Addis Ababa University, College of Health Sciences,

School of Public Health

Ethiopian Field Epidemiology Training Program (EFETP)

Compiled Body of Works in Field Epidemiology

By

Dessalew Shitu

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

May 2019

Addis Ababa, Ethiopia

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I. Acknowledgments

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VI. Abbrivations and acronyms

AFI	Acute Febrile Infection
AFRO	Regional Office for Africa
AIDS	Acquire Immune Deficiency Syndrome
AMB	African Meningitis Belt
ANC	Antenatal care
AOR	Adjusted Odds Ratio
AR	Attack Rate
ART	Anti-Retroviral Therapy
BCG	Bacillus Calmate Guarine
BEMONC	Basic Emergency Management of Obstetrics and
BGR	Benishangul-Gumuz Region
BPR	Business Process Re-engineering
CBN	Community Base nutrition
CBR	Crude Birth Rate
CFR	Case Fatality Rate
CHW	Community Health Workers
COR	Crude Odds Ratio
CSA	Central Statistical Agency
CSF	Cerebrospinal Fluid
EC	Ethiopian Calendar
EDHS	Ethiopian Demographic and Health Survey
EFY	Ethiopian Fiscal year
ELISA	Enzyme Linked Immunosorbent Assay
EPHI	Ethiopian Public Health Institute
EPI	Expanded Program of Immunization
EPTB	Extra Pulmonary Tuberculosis
ETB	Ethiopian Birr
FMOH	Federal Ministry of Health
GDP	Gross Domestic Production
GP	General Practioner
HC	Health Center
HDA	Health Development Agent
HEW	Health Extension Worker
HF	Health Facility
HH	House Hold
HIT	Health Information Technology
HIV	Human Immunodeficiency Virus
HO	Health Officer
IDP	Internally Displaced People
IDSR	Integrated Disease Surveillance and Response
IR	Incidence Rate

IRS	Indoor Residual Spray
ITN	Insecticide Treated net
IUCD	Intrauterine contraceptive Device
KG	Kindergarten
LLIN	Long Lasting Insecticide Nets
MAM	Moderate Acute Malnutrition
MCH	Maternal and Child Health
NGOs	Non-Governmental Organizations
NPW	Non Pregnant Women
OPD	Outpatient Department
OPV	Oral polio Vaccine
ORS	Oral Rehydration Salt
OTP	Outpatient Therapeutic Program
PCR	Polymerase Chain Reaction
PCV	Pneumococcal vaccine
PFSA	Pharmaceutical Fund and Supply Agency
PHCU	Primary Health Care Unit
PHEM	Public Health Emergency Management
PITC	Provider Initiated Test and Counseling
PLW	Pregnant and Lactating Women
PMTCT	Preventing Mother to Child Transmission
PNC	Postnatal Care
PPE	Personal Protective Equipment
PPV	Positive Predictive Value
PTB	Pulmonary Tuberculosis
PW	Pregnant Women
RDT	Rapid Diagnostic Test
RRT	Rapid Response Team
SAM	Sever Acute Malnutrition
SC	Stabilizing Center
SNNPR	South Nations, Nationalities and Peoples Region
Sq.Km	Square Kilometer
TB	Tuberculosis
TBA	Traditional Birth Attendant
TTBA	Trained Traditional Birth Attendant
TVET	Technical and Vocational Education Training
VCT	Voluntary counseling Test
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

VII: Summary foreword

This document contains all outputs which are accomplished in residency periods in field epidemiology training program. This body of works is compiled as per the format provided by the program and submitted to graduate school of public health for partial fulfillment of Master Degree in Field Epidemiology.

The document is organized by eight chapters consisting of expected outputs produced through the two years of residency periods. Chapter one contains two outbreak investigation reports. The two studies conducted on Rotavirus and suspected anthrax outbreaks using case-control study design. Chapter two contains report of surveillance data analysis which was conducted on five years aggregated meningococcal meningitis data reported through weekly bases in Southern Nations, Nationalities and Peoples (SNNP) region. Surveillance system evaluation report is included in chapter three which was conducted on meningococcal meningitis surveillance system as proxy indicator in Kolfe Keranio Sub-city, Addis Ababa. Chapter four contain health profile assessment of Ginir woreda in Bale zone, Oromia region. Chapter five contains scientific manuscript of Rotavirus outbreak for peer reviewed journals. In chapter six, two abstracts are presented on Rotavirus outbreak investigation and meningococcal meningitis surveillance data analysis. The other expected output is disaster situation narrative summary report which was conducted on IDPs in Bale zone and it was described on chapter seven. Lastly, epidemiologic research proposal entitled 'Mapping the risk of anthrax outbreaks both in humans and animals in Waghimra and South Gondar zones of Amhara regional state' are presented on chapter eight.

Chapter 1 : Outbreak investigation

1.1. Rotavirus Outbreak investigation in Kurmuk district of Benishangul-Gumuz Region, Ethiopia Feb 2019.

Abstract

Introduction: Diarrheal diseases are one of the leading causes of illness and death in children <5 years of age, particularly those in low-income countries, and cause >500,000 deaths per year globally. Rotavirus alone caused an estimated deaths of 214806, 121009 and 6800 in children <5 years of age globally, in Sub-Saharan Africa and Ethiopia respectively in 2013. The main objective of this investigation was to identify risk factors associated with an outbreak.

Method: Descriptive and unmatched case-control study was conducted from Jan 30-Feb 12, 2019 in Kurmuk woreda. ELISA techniques were used for confirmation of Rotavirus in cases. Structured questionnaire was developed to collect cases and controls. A total of 144 samples with 1:2 case to controls were selected. Data were analyzed using Epi-Info and the results were interpreted using Adjusted Odds ratio, P value <0.05 and 95% CI.

Result: Confirmed Rotavirus outbreak was occurred in Kurmuk Woreda with AR of 60.3/1000 and CFR of 0.87%. In multivariate logistic regression, contact with cases (AOR: 8.58, 95%CI: 3.02-24.41, P: 0.0001) and families practicing traditional gold mining (AOR: 6.34, 95%CL: 2.15-18.71, P: 0.0008) were risk factors. On the other hand, vaccination (AOR: 0.29, 95%CI: 0.11-0.75, P: 0.0108), history of similar illness (AOR: 0.18, 95%CI: 0.05-0.62, P: 0.0068), and practicing hand washing at least three critical times (AOR: 0.34, CI: 0.13-0.89, P: 0.0281) were found to be protective factors.

Conclusion: Contact with cases, traditional gold mining and failure to practice hand washing at least three times a day were found to be risk factors associated for the outbreak whereas being vaccinated and having previous history of Rotavirus infection were protective factors. Therefore, educating mothers about child caring, mode of diarrheal disease transmission and good hygiene practices combined with increasing coverage and quality of vaccination would reduce the disease incidence.

Keywords: Rotavirus, Outbreak, Investigation, Kurmuk, Benishangul-Gumuz**.**

1.1.1 Introduction

Diarrheal diseases are one of the leading causes of illness and death in children <5 years of age, particularly those in low-income countries, and cause >500,000 deaths per year globally (1-3). Among these diarrheal diseases are Rotaviruses which are ubiquitous and infect almost every child globally by 3–5 years of age (4, 5). In 2003, 114 million cases of rotavirus infection were reported in children <5 years of age globally, of which 24 million cases required outpatient visits and 2.3 million cases required hospitalization(6). In 2013, rotaviruses were associated with an estimated 214,806 and 121,009 deaths in children <5 years of age globally and in Sub-Saharan Africa respectively(7). Rotavirus infection was responsible for an estimated 128 500 deaths and 258 million episodes of diarrhea among children younger than 5 years throughout the world in 2016 an incidence of 0.42 cases per child-year, with 104 733 deaths occurring in sub-Saharan Africa(8).

Diarrhea is a leading killer of children in Ethiopia, causing approximately 14 percent of deaths in children less than five years of age(9). Rotavirus, the most common cause of severe and fatal diarrhea in young children worldwide, took the lives of more than 6800 Ethiopian children under five in 2013(7). Ethiopia is one of top 10 countries with the greatest rotavirus burden worldwide and accounts for 3.2% percent of all rotavirus deaths globally(7). It is estimated that 28 percent of all under-five diarrheal disease hospitalizations in Ethiopia are caused by Rotavirus (10). In Kurmuk district of Benishangul-Gumuz region, Rotavirus outbreak has been happening since February 2017 with 585 cases and CFR of 2.4% and in 2018 starting from 11th January with 444 cases and CFR of 0.2%(11).

Live attenuated oral vaccines against rotavirus were licensed for global use in 2006 and are used in more than 100 countries worldwide(12). Although the introduction of vaccines has reduced the number of rotavirus-associated deaths, the effectiveness of licensed vaccines is suboptimal in low-income countries, in which, rotavirus gastroenteritis still results in >200,000 deaths annually(7). In another study, the vaccine use is estimated to have averted more than 28 000 deaths among children younger than 5 years, and expanded use of the rotavirus vaccine, particularly in sub-Saharan Africa, could have prevented approximately 20% of all deaths attributable to diarrhea among children younger than 5 years(8). The rotavirus vaccine was introduced in the Ethiopian national infant immunization program since November 2013 (13). The

introduction of Rotavirus vaccination in Ethiopia reduced the occurrence of the disease by 17% from 24% during pre-vaccine period in 2011-2013 to 20% in post-vaccine periods of five consecutive years from 2014-2017(14). Regardless of this reduction and continued vaccination of the children, Rotavirus outbreaks are occurring in different parts of the country with the current report of outbreak in Kurmuk district of Benishangul-Gumuz region. After EPHI was being informed about the outbreak, a team for response and investigation was deployed to the area.

1.1.2 Objective

1.1.2.1 General objective

- To investigate the Rotavirus outbreak and identify associated risk factors with the outbreak in Kurmuk Woreda, Benishangul-Gumuz region.

1.1.2.2 Specific objectives

- To confirm existence of Rotavirus outbreak in Kurmuk woreda.
- To describe the outbreak in place, person and time.
- To identify possible risk factors for the Rota virus outbreak.

1.1.3 Methods and materials

1.1.3.1 Study area and period

The study was conducted from Jan 30/2019 to Feb 12/2019 in Kurmuk district of Benishangul-Gumuz regional state. The district is one of the 8 districts in Assosa zone consisting 14 rural and 2 urban kebeles with a total population of 23,669. Of the total district population, 12,035(50.8%) were males. Majority 20,988 (88.7%) population live in rural area. Children under five age constituted 3829 (16.2%) of total district population. The district is bordered by Sherkole district in the North, Homosha district in the East, Assosa district in the South and North Sudan in the West. The district has lowland agro ecological zone with total surface area coverage of 1437.7 Sq.Km and annual average rain fall ranges from 700ml-1000ml and temperature (26°C-35°C). The district has one functional health center and 11 health posts.

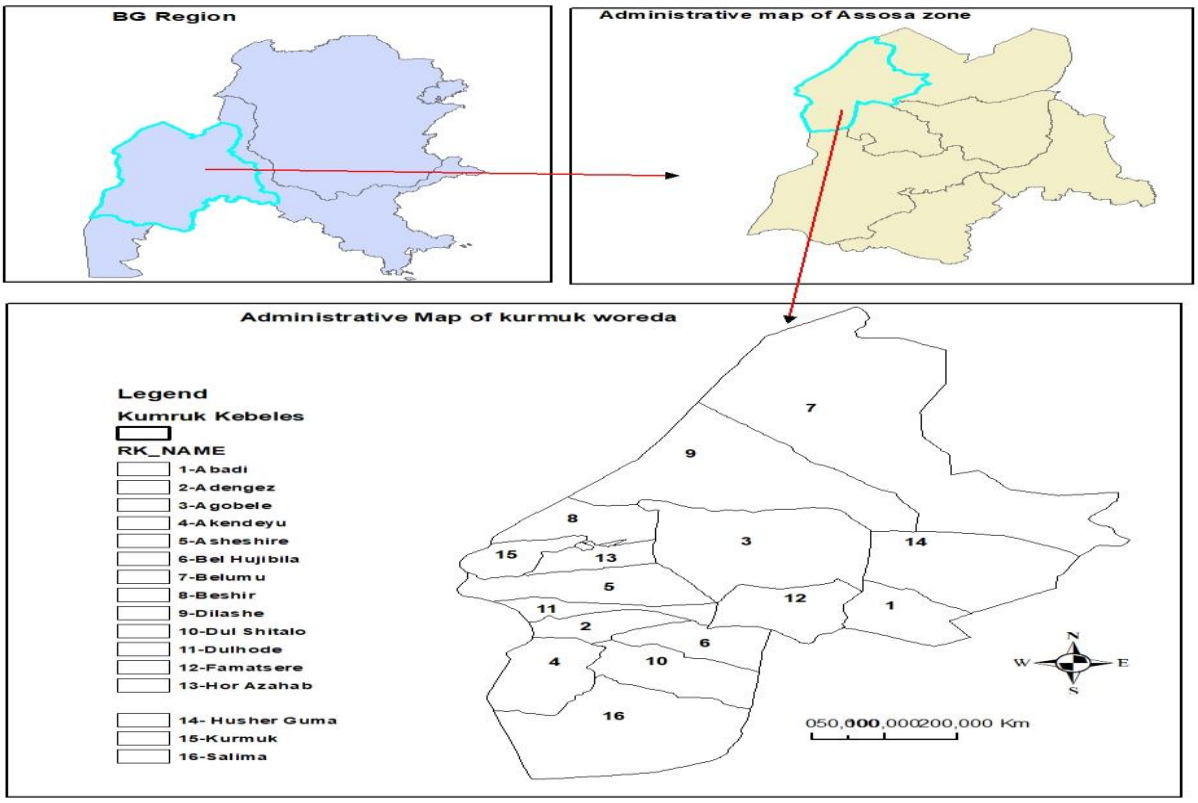

Figure 1.1: Administrative map of BGR, Assosa zone and Kurmuk district.

1.1.3.2. Study design

Unmatched case control study design supported by descriptive study was employed to investigate the Rotavirus outbreak in Kurmuk district.

1.1.3.3. Study population

All under five children living in outbreak affected kebeles of Kurmuk district, Benishangul-Gumuz regional state.

1.1.3.4. Sampling technique and sample size

Simple random sampling technique was used to select respondents for this case- control study. A line listed cases were selected randomly and controls neighboring with cases were also selected. When there are more than two eligible neighbor controls for a case, lottery method was used to take the first two. Accordingly with a ratio of one case to two controls, a total 144 respondents were selected. To determine sample size an OR of 2.9 and exposure of 35% in controls and 61% in cases were used from previous study (15) with 95% CL and 80% power.

1.1.3.5. Data collection method

A structured questionnaire was used to interview the guardians of cases and controls. By using the line list and health extension workers, we went door to door to interview parents or guardians of the study participants. Information regarding demographic characteristics, clinical history and risk factors were collected. In addition to this, documents regarding previous outbreaks were assessed and discussion about the overall outbreak situation was conducted with regional, zonal and district PHEM officers.

1.1.3.6. Laboratory method

A total of four stool samples were collected from children with diarrhea and vomiting. The stool samples were collected lately from the start of an outbreak due to insecurity problem in Western part of the country. The collected samples were transported to National Polio and Measles laboratory at EPHI and ELISA technique was used to confirm the presence of Rotavirus antigen in stool samples.

1.1.3.7. Statistical data analysis

The data was collected, entered, edited and analyzed using Epi-Info version 7.2.1.0 software. Descriptive statistics from line listed cases was produced using Microsoft excel 2013. Bivariate

and multivariate logistic regressions analyses were applied to determine possible risk factors for an outbreak. Factors with P value<=0.05 in bivariate analysis and biologically plausible were included in multivariate logistic regression and the result was interpreted using Adjusted Odds ratio, P value <0.05 and 95% confidence interval. Results for both descriptive and analytic statistics were displayed using tables and graphs. Geographical maps used in this document were produced by using ArcMap 10.4.1.

1.1.3.8. Case definitions

a) Suspected case: Any child under five years of age with sudden onset of diarrhea with vomiting, two or more episodes within 24 hours, from Dec 22, 2018 to Feb 9, 2019 and residence of Kurmuk Woreda.

b) Confirmed case: A suspected case in whose stool the presence of Rotavirus is demonstrated by means of an Enzyme Linked Immunosorbent Assay.

c) Controls: Any child under five years of age without diarrhea and vomiting and resident of Kurmuk Woreda within period of Dec 22, 2018 to Feb 9, 2019.

1.1.3.9. Inclusion and exclusion criteria

Inclusion

Cases: Any under-five child who is resident of Kurmuk district and had symptoms of Rotavirus and agreed to participate.

Controls: Any under-five child who is resident of Kurmuk district during the study who was a neighbor to a case and did not develop signs and symptoms of Rotavirus and agreed to participate was included.

Exclusion

Cases: Those cases whose parent or guardians refused to participate were excluded from the study.

Controls: Those who refused to participate were excluded from the study.

1.1.3.10. Ethical issues

A formal letter was delivered to Benishangul-Gumuz regional PHEM department from EPHI and then Regional PHEM in turn wrote a formal letter to Kurmuk district health office. Finally Kurmuk woreda health office gave permission to conduct the outbreak investigation.

1.1.4. Result

1.1.4.1. Descriptive Epidemiology

A total of 231 Rotavirus cases with 10(4.33%) hospitalization were reported in Kurmuk district from Dec.22nd 2018 up to Feb 9th 2019 in children under the age of 5 years. The overall attack rate of the outbreak was 60.3 per 1000 population. Two deaths were reported from the districts of two different kebeles with overall CFR of 0.87%. The index case was 11 months old male child from Dull-Shitallo Kebele reported on 22nd of Dec 2018 from the Health post. All (100%) of cases reported had watery diarrhea, 93(40.26%) vomiting and 53(22.94%) had fever. About 182(79%) of cases were vaccinated for Rotavirus and the vaccination coverage of woreda was 86% as of December 2018.

All of the samples collected were tested by using ELISA technique and all of them were positive for Rotavirus antigen. The remaining cases were linked epidemiologically. From the total of 29 EPI refrigerators in woreda only 16 refrigerators were functional.

Description by person

Table 1.1: Distribution of Rotavirus cases by sex and age group in Kurmuk district, 2019.

Variable	Frequency	Percent
Sex		
Male	131	56.7
Female	100	43.3
Total	231	100
Age group(Months)		
<12	88	38.1
12-35	117	50.6
36-59	26	11.3
Total	231	100

From the total reported Rotavirus cases, 131(56.7%) of them were males with the mean age of 17.33 months (SD=11.87) and 117(50.6%) were in the age group of 12-35 months (Table 1.1). Males were more affected than females with an attack rate of 67.3 cases per 1000 population. Children under the age of one year were more affected with AR of 121.2 cases per 1000 population and CFR of 2.3% (Table 1.2).

Table 1.2: AR/1000 and CFR by sex and age group in Kurmuk district, BGR, Ethiopia, 2019.

Variable	Popn. at risk	cases	Deaths	AR/1000	CFR
Sex					
Male	1947	131	1	67.3	0.76%
Female	1882	100	1	53.1	1%
Age group(Months)					
<12	726	88	2	121.2	2.3%
12-35	1504	117	0	77.8	0
36-59	1599	26	0	16.3	0
Total	3829	231	2	60.3	0.87%

Description by place

The Rotavirus cases were reported from 15 kebeles out of 16 kebeles found in Kurmuk Woreda. Among the total cases, 46 (19.91%) and 37(16.02%) were reported from Dull-Shitallo and B/Jiblla Kebeles respectively (Fig 1.2).

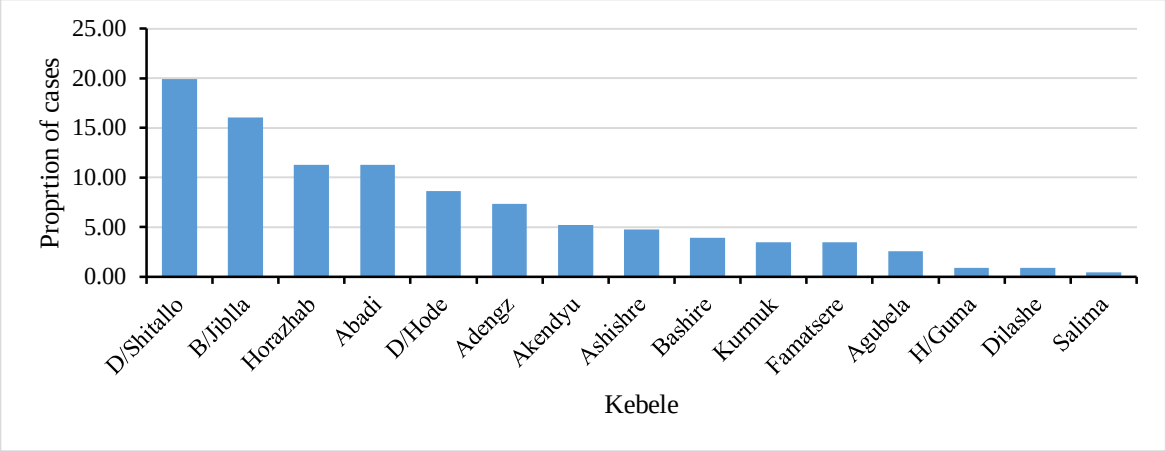

Fig 1.2: Proportion of Rotavirus cases reported by Kebeles during outbreak, Kurmuk, 2019.

Population in Bilehu-Jiblla, Horazhab, Dull-Hode and Adengz kebeles were more affected with an attack rates of 143.3, 100.8, 97.7 and 97.4 per 1000 population respectively. The overall attack rate and CFR of district were 60.3 per 1000 population and 0.87% respectively (Table 1.3).

Table 1.3: AR/1000 and CFR by reporting Kebeles of Kurmuk district, Benishangul-Gumuz, 2019.

Name of Kebele	Total Population	Population at risk	Cases	Death	Attack rate/1000	CFR
Kurmuk	1087	176	8	0	45.5	0.00%
Horazhab	1594	258	26	0	100.8	0.00%
Bashire	1255	203	9	0	44.3	0.00%
Agubela	1403	227	6	0	26.4	0.00%
Famatsere	906	147	8	0	54.6	0.00%
Abadi	2657	430	26	0	60.5	0.00%
H/Guma	1646	266	2	0	7.5	0.00%
Dilashe	1013	164	2	0	12.2	0.00%
D/Hode	1266	205	20	1	97.7	5.00%
Ashishre	1516	245	11	0	44.9	0.00%
Adengz	1079	175	17	1	97.4	5.88%
B/Jiblla	1596	258	37	0	143.3	0.00%
D/Shitallo	3189	516	46	0	89.2	0.00%
Akendyu	1089	176	12	0	68.1	0.00%
Salima	1497	242	1	0	4.1	0.00%
Total	23669	3829	231	2	60.3	0.87%

Description by time

As shown in the Fig 1.3, intervention was started lately because of delayed report from health facilities to the district health office. Health facilities continued managing patients as usual like other diarrheal diseases for more than two weeks after the first case with watery diarrhea and vomiting visited health post at Dull-Shitallo Kebele on 22 Dec 2018.

But when the cases were increasing from day to day, they started suspecting Rotavirus outbreak and informed the district health office. Accordingly the district PHEM officer informed the zonal health department and zonal health department to the regional PHEM department on 11th Jan 2019. It was after this the zonal and regional PHEM departments jointly deployed an RRT to the suspected Rotavirus outbreak area. The response and investigation team from EPHI was sent to the outbreak area lately due to security problems that caused for the blockage of roads. The outbreak continued for six weeks and the highest number of cases were recorded on 13-01-2019, the date that intervention started. This increase of new cases was related with community mobilization activities and enhancing surveillance.

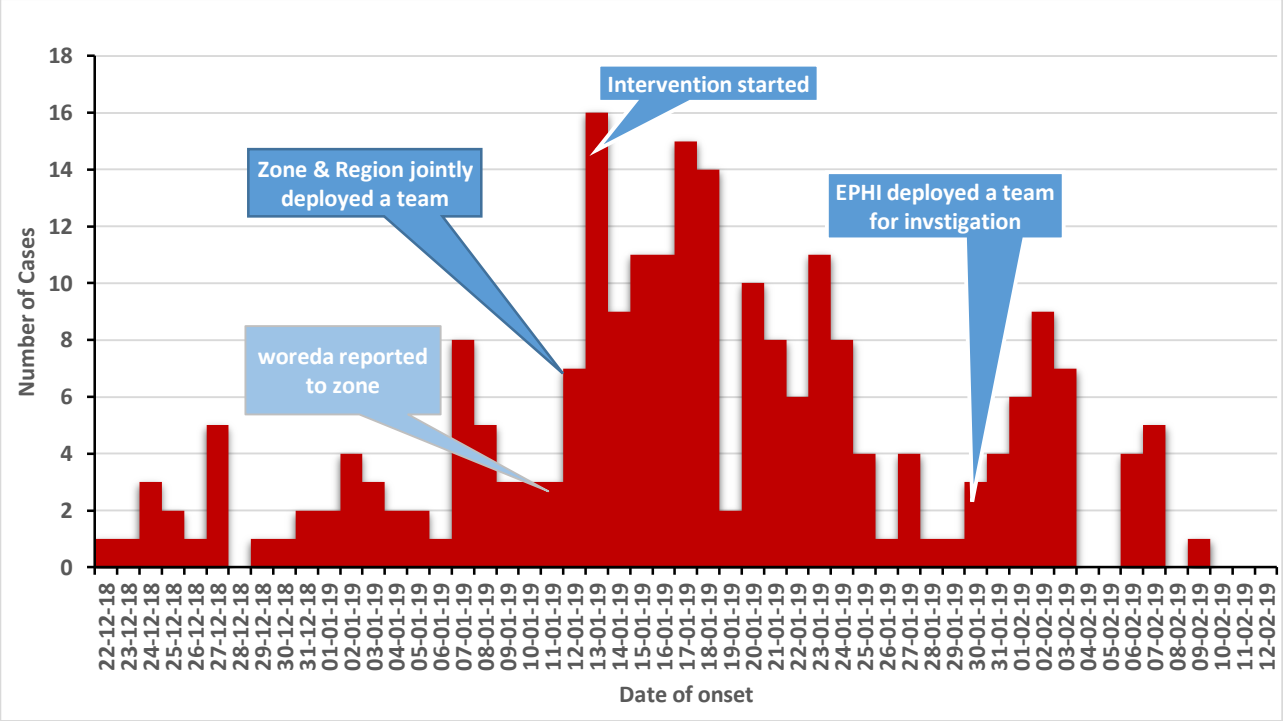

Fig 1.3: Date of onset of diarrhea/Vomit for Rotavirus outbreak from Dec 22nd 2018 to Feb 9th 2019.

Public health intervention

Cases were managed at health post and health centre levels with ORS, Zinc and supportive treatment. There was shortage of medical supplies initially but later on supplies were sent from the region, zone and also the district purchased some supplies from PFSA. The main challenges were shortage of beds for admission and treatment.

Surveillance was enhanced with house to house active case search, active case search on facility registers, provision of case definition and orientation, contact tracing and follow up, institution of daily reporting from facilities and community including zero reports. Social mobilization and health education was undertaken in the affected kebeles through the HDA and one to five community networking. Health education on the signs and symptoms, mode of transmission and on the need to seek health care was provided through meetings at school, religious institutions and market places.

1.1.4.2. Analytical epidemiology

A total of 144 study participants were include in this case control study with 48 cases and 96 controls. Majority of study participants both in cases (56.25%) and controls (58.33%) were females with mean age of 27.46±15.37 and 27.88 ±15.39 months respectively. The demographic characteristics of the study participants was shown below in Table 1.4.

Table 1.4: Demographic characteristics of participants for case-control study, Kurmuk, BGR, 2019.

Demographic variable	**Category**	**Case (%)**	**Control (%)**
Sex	Male	21 (43.75%)	40 (41.67%)
	Female	27 (56.25%)	56 (58.33%)
Age group(months)	<12	12 (25%)	16 (16.67%)
	12-35	28 (58.33%)	27(28.13%)
	36-59	8 (16.67%)	53(55.21%)
Religion	Orthodox	1(2.08%)	0
	Muslim	44(91.67%)	95(98.96%)
	Protestant	3(6.25%)	1(1.04%)
Educational status of guardian	Illiterate	15(31.25%)	44(45.83%)
	Elementary	22(45.83%)	31(32.29%)
	Secondary	7(14.58%)	6(6.25%)
	Tertiary	4(8.33%)	15(15.63%)
Ethnicity	Berta	42(87.5%)	95(98.96%)
	Amhara	2(4.17%)	0
	Gumuz	4(8.33%)	1(1.04%)
Marital status	Married	47(97.92%)	96(100%)
	Divorced	1(2.08%)	0
Occupation of family	Farmer	36(75%)	75(78.13%)
	Merchant	3(6.25%)	3(3.13%)
	Government employee	9(18.75%)	18(18.75%)

Residence	Rural	34(70.83%)	89(92.71%)
	Urban	14(29.17%)	7(7.29%)

Both bivariate and multivariate logistic regression analyses were conducted to determine risk factors for the outbreak of the disease. All factors which were statistically significant in bivariate analysis were included into the final mode of multivariate logistic regression analysis to determine potential risk factors (Table 1.5).

Table 1.5: Bivariate and multivariate logistic regression for Rotavirus outbreak in Kurmuk district, BGR, 2019.

Variable	**Category**	**Case**	**control**	**Bivariate analysis**		**Multivariate**
				COR (95% CI)	**P-v**	**AOR (95% CI)**
Contact with sick	Yes	33(68.8%)	36(37.5%)	3.67(1.75-7.66)	0.0006	**8.58(3.02-24.41)**
	No	15(31.3%)	60(62.5%)			
Vaccinated	Yes	23(47.9%)	72(75%)	0.31(0.15-0.64)	0.0015	**0.29(0.11-0.75)**
	No	25(52.1%)	24(25%)			
History of similar illnesses last year	Yes	5(10.4%)	36(37.5%)	0.19(0.07-0.53)	0.0015	**0.18(0.05-0.62)**
	No	43(89.6%)	60(62.5%)			
Traditional gold mining	Yes	40(83.3%)	51(53.1%)	4.41(1.87-10.41)	0.0007	**6.34(2.15-18.71)**
	No	8(16.7%)	45(46.9%)			
Exclusive breast feeding	Yes	25(52.1%)	68(70.8%)	0.45(0.22-0.92)	0.028	0.59(0.22-1.54)
	No	23(47.9%)	28(29.2%)			
Know advantage of vaccination	Yes	37(77.1%)	86(89.6%)	0.39(0.15-1.00)	0.05	0.33(0.09-1.29)
	No	11(22.9%)	10(10.4%)			
Practice hand washing at least 3 times	Yes	23(47.9%)	72(75%)	0.31(0.15-0.64)	0.0015	**0.34(0.13-0.89)**
	No	25(52.1)	24(25%)			
Have latrine	Yes	38(79.2%)	89(92.7%)	0.30(0.11-0.84)	0.0227	0.71(0.19-2.66)
	No	10(20.8%)	7(7.3%)			

In multivariate logistic regression, contact with cases (AOR: 8.58, 95%CI: 3.02-24.41, P: 0.0001) and traditional gold mining (AOR: 6.34, 95%CL: 2.15-18.71, P: 0.0008) were found to be risk factors. The region especially the district where the Rotavirus outbreak happened is known with high deposit of gold mineral that the community has been practicing traditional gold mining. This

practice brought a negative effect in child caring that parents left their children alone the whole day without care giver for mining. This in turn cause children to spend the day together which increases the chance of contact between sick and healthy individuals.

On the other hand, vaccination (AOR: 0.29, 95%CI: 0.11-0.75, P: 0.0108), history of similar illness (AOR: 0.18, 95%CI: 0.05-0.62, P: 0.0068), and practicing hand washing at least three critical times (AOR: 0.34, CI: 0.13-0.89, P: 0.0281) were found to be protective factors. Presence of first infection in children reduced the occurrence of the disease by about 82% after the infection which is proxy indicator for the development of immunity after first infection of Rotavirus.

1.1.5. Discussion

The study confirmed the existence of Rotavirus outbreak in Kurmuk district of Assosa zone, Benishangul-Gumuz region from Dec 22, 2018 to Feb 9, 2019. The regional health bureau declared the presence of Rotavirus outbreaks during the last two years in the same period. A study conducted on hospital-based surveillance for rotavirus gastroenteritis in children younger than 5 years of age in Ethiopia showed that Rotavirus circulated year round with peak prevalence from October through January(16). In another studies Rotavirus prevalence high peaks were observed during dry seasons of the year (17-19). Peak Rotavirus infection in Ghana was observed in cool dry months of January and February(20), which agrees with the current study. While rotavirus infections have been called a winter disease in the temperate zones, their incidence peaked in winter primarily in the Americas and that peaks in the autumn or spring are common in other parts of the world. In the tropics, the seasonality of such infections is less distinct and within 10 degrees latitude (north or south) of the equator, eight of the ten locations exhibited no seasonal trend(21). Study in Ukraine showed that increase in Rotavirus prevalence was noticed in winter months(22) which is similar with the current outbreak in Kurmuk district.

Vaccination is the best way to prevent severe rotavirus disease and the deadly, dehydrating diarrhea that it causes. In high and middle income countries, rotavirus vaccines confer 85-100% protection against severe disease, while in low income regions of Africa and Asia, protection is less, at 46-77%(23). In the current study, being vaccinated was protective against Rotavirus infection, which reduced the occurrence of a disease by 71% among vaccinated groups. After the introduction of vaccine in Thailand, Rotavirus related hospital admissions were reduced by 40%-69%(24). Similarly, following the vaccine introduction in Kenya, the proportion of children aged

<5years hospitalized for rotavirus declined by 30% in the first year and 64% in the second year. Reductions in rotavirus positivity were most pronounced among the vaccine-eligible group (<12months) in the first year post-vaccination at 42%. Greater reductions of 67% were seen in the second year in the 12-23months age group(25). In contrary to this, diarrhea hospitalizations due to Rotavirus among children <5years of age was decline only by 17% from 24% in the pre-vaccine period to 20% in post-vaccine in Ethiopia. In the same study, a reduction of 18% of diarrhea hospitalizations due to Rotavirus in children <12months of age in the post-vaccine periods was observed(14). Rotavirus vaccine has shown a major impact in hospital admission in Australia by reducing 71% of Rotavirus hospitalizations in under five years of age(3).

In the current study, children who had contact with cases of Rotavirus are 8.6 times more affected than those who hadn't contact with cases. A case-control study conducted for Rotavirus outbreak in South China found contact as risk factor that children who had contact with cases were 2.1 times more affected(26). Similarly in an outbreak happened during the school trip, the study revealed that the disease was spread from a single pupil to classmates due to prolonged contact(27). A study of infectious intestinal disease in England reported contact with cases as risk factor with Odds Ratio of 3.45 and P Value of < 0.001(28), which agrees with current outbreak in Kurmuk district.

A study conducted in Guinea-Bissau to determine the Protective immunity after natural rotavirus infection reported that primary infection conferred 52% and 70% protection against subsequent rotavirus infection and rotavirus diarrhea, respectively(29). Another study also indicated that primary Rotavirus infection conferred protection against reinfection for more than two years(30). Protection against moderate or severe disease increased with the order of infection but was only 79% after three infections. Early infection and frequent reinfection in a locale with high viral diversity resulted in lower protection than has been reported, providing a possible explanation why rotavirus vaccines have had lower-than-expected efficacy in Asia and Africa(31). In the current study, previous infection of Rotavirus reduced the subsequent reinfection by 82% which could be a serotype of best vaccine candidate.

Use of improved sanitation and hand washing are thought to be measures to reduce diarrheal diseases as indicated by a number studies. In a study conducted at rural kebeles of Adama district, the prevalence of under-five child diarrheal was reduced due to improved hand washing practice in mothers/guardians of children(32). Similarly, a study conducted in Arba Minch district

highlighted that poor hand washing practice among mothers resulted in high risk of diarrheal diseases in under-five children(33). Hand washing practice with soap during critical times and WASH educational messages reduces childhood diarrhea by 37% in Jigjiga district of Somali regional state(34). In addition to the above studies, many other studies reported low practice of hand washing in communities resulted for high prevalence of diarrheal diseases in under-five children(35-37). In the current study, those mothers/caretakers who has been practicing hand washing at least three times per day reduced the incidence of Rotavirus disease by 66%, which fairly agrees with above cited studies.

In this study, traditional gold mining was found to be statistical significant factor for the Rotavirus outbreak happened in the district. The Kurmuk district is known for high deposit of gold mineral that the community has been practicing traditional gold mining. Traditional gold mining practice in the district is high during winter because during this season most of the grass and bushes became dry and they set fire on them and the ground becomes suitable to locate gold deposit by sensor machines. This practice brought a negative effect in child caring that parents left their children alone the whole day without caretaker for mining. These children spent the day together and the chance of contact between sick and healthy, coming in contact with dirty materials are so high that contracting the disease is so high.

1.1.6. Conclusion and recommendations

Rotavirus outbreak was confirmed in the Kurmuk district and factors that increased the odds of Rotavirus infection in under-five children were contact with sick children and traditional gold mining whereas, being vaccinated, history of previous infection with Rotavirus and mothers/caretakers practicing hand washing at least three times per day were found to be protective against Rotavirus infection.

Therefore, to prevent the Rotavirus outbreak in the future:

- ✓ Mothers should be educated on child caring, mode of diarrheal disease transmission and good hygiene practices.
- ✓ Vaccination coverage should be improved and factors that affect vaccine efficacy like cold chain should be assessed in the woreda.

- ✓ Identifying the genotype of Rotavirus circulating in the community is necessary and helps to know the reason why previous infection is better protective than vaccination.

1.1.7. Limitation of the Study

During the house to house visit for case control study most of children didn't have vaccination card. Therefore, for most of children their vaccination status was obtained just by asking their parents. This may cause bias on vaccination status of children.

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1.2. Suspected Anthrax outbreak investigation in Homosha woreda, Assosa zone of Benishangul-Gumuz region, April, 2019.

Abstract

Introduction: Anthrax is a bacterial disease of warm blooded animals including human beings caused by the spore forming *Bacillus anthracis*. Anthrax has been an important cause of fatal human illness in most parts of the world, it holds an important position because of its zoonotic potential especially in developing countries where effective prevention and control measures are still low. This investigation was conducted mainly to identify risk factors for suspect anthrax outbreak.

Method: Descriptive followed by unmatched case-control study was conducted from April 12-19, 2019 in Homosha woreda of Benishangul-Gumuz regional state. A total of 92 samples with 1:1 case to controls were selected and data was collected by using structured questionnaire and analyzed using Epi-Info version 7.2.1.0. Results were interpreted using Adjusted Odds ratio, P value <0.05 and 95% CI.

Result: From 168 individuals who consumed the meat, 122 developed sign and symptoms. All of them had suspected GIT form of anthrax. One dog was died after consuming an offal. Females were more affected with AR of 4.9 persons per 1000 population and the overall AR was 3.97 persons per 1000 population. Eating cooked meat was protective compared to eating grilled meat (AOR: 0.053, 95%CI: 0.009-0.313, P: 0.001) whereas consuming raw meat was associated with developing anthrax compared with grilled meat (AOR: 5.14, 95%CI: 1.5-17.6, P: 0.009). Livestock anthrax vaccination coverage was zero in the woreda.

Conclusion: Consumption of raw meat was a statistically significant risk factor for the outbreak of anthrax. Those who consumed cooked meat were protected from developing a disease. Lack of livestock vaccination and culture of slaughtering sick animals for consumption would be contributing proxy factors for the current anthrax outbreak. Therefore, livestock vaccination, safe carcass disposal, public awareness campaigns and strong surveillance system for human and animal sectors should be implemented using the One Health approach in anthrax hotspot areas.

Key words: Anthrax outbreak, investigation, Homosha, Benishangul-Gumuz

1.2.1. Introduction

Anthrax is a bacterial disease of warm blooded animals including human being caused by the spore forming *Bacillus anthracis*, a Gram-positive, rod shaped bacterium the only obligate pathogen in the large genus *Bacillus*. Before vaccines and antibiotics became available, and at a time when understanding of industrial hygiene was relatively basic, workers in at risk industrial occupations processing animal products were exposed to significant numbers of anthrax spores on a daily basis(1). Anthrax has been an important cause of fatal human illness in most parts of the world, but in developed countries it is no longer a significant cause of human or livestock wastage because of appropriate control measures. However, it still holds an important position because of its potential as a zoonosis and it is still an important zoonosis in developing countries(2). *Bacillus anthracis* has always been high on the list of potential agents with respect to biological warfare and bioterrorism(3).

Anthrax is globally distributed disease, reported from all continents that are populated heavily with animals and humans. Animal anthrax outbreaks have been recorded in nearly 200 countries by The World Anthrax Data Site(4). An estimated 1.83 billion people live within regions of anthrax risk, but most of that population faces little occupational exposure. More informatively, a global total of 63.8 million livestock keepers and 1.1 billion livestock live within vulnerable regions. Human and livestock vulnerability are both concentrated in rural rain-fed systems throughout arid and temperate land across Eurasia, Africa and North America(5).

Animal anthrax is an endemic disease in Ethiopia which occurs in May and June every year (anthrax season) in several farming localities of the country (6). According to the surveillance data of Ethiopia Ministry of Health, a total of 1,096 suspected human anthrax cases and 16 deaths with a Case Fatality Rate (CFR) of 1.5% were reported from four regions (Tigray, Amhara, Oromia, and SNNPR) during Ethiopian fiscal year of 2010/2011(7). As Ethiopian health sector performance report of 2016/17 EFY, a total of 676 anthrax cases were reported with CFR of 1.0%. The highest proportion of cases was reported from Amhara Region (53.1%) followed by Tigray Region (18.2%), while highest CFR was from Somali Region (1.8%) followed by SNNPR (1.4%)(8). According to the retrospective data analysis report of years 2009-2013, a total of 5197 anthrax cases and 86 deaths with CFR of 1.7% was recorded in humans while a total of 26737 cases of animal anthrax were recorded during these five years period. This study also showed that,

99.9% human and 98% animal anthrax cases were reported from four regions Amhara, Oromia, SNNPR, and Tigray where they have comparatively good surveillance system and trained manpower (9). In Benishangul-Gumuz region where the current suspected human anthrax outbreak was reported, little is known except 216 cases of animal anthrax report from 2009-2013 may be due to week surveillance activities in the region.

Vaccination of livestock is the fundamental control measure for anthrax in enzootic areas with seasonal recurrence of the disease(10). Vaccination rates are alarmingly low in sub-Saharan Africa (0-6%), East Asia (0-5%) and South Asia (< 1%), where more than half of the livestock at risk and 48.5 million rural poor livestock keepers are located. In these regions, livestock vaccination is commonly used reactively after a major outbreak, rather than as a preventative measure(11, 12); improving proactive vaccination in under-vaccinated, hyper endemic countries (in particular Afghanistan, Bangladesh, Ethiopia, South Africa, Turkey, and Zimbabwe) could help bring anthrax outbreaks under control (13).

In the current suspected anthrax outbreak woreda animal anthrax vaccination coverage was zero before and after the outbreak even though the woreda has a total of 13,819 large domestic animals including sheep and goats and 16,669 poultry(14). On April 11/2019 Benishangul-Gumuz regional state health Bureau PHEM department reported the presence of suspected anthrax outbreak in Homosha woreda to EPHI. Following this report EPHI deployed a team consisting; one from zoonotic department, one from bacteriology laboratory and one Field resident with the aim of response and outbreak investigation activities.

1.2.2. Objective

1.2.2.1. General objective

To investigate suspected anthrax outbreak and identify risk factors associated with this outbreak in Homosha Woreda of Benishangul-Gumuz region.

1.2.2.2. Specific objectives

- To confirm existence of outbreak
- To describe the outbreak in place, person and time
- To identify possible risk factors for the outbreak

1.2.3. Methods and materials

1.2.3.1. Study area and period

The study was conducted from April 12/2019 to April 19/2019 in Homosha woreda of Benishangul-Gumuz regional state. The woreda is one of the 7 woredas in Assosa zone consisting 15 rural kebeles with a total population of 30,754. Of the total woreda population, 15685(51%) were females. Children under five age constituted 4976 (16.18%) of total woreda population. The woreda is bordered by Menge woreda in the East, Assosa woreda in the South and South West, Kurmuk woreda in the North and North West. The woreda has an altitudinal range of 1272-1572 feet from the sea level with total surface area coverage of 708.42 Sq.Km and annual average rain fall ranges from 900ml-2500ml and temperature (29°C-41°C). The woreda has one functional health center and 11 health posts.

