature, Yilmana Densa District, W/Gojjam Zone, Amhara Region, Ethiopia, 2004-2013.

Discussion

The transmission of malaria can be determined by climatic or non- climatic factors. But even leaving these non-climatic issues aside, the effect of climate itself on the intrinsic probability of malaria transmission, remains controversial. So, climate variability that impacts on the incubation rate of Plasmodium and breeding activities of *Anopheles* is considered one of the important environmental contributors to malaria transmission dynamics (10)

The result of our study revealed that during the last decade, a fluctuating trend of occurrence of malaria cases was observed in Yilmana Densa Woreda. A reduction in malaria cases occurrence from 2004-2008 and an increase of cases from 2009-2013 with peak cases occurring in 2013 was observed. Except for the year 2013, the remarkable increment of total malaria cases was mainly due to an increase of *P.falciparum* with little increase *of P.Vivax*. But for 2013 total malaria cases, P.Vivax contributed more than P.falciparum. The increment of malaria after 2009 may be due to strengthening of the surveillance system and the implementation of the health extension program in the country. The major malaria transmission was from Sep. to Nov., following the major rainy season and minor transmission seasons from May to June following the minor rainy seasons. The annual malaria trend showed dramatic increment after 2011, this may be due to strengthening of the surveillance system which enabled to identify almost every case of malaria and expansion of the health extension program and increased awareness of the population to bring people with fever to be diagnosed and treated early.

The transmission was high during the major malaria transmission season (September, October & November) which is similar to other studies (48). Besides it may be due to resistance to Deltametrine which was being used as a chemical for indoor residual spray throughout the nation and which was shifted to Bendocarb and Propoxure in 2012.

Timely and accurate information about the onset of malaria epidemics is essential for effective control activities. Early warning methods that provide earlier alerts usually by the use of weather variables may permit control measures to interrupt transmission earlier in the epidemic, perhaps at the expense of some level of accuracy.

An association between monthly confirmed malaria cases and meteorological variables (rainfall and relative humidity) was observed in the District. Malaria distribution depends on the availability and productivity of mosquito breeding habitats. It was observed that rainfall plays an important role in the distribution of breeding sites and relative humidity increases longevity of the mosquito vector (Anopheles Mosquito) thereby influencing malaria transmission. The availability of the breeding habitat is related to stagnant water that remains after rainfall. Rainfall raises the abundance of the breeding habitat. Relative humidity is also an important determinant for the survival and longevity of the malaria vector (anopheline mosquito) which plays role to increase the transmission of malaria. Average monthly rainfall was 86.6-316.3mm with the onset month April and cessation month October/November and 6 months average monthly relative humidity was 50-78%. Rainfall generally increases the number of permanent as well as temporary breeding places for mosquitoes and humidity increases the longevity of the malaria vector.

The average monthly temperature throughout the ten years period ranged from 14^0c to 29.4^0c, so temperature was probably not a limiting factor for malaria transmission in the District.

Limitations

1. Both the metrology and malaria data were not complete.
2. Lack of malaria data by sex and age groups.

Conclusion

Malaria is still one of the major public health problems in Yilmana Densa District. Climate variability is one of the most important determinants of malaria transmission.

The results of this study showed that climate variability influences the variation in malaria transmission in the District. It was observed that rainfall & relative humidity play an important role in the distribution of breeding sites & longevity for the mosquito vector thereby influencing malaria transmission. Based on the finding of this study and by strengthening the surveillance system it is possible to establish early warning and preparedness system and monitoring and to prevent early possible malaria outbreaks and reduce the impact of the disease.

Recommendations

- Climate data monitoring and malaria surveillance should be strengthened in order to control outbreaks earlier.
- The Regional Bureau PHEM should work closely with Regional Metrological Office in order to predict and respond to malaria outbreaks timely.
- PHEM at different stages of the health system should always be alert to detect and respond to malaria epidemics before causing public health damage.

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Chapter III-Surveillance System Evaluation

3.1: Surveillance System Evaluation of Malaria in Bure Town and Bure Zuria Woreda, West Gojjam Zone, Amhara, Ethiopia, July 2014.

Summary

Background: The surveillance system showed a dramatic improvement from the grass root up to the Regional and National levels since its implementation. Currently, PHEM is implemented in all Regions to strengthen the surveillance and early warning system for public health emergencies and events. However, the performance of core surveillance activities and quality of the system has not yet been assessed in the study area. So, the aim of this study was to assess the performance of core activities and attributes of surveillance system of malaria, in Bure Town and Bure Zuria Districts, Amhara Regional State.

Method: A cross-sectional descriptive study was employed from 9-20 July 2014 in one urban and one rural Districts of West Gojam Zone, Amhara Regional State. A total of 11 study units/sites were included in the study, two District Health Offices, four health centers and five health posts. Selection of the Districts, health centers and health posts was based on convenience sampling approach. Primary data was collected using semi-structured questionnaire and observation using check-list. Secondary data were also collected from annual and weekly reports of the two District Health Offices and health facilities. Data were entered, cleaned and analyzed using Excel; and qualitative data were also summarized to support the quantitative data.

Result: In Amhara Region and in the two woredas malaria remains as the major public health problem with a high rate of outpatient visit which accounted for about 698,658 (8.75%), 7,890 (33.5%) and 11,397 (21.1%) of outpatient visits in 2014 for the Region, Bure Zuria and Bure Town Districts respectively. The overall reporting rates of the visited Districts to the Zonal Health Department in 2014 were 1154/1248 (92.5%) and 260/260 (100%) for Bure Zuria and Bure Town Districts respectively. The reports were sent to the next level via telephone and sometimes directly. Timeliness of reporting, analysis and use of the data at the local level were not satisfactory. Laboratory confirmation of cases took from 20- 30 minutes.

In all sampled health offices and health facilities, there was a responsible person for data analysis; however, the data were not analyzed regularly at the visited health facilities and District health offices.

Both the assessed Districts did not experience malaria outbreak in the previous years. Most visited Districts had no epidemic preparedness and response plan for malaria and any stock and budget line for emergency. Besides, epidemic management committee and the rapid response teams were activated only when there was an event/outbreak. There was no regular supportive supervision in Districts and health facilities in the year and there was no written and documented feedback.

The surveillance system was flexible since the reporting form can be modified to include other variables and it is integrated into other diseases.

It was not possible to measure the PVP of the surveillance system in this assessment of the surveillance of these diseases. Because laboratory confirmation of all suspected cases using case definition was not done and health extension workers register only those malaria positive cases which seem malaria so the PVP was 100%.

Conclusion:-

Majority of the system attributes objective such as; quality, acceptability, representativeness, simplicity and stability at District level still need great attention and improvement.

Introduction

Evaluation is an important part of communicable disease surveillance. Systematic and objective evaluation of surveillance determines the relevance, effectiveness and impact of such systems (1). Public health surveillance is defined as the "ongoing systematic collection, analysis, and interpretation of data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the dissemination of these data to those who need to know". Reasons for conducting public health surveillance can include the need to assess the health status of a population, establish public health priorities, and reduce the burden of disease in a population by appropriately targeting effective disease prevention and control activities (2).

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 should be evaluated periodically, and the evaluation should include recommendations for quality, efficiency, and usefulness (3).

Most of the current disease surveillance systems are neither working effectively to measure the health impacts of major diseases nor adequately evaluate current disease control programs nor detecting outbreaks for early intervention (4).

A functional surveillance system is useful for priority setting, planning, resource mobilization and allocation, prediction and early detection of epidemics and monitoring and evaluation of intervention programs (4). Disease control and prevention programs have been successful when resources were dedicated to detecting a targeted disease, obtaining laboratory confirmation of the disease, and using thresholds to initiate action at the District level.

Accordingly, the World Health Organization (WHO) Regional Office for Africa (AFRO) proposed an Integrated Disease Surveillance and Response (IDSR) approach for improving public health surveillance and response in the African Region linking community, health facility, District and National levels (5).

Robust and responsive surveillance systems are critical for the success of malaria control and elimination(6). A malaria surveillance system consists of the tools, procedures, people and structures that generate information on malaria cases and deaths, which can be used for planning, monitoring and evaluating malaria control programmes. An effective malaria surveillance system enables programme managers to: identify the areas or population groups most affected by malaria, identify trends in cases and deaths that require additional intervention, e.g. Epidemics; and assess the impact of control measures (7).

Ethiopia is one of the most malaria epidemic-prone countries in Africa. Approximately 52 million people (68%) live in malaria risk areas in Ethiopia, primarily at altitudes below 2,000 meters. Malaria is mainly seasonal with unstable transmission in the highland fringe areas and of relatively longer transmission duration in lowland areas, river basins and valleys. Historically, there have been an estimated 10 million clinical malaria cases annually. Since 2006, however, cases have reduced substantially (8).

The core activities and the structure of the surveillance system were assessed in Burie Zuria District and Burie Town Health Offices and in study facilities to describe the surveillance system.

The core activities and components included were case definitions, flow charts of the surveillance system (participating agencies and information flow in the surveillance system), population under surveillance, case detection, data collection, reporting, analysis and result dissemination and resources used in the surveillance system.

Objective

General objective

- To assess the performance of core activities and attributes of the surveillance system monitored efficiently and effectively in Burie Zuria District and Burie Town Administration Health Offices, Amhara Region, Ethiopia, 2014.

Specific objectives

- To assess the core activities such as case detection, reporting, analysis, preparedness, feedback and response system in the study area
- To evaluate the attributes of the surveillance system of malaria in the study area
- To assess major challenges of quality surveillance system
- To assess the usefulness and utility of surveillance system in early detection of diseases and outbreaks and decreasing morbidity and mortality.

Materials and Methods

Study Design and Area

A cross-sectional descriptive study was employed from 09-20 July 2014 in two Districts of West Gojjam Zone, Amhara Regional State. These Districts were selected for their easy accessibility and the relative high burden of malaria for evaluation. West Gojjam Zone has 15 districts with a total population estimated to be 2,217,054 (projection from the 2007 census).

Burie Zuria Woreda has 20 kebeles with estimated population of 120,003 and Burie Town Health Office has 8 kebeles with a population of 44,973. The surveillance system was evaluated employing the status of malaria.

We assessed the structure and the core activities of the surveillance system in the two Districts (Bure Zuria & Bure Town) in particular to describe the surveillance system of the Districts.

The evaluation of the performance and attributes of the surveillance system involved assessment of the usefulness of the surveillance system, simplicity of the system, flexibility, quality of the data, acceptability, representativeness, timeliness and stability of the surveillance system.

Case definitions

There are two case definitions; standard case definitions and community case definitions:

Standard case definitions

Any person with fever or fever with headache, rigor, back pain, chills, sweats, myalgia, nausea, and vomiting.

Community case definitions

It is very important at the community level to strengthen the notification and increase the detection rate of malaria.

Any person with fever, or fever with headache, back pain, chills, sweats, muscle pain, nausea and vomiting

Sample Size and Sampling

Convenience sampling was used to select the two woreds on the basis of their relative high burden of malaria and accessibility.

Study Units: The study subjects were health facilities and health offices. A total of 11 study units/sites were included in the study. Those were two District Health Offices (Burie Zuria Woreda and Burie Town Health Office), four HCs and five HPs in Burie Zuria District and Burie Town Health Office. From Burie Zuria District the District Health Office, three HCs and three HPs were selected, and from Burie Town Health Office, the Town Health Office, one HC and two HPs were selected (Fig.3.1.1).

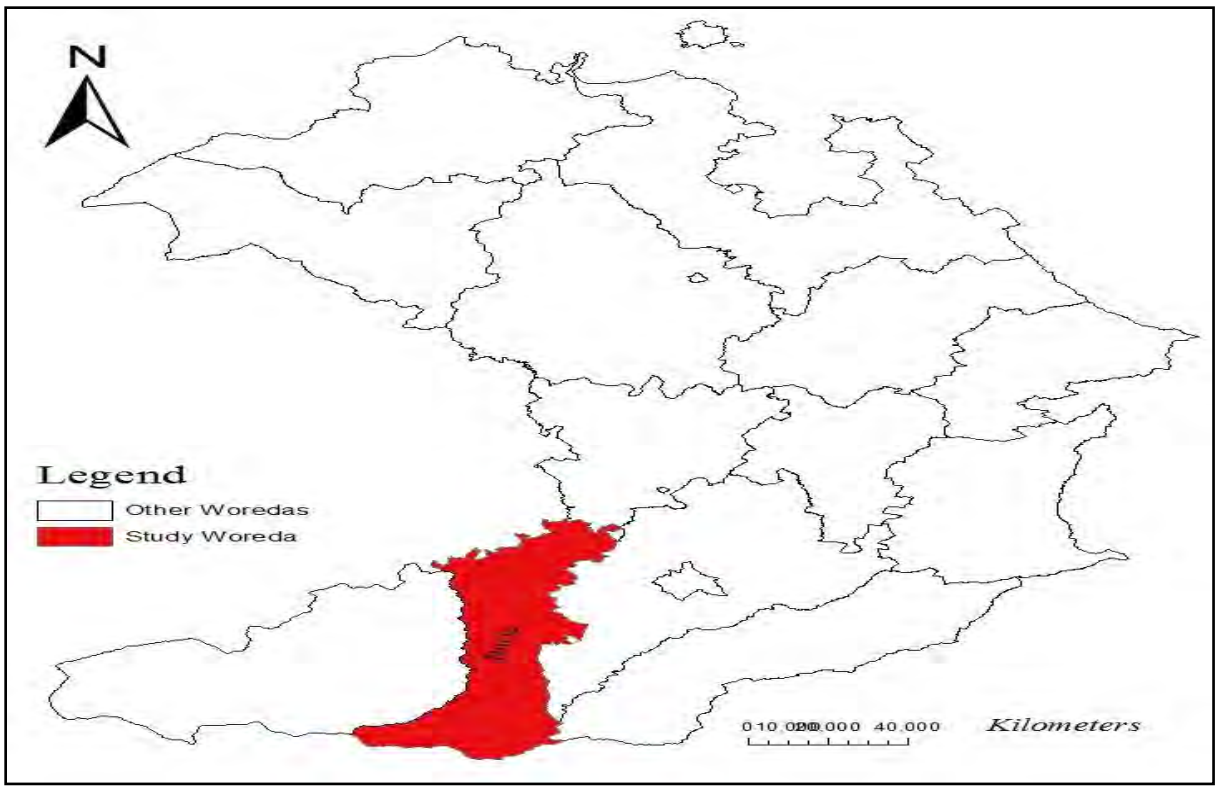

Figure 3.1.1: Map of Bure Town and Bure Zuria Woreda, W/Gojjam Zone, Amhara Region Ethiopia, July 2014.

Data collection

Primary data collection tools

Data were collected using structured questionnaire and observation using check-list. The questionnaires were adapted from the WHO guideline according to the objectives of evaluation system and made interview to the surveillance officers or focal persons in the selected health facilities and health offices (9).

Secondary data

Different data sources, such as annual reports of the Region, published articles in the areas of those diseases, national integrated diseases surveillance and response (IDSR), and the public health emergency management guidelines were used

Data analysis

Data were entered and analyzed using the Microsoft Excel and qualitative data were summarized to supplement the quantitative findings.

Ethical issue

Formal letter was written to the District Health Offices from the Amhara Regional Health Bureau Public Health Emergency Management Core Process (PHEM) for legal consent.

Results

A simplified flow chart of the surveillance system showing data transmission channels from health facilities to the national level has been found and functioning at all levels. When a suspected case presents to a health facility, health workers diagnose it based on case definition and confirmed using RDT and/or microscopy and recorded on a registration book. Using weekly standard reporting forms, health facilities report cases to the District level on Monday of each week. Reports from health facilities are compiled at the District and submitted to the Zonal level on Tuesdays. Reports from Districts are compiled at Zones and the summary reported to the Region till mid Wednesday. At the Regional level, reports are compiled and sent to the Ministry of Health on Thursday using standard PHEM weekly reporting forms.

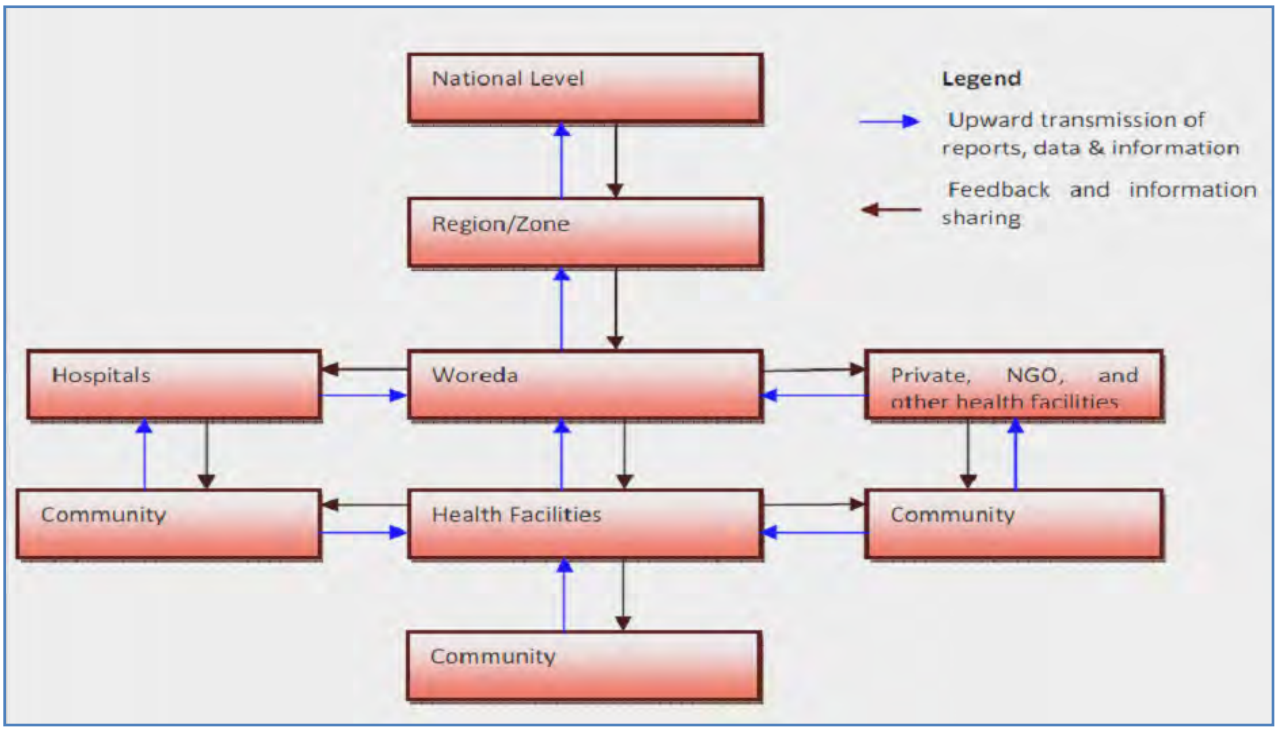

Figure 3.1.2: Diagram illustrating the formal and informal flow of surveillance data and information throughout a health system (source Public Health Emergency Management Guidelines for Ethiopia 2012).

Relevance and importance of the surveillance system of malaria

Malaria is among the major public health problems of the 20 priority diseases under surveillance in Ethiopia, but 21 in Amhara Region including, Leishmaniasis. In the Amhara Region, 80% of the land mass is favorable for malaria transmission and 75% of the populations are at risk of malaria each year. Malaria accounted for 698,658 (8.75%), 7,890 (33.5%) and 11,397 (21.1%) of all outpatient cases for the Region, Bure Zuria and Bure Town Districts respectively in 2013/14(58).

In West Gojam Zone, all the 15 Districts & all the 364 kebeles are malarious. A total of 95,870 outpatient and inpatient cases of suspected and confirmed malaria cases and six deaths were reported in 2013/2014 (59). Numbers of malaria cases were high during major and minor transmission seasons. From 628,614 suspected cases for malaria tested with microscopy or RDT; 44,672 cases were positive for *Plasmodium falciparum* and 45,695 cases were positive for *Plasmodium vivax.*

In Bure Town and Bure Zuria Woredas all of the kebeles are malarious. In Bure Zuria Woreda a total of 18,389 suspected malaria cases were tested with microscopy and/or RDT and 7,890 cases were positive for malaria of which 4,107(52%) were positive for *Plasmodium falciparum*, 3856(48.8%) cases were positive for *Plasmodium vivax* and 763(9.6%) cases were positive for both *Plasmodium falciparum* and *Plasmodium vivax* cases. The malaria trends are shown in Fig. 3.1.3 below.

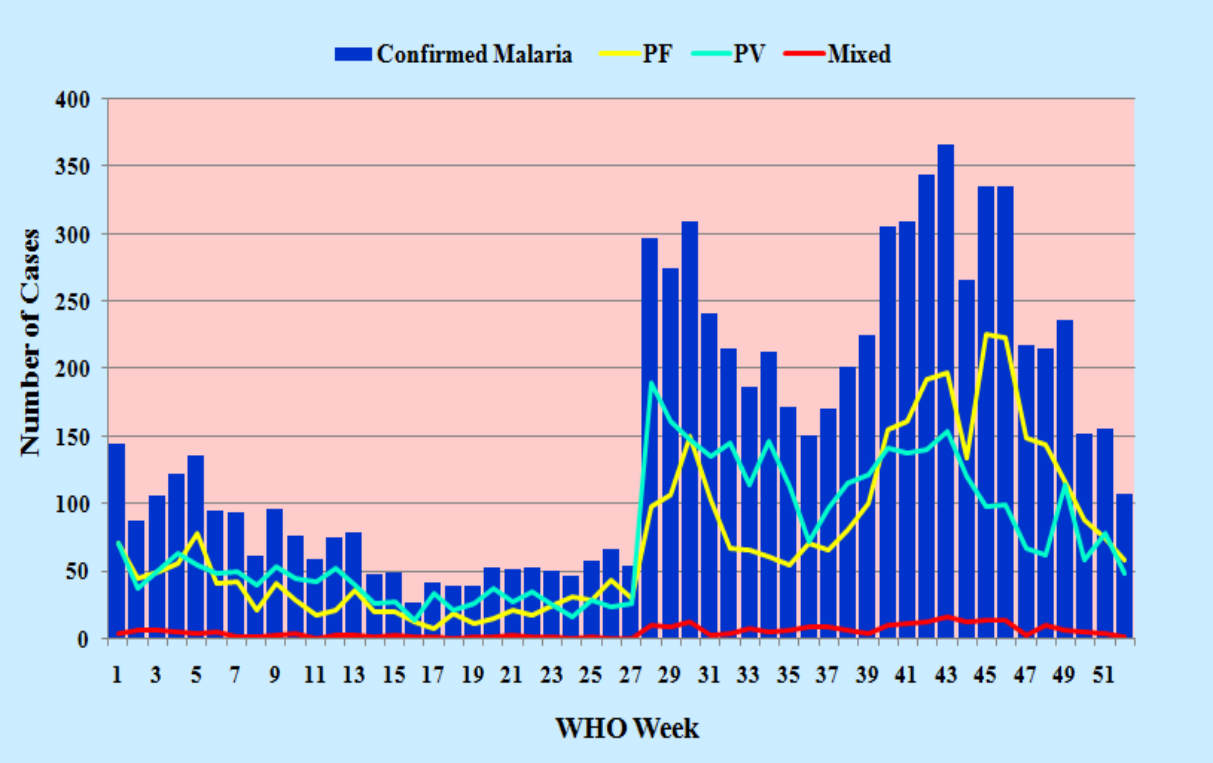

Figure 3.1.3: Weekly Malaria cases, Bure Zuria Woreda, W/Gojjam Zone, Amhara Region, Ethiopia, 2013/2014.

