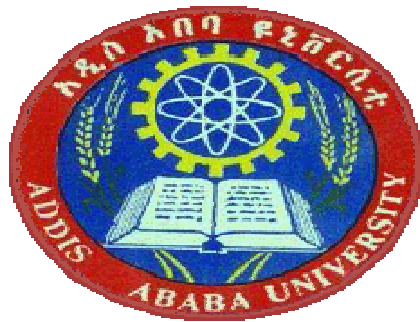


Addis Ababa University, College of Health Sciences,

School of Public Health

Ethiopian Field Epidemiology Training Program (EFETP)



Compiled Body of Works in Field Epidemiology

By:

Abraham Lere (BSc)

**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**

June 07, 2017

Addis Ababa

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List of Abbreviations and Acronyms

AAU	Addis Ababa University
AFI	Acute Febrile Illness
AIDS	Acquired Immunodeficiency Syndrome
ANC	Antenatal Care
AURTI	Acute Upper Respiratory Tract Infection
AOR	Adjusted Odds Ratio
AWD	Acute Watery Diarrhea
CA	Contraceptive Acceptance Rate
CBN	Community Based Nutrition
CDC	Communicable Disease Control
CFR	Case Fatality Rate
CI	Confidence Interval
CTC	Cholera Treatment Center
Dr	Doctor
EC	Ethiopian Calendar
EFY	Ethiopian Fiscal Year
EPHA	Ethiopian Public Health Association
EPHI	Ethiopian Public Health Institute
EPI	Expanded Program of Immunization
EPRP	Epidemic Preparedness and Response Plan
EWR	Early Warning and Response
FMOH	Federal Ministry of Health
EFETP	Ethiopian Field Epidemiology Training Program
HC	Health Center
HAD	Health development Army
HH	House Hold
HIV	Human Immunodeficiency Virus
HEWs	Health Extension Workers
HP	Health Post
HTZ	Hadero Tunto Zuria Woreda
HW	Health Worker
IDPs	Internally Displaced Persons
IDSR	Integrated Disease Surveillance and Response

IgM	Immunoglobulin M
IMR	Infant Mortality Rate
IPD	Inpatient Department
IRS	Indoor Residual Spraying
ITNs	Insecticide Treated Nets
MCH	Maternal and Child Health Care
MUAC	Mid Upper Arm Circumference
NGO	Nongovernmental Organization
OPD	Outpatient Department
OR	Odds Ratio
OTP	Outpatient Therapeutic Program
PHEM	Public Health Emergency Management
PICT	Provider Initiated Counseling and Testing
PMTCT	Prevention of Mother to Child Transmission
RDT	Rapid Diagnostic Test
RHB	Regional Health Bureau
RRT	Rapid Response Team
SAM	Severe Acute Malnutrition
SC	Stabilization Center
SD	Standard Deviation
SIA	Supplementary Immunization Activities
SNNPR	Southern, Nations, Nationalities, and Peoples Region
TB	Tuberculosis
UNICEF	United Nations Children Emergency Fund
VCT	Voluntary Counseling and Testing
WHO	World Health Organization
ZHD	Zonal health department

Executive Summary

The Ethiopian Field Epidemiology training program started in 2009. Field Epidemiology and Laboratory Training Program is an in-service training program in field epidemiology adapted from United States Center for Disease Control and Prevention (CDC) Epidemic Intelligence Service (EIS) program. It is a two years field base masters program. The School of Public Health (SPH) Addis Ababa University, the Federal Ministry of Health of Ethiopia (MOH) Ethiopian Public Health Institute (EPHI), and the Ethiopian Public Health Association (EPHA)/CDC Ethiopia are running the program together.

During residency I and II, I produced this body of work, which contains all my outputs. Among the out puts which were two outbreak Investigations in Chapter I was conducted descriptive followed by cases to controls study was used during investigations. In the first outbreak, we identified factors that contributed to measles outbreak in Cheta district, Kefa zone. The highest incidence in less than 15 years of age, the risk factors includes low vaccine coverage, Overcrowding, contact history with measles cases and lack of knowledge of mothers about measles. The second Acute Watery diarrhea outbreak investigation was conducted in Dilla town and Dilla Zuria district, Gedeo Zone, SNNPR 2016. The risk factors identified are drinking river water, eating raw vegetables and fruits, low educational status, daily laborers and contact history with cases have associated with the risk of AWD in the Zone.

Chapter II: It contains report of surveillance data analysis, which was conducted, on epidemiology of Malaria surveillance in Kembata Tembaro Zone; I used five years Malaria data (2011-2015) to describe the malaria burden by person, place and time. Trends and seasonality of malaria disease were determined. The average estimated annual incidence of reported total malaria for the calendar years(2011-2015) annual incidence of total malaria report dropped from 119/1000 to 9/1000 population.

Chapter III: A surveillance system evaluation was conducted in the Kembata Tembaro Zone, SNNP region for three priority diseases (Malaria, Measles and AWD) from January 17- February 16/2017. The PHEM surveillance attributes simplicity, flexibility, stability, acceptability, representativeness, timeliness and data quality assessed in this chapter.

Chapter IV: Health and health related data was collected in Hadero-Tunto Zuria district during February 01-15, 2016. AFI, Pneumonia, Helmentaisis, AURTI and Malaria were leading causes of adult morbidity in the district. Malnutrition is common in under five children in the district.

Chapter V: Scientific Manuscript for Peer Reviewed Journals was conducted on measles outbreak in Cheta district, Kefa Zone.

Chapter VI: We prepared abstracts of measles outbreak investigation conducted in Cheta district, Kefa Zone and AWD outbreak investigation conducted in Dilla town and Dilla zuria district, Gedeo Zone SNNP 2016. Both Abstracts was accepted for oral presentation at the 53rd annual medical conference and International exhibition of the Ethiopian Medical Association held in Addis Ababa from 27-30 April 2017.

Chapter VII: Narrative summary of disaster situation, which was conducted in SNNP region; as part of early warning and vulnerability assessment. It was done together with partners working on health and nutrition. The assessment was conducted to identify potential problems, which need humanitarian assistance in the Belg season. We conducted in Sidama and Gedeo zones. Malaria, Measles and severe acute malnutrition was the identified problem in the assessment area.

Chapter VIII: Protocol/proposal for Epidemiologic Research Project proposals was prepared. The main purpose of this study is To Assess Factors that Affect and Contribute for Low Measles Immunization Coverage in 9-59 month Children Cheta District, Kefa Zone, SNNPR, Ethiopia, 2017

Chapter IX: Other Additional Output Reports, We participated in response activities in IDPs population in Gedeo and Konso districts. Finally, Public Health Emergency weekly bulletin prepared. The bulletin is prepared on weekly basis and in this chapter epidemiological week 45th bulletin presented.

Chapter I – Outbreak/Epidemic Investigations

1.1 Measles outbreak investigation in Cheta Woreda, Kefa Zone, South, Nations, Nationalities, and Peoples Region, 2016

Abstract

Background: Measles is a highly infectious viral disease that can cause permanent disabilities and death. We investigated measles outbreak to identify the magnitude and factors associated with measles in Cheta woreda, Kefa Zone, SNNPR 2016.

Methods: We investigated 50 cases and 100 controls. We used a descriptive study followed by un-matched 1:2 cases to controls were conducted from February to March 2016. We defined a suspected measles case as any person with fever, rash, cough, and coryza or a person suspected of measles by a clinician. Four blood specimens were collected for laboratory confirmation. Data collection instrument was prepared. Multivariate logistic regression analysis was conducted by using Epiinfo 7.

Result: A total of 136 cases with AR 10.6/1000 and five deaths (CFR 3.6%) were identified. The median age of the cases was 3 years and IQR age was between 2 and 5years. Thirty-five of the cases (70%) and thirty-four (34%) of the controls were not vaccinated. Twenty-nine (58%) cases and 45 (45%) controls were males. The risk factors for contracting measles are - history of contact with suspected or confirmed cases (AOR=18.00 CI 4.31-80.46). Family size peoples living in one house more than five (AOR= 4.00 CI 1.34-11.98), Being vaccinated was protective effect from acquiring measles (AOR= 0.30 CI 0.10-0.78), Knowledge about measles disease is vaccine preventable (AOR= 0.27 CI 0.10-0.73).

Conclusion: The most affected age group under five (54%) years followed by 5-14 (32%) years of age. History of contact with suspected or confirmed cases, Un-vaccination, living people more than five members and Lack of knowledge of mother or caretaker were associated risk factors. We recommended supplementary measles vaccination for under 15 children, strengthening of routine immunization defaulter tracing, strengthening of cold chain management and awareness creation in the community.

Key words: Measles; Immunization; Outbreak; Cheta

1.1.1 Introduction

Measles is an acute, highly contagious viral disease caused by measles virus and it is highly outbreak-prone acute viral human disease. The measles virus is a member of the genus *Morbillivirus* of the *Paramyxoviridae* family. Transmission is primarily person-to-person via aerosolized droplets or by direct contact with the nasal and throat secretions of infected persons. The virus remains active and contagious in the air or on infected surfaces for up to 2 hours. In a non-immune person exposed to measles virus, after an incubation period of about 10 to 12 days (range 7-18 days). It is characterized by usually a high fever, which begins about 10 to 12 days after exposure to the virus, and lasts 4 to 7 days. A runny nose, a cough, red and watery eyes, and small white spots inside the cheeks can develop in the initial stage. After several days, a rash erupts, usually on the face and upper neck. Over about 3 days, the rash spreads, eventually reaching the hands and feet. The rash lasts for 5 to 6 days, and then fades. On average, the rash occurs 14 days after exposure to the virus (within a range of 7 to 18 days). Measles can be transmitted from four days before rash onset to four days after rash onset. Infectivity is greatest three days before rash onset. Measles is usually causing a mild or moderately severe illness. Post infectious encephalitis may occur approximately one per 1,000 reported measles cases. Approximately two to three deaths may occur for every 1,000 reported measles cases (1, 2, 3).

Globally before widespread vaccination, measles caused an estimated 2.6 million deaths each year. The disease remains one of the leading causes of death among young children, despite the availability of a safe and effective vaccine. Approximately 134 200 people died from measles in 2015 and about 367 deaths every day or 15 deaths every hour (4). Mostly children under the age of five are affected. Measles is still common in many developing countries – particularly in parts of Africa and Asia. The overwhelming majorities (>95%) of measles deaths occur in countries with low per capita incomes and weak health infrastructures but accelerated immunization activities have had a major impact on reducing measles deaths (4). During 2000-2015, measles vaccination prevented an estimated 20.3 million deaths. Global measles deaths have decreased by 79% from an estimated 651 600 in (2000) to 134 200 in 2015 (4).

In Ethiopia, the expected case-fatality rate is between 3% and 6%. The highest case-fatality rate occurs in infants 6 to 11 months of age, with malnourished infants at greatest risk (1). These rates may underestimate the true lethality of measles because of incomplete reporting of outcomes of measles illness. In certain high-risk populations, case-fatality rates as high as 30% have been reported in infants aged less than 1 year of age (1).

Complications are more common in the very young and in adults and include otitis media, pneumonia, diarrhoea, keratitis and encephalitis. Although measles still kills many children per year worldwide, in industrialized countries, case-fatality ratios are low with around one death for every 2000–5000 reported cases. The infection is most serious for individuals who are immune-suppressed, who may experience diffuse progressive pneumonitis or a delayed form of encephalitis, both associated with a high risk of death (5). Complications are more common in children under the age of five, or adults over the age of 20. Unless managed early and aggressively, these complications may lead to death within the first month after the onset of rash. The case fatality from measles is estimated to be 3 – 5% in developing countries but may reach more than 10% in outbreaks especially when it is compounded by malnutrition (6, 7).

When the measles vaccination is given at 9 months age, the sero-conversion rate is only 85%. Thus, provision of a second opportunity is necessary to reach children that have never been vaccinated and children not protected after the first dose. It is only when the vaccination coverage is more than 90% that herd immunity could develop to prevent measles outbreaks in the community (9).

Epidemics of measles occur when the number of susceptible individuals in a population reaches a critical threshold. Out breaks could occur in a community with lower vaccination coverage and higher malnutrition problem. As immunization coverage increases, the size of epidemics decreases. In addition, the inter-epidemic period lengthens, and the proportion of cases among older children increases. Even with high routine measles vaccine coverage (1st opportunity) at nine months of age, susceptible individuals within the community and children who have failed to develop antibodies following immunization since measles vaccine efficacy is only 85% at 9 months of age) will accumulate with time leading to the occurrence of periodic outbreaks. The provision of a second opportunity is necessary to reach children that have never been vaccinated and children not protected after the first dose. In African Region, this is provided through supplemental immunization activities (SIAs). The second opportunity serves to reduce the proportion of susceptible in a given population. It therefore helps to prevent measles outbreaks and, with high routine immunization coverage, favours the elimination of indigenous measles transmission. Catch-up campaigns (SIAs) to provide second opportunity for measles vaccination need to be organized in such a way as to target the age group in which at least 90% of measles cases are known to occur. In the African setting, this age group has included children aged 9 months to 14 years. After an initial wide age group catch-up supplemental immunization effort, periodic follow-up campaigns (conducted every three or four years) are needed to assure that the

number of susceptible children does not build up to a critical level. Follow-up campaigns target children born after the previous catch-up campaign (8, 9).

In Ethiopia outbreaks of measles reported every year. There were 16,028 suspected measles cases in 2014 and 14,100 confirmed measles cases in the same year (10). This represents a steep increase on the data for 2013, when there were 6,137 confirmed measles cases in Ethiopia with incidence rates of 6.52 and 14.61 in 2013 and 2014 respectively(10).

Measles was also a serious problem, which occurs as an outbreak in SNNP region. According to 2015/2016 Annual regional health bureau report 18 woredas affected and 2775 measles cases with case fatality rate of 120(4.3%) reported. In addition, in the last 7 years, SNNPR experienced measles outbreaks each year. There are different measles vaccination programs (Routine, SIA, NID, and outbreak response vaccinations). However, there are outbreaks of measles in different corners of the region. Measles outbreak is one of the health events that required outbreak investigation. This study designed to investigate suspected measles outbreak in Cheta woreda to confirm the etiology and determine possible risk factors associated with contracting measles in the district.

1.1.2 Literature Review

The WHO reports shows that the burden of measles decline from time to time but it is still a challenging problem especially in developing countries in the presence of measles vaccine. However, this report does not show why measles epidemic occurred in the presence of measles vaccine. It states that- Despite the existence of a safe, effective, and inexpensive vaccine, measles is still not being controlled in many parts of the world. However, the use of measles vaccine over the last 30 years has reduced global measles morbidity and mortality by 74% and 85%, respectively, compared with the pre-vaccine era. The World Health Organization (WHO) estimates that almost one million measles-related deaths occur each year, the majority (85%) in Africa and Asia (11).

According to FMOH Ethiopia EPI comprehensive multi year plan, the cases and out breaks were declined. The report states that- Major measles surveillance indicators were achieved over the past four years and the surveillance was able to confirm a number of cases and outbreaks. Available data shows that In Ethiopia, measles incidence dropped to 2.0 per million population during 2004 and 2005 but has been in excess of 5 cases per million since 2010. In 2013, measles incidence was 7.2 cases per 100,000 populations. A total of 243 measles outbreaks were

confirmed in 2013 compared to 146 outbreaks in 2012 with a total of 192 affected woredas in 2013 compared to 125 outbreaks in 2012(12).

Measles is endemic virtually in all parts of the world. It tends to occur in epidemics when proportion of susceptible children reaches about 40%. When the disease is introduced into a non-endemic community more than 90 % of that community will be infected (13).

Vaccine-preventable diseases are the most common cause of childhood mortality, with an estimated three million deaths each year. Over 20 million children across the globe are unvaccinated against measles. Half of these children come from ten countries, five of which are in Africa. Nigeria, Ethiopia, the Democratic Republic of Congo, Uganda, and South Africa have the largest numbers of unvaccinated or under-vaccinated children on the continent (14).

The measles vaccine not only protects the individual who has received it but also helps to protect the whole population because once 95% of the population is immunised, the disease dies out. As the numbers of unvaccinated children has risen, the “herd” immunity for the population has been lost. This results in the disease spreading quickly among those who have reduced immunity or are unvaccinated causing severe illness and sometimes death. Children who are too young to be vaccinated are at a much higher risk of catching the disease when herd immunity is lost (15).

In Ethiopia, a seasonal pattern of occurrence of measles has been observed over the years, with increased number of measles cases during the late-early part of the year December to February. Due to the low sub national routine measles coverage and prevailing poor living and nutritional conditions, measles outbreaks continue to occur frequently in different parts of the country, most especially in Oromia and SNNPR (southern) Regions where the density of the population is relatively high . The number of confirmed measles cases steadily increased from 73 in 2003 to a peak of 3,511 in 2008, following which there was a decline to 1,944 cases in 2009. Even though measles incidence rate has showed significant increase in the country since 2010, a dramatic increase is observed from 2012 up to 2014(16).

From the above literature review, the major cause for measles morbidity and mortality is the presence of un vaccinated children. However, it doesn't state the cause of un vaccination.

1.1.3 Rationale of the study

From mid February Southern Nation nationalities and people's regional health bureau received a rumor of measles outbreak from Cheta Woreda. Measles is one of the notifiable diseases, which have high epidemic potential. Outbreak investigation is one of the components of public health emergency response activities. Rapid outbreak investigation and response limits the number of cases and geographical spread, shorten the duration of the outbreak and reduce fatalities. Therefore, a team organized from regional health bureau and the respective zone and woreda assigned to conduct measles outbreak investigation, identify the possible risk factor associated with measles outbreak, and identify gaps that need to be addressed to prevent further spread of the disease.

1.1.4 Objective

General objective

- ✓ To investigate suspected measles outbreak in Cheta woreda, SNNPR, March 5-12/2016

Specific objectives

- a. To confirm the existence of the outbreak
- b. To describe the magnitude of the outbreak by person, place, and time
- c. To determine the factors associated with the outbreak

1.1.5 Methods and Materials

Study setting and population

This study was conducted in Cheta woreda, Kefa Zone, SNNPR with a total population of 40,446. Kefa Zone is one of the 15 Zones & 4 Special Woredas in SNNPR. The under five years children were 6,314 and under 15 years of children were 19,362 found in the district. The Cheta woreda is found in Kefa Zone, 741 km away from regional town, Hawassa. The capital of the woreda is Shama. Administratively the Woreda has two urban & 16 rural Kebeles. In the Woreda there were 15 HP and 2 HC are found. The measles vaccination coverage of the Woreda in 2012, 2013, 2014, and 2015, was >100%, 99.8%, 90% and 99% respectively.

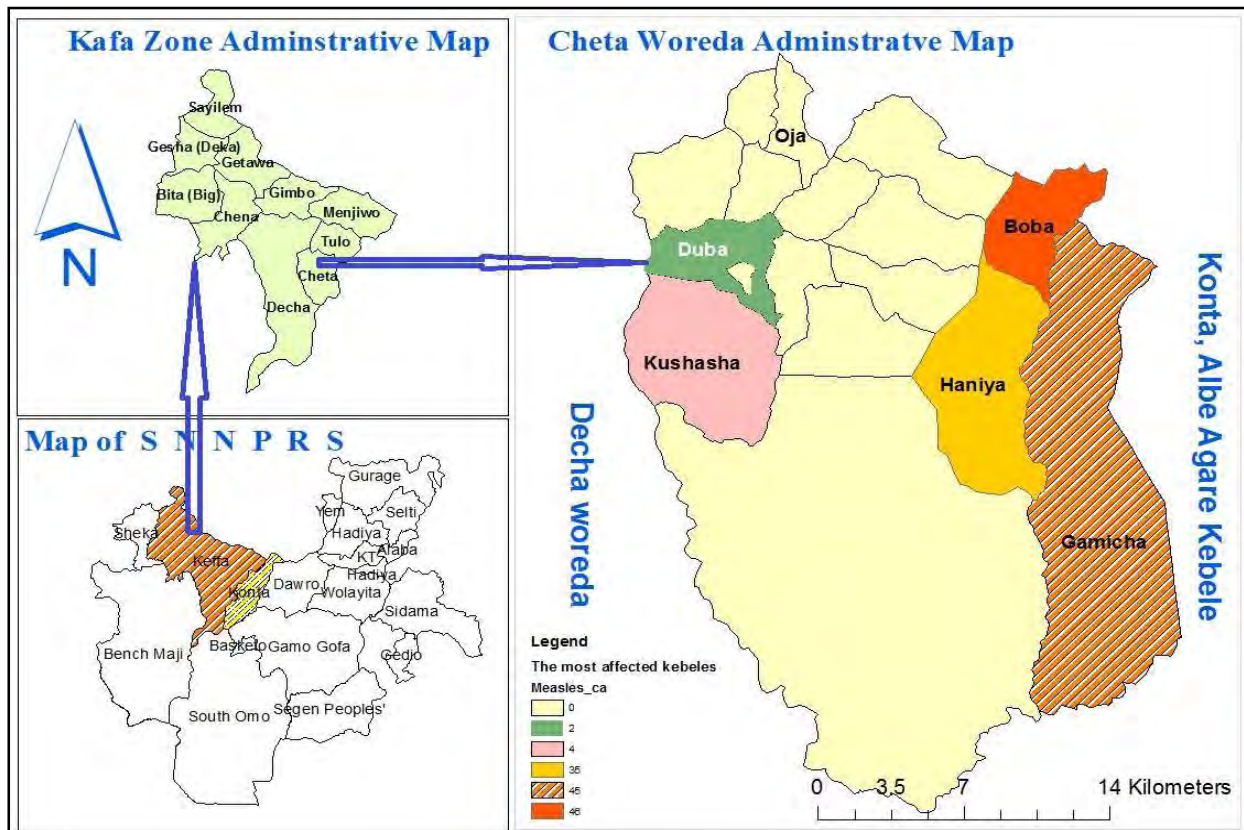


Figure 1: Map of Cheta woreda, Kefa zone, February 2016

Study design

We conducted a descriptive study followed by unmatched case control study to investigate the outbreak.

Case definition

We define: a suspected measles cases based on World Health Organization (WHO) case definition, as any person with fever, maculopapular generalized rash and cough, and either coryza, or conjunctivitis or any person in whom a clinician suspects measles. A laboratory confirmed case-patient was defined as a patient who tested positive for measles specific IgM. An epidemiologically linked case-patient was defined as a patient without laboratory testing that met the measles case definition and either had contact with a laboratory confirmed case or lived in the same or adjacent district of a laboratory-confirmed case with in the period of the outbreak. Blood sample was taken from four suspected measles cases and sent to the regional laboratory) for laboratory confirmation.

All cases that fulfilled this case definition were included in the study. Controls were a person without the history of measles and from the same area were cases enrolled. If those who developed sign and symptom during epidemic, they were enrolled as a case.

Data collection method

A structured questionnaire was used to interview the patients and controls. Information was collected regarding age, gender, previous history of measles infection, having contact with suspected or confirmed measles case, immunization status against measles before the illness. Data on immunization history was collected in two ways. One was based on the availability of immunization card and the other was based on mother/caretaker verbal report. After a case/control was identified from the household, mother/caretaker of the case/control was asked for the presence of child's immunization card. For the child with immunization card, the information on the doses and types vaccine received by the child copied from the card. If immunization card was unavailable for the child, the mother/caretaker was asked for immunization history. Case observation was made and active cases were searched for house to house. Medical registration books of two health centers and five health posts (Gamicha, Haniya, Boba, Oja and Kushasha) were assessed and suspected cases were identified. Mid Upper Arm Circumference (MUAC), measurement was employed to assess the nutritional status of both cases and controls. Interview of key informants (HCs medical directors, health care givers and Woreda and Zonal health authorities) were also conducted and availability of refrigerator, vaccine carrier, ice pack and cold chain management were observed.