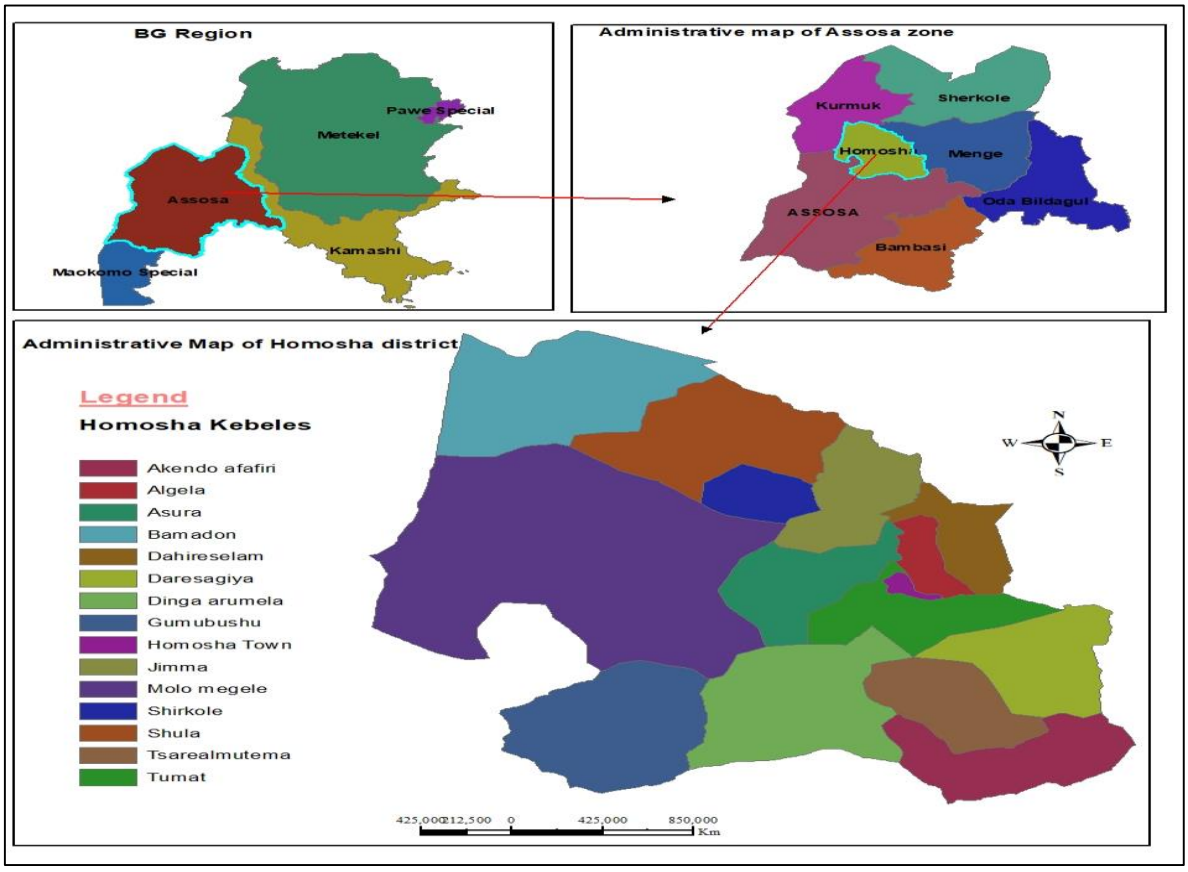

Fig 1.4: Administrative map of BGR, Assosa zone and Homosha woreda.

1.2.3.2. Study design

Unmatched case control study design was employed to investigate the Suspected Anthrax outbreak in Homosha woreda, Bamadon Kebele.

1.2.3.3. Study population

All population living in Bamadon Kebele of Homosha woreda, Benishangul-Gumuz regional state.

1.2.3.4. Sampling technique and sample size

Line listed cases in the affected Kebele were selected by random sampling technique and all individuals who consumed the meat of the sick bull but without sign and symptoms of anthrax were taken as controls. There were 46 individuals who didn't develop sign and symptoms of anthrax after consuming the meat. For each control one case was selected. Accordingly a total of 92 study participants were selected and interviewed. We closely followed those controls for one week and if they developed sign and symptoms of an anthrax we discarded from being control.

1.2.3.5. Data collection method

A structured questionnaire was used to interview cases and controls. By using the line list and health extension workers, we went door to door to interview the study participants. Information regarding demographic characteristics, clinical history and risk factors. During door to door interview when we encountered with underage case(less than 18 years), parents/guardians were interviewed as their proxy. In addition to this, documents regarding previous incidents, if any were assessed and discussion about the overall outbreak situation was conducted with regional, zonal and woreda PHEM officers. Information about livestock population and vaccination coverage of Assosa zone and its woredas was collected from Benishangul-Gumuz regional state Livestock and Fishery Development Agency.

1.2.3.6. Laboratory sample collection

A total of 11 blood samples were collected in to universal blood collection tube aseptically from anthrax suspected cases. These blood samples were centrifuged at Homosha health center and serum samples were transported to Ethiopian Public Health Institute Microbiology Laboratory keeping in cold icebox. In addition to this, meat sample of sick slaughtered bull was collected and sent to National Animal Health Diagnostic and Investigation Center at Sebeta for molecular characterization of the bacteria.

1.2.3.7. Statistical data analysis

The data was collected, entered, edited and analyzed using Epi-Info version 7.2.1.0 software. Descriptive statistics from line listed cases was produced using Microsoft excel 2013. Bivariate and multivariate logistic regressions analyses were applied to determine possible risk factors for an outbreak. Factors with P value<=0.05 in bivariate analysis and biologically plausible were included in multivariate logistic regression and the result was interpreted using Adjusted Odds ratio, P value <0.05 and 95% confidence interval. Results for both descriptive and analytic statistics were displayed using tables and graphs. Geographical maps used in this document were produced by using ArcMap 10.4.1.

1.2.3.8. Case definitions

a) Suspected case: Any person who consumed the meat of sick bull and with abdominal distress characterized by nausea, vomiting, diarrhea, abdominal bloating, anorexia and followed by fever, from April 9, 2019 to April 12, 2019 and resident of Bamadon Kebele, Homosha woreda.

b) Confirmed case: A suspected case that is laboratory confirmed with ELISA or Western blot, toxin detection, chromatography assay, fluorescent antibody test.

c) Controls: Any person who consumed the meat of sick bull but without clinical manifestation of anthrax and resident of Bamadon Kebele, Homosha woreda.

1.2.3.9. Inclusion and exclusion criteria

Inclusion

Cases: Any person who is resident of Bamadon Kebele, consumed the meat and had sign and symptoms of anthrax and agreed to participate in the study.

Controls: Any person who consumed the meat of a sick bull which was slaughtered at Bamadon Kebele but didn't develop sign and symptoms of anthrax and agreed to participate in the study.

Exclusion

Cases: those cases who were not around during the study were excluded from the study.

Controls: those controls who refused to participate in the study were excluded.

1.2.3.10. Ethical issues

A formal letter was delivered to Benishangul-Gumuz regional PHEM department from EPHI and regional PHEM in turn wrote a formal letter to Homosha woreda health office. Then the woreda health office permitted us to investigate the outbreak.

1.2.4. Result

1.2.4.1. Descriptive Epidemiology

Case scenario

A bull which was in the wild for a week was brought to a village in Bamadon Kebele by one the resident of this village who went to the forest for hunting purpose on April 6/2019. Fortunately the owner of the bull heard as it was found and came to the village on April 7, 2019 in the morning. The owner thanked the finder and decided to take the bull back on the next day of April 8, 2019 at the morning. But the bull manifested an acute sickness on April 7, 2019 midnight local time. According to the culture of the community a sick animal should be bleed before death and should be used for consumption. Therefore, the attendant of the bull in this case the finder discussed the issue with some of the community leaders and decided to be slaughtered/bled at that night. After reporting the event to the bull owner at the morning on April 8, 2019, the meat of bull was sold to the community with lower price for consumption. A total 168 individuals consumed the meat.

Following the consumption of meat on April 8, 2019 served for lunch, some of the consumers started showing signs and symptoms of gastro-intestinal anthrax on April 9, 2019 afternoon. Health extension worker reported to the Homosha woreda PHEM office as the number of cases increased hour to hour. After zonal and regional PHEM offices were notified on April 10, 2019, the presence of suspected anthrax outbreak was reported to EPHI. A total of 122 individuals developed sign and symptoms of GIT anthrax out of 168 individuals consumed the meat. In addition to the human cases, there was death of one dog after consuming an offal of sick slaughtered bull.

The outbreak was stopped in four days with highest number of cases recorded on April 10, 2019. This interruption of the disease within three days was because of the public health intervention activities especially targeted on door to door searching of meat and disposing it appropriately.

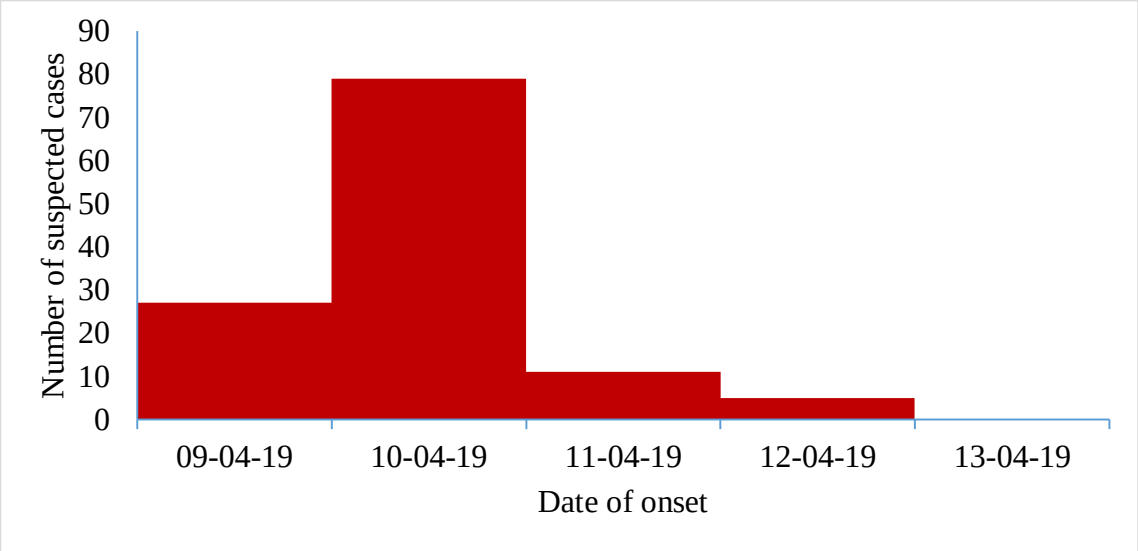

Figure 1.5: Date of onset of suspected GIT anthrax in Homosha woreda, Assosa zone, April 2019.

Major clinical findings of suspected gastro-intestinal cases were diarrhea, Vomiting, fever and abdominal cramp and their proportion was shown in Fig 1.6 below.

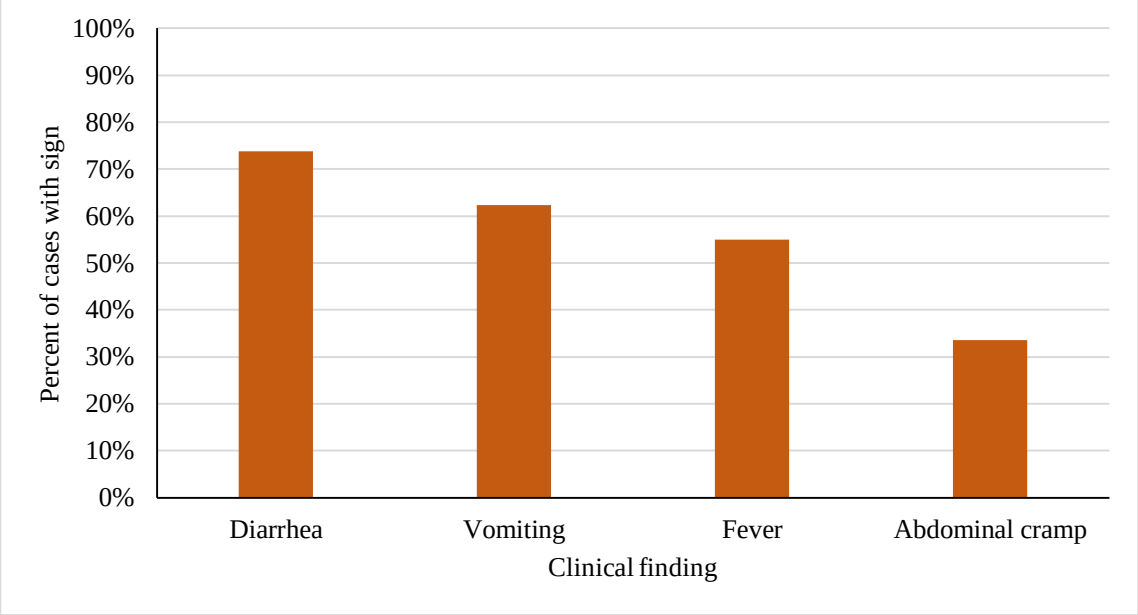

Fig 1.6: Major clinical findings in suspected GIT anthrax cases in Homosha Woreda, April, 2019

Table 1.6: Distribution of suspected GIT anthrax by sex and age group in Homosha woreda, April, 2019.

Variable	Frequency	Percent
Sex		
Male	45	36.9
Female	77	63.1
Total	122	100
Age groups(Yrs.)		
0-14	78	63.9
15-29	21	17.2
30-59	17	13.9
60+	6	5.0
Total	**122**	**100**

From the total reported suspected anthrax cases, 77(63.1%) of them were females with the mean age of 19.8 years (SD=17.2) and 78(63.9%) were in the age group of 0-14 years (Table 1.6).

Females were more affected than males with an attack rate of 4.91cases per 1000 population. During this suspected gastro-intestinal anthrax outbreak the only Kebele affected out of fifteen Kebeles found in Homosha woreda was Bamadon. The attack rate at the Kebele level was 50.31 cases per 1000 population whereas at woreda level it was 3.97 cases per 1000 population (Table 1.7)

Table 1.7: AR/1000 of suspected anthrax by sex and place in Homosha woreda, Assosa zone, BG, 2019.

Variable	Population at risk	cases	Deaths	AR/1000	CFR
Sex					
Male	15069	45	0	2.99	0%
Female	15685	77	0	4.91	0%
Place					
Bamadon Kebele	2425	122	0	50.31	0%
Homosha woreda	**30,754**	**122**	**0**	**3.97**	**0%**

Animal anthrax vaccination coverage

Table 1.8: 2018/2019 EFY livestock population and anthrax vaccination coverage by woreda in Assosa zone, April 2019.

Woreda	Population of livestock	Vaccination coverage
Assosa	57432	2%
Bambasi	61651	0
Sherkole	68388	0
Homosha	13372	0
Menge	45747	0
Kurmuk	17870	0
Oda	25882	0
Assosa zone	290342	0.4%

As shown in Table 1.8 above six woredas out of total seven woredas found in the zone had zero vaccination coverage before and after the suspected GIT anthrax outbreak. At zonal level anthrax vaccination coverage was only 0.4% which said to be very low. As the slaughtered sick bull and dead dog were from Homosha Woreda, where vaccination coverage was nil, their vaccination status against anthrax also nil.

Public health intervention

Cases were managed at health post and health centre levels with antibiotics like Amoxacyciline, Doxycycline and Ciprofloxacin and supportive treatments. Cases were recovering from the disease. Surveillance was enhanced with house to house active case search, active case search on facility registers, provision of case definition and orientation, tracing and follow up of those who ate infected meat of bull, institution of daily reporting from facilities and community including zero reports. During house to house visit, leftover meat was assessed in each and every house and properly disposed. The hide of bull was found during this assessment in one house and burned carefully far away from the villages. The floor where the bull was slaughtered and the hide was kept was disinfected thoroughly.

Social mobilization and health education was undertaken in the affected Kebele through the HDA and one to five community networking. Health education on the signs and symptoms, mode of transmission and on the need to seek health care was provided through meetings at school, religious institutions and market places.

Figure 1.7: Community awareness creation and data collection, Bamadon Kebele, Homosha woreda, April 2019.

Figure 1.8: Burning the hide of anthrax suspected bull slaughtered at Bamadon Kebele, Homosha Woreda, April 2019.

1.2.4.2. Analytical epidemiology

A total of 92 study participants were include in this case control study with 46 cases and 46 controls. The mean age of study participants was 31.4±14.24 years in which males were 54.34%. All of the cases had diarrhea, vomiting and abdominal cramps. More than half (55.4%) of study participants had no any kind of formal education. The demographic characteristics of the study participants was shown below in Table 1.9

Table 1.9: Demographic characteristics of participants for case-control study, Homosha woreda, BGR, April 2019.

Demographic variable	Category	Case (%)	Control (%)
Sex	Male	24 (52.17%)	26 (56.52%)
	Female	22 (47.83%)	20 (43.48%)
Educational status	Illiterate	26(56.52%)	25(54.35%)
	Elementary	19(41.3%)	21(45.65%)
	Secondary	1(2.17%)	0(0%)
Marital status	Married	34(73.91%)	32(69.57%)
	single	12(26.09%)	13(28.26%)
	Widowed	0	1(2.17%)
Occupation	Farmer	32(69.57%)	32(69.57%)
	student	12(26.09%)	13(28.26%)
	Government employee	2(4.35%)	1(2.17%)
	House wife	0	7(8.14%)
Residence	Rural	46(100%)	46(100%)
	Urban	0(0%)	0(0%)

Both bivariate and multivariate logistic regression analyses were conducted to determine risk factors for the outbreak of the disease. All factors which were statistically significant in bivariate analysis were included into the final mode of multivariate logistic regression analysis to determine potential risk factors (Table 1.10).

Table 1.10: Bivariate and multivariate logistic regression for anthrax outbreak in Homosha woreda, BGR, 2019.

Variable		case	control	Bivariate		Multivariate
				COR (95%CI)	P-V	AOR(95%CI)
Ate grilled meat		11(23.9%)	10(21.7%)	1.00	-	1.00
Ate cooked meat		2(4.4%)	30(65.2%)	0.06(0.01-0.32)	0.001	**0.05 (0.01-0.31)**
Ate raw meat		33(71.4%)	6(12.1%)	5.00(1.48-16.95)	0.01	**5.14(1.50-17.58)**
Have information about anthrax	Yes	8(17.4%)	17(37%)	2.78(1.06-7.34)	0.038	0.62(0.15-3.08)
	No	38(82.6%)	29(63%)			

During bivariate logistic regression factors like exposure to animal body fluids; exposure to any sick animal which has bleeding from natural orifices; exposure to animal products like skin/hide, hair/wool and milk/yoghurt; working with soil in the garden and working in microbiology laboratory were found be statistically insignificant factors. In multivariate logistic regression, eating cooked meat compared to grilled meat was found to be protective factor (AOR: 0.053, 95%CI: 0.009-0.313, P: 0.001) where as those who ate raw meat had 5.14 times higher chance of developing an anthrax disease compared to those who ate grilled meat (AOR: 5.14, 95%CI: 1.5-17.6, P: 0.009).

1.2.5. Discussion

Human anthrax is most common in enzootic areas in low- and middle-income countries, among people who work with livestock, eat undercooked meat from infected animals, or work in establishments where wool, goat skins and pelts are stored or processed. In impoverished communities, livestock owners are driven by economic factors to slaughter animals at the first sign of infection in order to salvage the meat, hair and hides(15). This study found that consumption of raw meat of slaughtered sick bull was significant risk factor which caused suspected anthrax outbreak in the community. In a study done in Tanzania, dressing of sick or dead animals and using them as meat for human consumption was a risk factor for disease outbreaks(16). Another study done in Zambia also indicated that consumption of meat of sick/dead animals was risk factor for anthrax transmission(17). Similarly a study from Lake Rukwa valley in southwest Tanzania reported that touching infected carcasses and animal products was a potential risk for anthrax transmission in the community(18). A study conducted in Paraguay reported an anthrax outbreak with (OR: 16.5, P: 0.02) following touching of raw meat of an ill cow(19). A study of risk factors for human anthrax in Kazakhstan reported that eating raw meat was a risk factor whereas eating boiled meat was protective against the anthrax disease(20).

The temporal sequence of consumption of meat from anthrax suspected sick animal and occurrence of human anthrax supports the theory that anthrax transmission occurs from animal to human(2, 10). This outbreak was reported during dry period that cattle are forced to graze tough, scratchy feed close to the ground, which results in abrasions of the oral mucosa and this facilitates entry of bacteria(2).

Animal vaccination is a vital tool to prevent and control anthrax in animals and, thus, prevent infection in humans(10). Regardless of this advantage of vaccine and the serious of disease for both public and animal population, the livestock anthrax vaccination coverage was negligibly low both at woreda and zonal levels compared to the study conducted in Raya Alamata woreda which reported the anthrax vaccination coverage of 41% from 2010-2011(21). Lack of livestock vaccination against the disease contributes for the spillover of human anthrax, according to the study conducted in Bangladesh(22). Another study conducted in Elu Aba Bor Zone, Western Ethiopia also reported anthrax vaccination coverage of 10.36% which is fairly higher than the current finding(23).

Lack of awareness in the community about the disease along with risky behaviors like high interest for meat and slaughtering sick animals for meat consumption made ease for the occurrence of anthrax outbreak in the area. Lack of the substantial level of public awareness in the outbreak areas is considered to be responsible for the human anthrax occurrence(22, 24). Similarly, a study conducted in Zambia among anthrax affected population reported that the main factors for their infection was consumption of dead/sick animal meat due lack of awareness, education and high poverty(25).

1.2.6. Conclusion and recommendations

Consumption of raw meat of sick bull was statistically significant risk factor for the anthrax where as those who ate boiled meat were protected from the disease. Lack of livestock vaccination, habit of slaughtering sick animals for human consumption would be proxy factors which contributed for the occurrence of current anthrax outbreak. Therefore, the following are recommendations forwarded as preventive and control measures:-

- Livestock should be vaccinated for anthrax and other diseases.
- Health education about the zoonotic diseases and their mode of transmission, prevention and control should be provided for the community.
- Awareness should be created regarding negative consequence of slaughtering sick domestic and wild animals for human consumption.
- Collaboration and communication between animal and human health sectors should be strengthened.

- Surveillance of anthrax and other zoonotic diseases should be strengthened and conducted as one health between these sectors.

1.2.7. Limitation of the study

Even though both blood and meat samples were collected and sent to the national laboratory, the results are still pending.

1.2.8. References

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Chapter 2 : Surveillance data analysis report

Surveillance data analysis report on Meningococcal meningitis in South Nations, Nationalities and Peoples' Region from 2013-2017.

Abstract

Background: Meningococcal meningitis is a contagious disease caused by Gram-negative diplococci bacteria called, *Neisseria meningitidis (Nm)*. Currently, the largest and most reoccurring outbreaks have been located in the semi-arid area of sub-Saharan Africa in an area known as the African meningitis belt. As Ethiopia is in the African meningitis belt and so does SNNPR, regular analysis of surveillance data is important in order to generate up to date information about the disease.

Method: The study used a retrospective descriptive analysis of secondary clinical and laboratory data collected in the SNNPR by weekly reporting forms from 2013-2017 and reported through the Public Health Emergency Management Surveillance system. The study used all patients of suspected and confirmed meningococcal meningitis in the region reported to EPHI on weekly basis from 2013-2017.

Result: A total of 4571 suspected meningitis cases and 83 deaths were reported in the region from 2013-2017. Out of the total suspected cases reported 969 (21.2%), 705 (15.4%), 479 (10.5%), 396 (8.7%) and 377 (8.2%) were reported from Sidama, Wolayita, Hawassa, Gedeo and Halaba zones respectively. The highest average incidence rate was recorded in Hawassa with IR of 32.57/100000 followed by Halaba and Basketo zones with average IR of 28.55/100000 and 13.35/100000 respectively and in regional level the highest incidence and case fatality rates were recorded in 2013 with IR and CFR of 8.8 per 100000 population and 2.30% respectively. The average incidence and case fatality rates of the region during five years was 5.01 per 100,000 population and 1.82% respectively.

Conclusion: Meningitis is still a public health problem in SNNPR, despite it showed a gradual decline in incidence during the years 2013 through 2017. But a slight increase in 2017 compared to the year 2016, highlights a need to further strengthening the surveillance activities and actions against the disease like booster vaccination in the region.

Keywords: Surveillance, SNNPR, Meningococcal meningitis

2.1 Background

Meningitis is a disease that has had some form of impact on nearly every part of the world. Currently, the largest and most reoccurring outbreaks have been located in the semi-arid area of sub-Saharan Africa in an area known as the African meningitis belt, occurring in seasonal cycles between late November and late June, meningococcal epidemic season can vary in intensity due to location and the arrival of the rainy season(1). Within the African Meningitis Belt, epidemics of meningococcal disease often occur in cycles of eight to fifteen years.

Bacterial meningitis is an ongoing threat to the population of the AMB, a region characterized by the highest incidence rates worldwide. The determinants of the disease dynamics are still poorly understood; nevertheless, it is often advocated that climate and mineral dust have a large impact. Over the last decade, several studies have investigated this relationship at a large scale. Bacterial meningitis is a contagious disease transmitted from individual to individual by airborne droplets of respiratory or throat secretions.

The highest burden of the disease occurs in the "**AMB**" a region stretching from Senegal to Ethiopia with an estimated population of over 300 000 million people (2). While Neisseria meningitis A is the main cause of large epidemics, serogroups W135, C and X are also responsible for localized outbreaks(3, 4) as well as *Streptococcus pneumoniae* or *Haemophilus influenzae* type B. Increase in incidence is typically observed every dry season, with weekly incidence rates reaching up to 100 per 100 000 population in individual communities (5, 6). Even with appropriate treatment, the mortality rate fluctuates around 10 percent, and 10–15% of survivors suffer long-term neurological sequelae (7). Asymptomatic carriage is common, which most often does not lead to the consecutive development of the illness (8, 9).

Despite a strong seasonality, the determinants of meningitis dynamics are still poorly understood. Various factors are likely involved in the underlying mechanism of the disease dynamics, including (re)introduction of consecutive strains (6, 10), vaccination impact, population dynamics and immunity (11, 12); climate and dust are often advocated as having a large impact. The epidemic season for meningitis coincides with the dry season and ends with the arrival of the African monsoon (2, 13, 14); early epidemic onset often correlates with high annual incidence(15).

Figure 2.1*: The African Meningitis Belt Area.* Source: Control of epidemic meningococcal disease, WHO practical guidelines, World Health Organization, 1998, 2nd edition, WHO/EMC/BAC/98.3.

As mentioned in WHO meningitis guideline (16), the following are risk factors which aggravate the disease occurrence.

Age: Infants are at higher risk for bacterial meningitis than people in other age groups. However, people of any age are at risk.

Community setting: Infectious diseases tend to spread more quickly where larger groups of people gather together. College students living in residence halls and military personnel are at increased risk for meningococcal meningitis.

Certain medical conditions: There are certain diseases, medications, and surgical procedures that may weaken the immune system or increase the risk of meningitis.

Working with meningitis-causing pathogens: Microbiologists who are routinely exposed to meningitis-causing pathogens are at increased risk.

Travel: Travelers to the meningitis belt in sub-Saharan Africa may be at risk for meningococcal meningitis, particularly during the dry season. Also at risk for meningococcal meningitis are travelers to Mecca during the annual Hajj and Umrah pilgrimage.

World Health Organization promotes a strategy comprising epidemic preparedness, prevention, and outbreak control. Preparedness focuses on surveillance, from case detection to investigation and laboratory confirmation. Prevention consists of vaccinating individuals from age groups at

major risk using a conjugate vaccine targeting appropriate sero-groups. Epidemic response consists of prompt and appropriate case management and reactive mass vaccination of populations not already protected through vaccination. In December 2010, a new meningococcal A conjugate vaccine was introduced in Africa through mass campaigns targeting persons 1 to 29 years of age. As of November 2017, more than 280 million persons have been vaccinated in 21 African belt countries. Its impact on the reduction in disease and epidemics is significant: a 58% decline in meningitis incidence and 60% decline in the risk of epidemics were described. It is now introduced into routine infant immunization. Maintaining high coverage is expected to eliminate meningococcal A epidemics from this region of Africa. However, other meningococcal sero-groups such as W, X and C still cause epidemics and around 30 000 cases are reported each year in the meningitis belt. World Health Organization is committed to eliminating meningococcal disease as a public health problem (17).

A Meningitis risk assessment conducted by WHO, with support from the Global Alliance for Vaccines and Immunization (GAVI), determined the risk profile by region in 2012. Ethiopia has launched large scale campaigns in three phases targeting all regions over a period of three years; the first phase, conducted in October 2013, successfully reached 19 million people. The second phase campaign to vaccinate 27 million Ethiopians between one and 29 years of age against Meningococcal Meningitis A began in the Southern Nations, Nationalities and Peoples Region (SNNPR), Oromia Region and Addis Ababa in October 2014, successfully vaccinated 26,268,708 people(18).

2.2 Literature review

Meningococcal meningitis is a contagious disease caused by Gram-negative diplococci bacteria called, *Neisseria meningitidis (Nm)*. There are two clinical forms of meningococcal disease. The first clinical form is meningococcal meningitis, which is more common, especially during outbreaks; outcomes are good if appropriately treated. The second clinical form is meningococcal septicemia, in which bacteria are found in the blood stream, less common but highly fatal, even in intensive care treatment setup. Patients who have meningitis and septicemia simultaneously are usually regarded as cases of meningitis.

Meningococcal meningitis, commonly known as cerebrospinal meningitis, is the only form of bacterial meningitis that causes outbreaks. The largest outbreaks occur mainly in the semi- arid

areas of sub-Saharan Africa, designated the African “meningitis belt”. Epidemics of meningococcal meningitis previously occurred every 8-12 years, however in recent years they have been occurring yearly (19).

Outbreaks can occur in any part of the world. However, the highest burden of meningococcal disease occurs in sub-Saharan Africa, which is known as the "Meningitis Belt". This hyper-endemic area is characterized by particular climate and social habits. During the dry season, between December and June, because of dry windy conditions and higher incidence of upper respiratory tract infections, the local immunity of the pharynx is diminished thereby increasing the risk of meningitis. At the same time, the transmission of *N. Meningitidis* is favored by overcrowding and large population displacements. These factors help explain some of the large outbreaks that occur during this season in the meningitis belt area (19).

The incidence of meningococcal meningitis varies by geographic region and ranges from <0.5 to 0.9 cases per 100,000 population in North America and Europe to 10 to 1,000 cases per 100,000 population in the African meningitis belt (20). In United States in 2013, 556 cases of meningococcal disease were reported to the National Notifiable Disease Surveillance System (0.18 cases/100,000 population). Between 2003 and 2013, the rate of meningococcal meningitis decreased from .61 per 100,000 to .18 per 100,000 in the United States (21). Among the combined 29 European Union countries reporting surveillance data, the rate of meningitis cases dropped from 1.9 per 100,000 population in 1999 to 1.1 per 100,000 population in 2007. Recently, however, an increase in meningitis disease has been reported in Sweden, as cases rose from .6 per 100,000 population in 2010 to .95 per 100,000 population in 2012. The CFR in Europe was 8.1% in 2007 and varied considerably among the reporting countries. The highest CFRs in 2007 were in Hungary (16.3% of 43 cases) and Poland (14.0% of 335 cases)(22, 23). In 2011, the CFR in Europe was 8.7%, with the highest rates occurring in Slovakia (40.0% of 20 cases) and Hungary (17.9% of 67 cases)(24). A study published in 2018 showed that the incidence of bacterial meningitis in Western countries (Finland, Netherlands, and the United States) gradually declined by 3–4% per year to 0.7–0.9 per 100000 per year in the past 10–20 years (25).

The rate of meningococcal meningitis in regions of sub- Saharan Africa greatly exceeds that occurring in other regions of the world (26). Meningococcal disease epidemics in the African meningitis belt typically occur during the dry season from January through June when the

incidence can reach as high as 1,000 cases per 100,000 population. In periods between outbreaks, the rate of endemic disease remains relatively high at 10 to 25 cases per 100,000 population (27). In 2005, before the introduction of MACV, the CFR among countries in the meningitis belt ranged from 4% in Mali to 26% in Benin (28). Since introduction of MACV, the overall CFR in the surveillance countries has been relatively stable at 8.5%, 9.1%, and 9.1% in 2012, 2013, and 2014, respectively (29-31). A study published in this year showed that in African countries (Burkina Faso and Malawi), incidence rates are still substantially higher at 10–40 per 100000 persons per year (25).

In Ethiopia, meningitis outbreaks have been described in written reports since 1901. Outbreaks were reported in 1935, 1940, 1950, 1964, 1981 and 1989.The 1981 and 1989 outbreaks were the largest ever recorded in Ethiopia with 50,000 and 45,806 cases, and 990 and 1686 deaths respectively. The 1981 outbreak affected the northern and western part of Ethiopia. The 1988-1989 meningococcal meningitis outbreaks affected all regions. Since these major outbreaks a number of smaller outbreaks have occurred in the country most notably outbreaks in Amhara, Tigray and Gambella Regions in February 2000. Between March and August 2000 there was an outbreak in Addis Ababa with 850 cases and 33 deaths. During 2001 major epidemic was recorded with 6964 cases and 330 deaths followed by another epidemic during 2003-2004 epidemic seasons which recorded a total of 3326 cases and 160 deaths from all regions and was not limited to the traditional meningitis belt areas of North West and South Western part of the country. Between the year 2005 and 2010 foci of epidemics occurred in few areas which were managed timely and contained at a local level (19).

During 2010, the country reported 1611 cases with 21 deaths (1.3%) from 23 woredas in Oromia, SNNPR, Amhara and Tigray while close to 1200 cases with 30 deaths (2.5%) from Oromia, SNNPR, Amhara and Gambella were recorded during the year 2011 and major epidemic was reported in 2013 from all zones of SNNP and central and south parts of Oromia region with report of 1466 cases with 40 deaths (CFR- 2.7%). In 2013, the Federal Ministry of Health stated that a meningitis outbreak occurred in some parts of the SNNPR region of Ethiopia. Here, the outbreak often occurs during the dry season, particularly from December to June. The presence of dusty winds and respiratory infections characterizes this period in the region (32).

A risk assessment carried out early 2012 in Ethiopia showed that 5 of the regions were at high risk, the remaining 6 regions were at moderate and low risk for meningitis outbreak. Accordingly; the country planned to introduce mass campaign for individuals between 1-29 years of age (70% of the total population) over three years period in three different phases from 2013 to 2015. The main objective of Men "A" campaign was set to eliminate epidemics of meningococcal meningitis caused by sero-type "A" from Ethiopia; thereby to reduce morbidity and mortality among the population by achieving ≥95% coverage in all target areas (33).

Table 2.1: Data of phase I and II Meningitis "A" campaign in 2013 and 2014.

S.N	Period	Area of implementation	Target	vaccinated	Coverage
1	October ,2013	30 zones in Tigray, Amhara, Gambella, B/Gumz, SNNPR and Oromiya regions	18,926,853	18,616,135	98.4
2	October ,2014	45 zones in Addis Ababa, Oromiya and SNNPR	26,910,795	26,268,708	97.6

Source: FMoH. Ethiopia national expanded programme on Immunization; comprehensive multi-year plan 2016 – 2020. April, 2015.

2.3 Rationale of the study

Ethiopia is in the African meningitis belt and is regularly affected by both the endemic and epidemic forms of the disease. Outbreaks have been recorded since 1935. The most recent major outbreak affecting the whole country occurred in 1988-1989, with nearly 50 000 cases and 990 deaths, and an overall attack rate of 133 per 100 000. A major outbreak is anticipated in 1999-2000, and the regions of Amhara, Gambella, and Tigray experienced an increase in the number of cases reported in March-April 2000 (34). The Southern Nations, Nationalities, and Peoples Region (SNNPR) and the Oromiya Region have been most severely affected in the past. A 2013 press release by the Federal Ministry of Health stated that a meningitis outbreak occurred in some parts of the SNNPR region of Ethiopia.

As Ethiopia is located on the African meningitis belt and bordering with meningitis prone countries it is good to conduct such type of data analysis with the regular basis of time. As it is known most of the surveillance data in Ethiopia haven't been analyzed regularly even though there is

surveillance system and the same is true in SNNPR for meningococcal meningitis surveillance data. Therefore, the current surveillance data analysis was focused to narrow those gaps and to provide up-to-date information regarding the disease in the region.

2.4 Objective

2.4.1 General Objective

- To describes the magnitude and distribution of Meningitis in SNNPR from 2013- 2017.

2.4.2 Specific Objectives

- To describe the distribution of meningitis by time from 2013-2017
- To describe the distribution of meningitis by place from 2013-2017
- To show the magnitude of the disease in the region from 2013-2017

2.5 Methods and materials

2.5.1 Study Area

The State of Southern Nations, Nationalities and Peoples' comprises 10% of the total area of the country. The State lies in the southern part of the country. It has common borders with Kenya in the south, the Republic of Sudan in the Southwest, the State of Gambella Peoples' in the North West, and the State of Oromiya in the North and East.

Based on the 2007 G.C Census conducted by the Central Statistical Agency of Ethiopia (CSA), the SNNPR has an estimated total population of 14,929,548, of whom 7,425,918 were men and 7,503,630 women. 13,433,991 or 89.98% of the population is estimated to be rural inhabitants, while 1,495,557 or 10.02% are urban; this makes the SNNPR Ethiopia's most rural region. With an estimated area of 105,887.18 square kilometers, this region has an estimated density of 141 people per square kilometer. For the entire region, 3,110,995 households were counted, which results in an average for the Region of 4.8 persons to a household, with urban households having on average 3.9 and rural households 4.9 people (35).

The State has an undulating land feature dissected by the Omo river basin into western and eastern parts. The elevation ranges from 376 to 4, 207 meters above sea level. The lowest area and highest peaks in the State are recorded near Lake Rudolf in South Omo and at Mount Goge in North Omo, respectively. About 56 % of the total area of the State is found below 1,500 meters elevation, which is categorized largely as hottest low land ("Kolla"). The rest 44% is found in the temperate climatic zone. The mean annual rainfall of the State ranges from 500 - 2,200 mm. Its intensity, duration and amount increase from South to Northeast and Northwest. The mean annual temperature of the State in general ranges from 15°C to 30°C (36).

2.5.2 Study Design

The study used a retrospective descriptive analysis of clinical data collected in the region by weekly reporting forms from 2013-2017 and reported through the Public Health Emergency Management Surveillance system

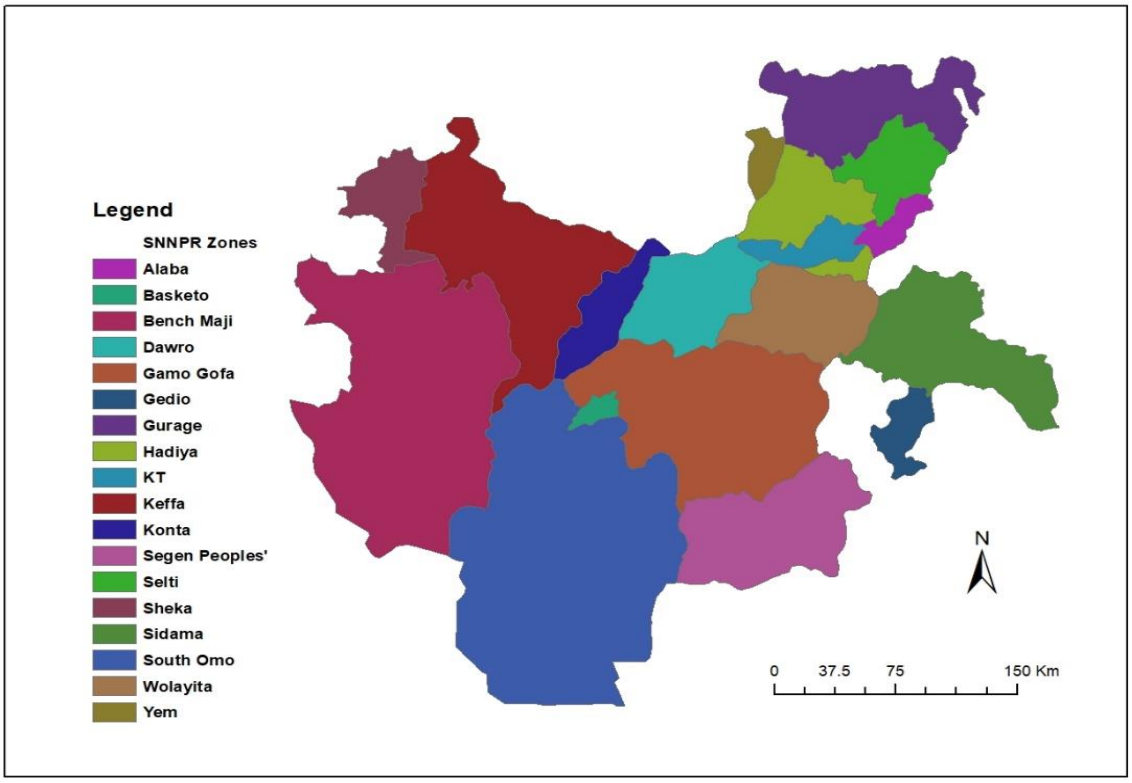

Figure 2.2: Administrative map of SNNPR

2.5.3 Study population

All patients of suspected and confirmed meningococcal meningitis in the region reported to EPHI on weekly basis from 2013-2017.

2.5.4 Sample Size

The study included all the suspected meningitis cases reported during 2013- 2017 from regional health bureau to EPHI.

2.5.5 Ethical Consideration

A formal letter from School of Public health, AAU was submitted to PHEM section at EPHI. Accordingly the PHEM team leader announced the data manager of this section to let me access the data. The collected data was used for an academic purpose in a confidential manner and any description that identifies the personality of the study units was not utilized

2.5.6 Data source

The data source was secondary meningococcal meningitis weekly surveillance data collected during 2013-2017 in SNNPR health bureau.

2.5.7 Analysis and data arrangement

Different types of graphs and descriptive calculation like percentages, CFR and IR used in this document were produced by using excel 2013 and the quality of data was ensured by checking each data field.

2.5.8 Limitation of the study

Due to secondary nature of data type, the current study lacks the following variables

- The data used in this study had no person variables like age and sex.
- There were no laboratory based reports, all the cases in this study were suspected.

2.5.9 Case definition

Based on the Ethiopian National Guideline on Meningococcal Meningitis Surveillance and Outbreak Management, First edition, November 2013:

Suspected case: Any person with sudden onset of fever (>38.5 ℃ rectal or 38.0 ℃ axillary) and one of the following signs: neck stiffness, altered consciousness, or other meningeal signs such as bulging fontanel, convulsion.

Probable case: Any suspected case with turbid or purulent CSF or with microscopic examination showing Gram-negative diplococci.

Confirmed case: A suspected or probable case confirmed by isolation of *Neisseria meningitidis* from CSF or blood by culture, PCR or agglutination tests were used.

2.6. Result

2.6.1 Data completeness

During 2013-2017 a total of 41788 reports were made to meningococcal meningitis surveillance data base. All the five years reporting weeks were reported as zero report or non-zero report in all zones of the region i.e. there was no missed week in all the years. From a total 41788 reports, 37217(95.5%) were reported as zero cases while 1701(4.1%) reports contained one or more cases. Regarding the completeness of time, place and person variables, the current data lacks age and sex variables which helps us to know the distribution of the disease age and sex wise.

2.6.2 Description by place

A total of 4571 and 83 suspected meningitis cases and deaths were reported respectively from 2013-2017 in SNNPR. As shown in Table 2.2 and Figure 2.3 below, from the total cases of the region during 2013-2017, 969 (21.2%), 705 (15.4%), 479 (10.5%), 396 (8.7%) and 377 (8.2%) were reported from Sidama, Wolayita, Hawassa, Gedeo and Halaba respectively and the remaining cases were reported from other zones of the region. But as shown in Figure 2.3 the highest average incidence rate was recorded in Hawassa with IR of 32.57/100000 followed by Halaba and Basketo zones with average IR 28.55/100000 and 13.35/100000 respectively. During these five years, the lowest incidence rate was reported from Gurage and Gamo Gofa zones both with average IR of 1.57/100000. The highest incidence rate of suspected meningitis in Hawassa was related with presence referral Hospitals.

From total deaths of suspected meningitis in the region during 2013-2017, 20(24.10%), 13(15.66%), 9(10.84%), 8(9.64%) and 33(38.76%) were reported from Sidama, Gedeo, Gamo Gofa, Segen and the other remaining zones of the region respectively. But the highest average case fatality rate was reported from Segen people's zone with average CFR of 7.77% followed by Gamo Gofa and Konta zones with average CFR of 6.21% and 5.77% respectively (Figure 2.4).