In Bure Town health Office a total of 16,854 suspected cases of malaria were tested with microscopy and/or RDT and 11,397 (67.6%) cases were positive for malaria of which 2,540 (22.3%) were positive for *Plasmodium falciparum,* 8064(70.7%) cases were positive for Plasmodium vivax and 963 (8.4%) cases were positive for both *Plasmodium falciparum & vivax,* but there was no death. There was no death in both Woredas. The malaria trends are shown in Fig. 3.1.4 below.

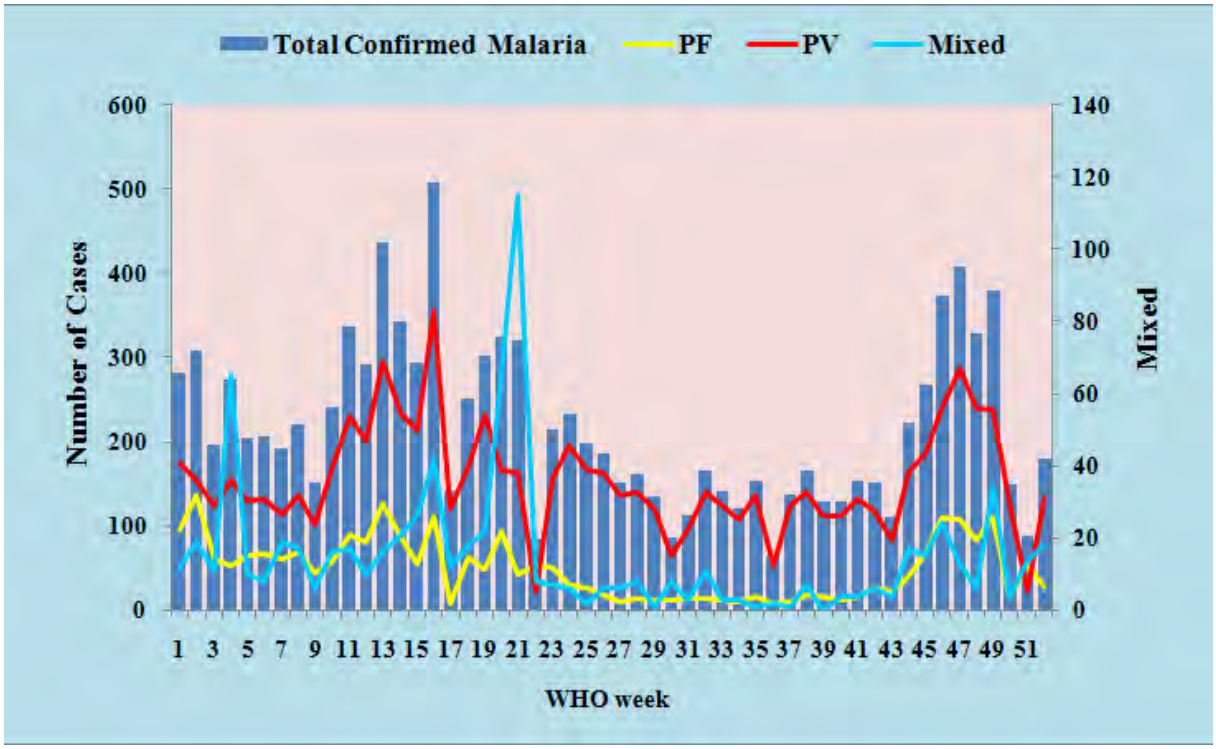

Figure 3.1.4: Weekly malaria case trend, Bure Town, W/Gojjam Zone, Amhara Region, Ethiopia, 2013/2014.

Performance of existing surveillance system

Population under surveillance

Public health emergency management targets all the population to be under surveillance for twenty priority diseases in the nation and twenty one in Amhara region which includes Leishmaniasis.

Table 3.1.1: Population under surveillance in the Region, West Gojam zone, Burie Zuria and Burie Town Districts, 2013/2014.

Population under assessment	Total projected population in 2014	Rural population	Urban population
Amhara Region	19,602,513	16, 882,893	2,719,620
West Gojam Zone	2,382,297	2,134,466	247,831
Burie Zuria Woreda	120,003	112,536	7467
Bure Town	44,977	17,591	27,386
Total	**22,149,790**	**19,147,486**	**3,002,304**

The majority of the communities live in the rural area of the Region (table 3.1.1). The Region has five referral hospitals, two zonal hospitals, 12 District Hospitals, 804 health centers, 3,317 health posts and two health research laboratories. Burie Zuria Woreda has four HCs and 20 HPs and Burie Town Health Office has one private hospital, one HC, two private clinics and four HPs under each health center five satellite health posts give service for the community. The health care coverage of the zone was 97% with health centers. In all assessed health facilities, the respondents agree that the population under surveillance have satisfactory health seeking behavior for malaria.

Table 3.1.2: Number of health facilities in Burie Zuria Districts and Burie Town W/Gojjam Zone, Amhara Region, Ethiopia, 2013/2014.

Number of health facilities expected to report							
Administrative area	**HP**	**HC**	**Hospital**	**NGO**	**Others**	**Total**	**Health service coverage**
Amhara region	3317	804	19	38	1097	5275	98%
West Gojam Zone	363	90	1	1	114	569	97%
Burie Zuria Woreda	20	4	0	0	7	31	84.7%
Burie Town HO	4	1	0	0	3	8	55.5%

Case detection and registration

The case definition of malaria was only available in 7 (63.6%) of the 11 visited health facilities. All health care providers in the visited health facilities understanding available case definitions well, as demonstrated by all of the heath care providers at the time of the field visit.

Even though the handling was poor, clinical register was found in all visited health facilities. Malaria treatment guideline was found in about 72.7% of the health facilities. Laboratory confirmation of malaria took only 20-30 minutes.

Reporting

There was no shortage of reporting form in the past one year in all visited health facilities. The weekly reporting rate for Bure Zuria Woreda over the past 16 weeks was 252/320 (78.8%) for health centers and 80/80 (100%) for health posts. All reports were sent to the next level via telephone and sometimes directly. The reporting rate of Bure Zuria Woreda is shown in table 3.1.3 below.

Table 3.1.3: Reporting rates of Bure Zuria Woreda in 16 week's period, W/Gojjam Zone, Amhara Region, Ethiopia, 2013/ 2014.

S.No	WHO Reporting Week	HP		HC		Total # of HFs	
		Reported	Expected	Reported	Expected	Reported in a week	Expected to report in a week
1	1	17	20	5	5	22	25
2	2	16	20	5	5	21	25
3	3	16	20	5	5	21	25
4	4	17	20	5	5	22	25
5	5	16	20	5	5	21	25
6	6	16	20	5	5	21	25
7	7	16	20	5	5	21	25
8	8	16	20	5	5	21	25
9	9	16	20	5	5	21	25
10	10	14	20	5	5	19	25
11	11	15	20	5	5	20	25
12	12	16	20	5	5	21	25
13	13	16	20	5	5	21	25
14	14	16	20	5	5	21	25
15	15	12	20	5	5	17	25
16	16	17	20	5	5	22	25
Average number of		**15.8**		**5.0**		**20.8**	
Average reporting rate per week (%) by facility type		**78.7%**		**100%**		**83.0%**	

The weekly reporting rate for Bure Town Health Office over the past 16 weeks was 16/16 (100%) for health centers and 64/64(100%) for health posts. All reports were sent to the next level via telephone and sometimes directly. The reporting rate of Bure Town Health Office is shown in table 3.1.4 below.

Table 3.1.4: Reporting rates of Bure Town Health Office in 16 weeks period, W/Gojjam Zone, Amhara Region, Ethiopia, 2013/2014.

S.No	WHO Reporting Week	HP		HC		Total # of HFs	
		Reported	Expected	Reported	Expected	Reported in a week	Expected to report in a week
1	1	4	4	1	1	5	5
2	2	4	4	1	1	5	5
3	3	4	4	1	1	5	5
4	4	4	4	1	1	5	5
5	5	4	4	1	1	5	5
6	6	4	4	1	1	5	5
7	7	4	4	1	1	5	5
8	8	4	4	1	1	5	5
9	9	4	4	1	1	5	5
10	10	4	4	1	1	5	5
11	11	4	4	1	1	5	5
12	12	4	4	1	1	5	5
13	13	4	4	1	1	5	5
14	14	4	4	1	1	5	5
15	15	4	4	1	1	5	5
16	16	4	4	1	1	5	5
Average number of reports per week		**4.0**		**1.0**		**5.0**	
Average reporting rate per week (%) by facility type		**100%**		**100%**		**100%**	

Data analysis

In all sampled health offices and health facilities, there was a responsible person for data analysis; however, the data was not analyzed regularly at the visited health facilities and District health offices. District Health Offices analyze and follow only weekly trend of malaria. There was a threshold for action of malaria at all Districts.

Epidemic preparedness and response

Both the assessed Districts did not experience malaria outbreak in the previous years. One of the assessed Districts had epidemic preparedness and response plan for malaria, and epidemic management committee. All Districts have no any stock and budget line for emergency. The epidemic management committee and the rapid response teams were activated only when there was an event/outbreak. Moreover, they did not evaluate their experience and preparedness.

Feedback and supervision

There was supportive supervision in Districts and health facilities once in a year, but surveillance information or supervision at District and health facility levels of the health system had no written feedback.

Training

All health facilities (HCs) and Districts, responded that all staffs working on surveillance units got short term training or workshops of 3-5 days by the Regional Health Bureau. At health facilities, only the focal person assigned for surveillance was trained, but other health care providers were not.

Resources available for surveillance

Resources for data management, communication, and logistics were available at health facility and District levels. The computers at health facility and District levels were properly functioning. All PHEM surveillance units at the District and health facility levels did not have internet services. Some of the health facilities did not have telephone services. Budget constraints were aired by all health units. Those were indicated to be the reasons for poor supervision and monitoring of the health facility reports.

Laboratory

Laboratory capacity in the surveillance of malaria was assessed at health facilities. The health center laboratories were able to test malaria by microscopy and health posts with RDT. Malaria was confirmed at all levels of health facilities (health posts and health centers) and there was frequent shortage of RDT in health posts.

Description of the performance and attributes of the surveillance system

Malaria surveillance is integrated with all other priority diseases which include laboratory support and passive surveillance which becomes active during outbreaks. We assessed system attributes including usefulness, simplicity, flexibility, data quality, acceptability, sensitivity, timeliness, stability and representativeness and usefulness.

Usefulness

Early detection of epidemics of diseases under surveillance and assessment of the effect of prevention and control programs were common understanding of all the respondents as the major use of the surveillance system. However, this well understood use of the surveillance system has many challenges in the area of case detection, reporting and response

In general, the users of the surveillance system, though they understood the usefulness in this regard, are not satisfied with the system and the utility of the system was very low.

Simplicity

All respondents agreed that the case definitions of malaria for identification of suspected cases are easy to understand and apply by all levels of health professionals. Though forms are easy to complete, it was noted that the system was not simple due to lack of functional communication mechanisms making it difficult to get weekly report from health facilities. There were no standard case definitions in 2 (18.2%) units. Manual data entry and collecting weekly reports from multiple reporting sources at Districts makes it complex. Data from health facilities were sent to the woreda health office, the Zonal and Regional Health Bureau in a paper form and use of data was also very limited at all levels.

Cases were detected using case definition and confirmed with RDT at health post level and microscopy at health center level. Most of report forms were easy to complete. Weekly reports were communicated by telephone from Districts to next level. There was no lack of reporting forms.

Flexibility

The reporting form can be modified to include other variables to report other newly occurring health events without much difficulty, and the formats are assumed to be easy and comprehensive. The standard reporting formats for suspected & confirmed malaria cases and standard epidemic reports were integrated into PHEM, which make the system flexible.

Data quality

The data quality was also assessed on the basis of completeness of the reporting format and timeliness of the report. There were some missed variable in reporting formats like week number, the expected number of health facilities to report, and blank variables rather to fill zero cases, especially in health posts. The major reasons are not considering some of the variable as important.

Acceptability

The acceptability of the surveillance system was assessed based on the engagement of the reporting agents and active participation in the case detection and reporting. In Bure Town and Bure Zuria Districts the engagement of the reporting agents was good and the reporting rates were 100% and 78.2% respectively as seen over 16 reporting weeks (Tables 3.1.3 and 3.1.4).

Sensitivity

The sensitivity of the surveillance system of malaria in the detection of the cases and outbreaks were seen separately.

The surveillance system to detect cases of malaria

Since the surveillance system is based in the health facilities, the capacity of the surveillance system to capture cases in the community is dependent on different reasons: one reason could be the health seeking behavior of the community- which was generally commented as poor, though there is improvement with the HEP and the community HW.

The other reason is lack of case management capacity of the health posts; the health posts record and report those whom they can give treatment like anti- malaria (co-artem), otherwise, cases are not recorded and reported if they are not given any drug.

Hence, the number of cases reported from the health post will be high when they have anti-malaria and RDT at hand. The third factor could also be the technical and logistic capacity of the health facilities in detection and laboratory confirmation of cases. These factors undermine the burden of cases in the community and hence the sensitivity of the surveillance to pick the case to be low.

The surveillance system to detect an outbreak of malaria

The capacity of the surveillance system to detect an outbreak is influenced by the definition of the outbreak.

The sensitivity of the surveillance system is dependent on different reasons, like regular analysis of the data, definitions of the thresholds, case detection and reporting rate of the expected health facilities and so on. Unfortunately, the reporting rate of the health facilities was good as shown in the table 3 & 4. But there was no regular analysis of the collected data, however, the sensitivity of the system increases once the number of cases is higher or death starts to occur, i.e. the surveillance system would be sensitive for high epidemics.

Predictive value positive

It was not possible to measure the PVP of the surveillance system in this assessment of the surveillance of these diseases. Because, laboratory confirmation of all suspected cases using case definition was not done and health extension workers register only those malaria positive cases which seem to be positive,

the PVP is 100%. But for case definitions that are broad at the health post and community level, the PVP is expected to be low, especially for febrile illnesses.

Timeliness

The reporting rates of the health facilities in the Districts were good (Tables 3.1.3 & 3.1.4). But of those which reported, the number of facilities which reported timely was difficult to know exactly; since the date reports were received were not recorded.

Stability

The surveillance system was stable based on availability of standard reporting format at Districts and easily integrated with other diseases. However, there were several factors reported that made the system not stable. Data available at District level for use was not from all facilities and lack of training for 4 (36.4%) of the respondents on PHEM. Case definitions were available in only 4 (36.4%) health facilities.

Representativeness

Most of the respondents reported that surveillance data were not received from peripheral health posts and private health facilities on time. All health facilities were accessible for weekly reports except few health posts.

Usefulness of surveillance

All of the participants agreed up on that the surveillance system is helpful to detect the outbreak of priority diseases early, to estimate the magnitude of morbidity and mortality related to these diseases, including identification of factors associated with these diseases. Even though there was no malaria epidemics, all District Officers believe that outbreaks should be investigated and response given within 48 hours of occurrence. All Districts have prepared written epidemics preparedness and response plan (EPRP). The challenge of all assessed area was none of epidemic management committee evaluated their preparedness and response activities.

At District level the data from representative and complete sources transmitted to the next level. In general the system was useful and utilizes the existing health system to provide evidence based information for action.

Case recording and reporting

PHEM targeted diseases were reported on weekly basis by telephone and hard copy using standard reporting format from health facility to Districts were reported from Monday to Sunday. Districts compiled and reported to zone and finally reported to Amhara Regional Public Health Emergency Management Core Process. The reporting forms and register books were available in both Districts.

Data analysis and interpretation

There was no analysis of malaria surveillance data completeness, timeliness, trends observed in study units. But there were PHEM reports by quarter, and annually in the two (50%) health facilities of the study areas.

Epidemic preparedness

Both Districts lacked drugs, budget, trained persons in epidemic investigation and management and active rapid response committee. Most of the study health facilities had weekly malaria monitoring chart, but all of them did not know the appropriate threshold.

Supervision

All of the study units received supportive supervision last year from higher level. But there were no documented feedback given, from Districts to health facilities to improve the surveillance system. Feedback to lower level was provided, mainly verbally.

Training

Seven of interviewed staffs (63.6%) were trained on PHEM, but most of the health facilities staffs were not trained.

Laboratory function

All health centers consistently confirm malaria. All laboratories in four health centers were equipped with microscope and all of them consistently confirmed malaria with microscope. However, there were shortage of reagents, supplies, and breakage of electric power. Health posts diagnose malaria using RDT, and reported frequent shortage of RDT.

Discussion

The understanding of health care providers to the case definition of malaria was found to be good but the collection and registration of data had some gaps. Besides, the health care providers and the HEWs were clear about the weekly reporting formats of PHEM.

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

The epidemic preparedness and response activities of the Districts were not well organized and had only planning, but there was no financial and/or logistic support. Besides the epidemic response committees and rapid response team had no regular meetings and they do not review their plans, actions, and learn from their experiences to reduce their dependence on the Regional Health Bureau in case of disasters. This makes responses to be late and disasters to spread fast and may cause many suffering & preventable death. Furthermore, the District Health Offices were allowed for emergency budget from the District Administration only after an event has occurred which hampers timely investigation, and mitigation of expected events in the District.

Data reporting was affected by poor communication affecting quality of the data collection. Further, there was no system quality control for data collection. Data were inadequate for meaningful interpretation and action based on the information.

At District level, manual data entry, lack of quick and simple way for data transmission from facilities and accessibility to multiple reporting sources, lack of training for only 36.4 % (four) of the respondents on PHEM and case definitions were available in only four (36.4%) health facilities makes the surveillance system complex. lack of training for 36.4 % (four) of the respondents on PHEM. Case definitions were available in only four (36.4%) health facilities

Conclusion

The surveillance system has shown a remarkable progress since the start of its implementation. But majority of the system attribute objectives such as; quality, acceptability, representativeness, simplicity and stability at District level still need great attention and improvement. Availability of PHEM focal persons at all levels, presence of multi-sectoral emergency Prevention and Preparedness Committee (EPPC) in all Districts in which the health sector is a member, national technical guideline for standard case definitions were available only in four (36.4%) health centers.

Evidence of data analysis was not observed in all District Health Offices and health facilities. All visited health facilities and Districts have established epidemic preparedness committee but was not well functional. Computers, communication, equipment and other essential items for improved implementation of PHEM were not consistently available in health facilities.

Contingency stocks of recommended drugs were not observed in all Districts, feedback to lower level was provided mainly verbally and there was no budget earmarked for epidemic response.

Recommendations

- Strengthening data processing capacity at all levels by providing necessary facilities where needed;
- Supportive supervision should be Strengthened at lower levels and there should be documented feedback
- There should be earmarked budget for epidemic response
- Short term trainings should be given on data analysis, interpretation and usage for all PHEM officers at the District level by the Regional Health Bureau

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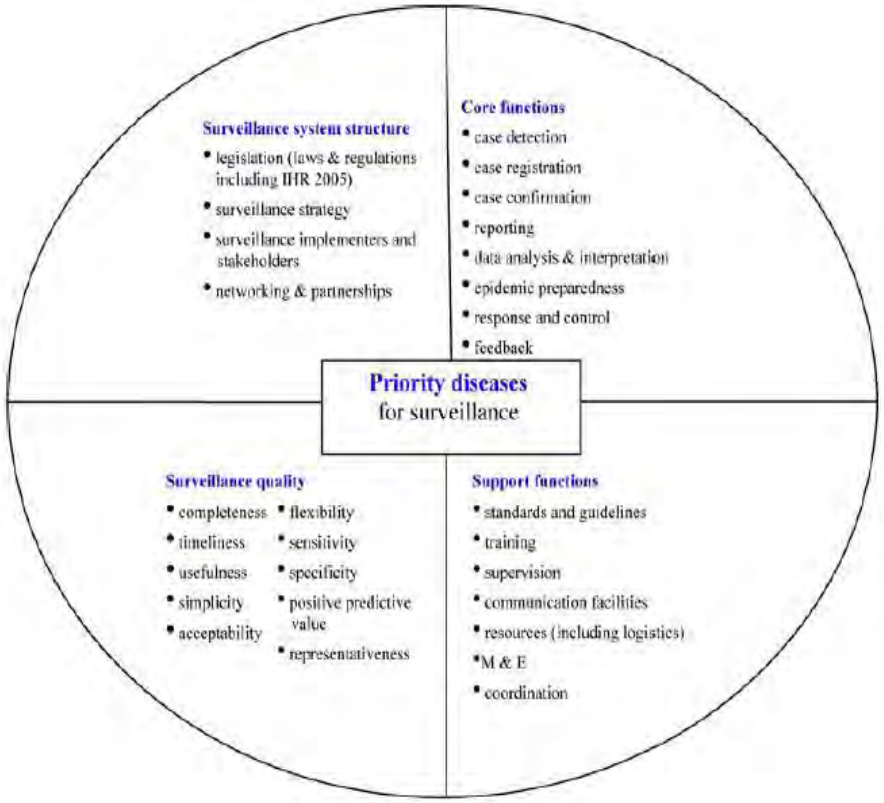

Annex 3.1.1: Components of the surveillance and response systems (Source Communicable disease surveillance and response systems. A guide to planning, WHO).

Chapter IV- Health Profile Description Report

4.1: Health profile description of Bure Zuria District, Amhara Region, Ethiopia, March 2014

Summary

Background: Health profile is vital for prioritizing prominent health and health related problems of the community. It is basic for planning and appropriate intervention; and it is an entry point for operational research. Stakeholders in health and health related areas of the community will have evidence-based information from well compiled health profile. The purpose of this document is to assess and describe the health and health related issues in Burie Zuria District and communicate the local burden of disease and other health related information.