Data processing and analysis

Collected data was entered in to Computer. By using Epi-info version 7.1.4.0 and Microsoft excel for calculating frequency, ratio, proportion, rate, odds ratio. Bi-variate analysis was used to assess the association between dependent and independent variables. We used binary logistic regression to run multivariate analysis. Results were displayed using tables and graphs and it was interpreted using Odd ratio and 95% confidence interval.

Study subjects Individuals admitted and treated in their catchment health centers, health posts and at their home. During active search, one case is included in the line list and their controls with ratio of 1:2 from the community.

Sample size determination and Sampling procedure

We took the first all 50 cases seen during investigation period in the community. We selected controls those who neighbors of cases but who do not suffer from measles from every other house. We conducted an active case investigation from 5 to 12 March 2016 in the affected district using line lists and questionnaires by house to house visit. We worked with community leaders, the public administration committee and health extension workers to identify additional patients with possible measles. The remaining cases were included and mentioned in descriptive

part after we return to region and the line list was sent to Regional bureau through the surveillance system of the district. In the descriptive part, we took all cases listed in line lists.

Training of data collectors

Six data collector (nurses) from health centers and one supervisor from district health office was received one day training before data collection.

Ethical clearance

Permission to carry out the study was obtained from SNNP regional health bureau, Kefa Zone, then from Cheta woreda health office. Cooperation letter was written to the respective health facility by woreda health office. An informed oral consent was obtained from all study participants.

Study variables

Dependent variables

- ✓ Case status of an individual

Independent variables

- ✓ Socio-demographic characteristics of mothers/caretakers
 - Educational level
 - Occupational status
 - Marital status
 - Religion
- ✓ Age of child
- ✓ Sex of child
- ✓ residence
- ✓ Clinical and other factors
 - Vaccination history
 - Travel history
 - Contact history
 - Family size
 - Nutritional status
 - Knowledge of mothers/caretaker

Operational definitions

Illiterate: person who cannot read and write

Primary: person who complete 1-8 grades

Secondary: person who complete high school (9-10 or 12) grade

Tertiary: Person who complete college and above

Far from health facility: if person travel above five kilometer to get health facility

Near to health facility: If a person travel less than five kilometer to access health facility

Knowledge of measles: If mother/care taker have awareness about, mode of transmission of measles diseases, sign and symptoms of measles diseases, prevention of measles diseases, the right age at the child begin, complete measles vaccination at right age considered as knowledgeable.

Standard definitions

Suspected Measles cases at community level: A community member should report any person with *rash* and *fever* to a health worker and advise the person to go to a health facility.

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

Epidemiologically linked case: A suspected measles case that has not had a specimen taken for serologic confirmation and is linked (place, person) to a laboratory confirmed case. (i.e., living in the same or in an adjacent district with a laboratory confirmed case where there is a likelihood of transmission); onset of rash of the two cases being within 30 days of each other (17).

Measles death: A measles death is defined as any death from an illness that occurs in a confirmed case or epidemiologically linked case of measles within one month of the onset of rash. The immediate and delayed complications of measles (like pneumonia, persistent diarrhea) may manifest and lead to death much later after the disappearance of the rash. Measles deaths are usually under-reported.

Suspected measles out-break. Occurrence of five or more reported suspected measles cases in one month in a defined geographic area such as a Kebeles, health facility catchment area, or woreda.

Confirmed measles out-break. Occurrence of three or more laboratory confirmed measles cases in one month in a defined geographic area such as a Kebeles, health facility catchment area or woreda.

Unvaccinated- A child who does not receive any dose of measles vaccines

Vaccinated- Child who take at least one dose of the measles vaccines

Coverage by card only: Coverage was calculated with numerator based only on documented measles dose, excluding from the numerator those vaccinated by history.

Coverage by history: Coverage was calculated with numerator based on mothers or care- taker report only

Vaccination coverage of measles: proportion of children took measles vaccination

Vaccination status: being vaccinated or unvaccinated with measles vaccine

Inclusion and exclusion criteria

Inclusion criteria

Case- A case was any resident of Cheta woreda who tested and positive for IgM or had sign and symptoms of measles from March 5-12/2016 and who agreed to participate in the study.

Controls- A control was any resident of Cheta district during the study who was a neighbor to a case and who did not develop signs and symptoms of measles and agreed to participate in the study.

Exclusion criteria

Cases and controls: Those who refused to participate in the study during interview period were excluded.

1.1.6 Result

Descriptive epidemiology

A total of, 136 (59 females and 77 males) suspected and confirmed measles cases with 3 (2.2%) death rate were reported by the district. But another two deaths were identified during investigation period in the district (17 January to 22 March) which is confirmed by their families, kebele's administrator, religious leaders, and HDA leaders by typical sign and symptom of measles. This made the total deaths of the district was five (3.6%) which were <5 years 4 Male children and adult one (25year female patient). Investigation team identified the index case in epidemiological week-2. There were no reported measles cases from epidemiological week-4 to epidemiological week-5 because the patients were treated and diagnosed as AFI cases.

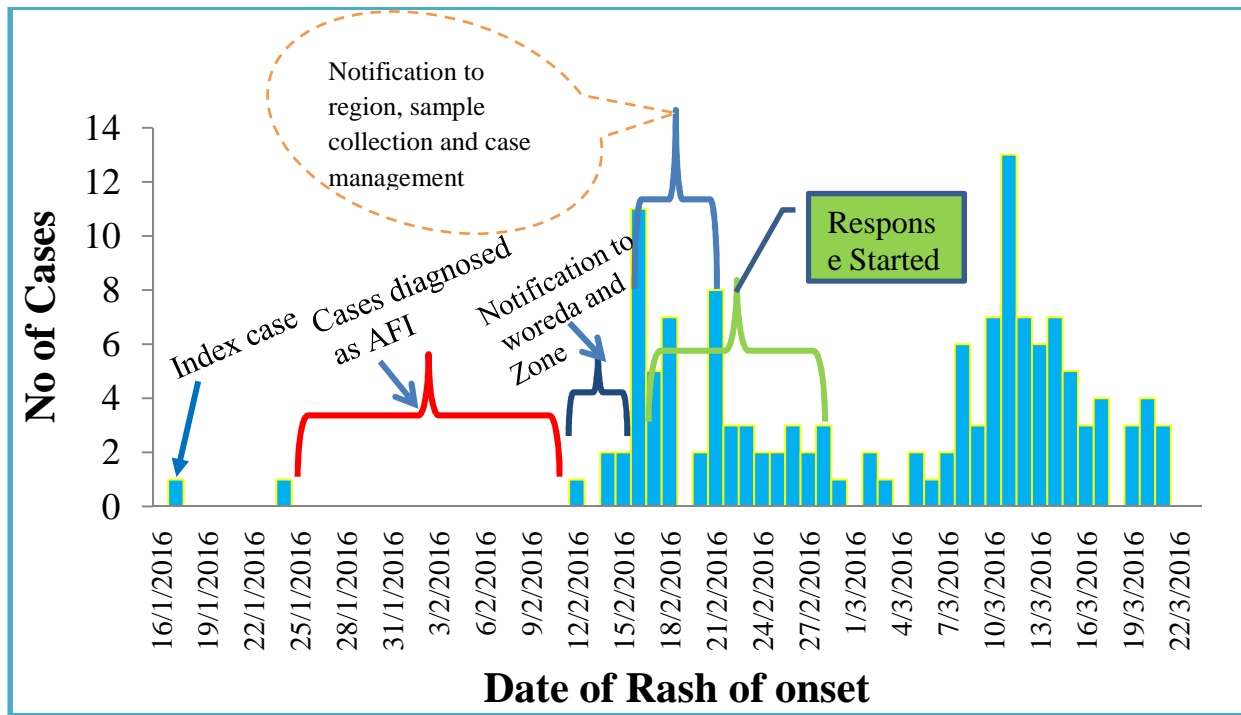


Figure 2: EPI Curve of Measles cases by Date of Rash of onset, Cheta Woreda, Kefa Zone, 2016.

A 25-year-old female was an index case identified during investigation period by investigation team. Her relative, who is affected and living in Konta woreda, Albe Agare kebele (Measles active area) come to their house due to fear of death in her kebele. She stayed for one week and return back to her kebele. After a week later (on 17/1/2016) the patient(index case) developed sign and symptom of measles which was fever, Head ache, rash all over the body, mouth ulcer, difficulty to swallow, diarrhea and cough followed by death of the case after one week (on 25/1/2016). Until notification and verification measles cases, other patients were treated as AFI cases (male-57 and female 50). After this, the catchment health center notifies to the woreda on 17/2/2016 and the district report to the Zone on the same day and verifies the cases and the response action started on the second day. A total of four specimens were collected and sent to regional lab, of which 4 of them were IgM positive.

Table 1: Measles cases by month, Cheta woreda, Kefa Zone, SNNPR, March, 2016

Month	Cases identified	Sample collected	IgM Pos.	IgM Neg.
Jan	2	0	-	-
Feb	57	4	4	0
March	77	0	0	0
T0tal	136	4	4	0

Out of the total 136 cases, 134 cases were treated at health center, health posts and at community level. The major cause for treatment was Pneumonia, diarrhea, and eye infection.

Table 2: Measles AR and CFR of Cheta woreda, Kefa Zone, SNNP March 2016

Kebeles	Total population	<5 year children	Total No of Cases	No of cases (<5 children)	No of deaths in each kebele	CFR	AR from <5yr pop/1000	AR from total popn/1000
HANIYA	1137	177	35	11	2	5.7	62	30.8
GAMICHA	1823	285	45	21	3	6.67	74	24.7
BOBA	3193	498	46	35	0	0	70	14.4
OJA	1615	252	4	2	0	0	8	2.5
KUSHASH A	2141	334	4	2	0	0	6	1.9
DUBA	2866	447	2	2	0	0	4	0.7
Sub-total	12775	1994	136	73	5	3.6	37	10.6
Total	40446	6314	136	73	5	3.6	12	3.4

The attack rate from total population of affected kebele's were 10.6 per 1000 population but from under five children attack rate was 37 per 1000 population. The highest attack rate was registered in Haniya Kebele, which was 30.8 cases per 1000 populations and followed by Gamicha , Boba, and Oja, 24.7, 14.10 and 2.5 cases per 1000 populations respectively.

Cold Chain Management

Lack of follow up and poor cold-chain management at woreda level, Health center and at Health post. From 19 refrigerators, only one is functional and the rests are non-functional due to lack of kerosene and minor maintenance problem. The health posts receive the vaccines from health center but they expected to travel long distance, in order to solve this problem they used HDA as vaccine transporter. The HDA start his journey early in the morning and arrived health center after a long journey and return to health post after 4pm local time and the vaccines are kept in vaccine carrier at health post. After 24 hour, the health extension worker delivered the vaccines to children in second and third day without replacement of ice bags (serious cold chain disruption). During rainy season, the HDA kept the vaccine in the vaccine carrier with him and return to health post second day.

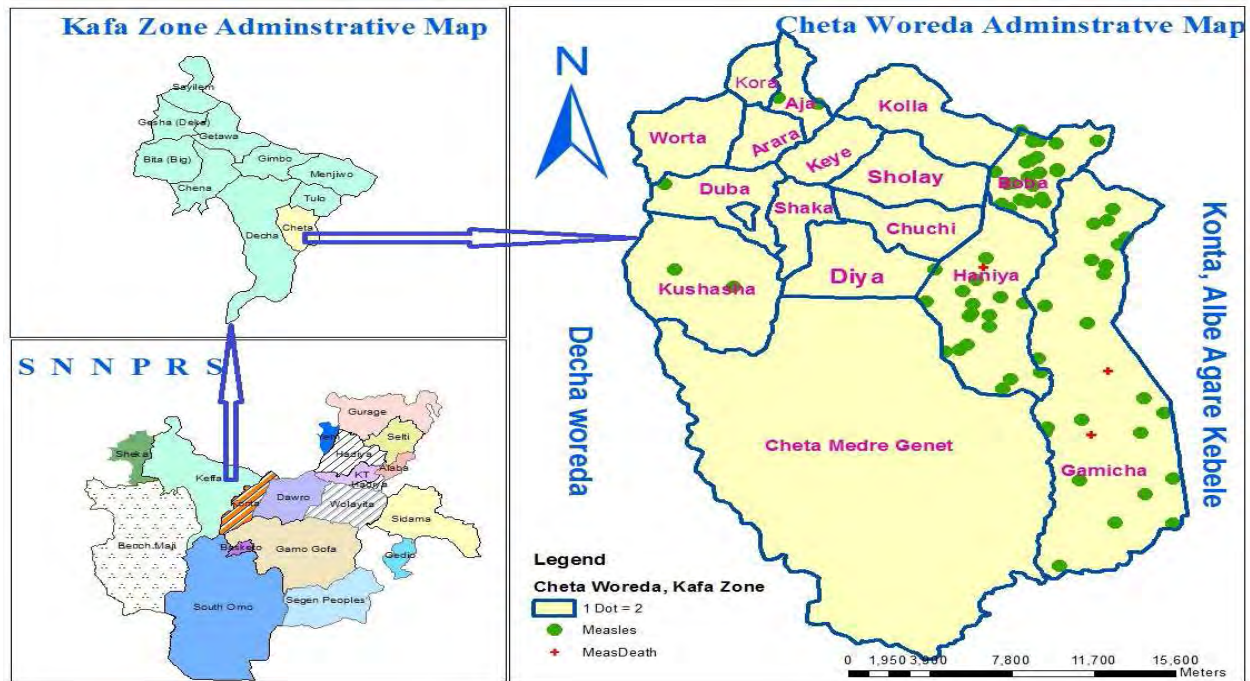


Figure 3: Spot Map of Measles cases by Kebele, Cheta Woreda, Kefa Zone, 2016

The most affected age groups from reported cases were one to four year age group, which were 64 (47%) followed by 5-14years of children 43 (32%) cases as shown.

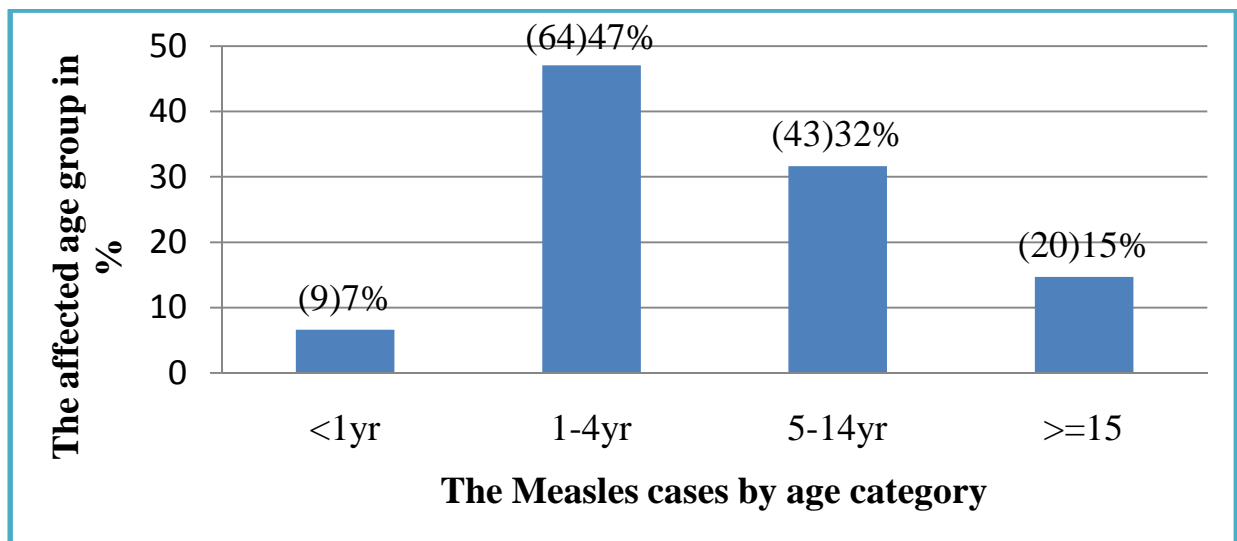


Figure 4: Measles cases by Age group, Cheta Woreda, Kefa Zone, SNNPR, 2016.

Among 136 measles cases reported in the line list of the district, 55 (41%) measles cases received no measles vaccine, 68 (50%) cases received one measles doses, 3(2%) cases received

two measles doses and 10 (7.2%) measles cases has unknown vaccination history.

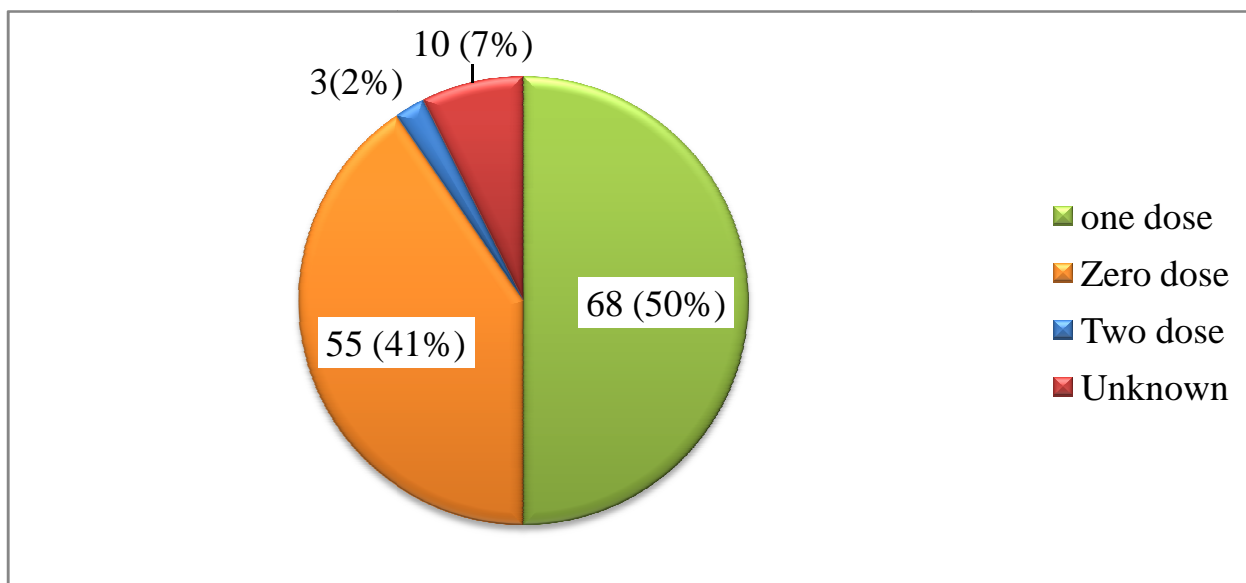


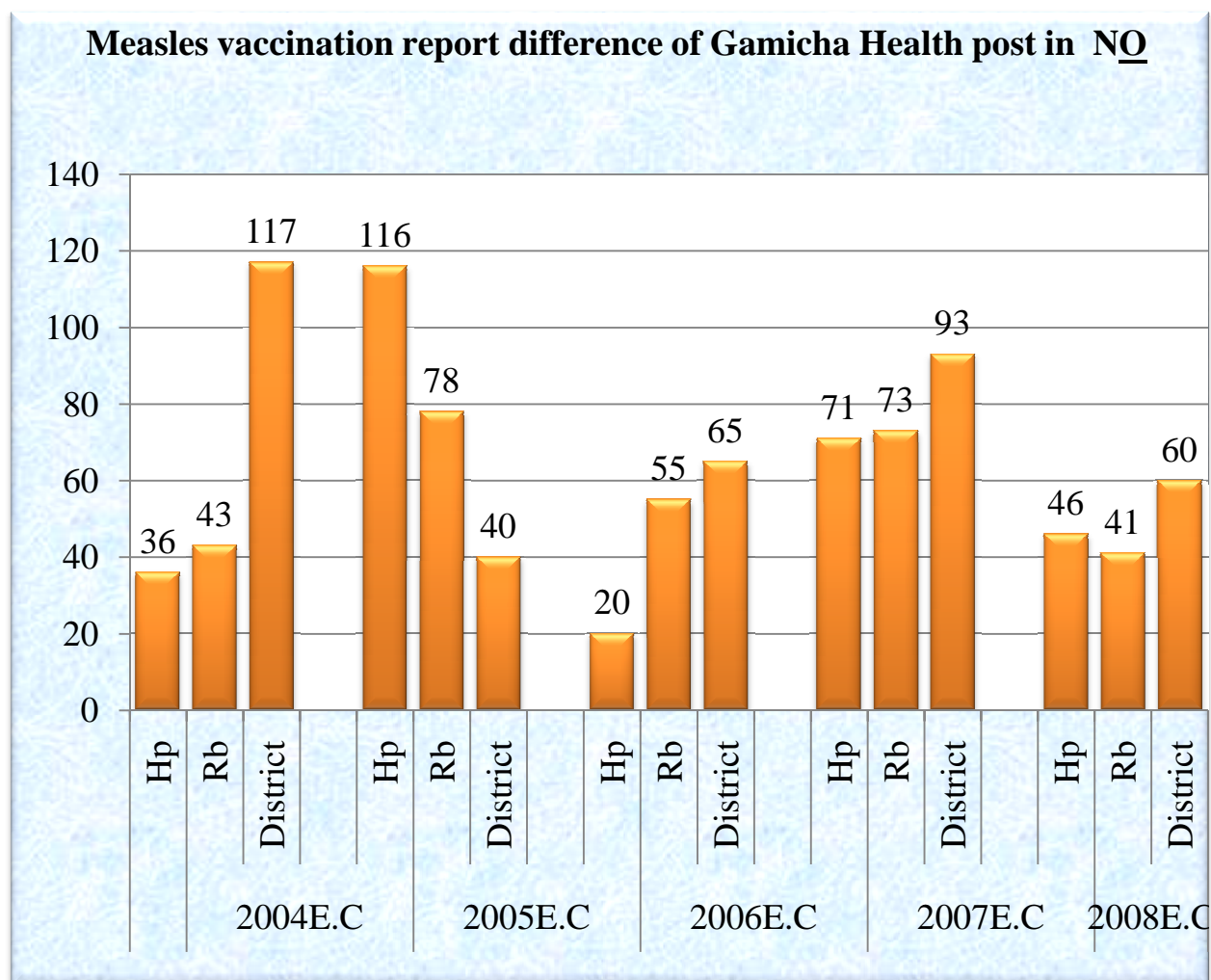
Figure 5: Number of measles cases by vaccination status in Cheta district, Kefa Zone, SNNPR, Eyhiopia 2016

However, there is a gap between district report, health posts and on registration book. For example, one of the health post report has discrepancies between on registration book, health post monthly report and the report at woreda level as shown below.