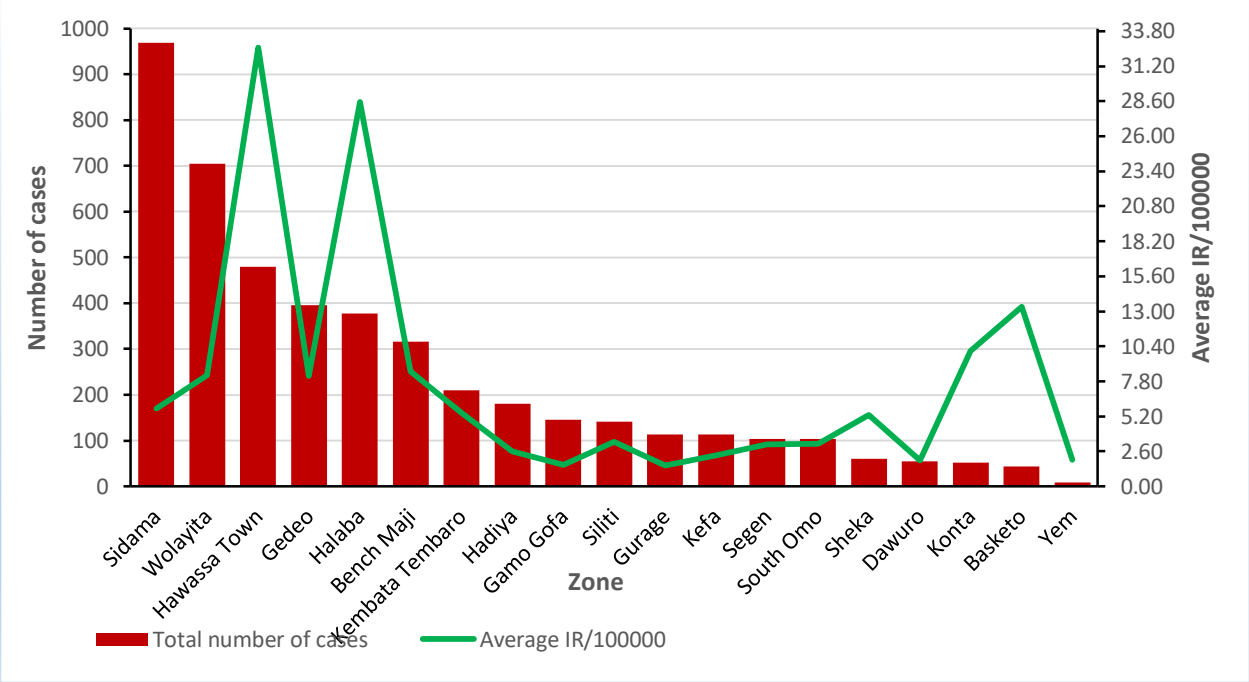

Figure 2.3: Suspected meningitis cases distribution and average IR/100000 by zone, SNNPR, 2013-2017.

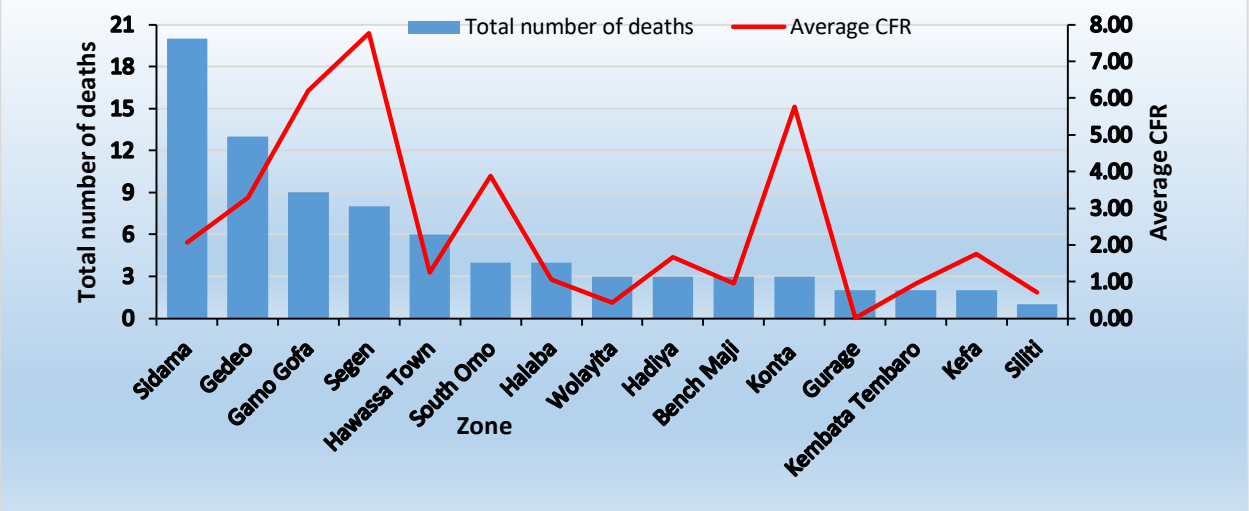

Figure 2.4: Total suspected meningitis deaths and average CFR by zones in SNNPR, 2013-2017.

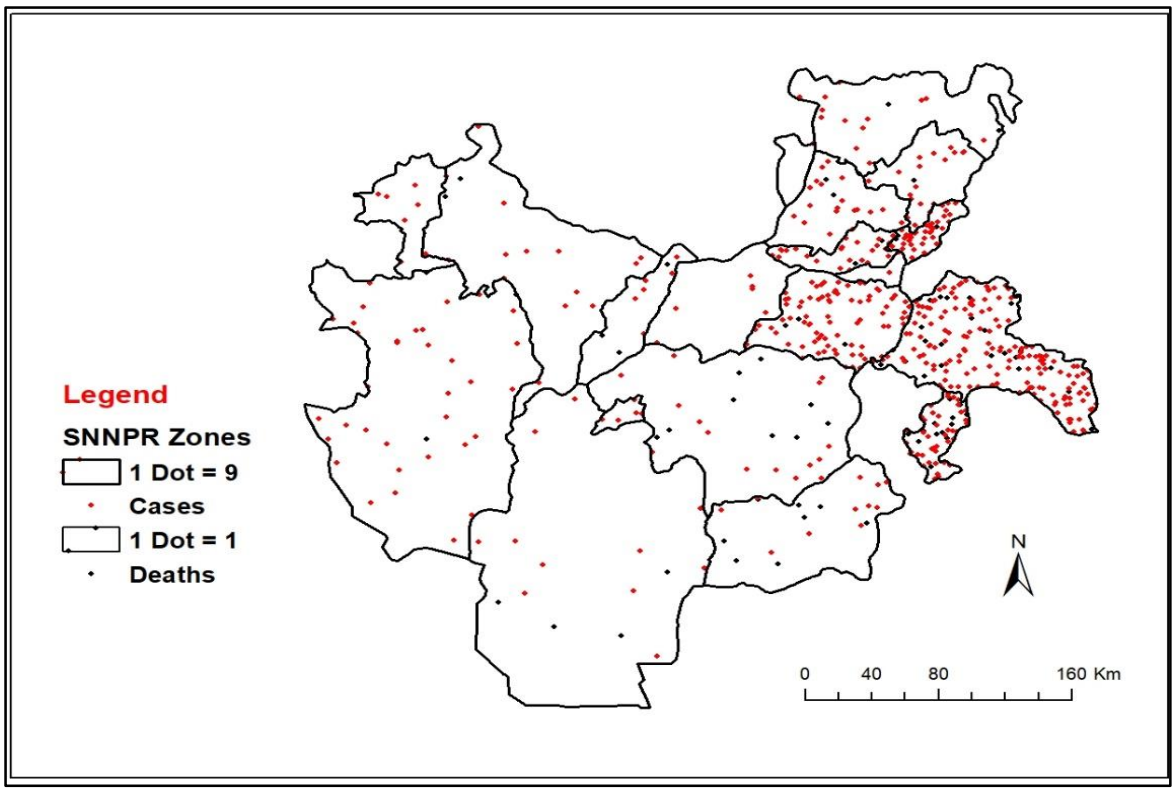

Figure 2.5: Dot-density distribution of suspected meningitis cases and deaths in SNNPR, 2013-2017.

In the Figure 2.5 above red dots indicate the number of suspected meningitis cases whereas green dots show the number of deaths due to meningitis. As shown in the figure higher number of cases were clustered in the Eastern part of the region.

2.6.3 Description by Place and time

As shown in Table 2.2 below, large number of suspected meningitis cases 1521(33.27%) of all cases in five years were reported in 2013 especially from Sidama, Wolayita, Bench Maji and Halaba zones. In this year, all of 19 zones reported one or more suspected meningitis cases and 8 out of 19 zones reported one or more suspected meningitis deaths. During this year, the largest case fatality rate was recorded in South Omo and Gamo Gofa zones with CFR of 8.00% and 7.84% respectively and 2.30% as region level, which was the highest of all years'.

From years 2013-2015, relatively large number of suspected meningitis cases were reported in Sidama and Wolayita zones which are two of the populous zones in the region. In 2016 and 2017, Hawassa and Gedeo zones reported a relatively large number of cases. At zonal level, the highest

case fatality rates were recorded in 2015 in Segen people and 2014 in Konta zones with CRF of 38.46% and 17.65% respectively. All zones except Yem, Sheka, Basketo and Dawuro reported deaths during five years duration. In the region, the lowest case fatality rate was recorded in 2017 with CRF of 0.85 %(Table 2.2).

2.6.4 Description By time

The occurrence of suspected meningitis cases in SNNPR was decreasing from 1521 suspected meningitis cases reported during 2013 to 604 suspected meningitis cases in 2016. But in 2017 the number of cases occurred increased by 99 suspected meningitis cases compared with the year 2016. The incidence of the suspected meningitis in the region was decreasing from 8.8 per 100000 population in 2013 to 3.2 per 100000 population in 2016, which was reduced by 5.6 cases per 100000 population. This reduction in the incidence of suspected meningitis could be related with expanded vaccination program launched in three phases in the country starting from October, 2013 up to 2015. Accordingly, the region (SNNPR) has benefited from the first two phases of vaccination programs in 2013 and 2014. But in 2017 like actual number of cases reported increased, the incidence rate also showed an increase by 0.5 cases per 100000 population from 3.2 cases per population in 2016 to 3.7 cases per 100000 population in 2017 but the average incidence rate of the region during five years was 5.01 per 100000 population (Table 2.3)

The highest number of death due to suspected meningitis in the region was reported in 2013 with case fatality rate of 2.30% and the lowest death was reported in 2017 with case fatality rate of 0.85%. Even though there were ups and downs on case fatality rates from 2013-2017, the general reduction of case fatality rate was by 1.45% from 2013 through 2017 and the average case fatality rate of five years in the region was 1.82 %(Table 2.3)

Table 2.2: Number of suspected meningitis reported cases, deaths and CFR by zones, SNNPR from 2013-2017.

Zone	Year														
	2013			**2014**			**2015**			**2016**			**2017**		
	Cases	**Deaths**	**CFR**	**Cases**	**Deaths**	**CFR**	**Cases**	**Deaths**	**CFR**	**Cases**	**deaths**	**CFR**	**Cases**	**Deaths**	**CFR**
Basketo										37	0	0.0	6	0	0.0
Bench .M	177	1	0.6	47	1	2.1	30	0	0.0	8	0	0.0	54	1	1.8
Dawuro	1	0	0.0	21	0	0.0	21	0	0.0	11	0	0.0			
Gamo.G	102	8	7.8	23	0	0.0	11	1	9.1	5	0	0.0	4	0	0.0
Gedeo	6	0	0.0	75	1	1.3	1	0	0.0	137	9	6.6	177	3	1.7
Gurage	46	0	0.0	11	0	0.0	53	2	3.8	1	0	0.0	3	0	0.0
Hadiya	56	2	3.6	61	0	0.0	54	1	1.9	9	0	0.0			
Halaba	164	3	1.8	102	0	0.0	35	1	2.9	7	0	0.0	69	0	0.0
Hawassa	102	4	3.9	29	0	0.0	61	0	0.0	178	1	0.6	109	1	0.9
Kefa	31	1	3.2	6	0	0.0	23	1	4.4	18	0	0.0	36	0	0.0
K.Temba	45	0	0.0	42	2	4.8	33	0	0.0	36	0	0.0	54	0	0.0
Konta	17	0	0.0	17	3	17.65	2	0	0.0	11	0	0.0	5	0	0.0
Segen	2	0	0.0	45	3	6.7	13	5	38.	9	0	0.0	34	0	0.0
Sheka	21	0	0.0	2	0	0.0	34	0	0.0	3	0	0.0			
Sidama	384	14	3.6	235	1	0.4	247	4	1.6	24	1	4.2	79	0	0.0
Siliti	30	0	0.0	4	0	0.0	36	0	0.0	41	1	2.4	31	0	0.0
South	25	2	8.0	12	0	0.0	45	2	4.4	18	0	0.0	3	0	0.0
Wolayita	303	0	0.0	154	0	0.0	158	1	0.6	51	1	1.9	39	1	2.6
Yem	9	0	0.0												
Total	**1521**	**35**	**2.30**	**886**	**11**	**1.24**	**857**	**18**	**2.1**	**604**	**13**	**2.2**	**703**	**6**	**0.85**

Table 2.3: Suspected meningitis cases, deaths, IR/100000 and CFR from 2013-2017 in SNNPR.

Year	Population	Total cases	Deaths	IR/100000	CFR
2013	17344125	1521	35	8.8	2.30
2014	17782932	886	11	5.0	1.24
2015	18232840	857	18	4.7	2.10
2016	18694131	604	13	3.2	2.15
2017	19167092	703	6	3.7	0.85
Total	**91221120**	**4571**	**83**	**5.01**	**1.82**

Regarding the trend of the disease in 2013 in the region, the highest number of cases were reported from 3rd to 15th epidemic weeks and within a period 3 weeks it sloped down to the lowest point at the week of 18. This could be happened due to intervention against the disease. Starting from the week of 18, the diseases continued with little ups and downs except for the week of 38 in which case a relatively larger number of cases were observed. During 2014, highest peaks were observed in the 1st, 11th and 13th of epidemic weeks of the year. After these weeks, disease occurrence was with little differences in its peaks. In 2015 highest number of cases were reported in 16th and 41st of its epidemic weeks. Moreover, in 2016 the highest cases were recorded in the 32nd epidemic week of the year and in 2017 there was no big difference in disease occurrence from week to week throughout the year. Generally speaking, the highest number of epidemic peaks are observed in the dry season of the years and this shows the seasonality of the disease (Figure 2.6).

Highest peaks of the disease were recorded in the epidemic weeks of 3-19 and 42 of 2013, 1of 2014, 16 and 41 of 2015 and 32 of 2016. Most of these highest peaks of cases were recorded in the dry season of the country as well as the region and this coincides with existing knowledge of disease epidemiology in AMB area. In the epidemic weeks of 2017, there was no a big difference of disease records from weeks to weeks as compared to other years' epidemic weeks. The possible hypothesis for this minimum variance could be effective vaccination campaign (Figure 2.7).

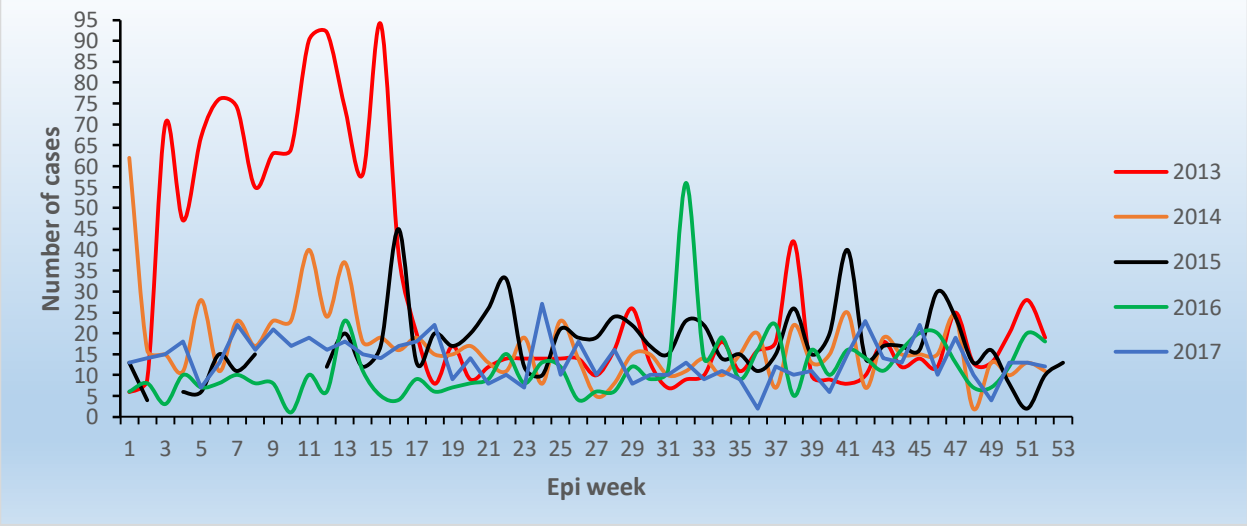

Figure 2.6: Annual trend of suspected meningitis in SNNPR, 2013-2017.

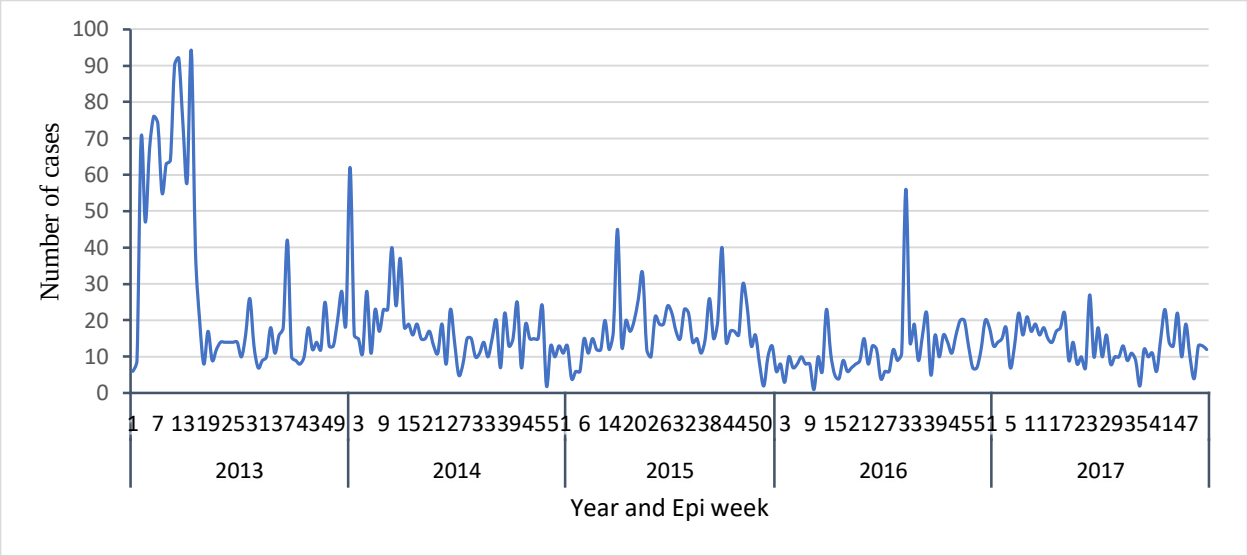

Figure 2.7: Trend of five years suspected meningitis cases by Epi week and year in SNNPR, 2013-2017.

The death due to suspected meningitis during 2013-2017 was highest in 3rd epidemic week of 2013 and immediately decreasing to one death in the 5th epidemic week of this year. The other relatively higher death peaks were recorded in 13th epidemic week of 2015 and in 1st and 40th epidemic weeks of 2014 as shown in Figure 2.8. The other important point in this graph is, after the 22nd epidemic week of 2015, all the epidemic weeks had one or zero suspected meningitis death except the epidemic week of 30th, 2016 in which two suspected meningitis deaths were reported.

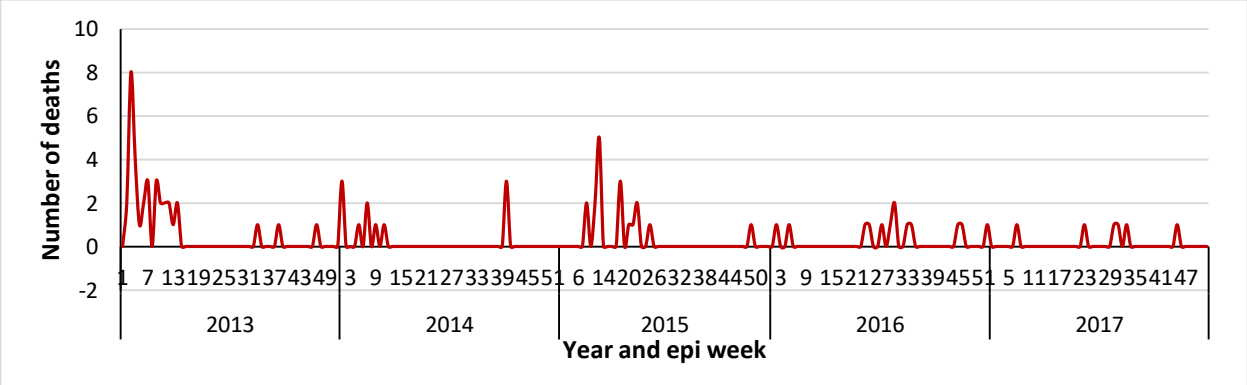

Figure 2.8: Trend of five years suspected meningitis deaths by epidemic weeks and year in SNNPR, 2013-2017.

2.7 Discussion

In this study, suspected meningitis is distributed in all zones of the region with the highest number of cases concentrated in the Eastern part of the region's zones like Sidama and Wolayita which are densely populated areas in the region. Even though the case clustering was highest in Eastern part of the region, the average incidence rate of the disease was high in Hawassa, Halaba and Basketo zones. The highest incidence rate of the disease in these areas might be due to the presences of Hospitals where people are coming from other areas.

The highest and the lowest incidence rates in the region were recorded in 2013 and 2016 with IR of 8.8 per 100000 and 3.2 per 100000 respectively and the average of five years IR was 5.01 per 100000 population. This result slightly agrees with the study that reported, in periods between outbreaks, the rate of endemic disease remains relatively high at 10 to 25 cases per 100,000 population (27). In African countries (Burkina Faso and Malawi), incidence rates are still substantially higher at 10–40 per 100000 persons per year (25). The incidence rate of the disease in North America and Europe ranges from 0.5 to 0.9 per 100000 population(37).

The case fatality rate of the current study was also higher in 2013 as indicated in Table 3. In 2010, 2011 and 2013 case fatality rates of 1.3%, 2.5% and 2.7% were reported respectively in Ethiopia (38) in which the result of the current study is consistent with. The study conducted in 2005 stated that before the introduction of MACV, the CFR among countries in the meningitis belt ranged from 4% in Mali to 26% in Benin(28). Another study also stated that the overall CFR in the surveillance countries found in meningitis belt areas of Africa has been relatively stable at 8.5%, 9.1%, and 9.1% in 2012, 2013, and 2014, respectively (29-31).

The weekly incidence data showed that most of the expected seasonal peaking of meningitis in the region was in the first 3-4 months of the years 2013-2015, although epidemics may start in December before the main season, but the highest peaks of incidence in meningitis in 2016 was observed in week 32 which is the rainy season of the country. This agrees with existing knowledge of Meningococcal disease epidemics in the African meningitis belt typically occur during the dry season starting from December and reaching up till June has invariably been implicated in meningococcal epidemics. Several studies indicated the seasonality of the disease in both meningitis belt areas and out of these areas (39). The study conducted at Gondar University Hospital indicated that 35% of the meningococcal meningitis cases presented in the months of

May and June and tapered markedly as the winter season approached. The cases peaked in the second quarter of the year (April to June), followed by a steep decline in the incidence (40). In this study, most of the cases were reported and high peaks are observed during the dry season of the country especially for the years from 2013-2015. This coincides with knowledge of the seasonal variation in the incidence of meningococcal meningitis in the countries of meningitis belt. Most of the peaks observed in the current study of the year 2017 were small compared with other years' peaks. Of all peak incidences occurred from 2013-2017, the highest peak was observed in the week 15 of 2013.

The disease trend in the region was decreasing especially from 2013-2016 and it increased in 2017 by 99 cases (Table 2.2). According to risk assessment conducted in 2012 and identified 5 risk regions, Ethiopia launched mass vaccination program starting from October, 2013. SNNPR is one of the 5 regions identified as risk region and benefited from the vaccination program in the first two phase of vaccination programs conducted in 2013 and 2014 which conducted the vaccination of 18,616,135 and 26, 268,708 people respectively in the country level (Table 2.1). This helped for the reduction of the disease, but the increment of the suspected meningitis in the region in 2017 highlights the need for the consideration of additional prevention measures in the region. The result of current study agrees with the study reported in 2018 stating: the incidence of bacterial meningitis in Western countries (Finland, Netherlands, and the United States) gradually declined by 3–4% per year to 0.7–0.9 per 100000 per year in the past 10–20 years even though in African countries, incidence rates are still substantially higher at 10–40 per 100000 persons per year and bacterial meningitis remains an important infectious disease, despite a gradual decline in incidence after large-scale vaccination campaigns(25).

2.8. Conclusion and recommendation

Meningitis is still a public health problem in SNNPR, despite it showed a gradual decline in incidence during the years 2013 through 2017 even though it showed a slight increase in 2017 compared to the year 2016. The disease is distributed all over the region with high clustering of cases in the Eastern part of the region but the most affected zones are Hawassa, Halaba and Basket zones during five years period.

Based on the result of the analysis the following are recommended:

- ✓ The increase of cases in 2017 highlights the need for additional action like booster vaccination.
- ✓ The current data lacks person variable in the weekly report of the disease and the concerned bodies should discuss to include this variable to who is most affected.
- ✓ Laboratory results should be included in the weekly report in order to know the burden of actual bacterial meningitis in the region.
- ✓ Strengthen the surveillance activities in the region.
- ✓ Further study should be conducted on prevalence of bacterial meningitis in the region.

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Chapter 3 : Surveillance System Evaluation

Meningococcal Meningitis Surveillance System Evaluation in Kolfe Keranio Sub-City, Addis Ababa, 2018

Abstract

Background: Public health surveillance is an ongoing systematic collection, analysis, interpretation and dissemination of data regarding a health related event for use in public health action to reduce morbidity and mortality, and to improve health. Surveillance system evaluation allows us to define whether a specific system is useful for a particular public health initiative. Therefore, the purpose of this study was to evaluate the meningococcal meningitis surveillance system and to forward recommendations in Kolfe Keranio Sub-city.

Method: Cross-sectional study design was employed to evaluate the surveillance system in Kolfe-Keranio Sub-city from December 17, 2018- January 2019. Data was collected from Sub-city health office, three woreda health offices, and three health centers and from urban HEWs by using checklist. The PHEM surveillance data were reviewed. Different reporting formats, graphs and poster were used as additional data source. Evaluation was made according to the updated CDC guideline.

Result: In 2018, the sub city PHEM did not receive either suspected or confirmed meningococcal meningitis cases from reporting sites in the area. All of the visited health institutions have guideline and case definitions for Meningococcal meningitis. Completeness and timeliness of reports in the sub-city was 96% and 95% respectively. Even in sub-city level, there was no vehicle assigned for PHEM only and no budget allocated for emergencies. In sub-city and woreda health offices level data analysis was conducted. The surveillance system in the study area is detecting trend of occurrences of diseases. The system's stability is in question due to poor resources allocation to operate the surveillance activities.

Conclusion: The participation of both government and private health institution in surveillance was good with report completeness and timeliness of above expected national target. The surveillance system in the sub-city is detecting health and health related events and found to be flexible, simple, and acceptable but respondent mentioned that stability for the future is in question because of poor resources allocation to the system. Therefore, the sub-city should allocated emergency budget and other resources like vehicles and computers for woreda PHEM officers and health centers focal persons.

Keywords: Meningococcal meningitis, Surveillance system, Evaluation, Kolfe-Keranio

3.1 Introduction

3.1.1 Background

Public health surveillance is an ongoing systematic collection, analysis, interpretation and dissemination of data regarding a health related event for use in public health action to reduce morbidity and mortality, and to improve health(1-3). Data disseminated by a public health surveillance system can be used for immediate public health action, program planning and evaluation and formulating research hypothesis(4).

Public health surveillance is used to measure the burden of a disease (or other health-related event), including changes in related factors, the identification of populations at high risk, and the identification of new or emerging health concerns; monitor trends in the burden of a disease (or other health-related event), including the detection of epidemics (outbreaks) and pandemics; guide the planning, implementation, and evaluation of programs to prevent and control disease, injury, or adverse exposure; evaluate public policy; detect changes in health practices and the effects of these changes; prioritize the allocation of health resources; describe the clinical course of disease; and provide a basis for epidemiologic research(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. IDSR promotes rational use of resources by integrating and streamlining common surveillance activities. Surveillance activities for different diseases involve similar functions (detection, reporting, analysis and interpretation, feedback, action) and often use the same structures, processes and personnel. Additionally, IDSR takes into account the One World-One Health perspective which is a strategy that addresses events at the intersection of human, domestic animal, wildlife, and ecosystem health(5).

Effective communicable diseases control relies on effective surveillance and response system that promote better coordination and integration of surveillance function. Recognizing this, the initiative to strengthen the disease surveillance system that promotes the integration of surveillance

activities in Ethiopia was started in 1996(6). Later in 1998 the WHO/AFRO, following the resolution of the 48th assembly, started promoting Integrated Disease Surveillance and Response (IDSR) for all member state to adopt as the main strategy to strengthen national disease surveillance system(6).

In order to combat with the challenges that are ever growing, the way working processes are organized and its capacities should also be changed. Based on this fact the health sector has identified Public Health Emergency Management (PHEM) as one of the core processes to be reengineered. PHEM is designed to ensure rapid detection of any public health threats, preparedness related to logistic and fund administration, and prompt response to and recovery from various public health emergencies(7).

The FMOH of Ethiopia currently identified 22 top priority diseases even though two of them, maternal death and Scabies are not yet included in the national PHEM guideline. These diseases are selected due to their high epidemic potential, required internationally under IHR2005, targeted for eradication or elimination, have a significant public health importance and that have available effective control and prevention measures for addressing the public health problem they pose. These diseases are monitored by a designated bodies through available means of communication-telephone, paper based reporting etc. These diseases are mandatory notifications which are immediately reportable diseases and routine surveillance reported weekly (7, 8).

Meningococcal meningitis is one of the priority diseases under surveillance which is reported in weekly basis. Meningitis outbreak has occurred in Ethiopia in several years since 1901(9). The 1988-1989 meningococcal meningitis outbreaks affected all regions. After these major outbreaks a number of smaller outbreaks have occurred in the country most notably in Amhara, Tigray and Gambella Regions in February 2000. Between March and August 2000 there was an outbreak in Addis Ababa with 850 cases and 33 deaths(10).

During 2001 major epidemic was recorded with 6964 cases and 330 deaths followed by another epidemic during 2003-2004 epidemic seasons which recorded a total of 3326 cases and 160 deaths from all regions and was not limited to the traditional meningitis belt areas of North West and South Western part of the country. Epidemics were reported during 2005, 2006, 2010, 2011 and 2013 in different parts of the country(10)

Disease surveillance and notification have been recognized as an effective strategy for the prevention and control of diseases most especially epidemic prone diseases. It is crucial to note that disease outbreak do not give notice before its occurrence neither do they respect the borders of nations. When they eventually occur, they are likely to spread like wildfire and often resulting in high morbidity and case fatality rate with consequent economic impact. An effective and efficient disease surveillance and notification system allows early detection of disease outbreaks that will prompt intervention for the reduction of morbidity and mortality that may result from the epidemics of these infectious diseases. Levels of disease surveillance and notification can be individual, local, national and international. National disease surveillance and notification system often depends on effective district disease monitoring and control mechanism with the clinicians' actively involved(11).

The evaluation of a surveillance system promotes the best use of data collection resources and assures that systems operate effectively. Surveillance system evaluation allows us to define whether a specific system is useful for a particular public health initiative and is achieving the overarching goals of the public health program and the data collection objectives. Any evaluation should include recommendations for improving the quality and efficiency of the system and a timeline for implementing changes based on available resources(12).

The routine flow of surveillance data is usually from reporting sites to the next level up to the central level as indicated in Figure 3.1 below. The community and facilities surveillances are the main source of information. The information collected from these site is compiled in standard forms and then forwarded to the woreda health office. Woreda level uses standard formats to compile aggregate, and send the data to sub city/ City Administration, from which the central level receives. Feedback and information sharing follows the route from national to the heath facility and then community level.

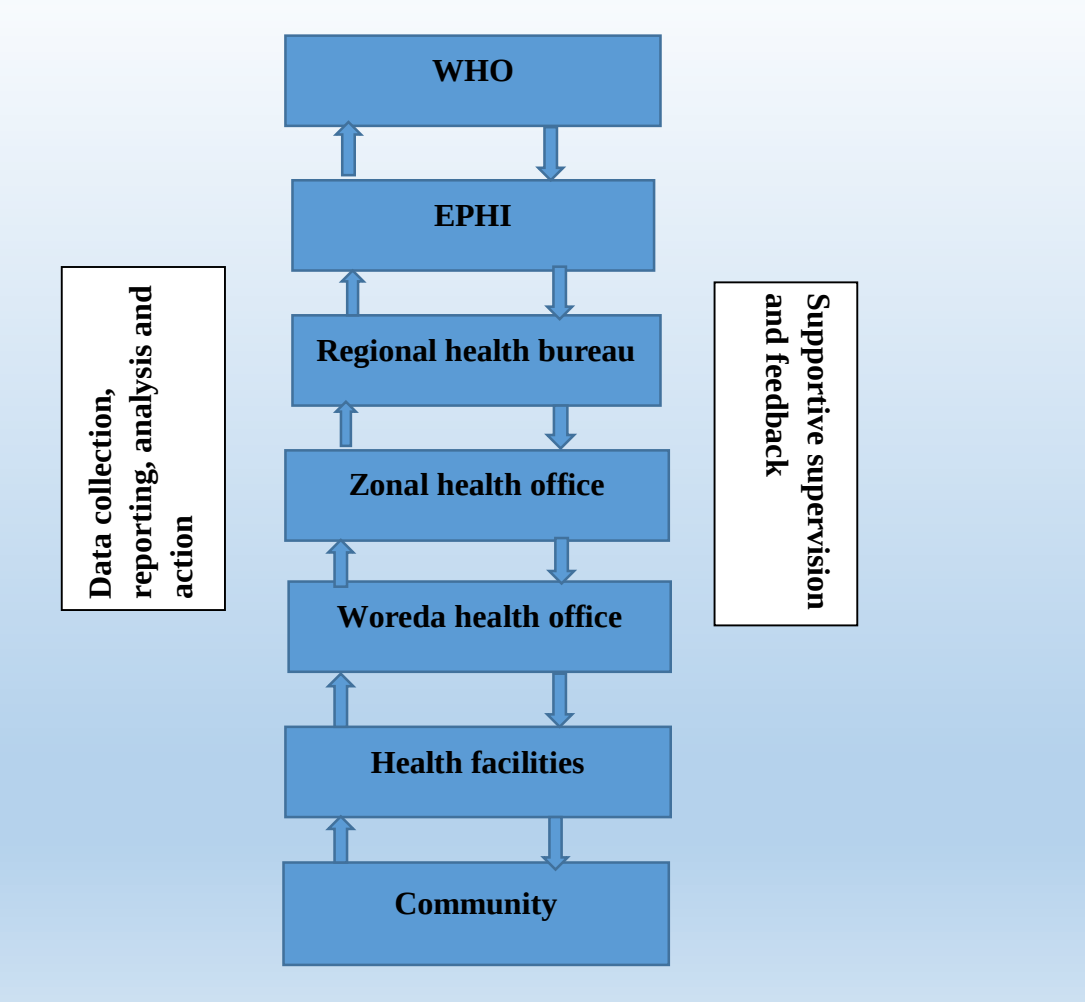

Figure 3.1: Diagram illustrating the formal flow of surveillance data and feedback

3.1.2 Rationale for Evaluation

Meningitis is one of the diseases of public health concern in both Addis Ababa and Kolfe Keranio Sub-city. Kolfe Keranio sub city is among the sub cities in Addis Ababa which reported suspected meningitis in 2018(13). The disease could be used as proxy indicator for the surveillance system of the sub-city. Therefore, the study assessed the status of core activities of the surveillance system, described the specific attributes of the system and identified areas for improvements.

3.2 Objectives

3.2.1 General Objective

- To evaluate the meningitis surveillance system and to propose the way forward in Kolfe Keranio Sub-city.

3.2.2 Specific Objectives

- To assess the core activities of the meningitis surveillance system such as case detection, reporting, analysis and response system in Kolfe Keranio Sub-city.
- To evaluate the attributes of surveillance system in Kolfe Keranio Sub-city.
- To identify the strength and weakness of the system and provide necessary recommendations.

3.3 Methods and materials

3.3.1. Study Area

Kolfe Keranio is one of the 10 sub cities of Addis Ababa, the capital of Ethiopia. The sub city has a total population of 546,219 and a total area of 61.25 Sq.Km. It is located in the western suburb of the city, near the Gefersa Reservoir and borders with the districts of Gullele, Addis Ketema, Lideta and Nifas Silk-Lafto(14).

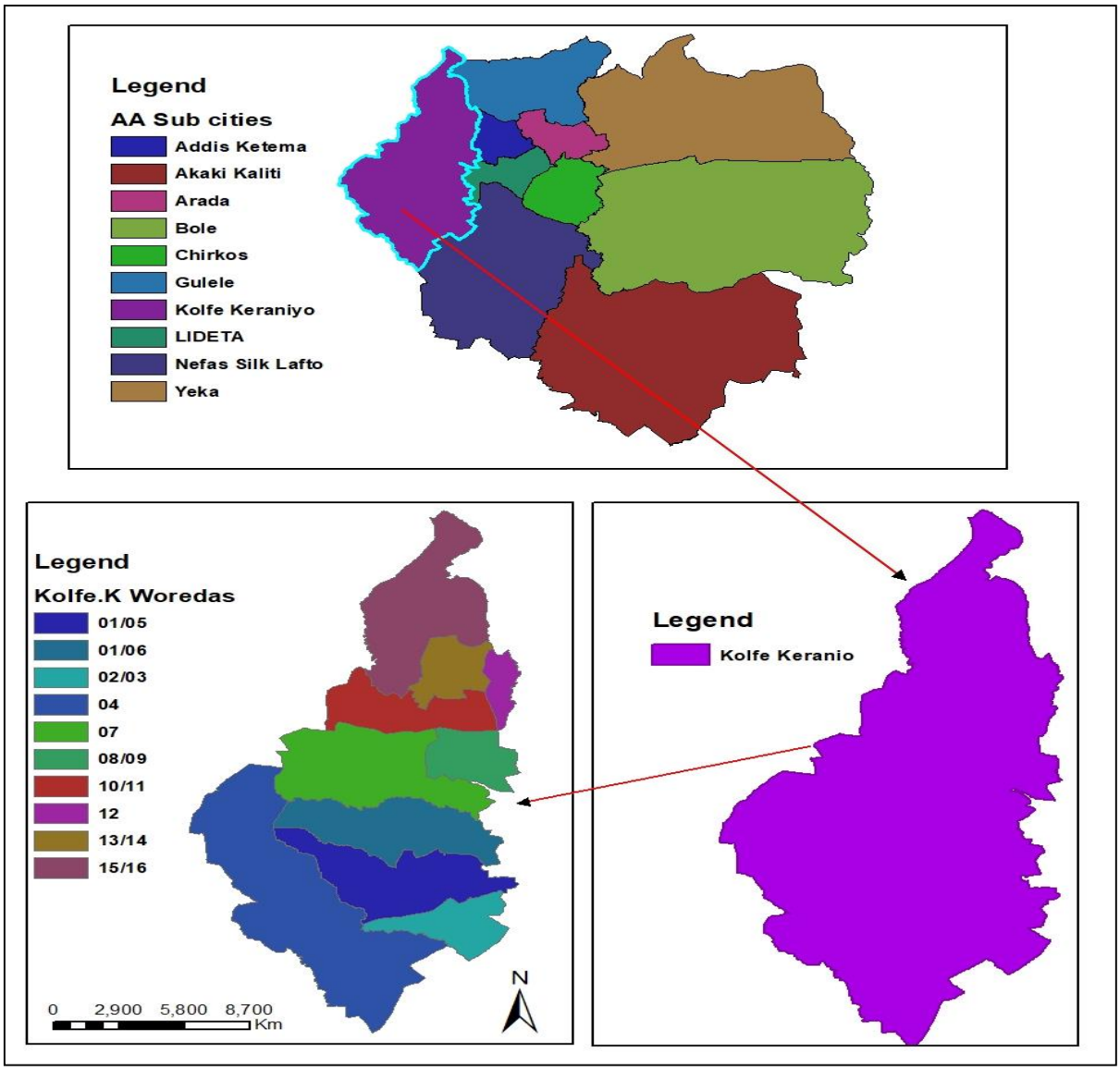

Figure 3.2: Kolfe Keranio Administrative map.

3.3.2 Study design and period

A descriptive cross-sectional study was undertaken from December 17, 2018- January 6, 2019 in Kolfe Keranio sub city, Addis Ababa.

3.3.3 Study units

The study units were Kolfe Keranio health office, Woreda 1, Woreda 5, Woreda 6 health offices and three health centers in the above mentioned woredas of the sub-city.

3.3.4 Sample Size and Sampling technique

Kolfe Keranio sub-city health office was selected purposively and from all woreda health offices found in the sub-city, three of them were selected by simple random sampling technique. All health centers in the above randomly selected woredas were assessed. Health extension workers found in assessed health centers were interviewed about the surveillance activities.

3.3.5 Data collection

The data were collected by using pre-prepared checklist. Discussion and interviews were made with Public Health Emergency Management (PHEM) officers and focal persons at zonal, Woredas and health centers. In addition to these, HEWs at assessed health centers were interviewed. The PHEM surveillance data were reviewed. Different reporting formats, graphs and poster were used as additional data source.

3.3.6 Standard case definition

Based on the Ethiopian National Guideline on Meningococcal Meningitis Surveillance and Outbreak Management, First edition, November 2013:

Suspected case: Any person with sudden onset of fever (>38.5 ℃ rectal or 38.0 ℃ axillary) and one of the following signs: neck stiffness, altered consciousness, or other meningeal signs such as bulging fontanel, convulsion.

Probable case: Any suspected case with turbid or purulent CSF or with microscopic examination showing Gram-negative diplococci.

Confirmed case: A suspected or probable case confirmed by isolation of *Neisseria meningitidis* from CSF or blood by culture, PCR or agglutination tests were used.

3.3.7 Operational definitions

Terms used in the evaluation were operationally mentioned as follows:-

- **Case detection**: is the process of identifying cases and outbreaks.
- **Case/outbreak Confirmation**: refers to the epidemiological and laboratory capacity for confirmation.
- **Reporting**: Refers to the process by which surveillance data moves through the surveillance system from the point of generation.
- **Epidemic preparedness**: Refers to the existing level of preparedness for potential epidemics
- **Stakeholders**: The organizations or individuals that generate or use surveillance data for promotion of health, prevention and control of diseases.
- **Usefulness**: Usefulness of the surveillance system is reflected by documented changes in policies and procedures as a result of information generated by the system.
- **Simplicity**: Simplicity denotes the structure and ease of operation of the surveillance system.
- **Flexibility**: Flexibility of a surveillance system is its capacity to adapt to changing information needs or operating systems within minimal additional time, personnel and funding.
- **Quality**: The quality of data reflects the completeness and validity of the data recorded in the Sub City Health Department.
- **Acceptability**: Acceptability is the willingness of persons, institutions or organizations to participate in the surveillance system.
- **Sensitivity**: Sensitivity refers to the ability of the system to detect cases or outbreaks through trends in the surveillance data.
- **Positive predictive value**: Positive predictive value refers to cases that actually have the health condition in question.
- **Representativeness:** Representativeness refers to the extent to which the surveillance system accurately describes the occurrence of medical condition over time and their distribution in the population by place and person.
- **Stability:** Stability was assessed by questioning the surveillance officers on the consistency of the system.

3.3.8 Data analysis

The data collected as hard copy was entered into excel spread sheet. Count, frequency and percentage were computed and the results were presented by using graphs and tables. Evaluation was made according to the updated CDC guideline for surveillance system evaluation.

3.3.9 Dissemination of study result

The technical report will be communicated to Addis Ababa University School of Public health, EPHI, Addis Ababa health bureau, Kolfe Keranio health office, all visited woreda health offices and EFETP academic coordinators and mentors.

3.3.10 Limitation of the study

Private and NGO health facilities were not included in the assessment.

3.4 Result

3.4.1 Engagement of stakeholders

To have inputs for the surveillance system evaluation, we discussed with Regional Health Bureau Administration at firsthand about surveillance system evaluation for Meningococcal meningitis in the study area. Then the regional health bureau wrote a legal letter to sub city and woreda health offices to be engaged in providing necessary information regarding the proxy disease surveillance in their area for the finding to be acceptable and useful.

3.4.2 Description of the surveillance system

The public health surveillance system of the Sub-city is structured by constituting government health center, private and NGO clinics, woreda and zonal health offices. All health personnel who are participated in evaluation were well aware on the objectives and purposes of disease surveillance and response system. They recalled that early detection and prompt action on health related event is the primary objective of surveillance.

Priority diseases case identification was conducting through the formal health system, private health system and community structures (using UHEW). Meningococcal meningitis is one of the 22 top priority diseases under surveillance which could cause public health threat in the sub city. In 2018, the sub city received 5 suspected meningitis cases from reporting sites in the area using standard case definition of the disease.