Methods: A descriptive cross sectional study had been conducted from 9- 20 March 2014 in Burie Zuria District. Health and health related data were collected using standard check list by interviewing and reviewing medical records in the District.

Results: The District has 20 kebeles which have a variable distance from Burie Town. Most of the kebeles (55%) have a distance of 20-45 kilometers from Burie Town and the rest have a distance of 7-15 kilometers. In 2012/13 the population estimates for the District was 118, 020 of which females constituted 59,557 (50.5%). Approximately 7,343 (6%) of the District population live in urban area. The age dependency ratio of the District was 53,921 (84.1%). There are four health centers and 20 health posts in the District. In the four health centers and 20 health posts under Burie Zuria District, there are 49 clinical Nurses, seven Laboratory professionals, 11 Pharmacy professionals, nine health officers, three Environmental health officers and 46 health extension workers.

The leading cause of outpatient visit was malaria which accounts for 32,410 (48.4%) of all cases. The annual population growth rate of the District was 1.7. The prevalence of malaria in the District was 285 per 1000 populations per year. Pentavalent (penta-3) immunization coverage in 2012/2013 was 2,593 (79.3%), measles 2,405 (73.6%) and fully immunization coverage was 2,405 (70.8%).

Conclusion and recommendations: Malaria was the leading cause of morbidity in the District. Therefore, prevention and control measures should be strengthened to reduce the morbidity and mortality due to malaria.

Introduction

Health profile is a summarized auditing and discussion of health related data and important health related indicators to describe the health and related social, economical, political and cultural factors in the geographic area under discussion. It is vital for prioritizing prominent health and health related problems of the community. It is basic for planning and for appropriate intervention; and is an entry point for operational research. Stakeholders of health and health related issues will have access to evidence-based information from well compiled health profile.

A community health profile includes both previously identified health issues and the identification of new, emerging issues(60). A comprehensive community health profile includes: A narrative description of the given community, community strengths and challenges, demographic and economic data, health status data, community resources, including services, coalitions, and systems and interpretation of data presented, from both the perspective of the health council and the broader community (60). However, in low income countries like Ethiopia, such information especially at District level is usually not complete and not comprehensive(60).

In Burie Zuria District, there was no organized and well documented community health profile at one place. Different health and health related data were available at different processes of the District in disorganized situation in such a way that no one can access and use these data at the right time and place.

This document presents a comprehensive health and health related information for Burie Zuria District. District sectors and other health partners will clearly understand the District communities' health need from this document. So, having this document, governmental and non-governmental health stakeholders working for the District communities' could have evidence based information for prioritizing and instituting appropriate public health interventions.

Specific objectives

- To assess primary health care coverage of the District
- To assess human resources of the District.
- To identify priority public health problems.
- To describe existing health infrastructure of the District.

Methods

A descriptive cross sectional study was conducted from 09-20 March 2014 in Burie Zuria District. Formal letter was written from the Amhara Regional Health Bureau Public Health Emergency Management Core Process (PHEM) to all concerned sectors in Burie Zuria District. Health and health related data were collected from Burie Zuria District Health, Education, Agriculture, Water Resource Offices and other sectors. All Kebeles of the District were included. Health and health related data were collected from the District Health Office while data of safe water supply coverage were collected from the District Water Resource Office. Education related data were collected from the District Education Office. Agriculture data were collected from the District Agriculture Office and other data were collected from other relevant sectors.

Structured questioners were developed and used to collect secondary data. Interviews were conducted with relevant officers of the above specified processes, based on the needed data. Different register books were also assessed. Spread sheet/excel, was used for data analysis.

Results

Historical background and culture

Burie is one of the oldest woredas in Amhara Region which was established in 1545.The District had no its own capital & Burie is serving as the District capital. Around 99% of the population of the District is Orthodox Christian, and 1% protestant. The ethnic composition of the District is 96% Amhara and 4% Oromo.

There are no historical places in the District, but there are potential historical places like Genbebun water fall which is found in Sontom kebele, southeast direction, about 34 km from Burie Town. The other potential place is Gantamen Forest which is found in Agni Fereda kebele and which covers about 336 hectares.

Historical designation of the District is related to colored (Bure) ox. Once upon a time there was a famous rich person whose name was Dejazmach Worasie from a neighboring kebele, known as Wan Gedam. He lost his ox and found it in Burie after three days. When he observed the area it was very green and attractive. So he declared that the area should be named Burie, based on the color of the ox (Bure).

Geography and climate

Burie, the District Town is found on highway 165 kilometers south of Bahir Dar. There is Bure Cool mineral water and soft drinks factory in the District Town Bure. Burie Zuria District shares boarders with Sekela woreda and Awi Zone in the north, Oromia Region in the south, Jabi Tehnan Woreda in the east, Womberma Woreda in the west and Dembecha Woreda & East Gojam Zone in the south east.

The climatic condition of the District is 1% Dega, 77.2% Woina Dega and 21.8% Kola. It covers about 587.95 square kilometers including Burie Town, with altitude ranging from 700-2350m above sea level. The geographic coordinates of the district is 10.2^0 North latitude & 37.1^o East longitudes. The mean annual rain fall is 1250 mm; and the monthly temperature ranges from 17^0C to 25^0C.

Administrative and political organization

The District is divided in to 20 kebeles. The District has its own council and representative in the Federal Parliament. All sector offices are found in Burie Town. The Amhara Development Association (ADA), Last 10 Kilometers (L-10K), United States Agency for International Development (USAID), United Nations Children's Fund (UNICEF), and World Health Organization (WHO) are the main supporting organizations in the District. The Ruling Political Party in the District is the Amhara National Democratic Movement (ANDM/EPRDF).

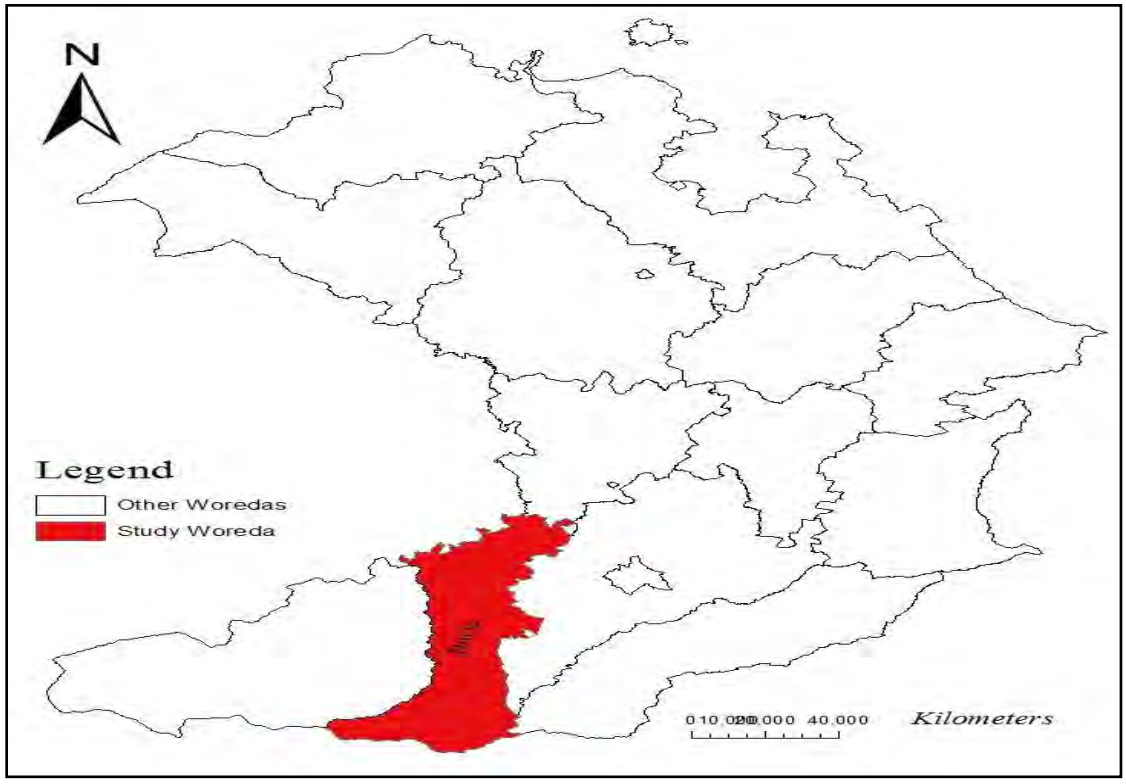

Figure 4.1.1: Map of Burie Zuria District, W/Gojjam Zone, Amhara Region, Ethiopia, March 2014.

Socio-Demographic information

The 2012/13 population estimate for the District was 118,020 of which females constituted 59,557 (50.5%). Approximately 7,343 (6%) of the District's population resided in urban areas during the study. The population distribution of the District was very variable ranging from 2,136 in Fezel kebele to 9,496 in Gulim. Eight kebeles (Gulim, Woinma Ambaye, Wohni Durbete, Agni Fereda, Fetam Sontom, Kuch 01, Denbun and Shakua) constituted more than half (53.2%) of the total population of the District. The sex ratio of the District was almost equal.

Religion composition of the District was 99% Orthodox Christian and 1% Protestant. Ninety six percent of the population was Amhara by ethnicity. The average household size was estimated to be 4.3. Most of the kebeles have variable distance from Burie Town, the nearest kebele was 7 kilometers from Burie Town and the farthest was 45 kilometer away from Burie Town. About 55% of the kebeles were 20-45 kilo meters from the District Capital, Burie Town. The District had 19 rural and 1 urban, a total of 20 kebeles. The population density of the District was 200 inhabitants per square kilometer (Table 4.1.1).

Table 4.1.1: Population distributions by kebele for 2012/13 with estimated population and distance in kilometers from the District Town (Burie).

S.No	Name of kebele	Total population	Male population	Female population	Distance of kebeles from Bure Town
1	Gulim	9496	4705	4791	20
2	Woinma Ambaye	8123	4023	4099	8
3	Wohni Durbete	8062	3993	4069	25
4	Agni Fereda	8005	3966	4039	20
5	Fetam Sontom	7525	3727	3797	36
6	Kuch 01	7343	3638	3705	27
7	Denbun	7138	3537	3601	10
8	Shakua	7102	3518	3584	8
9	Zalima	6825	3381	3444	15
10	Jibgedel	6286	3114	3173	10
11	Alefa	5452	2701	2752	10
12	Wadra Gindiba	5237	2593	2644	8
13	Arbisi	5113	2532	s2581	20
14	Sertekez	4795	2375	2420	27
15	Ziyew Shihun	4716	2336	2380	28
16	Tiatia	4488	2223	2265	7
17	Gedam Lijamor	3687	1826	1861	37
18	Adel Agata	3485	1726	1759	8
19	Boko Tabo	3006	1489	1517	45
20	Fezel	2136	1058	1078	26
Total population		**118,020**	**58,463**	**59,557**	

The population pyramid of the District was predominantly young, with 15,092 (43.3%) of the population being <15 years old. The population in the productive age group (15-64 years) constituted about 64,099 (54.3%) of the total population. Population > 64 years were only 2,829 (2.4%) of the total population (Fig.4.1.2).

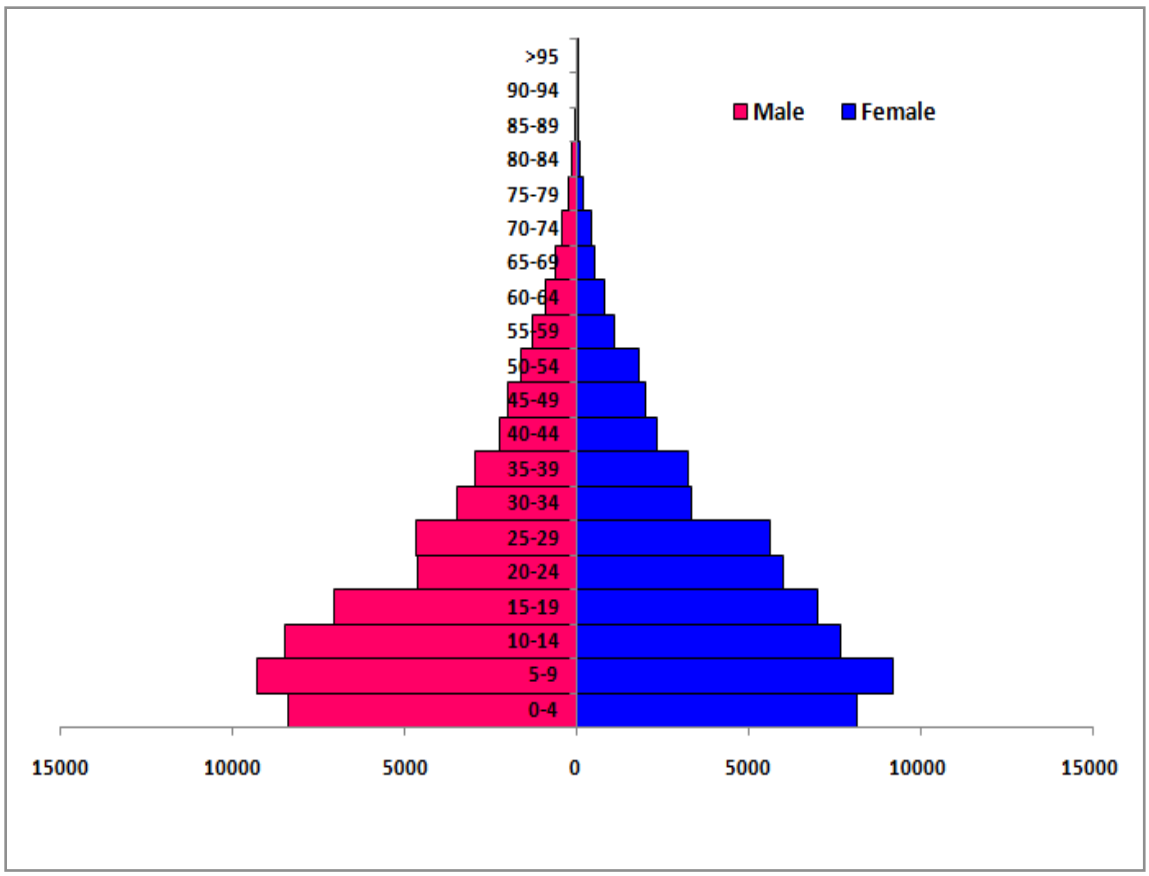

Figure 4.1.2: Population pyramid of Bure Zuria District, W/Gojjam Zone, Amhara Region, Ethiopia, 2012/2013.

Facilities

Burie, the District Capital had 24 hour electric power supply, mobile and cable based telephone services, postal service and bank (Commercial Bank of Ethiopia, Hibret Bank and Abyssinia Bank). Burie Zuria District did not have bank until recently. All, except 4 Kebeles were accessible to transport in all seasons.

All the 20 kebele offices have wireless telecommunication systems and are accessed by mobile telephone network; however, only one kebele (Kuck 01) had fixed telephone service and only 9 kebeles had 24 hour electric power supply. There was only one health center (Kuch HC) with safe water supply.

Education

The intimate linkage between health and education has been firmly established in a number of studies, which taken collectively, offer some ideas about how education and health could potentially reinforce each other towards the rapid socio-economic development of the country. Epidemiological and health service research in Ethiopia has shown that illiteracy is usually associated with high health risks and low health seeking behavior. In addition to a wide range of diseases and child mortality associated with illiteracy or under-education, HIV/AIDS infection is also disproportionately high in out of school youth. Despite major progress in education, national literacy levels are still low. The total adult literacy rate (persons above 15 years who can read and write) is 36% (62% for male and 39% for female) (61).

The District had 25 first cycles (Grades 1-4), 21 second cycle primary (Grades 5-8) and 01 secondary (Grades 9-10) school. There is no preparatory school in the District. First cycle has a total student population of 17, 254 with 8,324 (48.2%) females. Elementary schools (grades1-8) had a total student population of 26,354 of which 13,297 (50.5%) were females. In high schools there were a total of 853 students of which 413 (48.4%) were females.

In first cycle, there were a total of 331 teachers of which 170 (51.4%) were females. In elementary schools (1-8) there were 543 teachers of which 236 (43.5%) were females and in secondary schools there were 39 teachers of which 8 (20.5%) were females. School dropout rate for grades 1-8 students was 2.16% and for girls it was 1.8%, but for grades 9-10 it was 10% and for girls it was 12%. Education coverage for the District was 99.9%, but the literacy rate was not known.

Productivity and income

The District has fertile land which is suitable for agriculture. Most of the District population lives in rural area and on agricultural economy. The most common stable foods/crops in the District are “Maize” “wheat” Teff”, Dagusa (Melet), Barley & Pepper and the productivity of the land per hectare was 23, 55, 40, 26, 28 and 18 quintals respectively. The gross domestic product (GDP) of the District in Meher Season (regular crop season) was 1,627,946 quintals and 827,265 quintals from irrigation (in dry season) respectively. The total GDP of the District for 2012/13 was 2,500,211 quintals (total crop production). However, it was difficult to change this income in to dollar or Ethiopian Birr.

Drinking water supply

The District Water Resource Office was working to supply safe drinking water for the community in collaboration with different stakeholders and partners. In more than half of the kebeles, >80% of the population was getting safe drinking water.

But still there was a certain segment of the community using unsafe water for drinking. The coverage of safe water supply was very low in Gedam Lijamor kebele where only 7.4% of the population had access to safe drinking water. In two kebeles, Shakua and Fetam Sontom, 100% of the population had no access to safe drinking water. In addition to this, frequency of chlorination for drinking water sources was every 3-6 months even though the recommendation is every 3 months. In general 15.5% of the District population did not have access to safe and adequate water at all (Tables 4.1.2 & 4.1.3).

Table 4.1.2: Distribution of drinking water sources in Burie Zuria District, West Gojam Zone, Amhara Region, Ethiopia, 2012/2013.

No	Type of water source	Total	Functional	% of functional from total
1	Protected spring	54	52	96.3
2	Deep well	1	1	100
3	Hand dug well	192	164	85.4
4	Shallow well	100	90	90
5	Rope pump well	83	57	68.7
Total		**430**	**364**	**84.7**

Table 4.1.3: Safe water supply coverage by kebele in Burie Zuria District, W/Gojjam Zone, Amhara Region Ethiopia, 2012/2013.

S.No.	Kebele	Kebele population	Percentage of people who have access to safe water supply
1	Gulim	9496	98.1
2	Boko Tabo	3006	96.4
3	Wadra	5237	95.4
4	Jibgedel	6286	93.5
5	Tiatia	4488	91.4
6	Adel Agata	3485	89.2
7	Agni Fereda	8005	88.6
8	Wohni	8062	86.7
9	Ziyew Shihun	4716	86.7
10	Fezel	2136	80.5
11	Zalima	6825	80.1
12	Kuch 01	7343	78.2
13	Sertekez	4795	75.6
14	Woinma	8123	74
15	Denbun	7138	73.8
16	Arbisi	5113	71.6
17	Alefa	5452	66.8
18	Gedam	3687	7.4
19	Shakua	7102	0
20	Fetam Sontom	7525	0
Woreda		**118,020**	**71.1**

Health system organization

Country health system

The recently implemented BPR of the health sector has introduced a three-tier health care delivery system, characterized by a first level of a Woreda/District health system comprising of a primary hospital (with a catchment population coverage of 60,000-100,000 people), health centers (1/15,000-25,000 population) and their satellite Health Posts (1/3,000-5,000 population) that are connected to each other by a functional referral system. The Primary Hospital, Health Centers and Health Posts form a Primary health care unit (PHCU) with each health center having five satellite health posts. The second level in the tier is a General Hospital with population coverage of 1-1.5 million people; and the third a Specialized Hospital that covers population of 3.5-5 millions indicated in figure 4.1.3 (2).

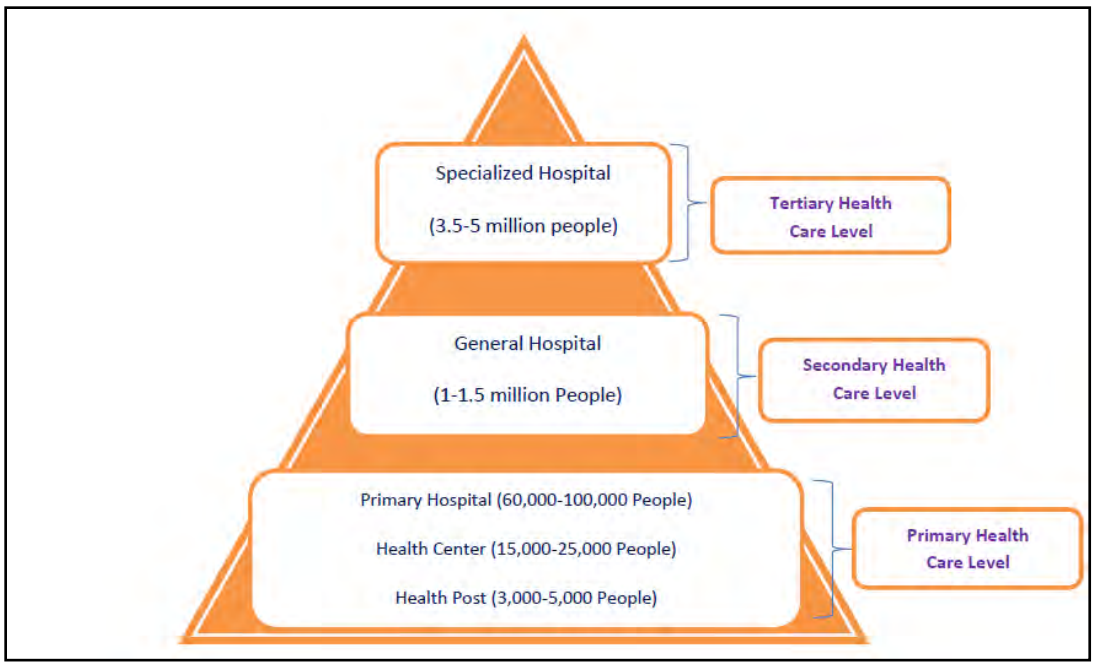

Figure 4.1.3: Ethiopian Health tier system. (Source: Health Sector Development Programme IV; 2010/11 – 2014/15)

District health system

Organo-gram of the District Health Office

The District has one core process, five case teams with in the direct command of the District Health Office (Fig. 4.1.4).