Table 3: The report gap in Gamicha health post, Cheta woreda, Kefa Zone 2016

2004E.C	Penta1			Penta3			Measles		
Gamicha health post	Plan No	Achie No	%	Plan No	Achie No	%	Plan No	Achie No	%
Health post	66	14	21	66	32	48	66	36	55
Registration	66	76	115	66	48	73	66	43	65
Woreda level	66	149	226	66	78	118	66	117	177
2005E.C									
Health post	55	77	140	55	83	150	55	116	211
Registration	55	79	143	55	104	189	55	78	142
Woreda level	55	38	69	55	45	82	55	40	73
2006E.C									
Health post	71	19	27	71	19	27	71	20	28
Registration	71	51	72	71	56	79	71	55	77

Woreda level	71	58	80.6	71	60	84.5	71	65	91.5
2007E.C									
Health post	58	73	126	58	70	121	58	71	122
Registration	58	92	157	58	79	136	58	73	126
Woreda level	58	86	148	58	81	139	58	93	160
2008E.C									
Health post	44	46	104.5	44	42	95.5	44	46	104.5
Registration	44	41	93	44	29	66	44	41	93
Woreda level	44	53	120	44	48	109	44	60	136



Measles vaccination report difference on registration book, Health post and woreda level report of Gamicha health post, Cheta woreda, Kefa Zone, SNNPR 2016

Case-control study

We conducted a 1: 2 unmatched 50 cases and 100 controls in this study. The median age of the cases was 3 years ranging from 7 month to 23 years and IQR age was between 2 and 5years, while that of controls was also 3 years, ranging from 4-month to 23 years. Twenty-one (21) /42.0%/ cases and Fifty-five (55) /55.0%/ controls were females. 49(98.0%) cases of respondents and 99 (99.0%) controls of respondents were married. 47 (94.0%) cases and 92 (92.0%) controls were not attended any education.

Table 4: Demographic characteristics of Measles Cases and Controls, Cheta woreda, Kefa Zone, SNNPR, March 2016

Variable	Category	Case n= 50 (%)	Control n= 100 (%)
Sex	Female	21(42.0%)	55(55.0%)
	Male	29(58.0%)	45(45.0%)
Age	<=5 years	40(80.0%)	85(85.0%)
	>5 years	10(20.0%)	15(15%)
Marital status	Married	49(98.0%)	99(99.0%)
	Single	1(2.0%)	1(1.0%)
Occupation	Daily laborer	2(4.0%)	1(1.0%)
	Farmer	20(40.0%)	55(55.0%)
	Employed	1(2.0%)	0(0%)
	House wife	27(54.0%)	44(44.0%)
Level of education	Illiterate	47(94.0%)	92(92.0%)
	Read and write	2(4.0%)	7(7.0%)
	Elementary	1(2.0%)	1(1.0%)
Religion	Orthodox	29(58.0%)	65(65.0%)
	Protestant	19(38.0%)	33(33.0%)
	Others	2(4.0%)	2(2.0%)
Family size	>5	29(58.0%)	82(82.0%)
	<=5	21(42.0%)	18(18.0%)

For vaccination status, 35 (70.0%) of cases and 34 (34.0%) controls were not received measles vaccine dose. Fifteen (30.0%) cases and 66 (66%) controls were received measles dose. 17(34%) of cases and eight (8.0%) of controls have history of contact with active measles cases (ill from measles). 45(90.0%) of the cases and 67(67.0%) controls have not ventilated homes. Out of 50 measles cases, 50 (100%) cases got treatment, 47 (94.0%) of treated cases were recovered during

the study period. The rest, three (6.0%) of cases were getting improvement during the study period.

Forty-nine (98%) of cases were treated at community and health facility level. Twenty-three (46%) of cases and 65(65%) of controls believed that when they get sick, they will go health facility. 5(10%) of cases and 17(17%) of controls believed that when they get sick, they will go traditional healers. 18(36%) of cases and 13(13%) of controls believed that when they get sick, they prefer stayed at home.

Seventeen 17 (34%) of cases and 33(33%) of controls thought, the cause of measles is contact with measles cases. Twenty-three (46%) of cases and 45(45%) of controls thought, the cause of measles is punishment from God. Three (6%) of cases and five (5%) of controls thought, the cause of measles is bad attitude of people. Four (8%) of cases and Fourteen (14%) of controls thought, the cause of measles is bad weather condition.

Twenty-nine/29/ (58%) of cases and Forty-eight/48/ (48%) controls thought; measles transmission is stopped by vaccination. Three /3/ (6%) of cases and 1(1%) of controls have history of measles infection before the epidemic. The mid-upper arm circumference of 49 (98.0%) cases and 98 (98%) of controls were greater than 12 centimeter. one (2.0%) case, the MUAC 11-12cm and one (1%) control the MUAC was<11cm.

Bi-variate analysis was performed to determine the strength of association of potential risk factors for measles cases as compared to controls. The statistically significant variables were found to be associated with measles as listed below in annex2:

Educational status /Illiterate/ (OR= 1.8 CI 0.36-9.03), occupation /being farmer/ (OR= 0.55 CI 0.27-1.08), daily laborer (OR= 4.12 CI 0.36-46.62) and marital status/being housewife/ (OR= 1.49 CI 0.75-2.96) were not significant risk factors (Annex 2). However, in multi-variate logistic regression analysis, the risk factors that are statistically significant association for contracting measles disease: history of contact with suspected or confirmed cases (AOR=18.00 CI 4.31-80.46). Family size peoples living in one house more than five (AOR= 4.00 CI 1.34-11.98). Being vaccinated (AOR= 0.30 CI 0.10-0.78). Knowledge about measles disease is vaccine preventable (AOR= 0.27 CI 0.10-0.73).

Table 5: Multivariate logistic regression analysis of risk factors for measles, Cheta Woreda, Kefa Zone, SNNPR, 2016

Variable	Response	Cases	Control	Crude OR(95%CI)	AOR	95% CI	P-value
*Being vaccinated	yes	15	66	0.22(0.11-0.46)	0.30	0.10-0.78	0.0134
	no	35	34				
*Do you know measles is vaccine preventable?	yes	14	67	0.19(0.09-0.40)	0.27	0.10-0.73	0.0106
	no	36	33				
*Family size>5	yes	29	82	3.29(1.54-7.04)	4.00	1.34-11.98	0.0074
	no	21	18				
*Any contact history with measles cases	yes	17	8	5.92(2.34-15.01)	18.00	4.31-80.46	0.0001
	no	33	92				
*Educational status(able to write and read)	yes	10	40	0.37(0.17-0.83)	0.24	0.07-0.70	0.0097
	no	40	60				
Hose Ventilation	Yes	5	33	0.23(0.08-0.62)	0.51	0.14-1.95	0.2124
	No	45	67				
Cases/family prefer Health Facility during illness	Yes	23	65	0.46(0.23-0.92)	0.41	0.15-1.05	0.0711
	No	27	35				
Do you know Modes of transmission	Yes	10	37	0.43(0.19-0.95)	0.3162	0.08-1.14	0.0772
	No	40	63				

1.1.7 Public health action

Community mobilization was very strong from zonal health department to kebeles HDA during the epidemic. They evaluate daily surveillance activities and follow up of the affected cases (progress of the treatment) at community level.

Vitamin-A supplementation and measles vaccination were given in eight kebeles for < 5 years of age in affected and high-risk areas to control the outbreak. Active case searching, case management at Health centers, health posts level, and at community level by Zonal, district, health centers and health post professionals.

Under five children measles vaccination during outbreak, Cheta woreda, Kefa Zone, SNNPR, 2016

Se No	Name of kebele	Plan	Achievement	%
1	Gamicha *	444	624	140
2	Boba *	780	754	96
3	Haniya *	278	299	108
4	Shelay	435	190	44
5	Cheta Amesh	374	429	115
6	Kalla	730	70	10
7	Duba *	448	192	43
8	Diya	488	174	36
	Total	3977	2732	69

NB: - *(affected kebeles by measles).

The above table shows the mass vaccination coverage was low and not covers the whole kebele's due to shortage of vaccine supply. Even the high risk kebele's not vaccinated due to shortage of vaccine during the epidemic period.

1.1.8 Discussion

We identified factors associated with measles outbreak in Cheta district, Kefa zone 2016. The most affected age group under 15 years of age. The identified risk factors associated with measles outbreak during the investigation period were History of contact with suspected or confirmed cases; Un-vaccination, living people more than five members and Lack of knowledge of mother or caretaker were associated risk factors.

According to this study, not vaccinated children are at higher rates of disease acquiring than vaccinated. Individuals not vaccinated for measles have 70% of high chance of likely to develop measles than vaccinated. The vaccination history in the line list of the district shows that around 68 (50%) of the cases were vaccinated at least one doses of measles vaccine before this measles infection. However, the districts' the last five consecutive years (2012 to 2016) administrative coverage of at least one measles dose was above 90%. The possible explanations for the contradiction were false report that we identified during the outbreak investigation. EPI reports and EPI registration books read differently. On the other hand; the vaccination status of cases and controls involved in the case control study; and the vaccination status in the line list implies that the actual immunization coverage of the district was lower than the administrative coverage.

Even though children got at least one dose of measles vaccine there are different factors that compromise the quality of the vaccine. During the investigation, less number of refrigerators (1/19) was functional. There are more than 80 outreach vaccination sites in the district. This mentioned all affected the cold chain management that result the accumulation of measles susceptible group in the population. This is Consistent with the report confirmed cases were reported by CDC (18). Other study also shown in 2014, Philippines experienced a large ongoing measles outbreak. According to the WHO report, most of the cases were among unvaccinated. Many children in ultra-Orthodox Jewish communities were affected due to low vaccination coverage (19, 20).

The other identified risk factors are any contact with measles cases and living in a room with more than five people was significantly associated with higher rates of contracting the disease. Those who have any contact with measles cases, have more likely to contract measles than who were not having contact history. In addition, People live in a house more than five, 4 times more likely to contract measles than those who were live in less than five family sizes. It is common to have large family size composed of extended family in the rural community that results crowded living condition. Overcrowding is one of the risk factors for measles transmission. Similar study found that close contact with an infected person increased measles transmission since measles is a highly infectious communicable disease. 75%–90% household contacts have been reported to be overcrowded (17, 21- 22)

The most affected age groups from reported cases were one to four year age group, which were 64 (47%) followed by 5-14years of children 43 (32%) cases which was similar as indicated by WHO and other literatures(1, 2). The measles case fatality rate (CFR) in this outbreak was 3.6%. This is consistent with expected case-fatality rate is between 3% and 6% on national guideline. The case fatality from measles is estimated to be 3-5% in developing countries but may reach more than 10% in outbreaks especially when it is compounded by malnutrition (23).

Lack of Knowledge of mother or caretaker on measles also was significantly associated with measles outbreak. Children whose mothers don't know about mode of transmission of measles were 73% of high chance of likely affected by measles than who were know modes of transmission (24, 25).

1.1.9 Limitations

Shortage of time and during the study time of home to home visiting for data collection some of them have not vaccination card in most of interviewed households. Because of that, vaccination history was taken by simply asking the family. This may introduce bias on the vaccination status.

1.1.10 Conclusion

A confirmed measles outbreak occurred in Cheta district, Kefa Zone, SNNPR 2016. The most affected age group is under 15 years of age. The identified risk factors associated with measles outbreak during the investigation period were History of contact with suspected or confirmed cases, Un-vaccination with measles vaccine, living five and more household members in rooms, poor cold chain management and Lack of knowledge of mother or caretaker were associated risk factors for occurring measles outbreak in the district.

1.1.11 Recommendation

- Conduct mop up campaign (Supplementary immunization activities) for Measles vaccine for less than fifteen years of age.
- Woreda health office should give special attention for hard to reach areas to strengthen routine vaccination.
- Establish restriction measures for visitors and movement of cases to the community during outbreak period.
- Poor maintenance of cold-chain system, lack of electric power and shortage of kerosene should be solved at each level.
- Strengthen Routine measles surveillance system for early detection of any measles outbreak and early response.
- Maintain routine immunization coverage
- Deliver health education to the community to create awareness regarding measles mode of transmission and control mechanisms.

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Annex1

Annex 1: Problems identified during Measles out break investigation in Cheta Woreda, Kefa Zone 2016

Lack of follow up and poor cold-chain management at woreda level, Health center and at Health post. From 19 refrigerators, only one is functional and the rests are non-functional due to lack of kerosene and minor maintenance problem. The health posts receive the vaccines from health center but they expected to travel long distance, in order to solve this problem they used HDA as vaccine transporter. The HDA start his journey early in the morning and arrived health center after a long journey and return to health post after 4pm local time and the vaccines are kept in vaccine carrier at health post. After 24 hour, the health extension worker delivered the vaccines to children in second and third day without replacement of ice bags (serious cold chain disruption). During rainy season, the HDA kept the vaccine in the vaccine carrier with him and return to health post second day. The non-potent vaccines were given to the children at third and fourth day without replacement of ice bags. Furthermore, the vaccination schedule dates are not regular and inconsistent. For example Gamicha health post vaccination program from 2012 to 2015/16 from registration book.

Incomplete EPI schedule Gamicha Health post, Cheta woreda, Kefa Zone, SNNPR 2016

Se. No	Years	Vaccination was done
1	2004E.C	For 6 Month only (July, Aug, Dece, March, April, May)
2	2005 E.C	For 8 Month only (July, Aug, Septe, Octo, Dece, Jan, March, April)
3	2006 E.C	For 7 Month only (July, Aug, Septe, Octo, Jan, May, June)
4	2007 E.C	For 9 Month only (July, Aug, Septe, Octo, Nov, Jan, Feb, March, June)
5	2008 E.C (half year)	For 3 month only (October, Jan, Feb)

Besides these, from 2011 onward, there is no integrated supportive supervision and no feedback given to health post (Gamicha hp). The primary health care unit support were not problem solving and not fill the health extension's skill gap.

Data quality was extremely affected in health posts level. The registration, recording and reporting system were very poor. They do not use tally sheet at all, not utilized folder, record incomplete information (date of vaccination were given. No monitoring charts, Not functional

RRT (but functional during the epidemic), No minute book for RRT, No phem focal at woreda not trained. The HEW have no annual, monthly and weekly plan but the catchment health center plan for them.

No HEW in haniya health post and the health post is severely destructed by wind and storms but not maintained due to these reasons the drugs, documents and medical equipments exposed to damage. Because this, no information taken from Haniya health post.



Haniya health post, Cheta woreda, Kefa zone, March 2016

Annex 2: Bivariate analysis of risk factors (case=50, controls=100) for measles, Cheta Woreda, Kefa Zone, SNNPR, March 2016.

Variable	Response	Case	Control	OR	95% CI
*Do you know modes of transmission of measles?	yes	10	37	0.4257	0.1907-0.9503
	no	40	63		
*Family size	>5	29	82	3.2989	1.5447-7.0449
	<= 5	21	18		
*Ever vaccinated for measles	yes	15	66	0.2208	0.1061-0.4594
	no	35	34		
*Any contact with measles case	yes	17	8	5.9242	2.3381-15.0106
	no	33	92		
*Do you know measles is vaccine preventable?	yes	14	67	0.1915	0.0909-0.4034
	no	36	33		
*Is the house is ventilated?	yes	5	33	0.2256	0.0819-0.6216
	no	45	67		
*Where did you go first when get ill? (health facility)	yes	23	65	0.4587	0.2297-0.9159
	no	27	35		
*Educational status(able to write and read)	yes	10	40	0.37	0.17-0.83
	no	40	60		
Age	<=5	40	85	0.71	0.29-1.71
	>5	10	15		
Cause of measles /bad attitude of people/	yes	3	5	1.2128	0.2779-5.2928
	no	47	95		
Cases prefer Traditional healers	yes	5	17	0.5425	0.1877-1.5675
	no	45	83		
Cause of measles /bad weather condition/	yes	4	14	0.5342	0.1662-1.7167
	no	46	86		
Cause of measles from God	yes	23	45	1.0412	0.5266-2.5058
	no	27	55		

1.1 1.2 AWD (Acute Watery Diarrhea) Outbreak Investigation Dilla Town and Dilla zuria district, Gedeo zone, South, Nations, Nationalities, and Peoples Region, 2016

Abstract

Background: - Acute watery diarrhea is an acute diarrheal disease caused by the bacterium, *Vibrio cholerae*. We investigated AWD outbreak to identify the magnitude and factors associated with AWD in both Dilla town and Dilla zuria district, Gedeo Zone, South, Nations, Nationalities, and Peoples Region, July- August 2016.

Methods: - We investigated 68 cases and 136 controls. We used un-matched 1:2 cases to controls were conducted from July 5/2016 to August 7/2016. We defined a case of suspected AWD based on National/WHO AWD guideline case definition. Data collected on socio-economic, age, sex, place of residence, household hygiene, personal hygienic practices, and on food and water consumption using a structured questionnaire. We used advanced statistics in Epi-Info to calculate multi-variate logistic regression analysis.

Results: - Males are the most affected group from cases 43 (63.2%). Median age was 25 years and IQR age was between 18 and 30years. The AR was 6 per 10,000 with no fatality. Risk factors that are significantly associated with AWD disease were- Drinking river water (AOR=20.58 CI 5.05-83.81). Eating raw fruits and vegetables (AOR= 4.14 CI 1.49-11.52). Contact history (AOR= 9.11 CI 1.29-64.44). Low educational status (AOR= 5.43 CI 1.89-15.75). Daily laborers (AOR= 3.18 CI 1.15-8.76), and those who have knowledge of how to prevent AWD (AOR= 0.11 CI 0.02-0.53) and Purifying drinking water (AOR= 0.028 CI 0.0008-0.9386,) have protective effect.

Conclusion: - we conclude that risk factors for AWD occurrence: drinking river water, eating raw vegetables and fruits, low educational status, daily laborers, contact with cases, have associated with the risk of AWD in the Zone. We recommended that to prevent transmission of AWD: preparation and consumption of food under hygienic conditions, avoid eating raw fruits and vegetables, use toilet facilities, maintaining effective hygiene standards regarding safe water supply, water disinfection, disinfecting vegetables and fruits, and education the community in each level.

Keywords: AWD/AWD; Risk factors; Epidemic; Attack rate; Gedeo Zone

1.2.1 Introduction

Acute watery diarrhea/AWD/ is an acute diarrheal disease caused by the bacteria. It is transmitted through faecally contaminated water or food. The bacterium is *Vibrio cholerae*, which can either be of type O1 or O139. AWD is one of the key indicators of social development and remains a challenge to countries where access to safe drinking water and adequate sanitation cannot be guaranteed. Its impact can be even more dramatic in areas where basic environmental infrastructures are disrupted or have been destroyed. Countries facing complex emergencies are particularly vulnerable to AWD outbreaks. Massive displacement of IDPs or refugees to overcrowded settings, where the provision of potable water and sanitation is challenging, constitutes also a risk factor. In consequence, it is paramount importance to be able to rely on accurate surveillance data to monitor the evolution of the outbreak and to put in place adequate intervention measures coordination of the different sectors involved is essential, and WHO calls for the cooperation of all to limit the effect of AWD on populations. It is characterized in its most severe form by a sudden onset of acute watery diarrhea that can lead to death by severe dehydration (1, 2).

The greatest risk occurs in over-populated communities and refugee settings characterized by poor sanitation, unsafe drinking water, and increased person-to-person transmission. A dose of more than 100 million organisms is usually needed to cause illness. About 20% of those who are infected develop acute, watery diarrhea. 10–20% of these individuals develop severe, watery diarrhea with vomiting. If these patients are not promptly and adequately treated, the loss of such large amounts of fluid and salts (more than 10-20 liters/day in severe forms) can lead to severe dehydration and death within hours. The case-fatality rate in untreated cases may reach 30–50%. Treatment is straightforward (basically rehydration) and, if applied appropriately, should keep the case-fatality rate below 1% (1, 2).

The typical presentation of AWD is a sudden onset of profuse, painless, watery stools, sometimes like rice-water, often accompanied by vomiting. Dehydration appears within 12–24 hours. The first 24 hours of AWD manifestation are the riskiest, and if the sufferer is not rehydrated, death can result (2). The extremely short incubation period - two hours to five days - enhances the potentially explosive pattern of outbreaks, as the number of cases can rise very quickly. About 75% of people infected with AWD do not develop any symptoms. However, the pathogens stay in their faeces for 7 to 14 days and are shed back into the environment, possibly infecting other individuals (3).

AWD is on the rise with an estimated 1.4 billion people at risk in endemic countries and an estimated 3 million to 5 million cases and 100,000-120,000 deaths per year worldwide(4). The

disease is now considered to be endemic in many countries and the pathogen causing AWD cannot currently be eliminated from the environment. Regions of the world where AWD is currently prevalent are Africa, Asia and parts of the Middle East. Sub-Saharan Africa is broadly affected by many AWD epidemics (3, 4, 5).

Risk for AWD spread exist in Ethiopia, which include: overcrowding in Refugee camps, increased population movements across borders, inadequate access to safe water, low personal and environmental hygiene and sanitation practices, inadequate food safety, low latrine coverage and utilization, unexpected flooding, low health seeking behavior, low community awareness on AWD prevention, and limited capacity of health system in some regions. The effect of the El-Nino also contributes to increased risks for spread of communicable diseases and disease outbreaks (6, 7, 8).

The presence of *V.cholerae* in stools is confirmed through laboratory procedures. However, a new rapid diagnostic test (RDT), now available, allows quick testing at the patient's bedside. WHO is currently in the process of validating this RDT, to be able to include it on the list of its pre-qualified products. In the meantime, WHO suggests that all samples tested positive with the RDT are re-tested using classic laboratory procedures for confirmation. Not all cases fitting the WHO clinical case definition need to be tested. It has been confirmed, the WHO clinical case definition is sufficient to diagnose cases. After that laboratory testing is required for antimicrobial sensitivity testing and for confirming the end of an outbreak. Rapid diagnostic tests can facilitate early warning and detection of first cases (9, 10).

Currently AWD outbreak has been occurred in Ethiopia, since October 25, 2015; in Oromia Region, Moyale Town of Borena zone and it spread from one kebele to other kebele. The spread of the disease has been progressively increasing from zone to zone and region to region. In SNNPR the first AWD case was seen in Amaro District of Segen Zone and Arbaminich Town Administration on February /2016. During this time Arbaminich zuria, Konso and gutazer Wolene districts were affected by the outbreak. These outbreaks were controlled at end of March. However, the outbreak persistently existed in some zones (Borena) of Oromiya Region. Since then allot of prevention and control activities have been carried out across the region but the outbreak re-existed in SNNPR and different Regions in Ethiopia. Currently, the disease has been aggressively affecting many zones in Oromia, Somali, SNNP regions and Addis Ababa city (11).

Gedeo Zone is one of densely populated zone in the SNNPR region. Majority of the zone is boarded with Oromiya region. The index case of AWD was reported on 4/7/2016 from Wolidena

kebele and treated at Odaya CTC since 4/7/2016 the preceding cases were reported from other kebeles of Dilla town and Dilla Zuria District. As the number of Cases increased in both Dilla town and Dilla Zuria district health offices notified to the Zonal health department on 4/7/2016. The Zonal health department notified the region on the same day because the team is already there for AWD response activities in wonago district. On July 5 /2016, the regional outbreak investigation and response team join zonal outbreak investigation and response team to confirm the existence of the outbreak, conduct active case search, identify possible risk factors, provide prompt prevention, and control measures.

1.2.2 Literature Review

A study showed that the main reason for the AWD outbreak occurrence in different part of the world is lack of safe water and poor hygiene. It similar with our study: - It remains a significant public health problem in many parts of the world. In 2015, 42 countries reported a total of 172, 454 cases including 1304 deaths, resulting in an overall case fatality ratio (CFR) of 0.8%. This represents a 9% decrease in the number of cases reported compared with 2014 (190 549 cases). Cases were reported from all regions, including 16 countries in Africa, 13 in Asia, 6 in Europe, 6 in the Americas, and 1 in Oceania. Afghanistan, the Democratic Republic of the Congo (DRC), Haiti, Kenya, and the United Republic of Tanzania accounted for 80% of all cases. Of cases reported globally, 41% were from Africa, 37% from Asia and 21% from Hispaniola. It is because of poor hygiene and sanitation, lack of safe water, lack of public health infrastructure, and inadequate access to medical care (12).