Because of scarcity of resources, doing surveillance for all kind of diseases is neither feasible nor possible. Due to this reason, the Ethiopian Federal ministry of health selected top 22 priority diseases to be under routine surveillance. These diseases are categorized as immediately and weekly reportable as shown in Table 3.1.

Table 3.1: List of Immediately and Weekly reportable diseases.

Immediately reportable	**Weekly reportable**
Measles	Malaria
Acute Flaccid Paralysis (AFP) /Polio	Meningococcal Meningitis
Yellow Fever	Typhoid fever
Anthrax	Epidemic typhus
Dracunculiasis/Guinea worm	Sever Acute Malnutrition

Viral hemorrhagic fever (VHF)	Relapsing fever
Avian Human influenza	Dysentery
Rabies	Scabies
NNT	
Pandemic influenza (H1N1)	
Cholera	
Small pox	
Sever Acute respiratory Syndrome	
Maternal death	

3.4.3 Availability of case definition, surveillance manuals, reporting formats and clinical register

According to Ethiopia PHEM guideline, there are two types of case definition: standard and community case definitions.

Standard case definition: is a case definition that is agreed upon to be used by every health professional within the country. Standard case definition can be classified as confirmed, probable, and possible or suspected(7).

Community case definition: is case definition of disease and conditions adapted to suit to health extension workers (HEWs) and community members including community health workers, traditional healers, birth attendants, Kebele administration, agricultural workers, teachers, drug outlets, etc. The community case definitions were modified for simplicity and ease understanding by HEWs and the community members(7). All of the visited health institutions, zonal health office, three woreda health offices and three health centers, have case definition and guideline for meningococcal meningitis(Table 3.2).

Table 3.2 : Availability of guide lines, case definitions, reporting formats and clinical registers in visited health institutions in Kolfe Keranio Sub city, 2018.

Variable	Health Center(N=3)	Woreda health office(N=3)	Zonal health office(N=1)	Total
Availability of case definition (Meningococcal meningitis).	100%	100%	100%	100%
Meningococcal meningitis guideline	100%	100%	100%	100%

Availability of clinical register	100%	NA	NA	NA
Availability of national PHEM guide lines	100%	100%	100%	100%
Weekly reporting forms	100%	100%	100%	100%
Case based reporting form	100%	100%	100%	100%
Line list form	100%	100%	100%	100%

3.4.4 Reporting sites, their completeness and timeliness

Kolfe Keranio sub city has a total of 117 reporting sites of which 11 are government health centers, 4 NGO health facilities and 102 private health facilities. Kolfe Keranio sub city expected a total of 6084 weekly surveillance reports in the past 52 weeks of 2018 from all 117 reporting site in the Sub city. A total of 5841(96%) reports were received and out of these reports 5549 (95%) were reported on time (Table 3.3).

Table 3.3: Reporting sites, their completeness and timeliness in Kolfe Keranio sub city, 2018.

Woreda	GOV_HC	NGO	Others HF	Total sites	Total report expect	Total report receiv	Total report receiv	Completenes s	Timeliness
Woreda 1	1	0	7	8	352	337	337	96%	96%
Woreda 2	0	0	6	6	264	258	258	98%	98%
Woreda 3	1	0	13	14	616	560	560	91%	91%
Woreda 4	1	0	14	15	660	627	627	95%	95%
Woreda 5	1	0	3	4	176	174	170	99%	97%
Woreda 6	1	0	6	7	308	308	305	100%	99%
Woreda 7	0	0	11	11	484	437	437	90%	90%
Woreda 8	1	0	6	7	308	308	308	100%	100%
Woreda 9	1	0	8	9	396	381	373	96%	94%
Woreda 10	0	0	3	3	132	132	132	100%	100%
Woreda 11	1	0	2	3	132	132	123	100%	93%
Woreda 12	0	0	4	4	176	176	176	100%	100%
Woreda 13	2	0	9	11	484	446	446	92%	92%
Woreda 14	0	3	7	10	440	438	420	100%	95%
Woreda 15	1	1	3	5	220	217	210	99%	95%
Total	**11**	**4**	**102**	**117**	**5148**	**4931**	**4882**	**96%**	**95%**

As shown in the Table 3.3, woredas 2, 7, 10, 12 and 14 did not have governmental health centers. Woreda 4 has the highest number of health facilities whereas woreda 10 and 11 have small number of health facilities in the Sub city.

As indicated in the figure below the average completeness and timeliness of reporting of woredas in the sub city were above the national target in 2018. Woreda 7 was the least performed reporting site relative to other woredas even though its performance was above the expected national target in the Sub city (Table 3.3).

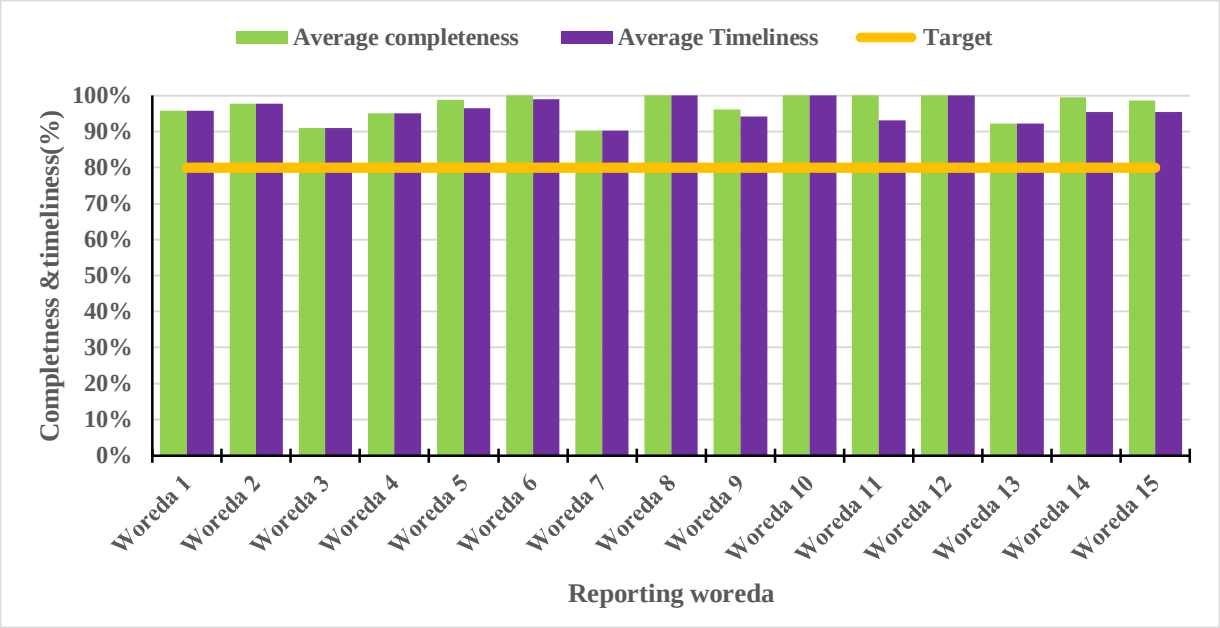

Figure 3.3: Average completeness and timeliness by Woredas in Kolfe Keranio Sub city, 2018

From the visited three woredas Woreda 6 performed better with completeness and timeliness rate of 100% and 99% respectively. Woreda 1 and woreda 5 also have performed above the expected national target (Figure 3.4).

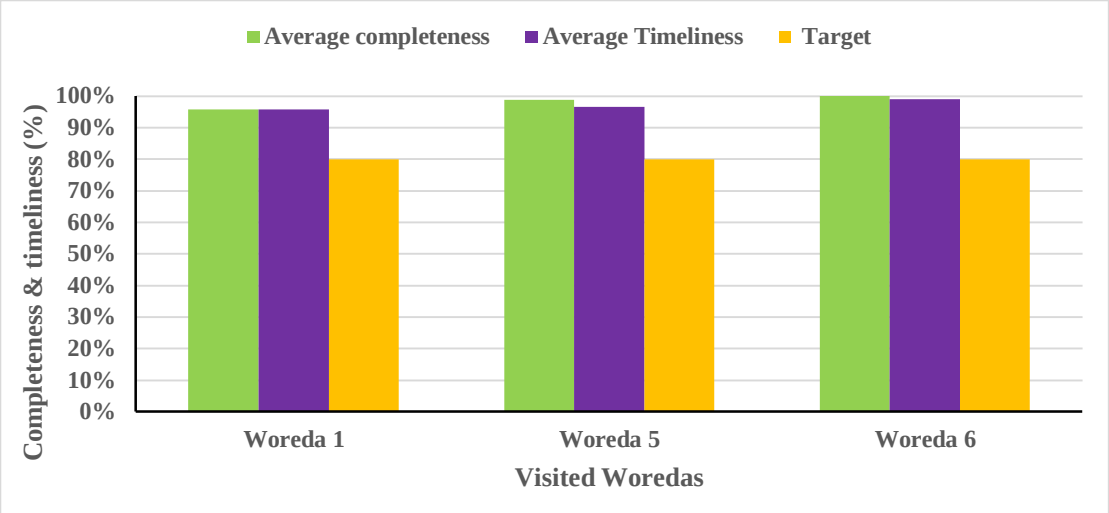

Figure 3.4: Completeness and timeliness of visited woredas in Kolfe Keranio Sub city, 2018.

In the sub city there are three types of health facilities by their ownership as government HCs, NGO health facilities and others/private health facilities. As indicated in Figure 3.5, the completeness and timeliness of these three types of health facilities was above the national expected target of 80%. Governmental HCs performed best with completeness and timeliness rate of 100% and 98.3% respectively in 2018.

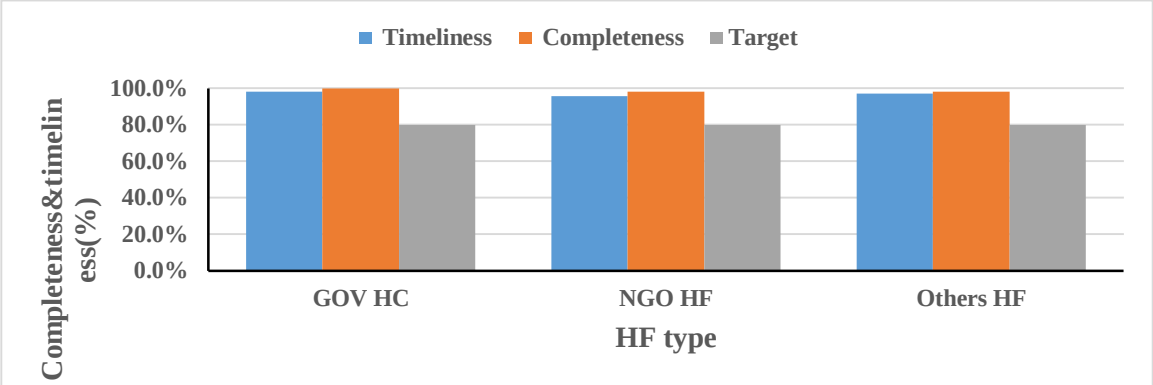

Figure 3.5: Completeness and timeliness of report by type of health facility in Kolfe Keranio sub city, 2018.

The trend of report completeness of reporting health in the sub city was above the national expected target in all of the weeks of 2108. All of the weeks had a report completeness rate of more than or equals to 93% performance (Figure 3.6). The trend of timeliness of weekly report in the sub city

was also above the expected national target. The lowest timeliness of reports was recorded in weeks 41, 44 and 50 with the rate of 85% (Figure 3.7).

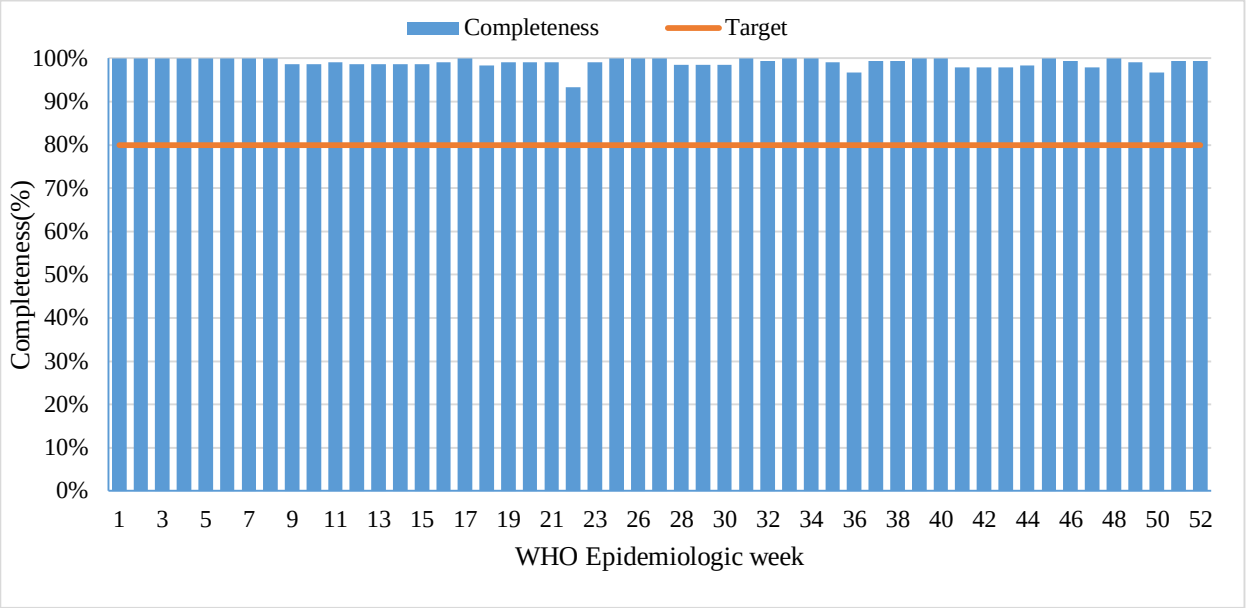

Figure 3.6: Report completeness of reporting health facilities by WHO epidemiologic week in Kolfe Keranio sub city, 2018.

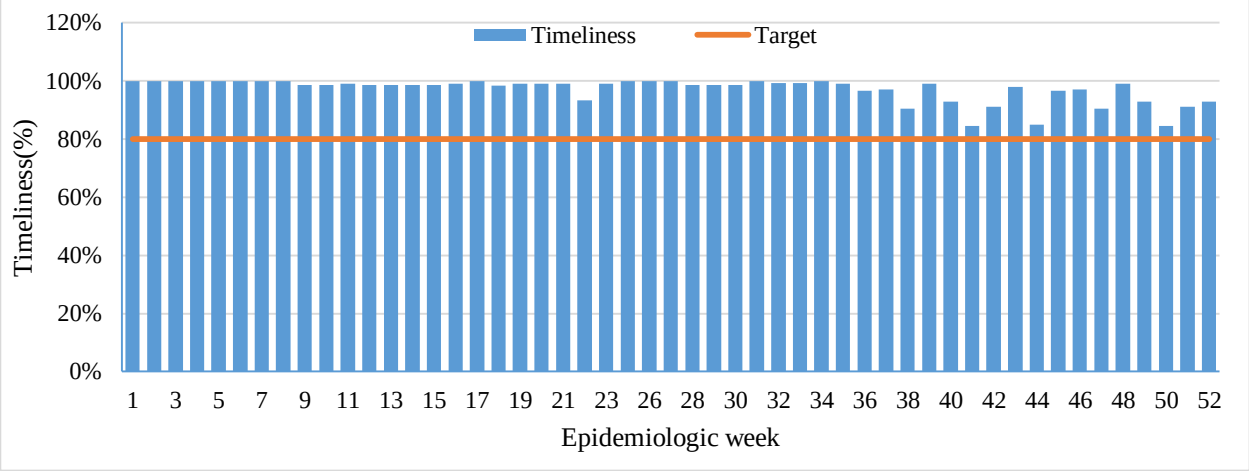

Figure 3.7: Report timeliness of reporting health facilities by WHO epidemiologic week in Kolfe Keranio sub city, 2018.

3.4.5 Data analysis, computer skill and training

PHEM officers in Kolfe keranio sub city had taken basic PHEM training and they have computer skills in Microsoft application and Epi info. They have functional computers but there was no

internet connection. They compile and analyze surveillance data weekly by place and time and not by person because of aggregate nature of data. They notified the result of the data analysis to both higher and lower level PHEM departments.

Two PHEM officers in three visited woreda health offices took frontline field epidemiology training program for three months while the other one took basic PHEM training for 5 days. In all of the visited woreda health offices, PHEM officers did not have independent computer for data analysis and compilation. They conduct data analysis and compilation by computers shared with other departments. In all of the visited health centers, PHEM focal persons have computer skills on Microsoft applications. Even though PHEM focal persons have computer skills, they didn't analyze surveillance data because of lack of computer in the office and hence data compilation was done manually. From the 15 interviewed HEWs from visited health centers, 13(86.67%) of them had taken training on vaccine preventable diseases.

3.4.6 Epidemic preparedness and response

All visited health offices had written epidemic preparedness and response plan. There was no any drug, PPE and supplies shortages in the visited health offices. Visited woreda health office had emergency stocks of drugs and supplies in their respective government health centers. In addition, all of them had established Rapid Response Team and task force committee but it lacks continuous functionality and had no regular scheduled meeting time. In all levels of visited health offices and health centers, they didn't have unique budget allocated and vehicles assigned for emergency in 2018 (Table 3.4).

Table 3.4: Availability of epidemic preparedness and response resource in visited sites, Kolfe Keranio Sub city, 2018.

S. No.	Variables	Sub City health department (N=1)	Woreda health offices (N=3)			Health Center (N=3)		
			Woreda 1	Woreda 5	Woreda 6	HC 1	HC5	HC6
1	Availability of Epidemic response and preparedness plan	✓	✓	✓	✓	X	X	X

2	Availability of Emergency stock of drugs and supplies	✓	✓	✓	✓	✓	✓	✓
3	Availability Outbreak investigation check list	✓	✓	✓	✓	X	X	X
4	Availability of Rapid Response Team (RRT)	✓	✓	✓	✓	X	X	X
5	Availability of task force committee	✓	✓	✓	✓	X	X	X
6	Availability of vehicles for emergency	X	X	X	X	X	X	X
7	Availability of budget for epidemics/ emergency	X	X	X	X	X	X	X
8	Experienced shortage of drugs and supplies during epidemics	X	X	X	X	X	X	X

3.4.7 Outbreak investigation

All of the interviewed respondents from visited Sub city health office, woreda health offices and Health Center didn't conduct any kind of outbreak in 2018. There was no outbreaks of Meningococcal meningitis and other diseases in the sub city during 2018. If an outbreak is happened in the sub city, RRTs are responsible to conduct an outbreak investigation by using available outbreak investigation checklist.

3.4.8 Supervision and Feedback

To strengthen surveillance system in each level, supportive supervision plays an important role. The Sub city and woreda health offices had supervision plan and supervision checklist. They conducted supportive supervision to their lower level according to the plan they prepared. The supervision was conducted every three months and all of the health institution visited were visited by respective higher level PHEM officer during 2018. Even though the sub city PHEM department was supervised by higher level officer, they didn't received any feedback. Visited woreda health offices and health centers had received feedback from 3-4 times in the last 52 weeks in 2018. In all of the visited health institutions they didn't face any challenge in conducting supervision except the transportation problem that there was no vehicle assigned for both Sub city and Woreda PHEM departments.

3.4.9 Resources

Availability of resource is one of the factors that determine the quality of disease surveillance in all levels of health system. Equipment and other resources needed to maintain and operate the surveillance system in all visited health system levels assessed were shown in Table 3.5 below.

Table 3.5: Availability of resources for PHEM activates in visited health systems levels in Kolfe Keranio sub city, 2018.

S.No	Variables	Sub city health office (N=1)	Woreda health office (N=3)	Health Center (N=3)	Total
1	Electricity	100%	100%	100%	100%
2	motor cycle	0%	0%	0%	0%
3	Vehicle	0%	0%	0%	0%
4	Computer	100%	0%	0%	0%
5	Printer	0%	0%%	0%	0%
6	Fax	0%	0%	0%	0%
7	Telephone	0%	0%	0%	0%
8	Internet connection	0%	0%	0%	0%

3.4.10 Description of attributes of the surveillance system

3.4.10.1 Usefulness

According to the PHEM officers in Sub city and woreda health offices, the data collected by surveillance system helped a lot in disease control and prevention. PHEM officers in Sub city and woreda health offices were conducting data analysis and producing weekly bulletin in order to detect trends that signal changes in the occurrence of disease including detection of epidemics (or outbreaks). Moreover, they used surveillance system to evaluate the effectiveness of disease control and prevention programs. But PHEM focal persons in visited health centers weren't using surveillance data to detect trends that signal changes in the occurrence of disease as they simply collect and send raw data to the higher level of health system without conducting any kind of analysis. Simply based on their theoretical knowledge, they responded that the surveillance system is important in disease control and prevention but in practice they hadn't produced any information from the collected data at least for their use at office.

3.4.10.2 Simplicity

According to the respondents' response, case definition of meningococcal meningitis is easily understandable and simple to any health care providers and health staffs in all levels of health system. Interviewed PHEM officers and focal persons responded that, health professionals in all levels can easily fill, record and report data timely to the next level. The reporting format can be filled within 5 to 10 minutes and the surveillance system allows updating of cases whenever there is a need.

Simplicity of surveillance system could also be measured by the number of organizations involved in reporting the health related event. Accordingly the sub city has 11 government health centers, 4 NGO and 102 private health facilities which have been involving in surveillance of top priority diseases in the country. Concerning types and contents included in the reporting format, all respondents said that all data elements included in weekly surveillance reporting format are important but it lacks person variable like sex.

3.4.10.3 Acceptability

Acceptability reflects the willingness of persons and organizations to participate in the surveillance system. In this case the participants of the surveillance system are health facilities, health offices, nongovernmental organizations and private health facilities as Organizations and health workers and the community as individuals. All of the aforementioned agents accept and are well engaged to the surveillance activities. The acceptance of the surveillance system was indicated by the use of the standard cases definitions and the recent and standard reporting formats. All visited health facilities and health offices were using surveillance standard case definition and reporting formats.

3.4.10.4 Flexibility

A flexible public health surveillance system can adapt to changing information needs or operating conditions with little additional time, personnel, or allocated funds. Flexible systems can accommodate, for example, new health-related events, changes in case definitions or technology, and variations in funding or reporting sources. In addition, systems that use standard data formats (e.g., in electronic data interchange) can be easily integrated with other systems and thus might be considered flexible(4). In visited health offices and health facilities, the respondents responded that the existing surveillance system is flexible in the structure and reporting format. Weekly reporting format of the system has blank spaces to accommodate newly occurring health event. In

addition to this, surveillance data entry format changed in 2018 was adopted and used without difficulty in both sub city and woreda health offices.

3.4.10.5. Representativeness

The representativeness of the surveillance system is related to the health service coverage, the reporting rate of the health facilities, the health seeking behavior of the community, and the technical capacity of the health care providers. The Sub city health service coverage was 100%. According to PHEM focal persons in visited health centers, the health seeking behavior of the community was dramatically changed due to awareness creation done by community voluntaries in collaboration with HEWs.

3.4.10.6 Stability

According to the respondents in all visited health systems all (100%) respondents have question on stability of the system for the future even though it is still working. As shown in Table 3.5, the availability of resources in all of the visited health institutions was very limited and scarce. All of the respondents agreed that with scarce resources making surveillance system stable is difficult and they are worrying on the sustainability of surveillance system of the sub city unless resources are allocated.

3.4.10.7 Data quality

According to the copies of weekly reports in visited health offices both at sub city and woreda, all weekly reporting formats didn't have unfilled responses and the recorded data were clear to read and understand. But in health centers some variables like reporting date and reporting facility were not filled in some reports which resulted in a report format completeness of 97% in these facilities. The recorded data were clear and understandable.

Regarding other attributes like Positive Predictive Value (PPV) and sensitivity, it is difficult to discuss as sub-city received only 5 suspected cases of meningitis and there was no laboratory confirmation status.

3.5 Discussion

Some case definitions, particularly those used for national surveillance, have been developed and adopted as national standards that ensure comparability. Use of an agreed-upon standard case definition ensures that every case is equivalent, regardless of when or where it occurred, or who identified it. Furthermore, the number of cases or rate of disease identified in one time or place can be compared with the number or rate from another time or place (15). All (100%) of the visited health offices and health centers had standard case definitions, national PHEM guideline and reporting forms; this was higher than the report that 74% of health facilities in dawuro zone had at least one standard case definition(16). It was also higher than the report from Nigeria in 2013 where 62 % of health facilities had case definitions for any of the priority diseases(17). Clinical registers for health facilities and community case definition for urban HEWs were also available in all visited health facilities in the Sub city.

Report completeness rate is one of the indicators to determine whether the surveillance system is strong or not. If reports are late, or are not submitted, the aggregated information for the zone, district (or other administrative area) will not be accurate .Outbreaks can go undetected, and other opportunities to respond to public health problems will be missed. According to the finding, Kolfe Keranio Sub City weekly surveillance report completeness was greater than the national target of 80%. When we see the reporting facilities as government, NGOs and private health facilities; their report completeness rate was higher than the expected national target.

When reports are sent and received on time, the possibility of detecting a problem and conducting a prompt and effective response is greater. As indicated in the result, the Sub city and other visited health offices and health facilities reporting timeliness was greater than the national target. This performance may indicate the quality of work towards disease surveillance as the reporting weekly itself tells the sensitivity of surveillance system. This clearly illustrates that timely reports will give timely information which helps to predict future outbreaks, trends of diseases occurrence, cases for further studies, future impact of diseases surveillance and action for problems identified on time.

Computers are important data management tools for public health surveillance system as they can be used for data entry and analysis. All assessed woreda health offices and health centers didn't have availability of computer and printer for data management and analysis. At the zone level, a computer was available for data management. Because of the unavailability internet services at all level of health system in the sub city, reporting to the zonal level was by the use of mobile phones. In contrast to this finding, 35.7% health facilities assessed in Dawuro zone of SNNPR (16) and all studied district and provincial directorates in Mozambique and Tanzania had computers for data management(18, 19). Other IDSR assessment study in Nigeria also indicated that 29% of health facilities assessed had computer(17).

Analysis and interpretation of data at the health centers, district and zonal health offices level is important and is one of the determinants of public health surveillance system implementation. It allows for practical use of the data collected for surveillance at all health facility, district and zonal health offices levels. In this assessment, none of the health centers visited had conducted data analysis whereas all of the visited district/woreda health offices and zonal health office had been conducting surveillance data analysis and producing weekly bulletins. The IDSR assessment in Dawuro zone of SNNPR showed that 7% of health facilities conducted data analysis(16), which was somehow better than the current assessment. Absence of conducting data analysis regularly may hinder early detection of health events and taking appropriate control and preventive actions before the events are causing more illness and disability in the community.

Epidemic preparedness is an essential and the basic action prior to the occurrence of any health related events. A public health emergency such as an acute outbreak or public health event calls for an immediate response. Being prepared to detect and respond to such an event is an essential role of all health systems. In this regard the visited health offices and health centers didn't have vehicles and emergency budget, which are important items to respond emergency timely and efficiently. In zonal and woreda health offices both task force committee and RRT were established but it lacked regular functionality.

For the success of surveillance program, capacity building plays a fundamental role. To increase the quality of early detection of diseases and reporting system, formal or on job training for PHEM officers and focal persons is necessary. In Kolfe Keranio, PHEM officers in both zonal and woreda

health offices and focal persons in health centers had taken training on basic PHEM or frontline field epidemiology for different periods of 5 days to 3 months and likewise urban HEWs were trained on vaccine preventable diseases. Because of this training was given in 2017and before 2017, PHEM officers and focal persons employed after this year didn't take training on basic PHEM. Therefore, considering employee turn flow rate in conducting refreshment training is important to update the health workers knowledge.

To strengthen and to create a well stabled surveillance system supportive supervision and feed backing system is important. Supervision and feedback system should be conducted with a regular time interval. In visited health institutions supportive supervision was conducted according to the plan but feedback is relatively poor. Lack of feedback from higher levels discourages staffs especially PHEM officers and focal persons as they may not see the results of reporting, and may lead to a poor performance in the future.

3.6 Conclusion and recommendations

In the sub city, the participation of government, NGO and private health facilities in surveillance system was good and the report completeness and timeliness was above the expected national target. Similarly the completeness and timeliness of the reporting as sub city and woreda health offices was above the expected target. On the other hand resources insufficiency was high in all levels of health institutions; especially with resources of data management and transportation which in turn have negative consequence on the stability of the system. Established task force committee and RRT regular functionality was poor in visited health institutions. In all levels of visited health institutions there was no emergency budget allocated and feedback system in assessed health institutions was poor; which may degrade the work enthusiasm of PHEM officers and focal persons in the future.

Based on the assessment result the following recommendations are forwarded:

- The sub city and woreda health offices should have resources for surveillance system functionality and stability especially computer with internet connection and Vehicles.
- Emergency budget should be allocated in Sub city and woreda health offices.
- Established task force committee and RRT) should have regular meeting time and be functional as needed.

- ❖ EPRP should be prepared and updated every year at all health institutions.
- ❖ Formal or on job training should be given for PHEM officers and focal persons considering employee flow turn rate.
- ❖ Supervision and feedback system should be improved in Sub city.

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Chapter 4 : Health profile

Health Profile Assessment Report of Ginir Woreda, Bale Zone of Oromia Region, Ethiopia, 2018

Abstract

Background: Health profile is a system of collecting and summarizing health and others health related events, demographic, socio-economic, political and cultural aspect of a given district. This summarized and prioritized public health data is important for public health surveillance officials to uses it for planning, implementation and evaluation of public health programs.

Methods: This health profile data was collected by thoroughly reviewing health and health related data in Ginir district from different sectors. In addition, the data was collected by reviewing publications and literature and interview of key informants about the area; which was not documented in the offices. The data was collected by using checklists and semi structured questionnaire as a tool from March 26-April 8, 2018 and then was processed, organized and analyzed by Microsoft excel.

Result: Ginir district has 28 rural and 3 urban kebeles. There are 25 sectors found in the district and their offices are found in Ginir town. Projections from the 2007 population and housing census estimated the total population for the year 2009 E.C (2016/17) of the district to be 159,645. There were 32416 House hold in the district. Of the total population, 81,419(51%) were females. In Ginir district the main income sources of population are agriculture and cattle breeding of which 123,246(77.2%) are practicing agriculture and 36,399(22.8%) are based on livestock breeding. Ginir district has 88 schools which is 93.6% coverage, of these, 80 were primary schools, 7 high schools and 1 preparatory school. Full immunization coverage of district was 97.4% and contraceptive use coverage was 30.7%. Safe water supply coverage of the district was 26% and 77.9% of households had latrine. Malaria, HIV/AIDS and TB/Leprosy are endemic diseases in the district.

Conclusion: Diseases of acute upper respiratory infection and malnutrition were main diseases of morbidity in adults and under five children respectively. The vaccination coverage of the district was high during study period in the district with performance of more than ninety percent coverage. In the district more children were affected by malnutrition. WASH, family planning, nutritional supplies and disaster related budgets should be given due emphasis.

Keywords: Health profile, Ginir, Bale, assessment

4.1 Introduction

4.1.1 Background

Health profile is a quantitative and qualitative description of the health of citizens and the factors which influence their health. It identifies problems, proposes areas for improvement and stimulates action. Health Profile is about the health of people and about the conditions in which they live. It is essential tool for change and it must be an integral part of local decision-making and strategic planning processes (1). The preparation of profiles provides a lively, scientifically and evidence based account of health in the district; it can stimulate public interest and political commitment; and it can identify targets for the future and monitor progress towards them.

The Health profile is a summarized auditing and discussion of health related data and important health related indicators to describe the health and related social, economic, political and cultural factors in the geographic area under discussion.

4.1.2 Rationale of the study

Health profile assessment is a way to gain a snapshot of a community‘s current assets and needs by examining and recording community strengths, challenges, and resources. It is important for prioritizing health program and health related problems of the community at any level. The planning and management of health services in developing countries often proceeds within an environment of inadequate information about the health status of the population served and the occurrence of important determination of health. This is particularly the case at the district level where health service have traditionally underdeveloped and information system is lacking (2). So far in our country, it is not familiar to find prepared district health profile even though basic for planning and for appropriate intervention; and is an entry point for operational research. Generation and usage of data and evidence to design and formulate appropriate programmes and to inform development programming remains haphazard in most districts of Ethiopia. Stake holders who are working on health may need compiled health and health related issues health profile but due to lack of this information they made their project intervention unsystematically.

In Ginir woreda health profile was not done before and there is no organized health and health related information. Therefore, this project work made access of compiled health and health

related issues of the district for planning, prioritizing health program and health related problems.

4.2 Literature Review

Study done in Tulu Woreda West Harerge zone, Oromia Region showed that the safe water coverage of the rural area was 41%, whereas urban safe water coverage was 80%. The main water sources for the rural community includes; 310 springs, one deep well, one shallow well and nine hand pumps. Among the 310 springs 71 (22.9%) were treated and protected. The main safe water source for urban population were two shallow well and one spring. The standard latrine coverage of Tullo District was 45% in 2005EFY (3).

Malaria is the top leading cause of morbidity at OPD leading by 40.3%, with incidence of 18.10 per 1000 population per year based on outpatient visit records, followed by Typhoid and diarrhea which account 13.76% and10.63% respectively. The proportion of delivery attended by skilled health personnel 16.2 %(1552/9575) and 15.4 %(1474/9575) attended by HEW in the same year. TB detection rate was low (58.84%) and Six TB cases were reported as defaulters. Absence of ITN's distribution in malaria endemic kebeles Safe drinking water supply coverage in the rural and urban community of the district was 21.4% and 32.6% respectively (4).

Study done in Efratana Gidim woreda , Amhara regional state of Semen Shewa zone showed that In the woreda the proportion of pregnant women who had at least one ANC visit are 74.5% and 22.4% of births were attended by skilled health personnel besides 1.4% of births attended by HEWs. Family planning coverage of the woreda is 80.3%. In the woreda the full immunization coverage was 67.6%. Pneumonia, acute febrile illness and diarrhea (non-bloody) are one of the top leading cause of adult morbidity and similarly Pneumonia, diarrhea (non-bloody) and acute febrile illness are top leading causes of morbidity in under five children (5)

Ethiopian Demographic Health Survey showed that education was one of the major socioeconomic factors that influence a person's behavior and attitude. In general, the higher the level of education of a woman, the more knowledgeable she is about the use of health facilities, family planning methods, and the health of her children. Survey results show that the majority of Ethiopians have little or no education, with females much less educated than males. Fifty-two percent of males and 67 percent of females have never attended school, and 32 percent of males and 25 percent of females

have only some primary education. Four percent of males and 2 percent of females have completed primary education only, and 8 percent of males and 5 percent of females have attended, but not completed secondary education. Only 3 percent of males and 2 percent of females have completed secondary school or higher (6).

The 2016 EDHS showed during the 5 years immediately preceding the survey, the infant mortality rate was 48 deaths per 1,000 live births. The child mortality rate was 20 deaths per 1,000 children surviving to age 12 months, while the overall under-5 mortality rate was 67 deaths per 1,000 live births. The neonatal mortality rate was 29 deaths per 1,000 live births, and the post neonatal mortality rate was 19 deaths per 1,000 live births. The findings further indicate that all childhood mortality rates have declined over time. For example, the under-5 mortality rate has declined from 116 deaths per 1,000 live births 10-14 years prior to the survey (2002-2006) to 67 deaths per 1,000 live births in the 0-4 years prior to the survey (2012-2016) (6).

4.3 Objectives

4.3.1 General objective

- To assess health and health related problems in the district.

4.3.2 Specific objective

- To assess existing health infrastructure of the district.
- To assess and describe health indicators and to identify problems for priority setting
- To assess primary health care coverage of the district.
- To describe endemic diseases as well as its control and prevention programs in the district.

4.4 Methods and materials

4.4.1 Study area

This health profile assessment was conducted in Ginir woreda, Bale zone of Oromia region. It is named after the administrative center of the woreda, Ginir. Part of the Bale Zone, Ginir is bordered on the south by the Gestro River (or Weyib River) which separates it from Goro, on the west by Sinanana Dinsho, on the northwest by Gaserana Gololcha, on the northeast by Seweyna, and on the east by Raytu (Figure 4.1).

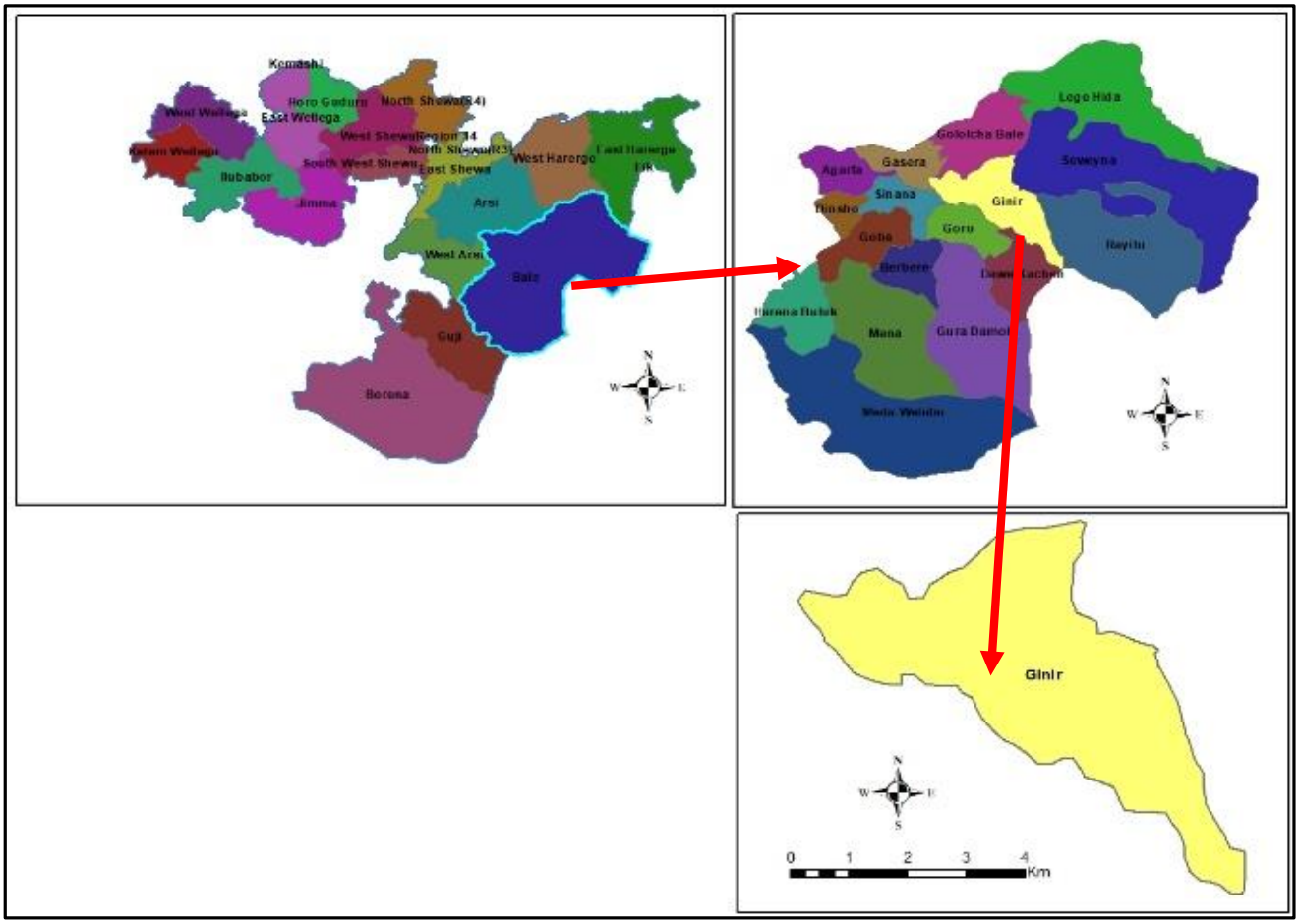

Figure 4.1: Map of Ginir Woreda

4.4.2 Study design and period

Cross-sectional study design was used from March 26-April 8/2018 to assess health profile of the district.

4.4.3 Data collection and procedure

Different instruments like checklists and semi structured questionnaire were used as tools for data collection from various governmental organizations such as district health office, health facilities, education sector, finance office, agriculture sector, district water resource office, district electric power authority and district political administration office. The publication and literature about the area were reviewed. Concerned health office heads, experts, health professionals of various disciplines and heads and experts of other sector offices were interviewed. Different health related documents and posted charts were examined for a list of different health problems, organizational structure and others.

4.4.4 Data analysis

During the data analysis, the data gathered from all sources was cross checked to assure its validity and reliability. Then the data was compiled and analyzed using the Microsoft Excel Software.

4.4.5 Ethical Clearance

Written ethical clearance letter was obtained from the Bale zonal health department. The purpose and objective of the study for which the data will be required was explained briefly to the Head of the District Health Office and other concerned sectors and organizations prior to the interview and discussion.

4.4.6 Limitation

In district there was no mortality data, no admission report. There was problem to get necessary data from different sectors in the district. Generally, soft copy of the required data was not available in all Woreda Offices. Even if the data was available in hardcopy it did not include all the required variables for description. Due to this limitation, the study may not include all the required characteristics for describing district health profile.

4.4.7 Operational definitions

The study of population and its characteristics, with reference to such factors: size, age structure, density, fertility, mortality, growth and social and economic variables. Clean and safe delivery: Proportion of deliveries attended by HEWs.

Child mortality rate: The number of death in 1-4years children occurring in 2016/17(2009) per 1000 women in the reproductive ages (i.e. women aged 15-49).

Crude birth rate: The number of births in a population during 2009 divided by the number of person-years-lived by the population during the same period. It is frequently expressed as births per 1,000 populations.

Crude Death Rate: The number of deaths in a population during 2009 is divided by the number of person-years-lived by the population during the same period. It is expressed as births per 1,000 populations.

Infant Mortality Rate (IMR): The ratio of the number of deaths under one year of age occurring in 2009 to the number of births in the same year.

Contraceptive prevalence rate: Proportion of women of reproductive age (15-49 years) who are using (or whose partner is using) a contraceptive method, on the year 2009.

Contraceptive acceptance rate: Proportion of women of reproductive age (15-49 years) who are not pregnant who are accepting a modern contraceptive method (new and repeat acceptors).

ANC rate (how many of the total expected pregnancies attended 1st ANC): Proportion of pregnant women attended, at least once during the current pregnancy, by a health professional, for reasons related to pregnancy.

Clean and safe delivery: Proportion of deliveries attended by HEWs.

Skilled delivery: : Proportion of deliveries attended by skilled health attendants; A skilled birth attendants an accredited health professional – such as a midwife, doctor, health officer or nurse who has been trained in the skills needed to manage normal (uncomplicated) pregnancies, child birth and the immediate postnatal period, and in the identification, management and referral of complications in women and newborns.

Tuberculosis (TB) case detection rate: Number of new smear positive TB cases detected, among the new smear-positive TB cases estimated to occur in the woreda.

TB treatment success rate: Percentage of a cohort of new smear positive TB cases registered in a specified period that successfully completed treatment. Successful completion entails clinical success with or without bacteriological evidence of cure.

TB cure rate: Percentage of a cohort of new smear-positive TB cases registered in a specified period that was cured as demonstrated by bacteriologic evidence (a negative sputum smear result recorded during the last month of treatment and on at least on one previous occasion during treatment).

TB defaulter rate: Percentage of a cohort of new smear-positive TB cases registered in 2009 that interrupted treatment for more than 2 consecutive months.

Skilled birth attendant: An accredited health professional such as midwife, doctor, health officer or nurse who has been trained in the skills needed to manage normal (uncomplicated) pregnancies, child birth and the immediate postnatal period and in the identification, management and referral of complications in women and newborn (Exclude TTBA and HEWs).

Leading causes of morbidity: The frequently occurring causes of morbidity among patients, of which the greatest number of cases have been reported during the year.

Fully immunized: Surviving infants who received all doses of vaccine antigen. The Infant Antigens are: BCG, Pentavalent (DPT-HepB, Hib), doses 1 -3; OPV, doses 1—3; and Measles

Antenatal coverage: Proportion of pregnant women attended, at least once during the current pregnancy, by a health professional, for reasons related to pregnancy.

Contraceptive accepter's rate: Proportion of women of reproductive age (15-49 years) who are accepting a modern contraceptive method (new and repeat acceptors).

Postnatal care (PNC) coverage: Proportion of women who seek care at least once during postpartum (42 days after delivery) from skilled health attendants including HEWs for reasons relating to post-partum.

Leading causes of mortality: The most frequently occurring causes of mortality under which the greatest number of deaths have been reported during a given year.

Maternal mortality rate: The number of maternal death while pregnant or within 42 days after termination of pregnancy from any cause related to pregnancy or its management per 100,000 populations.

4.5 Result

4.5.1 Historical Background

Ginir district is one of the 18 districts, which are found in the Bale zone, Oromia region. Regarding the naming of the district, there was written document in culture and truism bureau of the district which states that the name Ginir was named after the female sand worker Giniro. She sold her sand product in today's Ginir town. People Called that place Ginir and it was established as town in 1878 EC. But the District got this structure since 1983. Previously during the Dergu regime the town served as Awraja town.