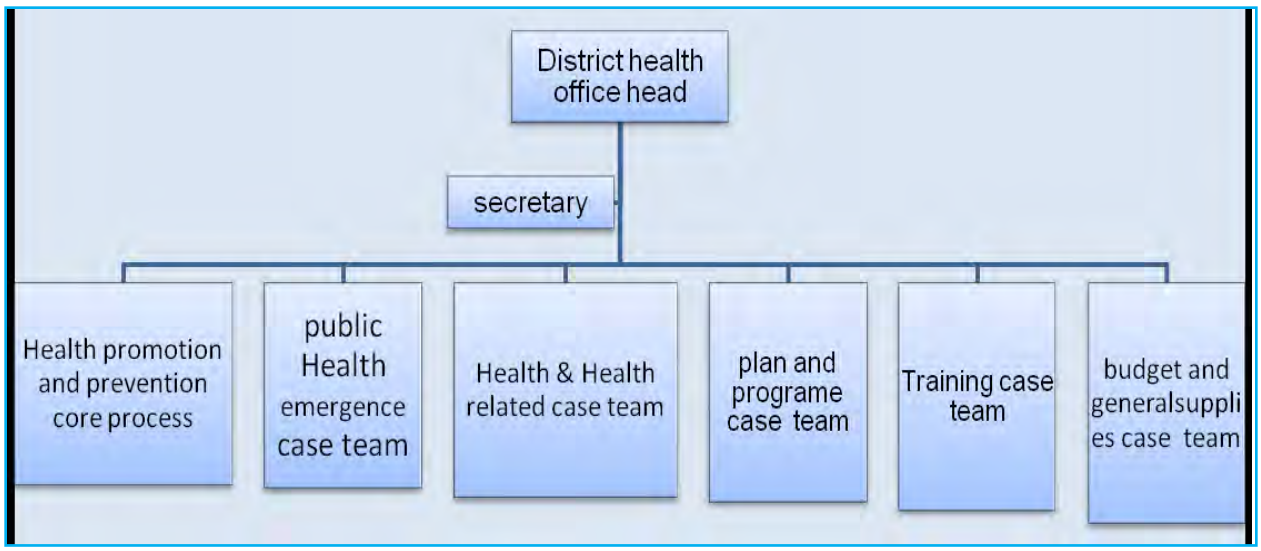

Figure 4.1.4: Organizational structures of Burie Zuria District Health Office, west Gojam, Amhara Regional State, Ethiopia, 2012/2013.

Health Infrastructure

There are 20 health posts and four health centers, but there is no hospital in Burie Zuria District. Regarding the availability of telephone service and electric power supply, three of the health centers and nine of the health posts have 24 hour electric power supply but only one health center has cable based telephone service. All the 20 kebele offices have wireless telecommunication systems and are accessed by mobile telephone network. There are seven private clinics, four drug vendors and one diagnostic laboratory in the District (Table 4.1.4 & Figure 4.1.5).

Table 4.1.4: Number of health facilities by type in Burie Zuria District, W/Gojjam Zone, Amhara Region, Ethiopia, 2012/2013.

S. No	Type of health facility	Services	Number
1	Number of Health Centers	with sustainable/ 24 hour electric power	3
		without sustainable/ 24 hour /electric power	1
		with telephone service (cable based/mobile)	3
		without telephone service (cable based/mobile)	1
		with piped water supply	1
		without piped water supply	3
2	Health Posts	with sustainable/ 24 hour electric power	9
		without sustainable/ 24 hour /electric power	11

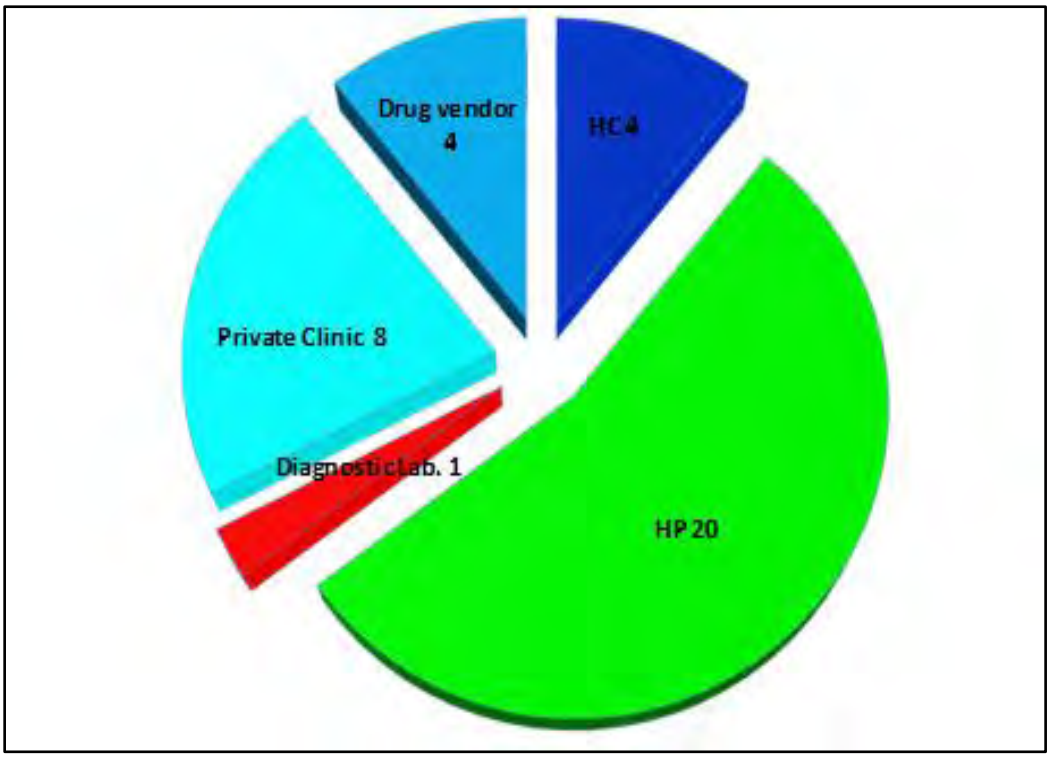

Figure 4.1.5: Distribution of Government and private Health Facilities in Burie Zuria District, 2012/2013.

The potential health service coverage in some kebeles was >100%, but in most/., kebeles it was between 50% and 98% which shows inequitable distribution of health facilities. The same is true for health centers. Kuch Health Center was serving for seven kebeles with a catchment population of 35,361 (PHSC 70.7%, but Tiatia Health Center was serving for only three kebeles, with a catchment population of 18,728 (PHSC 133.5%). In general, the potential health service coverage of the District was 84.7%, based on the estimate that one health center and five health posts giving service for 25,000 populations. The potential health service coverage by kebele is shown in table 4.1.5.

Table 4.1.5:Potential Health Service Coverage of Burie Zuria District by kebele W/Gojjam Zone, Amhara Region, Ethiopia, 2012/2013.

S.No	Name of Kebele	Kebele Popn.	# of HFs		# Of Popn. Getting service from the HC	Potential Health Service Coverage	
			HPs	HCs		HC	HP
1	Arbisi	5113	1	1	35,589	70.2%	98
2	Wohni Durbete	8062	1				62
3	Agni Fereda	8005	1				62
4	Jibgedel	6286	1				80
5	Woinma Ambaye	8123	1				62
6	Tiatia	4488	1	1	18,728	133.5%	111
7	Shakua	7102	1				70
8	Denbun	7138	1				70
9	Alefa	5452	1	1	28,342	88.2%	92
10	Wadra Gindiba	5237	1				95
11	Adel Agata	3485	1				143
12	Gulim	6825	1				73
13	Zalima	7343	1				68
14	Kuch 01	4716	1	1	35,361	70.7%	106
15	Ziyew Shihun	2136	1				234
16	Fezel	4795	1				104
17	Sertekez	3687	1				136
18	Gedam Lijamor	7525	1				66
19	Fetam Sontom	3006	1				166
20	Boko Tabo	9496	1				53
Woreda		**118,020**	**20**	**4**	**118,020**	**84.7**	**84.7**

Vital statistics and health indicators

Females in the reproductive age group (15-49 years) were estimated to be about 27,829 (23.58%) and non-pregnant women were estimated to be 24,005 (20.34%) of the total population in the District.

Children <1 year of age constituted about 3,187 (2.7%) and children <5 years of age constituted about 15, 933 (13.5%) of the total population. Vital statistics like total death, total births, under one and under five deaths were not recorded in the District and indices for each specific indicator mentioned in the table 6 were from the national estimates, projected from the 2007 national census.

Table 4.1.6: Distribution of population groups and vital statistics in Burie Zuria District, W/Gojjam Zone, Amhara Region, Ethiopia, 2012/2013.

S. No.	Parameter	Number (%)	Remark
1	Total population	118,020 (100%)	
2	Male	58,463 (49.5%)	
3	Female	59,557 (50.5%)	
4	Under 1 years old	3,187 (2.7%)	
5	Under five years old	15,933 (13.5%)	
6	Under 15 years old	50,312 (42.63%)	
7	Urban	7,317 (6.2%)	
8	Female 15-49 years old	27,829 (23.58%)	
9	Pregnancy	3,824 (3.24%)	
10	Live birth	3,470 (2.94%)	
11	Non pregnant women	24,005 (20.34)	
12	Average house hold size	4.3	
13	Age dependency ratio	53,921/64,099 (84.1%)	
14	IMR/1000	No data	
15	Under 5 MR/1000	No data	
16	CBR/1000/year	No data	
17	CDR/1000/year	No data	

Immunization coverage

In 2012/13, 3,269 people were targeted for immunization. Pentavalent (penta 3) immunization coverage was 2,593 (79.3%), measles 2,405 (73.6%) and fully immunization coverage was 2,315 (70.8%). Pentavalent dropout rate was 3.66% and measles dropout rate was 11.28% (Table 4.1.7).

Table 4.1.7: Immunization coverage of children <1 year of age by antigen, Burie Zuria District, W/Gojjam Zone, Amhara Region, 2012/2013.

S.No	Antigen	Planed	Achieved	Coverage from plan (%)
1	Pentavalent 3	3,270	2,593	79.3
2	Measles	3,270	2,405	73.6
3	Fully Immunized	3,270	2,315	70.8

Maternal and child health service coverage

In 2012/13 ANC achievement of at least one visit was 3,788 (100.3%), but at least 4 visits were 580 (15.3%). Proportion of skilled delivery was 674 (19.4%); family planning acceptance rate was 18,389 (77.9 %) (Table 4.1.8). The achievements of ANC at least one visit and CAR were good which were 100.3% and 77.9% respectively. This may be due to the Districts low plan of ANC and family planning or influx of people from other Woredas or mothers from bordering woredas may get service in the District.

Table 4.1.8: Family Health activities in Burie Zuria District, W/Gojjam Zone, Amhara Region, Ethiopia, 2012/2013.

Activity	Planned	Achieved	Coverage from plan (%)	Remark
ANC at least 1 visit	3776	3788	100.3	
ANC at least 4 visits	3790	580	15.3	
Skilled Delivery	3474	674	19.4	
Family Planning	23,605	18,389	77.9	(CAR)

Hygiene and sanitation

In 2012/2013 the latrine coverage and utilization rate in the District were 80% and 71% respectively. There were 12 ODF kebeles in the same year in the District.

Health education

Health education was given at health facilities and house to house by health care providers and the health extension workers (HEW) mainly on the prevalent health problems of the District i.e. nutrition, personal & environmental hygiene,

Leading causes of outpatient visit

Malaria was the top public health problem in the District accounting for about 48.4% (32,410) of the cases followed by AFI 30% (20,619) and diarrhea 7.1% (4900)(Table 4.1.9).

Table 4.1.9: Leading causes of all outpatient visits in Burie Zuria District, West Gojam Zone, Amhara Region, Ethiopia, 2012/2013.

No	Disease type	Number	Percent (%)
1	Malaria all forms	32,410	48.4
2	AFI	20,619	30.8
3	Diarrhea	4,900	7.3
4	Unspecified infection	2258	3.4
5	Acute upper Resp. Infection	2017	3.0
6	Pneumonia	2016	3.0
7	Helmenthiasis	1033	1.5
8	Infection of skin & Subcutaneous tissue	922	1.4
9	Dyspepsia	560	0.8
10	Trachoma	34	0.1
11	Others	172	0.3
Total		**66,941**	**100.0**

Endemic diseases

Malaria was prevalent throughout the year in Burie Zuria District and all 20 kebeles are malarious. There was high malaria transmission in 2013 in the major transmission season (September –October) in the District which may be an outbreak and then reduction since November. In 2010, there was malaria increment from April to June. There was malaria case increment both in the major and minor transmission seasons in 2012 i.e. September – November and May to June. But in 2011 there was high transmission of malaria cases in the minor transmission season (April to June) (Figure 4.1.6).About 82,038 (91%) of the population was protected by IRS and 47,622 HHs were addressed with at least one LLINs in 2012/2013.

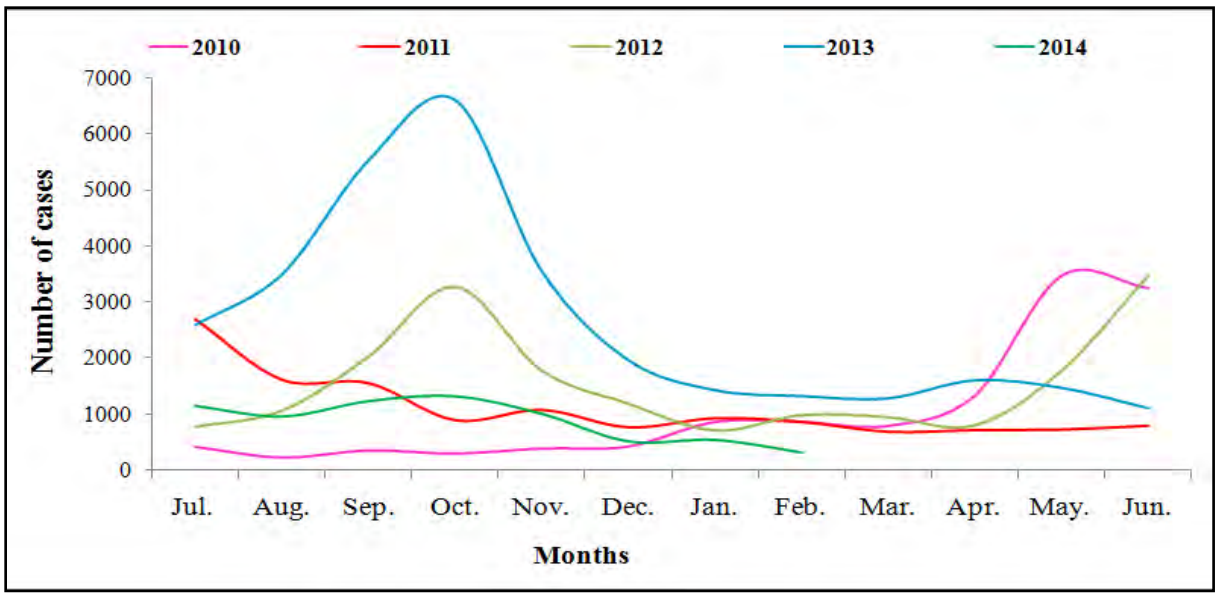

Figure 4.1.6: Annual Trends of Malaria in Burie Zuria District, W/Gojjam Zone, Amhara Region, Ethiopia, 2010-2014.

HIV/AIDS

There was increment of HIV test through the years 2004 – 2010 in the District, but there was a dramatic increment in 2010 (Figure 6). Males had a higher rate of being tested for HIV than females, except for the year 2006 where females had higher rate of being tested. In 2012/13 the District planned to give voluntary counseling & testing service for 9,442 individuals, but achieved only 3,302 (34.9%). The District has also planned to give PMTCT service for 3,777 mothers and achieved only 2,290 (60.6%). But PMTCT coverage was 59.88% (2290/3824). In PICT program 16,491 (107%) individuals got service out of 15,344 planned. 140 individuals were on ART and only one health center (Kuch HC) was giving HARRT service. However, there was no data for HIV prevalence and incidence.

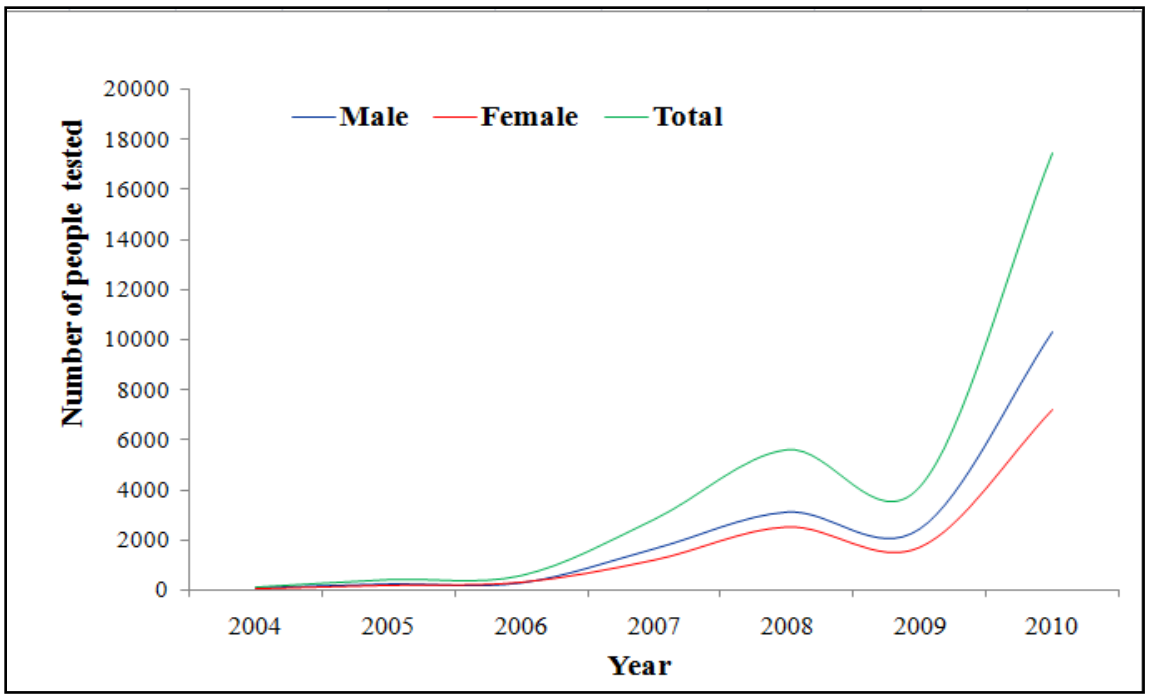

Figure 4.1.7: Annual Trend of VCT in Burie Zuria District, W/Gojjam Zone, Amhara Region, Ethiopia, 2004-2010.

Tuberculosis and Leprosy

Tuberculosis detection rate, treatment success rate and cure rate were 37.3%, 92.3% and 88.5% respectively in the District. There were no defaulters and MDR tuberculosis patients in the District in the study period. There were 2 leprosy patients (Table 4.1.10).

Table 4.1.10: Distribution of tuberculosis cases in Burie Zuria District, W/Gojjam Zone, Amhara Region, Ethiopia, 2012/2013.

Indicator	Planed	Achievement	Percent (%)
TB case detection rate (all forms of TB)	308	115	37.3
TB treatment success rate	26	24	92.3
TB cure rate	26	23	88.5
Defaulters	0	0	0
Leprosy	-	2	-

Immediately and weekly reportable diseases

The following thirteen diseases are targeted to be reported immediately using case based reporting format and line listing depending on the number of occurrence of cases in the District and the rest seven (eight in Amhara Region including Leishmaniasis) are reported on weekly basis.

1. Viral hemorrhagic fever (VHF)
2. Yellow fever
3. Acute flaccid paralysis (AFP/polio)
4. Anthrax
5. Avian human Influenza (AHI)
6. Cholera
7. Guinea worm
8. Measles,
9. Neonatal tetanus (NNT)
10. Human influenza (H1N1)
11. Rabies
12. Small pox
13. Sever acute respiratory syndrome (SARS)

The rest seven/eight diseases or conditions are reported on weekly bases to the next level;

1. Dysentery
2. Malaria
3. Meningitis
4. Relapsing fever
5. Typhoid fever,
6. Typhus,
7. Malnutrition
8. Leishmaniasis (Amhara Region only)

Nutrition, food shortage and any other disasters

The District is one of the food secured areas in the Region; hence there were no supplementary feeding units in the District. Disaster had not been reported in the area.

Health budget allocation

The total budget for the District Health Office, including health facilities was 10% (3,990,789) Ethiopian Birr from the District total annual budget of 39,343,433.00 for the year 2012/13.

Human resource: Health workers and supportive staffs

The District had a total of 90 health workers, 46 Health Extension Workers and 44 supportive/administrative/ employees a total of 180 workers during the study period (Table 4.1.11).

The HEWs to population ratio was almost equal to the current Amhara Regional status and WHO standards, but the clinical nurse to population ratio was better than the WHO standards. In other professionals, the proportion was not in line with the WHO standards, especially the midwife to population ratio (Table 4.1.12).

Table 4.1.11: Distribution of health workers in Burie Zuria District, W/Gojjam Zone, Amhara Region, Ethiopia, 2012/2013.

S.No.	Category	Number
1	Health officers	9
2	Bsc nurses	3
3	Diploma clinical nurses	49
5	Midwife Nurses	8
6	Medical Laboratory Technologist	1
7	Pharmacist	1
8	Pharmacy technicians	10
9	Medical Laboratory Technicians	6
10	Environmental Health officers	3
11	Health Extension workers	46
13	Supportive staffs	44
	Total	**180**

Table 4.1.12: Population to Health Professional Ratio, Burie Zuria District, W/Gojjam Zone, Amhara Region, Ethiopia, 2012/2013.

No.	Category	Number of Health Professionals	Population to Health Professional Ratio		
			WHO standard	Current Amhara Region	Burie Zuria District
1	Health officer	9	1:10,000	1:14,817	1:13,113
2	Diploma clinical nurse	49	1:5,OOO	1:2,714	1:2,408
3	Midwife Nurse	8	1:5,000	1:12,004	1:14,752
4	HEWs	46	1:2,500	1:2,775	1:2,565

Essential drugs and other supplies

The District reported that there was shortage of essential drug supply and diagnostic kits were not easily accessible in market to purchase.

Discussion

The leading cause of outpatient visit in the District was malaria which accounted for 32,410 (48.4%) of the total cases, which was similar to the 2012/2013 Regional malaria burden in which malaria accounted for 20% of the total cases. The prevalence rate of malaria in the District was 285 per 1000 populations per year which needs serious attention. Even though the prevalence was quite high, no death was reported in the District. This could be due to early diagnosis and treatment and quality of service or deaths may not probably be recorded.

Acute Febrile Illnesses (AFI) and Diarrheal diseases were the second & third causes of outpatient morbidity which accounted for 20,619 (30%) & 4,900 (7.1%) respectively.