According to CDC report, its transmission is mainly transmitted by fecal–oral route. This report also similar and consistent with our study result and with our recommendations to prevent AWD i.e., a person contracts AWD by ingesting something (usually water or food) that has been contaminated with fecal matter infected with *V. cholerae*, transmits AWD. Interrupting AWD transmission cycle helps to control and prevent the disease. Key elements of interrupting the cycle include providing safe drinking water, improving sanitation conditions, and ensuring proper hygiene (personal hygiene and food preparation). In particular, water of good quality needs to be provided in sufficient quantity so the population can practice good hygiene. Ensuring a safe and sufficient water supply should be a key element in planning AWD prevention and control strategy (13).

During our outbreak investigation period the coordination activities are not strong such a WHO recommendation but WHO recommends Afrian countries to coordinate the AWD outbreak response activities; conduct rapid assessments, alert and outbreak investigations and confirmation; establish Cholera Treatment Centres and infection prevention and control; engage

in active surveillance as well as supervising safe burial of the deceased. The Task Force is also coordinating regular meetings, public health education, and awareness activities at all levels, producing situational reports, and other outbreak documents. The WASH cluster is promoting hand washing and proper disposal of solid and liquid waste, as well as household water chlorination (14).

Assessments have shown that the main factors associated with the spread of the infection both in mainland Tanzania and in Zanzibar revealed that similar result with our findings such as- limited access to safe water and sanitation. Water supply institutions lack the capacity to chlorinate and conduct regular water quality monitoring and assessments. The coverage of improved latrines is also very low. Poor hygienic practices perpetuated by myths and misconceptions, and the lack of sanitation facilities in poor households have also been associated with the outbreak (15).

According to WHO report the National AWD Response Plan identifies the need to urgently scale-up Oral Rehydration Centers at the community level to provide services to non-life threatening cases and serve as a contact point for referring non severe patients to Cholera Treatment Units (CTUs) and severe patients to Cholera Treatment Centres (CTCs). The plan states the essential need to scale-up CTUs, which are attached to or near existing health centers, to provide essential treatment and triage patients with severe symptoms to CTCs. Nationwide, CTCs with a total capacity of 2 830 beds have been established in Haiti(16).

AWD epidemics often start at the end of the dry season or at the beginning of the rainy season, when water sources are limited. This makes people to concentrate at fewer water sources increasing risks of contamination and transmission of the disease. Furthermore, the salinity can increase during the dry season and favours the growth of vibrio. Heavy rains can also provoke the emergence of cholera: flooding of contaminated water from sewage systems, latrines or septic tanks may contaminate wells or other water sources and thereby increase the concentration (17).

1.2.3 Rationale of the study

On 4/7/2016 Southern Nations, nationalities and peoples regional health bureau received a rumor of AWD outbreak from Gedeo Zone (both Dilla town and Dilla Zuria district.) AWD is one of the notifiable diseases, which have high epidemic potential. Outbreak investigation is one of the components of public health emergency response activities. Rapid outbreak investigation and response limits the number of cases and geographical spread, shorten the duration of the outbreak and reduce fatalities. Therefore, a team organized from regional health bureau and the respective zone and districts assigned to conduct AWD outbreak investigation and to identify the

possible risk factors associated with AWD outbreak. In addition, to identify gaps those need to be addressed to prevent further spread of the disease.

1.2.4 Objective

General objectives

- ✚ To assess the magnitude of AWD and its risk factors in both Dilla Town and Dilla Zuria district from July 5/2016 to August 7/2016.

Specific objectives

- ✚ To Identify existence of the outbreak
- ✚ To assess the magnitude of AWD among the affected Community
- ✚ To Identify the source and mode of transmission of the outbreak
- ✚ To Describe the outbreak by place person and time
- ✚ To examine risk factors for AWD

1.2.5 Methods

Study area and population

Gedeo Zone is one of densely populated zone in the SNNPR region. It has a population of 1,086,768. The zone administered with six districts and two Town administrations. There are 3 Hospitals, 39 health centers and 144 Health posts in the zone. Majority of the zone is boarded with Oromiya region. In Gedeo Zone, Dilla Town and Dilla zuria district is 91 km and 96km away from regional Town, Hawassa and 360km and 365km from the capital city Addis Ababa respectively. Both Dilla town and Dilla zuria district has population of 84,930 and 121,151 respectively. Dilla town 84,930 population (male 41,615, Female 43314, <1year=2709, <3year=7059, <5 year= 13,258 and pregnant women=2939) and Dilla zuria District population 121,151 (male 60,333, Female 60,818, <1year=3865, <3year=10068, <5 year= 18,912 and pregnant women=4192). In addition, the total Households of the both Dilla town and Dilla Zuria district are 17,332 and 24,725 respectively. Administratively the Dilla town has 3 Kifle-ketama' and 9 kebele's and Dilla Zuraia District has one urban & 17 rural Kebeles. Both Dilla town and Dilla Zuria district have 2 & 5 Health Centers respectively. Dilla zuria district has 27 health Posts with potentials health coverage of 100%.

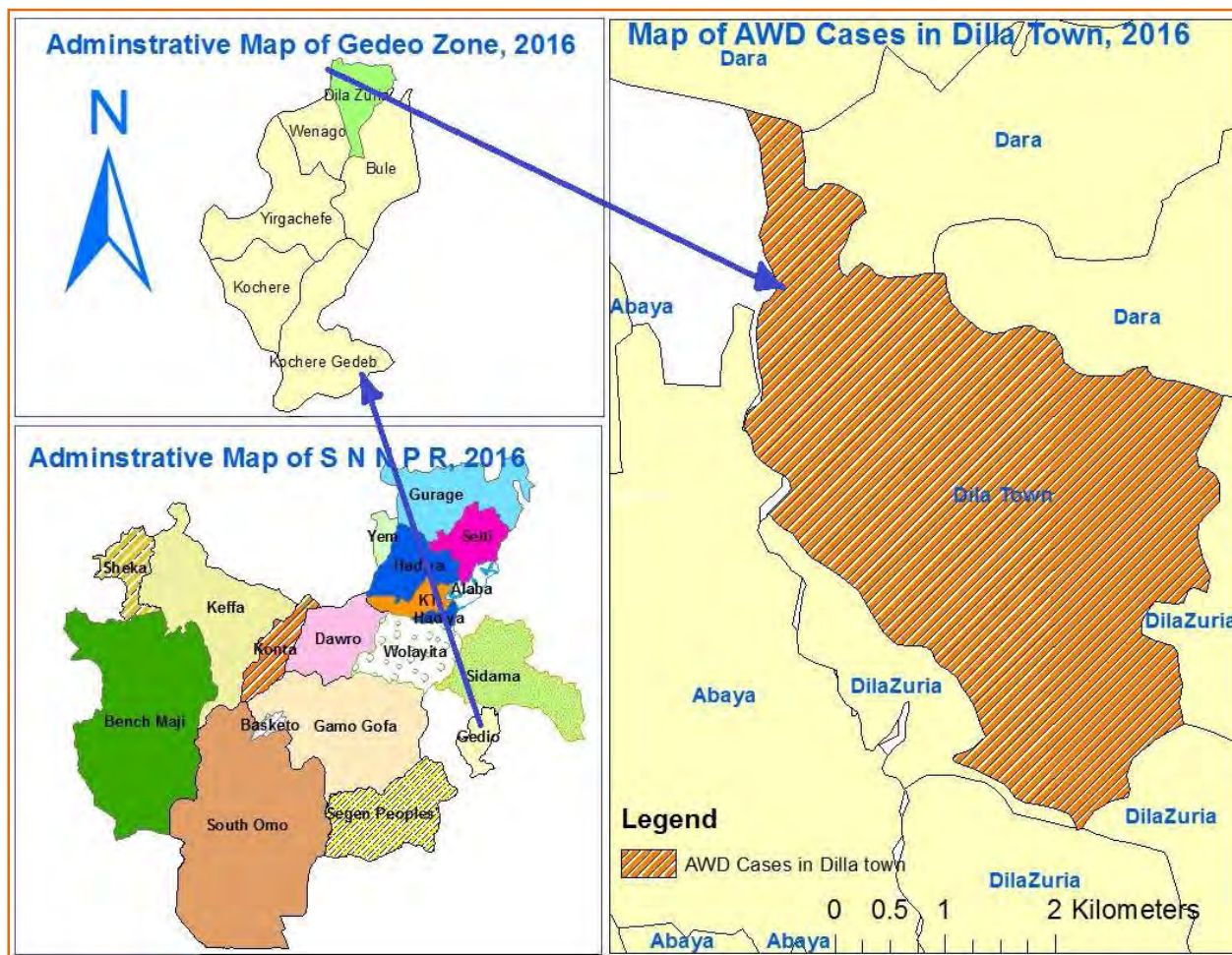


Figure 6: Background of Dilla Town Administration, Gedeo zone, July 2016

Study design

We conducted a 1:2 unmatched case-control study from July 5/2016 to August 7/2016. A case was any person who resided in both Dilla town and Dilla Zuria district and who developed AWD sign and symptom, or tested stool positive for AWD. A control was any person who resided in the same community or village with cases in both districts but who do not have history of signs and symptoms of AWD or tested stool negative between similar periods. If they develop sign and symptom, they will be a case. Case observation was made in Odaya CTC and active cases were searched for house to house. Surveillance reports and medical records were assessed and reviewed

Study subjects

Patients those who develop signs and symptoms of AWD and admitted and treated in Odaya CTC and during active case search from house to house those who developed sign and symptom and positive for AWD.

Sample size determination and Sampling procedure

We took all 68 cases in the community found during the investigation time and collect demographic and risk factor information for case control study. The remaining cases were found after we return and the line list sent to Regional bureau through the surveillance system. In the descriptive part, we took all cases listed by the District. Controls were neighbors of cases who did not suffer from AWD during the study period. Two controls for one case per household were selected from the neighbors of cases.

Data collection

The team engaged and interviewed, Zonal health department and districts Health Management Teams, Hospital management Teams, clinicians, nurses and Laboratory staff at all places visited. We reviewed records of cases (line list, OPD and admission folders) and conducted risk factor assessment of the cases. We followed-up cases into their residence and conducted environmental assessment of the communities.

Standardized questionnaire was used to collect demographic, clinical and exposure history from the cases and controls. Questionnaires were administered to the cases by trained data collector health workers and detected them in the AWD treatment center. Communities and neighborhoods of the cases were visited and interviewed the controls. Questions were asked about age, sources of drinking water, main source of food (whether home prepared or vended foods), hand washing practices, type of toilet use and household waste disposal practices from July 5/2016 to August 7/2016. For cases, data collected at Odaya CTC and house to house visiting those who are left (discharged) from the center before data collection date. But for controls house to house visiting are done during data collection with the same communities of those cases are found.

Data processing and analysis

Data obtained was entered in to Epi-Info version 7.1.4.0 and we used Epi-info and excel for calculating frequency, ratio, proportion, rate, odds ratio. Bi-variate analysis was used to assess the association between dependent and independent variables. We used logistic regression found in advanced statistics in Epi-Info to run multivariate analysis.

Training of data collectors

Four data collector (nurses) from health centers and one supervisor from district health office was received one day training before data collection.

Ethical clearance

Permission to carry out the study was obtained from SNNP regional health bureau, Gedeo Zone, then from Dilla town and Dilla zuria district health offices. Cooperation letter was written to the respective health facility by district health office. An informed oral consent was obtained from all study participants.

Study variables

Dependent variables

- ✓ status of an individual (case and controls)

Independent variables

- ✓ Socio-demographic characteristics of mothers/caretakers
 - Educational level
 - Occupational status
 - Marital status
 - Religion
- ✓ Age of patient
- ✓ Sex of patient
- ✓ residence
- ✓ Risk factors
 - Source of water
 - Travel history
 - Contact history
 - Family size
 - Knowledge of individuals

AWD Case Definition

Suspected case

It is most important to ascertain that all patients considered being AWD cases in fact have the same disease. According to the WHO case definition, a case of AWD should be suspected when:

- in an area where the disease is not known to be present, a patient aged 5 years or more develops severe dehydration or dies from acute watery diarrhoea;
- in an area where there is a AWD epidemic, a patient aged 5 years or more develops acute watery diarrhoea, with or without vomiting.

Confirmed case: A suspected case in which *Vibrio cholerae* O1 or O139 has been isolated from their stool.

Inclusion and exclusion criteria

Inclusion criteria

The participants of the study included all persons living in both Dilla town and Dilla Zuria district and confirmed with AWD or had epidemiological linkage with confirmed AWD cases detected during the outbreak and purposively selected community controls from the same neighborhood where the cases live.

Exclusion criteria

Those who refused to participate and not reside in the study area during interview period were excluded.

1.2.6 Result

Descriptive epidemiology

We identified a total of, 73 (30 females and 43 males) suspected and confirmed AWD cases with no death rate were reported by the district. Nine kebeles from Dilla town and 4 kebeles from Dilla zuria district were affected. Of the cases 43(58.9%) cases were male while the rest 30 (41.1%) were female. Crude attack rate was 6 per 10,000 populations. In which the attack rate was 7 per 10,000 in male and 5 per 10,000 in female populations. The AWD outbreak in Gedeo Zone, both Dilla town and Dilla Zuria district started during epidemiological week 27-week 34 of 2016 (from July 4/2016 to August 19/2016), seventy three (73) suspected and confirmed AWD cases reported. From these cases, 21 of them are tested by RDT, all of them are positive for test AWD.

The index case (the first confirmed AWD case in Dilla Town) was a 30 year old female patient from wolidena' kebele and she has history of travel to AWD active area which is called wonago district. The date of onset of diarrhoea was 3rd July 2016 and was admitted on 4th July 2016 at Odaya CTC. She survived the infection after being managed with Intravenous infusions, ORS, and doxycycline antibiotics. Stool specimen taken from her on the date of reporting tested positive for AWD *Vibrio cholerae* O1 of the Ogawa sub type. The evening prior to the onset of diarrhoea she ate potato and pea kollo (she is a kollo merchant which bring kollo from wonago and sold at Dilla Town streets).

As of July 5th-7th 2016 for 3 consecutive days no case was reported to the Odaya CTC. However, on the 8th July 2016 three (3) cases with profuse watery diarrhoea reported at Odaya CTC and three of them are tested positive by AWD Rapid Diagnostic test (RDT).

On July 9th 2016, further spread of the outbreak to other district and a 30 year male severely ill patient seen at Odaya CTC from Golla kebele of Dilla zuria district and also he was tested positive by AWD Rapid Diagnostic test (RDT). He was admitted to the Odaya CTC 9th July 2016 with diarrhoea, which started, or onset of day was before July 7th 2016 and he was treated at private clinics but he didn't get improvement. After the report of the 4th positive case in the same week 27, there was sudden upsurge of the AWD cases from week 28 onwards in both Dilla town and Dilla Zuria district. However, after several weeks later which is from week 33 onwards declining of AWD cases in the affected zone. This is as shown in the epi curve below

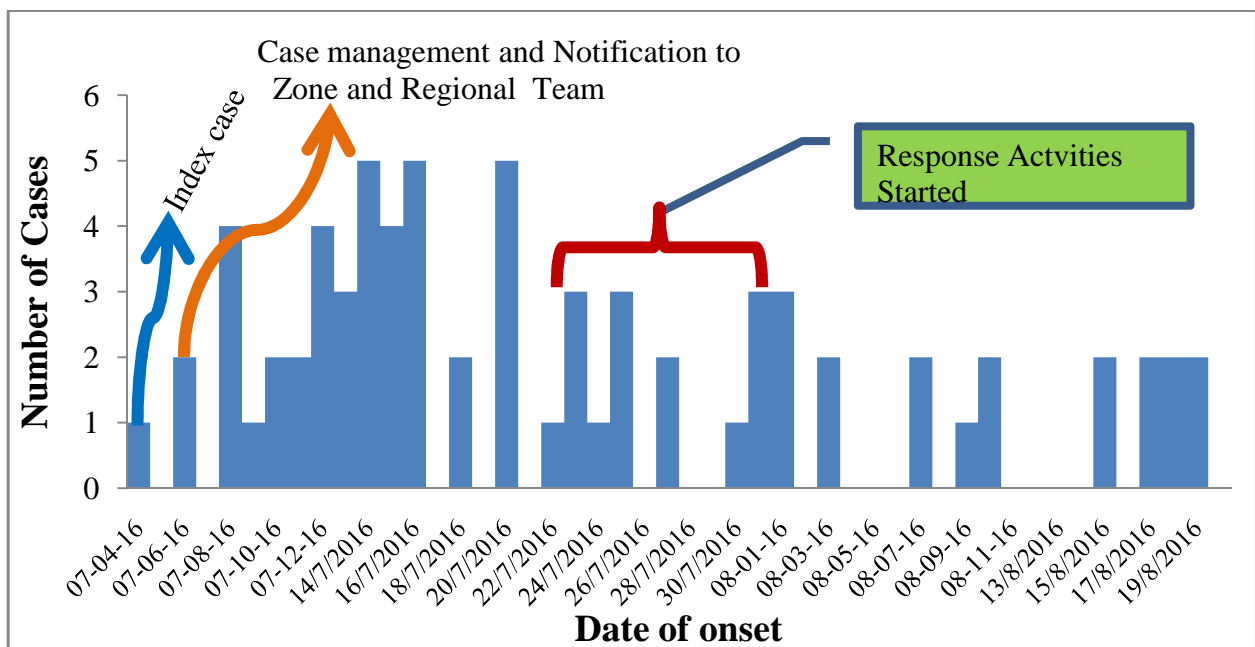


Figure 7: Epi curve of AWD cases by Date of onset, Dilla town and Dilla Zuria district, Gedeo Zone, July 2016

The epidemic curve (Figure 7) shows an intermittent type and it has multiple source outbreaks with increasing peaks starting in week 27 of 2016 (July 4-10, 2016) reaching the highest peak in week 28 (July 11-17, 2016) with the number of cases slightly declining in week 32 (August 8-14) onwards.

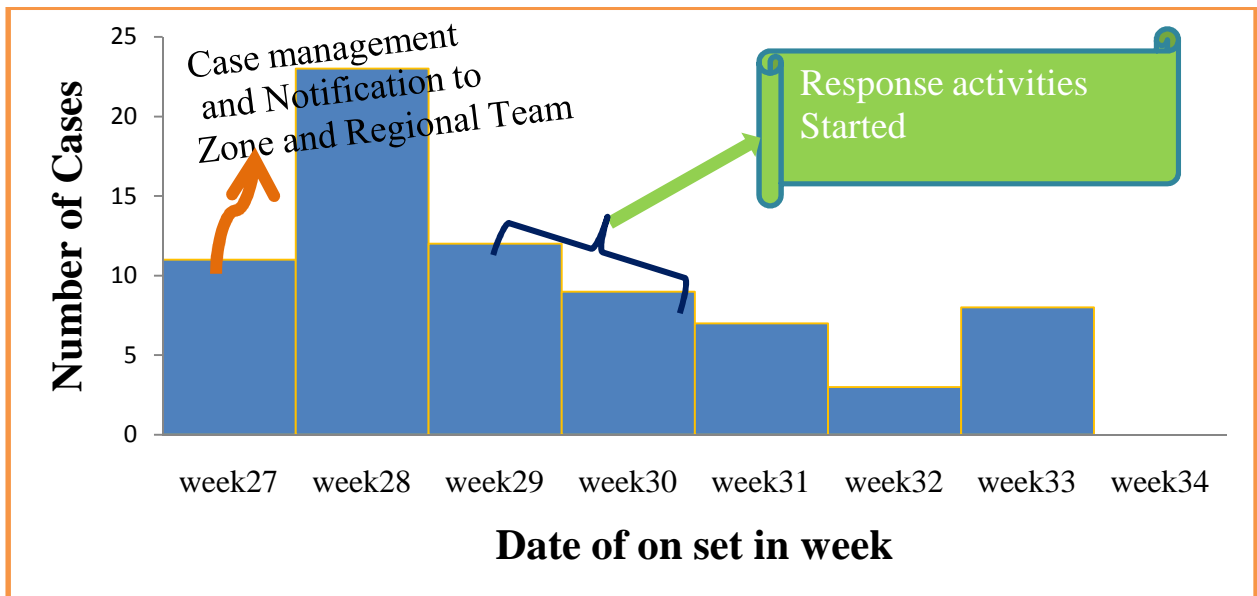


Figure 8: AWD cases by Date of onset in weeks, Dilla town and Dilla Zuria district, Geddo Zone, July 2016

Magnitude of Outbreak

The outbreak is spread within both Dilla town and Dilla Zuria district. A total of 73 suspected AWD cases, 21 confirmed with zero deaths were reported between 4th July and 19th August 2016. The overall attack rate was approximately 6 per 10,000 populations with sex specific attack rates of 7% and 5% for males and females respectively.

The most affected kebeles were Odaya kebele from Dilla town with attack rate of 20 per 10,000 and Golla kebele from Dilla Zuria district with an attack rate of 9 per 10,000.