4.5.2 Geography and Climate

The Ginir district is found 529Km far from Addis Ababa, the capital city of Ethiopia, at East direction and it is 129 Km far from Robe, the capital city of Bale zone. Its altitude ranges from 1750mt -1986mt above sea level. About 15% of the area of this woreda is covered with valley, gorges and hills. Rivers include the Dinkit, Gololcha and Tebel Rivers. A survey of the land in this woreda shows that 30.5% is arable or cultivable, 31.2% pasture, 35.6% forest, and the remaining 2.7% is considered swampy, mountainous or otherwise unusable. Khat, fruits and vegetables are important cash crops. Coffee is also an important cash crop; between 2,000 and 5,000 hectares of land is planted with it.

It has found at geographical coordination of 6° 26' – 7° 12' north latitudinal and 40° 06'-40° 18'east longitudinally. The average altitude of district is 1685 meters above sea level. Total estimated area of the district is around 2,350.63 square. It has three climatic zone.' kola', 'Weina dega' and 'Dega'. 'Kola' encompasses 37.87%, 'Weinadega' encompasses 61.87 % and Dega encompasses 0.9%.

4.5.3 Administrative setup

Ginir district has 28 rural and 3 urban kebeles. There are 25 sectors found in the district and their offices are found in Ginir town. It is bordered on the south by the Weyib River which separates it

from Goro, on the west by Sinanana, on the northwest by Gaserana and Gololcha, on the northeast by Sewena, and on the east by Raytu.

4.5.4 Demographic Information

Projections from the 2007 population and housing census estimated the total population for the year 2009 E.C (2016/17) of the district to be 159,645. There were 32416 House hold in the district. Of the total population, 78,226(49%) were males and 81,419(51%) were females. The male to female ratio was 1 to 1.04. About 12,133 (7.6 %) population live in urban and 147,512(92.4%) population live in rural. The pyramidal age structure of the population has remained predominately young with 34.5% under the age of 15 years, and 63% of the population in the age group of 15 and 65 years. The age group above 65 years accounts 3.7% of the total population (Figure 4.2). The reproductive age group of women were 18.4% of the population.

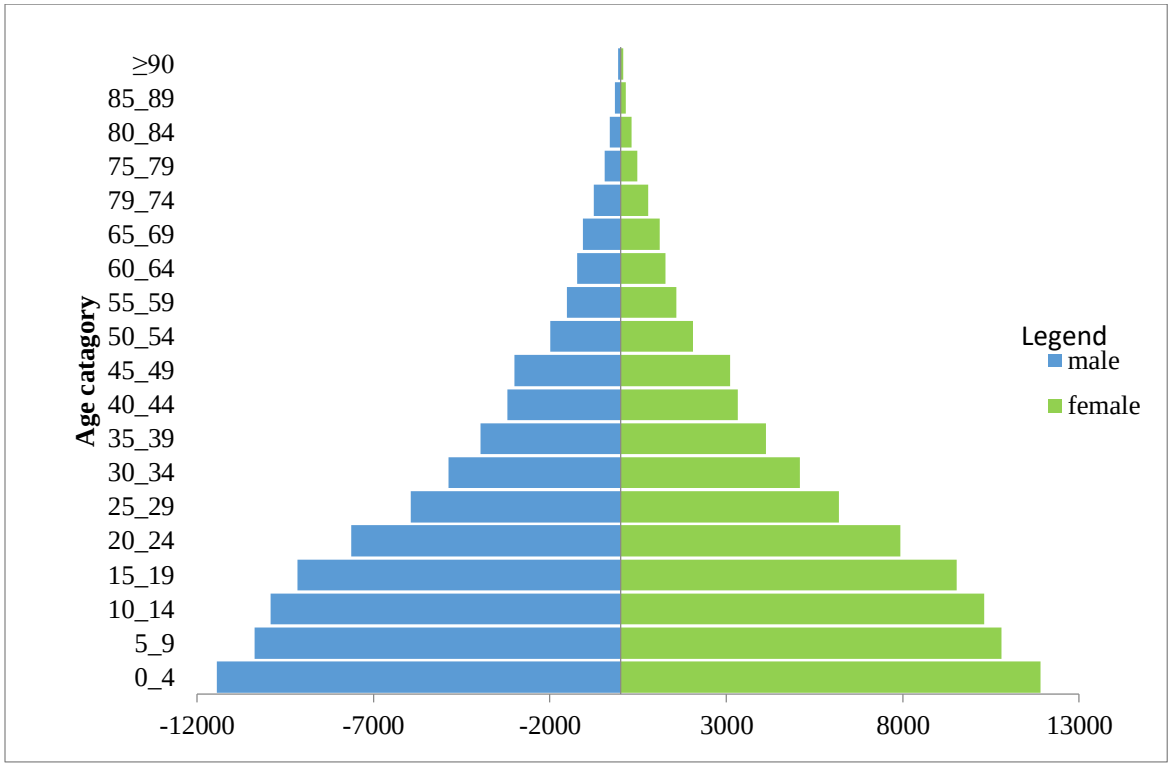

Figure 4.2: Population pyramid of Ginir district, Bale zone, Oromia, 2009 EFY

Of the total population, 150,705(94.4%) are ethnic Oromo and spoke oromifaa, the rest 8940(5.6%) of the population to be Amhara. In the district, majority of the inhabitants are Muslim, with 125,098 (78.36%) of the population have been practicing this belief, while 34,372(21.53%) of the population have been practicing Orthodox Christianity and the rest practiced protestant and others.

4.5.5 Productivity and income

In Ginir district the main income sources of population are agriculture and cattle breeding of which 123,246(77.2%) are practicing agriculture and 36,399(22.8%) are based on livestock breeding. The district had 44,454 hectares of land, which is used for agriculture practices in the fiscal year. About 1,338,072.5 kuntal of wheat,"Teff" and other cereals were produced in the district. The livestock production of the district during study period was 204,503 in total.

There were about 1217 government employees found in the district, of those, 733(60.2%) were males and 484(39.8%) were females. About 11,419 were employed in different factories. Of whom 5007(43.8%) were males and 6412(56.2%) were females. According to Labor and Social affairs office, 1824 productive individuals were unemployed, of these, 1472(80.7%) were males and 352(19.3%) were females.

4.5.6 Education and school health

Ginir district has 88 schools which is 93.6% coverage, of these, 80 were primary schools, 7 high schools and 1 preparatory school. There was no college in the district. A total of 39,449 students were enrolled at different level of schools, of whom, 21530(54.6%) were males and 17,919(45.4%) were females. The male to female ratio of school attendance was about1.2 to1. From total schools, 9(10.2%) had water supply, 48(54.5%) had functional latrine separated for both sexes, 8 (9%) had functional latrine which were not separated for male and female, 2(2.3%) had standard latrine, 30 (34%) had no any kind of latrine and all schools had HIV and other health clubs.

4.5.7 Facilities

In the district there is main gravel road which crosses the district and connect it with Robe town. In addition to main road there are other gravel roads which connect kebeles to kebeles and main roads. In the district there was no asphalt road. The gravel roads are not accessible to all kebeles in the district. Three kebeles are access to road during dry season. There is no road in 8 (25.8%) kebeles. In the district 70,244(44%) of population had no access to gravel road.

Regarding communication, 27 (87%) of the kebeles were assess mobile telephone network, but no one uses fixed telephone in the district. Of the total population, 9,100 (5.7%) have access and use electrical power. Ginir district has eight health centers and 32 health posts. The health centers are Akasha, Arda tare, melka Oda, Harawa-2, Harawa-4, Waltai, Dalo Sabro and Kara. Among the health centers, two have electrical power and five have water supply. Dalo Sabro and Melka Oda have electric power. Waltai, Harawa-4 and Kara are health centers without piped water supply. All health centers have access to mobile and wireless phone but they don't have fixed telephone. All health centers Provide BEmONC services for community. All health centers have access of transportation for most of their catchment and for health posts to reach health center, it takes on average 30- 50 minutes. Three health posts are difficult to access during Rainy season. All health posts had no water supply and electric power. All health posts have medical equipment, provide CBN, OTP, ICCM and DOTs services and 10 (31.25%) of the health posts in district fully implement CHIS.

Flow of health Management and organogram of district health office

District Health office → PHCU → HC+HP

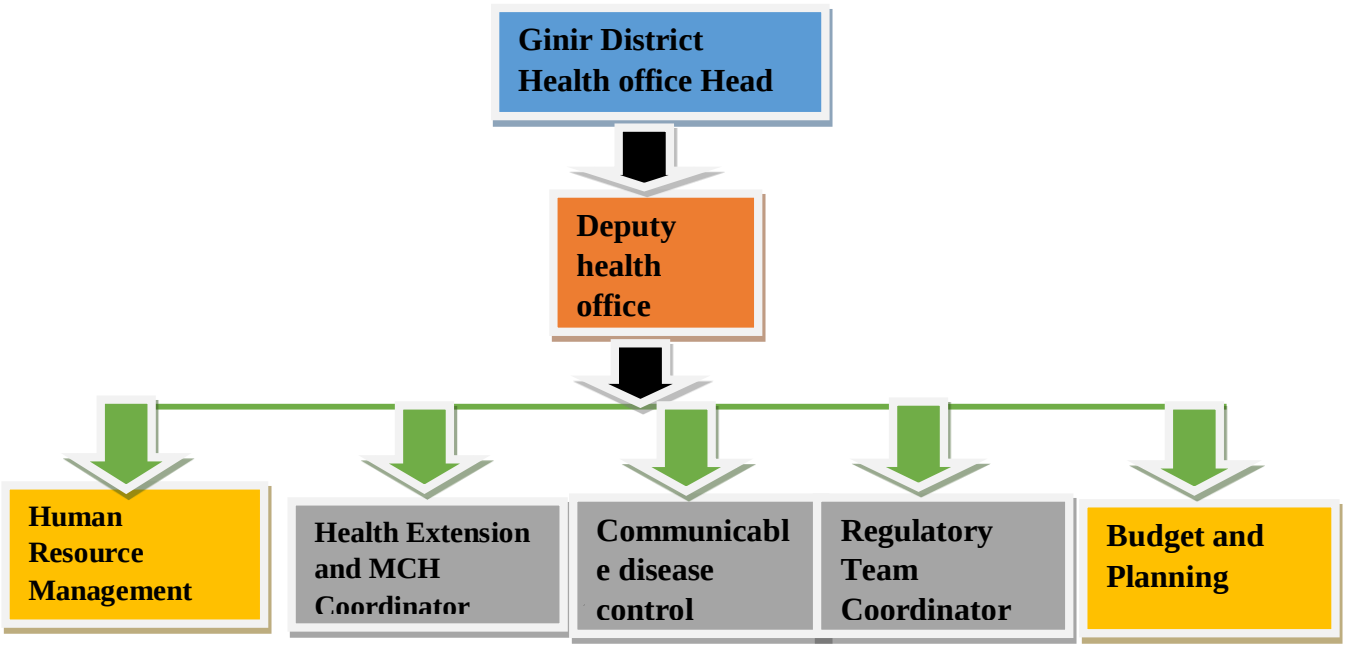

Figure 4.3: Ginir district health office organizational hierarchy

Health institutions and professionals

Besides to government health facilities, there are also private health facilities in the district which have been giving health services to the community (Table 4.1).

Table 4.1: Number of health facility in Ginir district, Bale, Oromia Region, 2016/2017

Type of health facility		Number	Remark
Health center		8	
Health post		32	
Private H/F (clinics/dia.lab/drug/pharmacy)	Clinics	3	Three of them are Lower
	Drug vender	4	
	Drug Store	0	

The district governmental health sectors had about 156 health professionals (Table 4.2). The health center to population ratio was 1:19450, HO to population ratio was 1:9725, Nurse to population ratio was 1:3990, Midwife to population ratio was 1:6765, and HEW to population was 1:2510. There was no physician in the government health facilities. The district health office facilitates health and health related activities by organizational hierarchy (hierarchy).

Table 4.2: Number and type of health professionals in Ginir woreda, Bale zone, Oromia region, 2016/17.

Professional type	Educational level	Number of professional		
		Sex		Total
		Male	Female	
Nurse	Degree	6	3	9
	Diploma	18	12	30
Midwife	Degree	4	0	4
	Diploma	1	18	19
Health officer(HO)	Degree	15	1	16
Laboratory	Degree	4	0	4
	Diploma	1	1	2
Pharmacy	Degree	1	0	1
	Diploma	2	0	2
Environmental Health	Degree	1	0	1
	Diploma	1	0	1
paramedic		4		4
HEWs			62	62
HIT			3	3
Total				156

4.5.8 Health indicators and vital statistics

Health indicators and vital statistics are crucial to estimate health services and indicate the health status of the community in the country, Region, Zone, District or Kebele. In Ginir district, there were no data of mortality, like Infant Mortality Rate, Child Mortality Rate, Crude Death Rate and Maternal Mortality Rate (Table 4.3).

Table 4.3: Vital statistics data of Ginir woreda health office, 2016/17

S.No	Parameter	Number (%)
1	Total population	159,645
2	Male	78226
3	Female	81419
4	House Hold	32416
5	Under 1 year	5399
6	Under two years	8885
7	Under 5 years	25565
8	Under 15 years	60729
9	Female 15-49 years old	34387
10	Pregnant Women	5399
11	Delivery	5010
12	Non pregnant women	28,988
13	Average House hold size	4.8
14	Dependency Ratio	82 per 100
15	CBR	32 per 1000

Table 4.4: Estimated Population and few vital statistics by Kebeles in Ginir district, Bale, Oromia, 2016/2017.

Name of Kebele	Total Pop.	HH	<1yr	< 2yrs	<5yrs	No. PW	No. NPW	Delivery
Dalo sabro	6518	1358	226	372	1071	226	1214	210
Arda Kobsa	5113	1065	177	292	840	177	953	165
Café	4920	1025	171	281	808	171	917	158
Nagaya Sabuna	1799	375	62	103	296	62	335	58
Harawa-1	6219	1296	216	355	1022	216	1159	200
Harawa-Misra	5143	1071	178	294	845	178	958	166
Elbuko	4265	889	148	244	701	148	795	137
Sura Alosh	5113	1065	177	292	840	177	953	165

Akasha	10410	2169	361	594	1710	361	1939	335
Ebisa	7847	1635	272	448	1289	272	1462	253
Ilane Doyo	6500	1354	226	371	1068	226	1211	209
Jame	3103	646	108	177	510	108	578	100
Bale kacha	1798	375	62	103	295	62	335	58
Kara	10589	2206	367	605	1740	367	1973	341
Magane Gubarbaja	3611	752	125	206	593	125	673	116
Shawade	3275	682	114	187	538	114	610	105
Getara	8804	1834	305	503	1446	305	1640	283
Harale	2741	571	95	157	450	95	511	88
Oda Roba	3636	758	126	208	597	126	677	117
Chancho	4097	854	142	234	673	142	763	132
Ketat	5084	1059	176	290	835	176	947	164
Arda Tare	4334	903	150	247	712	150	807	140
Melka Oda	2480	517	86	142	407	86	462	80
Tulicha	4274	890	148	244	702	148	796	138
Gamo Duksi	5707	1189	198	326	938	198	1063	184
Dhobu	3007	626	104	172	494	104	560	97
Haragodo Waltai	5225	1089	181	298	858	181	973	168
Kabena	4695	978	163	268	771	163	875	151
Sura Gafite	3180	663	110	182	522	110	592	102
Harawa-6	7109	1481	247	406	1168	247	1324	229
Harawa-3	5003	1042	174	286	822	174	932	161
Total Woreda	**159,645**	**32416**	**5399**	**8885**	**25565**	**5399**	**28988**	**5010**

4.5.9 Immunization coverage

The district had 32 EPI outreach sites and eight EPI static sites. An immunization program was conducted for children < 1 year and women in reproductive age group in the district. BCG immunization coverage was 4889(90.6%), OPV3 immunization coverage was 4715(94%), Penta valent 3 immunization coverage was 4773 (95%), PCV10-3 immunization coverage was 4701(93.8%) and routine measles immunization coverage was 4,899(97.8%) (Figure 4.4).

Regarding vaccine storage and handling, the health facilities had 26 refrigerators, of these 17(65.4%) were functional and 9(34.6%) were non-functional. Of these functional refrigerators 12 worked with kerosene and five worked with electrical power supply.

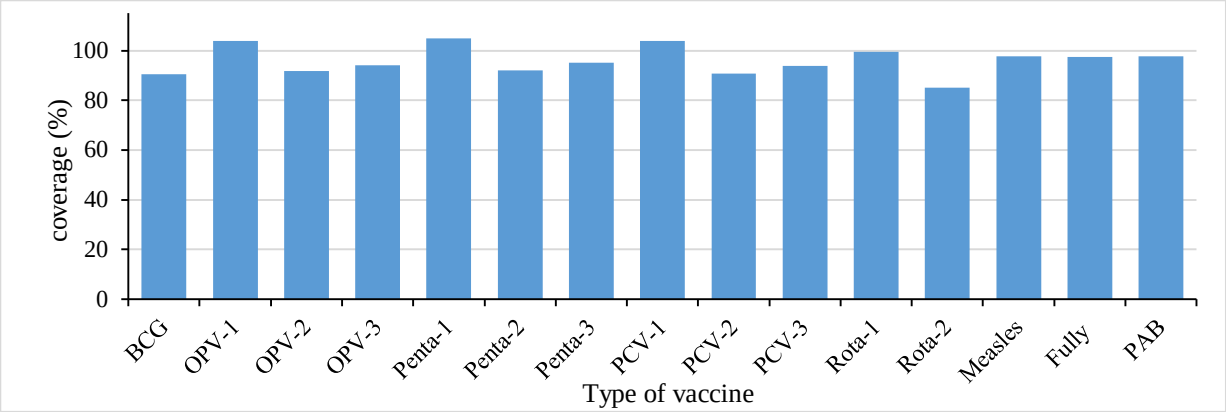

Figure 4.4: Immunization coverage of children <1 year and women in Ginir district, Oromia regional state, 2016/2017.

4.5.10 Maternal Health

In the district, in 2016/2017 there were 10,562 (30.7%) new and repeat accepter family planning users, among these, 4784(45.3%) were new acceptors and 5778 (54.7%) repeat acceptors. From all methods used in the district 4,584 (43.4%) were injectables (dipo provera) users and 2714(25.7%) used implants and 1976 (18.7%) used oral contraceptives (pills). So injectables (dipo provera) were the most commonly used family planning methods and IUCD was least commonly used method in district (Figure 4.5)

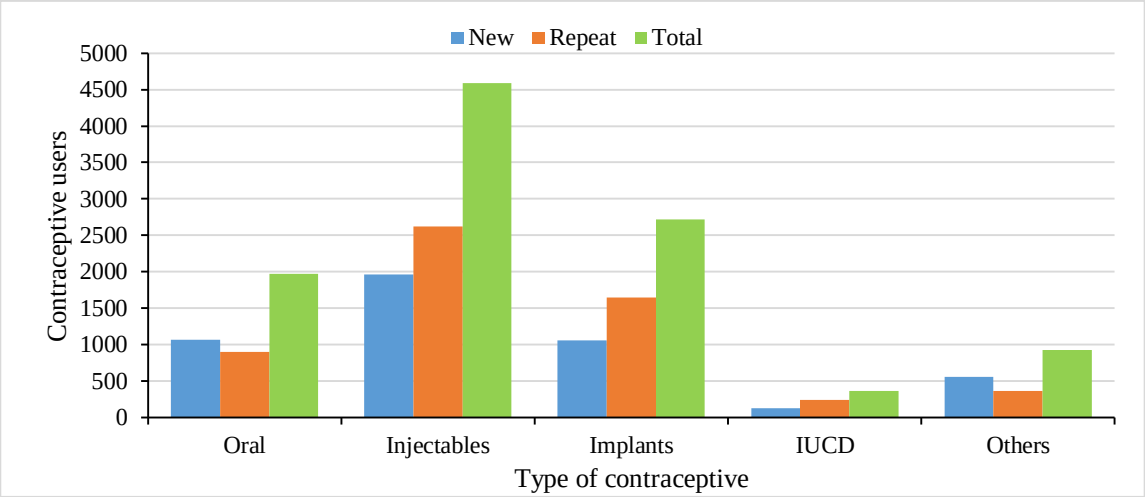

Figure 4.5: Family planning methods used in Ginir district, Bale zone, Oromia, 2016/2017.

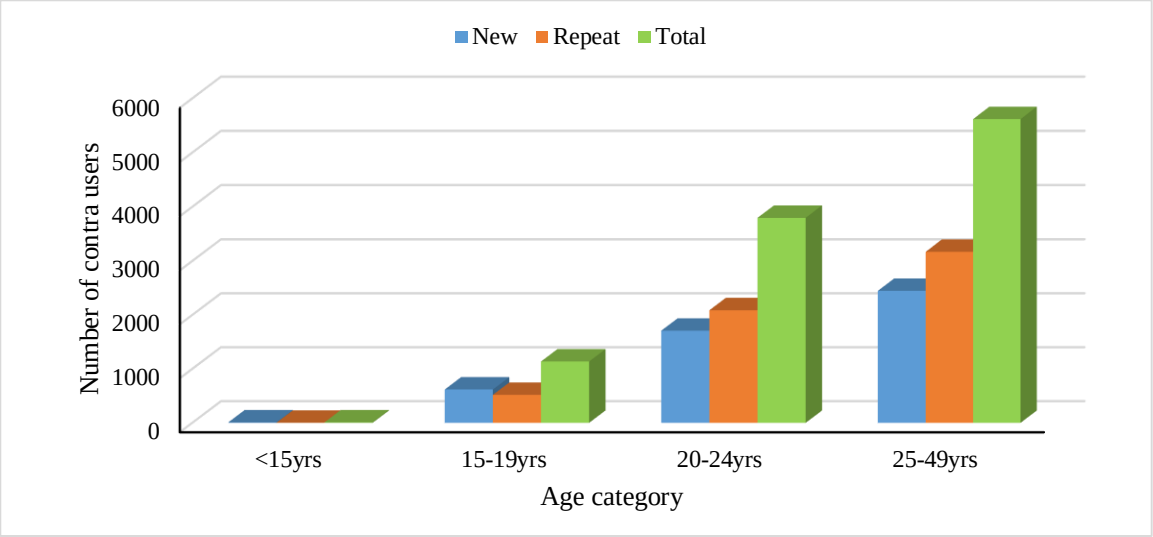

Figure 4.6: Family Planning acceptors disaggregated by age in Ginir Woreda, Bale Zone, Oromia, 2016/2017

From family planning users in the district, 5619 (53.2%) were 25-49 age group and 10 were under 15 ages group (Figure 4.6)

Regarding ANC services, there were 5399 pregnant women in the district, all of them (100%) used the ANC first and 3451(63.9%) were used at least ANC 4th service in the health facilities. In 2016/2017 delivery service of the district was 3950(73%). Of these119 (3%) were attended by health extension workers at health post and 3831(97%) were attended by skilled health personal at health centers. Three kebeles have been declared zero home delivery during study period (Figure 4.7).

From total pregnant mothers in the district, only 582 (10.8%) were tested for syphilis which is low performance as compared to ANC follow up. In the district during study period 4087 (75.7%) of delivered mothers got PNC services within 0 to 48hours of delivery, 582 (10.8%) of delivered mothers got PNC services within 49-72 hrs. and 641 (11.9%) of delivered mothers got PNC services within 4-6days of delivery. Comprehensive abortion cares were provided for 22 women and of them 9 were safe abortion.

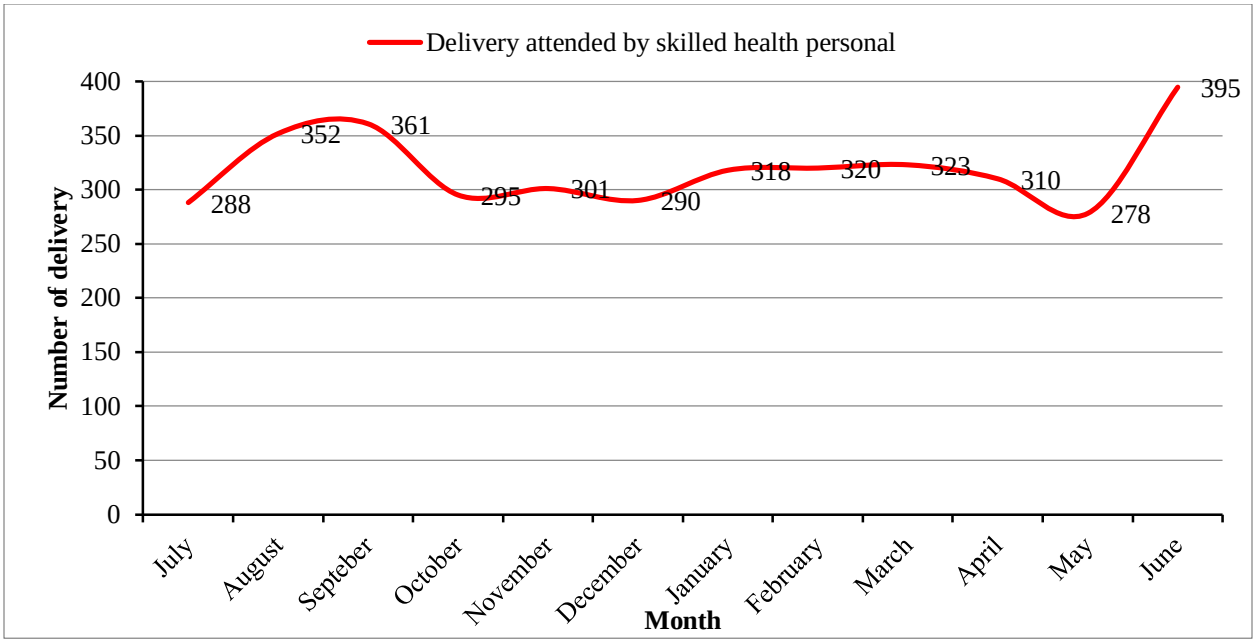

Figure 4.7: Trend of delivery attended by skilled health professional in Ginir Woreda, Bale Zone, Oromia, 2016/2017.

There was no community and facility maternal death reported during study period. The birth outcome in the district was 15(0.38%) were still birth and 3935 (99.6%) were live births. Total of 3924 births were weighed and of them 10 were less than 2.5kg.

Pregnant and lactating mothers of 4464 were tested for HIV/AIDS and knew their result. Among the tested mothers, five were tested positive for HIV and received ART to reduce the risk of mother to child transmission during pregnancy.

4.5.11 Water supply and Sanitations

In the district, 40,605 (26%) of the population have safe water supply. There are thirteen kebeles without safe water supply which need necessary support from woreda water office particularly during dry season. Majority of the community used river water. Regarding to the sanitation, from the total 32,416 households, 25,258(77.9%) of households constructed and use latrine in their compound. Of them, 13145 (40.5%) households were with unimproved latrine whereas 12,113 (37.4%) households were with improved latrine. Jame, Akasha, Ebisa, Kabana, Walta'I, Arda kabso, Hara'ale and canco were open defecation free kebeles in the district. There was no solid disposal sites found in district. The district had 2 Hotels and 5 Restaurant; all of them are inspected regularly based on the check list.

4.5.12 Health education

The health facilities provided health education to patients and clients on communicable disease, sanitation, immunization and family planning, institutional delivery, ANC and other health related issues.

4.5.13 Top ten leading causes of outpatients visit (Morbidity)

Top ten causes of morbidity for adult

There were different diseases occurred in the district in 2016/2017 (2009 EC), the ten top diseases are listed below for adults. In the list of top ten diseases a total of 10,116 patients were recorded, of which 17.4% of them were due to acute upper respiratory infections, 15.5% due to dyspepsia and 14.4% due to urinary tract infection (Table 4.5).

Table 4.5: Top ten causes of morbidity of adult in Ginir, Bale, Oromia, 2016/2017

Disease	Total cases	Percentage
Acute upper respiratory infections	1764	17.4%
Dyspepsia	1564	15.5%
Urinary tract infection	1452	14.4%
Trauma	1092	10.8%
Acute Febrile Illness (AFI)	900	8.9%
Pneumonia	892	8.8%
Malaria (clinical and confirmed)	820	8.1%
Infection of skin and subcutaneous tissue	664	6.6%
Helminthiasis	512	5.1%
Anemia	456	4.5%
Total	10116	100%

Top ten causes of morbidity for under- 5 children

In the district there were a total of 8782 cases due to top ten morbidity diseases in under 5 years children in 2009 EFY. From total morbidity cases 2261 (25.7%), 2049 (23.3%) and 1436 (16.4%) were because of malnutrition, non-bloody diarrheal disease, pneumonia respectively (Table 4.6).

Table 4.6: Top ten causes of morbidity in under 5 years in Ginir woreda, Bale zone, 2016/2017

Disease	Total cases	Percentage
Malnutrition (MAM and SAM)	2261	25.7%

Diarrhea (non-bloody)	2049	23.3%
Pneumonia	1436	16.4%
Acute upper respiratory infection	1076	12.3%
Infection of skin and subcutaneous tissue	396	4.5%
Helminthiasis	376	4.3%
Other or unspecified infection and parasitic diseases	332	3.8%
Otitis	328	3.7%
AFI	308	3.5%
Unspecified disease of eye and adnexa	220	2.5%
Total	**8782**	**100%**

4.5.14 Community Health services

In the district, community health services were provided by CHWs, Community leaders and HEWs. There are 235 CHWs (now changed to HDA) in the district and their responsibility was social mobilization in the community for the sake of development. There are 62 HEWs in the district and they executed health extension program included in the package for achieving the Millennium Development Goal.

4.5.15 Endemic diseases

4.5.15.1 Malaria

Malaria is an endemic disease in the district. Nine (29%) of the kebeles in the district are malaria endemic with about 35462(22.8%) population at risks of being infected by malaria. During the year 2016/2017 a total of 820 malaria cases were reported. Concerning prevention and treatment of malaria, Indoor Residual spray (IRS) was sprayed for 7423(100%) of households in the district for the year of 2009EFY. The district used malaria supplies like, coartem tablet, RDT, chloroquine, quinine and chloroquine syrup. The district has no shortage of coartem, RDT and other malaria prevention and treatment supplies.

4.5.15.2 Tuberculosis and Leprosy

In the district, there were 176 total TB cases detected in the 2009EFY. Of the total TB cases, 108(61.4%) were pulmonary types of TB and 61(34.6%) cases were Extra PTB. From those pulmonary TB cases, 52(45.2%) cases were PTB negative and 63(54.8%) of cases were PTB positive. Among PTB positive cases, 7 were relapse PTB cases. The TB detection rate of the district

is 40/100000, TB treatment completion rate was 97%, TB cure rate was 94%, TB treatment success rate were 94% and TB death among TB treated was 3.8 out 158 treated TB cases. All of the TB patients were screened for HIV and none of them were positive for the virus. Eight cases of leprosy were notified and 2(100%) of leprosy cases were completed treatment during study period (Table 4.7).

Table 4.7: TB and leprosy cases in Ginir Woreda, Bale, Oromia, 2016/2017

S/No.	Indicators	Number	%
1	Total TB cases	176	
2	PTB positive	63	35.8
3	PTB negative	52	29.5
4	EPTB	61	34.7
5	TB case detection rate		40
6	TB treatment success rate		94
7	TB treatment cure rate		94
8	Death on treatment	6	3.8
9	New leprosy cases detected	8	
10	New leprosy cases treatment completed	2	100
11	TB cases screened for HIV	176	100
12	TB cases screened for HIV and HIV negative	176	100

4.5.15.3 HIV/AIDS

A total of 13486 clients were screened for HIV in 2009 EFY at VCT, PITC and PMTCT service sites. Of these, 7992(59%) were females and 5 clients were found to be positive for HIV, of whom four (80%) were females (Figure 4.8).

The district has five VCT sites and Ginir Hospital was used to link with ART clinics. Different activities were done for prevention and control of HIV/AIDS through health education, condom distribution, and facilitated income generating activities.

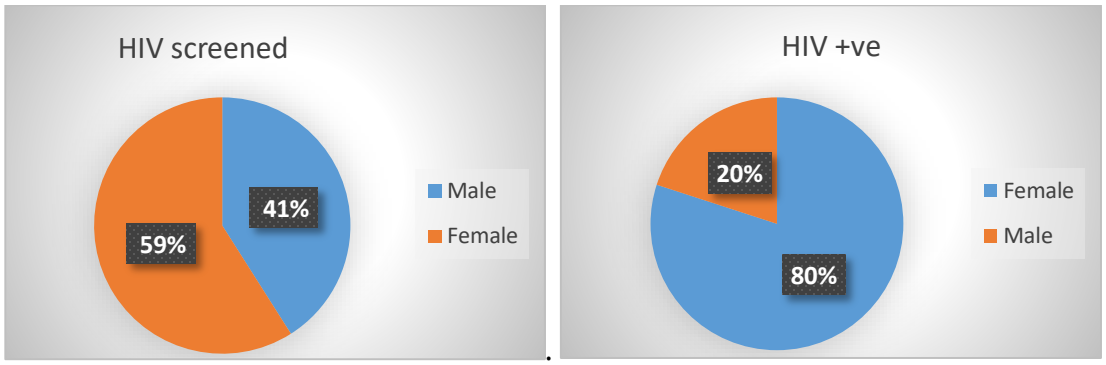

Figure 4.8: HIV screened clients and positive for virus by sex in Ginir district, Bale zone, Oromia, 2016/2017

4.5.16 Nutritional status and disasters

The district has 40 OTP and eight SC sites for nutrition. In 2016/2017 a total of 2261 under-five children were malnourished. Of these, 553(24.5%) cases were severe acute malnutrition and 1708(75.5%) were with moderate malnutrition (Figure 4.9). There were 21 cases admitted to SC site and 1085 were treated at OTP sites.

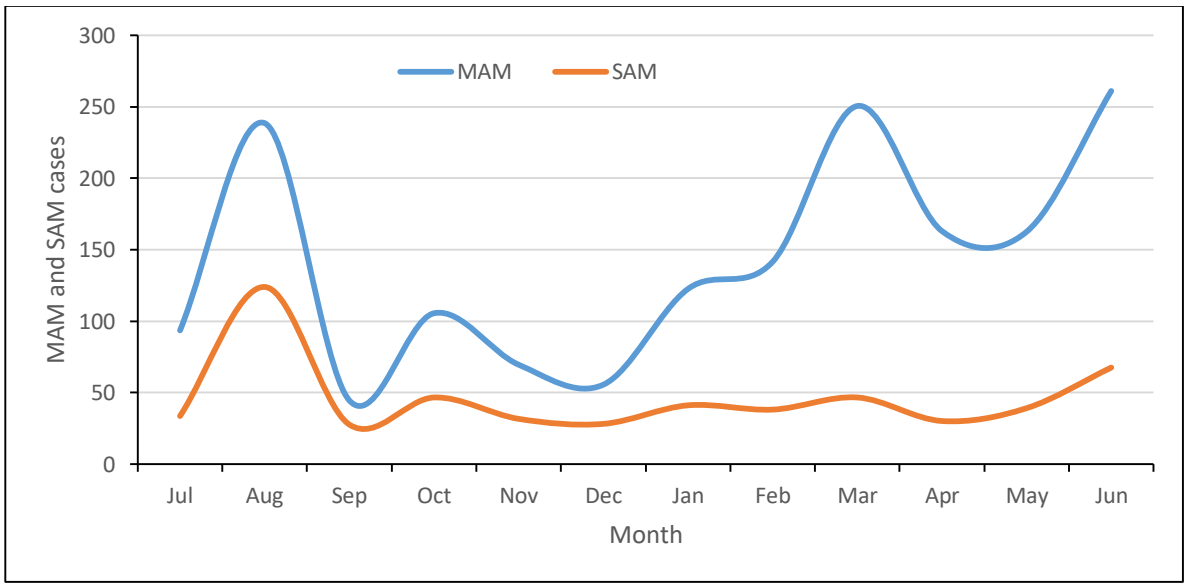

Figure 4.9: Trend of MAM and SAM cases in Ginir district, Bale zone, Oromia, 2016/2017.

In the district, CBN program is working towards improving nutritional status especially in under five children, pregnant and lactating women. CBN program has been supported by NGO Goal in

2016/17 (2009). Regarding the disaster situation of the district, it had experienced an outbreak of malnutrition in 2007 EFY. Even though there is previous experience on the situation, the district was not prepared for an outbreak and disaster due to scarcity of budget.

4.5.17 Health Insurance

Ginir woreda is one of the four woredas in Bale zone applying community health insurance. The district planned to provide service for 29,829, but it provided only for 7795 (26.1%) community members. From total community health insurance members, 3242 were supported by government for payment to be community insurance member.

4.5.18 Health budget allocation

In 2009 EFY (2016/17), a total government budget allocated for the district health office was 3,220662 ETB. The allocated budget was used according to budget break down of district health office for salary and work facilitation. There were NGOs such as Goal and save the children which were sources of finance in supporting the district health office.

4.5.19. Priority setting

To manage the public health and health related problems, putting them based on priority is mandatory in resource scarce countries. Criteria like magnitude, severity, concern, and feasibility to solve the problem was used to set the priority (Table 4.8).

Table 4.8: Priority problems of Ginir Woreda, Bale, Oromia, 2016/17.

Problems	Magnitude (5)	Severity (5)	Feasibility (5)	Community concern	Gov. concern	Total out of 25	Rank
Maternal Health (ANC,H/F delivery, F/P)	2	3	4	1	5	15	6
School latrine coverage	5	4	2	1	5	17	4
Water supply	5	5	1	5	5	21	1
Child health (Malnutrition)	4	4	4	2	5	19	2
Endemic diseases (TB,HIV)	2	1	4	1	5	13	7
Top ten Diseases	3	3	4	1	5	16	5
Woreda latrine coverage	4	4	4	1	5	18	3

Water supply was the 1st priority problem followed by malnutrition and latrine coverage in Ginir woreda.

4.6 Discussion

The estimated population for the year 2016/17(2009 E.C) in the district was 159645 with male to female sex ratio of 1.02 to 1, which is nearly similar to that of sex ratio(M:F) 1.01 to 1 of Lume district East Shewa in 2013. But it somehow higher from nation male to female ration of 0.99, an estimate of 2016(7). In the district the CBR was 35/1000 live births, which was nearly similar to that of the Lume district 34.7/1000 live births (8) and 36.5/1000 live births of 2017 estimate at national level(7). Majority of the population (92.4%) live in rural; so there income was depend on crop and livestock production which is nearly similar to the study conducted in Tullo district of west Hararge that majority of population (89.7%) live in rural areas and their live depend on the sedentary mixed farming system, which is heavily dependent on crop and livestock production (3).

During study period, from 88 schools 9 (10.2%) had safe water supply,48(54.5%) had functional latrine separated for both sexes,8 (9%)had functional latrine which were not separated for male and female, 2 had standard latrine, 30(34%) had no any kind of latrine and all schools had HIV and other health clubs. In contrast to this study, a study conducted in Sodo district Gurage Zone showed that there were 64 Schools in the district, of them 12 /18.8%/ schools had protected water supply and 61(95.3%) of them had functional pit latrines. Out of 61 Schools who had functional pit latrines 34 had separate latrines for males and females. Forty two (65.6%) schools had health clubs (9). In our study 34% of schools had no any kind of pit latrine and only nine schools had water supply. This shows that schools in the district have sanitation problem which result in negative health and educational impact. Regarding to health professions in the district, some of the professions were below the expected minimum number of requirement for health service standards especially professions like pharmacy, laboratory and environmental health. For example pharmacy to health center ratio in the districts was 1:8 that needs to be corrected.

In our study, immunization coverage were fairly agreed with study done in Shebedino district,Sidama,SNNPR in 2014, which showed the vaccination coverage of children < 1year of age with 95.50% BCG, 95.30 % Penta1, 93.72% penta3, 89.58 % measles and 89.38 % fully vaccinated (4). A study conducted in Arba Minch town and Zuria District of Southern Ethiopia found the full

immunization coverage of 76%(10), which was lower than the current finding of full immunization coverage o Ginir district.

In the district, in 2016/2017 the contraceptive prevalence rate was 10,562(30.7%). From all methods used in the district, injectables (dipo provera) were the most commonly method used and 364(3.4%) IUCD was least commonly method used. Study done by EDHS in 2016 showed that contraceptive prevalence rate at the national level was 36% which somehow higher than the current finding. And it also showed that injectable types of contraceptives were the most commonly used family planning methods in the country. IUCD users in that study were 8%, which was higher than the current study findings for IUCD users (11).

In our study ANC First is 100% during study period and ANC 4th is 63.9%. Delivery services in the district was 73% attended by health personal at health centers and 3% were attended by health extension worker. In contrary to this, a study done in Efratana Gidem woreda 2014 showed that the proportion of pregnant women who visited ANC 1st and ANC 4th were 74% and 4.3% respectively and 22.4% of births attended by skilled health personal and 1.4% by HEWs(5). Compared to this study, the current district's performance is much better. Only 32% of Ethiopian women with live birth received at least four visits during the length of their pregnancy(12). Even though ANC 1st is higher in our finding, ANC 4th, which is more appropriate to identify pregnancy related risks is low and pregnant women who were tested for syphilis were only 10.8% indicating poor quality of ANC services.

In the list of top ten diseases of adult in 2016/17 (2009 EC), a disease of acute upper respiratory infection, dyspepsia and urinary tract infection accounted for half of the cases in adults. In under 5 top ten morbidity, highest number of cases were because of malnutrition both MAM and SAM, non-bloody diarrhea and pneumonia respectively. This is nearly similar with study done in Lume district East Shewa in 2013, which showed AURTI, non-bloody diarrhea and pneumonia were top contributors for top ten morbidity in both adults and under five children (8). In our study non-bloody diarrhea is second most common causes of morbidity in under 5, which indicates a problem of hygiene practice in the district.

A study conducted in Sodo district of Gurage Zone in 2012 showed 177 new TB case registries, of which 73.3% were Pulmonary TB while 27.7% of the cases were with extra PTB. From PTB cases, 53.7% of them were smear positive and the remaining were smear negative. In study conducted in

2003 EFY, 54 new smear positive, 103 new smear negative cases and 77 new extra pulmonary TB cases were registered. TB detection rate, treatment completion rate, TB cure rate and TB treatment success rate were 41%, 85.7%, 72%, 57.1% and 74% respectively. Seven cases were registered as defaulters. Deaths during TB treatment were 7(3%) out of 234 cases. In study done in Sodo district defaulters were registered and low outcome result was shown(9) but in current study no defaulters were registered and more outcomes were observed compared to the above cited studies.

The district reported large number of malnutrition cases in the current assessment which is higher than the cases from Lume district, East Shoa zone with only 71 cases, of which 62 and 9 were MAM and SMA cases respectively. In the current study 8.84% of children were malnourished.

According to the 2015 estimate of safe water access, 93.1% and 48.6% of population had safe water supply in urban and rural respectively and 57.3% in average(7). But compared to this, the current safe water access assessment was low highlighting the improvement for safe water access is crucial to in turn prevent hygiene related illness. On the other hand 27.2%, 28.2% and 28% of population hand improved sanitation facility in urban, rural and at national (average) level respectively(7).

4.7 Conclusion and recommendations

In Ginir district water supply, child malnutrition and latrine utilization were main top three problems identified. Diseases of acute upper respiratory infection was top cause of morbidity in adults whereas malnutrition was the leading cause of morbidity in under- five children. The vaccination coverage of the district was high during study period with performance of more than ninety percent coverage. The children vaccination dropout rate from penta 1 to Penta 3 and Penta 1 to Measles were <10 %; this shows that the defaulters were traced and vaccinated timely or there were low defaulters live or they left the district. Even though, family planning is important indicator to prevent maternal mortality, low performance was recorded in the district. Most of the schools in the district had a problem concerning school water supply and latrine, which in turn has great impact on the health of students and community as a whole. Therefore, based on the findings of the assessment the following recommendations are forwarded:

- ✓ Woreda health office should strengthen screening of children for malnutrition and intervention should be done accordingly.
- ✓ Woreda health office should give attention for family planning.

- ✓ District educational bureau should work with water office to solve school water supply and sanitation problems.
- ✓ Water Bureau of the district should have to work to solve water supply problem in the district as a whole.
- ✓ Data should be properly compiled in both soft copy and hard copy in sectors of the district.
- ✓ The district health office should improve ANC follow up
- ✓ The district should have to allocate budget for disaster situations.
- ✓ The district should have to perform health profile description regularly.

4.8 References

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Chapter 5 : Scientific Manuscript for Peer Reviewed Journals

Rotavirus outbreak investigation in Kurmuk district, Assosa zone of Benishangul-Gumuz region, Feb, 2019.

Abstract

Introduction: Diarrheal diseases are one of the leading causes of illness and death in children <5 years of age, particularly those in low-income countries, and cause >500,000 deaths per year globally. Rotavirus alone caused an estimated deaths of 214806, 121009 and 6800 in children <5 years of age globally, in Sub-Saharan Africa and Ethiopia respectively in 2013. The main objective of this investigation was to identify risk factors associated with an outbreak.