The status of measles immunization was 2,579 (73.6%) in under one year children which seems well matched with absence of measles cases/outbreak, food shortage/malnutrition cases in the district unless there was under reporting.

Even though the performance of ante-natal follow up in the District was good which was 3,788 (100.3%), skilled delivery was quite low i.e. 674 (19.4%). This is above the 2011 Ethiopian DHS which was 10%, but below the 2012/2013 Regional annual report which was 21%. This low performance may be due to lack of awareness of mothers & traditional malpractices by the community, poor management of health workers at health facilities or lack of transport (4, 5).

Tuberculosis case detection rate was 37.5% which was below the regional 2012/2013 achievement and WHO standards which was 70% & 56% respectively. TB treatment success rate was 92.3% above the 2012/2013 regional achievement which was 88%. TB cure rate (88.5%) was also above the 2012/2013 Regional achievement which was 71%.

Vital statistics like total death, total births, under one and under five deaths were not recorded in the District (6). Although the District Health Office claimed to have shortage of man power, the health professional to population ratio of the District was almost better than the Regional Health Bureau, except in midwifery. (7).

There was no strong water quality monitoring. Chlorination was not applied as per the standard i.e. every three months. This might contribute to the higher rate of diarrhea and intestinal parasites in the District, which was 4900 (7.1%) and 1033 (1.5%) of the outpatient visits respectively (8).

According to the District Health Officials, the main problems of the District were limited budget, shortage of medical supplies at PFSA, Shortage of water and power supply in the health centers and shortage of human resources according to the Business Process Reengineering (BPR).

Limitation of the study

1. Unavailability /limited researches on health and heath related issues.
2. Absence of mortality records and reports in the District.

Conclusions and recommendations

Malaria was the most important public health problem of the District. Therefore, prevention and control measures should be strengthened to reduce the morbidity due to malaria.

Proportion of delivery attended by skilled health personnel was low. There were no mortality and birth records, and there was shortage of medical supplies in the District. Therefore, the District Health Office should give emphasis for community awareness about safe delivery and should have proper records on births and deaths.

Tuberculosis case detection rate, was very low and that need serious attention and follow-up by the Woreda Health Office and Zonal Health Department. Skilled delivery is far from the targets and very difficult to achieve the MDG goals if we don't give emphasis and attention to it.

The District should also be supported to have under one, under five years death and other deaths records for better planning and success. There should be strong water quality monitoring and regular chlorination as per the standard.

Action Plan

Finally I have proposed action plan based on priority health problems which will be implemented by the District Health Office with its partners and stakeholders in the time frame indicated in table 4.1.13.

The criteria used to prioritize the problems are as follows:

A. Size of the problem

Definition: Number or percentage of people affected by a health condition in a particular area.

Rating for size of the problem

1= Relatively few people affected

2= Moderate people affected in particular subgroup

3= Moderate number affected across the entire population

4= Large number affected in particular subgroup

5= Large number affected across entire population

B. Seriousness of Problem

Definition: Potential of a health problem to result in severe disability or death

Rating for seriousness of problems

1= Not life threatening or disabling

2= Not life threatening bus sometimes disabling

3= Moderately life threatening or disabling

4= Moderately life threatening, with a strong likelihood of disabling

5= High likelihood of death or disability

C. Availability of current intervention

Definition: Are there evidence-based interventions or promising practices to prevent or control this health problem? Can these interventions be implemented easily?

Rating for availability of current interventions

1= No evidence-based intervention or promising practices available

2= No evidence-based intervention available but promising practices are available.

3= No evidence-based intervention available but difficult to implement

4= Evidence-based intervention available and can be implemented with moderate effort

5= Evidence-based intervention available and can be implemented easily

D. Economic and social impact

Definition: Monetary and societal costs

Rating for economic and social impacts

1= Economic or societal costs are minimal

2= There is some potential increased cost

3= There is likely to be moderate costs

4= There is likely to be substantial costs

5= There are great economic and social costs

Based on the above criteria priority health and health related Problems of the District are the following:

1. High Malaria burden
2. Poor Water treatment and chlorination
3. Low coverage of Skilled Delivery
4. Low Tuberculosis Detection rate
5. Poor Recording and reporting system

Table 4.1.13: Criterias for rating a public health problem, Bure Zuria District, W/Gojjam Zone, Amhara Region, 2014.

Health Problem	Size of the problem	Seriousness of the problem	Availability of intervention	Economic/ Social impact	Total Score	Rank
Malaria	5	5	5	5	20	1
H_2O treatment	3	5	3	4	15	2
Skilled Delivery	5	5	2	1	13	3
TB detection	3	5	2	2	12	4
Recording & Reporting	5	1	3	1	10	5

Table 4.1.13: Action plan of Burie Zuria District Health Office for the year 2015/2016, W/Gojjam Zone, Amhara Region, Ethiopia, 2014.

No	Activities	Timeframe	Responsible Body
1	Training Of HWs & HEWs on data management	As of July 2015	WoHO & ZHD
2	Training of HWs & HEWs on malaria prevention & control	Biannually	ZHD & WoHO
3	Community mobilization and awareness raising on the prevention & control of malaria: (Proper use of LLINs, IRS, early diagnosis and treatment environmental management, etc)	As of August 2015	WoHO and community
4	Community mobilization and sensitization on the use of delivering in health institutions	As of September 2015	WoHO and partners
5	Community mobilization and awareness raising on early diagnosis of people with cough for more than 2 weeks and prompt treatment of those with tuberculosis	As of October 2015	WoHO and community
6	Training of HWs & HEWs on TB case detection	As of October 2015	WoHO
7	Working closely with water resource office to improve water safety and quality	Every time	WoHO and Water Resource Office

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Chapter V – Scientific Manuscript for Peer Reviewed Journals

5.1: Investigation of measles outbreak, Bure Zuria District, West Gojjam Zone, Amhara Region, Ethiopia, April 2015

Abstract

Background: Measles is one of the most contagious diseases known to man and often occurs in explosive epidemics. Worldwide, it is estimated that measles kills some 880,000 children annually, a toll more than any other vaccine preventable disease. Measles is one of the communicable diseases still causing preventable mortality and morbidity in Ethiopia. There has been a recent occurrence of measles outbreak in Bure Zuria District. Hence, this investigation was conducted to assess the magnitude of the problem and identify risk factors contributing to measles infection.

Methods: Unmatched case-control study was conducted from 13-23 March 2015, in Bure Zuria District. Cases were identified using WHO case definition. The outbreak was confirmed by laboratory (five blood serum samples were sent to national polio and measles laboratory and three of them were positive for measles IgM) and others were epidemiologically linked to confirmed cases. Data collection instrument was prepared. Attack rate was calculated. Bivariate and multivariate analyses were conducted using SPSS and odd ratio with 95% confidence interval (CI).

Results: A total of 50 cases (over all AR 40.4/100,000 cases) and no deaths were identified. Of the 50 cases, 20 (40%) were less than 5 years of age. The 2013/14 and 2014/15 (for 6 months) vaccination coverage were 73.6% and 50.4% respectively. Being unvaccinated (OR 12.6, 95% CI 3.8-42.6), lack of vitamin A (OR 8.6, 95% CI 2.8-26.2), age group <5 years (OR 11.5, 95% CI 2.5-52.9) were statistically significant.

Conclusions and Recommendations: Less than 5 years of age were primarily affected by the outbreak. Malnutrition, low community awareness and low vaccination coverage likely contributed to the outbreak. Undertaking supplementary immunization activities, strengthening routine vaccination, increasing community awareness can reduce measles outbreak.

Keywords: measles outbreak, Bure Zuria, Amhara, 2015, Case control, Risk factors.

Introduction

Measles is a contagious disease caused by measles virus. Measles virus is paramyxoviruses of a single serological type. The disease is highly communicable with an incubation period of about 10 days (with a range of 7-18 days). The disease is characterized by prodromal fever, conjunctivitis, coryza, cough, and presence of Koplik spots. A characteristic maculopapular rash appears on the third to seventh day beginning on the face and gets more generalized. Man is the only source of measles virus (1). Measles infected person is contagious from four days before to four days after the rash appears(2).

Measles is one of the most contagious diseases known to man and often occurs in explosive epidemics. It usually does not kill children directly; however, as a result of its associated immunosuppression, measles can lead to lethal complications such as pneumonia, croup, and diarrhea. Measles can also lead to lifelong disabilities, including blindness, brain damage and deafness (68).

Measles remains the leading cause of childhood morbidity and mortality in the world (10). Worldwide, it is estimated that measles kills some 880,000 children annually, a toll more than any other vaccine preventable disease. The global plan established by the World Health Organization (WHO) and United Nations Children's Fund (UNICEF) is to cut this burden by two thirds between 2000 and 2005, and therefore to prevent 600,000 measles fatalities annually. Half of the total deaths are concentrated in three African countries (Congo, Ethiopia and Nigeria) and one Asian country (India) (9).

Since the introduction of effective measles vaccines, the epidemiology of measles has changed in both developed and developing countries. As vaccine coverage has increased, there has been a marked reduction in measles incidence, and with decreased measles virus circulation, the average age at which infection occurs has increased (6).

Measles outbreaks pose a continuing public health problem in Africa and other developing nations of the world(15). During 2011, large measles outbreaks were reported by DRC (134,042 cases), Nigeria (18,843), Somalia (17,298), Zambia (13,324), Chad (8,650), Sudan (5,616), Uganda (3,312), Ethiopia (3,255) (16).

Measles is one of the communicable diseases still causing preventable mortality and morbidity in Ethiopia (12).

So the aim of this assessment was to investigate the occurrence of measles**,** identify the risk factors associated with the outbreak and suggest practical control measures to alleviate the disease burden in the community in the District.

Material and Method

Study area and population

This study was conducted in Bure Zuria wereda which is one of the weredas in west Gojam zone, Amhara Regional State. Bure is located at a distance of 165 kms from the Regional Town (Bahir Dar) and 410 kms from Addis Ababa. The geographic coordinates of the District are 10.2^0 North latitude & 37.1^o East longitudes.

The catchment area of the District is about 587.95 square kilometers with a total population of 123,690. The ethnic composition of the District is 96% Amhara & 4% Oromo, and regarding the religious composition more than 99% were followers of Orthodox Christian and 1% were Protestant. The District has 20 kebeles, 19 health posts and 4 health centers which are currently giving service. The physical health service coverage of the District was 100%. The District had history of outbreak of measles and registered more than 66 cases before 5 years in same kebele

Study period

The study was conducted from 13-23March 2015.

Study design

Case control study design was used to identify risk factors for the occurrences of the measles outbreak.

Data collection

Surveillance reports and patient registrations were reviewed. Active cases were searched house to house. Line list and daily epidemic reporting formats were used. Discussions were made with Woreda Health Office and Kuch Health center staff which is the outbreak kebele and over all response activities were evaluated. National measles surveillance guideline was used.

Case Definition:

Suspected measles case: Any person with fever and maculopapular (non-vesicular) generalized rash and cough, coryza or conjunctivitis (red eyes) OR any person in whom a clinician suspects measles.

Confirmed measles case: A suspected case with laboratory confirmation (positive IgM antibody) or epidemiologically linked to confirmed cases in an outbreak.

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

Results

A total of 50 cases and no deaths were identified. Out of the 50 cases 39 (78%) were females and 11 (22%) were males. The mean age of the cases was 8 years with a range of 8 months to 30 years. The overall attack rate (AR) was 40.4 per 100,000 populations. The attack rate was high in females (31.5 cases per 100.000 populations) than males (8.8 cases per 100,000 populations). Eight (16%) of the cases and 75 (75%) of the controls were vaccinated for measles. Almost all the cases and controls did not know the mode of transmission of measles infection. The most affected age group was <5 years which was 20 (40%) (Attack rate of 137/100,000).The onset date of the first case was recorded on March 01, 2015. The highest cases were registered on March 17, 2015.

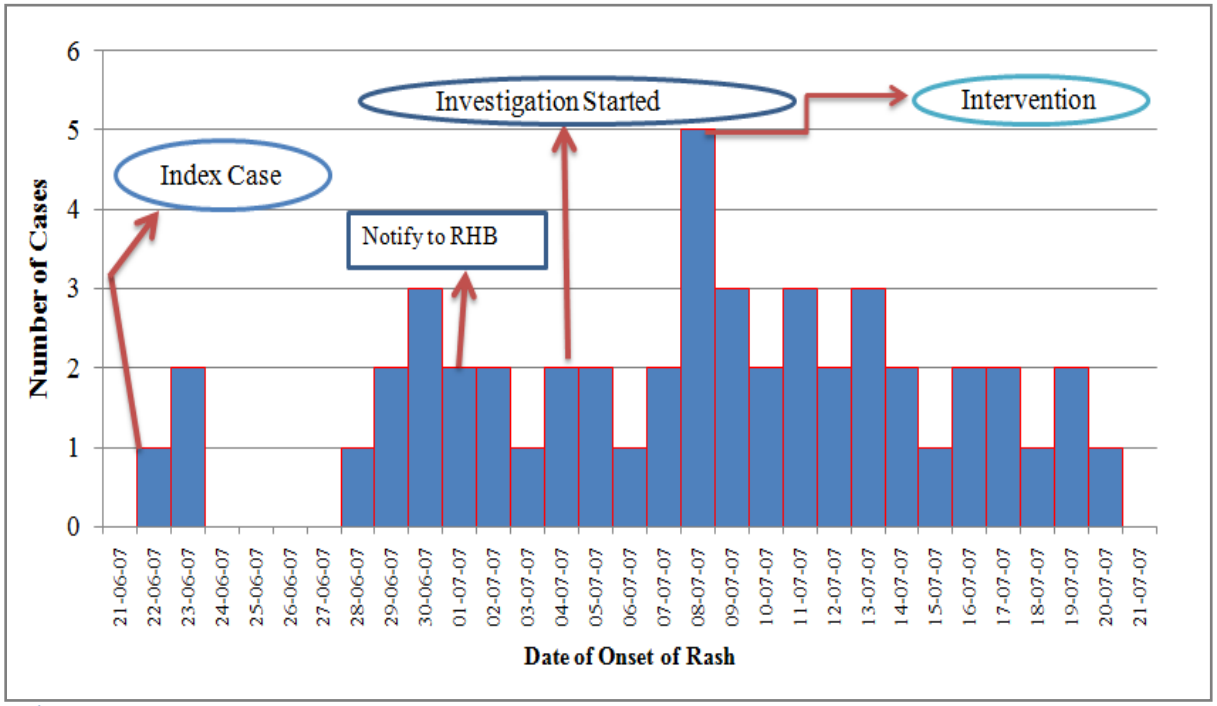

Figure 5.1.1: **Epi curve of measles outbreak, Bure Zuria Woreda, W/Gojjam, Amhara, Ethiopia, April 2015.**

On bivariate logistic regression analysis the statistically significant variables were absence of vaccination (OR 12.6, 95% CI 3.8-42.6) and not receiving vitamin A within 6 months of onset of illness (OR 8.6, 95% CI 2.8-26.2).

On multivariate logistic regression analysis the statistically significant variables were absence of vaccination (OR 57.6, 95% CI 15.0-221.8) and Age group less than five years (OR 11.5, 95% CI 2.5-52.9) (Table 5.1.1).

Table 5.1.1: Bivariate and multivariate logistic regression analysis of measles outbreak in Bure Zuria District, W/Gojjam Zone, Amhara Region, Ethiopia, April 2015.

Variable	Case (n=50)	OR	95% CI
Vit. A	No Vit. "A" wthin 6 months of infection	8.6	2.8-26.2
Vaccination status	Unvaccinated	57.6	15.0-221.8
Age Group	<5 year	11.5	2.5-52.9

Discussion

This study identified several factors that were associated with contracting measles in Bure Zuria District. Measles immunizations were significantly lower in the children who had measles compared to those who had not, suggesting that poor immunization coverage plays a crucial role in measles outbreaks. This is consistent with findings conducted in Laos about factors associated with a measles outbreak in children admitted at Mahosot Hospital, Vientiane, Laos (18).

In addition not taking vitamin A supplementation within 6 months of infection was also found to be a risk factor for contracting measles. Low Vitamin A supplementation may lead to increased risk of contracting measles and its complications. This is consistent with findings of measles outbreak investigation in Zaka, Masvingo Province, Zimbabwe, 2010. Vitamin A supplementation has been shown to increase measles specific antibody formation if it is administered simultaneously with the measles vaccine (10).

Three of the five samples were confirmed as measles IgM positive. All other cases were epidemiologically linked. Several factors contributed to the occurrence of this measles outbreak. The Majority of measles affected children had not received measles vaccination which is comparable in a study conducted in Abaya of Oromia Region in which 61% of the affected children had not received any dose of measles (6).

In this study most of the cases (40%) of measles were in the age group of <5 years which is similar to other studies. The attack rate was also high in the same age group. There was no measles related death in present outbreak. A study done in

Chandigarh Outbreak of measles amongst vaccinated children in a slum of Chandigarh revealed similar results. Low attack rates and no mortality may be due to early detection and follow up of the cases (19).

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Chapter VI – Abstracts Submitted for Scientific Presentation

6.1: Abstracts Submitted

Title: Impact of Climate Variability on the Transmission of Malaria in Yilmana Densa District, Amhara Region, Ethiopia, 2004-2013

Background: Malaria is seasonal and unstable in Ethiopia causing frequent epidemics. It usually occurs at altitudes <2000m above sea level. For transmission of malaria parasite climatic variables are important determinants. There is scarcity of information on the correlation between climatic variability and malaria transmission risk in Ethiopia in general and in the study area in particular. Therefore we compared rainfall, temperature and relative humidity patterns with confirmed malaria cases for developing forcasting and early warning system.

Methods: We analyzed climate and malaria data from January 2004-December 2013 in Yilmana Densa District of Ethiopia. We compared monthly rainfall, humidity and temperature data with the number of confirmed malaria cases using Micro Soft Excel 2007.

Results: Over the last decade a total of 67,839 microscopically confirmed malaria cases were reported in the District. A fluctuating trend of malaria cases through the years 2004-2013 was observed. There was a dramatic reduction in malaria cases from 2004-2008 and there was an increase of cases from 2009-2013, but a remarkable increase was observed in 2013. A high fluctuation of malaria cases was also observed by species. The highest peak of malaria cases was observed in June in all the years with the exception that in 2004 the highest number of cases occurred in September.

An association between monthly confirmed malaria cases and meteorological variables (rainfall and relative humidity) was observed in the District. Average monthly rainfall was 86.6-316.3mm and 6 months average monthly relative humidity was 50-78%.Average temperature throughout the ten years ranged from 14^0c to 29.4^0c, so temperature was probably not a limiting factor for malaria transmission in the District.

Conclusions: Malaria still constitutes a serious public health problem in Yilmana Densa District of Ethiopia. Rainfall and relative humidity were related with increased malaria transmission rates in the District, and temperature was not a limiting factor for malaria transmission. We recommend the continued development of climate prediction to help forecast and control malaria outbreaks in the District.

Key words- Climate variability, Confirmed malaria cases, Yilmana Densa District.

Title: Investigation of measles outbreak, Bure Zuria District, West Gojjam Zone, Amhara Region, Ethiopia, April 2015

Abstract

Background: Measles is one of the most contagious diseases known to man and often occurs in explosive epidemics. Worldwide, it is estimated that measles kills some 880,000 children annually, a toll more than any other vaccine preventable disease. Measles is one of the communicable diseases still causing preventable mortality and morbidity in Ethiopia. There has been a recent occurrence of measles outbreak in Bure Zuria District. Hence, this investigation was conducted to assess the magnitude of the problem and identify risk factors contributing to measles infection.

Methods: Unmatched case-control study was conducted from 13-23 March2015, in Bure Zuria District. Cases were identified using WHO case definition. The outbreak was confirmed by laboratory (five blood serum samples were sent to national polio and measles laboratory and three of them were positive for measles IgM) and others were epidemiologically linked to confirmed cases. Data collection instrument was prepared. Attack rate was calculated. Bivariate and multivariate analyses were conducted using SPSS and odd ratio with 95% confidence interval (CI).

Results: A total of 50 cases (over all AR 40.4/100,000 cases) and no deaths were identified. Of the 50 cases, 20 (40%) were less than 5 years of age. The 2013/14 and 2014/15 (for 6 months) vaccination coverage were 73.6% and 50.4% respectively. Being unvaccinated (OR 12.6, 95% CI 3.8-42.6), lack of vitamin A (OR 8.6, 95% CI 2.8-26.2), age group <5 years (OR 11.5, 95% CI 2.5-52.9) were statistically significant.

Conclusions and Recommendations: Less than 5 years of age were primarily affected by the outbreak. Malnutrition, low community awareness and low vaccination coverage likely contributed to the outbreak. Undertaking supplementary immunization activities, strengthening routine vaccination, increasing community awareness can reduce measles outbreak.

Keywords: measles outbreak, Bure Zuria, Amhara, 2015, Case control, Risk factors.

Chapter VII-Narrative Summary of Disaster Situation Visited

7.1 Rapid Meher assessment summary report of East Gojjam, Awi and North Shoa Zones, Amhara Region, November 30-December 21/2014.

Summary

Meher season assessment was conducted from 30 November up to 21 December 2014 in seven selected Districts from three zones (East Gojjam, Awi and North Shoa). The assessment was done for health and non- food problems which results from health, nutrition and WASH emergencies. Many people suffer from multiple natural and artificial crises. Malaria, AWD, measles and malnutrition are all associated with natural calamities or disruption of healthy human activities in the given ecosystem or living environment.

The objectives of the assessment was to determine magnitudes of hazards of different types, identify risk factors and effective humanitarian planning to take reliable intervention measures that address problems encountered.

According to the assessment findings malaria, diarrhea, pneumonia, upper respiratory tract infections (URTI) were the leading cause of morbidity in children under five years of age. In adults above the age of five years was malaria, acute febrile illnesses (AFI), trauma and pneumonia were reported to be the leading cause of morbidity in the year (2014/15) in the visited Districts. Malaria was found to be the leading cause of morbidity in most of the assessed Districts of Awi and East Gojjam zones.

There were no reported cases of AWD and meningitis in all visited Districts of selected zones.

A total of 16,230 malaria cases and one death with 0.006% CFR have been reported in the year 2014, January – October 2014 in the three zones. The recent data review also indicated that there were 24 measles cases and no deaths with in the year 2014, January to October. There was no measles ongoing outbreak in all assessed Districts.

In the zonal stock, Equipment and supplies for malaria preparedness and epidemic control were relatively available in majority of Districts. In the Districts, there was no risk of meningitis identified, and hence, no preparedness supplies for meningitis were available. Lack of supplies for AWD exists in majority of Districts (Table7.1.5).