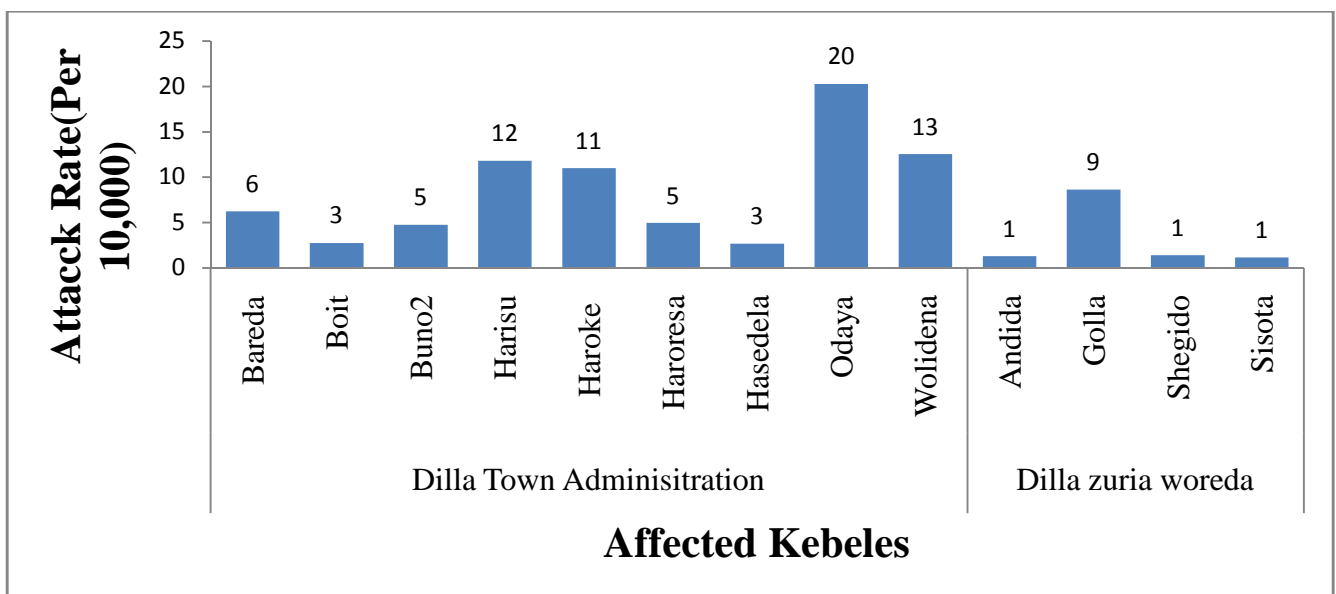


Figure 9: Attack Rate of AWD by kebeles during outbreak, both Dilla town and Dilla Zuria district, Geddo Zone, July-August 2016

Table 6: Number of AWD Cases and Deaths by Kebele in Dila Town, July 2016

Kebele	Population	Male	Female	Cases	AR per 10,000	Male Cases	Female Cases	SSAR Male Per 10,000	SSAR Female per 10,000	Death	CFR %
Dilla town											
Bareda	8009	3924	4085	5	6	1	4	3	6	0	0
Boit	10904	5343	5561	3	3	3	0	6	10	0	0
Buno2	8374	4103	4271	4	5	3	1	7	17	0	0
Harisu	5926	2904	3022	7	12	3	4	10	34	0	0
Haroke	7283	3569	3714	8	11	6	2	17	45	0	0
Haroresa	16145	7911	8234	8	5	5	3	5	6	0	0
Hasedela	15006	7353	7653	4	3	4	0	5	7	0	0
Odaya	6908	3385	3523	14	20	4	10	12	34	0	0
Wolidena	6375	3124	3251	8	13	5	3	16	49	0	0
Total	84930	41616	43314	61	7	34	27	8	2	0	0
Dilla Zuria district											
Andida	7563	3706	3857	1	1	0	1	0	3	0	0
Golla	10400	5096	5304	9	9	7	2	14	4	0	0
Shegido	7130	3494	3636	1	1	1	0	3	0	0	0
Sisota	8467	4149	4318	1	1	1	0	2	0	0	0
Total	33560	16444	17116	12	4	9	3	5	2	0	0
G. Total	118490	58060	60430	73	6	43	30	7	5	0	0

Distribution of AWD cases by place

The majority of cases were in the Odaya kebele (19%). Of the 73 AWD cases analysed in both Dilla town and Dilla Zuria district, 7% (5/73) were from Bareda Kebele. 4%(3/73)Boit Kebele, 5%(4/73) From Buno kebele, 10%(7/73)from Harisu kebele, 11%(8/73) from Haroke kebele,11%(8/73) from Haroresa kebele,5% (4/73) from Hasedela kebele, 19% (14/73) Odaya kebele. From all kebeles, 11 % (8/73) from wolidena kebele which is the first index case seen in Dilla town administration. After a few days, on 27th week (July 9th) other cases are seen Dilla zuria district at Golla kebele. 1 % (1/73) from Andida kebele, 12%(9/73) from Golla kebele which is bordered with Dilla Town. 1 (1/73) from shegido kebele and 1% (1/73) from sisota kebele are the least kebeles which the cases were seen. (Fig.4)

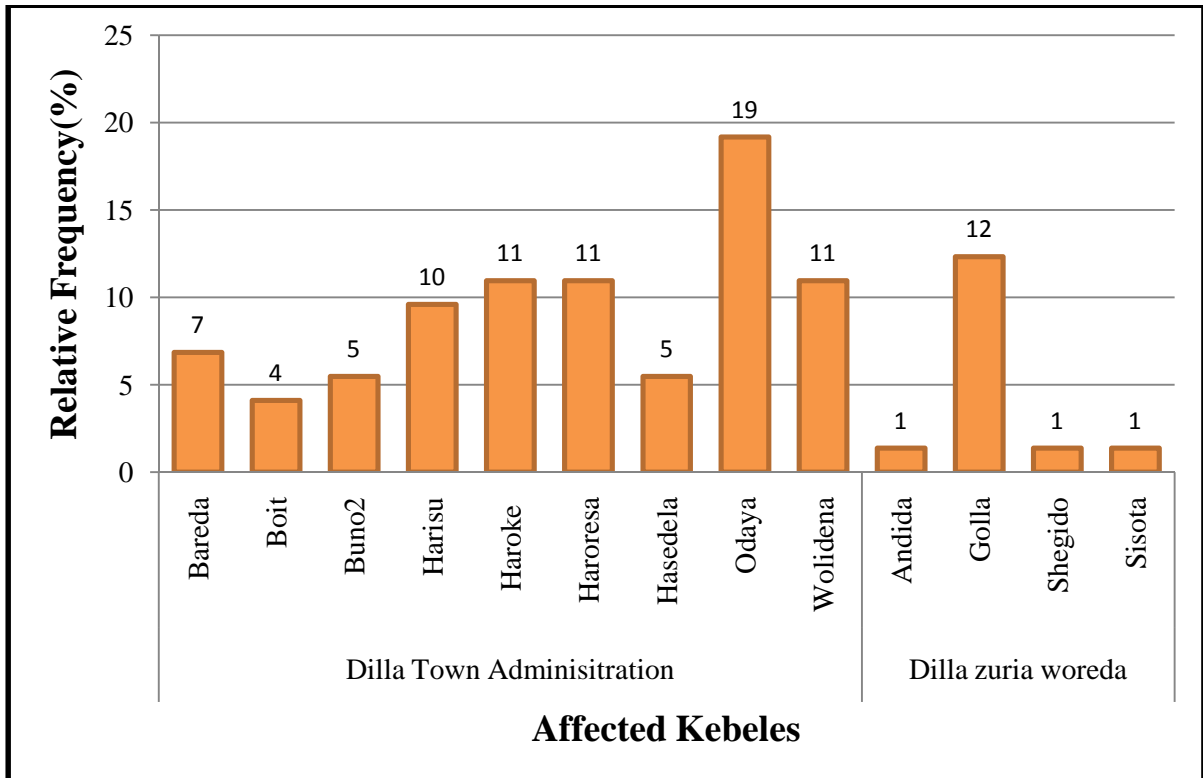


Figure 10: Distribution of AWD cases by kebeles, both Dilla town and Dilla Zuria district, Gedeo Zone, July-August 2016.

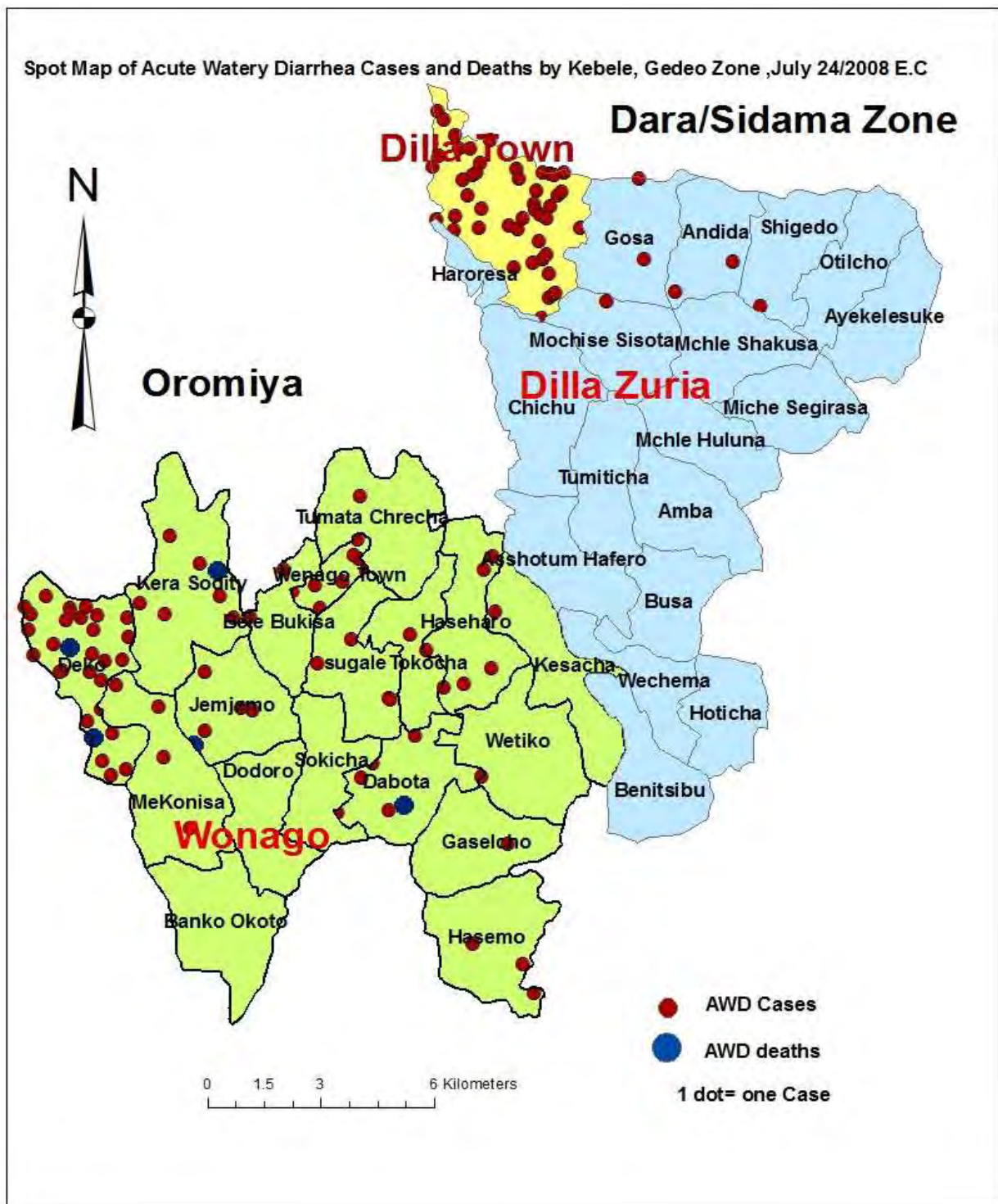
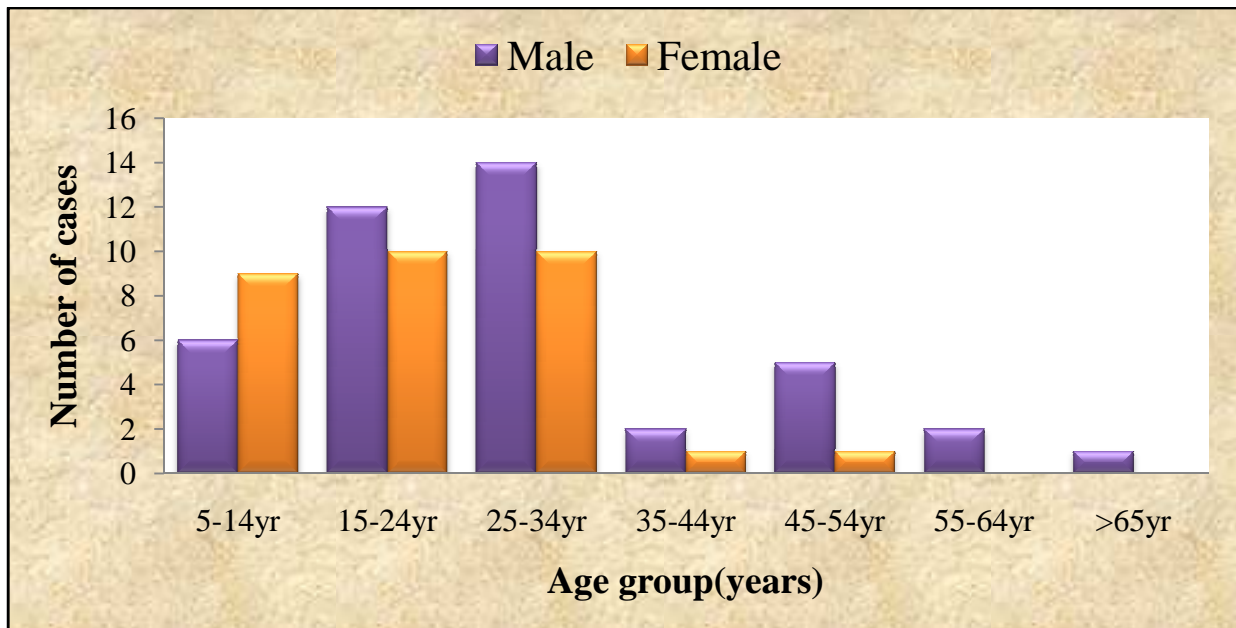


Figure 11: Spot map AWD (Acute watery diarrhea) cases by kebele, Gedeo zone, SNNPR, Ethiopia 2016

Age Sex Distribution of Cases

The affected ages ranged from 6 year to 70 years with a median of 24 years, mean 18.3 years and standard deviation of 13.5 years. The age group 25-34 years was the most affected; 24 (32.8%).

The least one (1.4%) affected age group was sixty-five years and above. From the affected population Males are the most affected group 43 (58.9%).



Distribution of AWD cases by Age and sex, both Dilla town and Dilla Zuria district, Geddo Zone, July-August 2016.

Level of Dehydration

All the cases were managed according to their level of dehydration, from all cases inpatient cases 44(60%) have severe dehydration, 26(36%) have some dehydration and among the cases 3(4%) have no dehydration (figure 7).

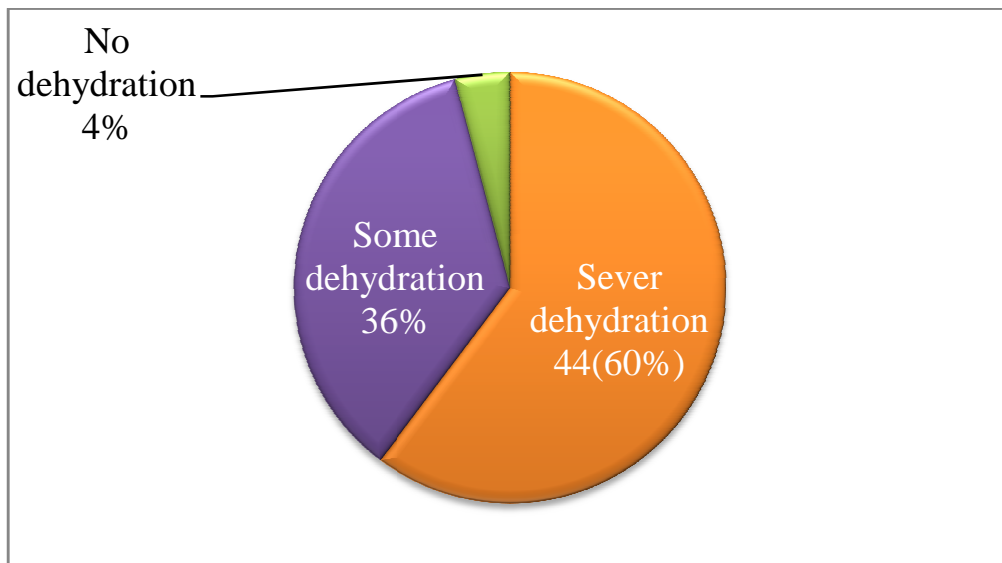


Figure 12: Percentage of dehydration levels of AWD patients in both Dilla town and Dilla Zuria district, Geddo Zone, July-August 2016.

Case-control study

We conducted a 1: 2 unmatched case-control study and the median age of the cases was 25 years ranging from 6 years to 70 years and IQR age was between 18 and 30years, while that of controls median age was also 30 years, ranging from 15years to 74 years. Twenty five (25) /36.76%/ cases and Eighty (80) /58.82%/ controls were females. 33(48.53%) cases of respondents and 112 (82.35%) controls of respondents were married. 10 (14.71%) cases and 37 (27.21%) controls were not attended any education.

Table 7:Demographic characteristics of AWD cases and controls, in both Dilla Town and Dilla Zuria district, Gedeo Zone, July-August 2016.

Variable	Category	Case n= 68 (%)	Control n= 136 (%)
Sex	Female	25(36.76%)	80(58.82%)
	Male	43(63.24%)	56(41.18%)
Marital status	Married	33(48.53%)	112(82.35%)
	Single	18(26.47%)	17(12.50%)
	Divorced	2(2.94%)	0
	Widowed	2(2.94%)	7(5.15%)
	Not applicable	13(19.12%)	0
Occupation	Daily laborer	43(63.24 %%)	26(19.12%)
	Farmer	2(2.94%)	16(11.76%)
	Gov Employee	1(1.47%)	13(9.56%)
	Private Employee	1(1.47%)	12(8.82%)
	House wife	5(7.35%)	35(25.74%)
	Merchant	3(4.41%)	20(14.71%)
	Student	11(16.18%)	14(10.29%)
	NA(for <5 children)	2(2.94%)	0
Level of education	Illiterate	10(14.71%)	37(27.21%)
	Read and write	0	4(2.94%)
	Elementary(1-8)	44(64.71%)	43(31.62%)
	Secondary School (9-12)	7(10.29%)	42(30.88%)
	Tertiary	5(7.35%)	10(7.35%)
	School(College+)		
	NA(for <5 children)	2(2.94%)	0
Religion	Muslim	7(10.29%)	11(8.09%)

	Orthodox	16(23.53%)	34(25.00%)
	Protestant	44(64.71%)	86(63.24%)
	Catholic	1(1.47%)	5(3.68%)

Signs and Symptoms	Number (%) N=68
Diarrhoea	68 (100%)
Vomiting	68 (100%)
Muscle Cramps	14 (20.59%)
General body weakness	12 (17.65%)

Risk Factors (case=68, controls=136) Bivariate analysis of risk factors for AWD in Annex4

In multi-variate logistic regression analysis, the risk factors that are statistically significant association for contracting AWD disease are - individuals have history of drinking water from river (AOR=20.58 CI 5.05-83.81). Those who ate raw fruits and vegetables (AOR= 4.14 CI 1.49-11.52). The presence of sick person in the house (AOR= 9.11 CI 1.29-64.44). The patients who have history of low educational status are more exposed to AWD (AOR= 5.43 CI 1.89-15.75). Daily laborers are affected easily by AWD (AOR= 3.18 CI 1.15-8.76), those who have knowledge of how to prevent AWD (AOR= 0.11 CI 0.02-0.53) and Purifying drinking water by chemicals (AOR= 0.028 CI 0.08-0.93) also have protective effect. (Table 9)

Table 8: Risk factors of multivariate analysis for AWD, in both Dilla town and Dilla Zuria district, Gedeo Zone, July-August 2016

Variable	Response	Cases	Controls	Crude OR(95%CI)	AOR	95% CI																																																																																						
*River water for drinking	yes	36	5	29.5(10.71-81.09)	20.58	5.05-83.81																																																																																						
	no	32	131				*Eating raw fruits and vegetables	yes	40	19	8.80(4.44-17.44)	4.14	1.48-11.52	no	28	117	*Any contact with cases	yes	14	3	12.53(4.48-35.01)	9.11	1.28-64.44	no	54	133	*Daily Laborer	yes	43	26	7.28(3.79-13.97)	3.18	1.15-8.76	no	25	110	*Knowledge of prevention of AWD	yes	3	66	0.05(0.009-0.16)	0.11	0.02-0.53	no	65	70	Did you have travel history to AWD area in the past 7 days?	yes	22	5	2.31(1.07-4.96)	2.77	0.46-16.36	no	46	131	*Educational Status (Elementary)	yes	44	43	3.8(2.14-7.33)	5.4341	1.88-15.75	no	24	93	*Is there any sick person in your house?	yes	14	3	11.5(3.18-41.60)	9.1064	1.28-64.44	no	54	133	*Are you purifying the water?	yes	1	31	0.05(0.006-0.38)	0.0279	0.08-0.93	no	67	105	Did you eat food from street?	yes	7	2	7.69(1.55-38.09)	35.25
*Eating raw fruits and vegetables	yes	40	19	8.80(4.44-17.44)	4.14	1.48-11.52																																																																																						
	no	28	117				*Any contact with cases	yes	14	3	12.53(4.48-35.01)	9.11	1.28-64.44	no	54	133	*Daily Laborer	yes	43	26	7.28(3.79-13.97)	3.18	1.15-8.76	no	25	110	*Knowledge of prevention of AWD	yes	3	66	0.05(0.009-0.16)	0.11	0.02-0.53	no	65	70	Did you have travel history to AWD area in the past 7 days?	yes	22	5	2.31(1.07-4.96)	2.77	0.46-16.36	no	46	131	*Educational Status (Elementary)	yes	44	43	3.8(2.14-7.33)	5.4341	1.88-15.75	no	24	93	*Is there any sick person in your house?	yes	14	3	11.5(3.18-41.60)	9.1064	1.28-64.44	no	54	133	*Are you purifying the water?	yes	1	31	0.05(0.006-0.38)	0.0279	0.08-0.93	no	67	105	Did you eat food from street?	yes	7	2	7.69(1.55-38.09)	35.25	0.92-1337.9	no	61	134						
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Public interventions- In Anex3

1.2.7 Discussion

The identified risk factors associated with AWD outbreak during the investigation period both Dilla town and Dilla Zuria district- drinking of river water, eating raw vegetables and fruits, low educational status, daily laborers, contact with cases, lack knowledge have associated with the risk of AWD in the Zone. AWD is one of the key indicators of social development and remains a challenge to countries where access to safe drinking water and adequate sanitation can not be guaranteed. For a AWD outbreak to occur, two conditions have to be met: there must be significant breaches in the water, sanitation, and hygiene infrastructure used by groups of people, permitting large-scale exposure to food or water contaminated with *Vibrio cholerae* organisms(18).

During the investigation period, both Dilla Town and Dilla Zuria district were drinking contaminated water from river significantly associated with higher rates of disease. AWD cases were twenty times more likely to have drunk water from river. This study is consistent with explosive AWD outbreak began in Haiti on October 20th, 2010 in the Artibonite river Delta the most likely cause of the outbreak was the consumption of contaminated water from the river(19). The significant association observed between eating raw vegetables and fruits were four (4) times more likely to have AWD as compared to the controls. This result is consistent with those that have been reported by other studies of AWD outbreak in Alborz Province, Iran (21).

The outbreak investigation shown that, the AWD outbreak affected all age groups in the affected area and more especially among young adult males; however, people in age 25-34 in both sexes are most affected. Why adults are more affected? This age groups move from place to place for different purposes like work, social issues and community gatherings like markets, mosques and churches. Male cases out number their female counter parts which are largely a function of male behavior since males are more likely to eat outside home foods. This is similar with the study done in Buea Health District in Cameroon (22).

Patients who have history of low educational status, low economic status (daily laborers) are affected easily by AWD. Moreover, those who have knowledge of how to prevent AWD have protective effect. This is similar with AWD outbreak in urban Bangladesh in 2011, Buea Health District in Cameroon and AWD outbreak in Ethiopia's Oromiya region. (22, 23, 24)

In addition to this, Knowledge of mode of AWD transmission significantly reduces the risk of acquiring AWD by almost 91% and those who have secondary and above educational status have found to be protective against acquiring AWD. This is also the same with, Alexander and

colleagues (25) reported that, higher levels of education were correlated with reduced risk for AWD hospitalization in both rural and urban Bangladesh (23).

Moreover, presences of sick person in their house and contact with cases have associated with the risk of AWD in both districts. This is consistent with other studies done in Iran also have found that the presence of a case at home is a risk factor and that family members can spread AWD via contact with food and water at home(21).