Method: Descriptive and unmatched case-control study was conducted from Jan 30-Feb 12, 2019 in Kurmuk woreda. ELISA techniques were used for confirmation of Rotavirus in cases. Structured questionnaire was developed to collect cases and controls. A total of 144 samples with 1:2 case to controls were selected. Data were analyzed using Epi-Info and the results were interpreted using Adjusted Odds ratio, P value <0.05 and 95% CI.

Result: Confirmed Rotavirus outbreak was occurred in Kurmuk Woreda with AR of 60.3/1000 and CFR of 0.87%. In multivariate logistic regression, contact with cases (AOR: 8.58, 95%CI: 3.02-24.41, P: 0.0001) and families practicing traditional gold mining (AOR: 6.34, 95%CL: 2.15-18.71, P: 0.0008) were risk factors. On the other hand, vaccination (AOR: 0.29, 95%CI: 0.11-0.75, P: 0.0108), history of similar illness (AOR: 0.18, 95%CI: 0.05-0.62, P: 0.0068), and practicing hand washing at least three critical times (AOR: 0.34, CI: 0.13-0.89, P: 0.0281) were found to be protective factors.

Conclusion: Contact with cases, traditional gold mining and failure to practice hand washing at least three times a day were found to be risk factors associated for the outbreak whereas being vaccinated and having previous history of Rotavirus infection were protective risk factors. Therefore, educating mothers about child caring, mode of diarrheal disease transmission and good hygiene practices combined with increasing coverage and quality of vaccination would reduce the disease incidence.

Keywords: Rotavirus, Outbreak, Investigation, Kurmuk, Benishangul-Gumuz.

5.1 Introduction

Diarrheal diseases are one of the leading causes of illness and death in children <5 years of age, particularly those in low-income countries, and cause >500,000 deaths per year globally (1-3). Among these diarrheal diseases are Rotaviruses which are ubiquitous and infect almost every child globally by 3–5 years of age (4, 5). In 2003, 114 million cases of rotavirus infection were reported in children <5 years of age globally, of which 24 million cases required outpatient visits and 2.3 million cases required hospitalization(6). In 2013, rotaviruses were associated with an estimated 214,806 and 121,009 deaths in children <5 years of age globally and in Sub-Saharan Africa respectively(7). Rotavirus infection was responsible for an estimated 128 500 deaths and 258 million episodes of diarrhea among children younger than 5 years throughout the world in 2016 an incidence of 0.42 cases per child-year, with 104 733 deaths occurring in sub-Saharan Africa(8).

Diarrhea is a leading killer of children in Ethiopia, causing approximately 14 percent of deaths in children less than five years of age(9). Rotavirus, the most common cause of severe and fatal diarrhea in young children worldwide, took the lives of more than 6800 Ethiopian children under five in 2013(7). Ethiopia is one of top 10 countries with the greatest rotavirus burden worldwide and accounts for 3.2% percent of all rotavirus deaths globally(7). It is estimated that 28 percent of all under-five diarrheal disease hospitalizations in Ethiopia are caused by Rotavirus (10). In Kurmuk district of Benishangul-Gumuz region, Rotavirus outbreak has been happening since February 2017 with 585 cases and CFR of 2.4% and in 2018 starting from 11th January with 444 cases and CFR of 0.2%(11).

Live attenuated oral vaccines against rotavirus were licensed for global use in 2006 and are used in >100 countries worldwide(12). Although the introduction of vaccines has reduced the number of rotavirus-associated deaths, the effectiveness of licensed vaccines is suboptimal in low-income countries, in which, rotavirus gastroenteritis still results in >200,000 deaths annually(7). In another study, the vaccine use is estimated to have averted more than 28 000 deaths among children younger than 5 years, and expanded use of the rotavirus vaccine, particularly in sub-Saharan Africa, could have prevented approximately 20% of all

deaths attributable to diarrhea among children younger than 5 years(8). The rotavirus vaccine was introduced in the Ethiopian national infant immunization program since November 2013 (13). The introduction of Rotavirus vaccination in Ethiopia reduced the occurrence of the disease by 17% from 24% during pre-vaccine period in 2011-2013 to 20% in post-vaccine periods of five consecutive years from 2014-2017(14). Regardless of this reduction and continued vaccination of the children, Rotavirus outbreaks are occurring in different parts of the country with the current report of outbreak in Kurmuk district of Benishangul-Gumuz region. The investigation was mainly conducted to identify risk factors for the occurrence of the outbreak.

5.2 Methods and materials

5.2.1 Study area and period

The study was conducted from Jan 30/2019 to Feb 12/2019 in Kurmuk district of Benishangul-Gumuz regional state. The district is one of the 8 districts in Assosa zone consisting 14 rural and 2 urban kebeles with a total population of 23,669. Of the total district population, 12,035(50.8%) were males. Majority 20,988 (88.7%) population live in rural area. Children under five age constituted 3829 (16.2%) of total district population. The district is bordered by Sherkole district in the North, Homosha district in the East, Assosa district in the South and North Sudan in the West. The district has lowland agro ecological zone with total surface area coverage of 1437.7 Sq.Km and annual average rain fall ranges from 700ml-1000ml and temperature (26°C-35°C). The district has one functional health center and 11 health posts.

5.2.2 Study design

Unmatched case control study design supported by descriptive study was employed to investigate the Rotavirus outbreak in Kurmuk district.

5.2.3 Sampling technique and sample size

Simple random sampling technique was used to select respondents for this case- control study. A line listed cases were selected randomly and controls neighboring with cases were also selected. When there are more than two eligible neighbor controls for a case, lottery method was used to take the first two. Accordingly with a ratio of one case to two controls, a total 144 respondents were selected. To determine sample size an OR of 2.9 and exposure of 35% in controls and 61% in cases were used from previous study (15) with 95% CL and 80% power.

factors were collected. In addition to this,

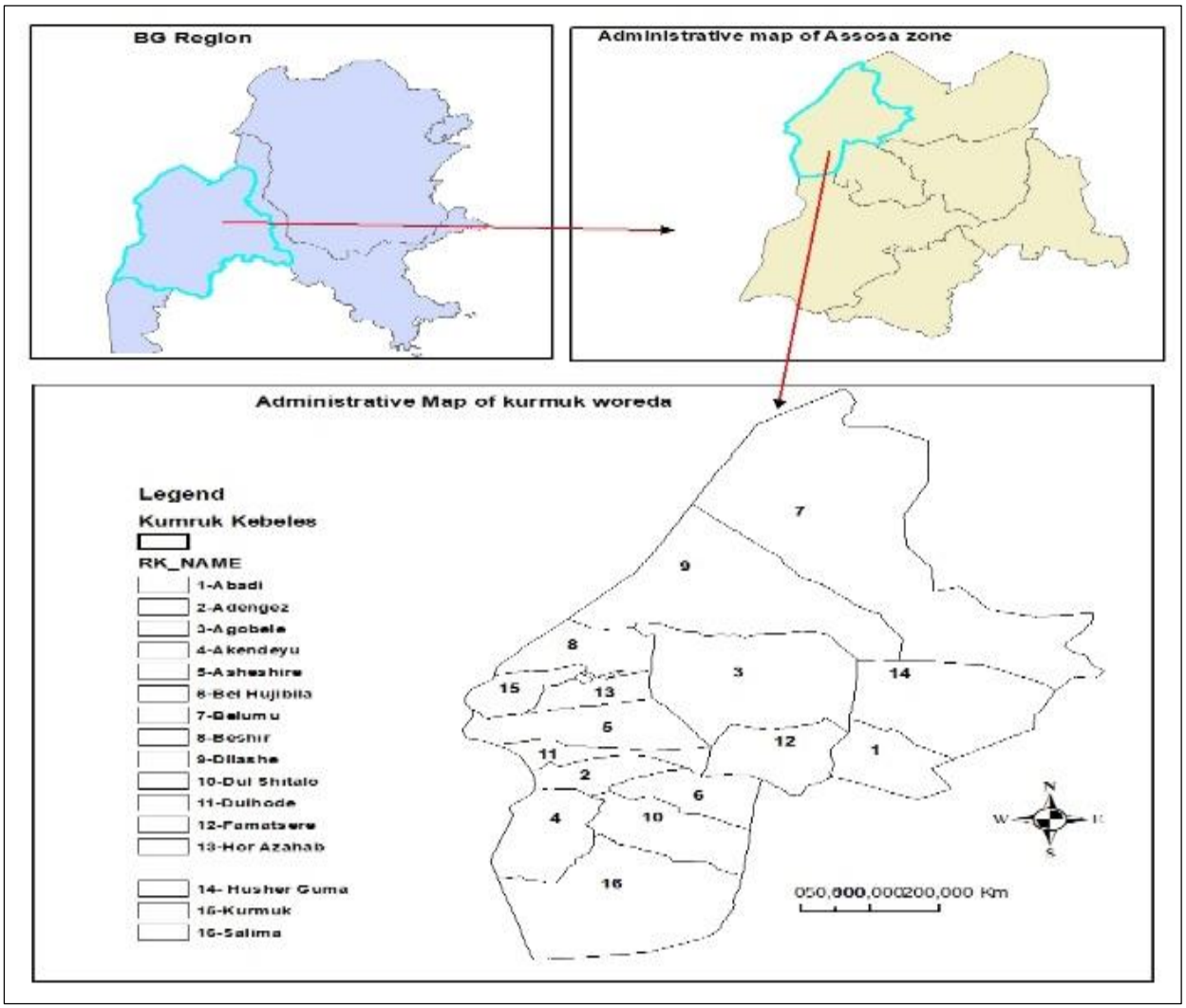


Figure 5.1: Administrative map of BGR, Assosa zone and Kurmuk district.

5.2.4 Data collection

A structured questionnaire was used to interview the guardians of cases and controls. By using the line list and health extension workers, we went door to door to interview parents or guardians of the study participants. Information regarding demographic characteristics, clinical history and risk documents regarding previous outbreaks were assessed and discussion about the overall outbreak situation was made with regional, zonal and district PHEM officers.

5.2.5 Laboratory method

A total of four stool samples were collected from children with diarrhea and vomiting. The stool samples were collected lately from the start of an outbreak due to insecurity

problem in Western part of the country. The collected samples were transported to National laboratory at EPHI and ELISA was used to confirm the presence of Rotavirus antigen in stool samples.

5.2.6 Statistical data analysis

The data was collected, entered, edited and analyzed using Epi-Info version 7.2.1.0 software. Descriptive statistics from line listed cases was produced using Microsoft excel 2013. Bivariate and multivariate logistic regressions analyses were applied to determine possible risk factors for an outbreak. Factors with P value<=0.05 in bivariate analysis and biologically plausible were included in multivariate logistic regression and the result was interpreted using Adjusted Odds ratio, P value <0.05 and 95% confidence interval. Results for both descriptive and analytic statistics were displayed using tables and graphs. Geographical maps used in this document were produced by using ArcMap 10.4.1.

5.2.7 Case definitions

a) Suspected case: Any child under five years of age with sudden onset of diarrhea with vomiting, two or more episodes within 24 hours, from Dec 22, 2018 to Feb 9, 2019 and residence of Kurmuk Woreda.

b) Confirmed case: A suspected case in whose stool the presence of Rotavirus is demonstrated by means of an Enzyme Linked Immunosorbent Assay.

c) Controls: Any child under five years of age without diarrhea and vomiting and resident of Kurmuk Woreda within period of Dec 22, 2018 to Feb 9, 2019.

5.2.8 Ethical issues

A formal letter was delivered to Benishangul-Gumuz regional PHEM department from EPHI and regional PHEM in turn wrote a formal letter to Kurmuk district health office. Then we were permitted to conduct an investigation by district health office.

5.3 Result

5.3.1 Descriptive Epidemiology

A total of 231 Rotavirus cases with 10(4.33%) hospitalization were reported in Kurmuk district from Dec.22nd 2018 up to Feb 9th 2019 in children under the age of 5 years. The overall attack rate of the outbreak was 60.3 per 1000 population. Two deaths were reported from the districts of two different kebeles with overall CFR of 0.87%. The index case was 11 months old male child from Dull-Shitallo Kebele reported on 22nd of Dec 2018 from the Health post. All (100%) of cases reported had watery diarrhea,

93(40.26%) vomiting and 53(22.94%) had fever. About 182(79%) of cases were vaccinated for Rotavirus and the vaccination coverage of woreda was 86% as of December 2018.

All of the samples collected were processed by confirmatory test of ELISA and all of them were positive for Rotavirus antigen. The remaining cases were linked epidemiologically. From the total of 29 EPI refrigerators in woreda only 16 refrigerators were functional.

Description by person

Variable	Frequency	Percent
Sex		
Male	131	56.7
Female	100	43.3
Total	231	100
Age		
<12	88	38.1
12-35	117	50.6
36-59	26	11.3
Total	**231**	**100**

Table 5.1: Distribution of Rotavirus cases by sex and age group in Kurmuk district, 2019.

From the total reported Rotavirus cases, 131(56.7%) of them were males with the mean age of 17.33 months (SD=11.87) and 117(50.6%) were in the age group of 12-35 months (Table 5.1).

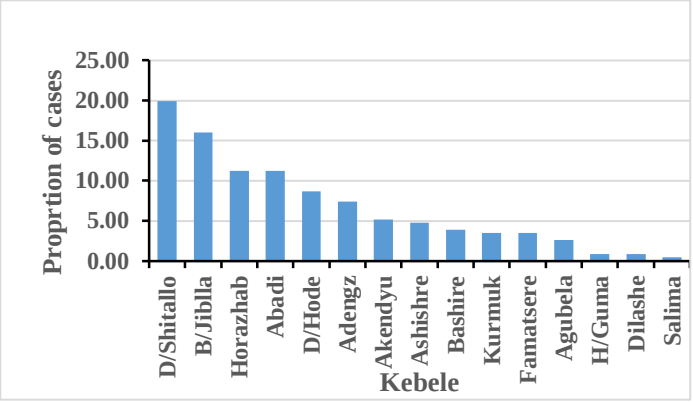
Table 5.1 Males were more affected than females with an attack rate of 67.3 cases per 1000 population. Children under the age of one year were more affected with AR of 121.2 cases per 1000 population and CFR of 2.3 % (Table 5.2).

Table 5.2: AR/1000 and CFR by sex and age group in Kurmuk district, 2019.

Variable	Popn. at risk	cases	Death	AR/1000	CFR
Sex					
Male	1947	1	1	67.3	0.76
Female	1882	1	1	53.1	1%
Age group(Months)					
<12	726	8	2	121.2	2.3%
12-35	1504	1	0	77.8	0
36-59	1599	2	0	16.3	0
Total	**3829**	**2**	**2**	**60.3**	**0.87**

Description by place

The Rotavirus cases were reported from 15 kebeles out of 16 kebeles found in Kurmuk district. Among the total cases, 46 (19.91%) and 37(16.02%) were reported from DullShitallo and B/Jiblla Kebeles



respectively (Fig 5.2).

Population in Bilehu-Jiblla, Horazhab, Dull-Hode and Adengz kebeles were more affected with an attack rates of 143.3, 100.8, 97.7 and 97.4 per 1000 population respectively. The overall attack rate and CFR

Name of Kebele	Total Population	Population at risk	Cases	Death	AR/1000	CFR
Kurmuk	1087	176	8	0	45.5	0.00%
Horazhab	1594	258	26	0	100.8	0.00%
Bashire	1255	203	9	0	44.3	0.00%
Agubela	1403	227	6	0	26.4	0.00%
Famatsere	906	147	8	0	54.6	0.00%
Abadi	2657	430	26	0	60.5	0.00%
H/Guma	1646	266	2	0	7.5	0.00%
Dilashe	1013	164	2	0	12.2	0.00%
D/Hode	1266	205	20	1	97.7	5.00%
Ashishre	1516	245	11	0	44.9	0.00%
Adengz	1079	175	17	1	97.4	5.88%
B/Jiblla	1596	258	37	0	143.3	0.00%
D/Shitallo	3189	516	46	0	89.2	0.00%
Akendyu	1089	176	12	0	68.1	0.00%
Salima	1497	242	1	0	4.1	0.00%
Total	**23669**	**3829**	**231**	**2**	**60.3**	**0.87%**

Table 5.3: AR/1000 and CFR by reporting Kebeles of Kurmuk district, Benishangul-Gumuz, 2019

of woreda were 60.3 per 1000 and 0.87% respectively (Table 5.3).

Description by time

As shown in Figure 5.2, intervention was started lately because of delayed report from health facilities to the district health office.

Health facilities continued managing patients as usual like other diarrheal diseases for more

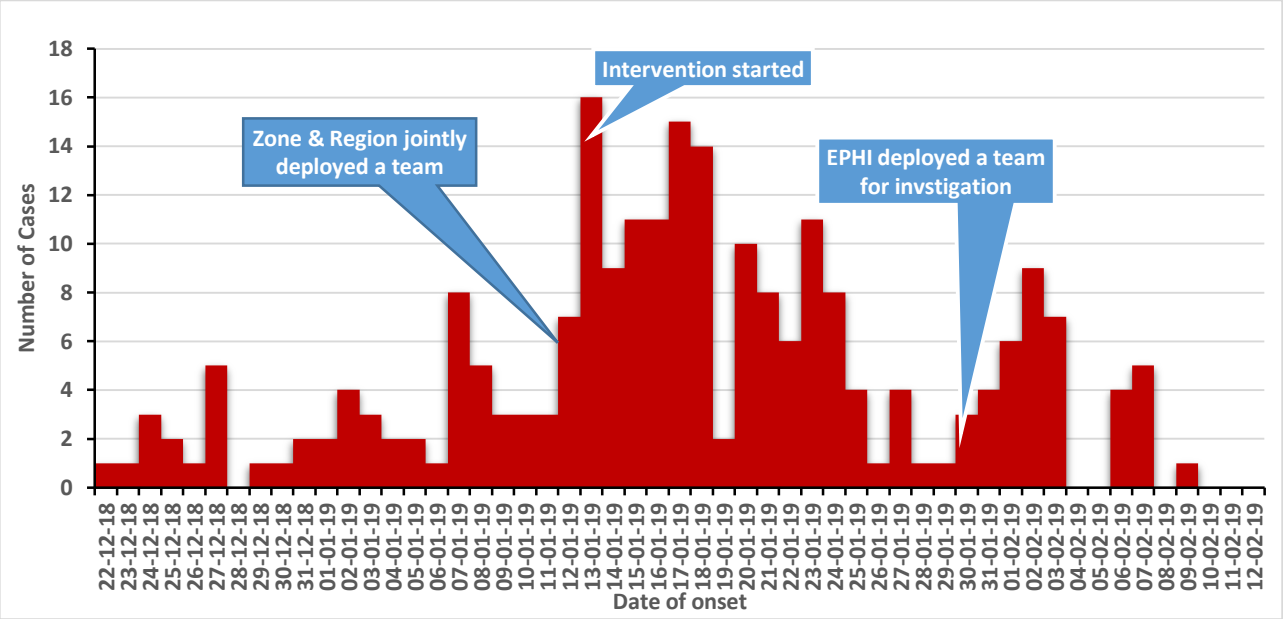


Figure 5.2: Date of onset of diarrhea/Vomit for Rotavirus outbreak from Dec 22nd 2018 to Feb 9th 2019.

than two weeks after the first case with watery diarrhea and vomiting visited health post at Dull-Shitallo Kebele on 22 Dec 2018.

But when the cases were increasing from day to day, they started suspecting Rotavirus outbreak and informed the district health

Office. Accordingly the district PHEM officer informed the zonal health department and zonal health department to the regional PHEM department on 11th Jan 2019. It was after this the zonal and regional PHEM departments jointly deployed an RRT to the suspected Rotavirus outbreak area. The response and investigation team from EPHI was sent to the outbreak area lately due to security problems that caused for the blockage of roads. The outbreak continued for six weeks and the highest number of cases were recorded on 13-01-2019, the date that intervention started. This increase of new cases was related with community mobilization activities and enhancing surveillance.

Public health intervention

Cases were managed at health post and health centre levels with ORS, Zinc and supportive treatment. There was shortage of medical supplies initially but later on supplies were sent from the region, zone and also the district purchased some supplies from PFSA. The main challenges were shortage of beds

for admission and treatment. Surveillance was enhanced with house to house active case search, active case search on facility registers, provision of case definition and orientation, contact tracing and follow up, institution of daily reporting from facilities and community including zero reports.

Social mobilization and health education was undertaken in the affected kebeles through the HDA and one to five community networking. Health education on the signs and symptoms, mode of transmission and on the need to seek health care was provided through meetings at school, religious institutions and market places.

5.3.2 Analytical epidemiology

Variable	Cate	Case	control	Bivariate analysis	Multivariate analysis	
				COR (95% CI)	P-v	AOR (95% CI)
Contact with sick	Yes	33	36	3.67(1.75-7.66)	0.0006	**8.58(3.02-24.41)**
	No	15	60			
Vaccinated	Yes	23	7	0.31(0.15-0.64)	0.0015	**0.29(0.11-0.75)**
	No	25	24			
History of similar illnesses last year	Yes	5	36	0.19(0.07-0.53)	0.0015	**0.18(0.05-0.62)**
	No	43	60			
Traditional gold mining	Yes	40	51	4.41(1.87-10.41)	0.0007	**6.34(2.15-18.71)**
	No	8	45			
Exclusive breast feeding	Yes	25	68	0.45(0.22-0.92)	0.028	0.59(0.22-1.54)
	No	23	28			
Know advantage of vaccination	Yes	37	86	0.39(0.15-1.00)	0.05	0.33(0.09-1.29)
	No	11	10			
Practice hand washing at least 3 times	Yes	23	72	0.31(0.15-0.64)	0.0015	**0.34(0.13-0.89)**
	No	25	24			
Have latrine	Yes	38	89	0.30(0.11-0.84)	0.0227	0.71(0.19-2.66)
	No	10	7			

Table 5.4: Bivariate and multivariate logistic regression for Rotavirus outbreak in Kurmuk district, BGR, 2019

A total of 144 study participants were include in this case-control study with 48 cases and 96 controls. Majority of study participants both in cases (56.25%) and controls (58.33%) were females with mean age of 27.46±15.37 and 27.88±15.39 months respectively

Both bivariate and multivariate logistic regression analyses were conducted to determine risk factors for the outbreak of the disease. All factors which were statistically significant in bivariate analysis were included into the final mode of multivariate logistic regression analysis to determine potential risk factors (Table 5.4).

In multivariate logistic regression, contact with cases (AOR: 8.58, 95%CI: 3.02-24.41, P: 0.0001) and traditional gold mining (AOR: 6.34, 95%CL: 2.15-18.71, P: 0.0008) were found to be risk factors. The region especially the district where the Rotavirus outbreak happened is known with high deposit of gold mineral that the community has been practicing traditional gold mining. This practice brought a negative effect in child caring that parents left their children alone the whole day without care giver for mining. This in turn cause children to spend the day together which increases the chance of contact between sick and healthy individuals. On the other hand, vaccination (AOR: 0.29, 95%CI: 0.11-0.75, P: 0.0108), history of similar illness (AOR: 0.18, 95%CI: 0.05-0.62, P: 0.0068), and practicing hand washing at least three critical times (AOR: 0.34, CI: 0.13-0.89, P: 0.0281) were found to be protective. Being vaccinated reduced the disease of Rotavirus by 71% while being infected in previous year reduced the occurrence of disease by 82%, which is proxy indicator for the development of immunity after first infection of Rotavirus.

5.4 Discussion

The study confirmed the existence of Rotavirus outbreak in Kurmuk district of Assosa zone, Benishangul-Gumuz region from Dec 22, 2108 to Feb 9, 2019. The regional health bureau declared the presence of Rotavirus outbreaks during the last two years in the same period. A study conducted on hospital-based surveillance for rotavirus gastroenteritis in children younger than 5 years of age in Ethiopia showed that Rotavirus circulated year round with peak prevalence from October through January(16). In another studies Rotavirus prevalence high peaks were observed during dry seasons of the year (17-19). Peak Rotavirus infection in Ghana was observed in cool dry months of January and February(20), which agrees with the current study. While rotavirus infections have been

called a winter disease in the temperate zones, their incidence peaked in winter primarily in the Americas and that peaks in the autumn or spring are common in other parts of the world. In the tropics, the seasonality of such infections is less distinct and within 10 degrees latitude (north or south) of the equator, eight of the ten locations exhibited no seasonal trend(21). Study in Ukraine showed that increase in Rotavirus prevalence was noticed in winter months(22) which is similar with the current outbreak in Kurmuk district.

Vaccination is the best way to prevent severe rotavirus disease and the deadly, dehydrating diarrhea that it causes. In high and middle income countries, rotavirus vaccines confer 85-100% protection against severe disease, while in low income regions of Africa and Asia, protection is less, at 46-77%(23). In the current study, being vaccinated was protective against Rotavirus infection, which reduced the occurrence of a disease by 71% among vaccinated groups. After the introduction of vaccine in Thailand, Rotavirus related hospital admissions were reduced by 40%-69%(24). Similarly, following the vaccine introduction in Kenya, the proportion of children aged <5years hospitalized for rotavirus declined by 30% in the first year and 64% in the second year. Reductions in rotavirus positivity were most pronounced among the vaccine-eligible group (<12months) in the first year post-vaccination at 42%. Greater reductions of 67% were seen in the second year in the 12-23months age group(25). In contrary to this, diarrhea hospitalizations due to Rotavirus among children <5years of age was decline only by 17% from 24% in the pre-vaccine period to 20% in post-vaccine in Ethiopia. In the same study, a reduction of 18% of diarrhea hospitalizations due to Rotavirus in children <12months of age in the post-vaccine periods was observed(14). Rotavirus vaccine has shown a major impact in hospital admission in Australia by reducing 71% of Rotavirus hospitalizations in under five years of age(3).

In the current study, children who had contact with cases of Rotavirus are 8.6 times more affected than those who hadn't contact with cases. A case-control study conducted for Rotavirus outbreak in South China found contact as risk factor that children who had contact with cases were 2.1 times more affected(26). Similarly in an outbreak happened during the school trip, the study revealed that the disease was spread from a single pupil to classmates due to prolonged contact(27). A study of infectious intestinal disease in England reported contact with

cases as risk factor with Odds Ratio of 3.45 and P Value of < 0.001(28), which agrees with current outbreak in Kurmuk district.

A study conducted in Guinea-Bissau to determine the Protective immunity after natural rotavirus infection reported that primary infection conferred 52% and 70% protection against subsequent rotavirus infection and rotavirus diarrhea, respectively(29). Another study also indicated that primary Rotavirus infection conferred protection against reinfection for more than two years(30). Protection against moderate or severe disease increased with the order of infection but was only 79% after three infections. Early infection and frequent reinfection in a locale with high viral diversity resulted in lower protection than has been reported, providing a possible explanation why rotavirus vaccines have had lower-than-expected efficacy in Asia and Africa(31). In the current study, previous infection of Rotavirus reduced the subsequent reinfection by 82% which could be a serotype of best vaccine candidate.

Use of improved sanitation and hand washing are thought to be measures to reduce diarrheal diseases as indicated by a number studies. In a study conducted at rural kebeles of Adama district, the prevalence of under-five child diarrheal was reduced due to improved hand washing practice in mothers/guardians of children(32). Similarly, a study conducted in Arba Minch district highlighted that poor hand washing practice among mothers resulted in high risk of diarrheal diseases in under-five children(33). Hand washing practice with soap during critical times and WASH educational messages reduces childhood diarrhea by 37% in Jigjiga district of Somali regional state(34). In addition to the above studies, many other studies reported low practice of hand washing in communities resulted for high prevalence of diarrheal diseases in under-five children(35-37). In the current study, those mothers/caretakers who has been practicing hand washing at least three times per day reduced the incidence of Rotavirus disease by 66%, which fairly agrees with above cited studies.

In this study, traditional gold mining was found to be statistical significant factor for the Rotavirus outbreak happened in the district. The Kurmuk district is known for high deposit of gold mineral that the community has been practicing traditional gold mining. Traditional gold mining practice in the district is high during winter because during this season most of the grass and bushes became dry and they set fire on

them and the ground becomes suitable to locate gold deposit by sensor machines. This practice brought a negative effect in child caring that parents left their children alone the whole day without caretaker for mining. These children spent the day together and the chance of contact between sick and healthy, coming in contact with dirty materials are so high that contracting the disease is so high.

5.5 Conclusion and recommendations

Rotavirus outbreak was confirmed in the Kurmuk district and factors that increased the odds of Rotavirus infection in under-five children were contact with sick children and traditional gold mining whereas, being vaccinated, history of previous infection with Rotavirus and mothers/caretakers practicing hand washing at least three times per day were found to be protective against Rotavirus infection.

Therefore, to prevent the Rotavirus outbreak in the future:

- ✓ Mothers should be educated on child caring, mode of diarrheal disease transmission and good hygiene practices.
- ✓ Vaccination coverage should be improved and factors that affect vaccine quality like cold chain should be assessed in the woreda.
- ✓ Identifying the genotype of Rotavirus circulating in the community is necessary and helps to know the reason why previous infection is better protective than vaccination.

1.7. Limitation of the Study

During the house to house visit for case control study most of children didn't have vaccination card. Therefore, for most of children their vaccination status was obtained just by asking their parents. This may cause bias on vaccination of children.

Acknowledgment

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Chapter 6 : Abstracts for scientific presentation

Rotavirus outbreak investigation in Kurmuk district, Assosa zone of Benishangul-Gumuz region, Feb, 2019.

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Abstract

Introduction: Diarrheal diseases are one of the leading causes of illness and death in children <5 years of age, particularly those in low-income countries, and cause >500,000 deaths per year globally. Rotavirus alone caused an estimated deaths of 214806, 121009 and 6800 in children <5 years of age globally, in Sub-Saharan Africa and Ethiopia respectively in 2013. The main objective of this investigation was to identify risk factors associated with an outbreak.

Method: Descriptive and unmatched case-control study was conducted from Jan 30-Feb 12, 2019 in Kurmuk woreda. ELISA techniques were used for confirmation of Rotavirus in cases. Structured questionnaire was developed to collect cases and controls. A total of 144 samples with 1:2 case to controls were selected. Data were analyzed using Epi-Info and the results were interpreted using Adjusted Odds ratio, P value <0.05 and 95% CI.

Result: Confirmed Rotavirus outbreak was occurred in Kurmuk Woreda with AR of 60.3/1000 and CFR of 0.87%. In multivariate logistic regression, contact with cases (AOR: 8.58, 95%CI: 3.02-24.41, P: 0.0001) and families practicing traditional gold mining (AOR: 6.34, 95%CL: 2.15-18.71, P: 0.0008) were risk factors. On the other hand, vaccination (AOR: 0.29, 95%CI: 0.11-0.75, P: 0.0108), history of similar illness (AOR: 0.18, 95%CI: 0.05-0.62, P: 0.0068), and practicing hand washing at least three critical times (AOR: 0.34, CI: 0.13-0.89, P: 0.0281) were found to be protective factors.

Conclusion: Contact with cases, traditional gold mining and failure to practice hand washing at least three times a day were found to be risk factors associated for the outbreak whereas being vaccinated and having previous history of Rotavirus infection were protective risk factors. Therefore, educating mothers about child caring, mode of diarrheal disease transmission and good hygiene practices combined with increasing coverage and quality of vaccination would reduce the disease incidence.

Keywords: Rotavirus, Outbreak, Investigation, Kurmuk, Benishangul-Gumuz.

Surveillance data analysis report on Meningococcal meningitis in South Nations, Nationalities and Peoples' Region from 2013-2017

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Abstract

Background: Meningococcal meningitis is a contagious disease caused by Gram-negative diplococci bacteria called, *Neisseria meningitidis (Nm)*. Currently, the largest and most reoccurring outbreaks have been located in the semi-arid area of sub-Saharan Africa in an area known as the African meningitis belt. As Ethiopia is in the African meningitis belt and so does SNNPR, regular analysis of surveillance data is important in order to generate up to date information about the disease.

Method: The study used a retrospective descriptive analysis of secondary clinical and laboratory data collected in the SNNPR by weekly reporting forms from 2013-2017 and reported through the Public Health Emergency Management Surveillance system. The study used all patients of suspected and confirmed meningococcal meningitis in the region reported to EPHI on weekly basis from 2013-2017.

Result: A total of 4571 suspected meningitis cases and 83 deaths were reported in the region from 2013-2017. Out of the total suspected cases reported 969 (21.2%), 705 (15.4%), 479 (10.5%), 396 (8.7%) and 377 (8.2%) were reported from Sidama, Wolayita, Hawassa, Gedeo and Halaba zones respectively. The highest average incidence rate was recorded in Hawassa with IR of 32.57/100000 followed by Halaba and Basketo zones with average IR of 28.55/100000 and 13.35/100000 respectively and in regional level the highest incidence and case fatality rates were recorded in 2013 with IR and CFR of 8.8 per 100000 population and 2.30% respectively. The average incidence and case fatality rates of the region during five years was 5.01 per 100,000 population and 1.82% respectively.

Conclusion: Meningitis is still a public health problem in SNNPR, despite it showed a gradual decline in incidence during the years 2013 through 2017. A slight increase in 2017 compared to the year 2016, highlights a need to further strengthening the surveillance activities and other actions like booster vaccination against the disease in the region.

Keywords: Surveillance, Data analysis, Meningococcal meningitis, SNNPR

Chapter 7 : Narrative Summary of Disaster Situation

Loss and damage assessment in IDPs affected due to conflict between Ethnic Oromos and Somalis in Bale zone, Oromia regional state, Ethiopia, 2018.

Executive Summary

Internal displacement is a global phenomenon and a political, economic, humanitarian and development challenge. In Ethiopia, border disputes and revenge attacks, and competition over increasingly scarce resources such as land and water in the Oromia and Somali regions triggered more than 725,000 new displacements, most of them in the last quarter of the year. Bale zone is one of the largest zones in Oromia regional state which was affected by the recent conflict between ethnic Oromos and Somalis.

During the conflict many people were displaced, homes were damaged and burnt or looted, livestock were taken or killed, and government and public infrastructures were fully destroyed or partially damaged. The conflict caused the displacement of 134,208 individuals from their home, an estimated loss of 6,732,005.00 ETB due to destruction of government infrastructures and 59,190,000.00 ETB due to destruction of individual and investors' property. From zone, about 7375 Camels, 30855 cattle, 59470 Shoats (Sheep and Goats) and 3529 Equines were taken or killed during the conflict. These loss was changed into money and it was reported to be equivalent to 509,434,000.00ETB.

Deworming, vaccination and supplementation of vit A was conducted in the IDPs in the zone even though security was a big problem in some of the woredas leading to a low performance. Nutritional screening wasn't conducted regularly in all areas because of security problems in some places and supplementary feeding for children and PLWs was reported to be inadequate. Water and sanitation access was low for IDPs in the zone. Federal, regional and zonal government in both regions should talk for peace and to return IDPs to their home. Shortages of food, shelter, water and sanitation should be addressed.

Key words: IDPs, Bale zone, Conflict

7.1 Introduction

Internal displacement is a global phenomenon and a political, economic, humanitarian and development challenge. First and foremost, however, it is a personal experience, shaped by the conditions in which displacement takes place: whether it is driven by a disaster, war or other form of violent disruption; how long it lasts; and whether governments and host communities are willing or able to support those displaced(1). In 2017, there were about 30.6 million new displacements associated with conflict and disasters recorded across 143 countries and territories worldwide. The ten worst-affected countries were China, the Philippines, Syria, the Democratic Republic of the Congo, Cuba, the United States, India, Iraq, Somalia and Ethiopia accounted for more than a million new displacements each(1).

Sub-Saharan Africa accounts for only 14 per cent of the world's population, but almost half of new conflict displacement took place in the region(2). There were 5.5 million new displacements associated with conflict and violence in 2017, double the figure for the previous year. The Democratic Republic of the Congo was hardest hit, with almost 2.2 million new displacements, more than twice the number in 2016 and more than the next three worst-affected countries in the region combined. Together, South Sudan, Ethiopia and the Central African Republic accounted for a total of more than 2.1 million new displacements(1).

The Horn of Africa accounted for a fifth of the region's new displacements, the result not only of conflict but also sudden and slow-onset disasters and the complex, overlapping dynamics between them(3). In Ethiopia, border disputes and revenge attacks, and competition over increasingly scarce resources such as land and water in the Oromia and Somali regions triggered more than 725,000 new displacements, most of them in the last quarter of the year(1). In Ethiopia conflict was reported as the primary driver of displacement causing 1,472,209 IDPs followed by displacement due to climate induced factors which accounts for IDPs of 531001. This trend is consistent over time, with conflict constantly being the primary cause of displacement across the country(4).

Bale zone is one of the largest zones in Oromia regional state which was affected by the recent conflict between ethnic Oromos and Somalis. At the national level, countries have worked to improve their response capacities and their collaboration with international organizations and agencies to facilitate the delivery of humanitarian assistance. Plenty of obstacles and lessons to be

learned remain, but the growing importance that internal displacement has assumed within the international humanitarian community should be recognized (5). Recently the response activities in IDPs has been being decreasing due to different factors. For example, in Ethiopia insecurity and difficulty in accessing roads to give humanitarian support is becoming a challenge. Therefore, this study was aimed at assessment of loss and damage of public and government infrastructures as well as IDPs support activities in Bale zone and this in turn helps as an input for rehabilitation process.

7.2 Objectives

7.2.1 General objective

- To assess the loss and damage of public and government infrastructures and IPD support activities

7.2.2 Specific objective

- To assess damage and loss of public and government infrastructures like health facilities, schools, water points etc.
- To assess support activities on food and non-food items
- To assess support activities on WASH

7.3 Methods and materials

This cross-sectional study was conducted in Bale zone of Oromia regional state from March 12-30, 2018. Before the data was collected discussion was made with Disaster Risk Management Technical Working Group from the region and zone. We also made discussion with different stakeholder like zonal health offices and zonal PHEM officers, zonal educational office, zonal water offices and zonal women and children affairs office. Data concerned about the IDPs was collected from the above mentioned zonal offices and based on the available data, field surveys were conducted on selected sample woredas in the Zone, with a standard checklist prepared and approved. The data found was presented by tables and graphs by using Microsoft excel 2013.

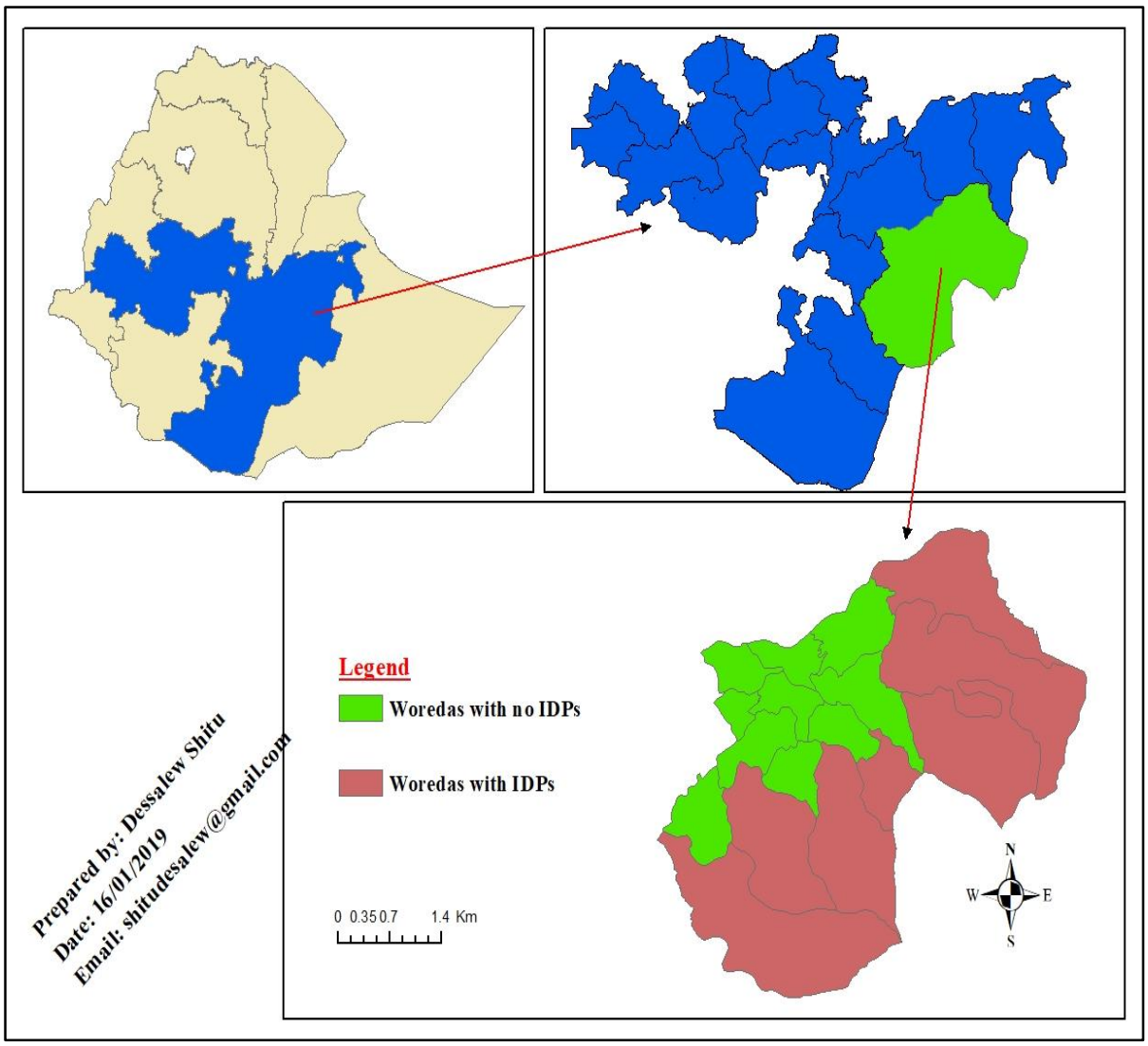

Figure 7.1: Woredas with IDPs and with no IDPs, Bale zone, Oromia region, 2018.

7.4 Result

7.4.1 Situation overview

Due to the conflict between communities living in adjacent areas of Oromia and Somali Regions since August 2017, human lives and properties of government and individuals were affected. During the conflict many people were displaced, homes were damaged and burnt or looted, livestock were taken or killed, and government and public infrastructures were fully destroyed or

partially damaged. To support these affected IDPs, regional and federal governments and partners as well as societies in the region were providing food and non-food assistance.

7.4.2 Number of IDPs in Bale zone

The conflict occurred between two communities living in adjacent areas of Oromia and Somali regions claimed lives of so many people in both sides and it also caused a huge social, political and economic impacts in the area. In addition to the local drought, the conflict caused the displacement of 134,208 individuals. Among them are 88,196 pastoralists and 1,900 with different occupations, with a total of 90,096 families from the Somali Region, while 44,112 were displaced from the border areas of Oromia due to the fear of the conflict and settled in different woredas of Bale zone (Table 7.1)

Table 7.1: Number of IDPs displaced from border areas of Oromia with Somali region and settled in different woredas of Bale zone, 2018.

Place IDPs living		HH			Family size			Total		
Woreda	IDPs site	M	F	Total	M	F	Total	M	F	**Total**
G/Damole	Jibri	195	207	402	822	901	1723	1017	1108	**2125**
Legehida	Jigo	388	77	465	1149	1181	2330	1537	1258	**2795**
	Biyo	332	89	421	1127	978	2105	1459	1067	**2526**
M/walebu	Mada	892	314	1206	4147	4459	8606	5039	4773	**9812**
	Odaboji	226	78	304	1180	1207	2387	1406	1285	**2691**
Dawe Kachen	H/biko	206	26	232	642	952	1594	848	978	**1826**
	Fursa	201	47	248	720	981	1701	921	1028	**1949**
	Fursa	181	34	215	567	814	1381	748	848	**1596**
	D/Gale	117	20	137	350	489	839	467	509	**976**
Sewena	Keshoshiko	505	34	539	763	1286	2049	1268	1320	**2588**
	Hada	652	36	688	998	1616	2614	1650	1652	**3302**
	Hada	115	9	124	364	445	809	479	454	**933**
	Digelu	260	285	545	1300	1325	2625	1560	1610	**3170**
Rayitu	T/ Bela	410	215	625	980	860	1840	1390	1075	**2465**
	Herbicha	140	120	260	700	600	1300	840	720	**1560**
	Beredimtu, Muta,Hero	300	333	633	1500	1665	3165	1800	1998	**3798**
Total		**5120**	**1924**	**7044**	**17309**	**19759**	**37068**	**22429**	**21683**	**44,112**

As mentioned above, about 90,096 IDPs; 88,196 pastoral farmers and 1900 with different skills and professions were displaced from Somali region and living in IDP sites found in different

woredas, towns and town administrations of the bale zone. The sites where they are living are shown below in Table 7.2.

Table 7.2: IDPs displaced from Somali region and living in different IDP sites found in Bale zone, 2018.