It was found that there is established multi sectorial PHEM coordination forum at regional, zonal and in most visited woredas but it is not active at all levels. Regional and zonal EPR plan is not funded at all. In the region high turnover of trained PHEM officers is reported.

As to risk factors, most woredas are at risk for malaria, measles, and AWD. Possible reasons include low LLINs utilization, uncontrolled irrigation sites, low measles vaccine coverage, and low latrine utilization.

Regarding malnutrition, currently the nutrition situation is normal and stable in the assessed woredas of the region.

A total of 670,439 beneficiaries are estimated for six months for Malaria, AWD, Measles and Meningitis and 1,340,878 ETB are calculated to address them.

Reactivation of multi-sectoral PHEM coordination forum at all levels, strengthening surveillance and preparedness activities, strengthening of malaria prevention and control activities are recommended.

Background

Amhara Region is one of the nine administrative Regions in the country. It is the second populated with the total population of 20,398,999 with mean annual growth rate of 1.8%. The region shares boundaries with four national regions (Oromia, Tigry, Afar & Benshangul Gumze) and one international country Sudan. In the region there are 10 zones, 3 Town administrations 167 woredas and about 3,431 kebeles, from which 318 are urban kebeles.

Ethiopian Public Health Institute (EPHI) in collaboration with Disaster prevention and preparedness coordination office (DPPC) and Regional health bureaus has planned and implemented Meher season needs assessment of 2014.

The Meher assessment was conducted in Amhara Region from 30 November up to 21 December 2014 in seven selected woredas of three zones, East Gojam Awi and North Shoa.

Awi zone has 11 Districts and a total population of 1,119,556 in 2014/15 as shown in tables 7.1.1.

Table 7.1.1: Districts in Awi zone with population by sex, Awi Zone, Amhara Region, Ethiopia, June 2014.

S.No	Districts	Total Population	Male Population	Female Population
1	Dangila	145,695	73,319	72,376
2	Guangua	133,682	66,778	66,904
3	Banja	101,300	50,146	51,154
4	Anrkasha Guagsa	225,734	112,228	113,506
5	Guagusa Shkudad	95,312	47,037	48,275
6	Jawi	89,631	46,884	42,747
7	Fagita Lekoma	142,415	70,681	71,734
8	Enjebara Town	27,631	13,911	13,720
9	Chagni Town	32,238	15,747	16,491
10	Dangila Town	36,801	18,892	17,909
11	Zigem	89,117	43,667	45,450
Total		**1,119,556**	**560,130**	**559,426**

East Gojjam constitutes 20 Districts with total population of 2,441,751 in 2014/15 as shown in table 7.1.2.

Table 7.1.2: Districts in E/Gojam zone with population by sex, E/Gojjam Zone, Amhara Region Ethiopia, June 2014.

S.No	Districts	Total Population	Male Population	Female Population
1	Bibugn	92,523	45,356	47,167
2	Hultju Enese	249,495	124,193	125,302
3	Mota Town	63,728	31,966	31,762
4	Goncha Sisoenese	167,991	83,463	84,528
5	Enese Sarmidir	151,507	74,846	76,661
6	Enarji Enawga	189,083	93,629	95,454
7	Enemay	130,412	65,461	64,951
8	Bichena Town	57,540	27,947	29,593
9	Debay Tilatgin	143,379	71,751	71,628
10	Debre Elias	93,077	46,549	46,528
11	Machakel	133,188	66,017	67,171
12	Gozamen	141,718	70,797	70,921
13	Baso Liben	155,135	76,281	78,854
14	Awabel	137,783	68,249	69,534
15	Dejen	95,797	46,427	49,370
16	Dejen Town	19,905	9,502	10,403
17	Shebel Berenta	116,478	57,047	59,431
18	D/ Markos Town	90,331	43,316	47,015
19	Sinan	110,947	55,420	55,527
20	Aneded	101,734	50,617	51,117
Total		**2,441,751**	**1,208,834**	**1,232,917**

North Shoa Zone constitutes 27 Districts with total population of 2,197,330 in 2014/15 as shown in table 7.1.3.

Table 7.1.3: Districts in N/Shoa zone with population by sex, N/Shoa Zone, Amhara Region, Ethiopia, June 2014.

S.No	Districts	Total Population	Male Population	Female Population
1	Mida Oromo	107,595	54,000	53,596
2	Merhabete	119,042	60,350	58,692
3	Alem Town	21,528	10,718	10,811
4	Ensaro	66,484	34,103	32,381
5	Moretna Jiru	107,237	54,899	52,338
6	Menz Gera	96,593	47,137	49,455
7	Mehalmeda Town	96,593	47,137	49,455
8	Gishe	70,119	34,721	35,398
9	Antsokia Gemza	92,586	46,009	46,577
10	Ephratana Gidim	106,331	53,444	52,888
11	Ataye Town	22,414	11,423	10,991
12	Menz Mama	97,753	48,329	49,424
13	Tarmaber	98,053	49,592	48,462
14	Mojana Wodera	79,223	40,003	39,220
15	Kewot	92,194	47,563	44,631
16	Shoa Robit	46,057	23,552	22,506
17	Angolela Tera	94,382	47,898	46,484
18	Asagirt	54,886	27,995	26,890
19	Ankober	87,462	44,291	43,170
20	Hageremariam	62,872	32,314	30,558
21	Berehet	40,330	20,448	19,882
22	Minjar Shenkora	148,637	77,087	71,550
23	Basona Worana	136,679	69,973	66,707
24	Debrebirhan Town	88,214	42,780	45,435
25	Menz Keya	52,825	26,249	26,576
26	Menz Lalo	41,183	20,390	20,793
27	Siadebirna Wayu	70,058	35,919	34,139
Total		**2,197,330**	**1,108,324**	**1,089,009**

Objective

General objective

- To contribute in ensuring appropriate and effective humanitarian planning and responses that leads to reducing morbidity and mortality in the most vulnerable areas of the assessed zones and Woredas.

Specific objectives

- To assess the extent, types, magnitude, severity and likely of the different hazards (drought, human epidemics, sever and acute malnutrition, etc) and risks to the populations in the most vulnerable Woredas (including to identify the most vulnerable populations) for epidemic prone problems considering health and nutrition emergencies.
- To assess the existing capacity of the health services to address health and nutrition emergencies likely to occur during the coming six months of 2015.
- To determine the shortcomings (gaps) in the capacity of the existing health services to address health and nutrition emergencies likely to occur between Januarys to June 2015.
- Based on the findings on the assessment of risks, and the need to address, potential health and nutrition emergencies during January through June 2015, to formulate workable mechanisms and develop necessary plans for fostering preparedness of health and nutrition for appropriate and adequately addressing the potential emergencies.
- To identify areas where health and nutrition emergency assistance might be needed during the coming six months of 2015 due to acute problems and come up with reasonable estimates of the size of the population needing emergency assistance.

Methods

Assessment area

The assessment was conducted using a nationally standardized non - food Meher assessment check list. In addition to the formatted checklists, observations were also made based on discussions with officials and concerned experts. Data were collected from five Wereda Health Offices and three Zonal Health Departments. Based on the checklist and discussions, information was collected on existing and or potential emergencies on health, nutrition, water –sanitation. Information collected on health include: top diseases, disease outbreaks, epidemic prone diseases and nutritional status. Information collected on WASH include: WASH emergencies, water and sanitation status at community and institutional levels.

Based on the discussion with zonal health departments and Regional PHEM Officers, 7 Districts with relatively high risk of public health emergency were identified.

- Briefing was conducted at zonal and each assessed Districts.
- Debriefing was made on assessment findings to visited Districts and Zones.
- Primary and secondary data were collected using checklists

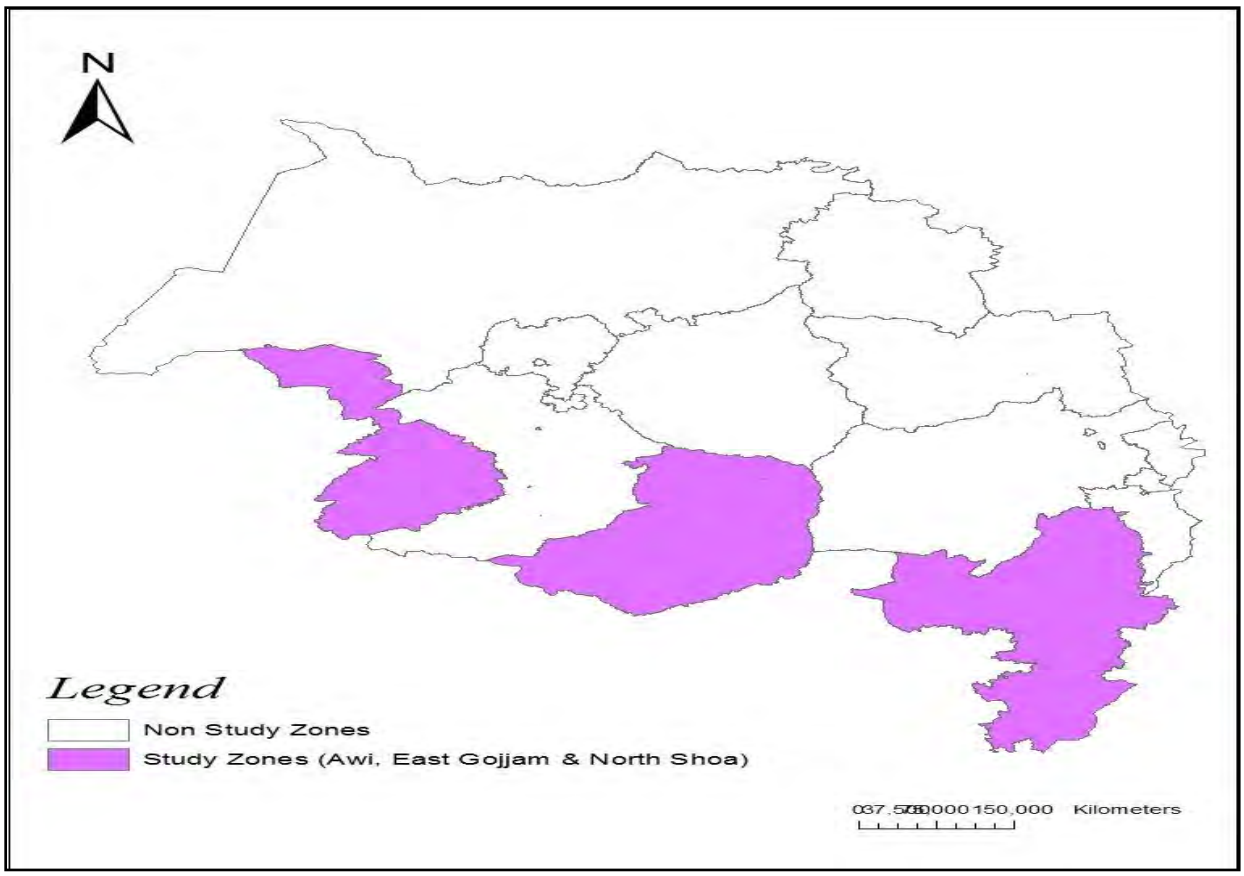


Fig 7.1.1: Map of Awi, East Gojjam and North Shoa Zones, Amhara Region, Ethiopia, 2014/15.

Interview with key informants

Interview was made with Regional PHEM Officers, Zonal PHEM and malaria officers and health commodities and supply officers, District Health Office Heads, District PHEM and malaria officers and other relevant officers at all levels.

Secondary data

Review of PHEM reports monthly and quarterly reports as well as annual reports were reviewed to capture necessary data.

Observation

Observation was made at health center level to observe patient flow and management of cases. Thus, we reviewed records and reports at health center level. At District level questionnaire and Zonal/Regional questionnaire were used to collect necessary information.

Data analysis

Database template given from central coordinating team was used to compile the data. Microsoft excel was used to compute tables and graph.

Results

Regional level

Coordination

Amhara Regional Health Bureau has functional multispectral coordination forum which conducts meeting every month. But, it is not represented particularly by all relevant government sectors.

Ongoing outbreak

In the region, there are reported ongoing outbreaks of measles, reported from N/Gondar, S/Gondar, Wag Hamira and S/Wollo Zones.

Outbreak in the last three months

There were measles, malaria, typhoid fever, food poisoning and rabies outbreaks in different areas of the Region in the last three months, 2014.

Anticipated epidemics

The Region is at risk of Malaria, AWD, Measles and Meningitis outbreaks in different Zones and woredas. Malnutrition could also be a major problem especially in Easter part of Amhara.

Table 7.1.4: At risk population in Awi and East Gojam Zones, Amhara Region Ethiopia, 2014/15.

Region	Number Woredas at Risk	At risk population	Type of risk	Required Finance
Amhara	40	6,677,350	Malaria	23,496,896.60
	38	11,877	AWD	596,310.50
	36	1,812,165	Measles	1,576,933.70
	19	875,085	Meningitis	13.732.979.50
	Total			**39,403,120.40**

Public health emergency management

At regional level, there is public health emergency preparedness and response plan but not budgeted or funded. There are about 2 trained PHEM focal personnel at Regional level and there is lack of trained PHEM focal personnel on public health emergency preparedness and response at zonal and woreda levels.

Emergency drugs and supplies

In the regional stock, drugs and supplies for meningitis control (meningitis vaccine, LP set, RDT for meningitis and oily CAF), drugs and supplies for AWD (CTC kits, PPE such as duty gloves) Doxycycline and Ringer Lactate (ORS, Amoxil suspension ,Cotrimoxazole, for measles Tetracycline Ointment are the major gaps (Table 7.1.5).

Table 7.1.5: Emergency drugs and supplies for Amhara Region required for six months (December 1-June 30/ 2015), December 2014.

No	Items	Unit	Required	Available	Gaps	Unit Price	Total price
1	RL/NS bag of 1000ml	Bag	69,680	0	69,680	25	1,472,000
2	ORS [sachets]	Each	75,475	0	75,475	2	150,950
3	Doxycycline 100 mg 0f 1000 Caps	Tin	30	0	30	245	7,254
4	PNGT	Each	261	0	261	1.5	392
5	ANGT	Each	1,393	0	1,393	1.5	20,90
6	IV Cannula	Each	9,289	0	9,289	10	92,893
7	Scalp Vein	Each	871	0	871	0.5	435
8	Erythromycin 250 mg of 1000 tabs	tin	3	0	3	345	961
9	Amoxicillin 250mg/5ml susp,100 ml	Bottle	1742	0	1,742	25	43,543
10	CTC kit	PK	60	0	30	10,000	300,000
11	Co-Artem of 24 tabs	Dose	556,516	9360	547,156	15	8,207,335
12	Artesunate (Rectal) of 50 mg	Dose	166,955	0	166,955	5	834,773
13	Quinine 600 mg (PO) of 1000 tab	Tin	234		234	295	68,952
14	Chloroquine 150 mg of 1000tab	Each	2226	162 tin	2,066	210	433,873
15	RDT of 25 Pcs	pk	779,122	15200	763,922	10	7,639,219
16	Meningococcal vaccine bivalent A+c	Dose	1,226,247	0	1,226,247	15	18,393,706
17	CAF oil of 3gm injection of 100	Box	7357	0	7,357	120	882,898
18	TI bottle	Each	307	0	307	250	76,750
19	LP set		307	0	307	640	196,480

20	syringe with needle 5 ml of 1000	Box	2.452	0	2,452	150	367,800
21	Vit A Of 1000 caps	Tin	250	60	190	370	70,000
22	Tetracycline eye ointment of 100 tube	Box	200	0	200	210	42,000
23	Amoxicillin Syrup of 250/5ml of 100	Bottle	2,000	0	2,000	30	60,000
24	Amoxicillin 500 mg of 1000 caps	Tin	50		50	295	14,750
25	B.ASA of 100 mg	Tin	40	0	40	220	8800
26	Antipain sup.	Tube	320	0	320	640	204,800
Total							**39,572,654**

Zonal level

Awi, East Gojjam and North Shoa zones were selected for health and nutrition part of the Meher Assessment in 2014/15.

Coordination

Multisectoral coordination forum was established in east Gojam and N/Shoa zones but not in Awi Zone. However, the forums in both the two zones are not active and have no regular meeting if there is no emergency.

Ongoing outbreak

There was no ongoing outbreak of malaria, measles, AWD or Meningitis in all the three zones.

Anticipated epidemics

Malaria, measles, water borne diseases including AWD and Rabies were anticipated outbreaks. A total of 251,714 cases from E/Gojjam, 325,576 cases from Awi and 93,149 cases from N/Shoa zone were estimated for support in the coming six months. For these, 1,340,878 ETB was required. In addition, supplies of anti-rabies vaccine, measles vaccine, meningitis vaccine, vitamin A, LLINs, IRS chemical and CTC kits are required.

Public health emergency management

All three visited zones have public health emergency preparedness and response plan. However, their plan is not funded. With respect to training, most of the assessed zones reported high turnover of trained manpower. Zones couldn't give the specific number of trained PHEM officers. Information from N/Shewa has revealed that currently there are only 13 trained PHEM officers in the zone. Meanwhile, E/Gojjam and Awi zones have 108 and 65 HWs trained on PHEM respectively. All three zones have no trained Rapid Response Team (RRT). As to emergency drugs and supplies, the assessed zones have required emergency drugs and supplies for meningitis, AWD, malaria and measles.

Comments given by the assessed zones

- The need to train PHEM officers as high turnover of trained ones.
- Special attention should be given to Tsadikane Mariam in Mojan Wadra woreda and Shenkora Johannes in Minjar Shenkora woreda due to increased number of attendants every year.
- IRS and ITNs strategies should get emphasis for the coverage is compromised this year, 2014.
- Budget is critical shortage to strengthen supportive supervision in emergency risk areas.
- Rapid response team needs training.
- Emergency preparedness and response plan should be supported by budget.
- They have been requesting trainings on emergency management issues like risk mapping, risk identification, stock estimation matrix, etc.

Socio-demographic profile

Out of the 7 Districts included in the assessment, three were from Awi zone, two were from east Gojjam zone and two were from N/Shoa Zone. Under five years children constituted about 136,659 (2.3%) Table 7.1.6.

Figure 7.1.6: Socio-demography of population included in Meher 2014 assessment, Amhara Region, Ethiopia.

Zones	Assessed Districts	Zonal Population	population assessed	Male	Female	Under 5 years
East Gojjam	Gozamen and D/Elias	2,441,751	311,646 (12.8%)	150,230	161,416	48, 219
Awi	Ankasha, Guagusa and Chagni	1,119,556	396,233 (35.4%)	196,454	199,779	56,361
North Shoa	Merhabete and Mida woremo	2,197,330	226,637 (10.3%)	114,350	22,634	32,079

Health profile

According to the assessment findings, diarrhea (non-bloody), pneumonia, Acute Febrile Illness (AFI), diarrhea (with blood), and upper respiratory tract infections (URTI) were the leading cause of morbidity in children under five years of age. Moreover, malaria, AFI, intestinal parasitosis, pneumonia and trauma were the leading cause of morbidity among adults above five in the year 2006/2007 (2014) in the visited Woredas.

Morbidity and Mortality Data

Top five morbidity data were included in the assessment. The data shows diarrhea was the leading cause of morbidity in under five children and malaria among adults. Malaria was the top cause of morbidity in all Districts included in the assessment. Diarrheal diseases, pneumonia, intestinal parasitosis and acute febrile illnesses were among common top five diseases.

There were no reports of AWD and meningitis in the last six months (June to November 2014). There were a total of 24 measles cases reported from the assessed Districts; eight cases from Baso Liben District of East Gojam Zone, 16 cases from Chagni Town of Awi Zone (Table7.1.7).

All Districts included in the assessment were malaria endemic areas with average monthly report of 3,397 cases. The malaria case load was higher in Awi zone than E/Gojam Zone. In general, there was increasing case burden of malaria especially in Awi Zone (Table 7.1.7).

Table 7.1.7: District distribution of malaria and measles cases in Awi, E/Gojjam and N/Shoa zones, Amhara Region Ethiopia, June-November 2014.

Zone	Woreda	Malaria						Measles					
		June	July	Augt	Sep	Oct.	Nov.	Jun	July	Augt	Sep	Oct.	Nov
E/Gojam	B/Liben	1631	744	555	346	145	235	0	1	3	2	0	2
	Gozamen	325	162	328	656	817	531	0	0	0	0	0	0
Awi	Ankesha	1053	826	791	880	631	556	0	0	0	0	0	0
	Guangua	432	408	462	430	559	907	0	0	0	0	0	0
	Chagni	433	388	350	335	219	848	0	7	5	3	1	0
N/Shoa	Merhabete	303	133	163	122	226	189	0	0	0	0	0	0
	Mida Woremo	59	215	174	85	257	291	0	0	0	0	0	0

Ongoing outbreak

There was no ongoing outbreak of malaria; measles, meningitis and AWD in all the assessed Districts except malaria case build up in Merhabete District.

Emergency drugs and supplies for preparedness

Equipment and supplies for malaria preparedness and epidemic control were relatively available in majority of Districts. In the Districts, there was no risk of meningitis identified, and hence, no preparedness supplies for meningitis were available. Lack of supplies for AWD exists in majority of Districts (Table 7.1.5).

Budget allocation by Districts

No District allocated budget for health emergency preparedness and response.

Coordination

Majority of the Districts (71.4%) have multi-sectoral PHEM coordination forum/epidemic committee at health office level. The major role of this committee was epidemic investigation and management, however less than 50% of the Districts reported have PHEM plan. On observation, had consisted mainly of PHEM activities and estimated number of diseases in the District. It lacks list of supplies and drugs as well as budget.

Risk analysis

Malaria

All Districts have endemic kebeles, malaria breading sites, interrupting rivers and unprotected irrigations. One District reported that they had LLINs coverage less than 80%. And others had distribution coverage above 80% except the low utilization rate. Generally, there was high risk of malaria outbreak in all Districts. Unprotected irrigations are major breeding sites in Mida Weromo, Merabete and Gozamen woredas.

AWD

There was no AWD epidemic in the last three years in all assessed woredas. However, most are at risk of outbreak due to history of AWD, low safe and adequate water, and low latrine utilization. Woredas such as Gozamen in E/Gojjam zone reported Latrine coverage and utilization more than 85% and 80% respectively. Water coverage was in the range of 65%-75%.

Measles

Ongoing measles outbreak reported in some of the visited woredas. More than 90% measles vaccination coverage is reported by all the assessed woredas. The assessment also identified that there was SIA in some of the assessed woredas in the year 2006 (2014).

Meningitis

All the visited woredas reported no meningitis epidemic in the last three years. Meningitis A vaccination campaign was conducted in October 2013 in E/Gojjam and Awi zones. However, it was not conducted in North Shoa zone. Data indicating the date and number of people vaccinated could not be accessed.