Zero case fatality rate recorded in both districts below the recommended percentage or target i.e (<1%). This indicate, Quality of care access to appropriate treatment and quality of care effectiveness (26)

1.2.8 Problems and challenges Identified

- ❖ Uneven/irregular distribution of water for Dilla Town this leads to utilization or consumption of river and unprotected spring water source.
- ❖ Maintenance problem of water supply systems
- ❖ Low community awareness about sanitation and hygiene at initial of the outbreak
- ❖ Previously less attention was given to sanitation campaign in the Town.
- ❖ Weak management of Waste collection and shortage of waste trucking
- ❖ Open defecation at rivers, Market area, sewerage ditches and communal residential areas
- ❖ Water pipeline and sewerage line installation is interconnected
- ❖ Poor waste disposal system management of prison and slaughter house
- ❖ Absence of public latrines at communal residential areas
- ❖ Existing Public and communal latrines as well as shower rooms were not functional in kofe Market area
- ❖ Inadequate Solid and liquid waste disposal areas
- ❖ Low awareness about Water treatment chemicals and its utilization
- ❖ Shortage of Households Water treatment chemicals (especially in areas where no improved drinking water sources)

1.2.9 Limitations

Controls were not tested for evidence of recent AWD infection. Because some AWD patients may remain asymptomatic for the duration of the infection, controls might have been misclassified despite the fact that they did not have diarrhea during the epidemic.

1.2.10 Conclusion

We confirmed, this outbreak resulted primarily from insufficient access to clean water and poor sanitation in Dilla town and Dilla zuria District. AWD outbreak affected all age groups in the affected area and more especially among young adult males; however, people in age 25-34 in both sexes are mostly affected. Risk factors that are identified during study period were drinking contaminated water from river, eating raw vegetables and fruits. In addition, patients who have history of low educational status, Low economic status (daily laborers), presences of sick person in their house and contact with cases, eating street foods and people who utilize water from river for cooking food and utensils have associated with the risk of AWD in the Zone. Therefore, the most likely vehicles of the AWD transmission in the zone was contaminated river water, eating of raw fruits and vegetables, street vended food and poor environmental sanitation.

1.2.11 Recommendation

- Preparation and consumption of food under hygienic conditions
- Avoid eating street vended food, avoid defecating in open field, use toilet facilities and maintaining effective hygiene standards
- Provision of safe water supply and water disinfection
- disinfecting vegetables and fruits
- Deliver health education to the community to create awareness regarding AWD mode of transmission and control mechanisms.
- Conduct regular Sanitation campaign.
- Effective coordination mechanisms and multi-sector approach with emphasis to outbreak affected and most at risk areas, effective surveillance, including active cases search and contact tracing

1.2.13 References

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Annex 3: Public health intervention done during AWD outbreak investigation in Dilla town and Dilla Zuria Woreda, Gedeo Zone, 2016

Risk factor assessment in House Holds, institutions, rivers and Open defecation areas.

There was generally poor environmental sanitation at all the communities where the cases reside. We observed crude dumping of refuse in most places and refuse containers full and overflowing, drains were saw with people openly defecating in them, and some water pipe lines laid directly through some of the drains. We observed broken sewage pipes with sewage leaking into the environment at some places. There were inadequate water supply from the Dilla Town Water Office; some taps were closed and people normally fetch with buckets and gallons and further stored in rubber bowls, gallons and Rotto' for use. We observed inadequate hand washing facilities.

Many food vendors were observed selling food along street food vendors outside home.

Area risk assessment done and problems Identified

A. Dilla Town prison house

- ❖ Leakage and overflowing of latrine with in short few days/3-5 days
- ❖ leakage in Liquid waste disposal system(liquid waste from the person leaked to river legadara



Photo of Sewerage Leakage from Dilla Preson house July 2016

B. Slaughterhouse

- ❖ Unhygienic compound (bones, and other wastes not properly desposed)
- ❖ Liquid waste disposal problems(blood)

C. Dilla Town Solid waste disposal

- ❖ No solid waste containers in most villages
- ❖ Improper house hold solid waste management

- ❖ Shortage of trucks to pick solid wastes to final disposal sites
- ❖ Waste containers were not emptied timely

D. Legadara & chichu Rivers

- ❖ Washing of Cars, and clothes that have potential of contaminating surface water
- ❖ The community used showering in the river
- ❖ Using river water for drinking and preparing `tej`, `keneto`, `Tela`, and `cheka`.
- ❖ Most house hold use water from these rivers for domestic purpose



Photo from community used showering in the river Legadara & chichu Rivers, July 2016

E. Sewerage system of Dilla Town;

- ❖ Most of the Dilla Town ditches are filed with solid waste and there is cross contamination with water pipe line leakage



Photo from Water line and sewerage system in Dila Twon July 2016

F. Open defecation areas

- ❖ legadara & chichu Rivers
- ❖ Kofe gebaya

- ❖ Kebele 07 communal resident areas
- ❖ Public latrines were not clean ,some locked due water problem

Coordination activities done

Outbreaks of acute watery diarrhea need integrated and aggressive response. In order to share role and responsibilities there should be coordination based on the required interventions. Two committees were organized for the prevention and control of the outbreak. The two committees have different role and responsibilities with common goal. The committees are Zonal/District emergency management committee, led by Zonal/district administrator, which focus more on administrative and leadership component; and the technical committee which encompass different technical expertise. The Zonal and District emergency management committee meet every other day and monitor the response activity and take decision based on technical reports presented. The technical committee led by zonal health Desk or District health office head and it organized to other sub committees by thematic areas. The thematic areas are:-

1. Social mobilization and awareness creation
2. Surveillance /Active case search
3. Hygiene and sanitation
4. Logistic management(Emergency preparedness)
5. Case management

Each subcommittee has plan and daily activity. The technical committee meets daily and hears daily activity reports and challenges from each subcommittee. Challenges that could not solved by the technical committee have been taken to the higher emergency management committee for decision.

Major areas of interventions attention

- I. Strengthening disease surveillance system and effective communication on cases management and referral system at kebele level to control and prevent the disease.
- II. Ensuring effective cases contact tracing and cases home disinfection
- III. Ensuring strong and capable different technical working groups are assigned for quality implementation of activities in priority technical areas of AWD prevention and control.
- IV. Strengthening social mobilization and advocacy interventions on awareness creation and promotion of practical application of safe water, hygiene and sanitation utilization in the community



Figure 13 Photo taken Joint planning meeting at Dilla Town July 2016

Social mobilization and Awareness creation

The social mobilization and Awareness creation team aware the community about acute watery diarrhea ,its sign and symptoms, mode of transmission ,prevention and control measures and actions to be taken if an individual got AWD. Methods used to deliver the message were; announcement using mobile van; house to house education during hygiene and sanitation utilization inspection and monitoring by kebele team(HEW, HW and kebele administrators); discussion with HDA and 1to 5 health networks; religious institutions; Teachers training colleges and distributing and posting of leaflets and posters in areas where public gathering exists.



Photo taken during health education at Teachers Training College in Dilla Town, July 2016

Surveillance and Active case search

The surveillance team which is led by zonal and District Public health Management head, collect information from all health institutions and communities on daily basis and organization.

Major activities done

- Training on AWD surveillance, outbreak investigation and response provided to hospital and health center health workers
- Standard case definition guide line provided to all CTC and HF especially for AWD affected Districts and health institutions.
- Contact tracing done for all active cases
- Active case search done on daily bases
- Disinfecting the house of cases
- Roomers verified (17 suspected AWD cases reported by the community)
- Data analyzed and timely communicated

Case Management

The case management team established 1 CTC at Odaya kebele, Odaya CTC and 1CTU at Dila Town. In order to minimize cross contamination and level of dehydration in all health Centers and health posts informed to prepare isolation room and ORP. Training was given on case and CTC management for health workers. Most of the cases admitted at Dilla Town Administration, Odaya kebele, Odaya CTC. Almost all cases were cured and return to their homes.

Hygiene and Sanitation

The hygiene and sanitation team in collaboration with the community implemented different important AWD prevention and control activities. Major activities done under this team was;-

1. Water quality control test

The microbiological water quality analysis result described in bellow table except Legadara treatment plant, Reservoir Dama School all water sources are contaminated with fecal origin contaminants. Therefore, it needs urgent response to improve the quality of drinking water in Dila Twon.

Table 9: Depicting microbiological Water quality analysis report July 17/2016

S.N	Zone	District	Source Number	Total Coliform at 37 ^{oc}	Fecal Coliform at 44 ^{oc}
1	Gedeo	Dila Town	Mariam sefer	Many	Many
2	Gedeo	Dila Town	Hanjiso Mender Hand pump	23	10
3	Gedeo	Dila Town	Millennium Bore hole	Many	Many
4	Sidama	Dara	Legedara River	Many	Many
5	Gedeo	Dila Town	Household Water	Many	Many
6	Gedeo	Dila Zuria	Chichu River	Many	Many
7	Gedeo	Dila Town	Legedara Treatment plant	0	0
8	Gedeo	Dila Town	Dama School Reservoir	4	0
9	Gedeo	Dila Town	Batamariam	0	o

Access and utilization of House hold, public & communal latrines

-House hold latrine Survey was done in AWD affected kebeles

-The existing but previously closed Public and communal latrines as well as shower rooms were maintained and functional in the emergency area

Dilla Town

Two previously existing non functional latrines with shower were maintained and now start utilization in the Town at kofe gebeya.

349 New hose hold latrines were constructed and maintained.

Dilla Zuria district

- 1243 new latrines constructed
- 268 public latrines rehabilitated

Water chemicals Dilla zuria district

- 285 HH water guard distributed

- 2820 HH Bishangari distributed

1. Community focus group discussion on Sanitation and hygiene

- ❖ Sanitation and hygiene Community sensitization was conducted in 9 Kebeles of Dilla Town and Dilla zuria district.

2. Sanitation campaign

- ❖ Sanitation campaign done in all 9 (Nine) Kebeles of dilla Town.

3. Proper management of Solid & Liquid wastes

- ❖ Liquid wastes /sewerage were sucked and disposed safely from Households, institutions, Slaughter house, Condominium houses, Hotels, etc

Food and drinking establishment inspection and Regulation Dilla Town July 2016

- ❖ 315 food handlers medically checked.
- ❖ 184 food and drinking establishments were inspected and the awareness on hygiene and sanitation orientation done in Dilla Town.
- ❖ 134 food and drinking establishments given the letter of warning.
- ❖ 22 food utensils were disposed.
- ❖ 13.5kg meat disposed.
- ❖ 42 bottles of packed drinks were disposed.
- ❖ 50 food and drinking establishments construct new liquid waste pits.
- ❖ One food and drinking establishments construct new latrine.
- ❖ 11 food and drinking establishments suck their latrines.

4. Water supply system.

- ❖ Daily 18,000 lit. Water was distributed for severely water shortage Kebeles Five sites like Kofe gebeya, Chiging tabiya, legedhara river, new prison and odolla kebeles by water truck.
- ❖ Three shallow wells were rehabilitated
- ❖ One Water Treatment Plant was installed at `Legedara` river.
- ❖ Eighteen/18/ bono`s maintained and start water supply.
- ❖ Thirteen/13 / Manholes were constructed in the dilla Town.
- ❖ Eight pipe line leakages were maintained.

Annex 4: Bi-vibrate analysis Table Exposures among (case=68, controls=136) for AWD cases and controls, in both Dilla town and Dilla Zuria district, Gedeo Zone, July-August 2016.

Variable	Response	Case	Control	OR	95% CI
Drinking water from river	yes	36	5	29.4750	10.7125-81.0991
	no	32	131		
Eating of raw fruits and vegetables	yes	40	19	8.7970	4.4376-17.4390
	no	28	117		
Having contact history with AWD cases	yes	22	5	12.5304	4.4846-35.0113
	no	46	131		
Purifying water by chemicals	yes	1	31	0.0506	0.0012-0.3213
	no	67	105		
Daily laborer	yes	43	26	7.2769	3.7896-13.9733
	no	25	110		
Educational status (elementary)	yes	44	43	3.9651	2.1441-7.3329
	no	24	93		
Presence of sick person in the house	yes	14	3	11.4938	3.1752-41.6067
	no	54	133		
Did you eat food from other house(street foods)	yes	7	2	7.6885	1.5517-38.0963
	no	61	134		
Do you think AWD is preventable?	yes	3	66	0.0490	0.0095-0.1631
	no	65	70		

Chapter II – Surveillance Data Analysis Report

1.1 2.1 Epidemiology of Malaria in kembata-Tembaro Zone, South, Nations, Nationalities, and Peoples Region, 2016: A Five Year Data Analysis From 2011-2015

Abstract

Background: Between 2000 and 2015, the number of malaria cases declined by 42% while the malaria death rate declined by 66% in the African Region. However, Malaria is a major public health challenge in Ethiopia, contributing 4% of all cases in Africa. It makes approximately 68% of the population the country at risk. Therefore, this surveillance data analysis needed to analyze magnitude, trends, and geographical distribution of the disease in Kembata-Tembaro Zone from 2011 to 2015.

Methods: A descriptive study was employed for analysis of data on malaria indicators from the Integrated Disease Surveillance and Response System database for the years 2011-2015. The surveillance data were analyzed to show incidence, trends and variation in risk by reporting woredas by using charts, graphs and tables.

Result: In the Zone, the average estimated annual prevalence of reported total malaria in the overall population was 69 per 1000 persons and confirmed malaria were 54 per 1,000 per year over the five years (2011 to 2015). As of the calendar years 2011-2015, the annual prevalence of total malaria report dropped from 119/1000 to 9/1000 and reported malaria in-patient admissions and deaths dropped from 1.7/1000 to 0.1 per 1,000 per year and 1.3/100,000 to zero respectively. In addition, laboratory test increases from 60% in 2011 to 90.2% in 2015.

Conclusion and recommendation: We conclude that the magnitude of Malaria in Kembata Tembaro Zone declined (dropped significantly from 119/1000 to 9/1000) from 2011-2015. From all woredas, kedida woreda is most frequently affected woreda in the Zone. Even though different malaria control strategies were designed to roll back to its minimum level in Kembata Tembaro Zone, still malaria cases were not decreased as expected. Therefore, the zonal health department should maintain such reduction in both morbidity and mortality due to malaria.

Key words: cross sectional; descriptive; malaria; Trends; Kembata Tembaro.

2.1.1 Introduction

Malaria is an acute febrile illness caused by a parasite known as Plasmodium. The disease is transmitted via the bites of infected mosquitoes. Of the four species that infect human beings, Plasmodium falciparum and Plasmodium vivax are the two most dominant malaria parasites in Ethiopia, accounting for 60% and 40% of all cases, respectively. Anopheles arabiensis is the main vector; Anopheles pharoensis is also widely distributed in the country and is considered to play a secondary role in malaria transmission. They are prevalent in all malarious areas in the country (usually below 2000 meters above sea level) with P.falciparum representing about 65-75% of the total reported malaria cases, relative frequency varying in time and space within a given geographical ranges. Symptoms of malaria include fever, headache, backache, joint pains and vomiting, usually appearing between 10 and 15 days after the mosquito bite. If not treated, malaria can quickly become life-threatening by disrupting the blood supply to vital organs. Key interventions to control malaria include: prompt diagnosis and effective treatment with appropriate antimalarial drugs, use of insecticidal bed nets; and indoor residual spraying of houses with insecticides to control the vector population (1).

Malaria were expanded across the world, the burden of malaria in countries sub-Saharan Africa has declined with scaling up of prevention, diagnosis and treatment (2). Up to 2 million people die of malaria around the world annually, mostly in Africa and half of them are children. An estimated 300-500 million cases of acute malaria occur each year globally. From these, 90 percent (2 million) malaria deaths occur in Africa, mostly in young children, especially in sub-Saharan Africa. It is the leading cause of mortality in African children under-five. The deadliest form of the malaria parasite, Plasmodium falciparum, is most commonly found in Africa. (3, 4, 5)

About 75% of the land and 60% of the population is exposed to malaria in Ethiopia. In most parts of the country, the peak periods of malaria incidence occurs from September to December, following the main rainy seasons (June-September), and from March to May, during and after the small rainy seasons (February-March)(6). Ethiopia is generally considered as a low- to-moderate malaria transmission intensity country. However, the health sector in Ethiopia is greatly affected by climate change which has profound consequences on the transmission cycles of vector-borne infectious diseases like Malaria. Due to the unstable and seasonal transmission of malaria in the country, protective immunity of the population is generally low and all age groups

are at risk. Prevalence of malaria is currently estimated to be 1.3% (Ethiopia Malaria Indicator Survey 2011).

Ethiopia has achieved remarkable progress in the fight against malaria during the most recent decade through strong preventive and case management interventions with large engagement of the Health Extension Workers (HEWs) and the Health Development Army (HDA) volunteers providing community based care at the household level.

In 2010, the Federal Ministry of Health (FMOH) reported 4,068,768 clinical and confirmed malaria cases to World Health Organization (WHO) as recorded in the 2011 World Malaria Report (7- 8). Since 2005 the Ethiopian National Malaria Control Program has considerably scaled-up, it had brought considerable impact on malaria in-patient cases and mortality. In children under five years of age, malaria admissions and deaths fell by 81% between 2001 and 2011 and 73% respectively. The country is also one of the few sub-Saharan countries that have shown progress in the fight against malaria and in attaining the MDG 6c: halt and begin to reverse the incidence of malaria and other major diseases by 2015(9).

WHO has been actively supporting the Federal Ministry of Health of Ethiopia (FMoH) in the fight against malaria. Among other contributions, WHO have been providing technical support in building the capacity of health of workers, programme monitoring, review and evidence generation, resource mobilization, supportive supervision at all levels, as well as supporting the revision and updating of strategic documents and guidelines. MoH and WHO have jointly developed a new stratification map using health facility based surveillance data (10). So that Public health surveillance plays great important roles in reduction of morbidity and mortality of malaria by ongoing, systematic collection, analysis, interpretation and dissemination of data regarding to health-related event for use in effective and efficient.

This continuous analysis of surveillance data is important for detecting outbreaks and unexpected increases or decreases in disease occurrence, monitoring disease trends, and evaluating the effectiveness of disease control programs and policies. This information is also needed to determine the most appropriate and efficient allocation of public health resources and personnel. Routine malaria surveillance data is useful for assessing incidence and trends over time, and in stratification for targeting of malaria control.

This analysis tried to assess trends of malaria morbidity and mortality by place, person and time in Kembata Tembaro Zone, SNNPR, 2016.

2.1.2 Literature review

According to WHO 2015 report, Rates of disease have decreased from 2000 to 2015 by 37%, but increased from 2014 during which there were 198 million cases. Malaria is commonly associated with poverty and has a major negative effect on economic development. In Africa, it is estimated to result in losses of US\$12 billion a year due to increased healthcare costs, lost ability to work, and negative effects on tourism (11).

Study showed that the burden of malaria in Africa, Malaria mortality in under-5 children almost doubled in eastern and southern Africa over the period 1990–1998 compared with 1982–1989. It is known that the prevalence of malaria infections caused by chloroquine-resistant parasites increased substantially from the late 1980s in these same areas (12).

The reduction of malaria cases from 2004 coincides with the increased availability of the new effective drug Coartem for the treatment of *P. falciparum* malaria at national and local levels. Other possible reasons for malaria reduction during this period (2005–2008) might be due to the increased attention to malaria control and preventive activities by different responsible bodies, increased awareness of the community on use of ITNs, increment of budget for malaria control and prevention activities (personal communication) and climate change at national and international level (13)

According to WHO African Region reports: The most of the global burden of malaria in 2015, 88% of global cases and 90% of global deaths occurred in the African region however between 2000 and 2015, the number of malaria cases declined by 42% while the malaria death rate declined by 66% in the African Region. This reduction is due to improved availability and use of insecticide-treated nets, diagnosis-based treatment with artemisinin-based combination therapy, engagement of communities in malaria control, and strengthening capacity in vector control for malaria (14).

About 75% of the land and 60% of the population is exposed to malaria in Ethiopia. Ethiopia is generally considered as a low- to- moderate malaria transmission intensity country. However, the health sector in Ethiopia is greatly affected by climate change which has profound consequences on the transmission cycles of vector-borne infectious diseases like Malaria. Due to the unstable and seasonal transmission of malaria in the country, protective immunity of the population is generally low and all age groups are at risk. Prevalence of malaria is currently estimated to be 1.3% (15).

2.1.3 Rationale of the study

Kembata Tembaro, as one of the zone with high burden of malaria experienced and remain as the major diseases of burden with a high rate of outpatient consultation in 2004EFY [2012/13] of the region.

In relation to this, Malaria is one of the epidemic prone diseases tracked by PHEM surveillance system. Hence, this surveillance data analysis was done to review the epidemiology of Malaria in Kembata Tembaro Zone from 2011-2015 in order to see the trend and seasonality, to assess the burden and distribution, and to make possible recommendation in an attempt to improve the future interventions against the disease.

2.1.4 Objectives

General objectives:

To assess the epidemiology of malaria in Kembata Tembaro Zone from 2011-2015 G.C

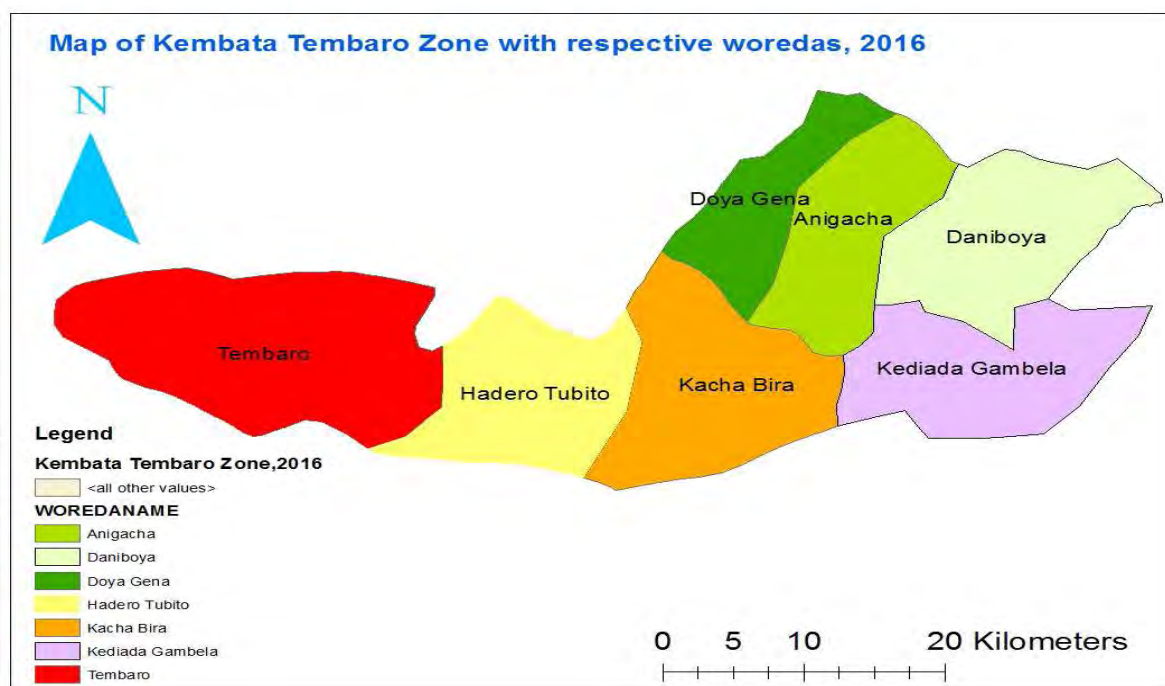
Specific objectives:

- To describe malaria morbidity and mortality by person, place and time
- To assess the distribution of malaria species

2.1.5 Materials and Method

Study area and population:

Kembata- Tembaro zone is one of the central zones of SNNPR located in the south west direction from the regional capital, Hawassa, and about 350 kms away from Addis Ababa in the south direction, bordered with Halaba, Hadiya, Dawro and wolayita zones in the east, north, west and south respectively. The total population of the zone was 857,375. Administratively there were 7-rural Woreda and 1-town administration. Durame town administration and 6- rural woredas are known malaria endemic areas. Out of these areas, 4-rural woredas are hot spot woredas (Kedida-Gamela, Kacha-Bira, Hadero-Tunto, and Tembaro). Regarding to health facility distribution in the zone, there was 1-Hospital, 33-governmental health centers, 3-NGOs health centers, and 133- health posts and the potential health service coverage of the zone was 100%.