Place IDPs living		HH			Family size			Total		
Woreda	IDP site	M	F	Total	M	F	Total	M	F	Total
G/Damole	Jibri,Awiche	89	73	162	437	408	845	526	481	1007
	Jibri	24	6	30	47	68	115	71	74	145
Legehida	Funayamorm	2383	578	2961	8809	9250	1805	1119	9828	21020
	Biltu	59	5	64	52	70	122	111	75	186
M/waleb	Mada	1363	758	2121	7111	8281	15392	8474	9039	17513
	Bidere	26	4	30	22	44	66	48	48	96
D/Kachen	H/Gadeb	103	44	147	430	445	875	533	489	1022
Sewena	Harale &Kololo	301	546	847	1413	959	2372	1714	1959	3219
	B/Harkele	539	15	554	1175	1768	2943	1714	1783	3497
	Mecha	23	1	24	9	17	26	32	18	50
Rayitu	Baradimtu፣ Mutiharo	720	282	1002	2057	1949	4006	1868	3140	5008
	Borore	132	120	252	1250	1150	2400	1382	1270	2652
	Tedecha,Baladiha	90	75	165	564	278	842	654	353	1007
Delomena	Bararak	442	366	808	3673	3837	7510	4115	4203	8318
	Mana	24	3	27	3	0	3	27	3	30
D/Sarar	Buta	775	813	1588	4042	5170	9212	4817	5983	10800
	buti	61	100	161	372	272	644	433	372	805
	Bared	221	173	394	771	877	1648	1032	1050	2082
	Hantutu	517	677	1194	3364	4174	7538	3881	4851	8732
	Gora	252	279	531	256	221	477	507	500	1007
Total		**8144**	**4918**	**13062**	**35857**	**39238**	**75095**	**43131**	**45519**	**88196**
IDPs displaced from Somali region due to conflict and living in different woredas towns and Town administrations found in Bale zone										
Agerfa	Agerfa	55	6	61	21	52	73	76	58	134
Berberie	Berberie	51	16	67	17	19	36	68	35	103
Dinsho	Dinsho	4	0	4	1	7	8	5	7	12
Gasera	Gasera	70	5	75	33	42	75	103	47	150
Ginir	Ginir	135	20	155	194	172	366	329	192	521
Goba	Goba	11	1	12	8	15	23	19	16	35

Gololcha	Gololcha	32	3	35	11	10	21	43	13	56
Goro	Goro	25	5	30	29	32	61	54	37	91
H/bulik	H/bulik	30	2	32	6	1	7	36	3	39
Sinana	Sinana	63	23	86	43	68	111	88	75	163
Goba town	Goba town	17	3	20	7	9	16	24	12	36
Ginir town	Ginir town	78	48	126	216	218	434	294	266	560
Total		**571**	**132**	**703**	**586**	**645**	**1231**	**1139**	**761**	**1900**
Grand Total		**8715**	**5050**	**13765**	**36443**	**39883**	**76326**	**44270**	**46280**	**90096**

From total of 134,208 IDPs found in the zone, 90096 were displaced from Somali region and due psychological, Economic and social impacts of the conflict as well as life threatening conditions, they told us that they will not go back to their original home in Somali region and instead they want permanent settlement in Oromia regional state. But those 44,112 IDPs displaced from borders of Oromia region mentioned that they will go back to their home if conflict is resolved between these communities. The IDPs coming from Somali region are increasing from time to time due to IDPs stayed in detention and prison in Somali region. From a total of 134,208 IDPs found in Bale zone only 97,065 are getting support from government and partners working in zone.

7.4.3 Losses and damages due to conflict in the zone

7.4.3.1 Losses and damages in government infrastructures

In addition to the psychological and social impacts, the conflict between two regions caused variety of damages and losses in government infrastructures like Buildings, roads, power supply facilities, health institutions, Schools, Water institutions and stores as shown in the Table 7.3 below.

Table 7.3: Facilities damaged, destroyed or Shattered due to conflict and their estimated cost, Bale zone, 2018.

Woreda	Kebele	Damaged facility type	Qty	Type of damage	Amount of damage (%)	Damage in Money(ETB)
Dawe Sarar	Dikay	School	1	Shattered	18	350,000.00
		Health Post	1	Shattered	63.4	950,981.00
		PTC	1	damaged	51	759,955.00

		School under construction	1	Shattered	34	685,960.00
Rayitu	H/Dube	Water well		destroyed	100	50,000.00
	Harbucha	School	1	destroyed	100	2,000,000.00
		Water well		destroyed	100	500,000.00
D/kachen	Adeharga	Roto for water		Shattered	100	70,000.00
Sawena	Hatawi	Waterpipe & Generator		Burnt	90	900,000.00
	Wangaya	Generator		Burnt	90	900,000.00
	Digelu	Generator		Burnt	90	900,000.00
	Burakadero	Health Post	1	destroyed	100	1,500,000.00
Gura Damole	Habrona	School	1	destroyed	100	100,000.00
	Jibribadyia	School	1	damaged	90	2,000,000.00
						6,732,005.00

7.4.3.2 Damage and loss in individuals and investors property

The conflict caused damage in individuals' and investors' properties like crops, domestic animals and burnt houses and the damage and loss of properties are shown in the tables as follows. The conflict caused a total of 1973 permanent and mobile houses to be burnt in the zone. Those burnt houses were equivalent to a cost of 59,190,000.00 Ethiopian Birr as shown in Table 7.4.

Table 7.4: Numbers and type of houses burnt during conflict and their cost estimate, Bale Zone, 2018.

Woreda	Kebele	HH	Family size			No. of houses burnt	Type of house burnt	Value of houses burnt (ETB)
			M	F	Total			
Rayitu	Anole	7	17	18	35	7	Permanent	105,000
	Wichiro	4	13	11	24	4	Permanent	60,000
	H/Dube	96	219	229	448	96	Permanent	1,440,000
Dawe Sarar	G/Korma	275	584	1251	1835	23	Mobile	345,000
	Guracha	426	1133	704	1837	32	Mobile	480,000
	Dikay	925	1360	1415	2775	30	Mobile	450,000
D/Kachen	A/Aga	74				74	Permanent	1,110,000
Sewena	B/Dero	16	65	18	83	16	Permanent	240,000

Legehida	Adele	870	2859	2976	5835	870	Permanent	13,050,000
	Yabelo	821	2710	2821	5531	821	Permanent	12,315,000
Total		**3514**	**8960**	**9443**	**18403**	**1973**		**59,190,000**

Even though there was no report of dead or burnt animal in the zone, raiding of animals in the border areas was known and it was the main challenge of pastoralists. According to the reported data from the respective woreda in Bale zone, about 7375 Camels, 30855 cattle, 59470 Shoats (Sheep and Goats) and 3529 Equines were taken or killed during the conflict. These loss was changed into money and it was reported to be equivalent to 509,434,000.00ETB. The type of animals stolen or killed and the average price per animal was shown in Table 7.5

Table 7.5: Type of domestic animals, their number and estimated cost of animals killed or taken due to conflict, Bale Zone, 2108.

Woreda	**IDPs by HH**	**Raided/killed animals**		**Price of animals**	
		Type	Qty	Average price/animal	Total(ETB)
Rayitu	2,112	Camels	468	17,500	8,190,000
		Cattle	4,205	10,000	42,050,000
		Shoats	15,763	1,000	15,763,000
		Equines	410	3,500	1,435,000
		Subtotal			67,438,000
G/Damole	1,002	Camels	5,691	17,500	99,592,500
		Cattle	22,641	10,000	226,410,000
		Shoats	37,329	1,000	37,329,000
		Equines	2,797	3,500	9,789,500
		Subtotal			373,121,000
Legehida	1,691	Camels	0	17,500	0
		Cattle	450	10,000	4,500,000
		Shoats	0	1,000	0
		Equines	0	3,500	0
		Subtotal			4,500,000
D/Kachen	1,155	Camels	0	17,500	0
		Cattle	0	10,000	0
		Shoats	0	1,000	0
		Equines	0	3,500	0
		Subtotal			0
Sawena	1,982	Camels	103	17,500	1,802,500
		Cattle	379	10,000	3,790,000
		Shoats	336	1,000	336,000
		Equines	31	3,500	108,500

		Subtotal			6,037,000
M/Walebu	1,510	Camels	1113	17,500	19,477,500
		Cattle	3180	10,000	31,800,000
		Shoats	6042	1,000	6,042,000
		Equines	291	3,500	1,018,500
		Subtotal			58,338,000
Total	**10,615**				**509,434,000**

7.4.4. Health

Regarding the health, except the physical damages during conflict there was no any new disease outbreak happened in IDPs in the zone. IDPs were getting health services by mobile health team. Health posts in some of the kebeles were damaged along with destruction of medical equipment and drugs.

7.4.4.1. MCH

Deworming, vaccination and supplementation of vit A was conducted in the IDPs in the zone even though security was a big problem in some of the woredas leading to a low performance. The vaccination coverage of IDPs in the zone was shown in Figure 7.2 and deworming and vitA supplementation coverage was shown in the Figure 7.3 below. Deworming and VitA supplementation coverage is still low in some of the IDP woredas.

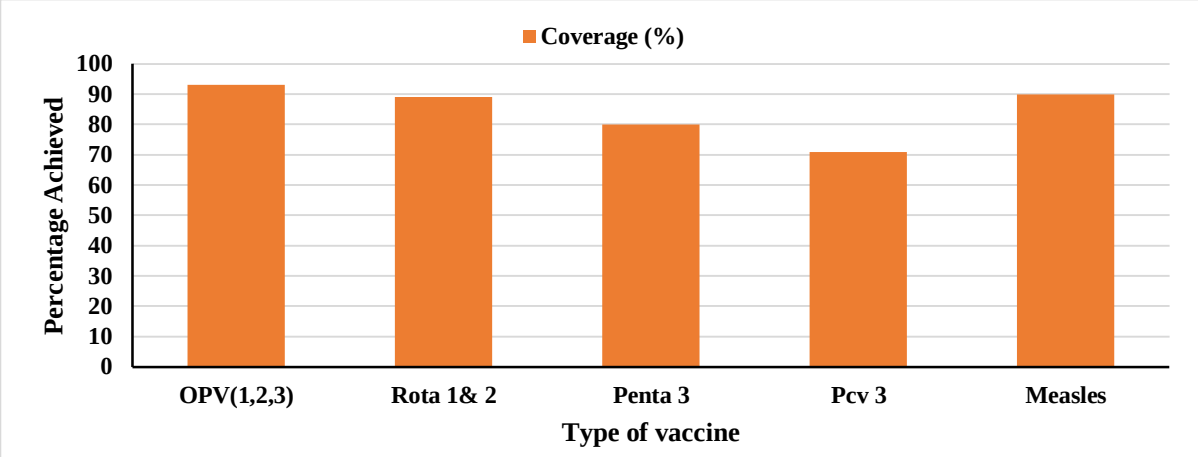

Figure 7.2: Vaccination coverage in IDPs of Bale zone, Oromia, 2018.

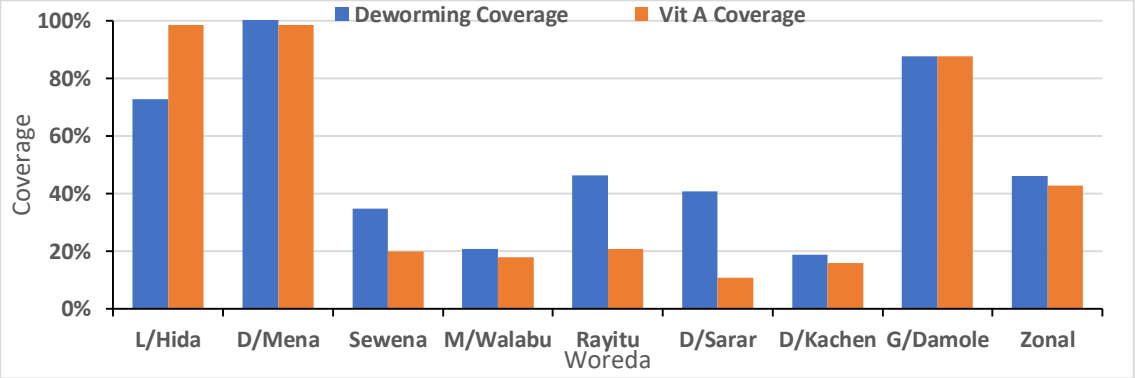

Figure 7.3: Deworming and VitA supplementation coverage in IDPs, Bale zone, 2108.

Nutritional screening wasn't conducted regularly in all areas because of security problems in some places and supplementary feeding for children and PLWs was reported to be inadequate and their physical condition was deteriorating from time to time as reported from zonal Disaster risk management commission. Nutritional screening was conducted for a total of 15733 children and 7911 PLWs. A total of 4356 under-five malnutrition cases with 4097 MAM and 259 SAM cases were identified during seven week period. From total screened PLWs, 3223 MAM cases were reported. From MAM cases in both under five and PLWs, 26.16% and 47.81% were received treatment respectively and all (100%) SAM under five cases were treated as shown in Figure 7.4.

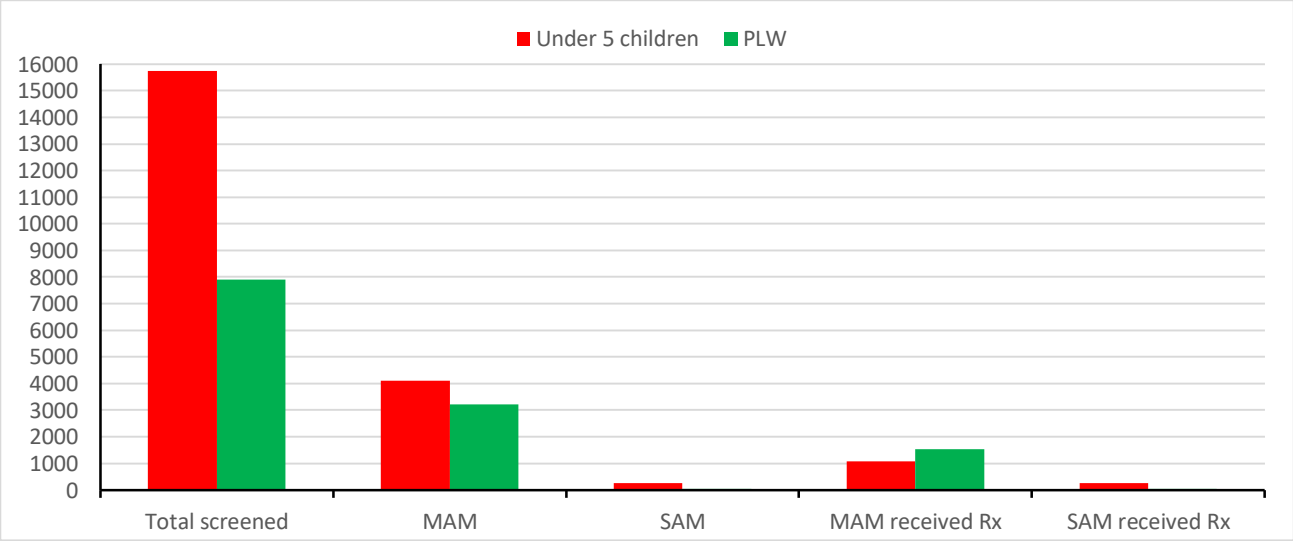

Figure 7.4: Nutritional screening in Under 5 children and PLW; MAM & SAM received treatment, Bale zone, 2018

7.4.4.2 OPD /IPD services delivered

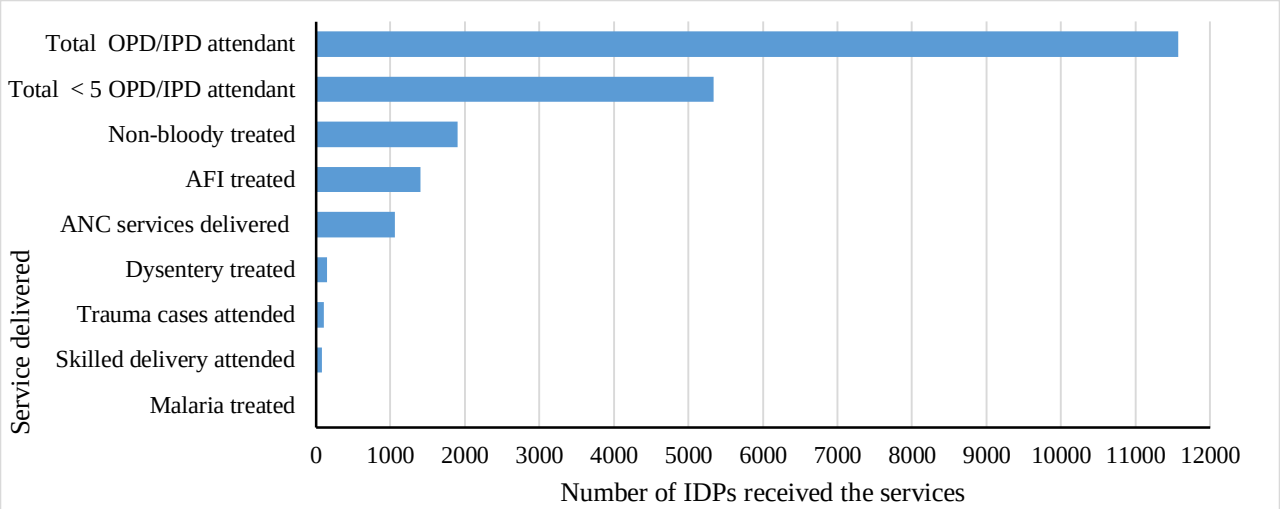

Figure 7.5: OPD/IPD services delivered for IDPs during in Bale zone, 2018.

7.4.5. Food and non-food items distributed

For the conflict affected IDPs there was food support from regional and federal governments and a total of 18059 Kg of food items either in flour or grain form was distributed even though it was not adequate to support all IDPs in the zone. Non-food items distributed for IDPs was shown in the Table 7.6 below.

Table 7.6: Different types of non-food materials distributed for IDPs in Bale zone, 2018.

S.No.	Types of items		Unit	Amount
1	Different types of clothes		Number	13873
2	Blankets		Number	9991
3	Soaps		Number	36148
4	Mattress		Number	3177
5	House hold Utensils		Number	11801
6	Money	collected	ETB	394000
		distributed	ETB	49500

7.4.6. WASH

Water and sanitation are critical determinants for survival in the initial stages of a disaster. People affected by disasters are generally much more susceptible to illness and death from disease, which to a large extent are related to inadequate sanitation, inadequate water supplies and inability to maintain good hygiene. The most significant of these diseases are diarrheal and infectious diseases transmitted by the faeco-oral route. Other water- and sanitation-related diseases include those

carried by vectors associated with solid waste and water. Water infrastructure development was poor in border areas where IDPs were displaced. People were getting water from aid and one water infrastructure was destroyed by burning water pump and generator in Haregedeb Kebele. The original place where IDPs living before the conflict occurred was lowlands and salty which are not suitable areas to supply potable water by making deep water well and water ponds. But currently 16 water trucks were working to supply water for schools and IDPs in the zone. In addition to these, other 10 water trucks were requested. Generally, water supply for IDPs in the zone is lower than from expected.

In the zone only a total of 253 trench latrines were constructed for IDPs in the last seven weeks and it was very lower than what it was planned to be and the recommended standard for IDPs at the begging. Water treatment chemicals of 55895 sachets and 4048 hand washing materials were distributed in seven weeks for IDPs in the zone. During this period a total of 62452 IDPs had taken health education in the zone which was referred to be low performance compared to the plan of 90802 IDPs will take health education. To improve water supply for IDPs, the zone is working to rehabilitate nonfunctional water points and the activities conducted were shown in the Table 7.7 below.

Table 7.7: Water scheme rehabilitation activities conducted to enhance potable water supply for IDPs in Bale zone, 2018.

Woreda	**Kebele**	**Activities conducted**
Sewena	Mecha town	Water Pump was changed
	Leku	200 meter & 2 inch riser pump was changed
	Seledergami	120meter & 2.5 inch riser pump changed
	Gale	Pump was changed
	Boditi	Switch board panel was changed
	Kalgach	ginratore was repaired
Rayitu	didedecha Bela	Pump was changed
	Wacharo	Generator was repaired
D/Kachen	Myio	Generator was repaired
	Hadi Rega	Not repaired because of pump was fall downwards
	Hargedeb	Not repaired because of no generator and pump
Delo Mena	Kele Gurba	120 meter & 2 inch riser Pump was changed

7.4.7 Women and children

According to the Data from zonal disaster risk management commission, from a total of 134,208 IDPs displaced due to conflict, women and children victimized for different assaults were shown in the Table 7.8 as follows.

Table 7.8: Women and children victimized for different types of assaults in IDPs, Bale zone, 2018.

S.no	Type of assault	Woreda						Total	
		Delo Mena		M/Walebu		G/Damol			
		M	F	M	F	M	F	M	F
1	Rape		6		18	-	-		24
2	Mental problem	8	4	7	10	-	-	15	14
3	Children living in bad conditions	18	22	-	-	-	-	18	22
4	Children separated from family	66	10	-	-	-	-	66	10
6	Child labour	40	15	-	-	-	-	40	15
8	Children attacked	-	-	-	-	1	-	1	-
Grand total								140	85

7.5. Conclusion and recommendations

The conflict between Ethnic Oromos and Somalis in two regions cost human life, brought different types of economic, social and political impacts in these two neighboring regions. The conflict caused displacement of over more than 134,208 Ethnic Oromos from their home and forced them to live in IDP sites found in different woredas of the Bale zone. Due to the conflict a number of government infrastructures were destroyed or damaged and this was estimated to cost 6,732,005 ETB for rehabilitation. In addition to government infrastructures, the conflict caused for destruction of individuals properties like burning of many houses, killing or raiding of domestic animals. The conflict caused a loss of an estimated 568,624,000 ETB in private property. The following are recommendation forwarded:

- ✓ The shortage of supplementary food for IDPs should be addressed.
- ✓ IDP sites that are with shortage of water and sanitation should be addressed.
- ✓ Peoples in both regions have been lived together for so many years in peace, love, trustfully. For This known togetherness to be continuous reconciliation should be done at different levels.

- ✓ Federal, regional, zonal governments and NGOs should work together to return IDPs to their home by ensuring security between two regions.
- ✓ Even though the Federal, regional, zonal governments and NGOs have been conducted studies many times, the change it brought to IDPs is very minimal. So, for the next studies or activities to be conducted in IDPs, due emphasis should be given to bring something a tangible change.
- ✓ Starting from lower communities a heartfelt reconciliation should be done and officials in both regions who are engaged in war/ conflict should sit together and talk for peace.
- ✓ Milling/grinding machine should be considered as most of food supports are in the form of grains; IDPs have no access for grinding machine in the area.
- ✓ As the coming season is rainy, those IDPs who don't have shelter should be provided with plastic sheet.

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Chapter 8 : Proposal for epidemiologic research project

Mapping the risk of anthrax outbreaks both in humans and animals in Waghimra and South Gondar zones of Amhara regional state

Executive summary

Introduction: Anthrax is a bacterial disease of warm blooded animals including human being caused by the spore forming *Bacillus anthracis*, a Gram-positive, rod shaped bacterium**.** Anthrax is zoonotic disease which has been an important cause of fatal human illness in most parts of the world, especially in developing countries where effective control and prevention methods are still scarce. Animal anthrax is an endemic disease in Ethiopia which occurs every year in several farming localities of the country**.** Amhara region is one of the regions in Ethiopia where higher proportion of anthrax cases has been being reported every. Wag Himra is one of the zones in Amhara region with frequent anthrax outbreaks. Therefore, the objective of this study to provide spatial and temporal distribution of anthrax disease, produce risk map for anthrax and identify hotspot areas of anthrax in both zones.

Methods: The study will apply a cross-section study design in Wag Himra and South Gondar zones from July 2019- September 2019. Both secondary and primary type of data will be collected from animal and human health offices in woredas and in the anthrax outbreak sites respectively. Anthrax cases, Soil pH, monthly average temperature and rainfall and livestock population of five years from 2014-2018 will be collected as secondary data and the coordinates of anthrax outbreak sites will be collected as primary data. Data will be managed and analyzed using excel 2013 and ArcMap V10.4.1.

Expected output: The will brought a better understanding of spatial and temporal distribution of anthrax disease in the zones. By identifying hotspot areas, it will help to prioritize areas for control of the disease and helps for evidence based decision making.

Work plan: Tentative work plan to accomplish this project is from 1, July 2019- 1, October 2019.

Budget: The project will cost a total of 122,640 ETB including 5% contingency to be accomplished.

8.1. Introduction

Anthrax is a bacterial disease of warm blooded animals including human being caused by the spore forming *Bacillus anthracis*, a Gram-positive, rod shaped bacterium the only obligate pathogen in the large genus *Bacillus(1).* Anthrax has been an important cause of fatal human illness in most parts of the world, but in developed countries it is no longer a significant cause of human or livestock wastage because of appropriate control measures. However, it still holds an important position because of its potential as a zoonosis and it is still an important zoonosis in developing countries(2). Anthrax is globally distributed disease, reported from all continents that are populated heavily with animals and humans(3). A total of 63.8 million livestock keepers and 1.1 billion livestock live within vulnerable regions. Human and livestock vulnerability are both concentrated in rural rain-fed systems throughout arid and temperate land across Eurasia, Africa and North America(4).

Animal anthrax is an endemic disease in Ethiopia which occurs every year in several farming localities of the country (5). According to the surveillance data of Ethiopia Ministry of Health, a total of 1,096 suspected human anthrax cases with a CFR of 1.5% were reported from four regions (Tigray, Amhara, Oromia, and SNNPR) in which a large proportion of suspected cases were reported from Amhara region (6). Similarly, Ethiopian health sector performance report of 2016/17 EFY reported a total of 676 anthrax cases with CFR of 1.0% and 53.1% of suspected cases were reported from Amhara Region (7). A total of 5,197 human and 26,737 animal anthrax cases were reported from 2009 to 2013 with CFR of 1.7% in humans. This study reported that national human anthrax prevalence was found to be 1.3 per 100,000 populations per five years, while it was 2.3 per 100,000 in Amhara regional state (8). Wag Himra and South Gondar zones were highest contributing zones for reported anthrax cases in 2017/2018 EFY in the region.

In favorable environmental conditions, *Bacillus Anthracis* forms spores, which can remain dormant for an extended period of time in the soil, until they get a new susceptible host (9). Many studies on the environmental suitability for the persistence of spores have shown that soil parameters such as alkalinity, calcium and high organic matter contents(10), elevation, precipitation, temperature, and vegetation biomass(11) could help for the extended survival of *B. anthracis* spores in the environment. A study conducted in northern Tanzania found that recurrence

of anthrax outbreaks in human, livestock, and wildlife interface areas were highly correlated with cycles of short rainfall followed by dry and hot weather(12). Other studies have also reported that areas with an ambient temperature above 15.5°C (13), and a cyclic rainfall pattern with high evaporation potential characterized by calcareous soil(14) tend to favor long-term survival of the *B. anthracis* spores, causing frequent anthrax outbreaks in such areas. These variables have been incorporated into GIS tools to map the suitability of the environment for *B. anthracis* spore survival, predict risk of outbreaks and identify hotspots in studies in regions such as Ghana(15) Kazakhstan (16) and Saskatchewan (17).

To attain more effective levels of disease management, a recent study has suggested that in resource constrained environments identifying hotspots of transmission may allow for a better allocation of public health services(18). Risk mapping of anthrax was conducted in different countries like Ghana(15), United States (19), China(20), Georgia(18, 21), Tanzania(22), Kazakhstan(16) and Kyrgyzstan(23). Despite the establishment of zoonotic disease epidemiology long ago, risk mapping and hotspot identification of anthrax outbreak areas have not been done in Amhara as a region and in Ethiopia as country (24, 25). Therefore, in countries like Ethiopia which have limited resources, risk mapping and hotspot identification of diseases is very important to prioritize for control programs like vaccination and to strengthen surveillance activities.

8.2. Objective

8.2.1 General objective

The general objective of this study will be building predictive risk maps to identify anthrax outbreak hotspot areas in Waghimra and South Gondar zones.

8.2.2 Specific objective

- To show spatial and temporal distribution of both human and animal anthrax outbreaks.
- To build predictive map for risk of anthrax outbreak using environmental variables and livestock population.
- To identify hotspot areas of anthrax for surveillance and control programs like vaccination of livestock.

8.3 Methods and Materials

8.3.1 Study area

The current study will be conducted in two neighboring zones of Wag Himra and South Gondar. These zones especially Wag Himra zone is known for frequent anthrax outbreaks in the region where more than 64% of suspected human anthrax cases were reported during 2017/2018 EFY.

Wag Himra is bordered on the south by South Wollo, on the southwest by South Gondar, on the west by North Gondar, and on the north and east by the Tigray Region. The projected population based on the Census of 2007 is 528,759. With an area of 9,039.04 square kilometers, Wag Himra has a population density of 47.15 and 7.03% of the population are urban inhabitants. The zone has 3 Hospitals, 33 Health centers and 136 health posts. South Gondar is one of the bordering zone of Wag Himra and has a total population of 2,568,864 according to the projected estimate from the census of 2007. The zone has 8 Hospitals, 97 health centers and 390 health posts.

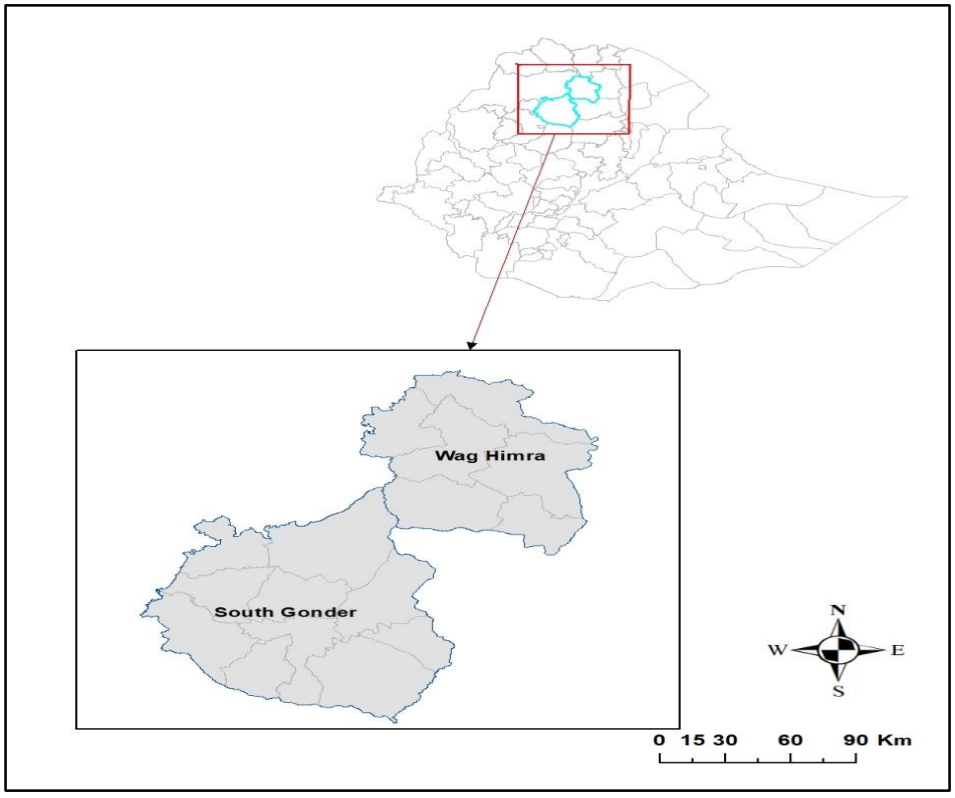

Fig 8.1: Map of Wag Himra and South Gondar zones.

8.3.2 Study design and period

A descriptive cross-sectional study design which will involve 5 year record review of rainfall, temperature, soil pH, livestock population and Anthrax outbreak records from 2014-2018. The study will be conducted from July 2019-September 2019.

8.3.3. Study site selection

The current study areas are selected purposively based on the frequent report of animal and human anthrax outbreaks. Even though there are frequent report of anthrax cases from the zones, there is no study conducted regarding spatial and temporal distribution of the disease and suitability of the area for anthrax. All the woreda health offices of both human and animal will be sources of anthrax secondary data.

8.3.4 Data type and collection

Secondary type of data about both animal and human anthrax cases from 2014-2018 will be collected from woreda animal and human health offices. All suspected and confirmed anthrax outbreak cases will be collected. In addition to this, data will be collected from zonal health offices of human and animal to check for its correctness. After taking data in these offices, the outbreak sites will be asked and the coordinates of all the outbreak sites of both human and animal anthrax will be taken within 1 Km radius based on the history using hand-held Garmin GPS. Data of monthly rainfall and temperature will be collected from Metrological office in the region while soil pH will be collected from Soil Research Centers in the region. Additionally livestock population of both zones will be collected from livestock offices in the woredas. Soil pH, Monthly average rainfall and temperature, and livestock population are factors used for risk mapping of anthrax outbreaks.

8.3.5 Statistical data analysis

Microsoft Excel will be used for editing, validation, verification and descriptive data analysis to summarize the data. The monthly mean values of rainfall, temperature and soil pH will be calculated per district for the study period. The descriptive summary of the outbreaks will be done by adding the respective monthly outbreaks data over the period under study to determine monthly occurrences. For seasonal analysis, the year will be divided in to four as summer, autumn, winter and spring. For yearly trend analysis, the outbreaks of the respective years will be added together.

The geo-referenced data of outbreaks sites will be used to generate distribution map of the spatial spread of the outbreaks using ArcMap V10.4. We will use an existing shape file of Ethiopia from Central Statistics Agency to clip the current study area and to conduct risk mapping.

The mean values of environmental variables and livestock population will be joined to their respective spatial woreda boundary with the help of the "join" tool in ArcMap. These values will be interpolated using the kriging method in ArcMap (26) to get values within the entire study zones. With the help of the reclassify tool in ArcMap, each factor rainfall, temperature, soil pH and livestock population will be categorized into three classes. Constant raster of values will be created as weights for soil pH, rainfall, and temperature and livestock population. The re-classified layers of soil pH, rainfall, temperature and livestock population will be multiplied by their constant raster value using the spatial analyst tool in ArcMap. The product of each factor with its respective standard weight will be added step by step to get the final soil pH, rainfall, temperature and livestock population predictive map. The goodness of fit of the model will be assessed by overlaying the predictive map with the spatial distribution of Anthrax outbreaks in the study area. The final predictive map will be classified as high, moderate and low risk areas considering suitability of environment for anthrax spore survival.

8.3.6. Data quality control

Data collectors and supervisors will be well trained on how to extract monthly temperature and rainfall as well as how to take coordinates. Secondary data of anthrax cases collected from woreda will be cross checked for its consistency with the zonal data.

8.3.7. Dissemination of findings

The results of finding will be submitted to Ethiopia Field Epidemiology Training Program; to Ethiopian Public health institute, Amhara regional health bureau, Wagi Himra and South Gondar zonal as well as woreda health offices.

8.3.8. Ethical consideration

The study won't involve any direct contact with the patients and it will use a fully anonymized data recorded by the diseases surveillance and control officers. Ethical clearance to use data of patients will be obtained from School of Public health, Addis Ababa University. Permission will

be obtained from the Amhara regional health Bureau and Livestock agency. The data collected will be used only for research purpose.

8.4. Expected output

The study will brought a better understanding of spatial and temporal distribution of anthrax disease in the zones. By identifying hotspot areas, it will help to prioritize areas for control of the disease. Additionally the study will help for informed decision making process of different bodies. As a base line study, it will initiate similar studies in different parts of the country for better control and prevention programs of different diseases.

8.5. Work Plan

Figure 8.2: Tentative work plan for epidemiologic project activities.

8.6. Budget breakdown

Table 8.1: Budget required for epidemiologic project activities.

	Activities/Supplies	Qty.	Unit pay/cost (ETB)	Duration of activity	Total (ETB)
I	**Training**				
	Principal investigator	1	450	2	900
	Data collectors	4	300	2	2400
	Supervisor	1	350	2	700
	Hall, Tea and coffee			2	2000
	Sub total				**6000**
II	**Per diem for Data collection**				
	Principal investigator	1	450	30	13,500
	Data collectors	4	300	30	36,000
	Supervisor	1	450	30	13500
	Sub total				**63,000**
III	**Supplies**	**Unit**	**Unit cost(ETB**	**Qty.**	**Total (ETB)**
	Pen	Pack	60	1	60
	Flash disk	count	150	4	600
	Paper	Pack	150	1	150
	Printing and binding	Page	4	30	120
	Hand-held Garmin GPS	count	2000	2	4000
	Sub-total				**4930**
IV	**Car rent for 30 days**	**count**	**1450**	**1**	**43500**
	Total				**116,800**

*With 5% contingency the total budget for the project is **122,640 ETB***

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Annex 1: Declaration

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

Dessalew Shitu

Signature_____

Place: Addis Ababa University, Ethiopia

Date of submission _____

The thesis has been submitted for examination with my approval as a university advisor

Name of advisor: Dr. Abiy Girmay

Signature_____

Date_____

Annex 2: Questionnaire for Data collection of Rota virus outbreak investigation in Kurmuk Woreda, Assosa zone of Benishangul-Gumuz regional state

Status: Case_____Control_____
Region_____Zone_____Woreda_____Kebele_____

Interviewee_____

I. Socio-demographic characteristics

1.1. Sex 1. Male 2. Female 1.2 Age in month _____

1.3. Ethnicity: 1. Berta 2. Amhara 3. Gumuz 4. Oromo 5. Other (Specify_____)

1.5. Religion: 1. Orthodox 2. Protestant 3. Muslim 4. Other

1.6. Occupation: 1. Farmer 2. Merchant 3. House wife 4. Government employee

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

1.8. Level of education of guardian 1. Illiterate 2. Read and writing 3. Elementary 4. Secondary 5. Tertiary

1.10. Family size _____?

1.11. Residence? 1. Urban 2. Rural

1.12. Do you mine gold? 1. Yes 2. No

II. Vaccination assessment

2.1. Do you know about advantage of vaccination? 1. Yes 2. No

2.3. Has he/she been vaccinated against Rota virus at 6/10 weeks of age? 1. Yes 2. No

2.4. What is the number of Rota vaccine doses received? 1. One 2. Two 3. Don't know

2.5. If the child was not vaccinated, what is the reason for not vaccinating?

1. H/facility too far 2. No vaccine at the site 3. Other, specify _____

2.6. How far is your home from health facility? 1. < 5Km 2. 5-10 Km 3. > 10Km

2.7. Had the child has similar illness in the past? 1. Yes 2. No

III. History of exposure

3.2. Did he/she have contact with sick child? 1. Yes 2. No

3.3. If yes, where did he / she has contact with sick child? 1. Home 2. Neighbors 3. Others_____

3.4. Was he / she exclusively breast fed? 1. Yes 2. No

IV. Clinical history

4.1 Did the child have vomiting? 1. Yes 2. No

4.2 did the child have diarrhea? 1. Yes 2. No

4.5 Date of vomit/diarrhea onset? _____

4.6 What was the child dehydration status? 1. Some 2. Severe

4.8 Did the child take the treatment? 1. Yes 2. No

4.9 treatment taken? 1. ORS 2. IV medication 3.Zinc

V. WASH

5.1 Do you Have latrine? 1. Yes 2. No

5.2 Where do you dispose your child's feces? 1. Toilet 2. Open field

5.3 What is your water source for your house hold drinking purpose? 1. Pipe water 2. Spring

3. River 4. Hand dug well 5. Deep well 6. Bottled water

5.4 Do you wash your hand after toilet? 1. Yes 2. No

5.5 Do you wash your hand before serving food? 1. Yes 2. No

5.6 Do you wash your hand after cleaning child's stool? 1. Yes 2. No

Annex 3: Anthrax outbreak investigation questionnaire, Assosa zone, Benishangul-Gumuz region, April, 2019

Identifying information

Region_____Zone_____Woreda_____Kebele_____

Respondent Status A. Case B. Control

Respondent: A. Patient B. Patients' family (Mother, father, sister, etc.)