Nutrition

Four Districts, namely Merhabete, Mida Woremo, Baso Liben and Ankesha Districts had therapeutic program (TFP), and reported 751 SAM cases in the last 6 months. There was slight decrease in number of cases from July to September 2014. There was no adequate supply of Plumpy Nut in all Districts assessed. Those discharged from TFP were not referred to supply food program (SFP). In general, malnutrition was an emergency problem in North Shoa Zone.

Challenges/ Gaps

- Inactive emergency preparedness and response forum
- Lack of fund access for EPRP and most did not allocate budget for emergency.
- High turnover of trained PHEM officers.
- No trained RRT
- Low action in environmental activities for prevention and control of malaria
- Shortage of budget and chemicals for IRS operation.
- Difficulty to get the right persons/experts for the information during woreda visiting
- Difficulty to get the required data easily at all levels
- Inadequate time for conducting Meher emergency needs assessment

Recommendations

- Activate emergency preparedness and response forum
- Strengthen the surveillance preparedness for the identified risk
- The prepared EPRP budget should be funded at all levels
- Prevention and control of malaria should be enhanced
- Attention should be given during such national assessment
- Adequate time should be allocated for emergency needs assessment.

Chapter VIII-Protocol/Proposal for Epidemiologic Research Project

Protocol/Proposal for Epidemiologic Research Project

Assessment of factors associated with Institutional delivery service utilization among mothers in Guangua District, Awi Zone, Amhara Region, Ethiopia, 2015/16

ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

RESEARCH PROJECT PROPOSAL

Name of investigator	Yirdaw Emiru Legesse
Name of Mentors	Professor Ahmed Ali Mr. Belay Bezabih
Full title of the research project	Assessment of factors associated with Institutional delivery service utilization among mothers in Guangua District, Awi Zone, Amhara Region, Ethiopia, 2015/16
Duration of project	3 months
Study area	Guangua Woreda, Awi Zone
Total cost of the project	4,617.80 USD
Address of investigator	Tel: +251 (0)918 08 60 89 E-mail: yirdaw_emiru@yahoo.com : fyirdawe@gmail.com

Summary

Background: The health of mothers and children is central to global and national concerns, and improvements in maternal and child survival are the two important Millennium Development goals. Maternal deaths cause considerable social and personal distress in families, especially because women have the major responsibility in most family matters, including raising children. Every day, at least 1,600 women die from complication of pregnancy and child birth, 90% of which occurring, in Asia and Sub-Saharan Africa. World Health Organization (WHO) estimates that more than half a million women lose their lives in the process of reproduction worldwide every year; of these deaths, about 99 percent are from developing countries. The share of Sub-Saharan Africa from the total death toll for developing countries is more than fifty percent.

According to the EDHS 2005 and 2011 the levels of maternal and infant morbidity and mortality in Ethiopia, are among highest in the world. There are 673 and 676 maternal deaths for every 100,000 live birth and the infant mortality rate was 39 and 37 per 1, 000 live births, but the rate of institutional delivery, ANC follow up and MCH remain lower even though they are major indicators of health service utilization in one country.

Despite the international emphasis in the last few years on the need to address the unmet health needs of pregnant women and children, progress in reducing maternal mortality has been slow. This is particularly worrying in sub-Saharan Africa where over 162,000 women still die each year during pregnancy and childbirth, most of them because of lack of access to skilled delivery attendance and emergency care.

Objective: To assess institutional delivery service utilization and associated factors among mothers who give birth during the last five years preceding the study in Guangua Woreda.

Methods and materials: Samples will be selected using a stratified, two-stage cluster design and villages (kebeles) will be the sampling units for the first stage (PSUs) and households will comprise the second stage of sampling. A representative sample of 50 clusters will be selected with probability proportional to size (PPS). The desired precision is ± 5% with 95% confidence and 50 clusters will be sampled, for 50% expected coverage. The required sample size will be 845 including 10% contingency to overcome non response rate**.** Data will be collected for risk factors using interview of the mother by standard questionnaire. Then data will be analyzed by Epi Info.

Work plan and budget: Data collection and analysis will be from 30 June-30 September 30, 2015. The total cost is 4,617.80 *USD*. The detail break dawn is given in the budget section.

Dissemination of results: The final document of this study will be submitted and presented to Ethiopian Field Epidemiology Training Program (EFETP) School of public health, Amhara Regional Health Bureau and District Health Office. Findings will be disseminated to the national and regional program managers and policy makers. It will also be submitted to journals for publication and presented in scientific conference.

1: Introduction

1.1: Background

Child bearing is one of the hazardous experiences that women engage in while bringing new life to this world. It is often associated with complications that may cause morbidities, disabilities, and mortalities. In addition to the risk of dying during pregnancy and childbirth, many more women suffer from short and long-term maternal disabilities and illness. According to WHO (2001) for every maternal death, an estimated 30 to 50 women suffer pregnancy related health problems such as vesicovaginal fistulae, infertility, and depression that can be permanently debilitating(1).

The health of mothers and children is central to global and national concerns, and improvements in maternal and child survival are the two important Millennium Development goals(2).

Maternal deaths cause considerable social and personal distress in families, especially because women have the major responsibility in most family matters, including raising children(3).Every day, at least 1,600 women die from complication of pregnancy and child birth, 90% of which occurring, in Asia and Sub-Saharan Africa (4).

Despite the international emphasis in the last few years on the need to address the unmet health needs of pregnant women and children, progress in reducing maternal mortality has been slow. This is particularly worrying in sub-Saharan Africa where over 162,000 women still die each year during pregnancy and childbirth, most of them because of lack of access to skilled delivery attendance and emergency care (5).

Maternal mortality rate was shown to have the largest discrepancy between developed and developing countries, among others. A lifetime risk of maternal death in developing countries is forty times higher than that of the developed world. Bleeding, obstructed labor, hypertensive disorder, unsafe abortion and infection contribute for up to 80% of maternal deaths with resultant increased fetal loss, perinatal mortality and poor survival of small children (4).

The World Health Organization (WHO) estimates that more than half a million women lose their lives in the process of reproduction worldwide every year; of these deaths, about 99 percent are from developing countries. The share of Sub-Saharan Africa from the total death toll for developing countries is more than fifty percent and lifetime risk of dying from pregnancy is extremely high; that is, for every 26 mothers, one mother dies as the result of pregnancy and childbirth in Sub-Saharan Africa. This frequency is about 281 times more than the maternal death in more developed countries in which one mother dies from 7300 mothers (1).

1.2: Statement of the problem

The World Health Organization (WHO) estimates that about 536,000 women of reproductive age die each year from pregnancy related complications. Nearly all of these deaths (99%) occur in the developing world. These deaths are almost equally divided between Africa (251,000) and Asia (253,000), with about 4% (22,000) occurring in Latin America and the Caribbean and less than 1% (2,500) in the more developed regions of the world (6).

Globally, 287,000 mothers die from complications of pregnancy and childbirth. Developing countries continue to account for 99% of the total maternal deaths.

Of these estimated deaths, sub-Saharan Africa and South Asia accounted for 87% of the global maternal deaths(7). In Sub-Saharan Africa the MMR is 640 per 100,000 live births, which is in stark contrast to the situation in developed regions where the figure is only 14 deaths per 100,000 live births. The lifetime risk of maternal death in Sub-Saharan Africa is 1 in 16 while in affluent countries the figure is 1 in 2800 (8).

The proportion of births that occur at home remains high in Ethiopia, and skilled health professionals attend very few births. The proportion of births attended by a skilled health professional and delivered in a health facility has remained around 6 percent over the past five years, a far lower level than in other African countries, such as Cameroon (62 percent), Senegal (62 percent), Malawi (57 percent), and Lesotho (52 percent). Increasing the proportion of births delivered in a health facility and under the supervision of health professionals is important to lowering health risks among mothers and children (3).

According to the EDHS 2005 and 2011 the levels of maternal and infant morbidity and mortality in Ethiopia, are among highest in the world. There are 673 and 676 maternal deaths for every 100,000 live birth and the infant mortality rate was 39 and 37 per 1, 000 live births, but the rate of institutional delivery, ANC follow up and MCH remain lower even though they are major indicators of health service utilization in one country (3).

1.3: Significance of the Study

Despite the international emphasis in the last few years on the need to address the unmet health needs of pregnant women and children, progress in reducing maternal mortality has been slow. This is particularly worrying in sub-Saharan Africa where over 162,000 women still die each year during pregnancy and childbirth, most of them because of the lack of access to skilled delivery attendance and emergency care (6).

Home delivery is common in many developing countries including Ethiopia. For example, 42.0% of women in Malawi, 69% in Nepal, 70% in Zaria (Northern Nigeria), 74% in Pakistan and 87.6% in Eastern Burma gave birth at home (9).

In Ethiopia Institutional deliveries at public and private hospitals, health centers and clinics were estimated to be 6%-10%(10). This implies that majority of pregnant women depend on assistance of non-medical personal like relatives, neighbors and TBA during their delivery. By contrast, the rate of institutional deliveries for developed countries is about 95% (10).

Achieving the MDG5 requires reducing maternal mortality at a much faster rate in the future than it was reduced between 1990 and 2005. According to the WHO 2005 report, in 56 of the 68 priority countries where 98% of maternal deaths occur, mortality ratios are still high, exceeding 300 maternal deaths per 100,000 live births (11).

1.4: Rationale for the study

In Ethiopia, studies addressing determinants of maternity care services utilization are scarce, and these studies have been mainly focused on urban areas and health centers and hospitals. Therefore, it is important to explore and describe determinants of institutional delivery service utilization in rural areas at the primary health care unit level (11).

Safe delivery practices and antenatal care are among the most effective health interventions for preventing maternal morbidity and mortality particularly in places were general health status of the women is poor. The antenatal period presents an important opportunity for identifying threats to the mother and unborn baby's health status, as well as for counseling on birth preparedness, delivery care and family planning options after the birth (10).

Delivery by skilled birth attendance serves as an indicator of progress towards reducing maternal mortality. Place of delivery is a crucial factor which affects the health and wellbeing of the mother and the newborn. It's usually a joyful event when women give birth to a baby she wants. However, birth is a critical time for the health of the mother and baby. If problems arise during labor and delivery and are not treated properly and effectively those could lead to ill health and even death of one or both of them (12).

2: Literature Review

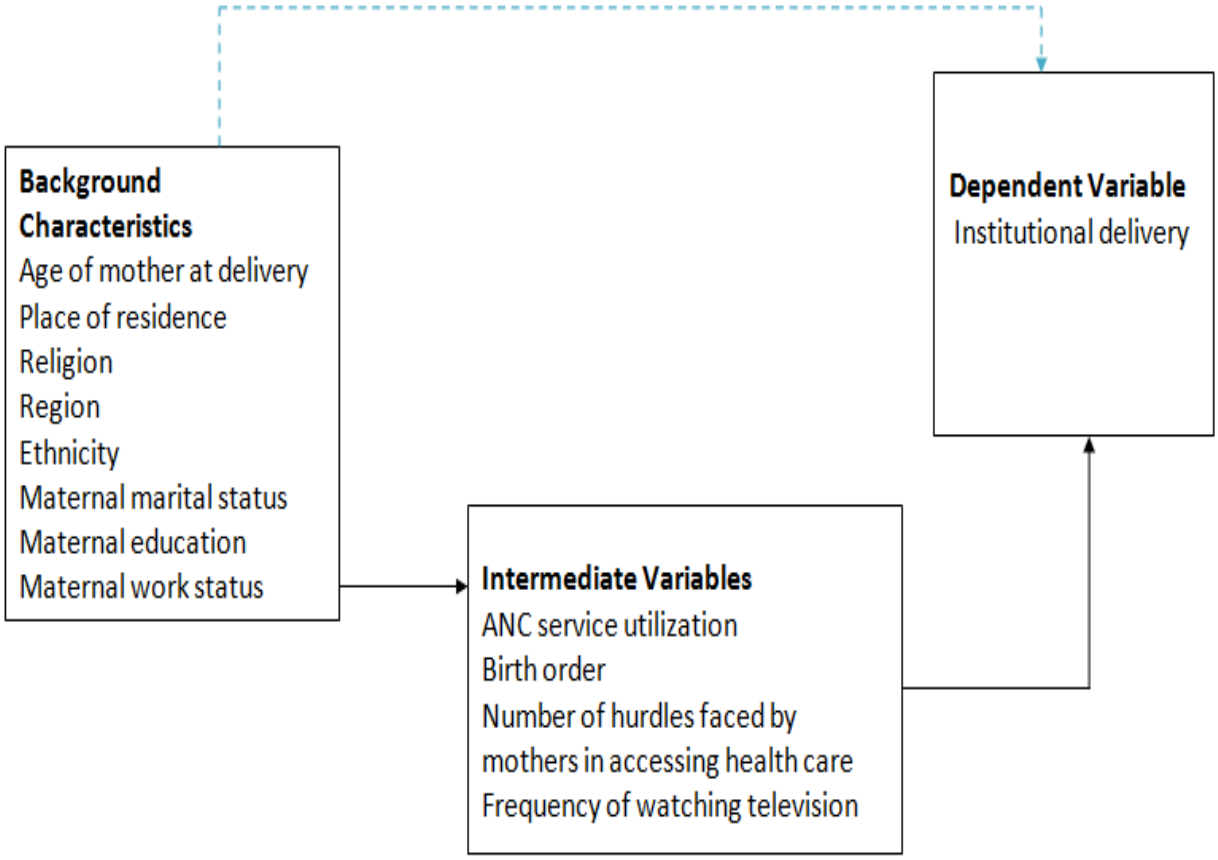
Globally, it is estimated that 34% of the mothers deliver with no skilled attendant; this means there are 45 million births occurring at home without skilled health personnel each year. In five countries including Ethiopia the percentage drops to less than 20% (11).

A study conducted in Tanzania and WHO indicated as perceived key determinants of selection of place of delivery were lack of socio economic status/money, lack of transport, sudden onset of labor, short labor duration, staff attitudes, lack of privacy, reproductive behaviour, traditions and cultures and the patterns of decision making power within household (10).

According to the World Health Organisation (WHO), 60 million deliveries take place worldwide each year in which the woman is cared for only by a family member, by an untrained traditional birth attendant, or by no one at all (11).

Home delivery is common in many developing countries including Ethiopia. For example, 42.0% of women in Malawi, 69% in Nepal, 70% in Zaria (Northern Nigeria), 74% in Pakistan and 87.6% in Eastern Burma gave birth at home. Similarly, 81.8% of women in Dodota District, 95.9% in Tigray, and 87.7% of women in Arsi reported that they gave birth at home. In Amhara Region, 89.3% of mothers gave birth at home which is the fourth highest home delivery rate among the nine Ethiopian Regions (9).

Figure 8.1.1: Conceptual Framework for factors affecting institutional delivery service.



3: Objectives

3.1: General objective

To assess institutional delivery service utilization and associated factors among mothers who give birth during the last five years preceding the study in Guangua Woreda.

3.2: Specific objectives

- To determine the magnitude of delivery and skilled birth attendant service utilization at health facilities in the last five years.
- To identify the socio-cultural, economic and health service factors contributing to low institutional delivery service.
- To assess the trends of maternal health care service utilization in the study area.

4: Methods

4.1: Study area

This project will be conducted in Guangua District, Awi Zone, Amhara Region, Ethiopia.

4.2: Study period

The project will be conducted from 30 June to 30 September 2015.

4.3: Study design

The sampling frame will be the population and housing census conducted by the Central Statistical Agency (CSA) in 2007. The samples will be selected using a stratified, two-stage cluster design and villages/kebeles will be the sampling units for the first stage (PSUs) and households will comprise of the second stage of sampling.

4.4: Target population

All households with mothers aged 15-49 years residing in Guangua Woreda constitute the source population of the study.

4.5: Study population

All mothers aged 15–49 years in the selected clusters who stayed in the household the night before the survey in the District.

4.6: Sample population

Mothers in the age group of 15-49 years of age in the District who are included in the actual study.

4.7: Sampling method

A complete listing of households will be carried out in each of the selected villages/kebeles. The listing will exclude institutional living arrangements (e.g., army barracks, hospitals, police camps, and boarding schools). A representative sample of 50 clusters will be selected with probability proportional to size (PPS).

4.8: Sample size determination

Sample size will be calculated based on the proportion of mothers aged 15-49 years who gave birth at health facility with expected 50% delivery coverage with 95% confidence interval and precision level of 5%. The final sample size shall be taken after multiplying by the design effect (82).

$$\mathbf{N = \frac{Z^2\ 1\text{-}\alpha/2 \times p(1-p) \times DE}{d^2}}$$

Where,

p - The District reported delivery coverage for 2015

DE - Design effect = 2

d - Degree of precision = 0.05

$Z^2 1\text{-}\alpha/2$ - Confidence level (α = 0.05, 95% Z1- α/2) = 1.96

$$N = \frac{2 \times 1.96^2 \times 0.50 \times 0.50}{0.05^2} = 768$$

After addition of 10% contingency to overcome non response rate to the calculated sample size, a total of 845 mothers aged between 15-49 years are targeted for the study.

4.8.1: Cluster Selection using Probability Proportional to Size (PPS)

4.8.1.1: Steps for selection of clusters with PPS

- Collect population figures for each village, division or section of the map using the smallest geographical unit with existing data and a name.
- Calculate the cumulative total population and allocate numbers.
- Determine the sampling interval. We know that we have a total population of 133,682 and we want to draw 50 clusters. The sampling interval is equal to

  133,682/50 = 2,674
- Identify villages where you will conduct the clusters**:**

- **First cluster to survey:** we draw a number between 1 and the sampling interval 2,674 which is 1063. The number 1063 is located between one and 8121, which is in the village no 1. The first village to be surveyed will therefore be village number 1.
- **Next cluster to survey:** we add the number drawn (1063) to the sampling interval (2674): 1063 + 2674 = 3737. The number 3737 is located between 1 and 8121, in the village number 1. The second village to be surveyed is therefore again village number 1.
- And so on to obtain 50 clusters (Table 8.1.1 below).

Figure 8.1.1: Cluster selection using probability proportional to size in Guangua District, Awi Zone, Amhara Region, Ethiopia.

S.No	Kebele	Total population	Cumulative population	Selection numbers for the villages		Selected clusters
1	Luns Degera	8,121	8,121	1	8121	1,2,3
2	Degera Abo	10,833	18,954	8122	18,954	4,5,6,7
3	Sigadi	6,187	25,141	18,955	25,141	8,9,10
4	Mocha	9,375	34,516	25,142	34,516	11,12,13
5	Abeba	5,382	39,898	34,517	39,898	14,15
6	Tsirgi	5,981	45,879	39,899	45,879	16,17
7	Anguay	5,782	51,661	45,880	51,661	18,19
8	Dangula	5,255	56,916	51,662	56,916	20,21
9	Waykela	8,199	65,115	56,917	65,115	22,23,24
10	Tengeha	9,821	74,936	65,116	74,936	25,26,27,28
11	Ambiki	6,328	81,264	74,937	81,264	29,30
12	Yimali	13,426	94,690	81,265	94,690	31,32,33,34,35,36
13	Bizrakani	6,438	101,128	94,691	101,128	37,38
14	Mentawuha	8,863	109,991	101,129	109,991	39,40,41
15	Mota	7,088	117,079	109,992	117,079	42,43,44
16	Yechereka	8,165	125,244	117,080	125,244	45,46,47
17	Addis Alem	8,438	133,682	125,245	133,682	48,49,50
Total		**133,682**	**133,682**	**133,682**		

4.9: Inclusion and exclusion criteria

4.9.1: Inclusion criteria

Households with at least a mother aged between 15-49 years who has given birth to at least one child shall be eligible for the study.

4.92: Exclusion criteria

Households without mothers aged between 15-49 years who has given birth to at least one child will not be included.

4.10: Study variables

4.10.1: Dependent variable

Institutional Delivery

4.10.2: Independent variables

- Socio demographic characteristics of mothers
- Knowledge of mothers
- Family size
- Number of child ever born
- Experience of child death
- Birth order
- Residence
- Time of travel to reach the nearest health facility
- Place of delivery
- Maternal tetanus toxoid immunization
- ANC follow up
- Family income
- Age

4.11: Data collection and analysis

In addition to the institutional delivery, information on socio-demographic characteristics, economic status, place of delivery, family size and knowledge of mothers on safe delivery will be included in the questionnaires. The questionnaire will be prepared in English and translated to local language Amharic and will be translated back to English to ensure consistency. The questionnaire will be pretested in one kebele of the District which will not be selected for the study to determine its appropriateness on the local context. Data will be analyzed by Epi Info version 7.1.3.0.

4.12: Operational definitions

Maternal Death: Death of a woman whiles pregnant or within 42 days of termination of pregnancy, irrespective of what but not from accidental or incidental causes.

Deliveries in health facilities: Percentage of deliveries in public and private hospitals, clinics and health centres, irrespective of who attended the delivery at these facilities

Ante Natal Care: Care given to women during pregnancy that provides an
important opportunity for discussion between a pregnant woman and a health care provider about health behaviour during pregnancy, recognising complications that may arise during pregnancy and delivery plans that will meet the needs of the individual woman.

Deliveries attended by skilled health personnel: Percentage of deliveries attended by skilled health personnel irrespective of outcome (live birth or fetal death).

Skilled Care: Care provided to a woman and her newborn during pregnancy, childbirth and immediately after birth by an accredited and competent health care provider who has at her/ his disposal the necessary equipment and the support of a functioning health system, including transport and referral facilities for emergency obstetric care.

Skilled Attendance: The process by which a woman is provided with adequate care during labor, delivery and the early post- partum period.

Skilled Attendant: Doctors (specials or non-specials), and/or persons with midwifery skills who can diagnose and manage obstetrical complications as well
as normal deliveries

Traditional Birth Attendant (TBA): A TBA who initially acquired her ability by delivering babies herself or through apprenticeship to other TBAs and who has undergone subsequent extensive training and is now integrated in the formal health care system.

4.13: Ethical review

The survey will be conducted in accordance with the national policies on ethics for surveys involving human subjects. The national and/or regional authorities will ensure the survey. Fieldwork in any cluster will start with introductions to the officials of the cluster. The field supervisor will have a letter of introduction from a higher authority outlining the work that the team will be doing in the community. The letter will request the officials' permission to make the necessary contacts in the community and for their support during the survey.

4.14: Communicating the results

The information obtained from the survey will be communicated to key stakeholders and partners by tables, diagrams and illustrations accompanied by clarifications, pointing out levels and trends.