Map of Kembata Tembaro Zone with Respective Woredas, SNNPR, 201

Study Design and Sampling procedure

Descriptive cross sectional study design were used to assess data from PHEM reporting format which includes malaria items encompassing total malaria cases (clinical and confirmed) for out-patients, in-patients and deaths; confirmed out-patient malaria cases by species; in-patient cases and deaths for malaria. All are given by age group <5 years and >=5 years indicators. Incidence estimates for summary malaria indicators by year and month were obtained by summing the appropriate indicator over the time period in question using the relevant population denominator (population at malaria's area) for each reporting unit.

Data collection and management: five year Malaria secondary data (2011-2015) was obtained from SNNPR PHEM surveillance database, furthermore, data cleaning was done and finally analysis was carried out by using Microsoft Office Excel 2007.

Sample size

All Malaria cases included during 2011-2015 and reported to region.

Data processing and analysis technique:

Microsoft Excel 2007 was used and all eligible key indicators were entered manually and finally data were organized, analyzed and displayed in different Figures (charts, graphs and tables).

Study period: We conducted a retrospective secondary surveillance data analysis from 2011-2015

Data dissemination: Witten report(hard and soft copies) was prepared and shared to Addis Ababa university school of public health, Regional Health Bureau, and Ethiopia Field Epidemiology Training program resident advisor and coordinator.

Expected outcome: The number of cases and deaths analyzed descriptively from 2011-2015, disease distribution by woredas. Conclusions made and possible recommendation suggested. Findings were communicated to the responsible body for appropriate action.

Ethical consideration

This five-year data were collected after having written consent letter from SNNP Regional Health Bureau to zone to get ethical clearance. After discussing the purpose and method of the study, permission was sought from the Kembata Tembaro Zonal health department head before the data collection.

Inclusion criteria All Malaria reported cases and deaths from 2011 – 2015 in
Kembata Tembaro Zone

Exclusion criteria All cases and deaths reported to Kembata Tembaro Zone
before 2011 and after 2015.

Case Definition:

Suspected Case Definition:

Any person with fever or fever with headache, rigor, back pain, chills, sweats, Myalgias, nausea, and vomiting diagnosed clinically as malaria (16).

Confirmed Case Definition:

A suspected case confirmed by microscopy or RDT for plasmodium parasites (16)

Presumed malaria (clinical malaria):

Suspected malaria case without a diagnostic test to confirm malaria but treated presumptively as malaria.

Total Malaria Outpatient-it is the total malaria (either clinical or by confirmation)

Population at risk: Populations at high risk for malaria are those living in areas where the number of reported cases is ≥ 1 per 1000 per year, and those at low risk are living in areas with < 1 case of malaria per 1000 per year (defined at the lowest administrative level for which data are provided). Other parts of the country are free of malaria transmission.

2.1.6 Results

Distribution by person

During the last five years, total of Malaria cases of 277,980 outpatients, 3840 in-patient and 17 deaths were recorded from 2011-2015 in Kembata Tembaro Zone.

Year	Population	Total Malaria Outpatient Cases	Total Malaria inpatient Cases	Total Malaria Deaths	TM Suspected Fever Examined	P.Falciparum	P.Vivax
2011	763,316	89821	1306	10	121323	34068	19419
2012	792,999	126093	1801	5	257191	69156	39886
2013	817,675	34622	494	1	147996	15255	15700
2014	843,162	19,504	171	1	129,914	8,989	9,747
2015	869,487	7,940	68	0	65,324	3,276	4,354
		277,980	3,840	17	721,748	130,744	89,106

The confirmed malaria cases also has increased from 2011 to 2012, 70 to 138 per 1000 person and 2013 to 2015 dropped from 38 to 9 per 1000 person respectively (Table 11).

Table 10: Total Malaria Out patient, IPD and Mortality of Malaria in Kembata Tembaro Zone, SNNPR 2011 -2015

Malaria Cases	Years in G.C				
	2011	2012	2013	2014	2015
Major Malaria Indicators					
Total Malaria Outpatient cases/1000	119	161	42	23	9
Malaria Inpatient cases /1000	2	2	1	0.2	0.1
Confirmed Malaria cases /1000	70	138	38	22	9
Malaria Inpatient death /100,000	1.3	0.6	0.1	0.1	0

Distribution by place

During the five years data analysis the most affected woredas in 2012 are Tembaro, Kachabirra, Hadero-Tunto, Durame town and Kedida-Gamella 264, 166, 163, 144 and 139 per 1000 respectively. The rest woredas are the least affected and they are not categorized as hot spot woredas regionally. From all woredas in the Zone, Tembaro, Kachabirra, Hadero-Tunto, Durame town and Kedida-Gamella woredas are the most affected woredas from 2011-2015.

Table 11: Distribution of malaria cases per 1000 by Woredas, kembata Tembaro Zone, SNNPR 2011-2015

Woredas	2011	2012	2013	2014	2015
Angacha	39	72	51	25	28
Damboya	22	33	23	11	14
Doyogena	13	17	24	14	14
Durame town	249	144	101	38	5
Hadero Tunto	65	163	50	13	14
Kachabira	46	166	48	19	19
Kedida Gamella	71	139	112	61	57
Tembaro	54	264	60	23	13

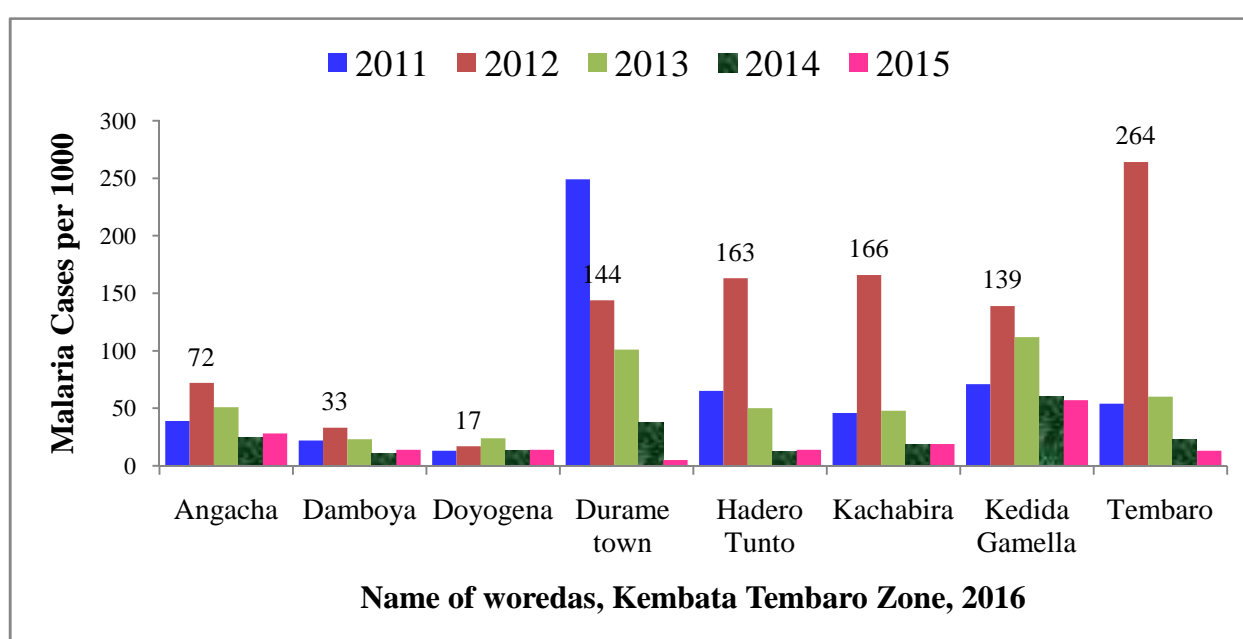


Figure 14: Distribution of malaria cases per 1000 by Woredas, Kembata Tembaro Zone, SNNPR 2011-2015

From figure 14, we are easily understand Tembaro, Durame town, kedida, Kachabira and Hadero Tunto woredas reported the high malaria over the past five years. The rest were not registered as the hot spot woreda's in this Zone. Tembaro woreda and Durame town were highly affected woredas with average annual incidence 264 and 249 per 1000 persons in 2012 and 2011 respectively. Followed by Kedida Gamella, Hadero Tunto and Kachabira woredas with the average of 73-166 per 1000 population in the same year, but from all woredas, kedida woreda is most frequently affected woreda in the Zone from 2011-2015 (See table: 12).

Table 12: Average Number of Malaria Cases by woredas, Kembata Tembaro Zone, SNNPR 2011-2015

	Angacha	Damboya	Doyogena	Durame town	Hadero Tunto	Kachabira	Kedida	Tembaro
2011	3821	2025	1128	6819	7135	5835	7076	6390
2012	7334	3138	1588	4440	18,819	21,959	14,345	32,274
2013	5397	2238	2232	3268	5926	6522	11,873	7555
2014	2683	1143	1339	1289	1639	2691	6683	2966
2015	3129	1422	1431	193	1801	2749	6379	1789
Total	22364	9966	7718	16009	35320	39756	46356	50974
Average	4472.8	1993.2	1543.6	3201.8	7064	7951.2	9271.2	10194.8

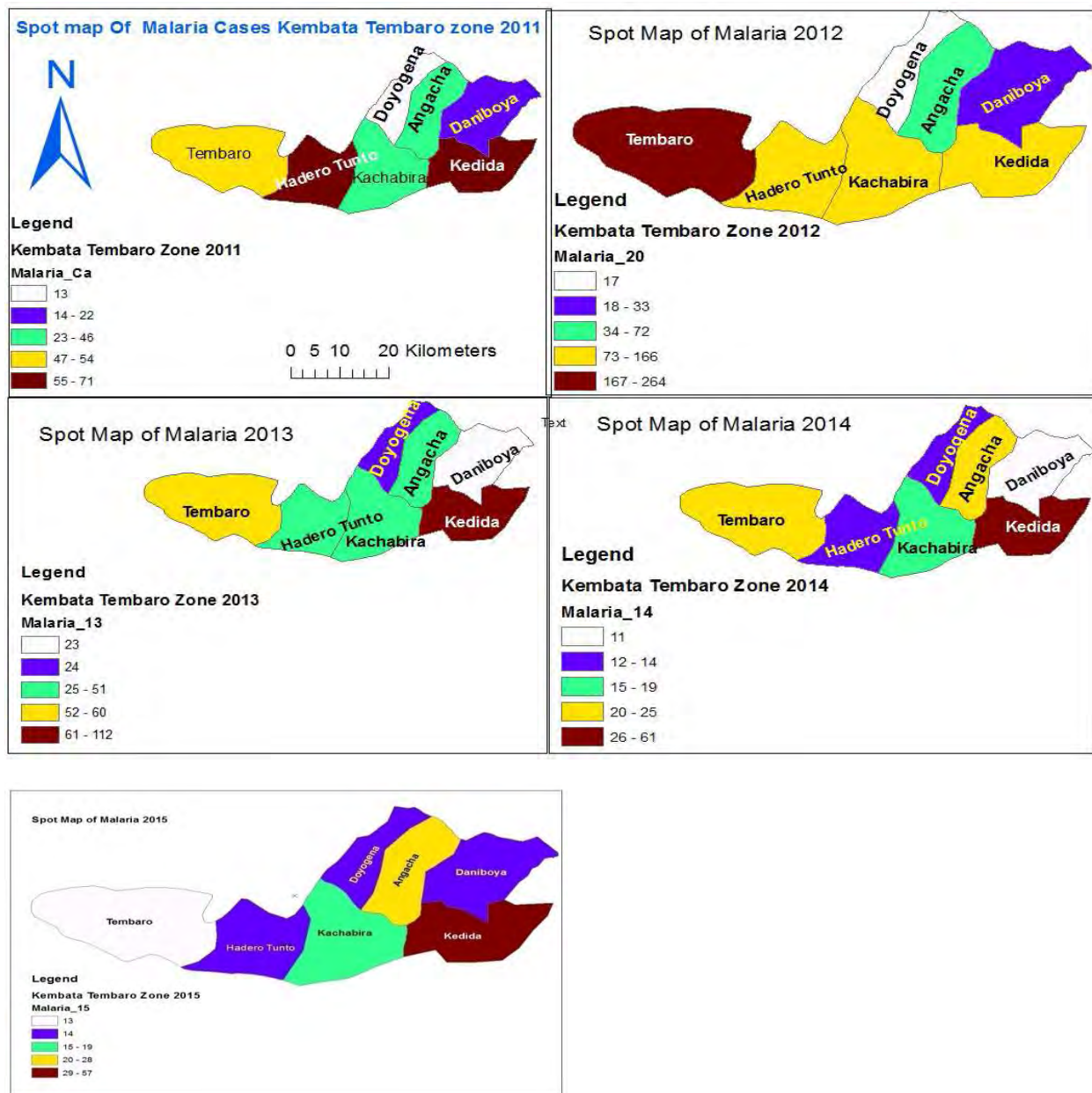


Figure 15: Distribution of Average incidence/1000 of malaria by Woredas, Kembata Tembaro Zone 2011-2015

Distribution by Time

In the Zone, the average estimated annual incidence of reported total malaria in the overall population was 69 per 1000 persons and of confirmed malaria were 54 per 1,000 per year over the five calendar years 2011 to 2015.

The analysis of the annual incidence over the years suggested, the average estimated incidence of reported total malaria for the calendar years (2011-2012) has increased from 119 to 161 per 1000 persons, on the other hand (2013- 2015) declined, 42 to 9 per 1000 persons (Table 11)

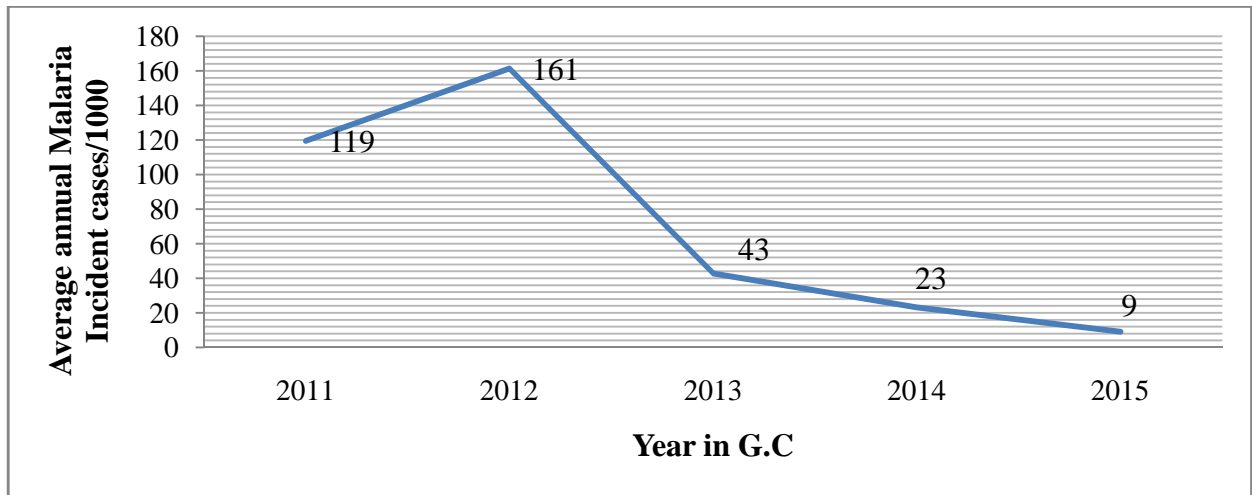


Figure 16: Clinical plus confirmed malaria cases per 1000 population Kembata Tembaro Zone, SNNPR, 2011-2015

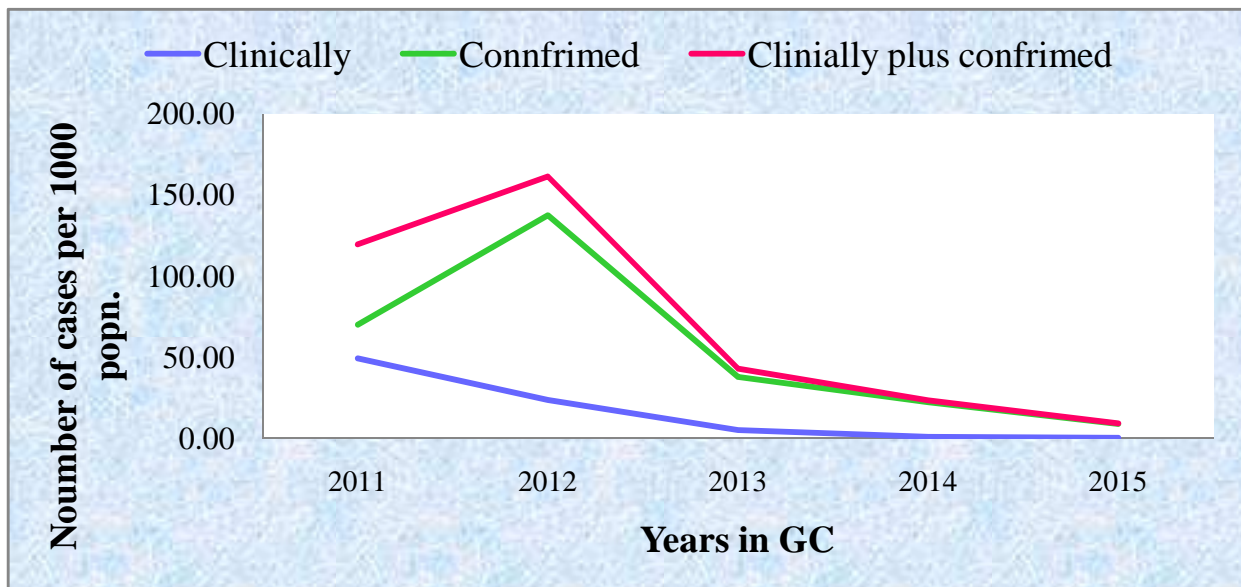


Figure 17: Average annual malaria clinical + confirmed cases per 1000, Kembata Tembaro Zone, SNNPR, 2011-2015

In the above figure 17, from 2011 to 2012 clinically, Confirmed and both clinically plus confirmed cases were increased, and then from 2013 to 2015 decreased steadily.

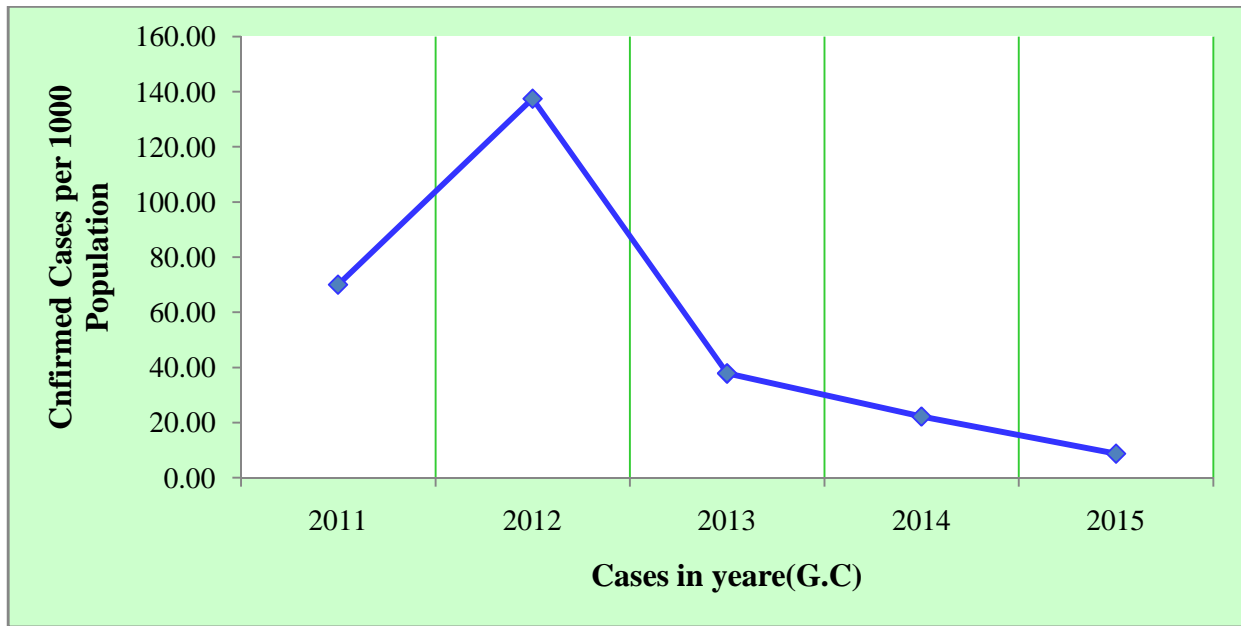


Figure 18: Average malaria confirmed cases per 1000 population, Kembata Tembaro Zone, SNNPR, 2011-2015

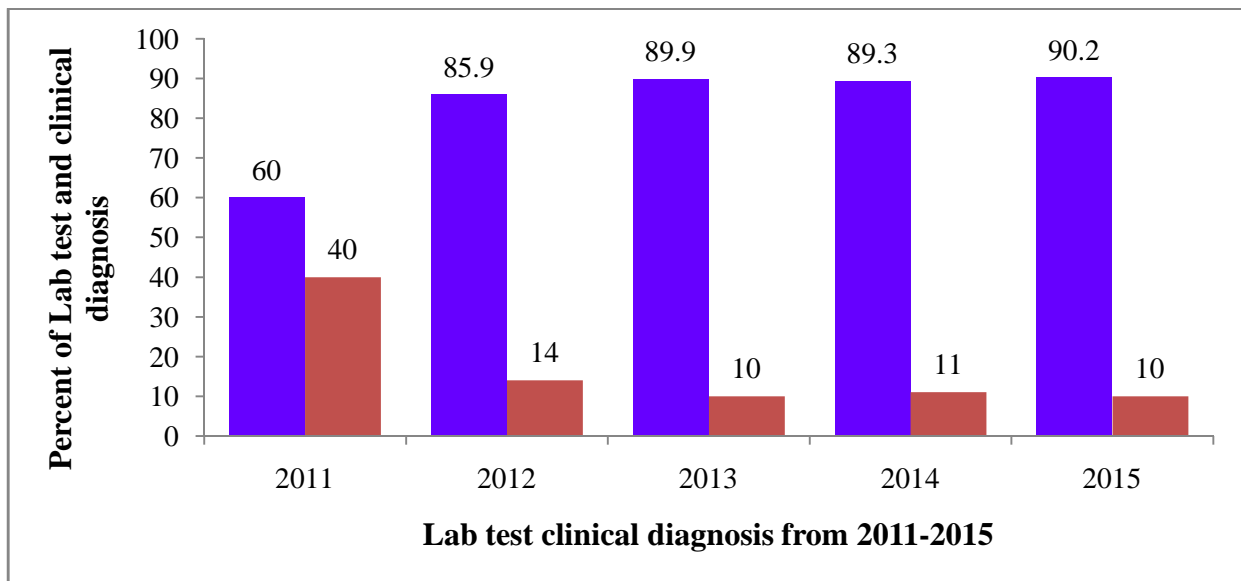


Figure 19: Malaria Lab test and clinical diagnosis of Kembata Tembaro Zone, from 2011-2015

Malaria tested by laboratory test increases from 60% in 2011 to 90.2% to 2015. But clinical diagnosis of the patient decreased significantly (from 40% to 10%) in the past five years.