I. Socio Demographic Information

1. Name of the Respondent_____
2. Age _____
3. Sex A. Male B. Female
4. Occupation: A. Farmer B. Pastoralist/Semi pastoralist C. Daily laborer D. Employee E. tannery worker F. Butchery worker G. Abattoir Worker(Including Meat inspectors) H. other_____
5. Marital status: A. Married B. Single C. Divorced D. widowed E. Not applicable
6. Educational Status A. None Educated B. Primary C. Secondary D. University student E, Already Graduated F. Other

II. Clinical symptoms (cases only)

1. Date of onset of symptoms: _____/_____/_____
2. Date seen at health facility: _____/_____/_____
3. Is there other sick person in your family A. Yes B. No
4. If Yes, how many_____ Age _____ Sex_____ educational status _____

Clinical classification of the case:

A. Gastrointestinal B. Cutaneous Anthrax C. Inhalational anthrax

Laboratory classification. A. Suspected B. probable C. confirmed

5. General Symptoms: A. Anoxia B. fever C. Malaise/fatigue D. cyanosis
6. Gastro/Intestinal: A. Vomiting B. Diarrhea (if yes was it bloody) C. Nausea D. fever E. abdominal bloating
7. Cutaneous: A. Skin lesion B. Pruritus C. Edema D. Vesicles E. Eschar
8. Location of ulcer A. Leg B. Hand C. Face D. Chest E. other body part
9. Inhalational: A. Cough B. Dyspnea (shortness of Breath)C. Difficulty in swallowing D. Fever E. Sweating F. others(specify)_____

III. Exposures/risk factors

1. Whre do you live /residence? A. Kola B. Woinadega C, Dega
2. Have you exposed to animal body fluids for the last two weeks? A. Yes B. No
3. Have you exposed to any sick animal which has bleeding from natural orifices (mouth, nose, anus, ear, etc.)? A. yes B. No

4. If yes, what was the status of the animal you have exposed to?

✓ Sick live animal B. Dead animal body C. both D. body fluid

5. Have you consumed meat of a sick animal prior to onset of symptoms? A. Yes B. No
6. If yes how did you consume? A. Raw B. Grilled C. Cooked
7. Have you exposed to the following animal products (if yes encircle the letter/s) A. Skin/Hide B. Hair/wool C. Milk/yoghurt, D, Others specify_____
8. Do you have a garden/work with soil? A. Yes B. No
9. Do you work in clinical microbiology/Laboratory? A. Yes B. No
10. Did you have any contact with people with similar Illness and symptoms? A. Yes B. No
11. If yes, when was it? A. before a week B. before two weeks C. I don't remember

IV. Mode of transmission

1. Do you know that anthrax is a zoonosis disease in your area A. yes B. No
2. Do you know the transmission modes of Anthrax? A. Yes B. No
3. If yes, what are they? A) Unsafe Handling of Sick animals B) Unsafe Handling of contaminated animal products C) Inhaling the spores from animal products/Soil D) Eating contaminated under cooked Meat E) Drinking of Raw/unboiled Milk F) improper disposal of dead animal body/carcass

V. Treatment taken

- Do you know that anthrax is treatable? A. Yes B. No
- Is there Traditional healers for anthrax in your area? A. Yes B. No
- Have you been treated for your illness? A. Yes B. No
- If yes what was the medication ?Antibiotics B. local traditional healing Medicines C. Tsebel/Dua D. actually I don't remember
- If you were treated with taraditional medicines, why you have chosen it? _____

VI. Prevention methods

12. What do you think is the ways to prevent anthrax infection?

A. Avoiding unsafe contact with animals which are sick or dead
B. Eating properly cooked meat or avoid eating/drinking under cooked meat and other animal products
C. Avoiding unsafe contact of humans with animals which are showing anthraxillness and symptoms
D. Vaccination(both humans and animals
E. Proper disposal of carcasses
F. Avoid unsafe contact/hunting of wild animals which have potential to transmit anthrax

Annex 4: Data Collection Tool for Surveillance System Evaluation

Questionnaire for Meningococcal Meningitis Surveillance System Evaluation (For Zonal Health Office)

Background:

Region _____ Zone_____

Total population _____ urban _____ Male _____ Female _____

Respondent(s) _____

Address: Office no _____ Cell phone no _____ e-mail _____

Part one:

Communication and reporting system assessment

1. What communication material do you have? ☐ E-mail ☐ wired phone ☐ mobile ☐ radio ☐ fax ☐ other----------
2. Did you have address of regional PHEM officers? ☐ Yes ☐ No
3. Did you have address of woreda PHEM officer? ☐ Yes ☐ No
4. Did you have address of Health center focal person? ☐ Yes ☐ No
5. If the Answer for Q2, 3, 4 is No, Why? ----------
   ----
6. How frequently you communicate with the regional PHEM officers on emergencies and other daily activities? ☐ Daily ☐ weekly ☐ every 2 week ☐ monthly ☐ quarterly ☐ every 6 month ☐ yearly ☐ others----------
7. How frequently you communicate with the Woreda PHEM officers on emergencies and other daily activities? ☐ Daily ☐ weekly ☐ every 2 week ☐ monthly ☐ quarterly ☐ every 6 month ☐ yearly ☐ others----------
8. When are you expected to send weekly report to the regional PHEM unit? ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
9. When are you expected to receive weekly report from Woreda health offices and health centers? ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
10. How is the zone communicating the HCs focal persons in case of immediately reportable diseases? ☐ By e-mail ☐ by phone ☐ by fax ☐ regular weekly report ☐ others
11. Did you send summary or short report to the administrative /program leaders or other responsible organs on planning, prevention and control activities addressing important issues at community level that have arisen through the surveillance system? ☐Yes☐ No

12. If answer for Q11 is yes to whom did you send? ----------

13. If the Answer for Q11 is No, Why? ----------

Assessment of availability of Surveillance Documentation, Registers, and Forms

1. Did you have National Guide line for PHEM? ☐ Yes ☐ No ☐ Not Applicable
2. If No, Why? ----------
3. Did you have Meningococcal meningitis guide line for PHEM? ☐ Yes ☐ No ☐ Not Applicable
4. If answer for Q3 is No, for which disease(s) did you lack the case definition? ----------
   ----
5. Was the case definition posted for meningococcal meningitis? ☐ Yes ☐ No
6. Did you have case based reporting formats for outbreaks? ☐ Yes ☐ No ☐ NA
7. If No, Why? ----------
8. Was there guide line for specimen collection, handling and transportation to the next level? ☐ Yes ☐ No ☐ NA
9. Did you have line list form for reporting outbreaks? ☐ Yes ☐ No ☐ Not Applicable
10. If No, Why ----------

Data analysis, Computer skill and training assessment

1. Had you trained on surveillance system? ☐ Yes ☐ No
2. If answer for Q1 is yes a) when----------? b) Topic----------? c) For how long? ----------
3. Did you give any onsite orientation about surveillance system for Woreda PHEM officers? ☐ Yes ☐ No
4. Was data compiled? ☐ Yes ☐ No
5. If yes, when? ----------
6. Did you have computer? ☐ Yes ☐ No
7. Is it functional)? ☐ Yes ☐ No
8. How the data entry and compilation is accomplished? ☐ Manual ☐ Computer ☐ Other---
9. Did you have computer skill on ☐ Ms word ☐ Ms excel ☐ MS power point ☐ Epi-info
10. Did you analyze data of the surveillance system? ☐ Yes ☐ No
11. If answer for Q9 is yes, did you describe data by ☐ time ☐ place ☐ person (Observe)

12. If the Answer for Q9 is No, why? ----------

13. Did you have denominators for data analysis? ☐ Total pop ☐ male ☐ female ☐ <5

14. If No, Why? ----------

15. Please indicate the frequency of your data analysis. ☐ Daily ☐ Weekly ☐ every two week ☐ Monthly ☐ quarterly ☐every 6 month ☐ annually ☐ No regular time

16. Did you notify the results of your analysis to the higher level PHEM? ☐ Yes ☐ No

17. Did you notify the results of your analysis to the lower level PHEM? ☐ Yes ☐ No

Epidemic response and preparedness assessment

1. Did you have plan for epidemic response and preparedness? ☐ Yes ☐ No
2. If No, Why? ----------
3. Did you have emergency stocks of drugs and supplies? ☐ Yes ☐ No
4. If answer for Q3 is No, how did you control epidemics? ----------
5. Had you experienced shortage of drugs, PEP and supplies in 2010 EFY? ☐ Yes ☐ No
6. If yes, why? ----------
7. Was an epidemic management committee built in your office? ☐ Yes ☐ No ☐ Not Applicable
8. Did the epidemic management committee have regularly scheduled meeting time? ☐ Yes ☐ No
9. Was Rapid response team (RRT) built in your office? ☐ Yes ☐ No ☐ Not Applicable
10. Did the RRT have regularly scheduled meeting time during epidemics? ☐ Yes ☐ No
11. Did you have case management protocol for epidemic prone diseases?☐ Yes☐ No ☐ Not Applicable
12. Did your PHEM have multi-sectorial emergency preparedness and response task force? ☐ Yes ☐ No ☐ Not Applicable
13. Were partners working together with your office on emergencies? ☐ Yes ☐ No
14. If answer for Q13 is yes, what type of supports did they give to your office? ----------
15. Was there a budget for epidemic response? ☐ Yes ☐ No
16. Who had the authority to mobilize the emergency finance? ☐ Zonal head ☐ Zonal health department ☐ experts ☐ other----------
17. Had a car assigned for emergencies (PHEM)? ☐ Yes ☐ No ☐ Not applicable

18. If answer for Q15 is NO, how did you address emergencies?
    _____

Outbreak investigation and case confirmation assessment

1. Had you investigated any outbreak in 2010EFY? ☐ Yes ☐ No, list if any
2. Did you have outbreak investigation check list? ☐ Yes ☐ No
3. If answer for Q2 is No, how did you know possible factors for the outbreak? ----------
   ----
4. Where was laboratory confirmation of suspected meningitis cases? ☐ Regional lab ☐ Hospital ☐ EPHI ☐ HC ☐ other----------
5. Who was responsible to investigate an outbreak? ☐ RRT ☐ HEWs ☐ staffs of zonal health office ☐ experts organized randomly ☐ health facility staffs ☐ others----
6. Had you faced any challenge in outbreak investigation in 2010 EFY? ☐ Yes ☐ No
7. If answer for Q6 is yes,
   a) List the challenges ----------
   b) List the alternatives that you took to tackle the challenges ----------

Supervision and feedback assessment

1. Did you have supervision plan in 2010 EFY? ☐ Yes ☐ No
2. If answer for Q1 is No, how did you supervise? ----------
3. If for Q1 is yes, did you supervise the Woreda and HCs according to your plan in 2010 EFY? ☐ Yes ☐ No
4. If answer for Q3 is No, what is the reason? ----------
5. If answer for Q3 is yes, how many times did you supervise each Woreda and HCs in 2010 EFY? _____
6. Had you reviewed about surveillance practice by higher level supervision in the last 12 months? ☐ Yes ☐ No
7. Did you have regular supervision checklist? ☐ Yes ☐ No
8. If answer for Q7 is No, how did you supervise the health facilities? ----------
9. Were you supervised by higher level officers in 2010 EFY? ☐ Yes ☐ No
10. If answer for Q9 is yes how many times in 2010 EFY? ----------
11. Did you send feedback of your supervision to the Woreda and health centers (HCs) commenting/indicating their strong and weak sides? ☐ Yes ☐ No
12. If answer for Q11 is No, why? ----------

13. If answer for Q11 is yes, for how many Woredas and HCs did you send a feedback in 2010 EFY_____
14. Had you received feedback from higher level supervisors in 2010 EFY? ☐ Yes ☐ No
15. If answer for Q14 is yes, how many feedbacks did you received in 2010 EFY? ----------
16. Had you faced any challenge on supervision and feedback in 2010 EFY? ☐ Yes ☐ No

Part-two

Is the surveillance system helpful?

1. To detect outbreaks early on time to permit accurate diagnosis? ☐ Yes ☐ No
2. To estimate the magnitude of morbidity and mortality? ☐ Yes ☐ No
3. Permit assessment of the effect of prevention and control programs? ☐ Yes ☐ No
4. To estimate research intended to lead to prevention and control? ☐ Yes ☐ No

Describe each system attributes:

Simplicity:

1. Is the case definition easy for case detection by all level health professionals?☐ Yes ☐ No
2. Does the surveillance system allow all levels of professionals to fill data? ☐ Yes ☐ No
3. Does the surveillance system help to record and report data on time? ☐ Yes ☐ No
4. Does the surveillance system have necessary information for investigation? ☐ Yes ☐ No
5. Does the surveillance system allow updating data on the cases? ☐ Yes ☐ No
6. How long does it take to fill the format? ☐ <5 min ☐5 to 10 min ☐ 10 to15min ☐ >15 min
7. How long does it take to have laboratory confirmation? ----------

Flexibility

1. Can the current reporting formats be used for other newly occurring health event (disease) without much difficulty? ☐ Yes ☐ No
2. Did you think that any change in the existing procedure of case detection and reporting formats will be difficult to implement? ☐ Yes ☐ No, Add your explanation ---------- ----------
3. Is the system easy to add new variables? ☐ Yes ☐ No
4. Is the surveillance system easy to integrate with other systems? ☐ Yes ☐ No
5. Is the surveillance system easy to add new disease on report? ☐ Yes ☐ No
6. Is the system easy to add new information technology? ☐ Yes ☐ No

Data quality

1. Are all reported forms Complete? ☐ Yes ☐ No
2. If answer for Q1 is No, how many unfilled spaces are in your 2010 EFY report? ----------
3. Percentage of unknown or blank responses to variables from the total reports of 2010 EFY report---
4. Percent of reports which are complete (that is with no blank or unknown responses) from the total reports ----------
5. Is the recorded data clear to read and understand? ☐ Yes ☐ No
6. If answer for Q5 is No, how many records are not clear/are difficult to understand in 2010 EFY report? --------
7. Percent of records which are difficult to read/ understand. ----------

Acceptability

1. Do you think all the reporting agents accept and well engaged to the surveillance activities? ☐ Yes ☐ No
2. If yes, how many are active participants (of the expected)? ----------
3. If No, what is the reason for their poor participation in the surveillance activity?
    A) Lack of understanding of the relevance of the data to be collected
    B) No feedback / or recognition given by the higher bodies for their contribution
    C) Reporting formats are difficult to understand
    D) Report formats are time consuming
    E) Other: ----------
4. Were all participants using the standard case definition to identify cases? ☐ Yes ☐ No
5. Were all the reporting agents send their report using the current and appropriate surveillance reporting format? ☐ Yes ☐ No
6. Were all the health professionals aware about the surveillance system? ☐ Yes ☐ No
7. Was all PHEM officers send report on time? ☐ Yes ☐ No

Representativeness

1. Was the surveillance system enabled to follow the health and health related events in the whole community? ☐ Yes ☐ No
2. If answer for Q1 is no, who do you think is well benefited by the surveillance system? ☐ The urban ☐ the rural ☐ both
3. Are all the Socio demographic variables included in the surveillance reporting format? ☐ Yes ☐ No

4. If the answer for Q3 is No, which a) Sex---- b) age group---C) ethnic group----d) religion---- is less represented?

Timeliness

1. Are all reporting sites reporting on time? ☐ Yes ☐ No
2. Percent of reporting sites that report on time. ----------

Completeness

1. Are all reporting sites reporting? ☐ Yes ☐ No
2. Percent of reporting sites that send report of each week in 2010 EFY. ----------

Stability

1. Was any new restructuring affected the procedures and activities of the surveillance? ☐ Yes ☐ No
2. Was there lack of resources that interrupt the surveillance system? ☐ Yes ☐ No
3. Was there any time /condition in which the surveillance is not fully operating?☐ Yes ☐ No
4. If the answer for Q3 is yes, explain why? ----------

Sensitivity

1. Does Meningitis case definitions able to pick all cases? ☐ Yes ☐ No
2. What were the total suspected Meningitis cases occurred in your zone in 2010 EFY? #Meningitis cases_____
3. How many of those cases were laboratory confirmed? Meningitis_____
4. Were there Meningitis epidemic in your woreda in 2010? ☐ Yes ☐ No
5. If yes, how many out breaks? ----------

Questionnaire for Meningococcal Meningitis Surveillance System Evaluation (Woreda Health Office)

Background:

Region _____ Zone_____ Woreda _____

Catchment population _____

Respondent(s) _____

Address: Office no _____ Cell phone no _____ e-mail _____

Part one:

Communication and reporting system assessment

1. Which communication material did you have? ☐ E-mail ☐ wired phone ☐ mobile ☐ radio ☐ fax ☐ other----------
2. Did you have address of regional PHEM officers? ☐ Yes ☐ No
3. Did you have address of zonal PHEM officers? ☐ Yes ☐ No
4. Did you have addresses of HCs focal persons? ☐ Yes ☐ No
5. How frequently you communicate with the Regional PHEM officers on emergencies and other daily activities? ☐ Daily ☐ weekly ☐ every 2 week ☐ monthly ☐ quarterly ☐ every 6 month ☐ yearly ☐ others----------
6. How frequently you communicate with the Zonal PHEM officers on emergencies and other daily activities? ☐ Daily ☐ weekly ☐ every 2 week ☐ monthly ☐ quarterly ☐ every 6 month ☐ yearly ☐ others----------
7. How frequently you communicate with the HC PHEM focal persons on emergencies and other daily activities? ☐ Daily ☐ weekly ☐ every 2 week ☐ monthly ☐ quarterly ☐ every 6 month ☐ yearly ☐ others----------
8. When are you expected to send weekly report to the zonal PHEM unit? ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
9. When are you expected to receive weekly report from HCs? ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday
10. How is the woreda communicating the HCs PHEM focal persons in case of immediately reportable diseases? ☐ by e-mail ☐ by phone ☐ by fax ☐ regular weekly report ☐ others
11. Did you send summary or short report to the administrative /program leaders or other responsible organs on planning, prevention and control activities addressing important issues at community level that have arisen through the surveillance system?☐Yes ☐ No
12. If answer for Q11 is yes to whom did you send? ----------
13. If answer for Q11 is No, Why ----------

Assessment of availability of surveillance documentation, registers, and forms

1. Did you have National PHEM Guide line?☐ Yes ☐ No ☐ Not Applicable
2. Did you have meningococcal meningitis guideline?☐ Yes ☐ No
3. Did you have standard case definition for all for meningococcal meningitis? ☐ Yes ☐ No ☐ NA
4. Was the case definition posted? ☐ Yes ☐ No
5. If answer for Q4 is No, why? ----------
6. Did you have case based reporting formats for out breaks? ☐ Yes ☐ No ☐ NA

7. If No, Why? ----------

8. Was there guide line for specimen collection, handling and transportation to the next level? ☐ Yes ☐ No ☐ NA

9. Did you have line list form for reporting outbreaks? ☐ Yes ☐ No ☐ Not Applicable

10. If No, Why? ----------

Data analysis, Computer skill and training assessment

1. Had you trained on surveillance system? ☐ Yes ☐ No

2. If answer for Q1 is yes a) when----------? b) Topic----------? c) For how long? ----------

3. Did you give any onsite orientation about surveillance system for HC PHEM focal persons? ☐ Yes ☐ No

4. Was data compiled? ☐ Yes ☐ No

5. Did you have computer? ☐ Yes ☐ No

6. Is it functional)? ☐ Yes ☐ No

7. How the data entry and compilation is accomplished? ☐ Manual ☐ Computer ☐ other---

8. Did you have computer skill on ☐ Ms word ☐ Ms excel ☐ MS power point ☐ Epi-info

9. Did you analyze data of the surveillance system? ☐ Yes ☐ No (Observe)

10. If answer for Q9 is yes, did you describe data by ☐ time ☐ place ☐ person

11. If answer for Q9 is No, Why? ----------

12. Did you have denominators for data analysis? ☐ Total pop ☐ male ☐ female ☐ <5

13. Please indicate the frequency of your data analysis. ☐ Daily ☐ Weekly ☐ every two week ☐ Monthly ☐ quarterly ☐every 6 month ☐ annually ☐ No regular time

14. Did you notify the results of your analysis to the higher level PHEM? ☐ Yes ☐ No

15. Did you notify the results of your analysis to the lower level PHEM? ☐ Yes ☐ No

Epidemic response and preparedness assessment

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

2. If No, Why? ----------

3. Did you have emergency stocks of drugs and supplies? ☐ Yes ☐ No

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

5. Had you experienced shortage of drugs, vaccines and supplies in 2010 EFY?☐Yes ☐ No
6. Was an epidemic management committee built in your office? ☐ Yes ☐ No ☐ Not Applicable
7. Did the epidemic management committee have regularly scheduled meeting time? ☐ Yes ☐ No
8. Was Rapid response team (RRT) built in your office? ☐ Yes ☐ No ☐ Not Applicable
9. Did the RRT have regularly scheduled meeting time during epidemics? ☐ Yes ☐ No
10. Did you have case management protocol for epidemic prone diseases?☐ Yes☐ No ☐ Not Applicable
11. Did your PHEM have multi sectorial emergency preparedness and response task force? ☐ Yes ☐ No ☐ Not Applicable
12. Were partners working together with your office on emergencies? ☐ Yes ☐ No
13. If answer for Q12 is yes, what type of supports did they give to your office?

    ---
14. Was there a budget for epidemic response? ☐ Yes ☐ No
15. Who had the authority to mobilize the emergency finance? ☐Woreda head ☐ woreda health department ☐ experts ☐ other----------
16. Had you a car assigned for emergencies (PHEM)? ☐ Yes ☐ No ☐ Not applicable
17. If answer for Q16 is NO, how did you address emergencies? ---------- ----------

Outbreak investigation and case confirmation assessment

1. Had you investigated any outbreak in 2010 EFY? ☐ Yes ☐ No
2. If yes for Q1, list the type of outbreak and the affected area_____
3. Did you have outbreak investigation check list? ☐ Yes ☐ No
4. If answer for Q3 is No, how did you know possible factors for the outbreak?

    _____
5. Where was laboratory confirmation of cases? ☐ Regional lab ☐ Hospital ☐ EPHI ☐ HC ☐ other----------
6. Who was responsible to investigate an outbreak? ☐ RRT ☐ HEWs ☐ staffs of woreda health office ☐ experts organized randomly ☐ health facility staffs ☐ other-------
7. Had you faced any challenge in outbreak investigation in 2010 EFY? ☐ Yes ☐ No

8. If answer for Q7 is yes,
    a) List the challenges ----------
    ----
    b) List the alternatives that you take to tackle the challenges ----------
    ----

Supervision and feedback assessment

1. Did you have supervision plan in 2010 EFY? ☐ Yes ☐ No
2. If answer for Q1 is No, how did you supervise? ----------
3. If for Q1 is yes, did you supervise the HCs according to your plan in 2010 EFY? ☐ Yes ☐ No
4. If answer for Q3 is No, what is the reason? ----------
5. If answer for Q3 is yes, how many times did you supervise each HCs in 2010 EFY? _____
6. Had you reviewed about surveillance practice by higher level supervision?☐ Yes ☐ No
7. Did you have regular supervision checklist? ☐ Yes ☐ No
8. If answer for Q7 is No, how did you supervise the woredas and health facilities? ----------
9. Were you supervised by higher level officers in 2010 EFY? ☐ Yes ☐ No
10. If answer for Q9 is yes how many times in 2010 EFY? ----------
11. Did you send feedback of your supervision to the Health Centers commenting/indicating their strong and weak sides? ☐ Yes ☐ No
12. If answer for Q11 is No, why? ----------
13. If answer for Q11 is yes, for how many HCs did you send a feedback in 2010 EFY_____
14. Had you received feedback from higher level supervisors in 2010 EFY? ☐ Yes ☐ No
15. If answer for Q14 is yes, how many feedbacks did you received in 2010 EFY? ----------
16. Had you faced any challenge on supervision and feedback in 2010 EFY? ☐ Yes ☐ No

Part-two

Is the surveillance system helpful?

1. To detect outbreaks early on time to permit accurate diagnosis? ☐ Yes ☐ No
2. To estimate the magnitude of morbidity and mortality? ☐ Yes ☐ No
3. Permit assessment of the effect of prevention and control programs? ☐ Yes ☐ No
4. To estimate research intended to lead to prevention and control? ☐ Yes ☐ No

Describe each system attributes:

Simplicity:

1. Is the case definition easy for case detection by all level health professionals?☐Yes☐ No
2. Does the surveillance system allow all levels of professionals to fill data? ☐ Yes ☐ No
3. Does the surveillance system help to record and report data on time? ☐ Yes ☐ No
4. Does the surveillance system have necessary information for investigation? ☐ Yes ☐ No
5. Does the surveillance system allow updating data on the cases? ☐ Yes ☐ No
6. How long does it take to fill the format? ☐ <5 min ☐5 to 10 min ☐ 10 to15min ☐ >15 min
7. How long does it take to have laboratory confirmation? ----------

Flexibility

1. Can the current reporting formats be used for other newly occurring health event (disease) without much difficulty? ☐ Yes ☐ No
2. Did you think that any change in the existing procedure of case detection and reporting formats will be difficult to implement? ☐ Yes ☐ No, Add your explanation ---------- ----------
3. Is the system easy to add new variables? ☐ Yes ☐ No
4. Is the surveillance system easy to integrate with other systems? ☐ Yes ☐ No
5. Is the surveillance system easy to add new disease on report? ☐ Yes ☐ No
6. Is the system easy to add new information technology? ☐ Yes ☐ No

Data quality

1. Are all reported forms Complete? ☐ Yes ☐ No
2. If answer for Q1 is No, how many unfilled spaces are in your 2010 EFY report? ----------
3. Percentage of unknown or blank responses to variables from the total reports of 2010 EFY report----------
4. Percent of reports which are complete (that is with no blank or unknown responses) from the total reports ----------
5. Is the recorded data clear to read and understand? ☐ Yes ☐ No
6. If answer for Q5 is No, how many records are not clear/are difficult to understand in 2010 EFY report? --------
7. Percent of records which are difficult to read/ understand. ----------

Acceptability

1. Do you think all the reporting agents accept and well engaged to the surveillance activities?☐ Yes ☐ No
2. If yes, how many are active participants (of the expected)? ----------
3. If No, what is the reason for their poor participation in the surveillance activity?
    A) Lack of understanding of the relevance of the data to be collected
    B) No feedback / or recognition given by the higher bodies for their contribution
    C) Reporting formats are difficult to understand
    D) Report formats are time consuming
    E) Other: ----------
4. Were all participants using the standard case definition to identify cases? ☐ Yes ☐ No
5. Were all the reporting agents send their report using the current and appropriate surveillance reporting format? ☐ Yes ☐ No
6. Were all the health professionals aware about the surveillance system? ☐ Yes ☐ No
7. Were all PHEM focal persons send report on time? ☐ Yes ☐ No

Representativeness

1. Was the surveillance system enabled to follow the health and health related events in the whole community? ☐ Yes ☐ No
2. If answer for Q1 is no, who do you think is well benefited by the surveillance system? ☐ The urban ☐ the rural ☐ both
3. Are all the Socio demographic variables included in the surveillance reporting format? ☐ Yes ☐ No
4. If the answer for Q3 is No, which a) Sex---- b) age group---C) ethnic group----d) religion---- is less represented?

Timeliness

1. Are all reporting sites reporting on time? ☐ Yes ☐ No
2. Percent of reporting sites that report on time. ----------

Completeness

1. Are all reporting sites reporting? ☐ Yes ☐ No

2. Percent of Health posts that send report of each week in 2010 EFY. ----------

Stability

1. Was any new restructuring affected the procedures and activities of the surveillance? ☐ Yes ☐ No

2. Was there lack of resources that interrupt the surveillance system? ☐ Yes ☐ No
3. Was there any time /condition in which the surveillance is not fully operating? ☐ Yes ☐ No
4. If the answer for Q3 is yes, explain why? ----------

Sensitivity

1. Does Meningitis case definitions able to pick all cases? ☐ Yes ☐ No
2. What was the total Suspected Meningitis cases occurred in 2010 EFY? #Meningitis cases_____
3. How many of those Suspected Meningitis cases were laboratory confirmed? #Meningitis cases_____
4. Was there Meningitis epidemic in your catchment area in 2010EFY? ☐ Yes ☐ No

If yes, how many outbreaks? Meningitis_____

Questionnaire for Surveillance System Evaluation of Meningococcal Meningitis (Health Center)

Background:

Region _____ Zone_____ Woreda _____ HC _____

Catchment population _____

Respondent(s) _____

Address: Office no _____ Cell phone no _____ e-mail _____

Part one:

Communication and reporting system assessment

1. Which communication material did you have? ☐ E-mail ☐ wired phone ☐ mobile ☐ radio ☐ fax ☐ other----------
2. Did you have address of Woreda PHEM officer? ☐ Yes ☐ No
3. Did you have address of Zonal PHEM officer? ☐ Yes ☐ No
4. Did you have address of regional PHEM officer? ☐ Yes ☐ No
5. How frequently you communicate with the Regional/Zonal/Woreda/ PHEM officers on emergencies and other daily activities? ☐ daily ☐ weekly ☐ every 2 week ☐ monthly ☐ quarterly ☐ every 6 month ☐ yearly ☐ others----------
6. When are you expected to send weekly report to the Woreda PHEM unit? ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday

7. How is the HC communicating the woreda PHEM officers in case of immediately reportable diseases? ☐ by e-mail ☐ by phone ☐ by fax ☐ regular weekly report ☐ others
8. Did you send summary or short report to the administrative /program leaders or other responsible organs on planning, prevention and control activities addressing important issues at community level that have arisen through the surveillance system? ☐Yes ☐ No
9. If answer for Q7 is yes to whom did you send? ----------

Assessment of availability of Surveillance Documentation, Registers, and Forms

1. Did you have National Guide line for PHEM? ☐ Yes ☐ No ☐ Not Applicable
2. Did you have meningococcal meningitis guideline? ☐ Yes ☐ No ☐ Not Applicable
3. Did you have standard case definition for meningococcal meningitis? ☐ Yes ☐ No ☐ NA
4. Was the case definition posted? ☐ Yes ☐ No
5. Did you have case based reporting formats for out breaks? ☐ Yes ☐ No ☐ NA
6. Was there guide line for specimen collection, handling and transportation to the next level? ☐ Yes ☐ No ☐ NA
7. Did you have line list form for reporting outbreaks? ☐ Yes ☐ No ☐ Not Applicable

Data analysis, Computer skill and training assessment

1. Had you trained on surveillance system? ☐ Yes ☐ No
2. If answer for Q1 is yes a) when----------? b) Topic----------? c) For how long? -------
3. Was data compiled? ☐ Yes ☐ No
4. Did you have computer? ☐ Yes ☐ No
5. It is functional)? ☐ Yes ☐ No
6. How the data entry and compilation is accomplished? ☐ Manual ☐ Computer ☐ other---
7. Did you have computer skill on ☐ Ms word ☐ Ms excel ☐ MS power point ☐ Epi-info
8. Did you analyze data of the surveillance system? ☐ Yes ☐ No
9. If answer for Q8 is yes, did you describe data by ☐ time ☐ place ☐ person (Observe)
10. Did you have denominators for data analysis? ☐ total pop ☐ male ☐ female ☐ <5
11. Please indicate the frequency of your data analysis. ☐ Weekly ☐ every two week ☐ Monthly ☐ quarterly ☐every 6 month ☐ annually ☐ No regular time

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

Outbreak investigation and case confirmation assessment

1. Had you investigated any outbreak in 2010 EFY? ☐ Yes ☐ No , list if any
2. Did you have outbreak investigation check list? ☐ Yes ☐ No
3. If answer for Q2 is No, how did you know possible factors for the outbreak? ----------
   ----
4. Where was laboratory confirmation of cases? ☐ regional lab ☐ Hospital ☐ EPHI ☐ HC ☐ other----------
5. Who was responsible to investigate an outbreak? ☐ RRT ☐ HEWs ☐ staffs of woreda health office ☐ experts organized randomly ☐ health facility staffs ☐ other----
   ----
6. Had you faced any challenge in outbreak investigation in 2010 EFY? ☐ Yes ☐ No
7. If answer for Q 6 is yes,
   a) List the challenges ----------
      ----
   b) List the alternatives that you take to tackle the challenges ----------
      ----

Supervision and feedback assessment

1. Had you reviewed about surveillance practice by higher level supervision?☐ Yes ☐ No
2. Were you supervised by higher level officers in 2010 EFY? ☐ Yes ☐ No
3. If answer for Q2 is yes how many times in 2010 EFY? ----------
4. Had you received feedback from higher level supervisors in 2010 EFY? ☐ Yes ☐ No
5. If answer for Q4 is yes how many feedbacks did you received in 2010 EFY? ----------
   ---

Part-two

Is the surveillance system help?

1. To detect outbreaks early on time to permit accurate diagnosis? ☐ Yes ☐ No
2. To estimate the magnitude of morbidity and mortality? ☐ Yes ☐ No
3. Permit assessment of the effect of prevention and control programs? ☐ Yes ☐ No
4. To estimate research intended to lead to prevention and control? ☐ Yes ☐ No

Describe each system attributes:

Simplicity:

1. Is the case definition easy for case detection by all level health professionals?☐Yes☐ No
2. Does the surveillance system allow all levels of professionals to fill data? ☐ Yes ☐ No
3. Does the surveillance system help to record and report data on time? ☐ Yes ☐ No
4. Does the surveillance system have necessary information for investigation? ☐ Yes ☐ No
5. Does the surveillance system allow updating data on the cases? ☐ Yes ☐ No
6. How long does it take to fill the format?☐ <5 min☐5 to 10 min☐10 to15min☐ >15 min
7. How long does it take to have laboratory confirmation? ----------

Flexibility

1. Can the current reporting formats be used for other newly occurring health event (disease) without much difficulty? ☐ Yes ☐ No
2. Did you think that any change in the existing procedure of case detection and reporting formats will be difficult to implement? ☐ Yes ☐ No, Add your explanation ---------- ----------
3. Is the system easy to add new variables? ☐ Yes ☐ No
4. Is the surveillance system easy to integrate with other systems? ☐ Yes ☐ No
5. Is the surveillance system easy to add new disease on report? ☐ Yes ☐ No
6. Is the system easy to add new information technology? ☐ Yes ☐ No

Data quality

1. Are all reported forms Complete? ☐ Yes ☐ No
2. If answer for Q1 is No, how many unfilled spaces are in your 2010 EFY report? ----------
3. Percentage of unknown or blank responses to variables from the total reports of 2010 EFY report---
4. Percent of reports which are complete (that is with no blank or unknown responses) from the total reports ----------
5. Is the recorded data clear to read and understand? ☐ Yes ☐ No
6. If answer for Q5 is No, how many records are not clear/are difficult to understand in 2010 EFY report? --------
7. Percent of records which are difficult to read/ understand. ----------

Acceptability

1. Do you think all the reporting agents accept and well engaged to the surveillance activities?☐ Yes ☐ No
2. If yes, how many are active participants (of the expected)? ----------

3. If No, what is the reason for their poor participation in the surveillance activity?
    A) Lack of understanding of the relevance of the data to be collected
    B) No feedback / or recognition given by the higher bodies for their contribution
    C) Reporting formats are difficult to understand
    D) Report formats are time consuming
    E) Other: ----------
4. Were all participants using the community case definition to identify cases? ☐Yes ☐ No
5. Were all the reporting agents send their report using the current and appropriate surveillance reporting format? ☐ Yes ☐ No
6. Were all the health professionals aware about the surveillance system? ☐ Yes ☐ No

Representativeness

1. Was the surveillance system enabled to follow the health and health related events in the whole community? ☐ Yes ☐ No
2. If answer for Q1 is no, who do you think is well benefited by the surveillance system? ☐ The urban ☐ the rural ☐ both
3. Are all the Socio demographic variables included in the surveillance reporting format? ☐ Yes ☐ No
4. If the answer for Q3 is No, which a) Sex---- b) age group---C) ethnic group----d) religion---- is less represented?

Timeliness

1. Does your health center report on time? ☐ Yes ☐ No
2. Percent of reports sent to Woreda on time. ----------

Completeness

1. Are all reports sent complete? ☐ Yes ☐ No
2. Number of weekly reports sent in 2010 EFY. ----------

Stability

1. Was any new restructuring affected the procedures and activities of the surveillance? ☐ Yes ☐ No
2. Was there lack of resources that interrupt the surveillance system? ☐ Yes ☐ No
3. Was there any time /condition in which the surveillance is not fully operating? ☐ Yes ☐ No
4. If the answer for Q3 is yes, explain why? ----------

Sensitivity

1. Does Meningitis case definitions able to pick all cases? ☐ Yes ☐ No
2. What was the total Meningitis cases occurred in your HC in 2010 EFY? #Meningitis cases_____
3. What were the total numbers of suspected Meningitis cases in 2010 EFY? #Meningitis suspected cases_____
4. How many of those cases were laboratory confirmed?
5. Was there Meningitis epidemic in your catchment area in 2010 EFY? ☐ Yes ☐ No
6. If yes, how many outbreaks? ----------

Annex 5: Health profile data collection tool

Health profile assessment checklist:

Region_____Zone_____Woreda_____Respondant_____Interviewer_____

1. Historical back ground of the area

Establishment time of the area as woreda_____Name of historical places_____

Historical Nomination_____

2. Population and demography

2.1 Total population of the woreda_____ Male_____ Females_____ M to F Ratio_____

2.2. Ethnic composition_____, _____, _____, _____

2.4. Population density_____ Crude death rate_____ under five mortality rate_____ cause specific mortality _____Total live births _____ under one year population_____ Under five year population_____Reproductive year female population_____Annual growth rate_____

2.7. Religion: Orthodox_____, Muslim_____, Protestant_____, Catholic _____, Others_____

3. Geographic and climate condition

3.1 Area in Square km _____

3.2. Location of the woreda from capital of the region_____

3.3. Boundaries_____

3.4. Altitude of the area (in meters) _____3.5. Latitude _____ 3.6. Longitude_____

3.7. Annual Rainfall _____Main rainy season_____

3.8. Annual Temperature _____Maximum temp_____3.10. Minimum temp_____

4. Political and administrative organization

4.1. Total number of Kebeles _____#Urban_____# Rural____

4.2. Number of Kebeles with transportation access_____ Asphalt road_____ without asphalt_____

4.3. Number of Kebeles without transportation access _____

4.4. Number of Kebeles with electric power _____

4.5. Number of Kebeles without electric power_____

4.6. Number of kebeles with telephone service (cable based/wireless_____

4.7. Number of Kebeles without telephone service_____

4.8. How many supporting NGOs are in the area _____?

4.9. Ruling political party _____

4.10. Number of Banks_____ #government bank_____#private bank_____

5. Productivity and income

5.1. Main base of economy _____

5.2. Part of the population (%) whose economic source is from

a) Farming _____b) Animal production _____c) Trade _____

d) Government employee (salary) _____ e) Others_____

5.3. Average annual income level_____

5.4. Productivity of the land/hectare _____quintal/hector

5.5. Common crop products _____, _____, _____, _____

5.6. GDP (during harvesting season/ meher) _____quintal

5.7. GDP from irrigation_____ quintal 5.8. Total GDP _____quintal

5.9. Employment rate_____ unemployment rate_____

6. WASH

A/Water supply

6.1. Safe water supply coverage_____ 6.2. Source of water_____

6.3. Separate water source for human and animal, A/yes_____ B/no_____

6.4. Number of kebeles with accessible water source____ without accessible water source_____

6.5. Number of pipe water supply_____

6.6. Is there treatment of water_____6.7. Frequency of treatment_____

6.8. Source other than pipe water Yes_____ No_____

6.9. If yes for Q 6.8, is the water source safe? (Fence/can cattle access the water)

B/ latrine

6.9. Percent of latrine coverage_____ A/ Pit Latrine _____B/ Ventilated pit latrine_____

6.10. Open field defecation (OFD) _____% 6.11. Number of public latrine in the woreda_____

C/ Sanitation

6.12. Any campaign in the last year for environment hygiene_____

6.13. Any prepared site or container for disposal of solid waste in the town_____

6.14. Drainage system for liquid waste disposal_____

7. Education

	Frequency	**Percentage**
Educational institution		
K.G		
Primarily School (1-8)		
Secondary (9-10)		
Preparatory(11-12)		
College/ University		
TVET		
Number Schools with water supply		
Schools with functional latrine. Female/male		
Schools with HIV/other health clubs		

School enrolment	Sex				Total
	Male		Female		
	Frequency	percentage	Frequency	percentage	Frequency
Illiterate					
KG					
1-8					
9-12					
TVET					
College/university					

School age children (target)					
Coverage					
School dropout in 6 months					

8. Social situation:

8.1. Number of libraries_____8.2. Number of NGO working on public health_____

8.3. Number of youth clubs_____8.2. Number of recreational area for youth_____

9. Health Service

9.1 Health service institutions, infrastructure and health institution to population ratio

S.NO	Type of health institution		# of institutions
1	Number of Hospitals	with sustainable/ 24 hour /electric power	
		without sustainable/ 24 hour /electric power	
		with telephone service(cable based/mobile)	
		without telephone service (cable based/mobile)	
		with piped water supply	
		Without piped water supply	
2	Number of Health Centers	with sustainable/ 24 hour /electric power	
		without sustainable/ 24 hour /electric power	
		with telephone service (cable based/mobile)	
		without telephone service (cable based/mobile)	
		with piped water supply	
		Without piped water supply	
3	Number of Hospitals		
4	Number of Health centers		
5	Number of Health post		
6	Number of private clinics		
7	Number of Pharmacies		
8	Number of Drug vendors		
9	Number of Diagnostic laboratories		
10	Hospital to population ratio		
11	Health center to population ratio		
12	Health posts to population ratio		
13	Physical health service coverage		

14	Number of institution providing service on OTP	Hospital_____ Health center____ Health post_____
15	Number of institution providing SC service	Hospital_____ Health center____ Health post_____

9.2 Health staff to population ratio:

Type and Number of health professionals

Type	Frequency	percentage	Health Professional: Population Ratio
Specialist			
G.P			
HO			
Nurses (Deg. and Dip.)			
Mid wife (Deg. and Dip.)			
Lab. (Deg. and Dip.)			
Pharmacy (Deg. and Dip.)			
Env. Health (Deg. and Dip.)			
HIT			
HEWs			
Total			

9.3. Community Health Services

Status of services provided by community health workers namely:

- No. of TBAs/TTBA_____ and their responsibility
- No. of CHWs/CHPs_____ and their responsibility
- Responsibility of HEWs _____

9.4 Maternal health coverage

S.No	Type of service	Coverage (%)
1	Antenatal care (ANC) Coverage (%)	
2	Contraceptive acceptance rate (CAR (%))	

3	Contraceptive prevalence rate (CPR (%))	
4	Post natal care (PNC) Coverage	
5	Proportion of delivery attended by skilled personnel	

9.5 Immunization coverage

S.N	Type of vaccine	Vaccination			
1	BCG	Plan	Achievement	Percentage	Rank
2	Penta 1				
3	Penta 3				
4	Measles				
5	PCV 1				
6	PCV 3				
7	Fully				
8	TT2+NPW				

9.6 Family planning methods

Methods	Frequency	Percentage
Oral contraceptive		
IUCD		
Implant		
Injection		
Condom		

10. Top 10 diseases of morbidity and mortality

10.1 Top 10 diseases of morbidity and mortality in adult OPD

Morbidity cases			Mortality cases		
Rank	Diseases	%	Rank	Disease	%
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		

7			7		
8			8		
9			9		
10			10		

10.2 Top 10 diseases of morbidity and mortality in under 5 OPD

Morbidity cases			Mortality cases		
Rank	Diseases	%	Rank	Disease	%
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		

11. Vital statistics and health indicators

S. No	Indicator	Rural	Urban	Total
1	Under 5 population			
2	Productive age female (15-49 years)			
3	Pregnant women			
4	Live births			
5	Total fertility rate			
6	Crude birth rate			
7	Crude death rate			
8	maternal mortality rate			
9	Child mortality			
10	Under 5 mortality rate			
11	Infant mortality rate			
12	Dependency ratio			
13	Average household size			

13. Endemic disease

A) Tuberculosis

S. No	Cases	Number		
		male	female	total
1. 5	TB case detection rate			
2. 6	TB treatment success rate			
3. 7	TB treatment cure rate			
4. 8	Defaulters			

b) Malaria

S. No	Malaria cases		Adult		Under 5		Preg.	Total		M + F
			Male	Female	Male	Female		M	F	
1	Confirmed malaria cases	Pf								
		Pv								
		Mixed								
2	Admission cases due to malaria									
3	IRs coverage	Urban								
		Rural								
4	Households with at least one LLIN	Urban								
		Rural								

c) HIV/AIDS

HIV prevalence____ HIV Incidence____VCT____PMTCT____ON ART____PITC____

14. Disasters and out breaks occurred, immediately reportable disease

14.1 Were any disasters occurred in these years_____?

14.2 If Q.14.1 is yes list the name

_____

_____

_____

14.3 Which of the above mentioned disaster(s) was (were) happened more than once?

_____

_____

14.4 How many out breaks occurred in the last 5 years_____
(List_____

14.5 Which of the above mentioned outbreak(s) was (were) occurred more than once?
_____
_____

14.6 Nutrition, food shortage
_____
_____

15. Health education (what, when, where, how and who conducted health education)

_____
_____

16. Health budget allocation: total district budget_____ Health budget_____

17. Essential drugs and other supplies_____

19.Discussion of the highlights and the main findings of the health profile assessment and description
_____
_____
_____

Annex 6: Data collection tool in IDPs affected due to conflict in Bale zone

1. Areas affected

1.1. When did conflict occur? Date----------time ----------

1.2. What was the Cause of conflict (brief description of the causes of the crisis?)

1.3. Location of conflict affected areas, kebeles _____woreda, _____Zone, _____Region_____

1.4. Total number of Kebeles in woreda_____

1.5. Number of affected kebeles in woreda_____

1.6. Accessibility of Affected kebeles, etc. _____

1.7. Some background information on past conflict occurrences in the area, if any.

2. Number and profile of the affected population

2.1. Total number of households in affected woreda/s _____ total household displaced_____

2.2. Total population in affected woreda/s _____ Total population displaced _____ female _____male _____

2.3. Name of affected Kebeles and number of displaced household in each kebeles

2.4. Number of people or household departed from their localities _____

2.5. Number of displaced households arrived to IDP sites and traveled to place of origin (kebeles and woreda) _____

2.6. Number of people died, _____ injured_____missed/not there _____

Unaccompanied minors (<18 yrs.) _____ Female _____ male_____

2.8. Number of elderly people and people with physical/mental disabilities_____

2.9. Number of pregnant and lactating women_____& _____

3. Damage and loss on:

3.1 Infrastructures and facilities

- Public facilities (buildings, roads, electricity, telephone, water system etc.),
- Health facilities (level of damage like total, mild or partial damages),
- Schools(level of damage like total, mild or partial damages),
- Water and sanitation facilities , equipment and storage facilities,
- Food stores,

3.2 Individual or community assets

- Crop damaged in hectares----------Number of houses burned/damaged----------
- Type and number of household items lost or stolen in the displacement---------
- Household stores damaged----------Other household items destroyed----------
- Number of livestock deaths (by type)----------

4. Food

- Type of Intervention program in the conflict affected woreda before the crisis (General Food Distribution and/or PSNP)----------
- Food assistance distributed after displacement (quantity and type of food provided, adequacy of food and timeliness of assistance)----------
- Any other sources of food (market, gift form community or friends or relatives, etc)
- Availability of fuel and cooking utensils----------

5. Non-food items and Emergency Shelter

- Number, type and situation of Shelter (quality, adequacy, type of shelters, etc.)
- Location of the displaced ----------≠ number of people living with relatives, --------≠ friends in nearby localities, ------ ≠ living in temporary shelters,--------≠ in mass shelter

- Number of the displaced that live in temporary shelters, (is it women/Girls friendly)----------
- Profile of the displaced in the temporary shelters (number of under -fives, elderly people, men, and women)----------
- Number of NFI kits provided----------
- Number of households without shelter----------

6. Health

6.1. Overall health status of the conflict affected people? Mention if there are any diseases of public health concern like communicable diseases---------- psychological/mental problems, health risks/hazard.

6.2. Was there any outbreak in the last 3 months at IDP/nearby community? Yes-----No------

If yes, specify the type of disease----------

6.3. Availability of active coordination body and response team to control communicable diseases and epidemics (e.g. measles, acute watery diarrhea, dysentery diseases, acute respiratory infections, malaria and other vector borne diseases)

6.4. Availability of health facilities and services which can deliver primary health care for the conflict affected people

6.4.1. Distance from shelter _____, Hours open _____, overnight stay: Yes/ No

6.4.2 Availabilities health professionals of # Doctors ___, Nurses____#, counselors, ___, HEW____ to serve conflict affected people

6.4.3. Is there referral linkage Yes/No Availability of Ambulance Yes /No

6.4.3. Medication and supply Yes/No

6.5. Is there preparedness and responses plan to health related problems interventions to the affected/displaced people? Observe the written plan

6.6. The availabilities of clans and religious leaders' engagement in behavior change communication activities----------

6.7. Major gaps, if any (essential drugs and related supplies, health professionals, BCC materials, etc.)----------

7. Nutrition:

7.1. Was nutritional screening conducted in the IDP site? Yes ____ No ____

Screening children: Number _____ % _____

SAM: Number _____%_____MAM: Number _____%_____

Screening PLW: Number _____ % _____Vitamin A children: Number _____%_____

De-worming children: Number _____ %_____

7.2. Was there a TSFP distribution at IDP Yes ____ No ____

7.3 Are children discharged from OTP referred to TSFP? Yes ____ No ____

7.4 Any signs of early malnutrition (good if clearly indicate early sign of malnutrition)

- Availability of ready-to-use nutrition supplies_____
- Availability of emergency nutrition coordination forums_____

8. <u>Water, sanitation and hygiene</u>

- Potable water for Conflict affected people (availability, quality of water, distance of water source)
- WASH intervention to date, if any----------
- Availability and adequacy of water purification chemicals including WASH facilities equipment, emergency water trucking operation, water containers, water storage units (bladders/tanks, etc.)
- Availability and types of latrines in the newly established shelters----------
- Number of people without water and sanitation facilities----------
- Water schemes damaged because of conflict

Types of damaged water supply system----------

Damaged status (completely damaged, partially damaged, minimal damaged) ----------