4.15: Project outcomes

The final document of this study will be submitted and presented to Ethiopian Field Epidemiology Training Program (EFETP) School of public health, Amhara Regional Health Bureau and District Health Office. Findings will be disseminated to the national and regional program managers, policy makers and the Ethiopian Field Epidemiology Training Program (EFETP) program advisors/coordinators in order to insure the implementation of the recommendations that will be forwarded from the project and it may be published upon the request of the authorized bodies. It will also be submitted to journals for publication and presented in scientific conference. The result will be communicated at all levels for health centre and health post workers, other providers in the area, and senior health officials. Feedback will be provided within one month, and through meetings to help health centre and health post staffs feel that they are an important part of the maternal services, thereby increasing their motivation to work hard. Presentation will be held to the responsible bodies at the national and regional levels to share the information gained from the project. The outcomes of the project will be evaluated periodically (on quarterly basis) through the reports coming to the region and national level.

5: Work plan

This study is planned to be completed within three months of duration. The data collection and analysis will be from 30 June-30 September 30, 2015.The key activities that will be done throughout the project are listed below (Table 8.1.2).

The implementation of the project will be overseen by the collaboration of the National and Regional Public Health Emergency Management (PHEM) and Ethiopian Field Epidemiology Training Program advisors/coordinators. And final report will be submitted at the end of the project (within three months).

Figure 8.1.2: Activity work plan for the major activities to be conducted during the project.

Major Activities	May 2015	June,2015	July, 2015	August, 2015	Sep.. 2015	Oct., 2015	Nov., 2015	Dec., 2015
Proposal submission								
Arranging administrative process								
Data collection (field)								
Data entry								
Data analysis and interpretation								
Writing progress report								
Write up								
Submitting final report								

6: Budget of the project

The planed budget presented is for supplies and personnel cost on the bases of work duration and type of activity needed. The total budget requested to conduct this survey is 4,617.80 US dollars (Table 8.1.3).

Figure 8.1.3: Budget breakdown to conduct the research proposal/project.

Item/Description	Quantity/Number	# of days	Price or (Rate per day) (USD)	Total cost (USD)	Remark
Personnel					
Principal investigator	1	30	20	600	
Consultant costs	1	15	20	300	
Field supervisors	5	10	15	750	Including training
Driver	1	30	10	300	
Data collectors	10 (three per team)	10	12	1,200	Including training
Rental of training site and equipment for training	1	2	30	60	
Local guider	10	10	6	600	
Sub Total		**97**		**3,810**	
Transportation					
Fuel cost	300 liters		1 per liter	300	Assuming to travel around
Sub Total				**300**	
Logistics and supplies					
writing pad	15		2	30	
Paper (A4 size)	5		5	25	
Blank WR-CD	2		1	3	
Printing and Photo copying				30	
Sub-Total				**88**	
Contingency 5%				**419.8**	
Grand Total				**4,617.8**	

7: References

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Annex 8.1.1: Dummy tables.

Table 1: Sociodemographic characteristics of study subjects.

S.No	Risk Factors		Number (%)
1	Mothers age	<18 years	
		18-35 years	
		>35 years	
2	Mothers religion	Orthodox	
		Muslim	
		Others	
4	Education status of the mother	Illiterate	
		Grades 1-5	
		Grades 5-8	
		Grades 9-12	
		Higher education	
5	Marital status of the mother	Married	
		Single	
		Divorced	
		Widowed	
6	Occupation	Farmer	
		Daily laborer	
		Merchant	
		Housewife	
		Government employee	
		Others (Specify)	
7	Husbands education	Illiterate	
		Grades 1-5	
		Grades 5-8	
		Grades 9-12	
		Higher education	

Table 2: Obstetric history and place of delivery.

S.No	Risk Factors		Number (%)
1	Year of birth of the first baby		
2	Number of Children	<5	
		>5	
3	Number of total pregnancies in lifetime	One to four	
		Five to seven	
		Eight to eleven	
		Other (specify)	
4	Number of pregnancies in the last five years	One	
		Two	
		Other (specify)	
5	Total family size	One to three	
		two to four	
		Five to seven	
		Eight to eleven	
		Other (specify)	
13	Place of birth for the recent baby	At home	
		Health post	
		Health Center	
		Others (specify)	
14	If at home who assisted you	Mother	
		Mother in low	
		TTBA	
		Neighbor	
		HEW	
		0thers (specify)	
15	If at health facility who assisted you?	HEW	
		Nurse	
		Midwife	
		Health officer	
		Don’t remember	

16	If you gave birth for the recent baby at home, why?	Easily labor	
		Transport problem	
		Health facility far	
		Husband refused	
		Afraid user fee	
		Poor service	
		Feel shame	
		Sr. Marry help me	
		Workers Poor skill of health	
		Don't knows importance	
		I was sick	
		Other (specify)	
17	Reasons for not attending ANC	No health problem	
		Work load	
		Too far health facility	
		Husband refusal	
		afraid of fee	
		poor handling of HWs	
		feel shame	
		Don't know importance	
		Other (specify)	
18	Reasons for home delivery	Easily labor	
		Transport problem	
		Too far health facility	
		Husband refusal	
		Afraid user fee	
		Poor service	
		Feel shame	
		Sr. Marry help me	
		Poor skill of health workers	
		Don't knows importance	

		I was sick	
		Other (specify)	
19	If you think home delivery is better how and why	No need of transport	
		No cost	
		No bleeding	
		There is privacy	
		other (specify)	
20	Who decide where you gave birth and by whom	Myself	
		My husband	
		Both of us	
		Mother	
		Mother –in-low	
		TTBA	
		Neighbor	
		HW	
		Father	
		0thers (specify)	
21	Which type of difficult labor (obstructed labor) have you ever faced?	Bleeding	
		Retain placenta	
		Prolonged labor	
		Mal presentation	
		Still birth	
		Other (specify	
22	Where do you prefer to give birth for your next delivery?	Home	
		health facility	

Table 3: Association of factors with place of delivery.

S.No	Risk Factor		Number (%)
1	Family Monthly Income	Low income ≤ $1,045	
		Middle income>$1,045 but < $12,746	
		High income ≥ $12,746	
2	How far is the nearest HC from your home	< 1 kilometer	
		2 kilometers	
		4 kilometers	
		>5 kilometers	
3	What means of transport do you use to reach the HF ?	On foot	
		Vehicle	
		Motor Bicycle	
		Others (Specify)	
4	How long would it take to reach to the HF	<1 hour	
		1-2 hours	
		3-4 hours	
		≥5 hours	
		Others (Specify)	

Annex 8.1.2: Information sheet and consent form.

Information sheet

Hello! My name is _____. We are working on the Assessment of factors associated with Institutional delivery service utilization among mothers in this District. This study tries to identify which factors are contributed to low skilled delivery service in the District, why mothers do not deliver at health facilities. I am one of the data collectors and I am asking you some questions about mother's choice of delivery places. Would you please co-operate in responding the following questions?

Your participation indirectly contributes in improving the problem of Institutional delivery service utilization in your communities.

Your response will never be exposed to any party without your consent and it is possible not to tell your name. The interview takes about 30 minutes. There is no obligation to participate in the study. You have full right to refuse participation, refrain during interview and decline from answering to some or more of the questions if you don't like to answer them.

Yes_____ No _____

Consent form

I have been briefly informed about the study and clearly understood the objective of the study. So I, here approve my consent with my signature to take part in the study.

Signature _____ Date _____

Annex 8.1.3: Questionnaire for research proposal.

Interviewer name: ---------- Interviewer code: ----------

Date: --------- / ------ / ---------- Kebele name: ---------- Kebele code: ----------

Household code: ----------

Section A: <u>Sociodemographic data</u>

1. Respondents age in years ----------

2. Marital status: 1. Married 2.Divorced 3. Single 4. Widowed

3. Respondent's occupation: 1. Farmer 2. Daily labourer 3.Merchant 4.Housewife

5.Governmentalemployer 6. Other (specify) _____

4. Respondent's education: 1.No formal education 2.Grades 1-4 3. Grades 5-8 4.Grades 9-12 5. Higher education 6.thers (specify) _____

5. Respondent's religion: 1. Orthodox 2.Muslim 3. Others (specify)_____

6. Occupation of the husband? 1. Farmer 2. Daily labourer 3.Merchant 4.Governmental employer 5.Diploma& above 6. Others (specify)_____

Section B: <u>Obstetric History</u>

7. Do you ever have health education on maternal health? 1. Yes 2.No

8. What are the major maternal health problems in your community?

1. Pregnancy related problems 2. Nutritional problems

3. Inadequate health care 4. Far of Health facility

5. Frequent of pregnancy 6. Fire smocking and related disease

7. No problem 8.Donot know

9. Others (specify) _____

9. Do you have any health facility in your Kebele? 1. Yes 2.No 3. Don't know

10. How far is the nearest health facility from your home?

1. Less than 1 kilometre 2. 2 kilometres

3. 4 kilometres 4. Over 5 kilometres

11. What type health facility is it? 1. Public 2. Private

12. Has it got maternity services? 1. Yes 2. No

13. If no, how far is the nearest health facility that offers maternity services?

1. Less than 1Kilometer 2. 1 – 2 Kilometres 3. 3 – 4 Kilometres 4. 5 and above Kilometres

14. What means of transport do you use to reach the health facility? 1. on foot

2. Motorcycle 3. Vehicle 4. Others (specify)_____

15. How long would it take you to reach the health facility? 1. <1 hour 2.1–2 hours 3.3–4 hours

4. 5 and above Kilometres

16. Monthly family income 1. $\leq$ $1,045 2. Middle income >$1045 but < $12,746

3. High income $\geq$ $12,746

17. Number of total pregnancies in lifetime 1.One to four 2. Five to seven

3. Eight to eleven 4.Others (specify) _____

18. Number of pregnancies in the last five years 1.One 2.Two3.Three 4.Others (specify) _____

19. Number of under five children: 1.One 2.Two 3.three 4.Others (specify) _____

20. Total family size 1.One to three 2.Two to four 3.Five to seven 4. Eight to eleven 5.Others (specify) _____

21. Do you have history of abortion? 27. 1. Yes 27.2. No

22. If yes (question 21) how many times? 1. One 2.Two 3.Three 4. More than three

23. Do you have any history of stillbirth? 1. Yes 2. No

24. If yes for (question 23) how many times? 1. One 2.Two 3.Three 4.More than three

25. Did you attend ANC for your recent pregnancy? 1. Yes .2.No

26. If yes for question (25) at what gestational age you start----------

27. If yes for question (25) how many times ----------

28. If yes for question (25) why? 1. I was sick 2. Near health facility

3. Good service 4. Encouraged by husband 5. To know my health stat 6. To know my fetus status 7.Other (specify)_____

29. If ANC yes, during your visit did you receive any advice where to deliver? 1. Yes 2. No

30. If ANC No, question (25).why? 1. No health problem 2. Work load

3. Health facility far 4. Husband refused 5.Afraid of fee 6.poor handling of HWs 7.Feel shame 8. Don't know importance 9. Other (specify) _____

Section C: History of the Recent Delivery

31. Year of birth of the recent baby ----------

32. Place of birth for the recent baby 1. At home 2 Health post 3. Health Center 4.Others (specify) _____

33. If at home who assisted you 1.Mother 2.Mother in low 3.TTBA 4.Neighbor 5. HEW 6. 0thers specify_____

34. If at health facility who assisted you? 1. HEW 2.Nurse 3.Midwife

4. Health officer 5. Don't remember

35. If you gave birth for the recent baby at home, why? 1. Easily labor

2. Transport problem 3. Health facility far 4.Husbandrefused 5. Afraid user fee 6. Poor service 7. Feel shame 8. Sr. Marry help me 9. Poor skill of health workers 10. Don't know importance 11.I was sick12. Other (specify)_____

36. If you gave birth at health facility for the recent baby, why? 1. I was sick

2. No fee 3.Health facility near 4.Good service 5.Family allowed

6. Save mothers life 7.Received health education 8. Other (specify) _____

37. Who decide where you gave birth and by whom? 1. Myself 2.My husband 3.Both of us 4.Mother 5 Mother –in-low 6.TTBA 7.Neighbor8.HW 9.Father 10. 0thers (specify) _____

38. Do you think there is a difference giving birth at home and health facility?

1. Yes 2. No 3. Don't know

39. If you think health facility is better (question 38) how and why? 1. Clean

2. Save mothers life 3.No retain placenta 4. No bleeding 5.save child life 6.shorten labor 7. Other (specify)_____

40. If you think home is better (question 38) how and why? 1. No need of transport 2.No cost 3. No bleeding 4. There is privacy 5.other (specify)_____

41. Did you have any history of difficult labor (obstructed labor)?

1. Yes .2 No

42. If yes for question (41) which type? 1. Bleeding 2.Retain placenta 3.Prolonged labor 4.Mal presentation 5.Still birth 6.Other (specify)____

43. Where do you preferred to give birth for your next delivery? 1. Home

2. Health facility

44. By whom do you prefer to be assisted for you next delivery? 1. Mother

2. Mother–in-low 3.TTBA 4.Neighbor 5.HW 6.0thers (specify) _____

45. Where is your husband's preference place for your next delivery? 1. Home 2. Health facility

Chapter IX-Other Additional Output Reports

9.1: Participate in AFENET 5th Conference

I attended the fifth AFENET Scientific Conference in Addis Ababa from 17-21 Nov 2013. The five days Conference provided a platform for hundreds of participants including trainees and graduates from various Field Epidemiology and Laboratory Training programs to benefit from oral and poster presentations presented.

Presenters, key note speakers, public health professionals and trainees from Field Epidemiology and Laboratory Training Programs from over 20 African countries attended the Conference and Exhibition. The Program not only involved oral and poster scientific presentations, themed workshops and keynote addresses, but also excursions and social events such as the opening cocktail, cultural dinner, and finally the international night.

The Conference was concluded on a high note, with a closing ceremony and international night at the Sheraton Addis Hotel in which representatives from the various countries presented songs and dances reflecting a variety of cultures.

Awards and certificates were given to the best oral and poster presenters and different contributors for the success of Conference.

9.2: Participation in the National PHEM Review Meeting and Ebola Training

I participated in the national PHEM Review Meeting in Hawasa which was held in August 2014. I attended Training on Ebola in the first day of the Review Meeting. In the subsequent four days, all the Regional Health Bureaus PHEM Process owners presented their annual performances and discussions were made at the end of each presentation. Finally high performing three regions were awarded and the review meeting was closed by emphasizing to strengthen the Public Health Emergency Management at each level of the health system.

9.3: Provision of training for health professionals primarily on public health emergency management

1. Participated in the Training for public health emergency officers at Woreta, South Gonder Zone

2. Engaged in Weekly PHEM Bulletins preparation each week together with other public health emergency management officers.

9.4: Suspected malaria out break investigation in Awi Zone, Jawi Woreda in July 2014.

I investigated suspected malaria outbreak in Awi Zone, Jawi Woreda in July 2014.

The objective of the investigation was to verify the existence of an outbreak, to analyze the outbreak by place, person and time and to institute prevention and control measures.

The catchment population of the wereda was 89,635. The ethnic composition of the wereda was 50% Agew, 48% Amhara and 2% Gumuz.

The wereda had 27 kebeles (26 rural and 1 town), 27 (1 Town and 26 Rural) health posts and 5 health centers which were currently giving service. Jawi ketena with 8 kebeles was suspected to be affected by the outbreak.

Weekly Surveillance malaria data was reviewed and norm chart was used to confirm the existence of an outbreak. Discussion with woreda health office head and woreda malaria officer, Beles AG sugar factory HC and Jawi HC staffs was conducted.

A total of 3,205 confirmed malaria cases were treated in the District for the last 50 weeks (week 1-50) in 2013/14. The highest malaria cases were reported in Jamaila kebele (984 cases) followed by Wombelase and Kumbir kebeles (900 and 664 cases respectively). The least number of cases was reported in Fendika kebele (23 cases only).

The woreda health office head and woreda malaria officer have informed us that there was malaria case build-up because of high influx of non-immune labor forces from different areas of the country to the sugar factory. The labor forces did not have LLINs and those who had LLINs did not use it properly due to lack of awareness so they acquire malaria easily.

We have also discussed with professionals in the sugar factory (Beles AG HC) and Jawi HC. They claimed that there is malaria case build up because of migration of people to the woreda.

We have analyzed the malaria data in Jawi ketena which comprises 8 kebeles to confirm whether the malaria case load exceeded the threshold. We have done norm chart for each of the 8 kebeles by doubling the last year data (2005) because there was no 5 years malaria data. It was impossible to get weekly malaria data before

Ethiopian week 13 of the year 2005 E.C but there was aggregated data by ketena only. According to the weekly malaria surveillance data In Jamaila kebele in the week 24-27 the current year i.e 2006 malaria cases crossed the threshold i.e. there was malaria outbreak and in Alkurand kebele weeks 44-48 the 2006 malaria case crossed the threshold but became below the threshold after week 48. But in all other kebeles the 2006 malaria cases was below the threshold.

Annexes

For simplicity of reading and printing of separate chapters; annexes are placed at the end of each chapter.

CURRICULUM VITAE

PERSONAL INFORMATION	
Name	**Yirdaw Emiru Legesse**
Address	Office: P.O. Box : 495, Bahir Dar Ethiopia
Telephone	Personal cell phone: 251(0)918 08 60 89
E-mail	Yirdaw_emiru@yahoo.com, fyirdawe@gmail.com
Nationality	Ethiopian
Date of birth	23 March 1973
Place of birth	Awi
Gender	Male
Marital status	Married
Religion	Orthodox Christian
Occupation	Public Health Specialist
Language	• Amharic (Excellent in Speaking, Reading, Writing & Listening) • English (Very good in Speaking, Reading, Writing & Listening)
EDUCATION	
Dates	***September 2009 to July 2011***
Title of qualification	Bachelor of Science in Public Health(Health Officer)
WORK EXPERIENCE	
Dates Position held	***From February 2009 to October 2012*** *Malaria Epidemiology, Diagnosis & Treatment officer*
Main responsibilities and activities	• Prepare the physical & strategic plan of the section • Monitoring & providing supportive Supervision to the zonal health departments, woreda health offices & health institutions to strengthen malaria prevention, control & elimination. • Prepare, organize, participate & conduct different trainings about malaria to zonal , woreda officers and health professionals at the grass root level • Prepare, organize & conduct quarterly & annual review meetings • Organize and facilitate meetings together with the process program officers and other partners in the region • Monitoring & close follow up of availability of anti- malaria commodities including for emergency situations • Timely gather, analyze, interpret malaria data on weekly basis and give

	feedback accordingly • Monitoring the quality of laboratory services to be provided as per the standards • Work jointly with local and international NGOs (UNICEF, WHO, Carter Center, JICA and MACEPA/PATH) and build collaborative relationship • participate in any other activities as necessary in the process
Name and address of employer Type of sector	Amhara Regional Health Bureau, P.O. Box 495,Bahir Dar Tel: 251(0) 58 222 17 14, 251(0) 58 226 22 81, Fax: 251 (0) 58 226 23 96 Regional Government Health Organization
Dates Position held	***From January 2008 to February 2009*** *Health Extension Officer*
Name and address of employer Type of sector	Bahir Dar City Administration Health Office, Bahir Dar Tel: 251(0) 58 226 37 43, Fax: 251 (0) 58 220 46 47 Regional Government Health Organization
Dates Position held	***September 2004 to January2008*** *Clinician & Head of Health Center*
Main responsibilities and activities	• Diagnose, treat and counsel patients • As head of HC in Coordinating and managing all clinical and managerial activities of the HC
Name and address of employer Type of sector	Bure Health Center (West Gojjam) Tel.251 (0) 058 774 01 03 Government organization
Dates Position held	***July 2001 to June 2002*** Maternal & Child Health Expert
Main responsibilities and activities	• Develop annual work plan • Compile necessary data, analyze, interpret and submit to relevant institutions • Conduct supervisions to health posts.
Name and address of employer	Bure Woreda Health Office (West Gojjam Zone) Tel.251 (0) 058774 00 15
Dates Position held	***May 1996 to September1998*** **Clinician (***Midwife Nurse)*

Main responsibilities and activities	• Diagnose, treat and counsel patients • Manage normal labor and delivery • Identify and timely refer mothers with complication • Follow up of ante natal care
Name and address of employer Type of sector	Bure Health Center (West Gojjam Zone) Government organization
Dates Position held	***March1989 to December1993*** *Clinician (Comprehensive Nurse)*
Main responsibilities and activities	• Diagnose, treat and counsel patients
Name and address of employer Type of sector	Bure Health Center (West Gojjam Zone) Government organization
TRAININGS	• National Training Course on Planning and Management of Malaria Control Program in March 2010 • TOT course on Urban Health Extension Program in May 2009 • TOT course on Integrated Refresher Training (IRT) in Augt. 2006 • Infant Feeding & Women's Nutrition in the Context of HIV/AIDS in Dec. 2007 • Training on PMTCT in 2008 • Training on IMNCI case management in Dec. 2007 • TOT on Adolescent & Youth Reproductive Health Service in Sep 2008 • HIV/AIDS Counseling & Testing (VCT) in June 2005 • Management of Opportunistic Infections ,Introduction to Anti-Retro-viral Drugs & Rational Use of OI/ARV drugs in Dec. 2004 • Behavioral Change Communication (BCC) in the Context of Essential Nutrition Action (ENA) in January 2005 • Monitoring & Evaluation in Public Health with Special Emphasis to Malaria Control Program in April 2011 • TOT on Comprehensive Indoor Residual Spraying in Nay 2011 • Syndrome Management of STIs in Oct. 2004 • Comprehensive Abortion Care in Jan. 2007

	• Training on Entomology in April 2012 • International Training Course on Planning and Managing Malaria Control Programmers in October 2012 • Malaria and other vector borne diseases in Dubai in March 2015
SKILLS	
Computer Skill	• MS Word,MS Excel, MS Access, Power Point, Basic Internet Application, SPSS, Epinfo, GIS.
Other Skills	• Team work • Strong interpersonal/ communication skills • Good communication, facilitation, presentation and reporting skills
INTEREST	✓ Working in the area of FP/RH and malaria programs ✓ Reading
REFERENCES	1. Mr. Mulusew Lijalem Amhara Regional Health Bureau, Health Promotion & Disease Prevention process , Bahir Dar Cell Phone: +251 (0)918 70 7621, e-mail: lijmulusewb@yahoo.co.uk
	2. Mr. Amsalu Shiferaw UNICEF , National Professional Officer, Addis Ababa Cell Phone: +251 (0)918 76 03 92, e-mail: amsalushif@yahoo.com
	3. Mr. Belay Bezabih Amhara Regional Health Bureau, Public Health Emergency Management process owner, Bahir Dar Cell Phone: +251 (0)918 76 44 16, e-mail: fiametaye@yahoo.com