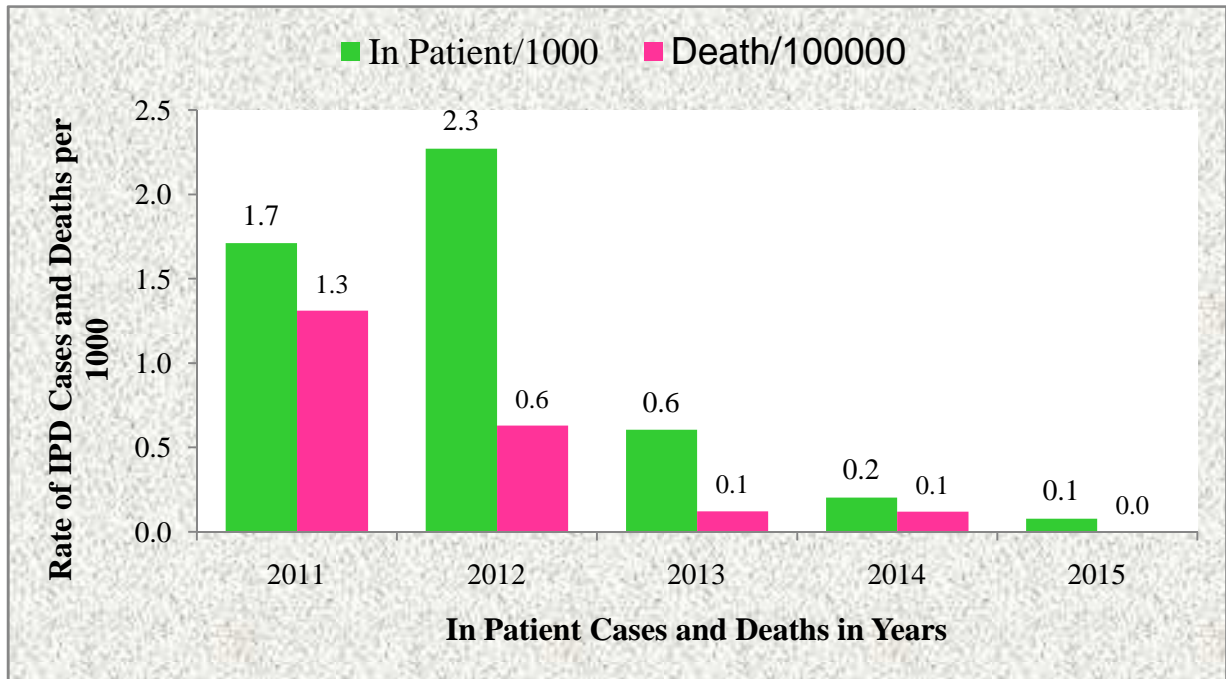


Figure 20: Death rates of malaria cases in Kembata Tembaro Zone from 2011- 2015

The IPD rate increases from 1.7 per 1000 in 2011 to 2.3 per 1000 in 2012 then decreases dramatically from 2.3/1000 population in 2012 to 0.1/1000 in 2015. Malaria death rates was 1.3 per 100, 000 in 2011 then decreases 0.6 per 100,000 in 2012 to 0.1 per 100,000 in 2014 and then decreases to zero in 2015. Fig 6

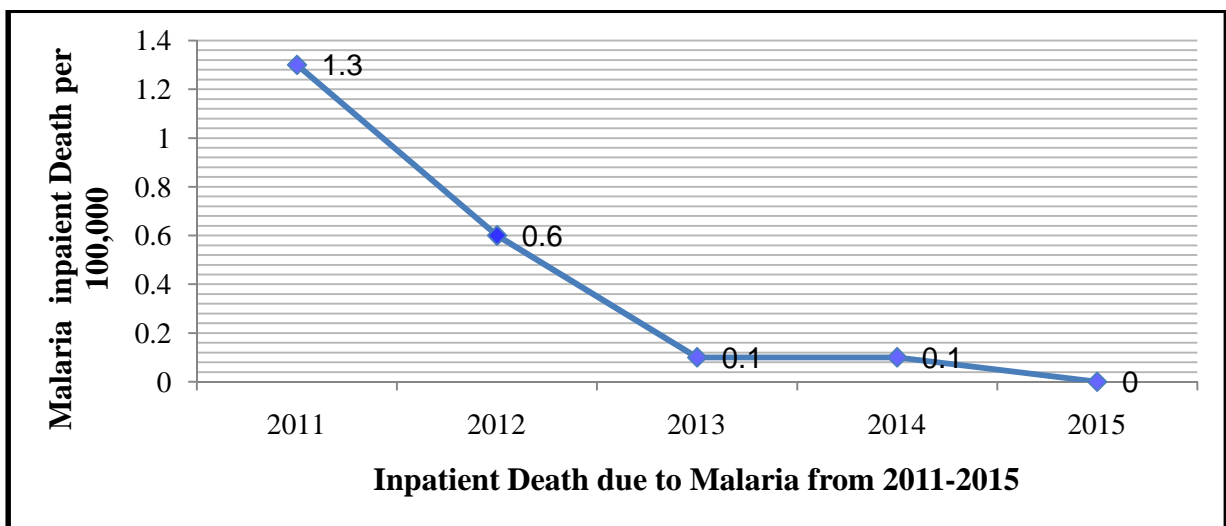


Figure 21: Death rates due to malaria in, Kembata Tembaro Zone from 2011- 2015

In general, from above figures and tables the trend of malaria morbidity in the zone does indicate the higher reduction both in outpatient, inpatient and death shows a higher reduction in relative to the previous time.

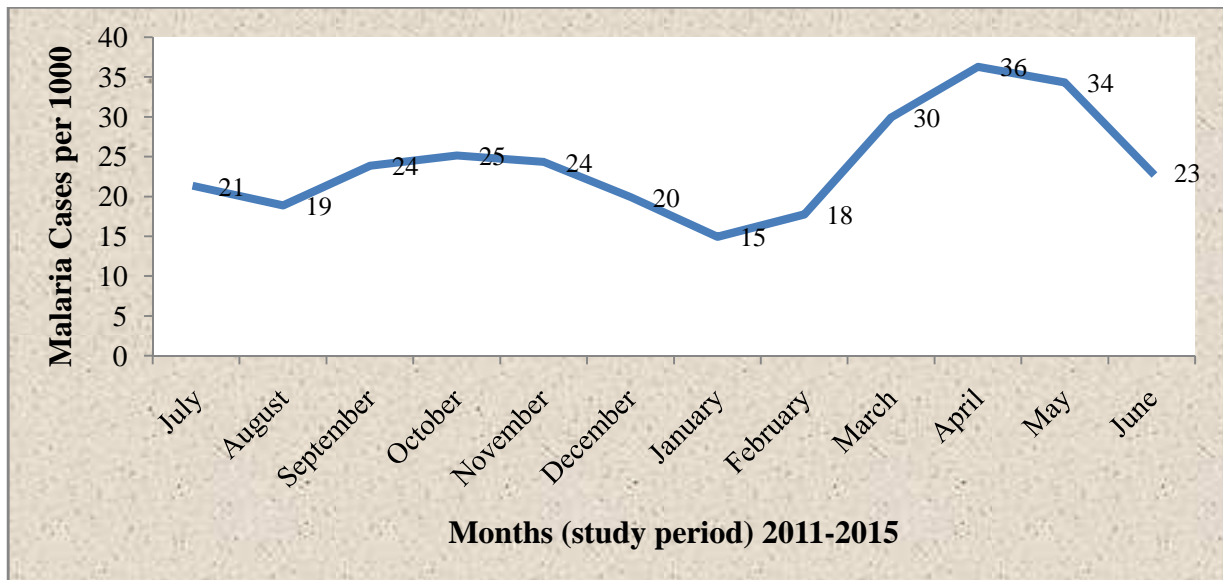


Figure 22: Malaria cases per 1000 Population by months, Kembata Tembaro Zone, 2011-2015

As Figure 22 depicts malaria incidence increased from 19 to 24/1000 persons from September-December, this indicated, the peak of malaria illness incidence usually follows the main peak rainfall season (June to September), major planting and harvesting season. Its peak occurs at October which is 25 per 1000 population. The second peak start from March to May increased from 30 to 34 per 1000 persons and its peak occurs at April, which is 36 per 1000 population following erratic rainy season.

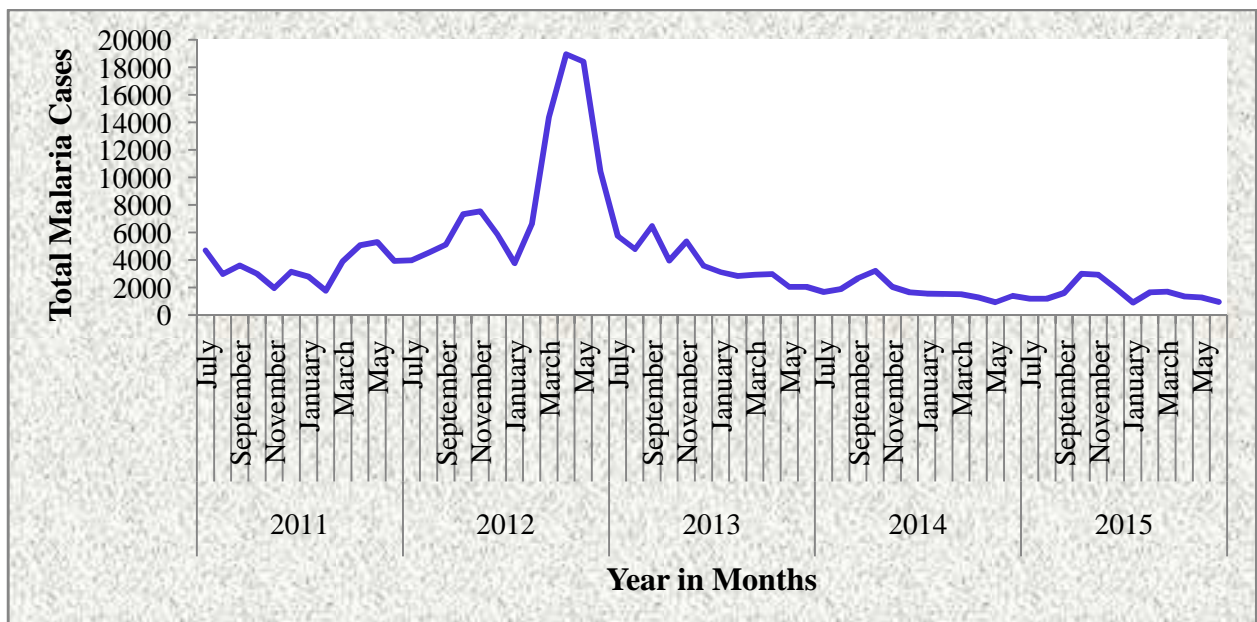


Figure 23: Trend of Total malaria cases in Kembata Tembaro Zone from 2011-2015

From The Figure 23, we can easily understand that the malaria morbidity is highest in the year of 2012 which shows increased and epidemic occurs from March to June and its peak reach during April, 2012.

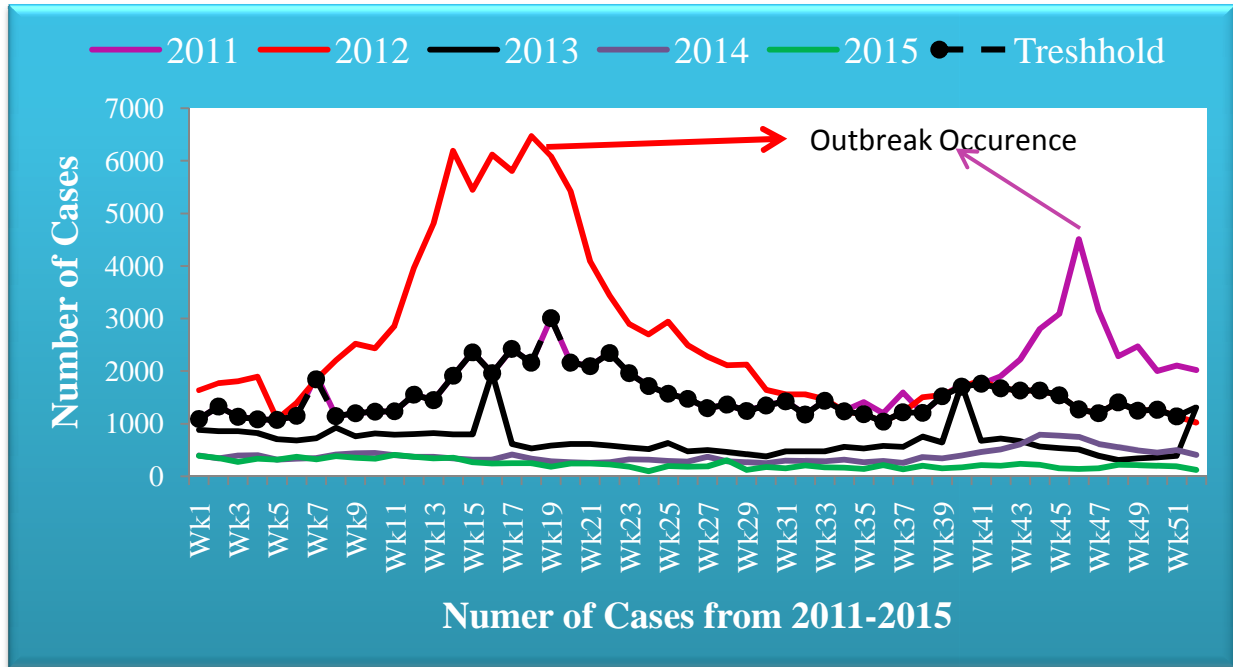


Figure 24: Trend of malaria in weeks, kembata Tembaro zone, SNNPR from 2011-2015

Distribution of Malaria by its species and Place

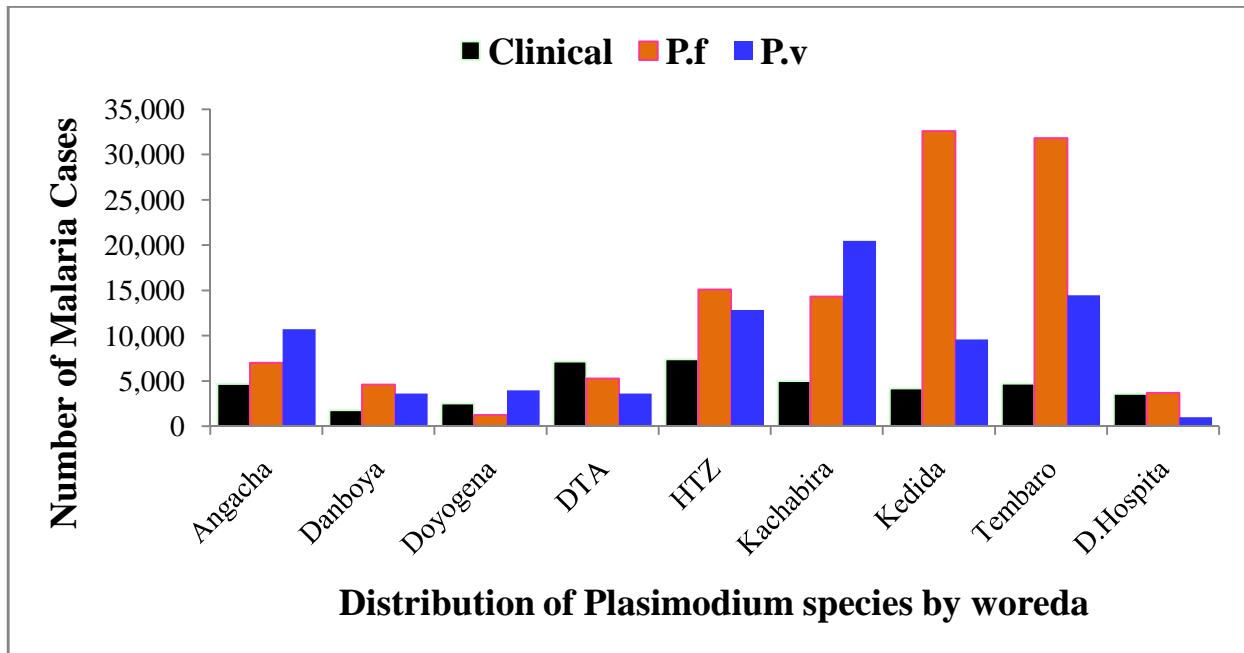


Figure 25: Plasimodium species by woreda, Kembata Tembaro Zone 2011-2015

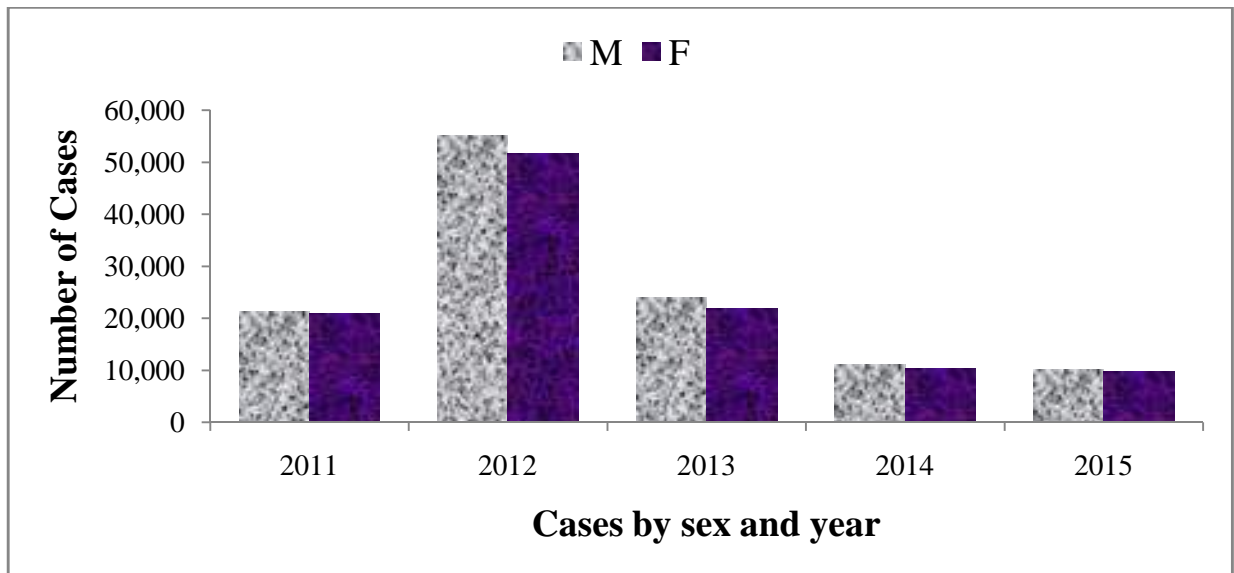
Table 13: Average Number of Malaria species by woredas, 2011-2015

Woreda	P.f	P.v	Clinical	% of P.f	% of P.v	% of Clinical	Total
Angacha	6,994	10,697	4,673	31	48	21	100
Danboya	4,585	3,622	1,759	46	36	18	100
Doyogena	1,250	3,963	2,505	17	51	32	100
Durame town	5,273	3,599	7,137	33	22	45	100
Hadero Tunto	15,107	12,824	7,389	43	36	21	100
Kachabira	14,315	20,453	4,988	36	51	13	100
Kedida	32,605	9,583	4,168	70	21	9	100
Tembaro	31,825	14,462	4,687	63	28	9	100
D.Hospital	3,672	990	3,558	45	12	43	100
Total	115,626	80,193	40,864	49	34	17	100

The plasmodium falciparum is one of the cause for the occurrence of outbreak, provided that it important to know its distribution across the Zone for its control and prevention. However, the distribution of plasmodium species in some woreda varies from the prior knowledge of the falciparum to Vivax (60:40) ratio; so that the distribution of plasmodium species across the woreda in the zone is greatly vary from each other (Table 14). From the data Angacha, Doyogena, and Kachbira woredas are relatively the plasmodium Vivax is higher than that of Falciparum. This may be due to the weather or agro-ecologic factors because most part of these woredas are 'Degga'

Table 14: Malaria cases by sex and age group in Kembata Tembaro Zone, SNNPR, From 2011-2015

	Male			Female		
	0-4 years	5-14 years	>=15 years	0-4 years	5-14 years	>=15 years
2011	5,192	5,341	10,731	4,569	4,782	11,666
2012	12,167	16,465	26,591	9,701	14,562	27,537
2013	5,869	5,893	12,253	4,249	5,090	12,617
2014	2,618	2,614	5,815	2,167	2,031	6,244
2015	2,307	2,583	5,223	2,054	2,222	5,530



Total malaria cases by sex and Number in Kembata Tembaro Zone, SNNPR from 2011-2015

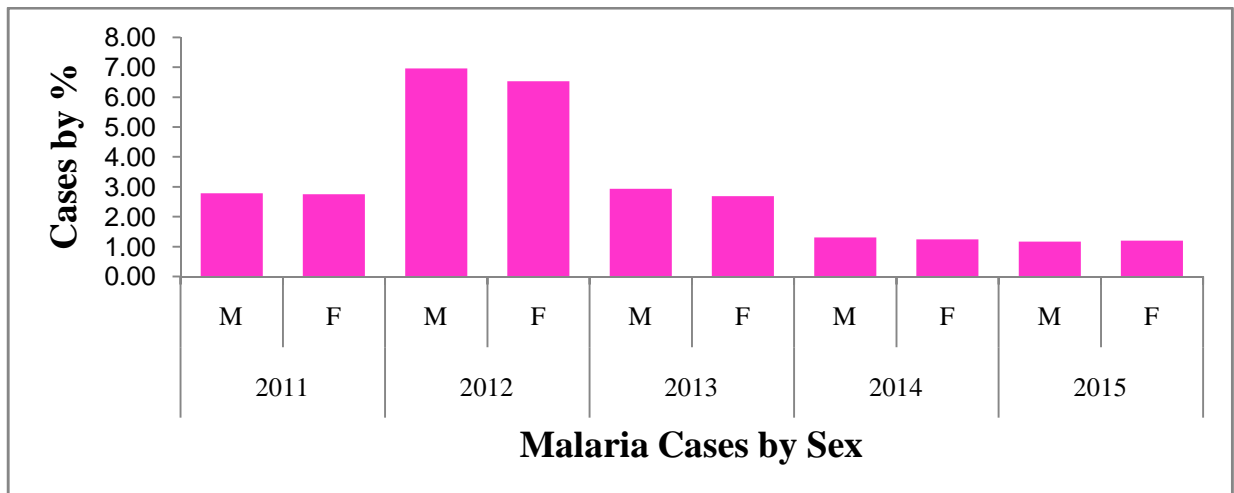


Figure 26: Total malaria cases by sex in Kembata Tembaro Zone, from 2011-2015

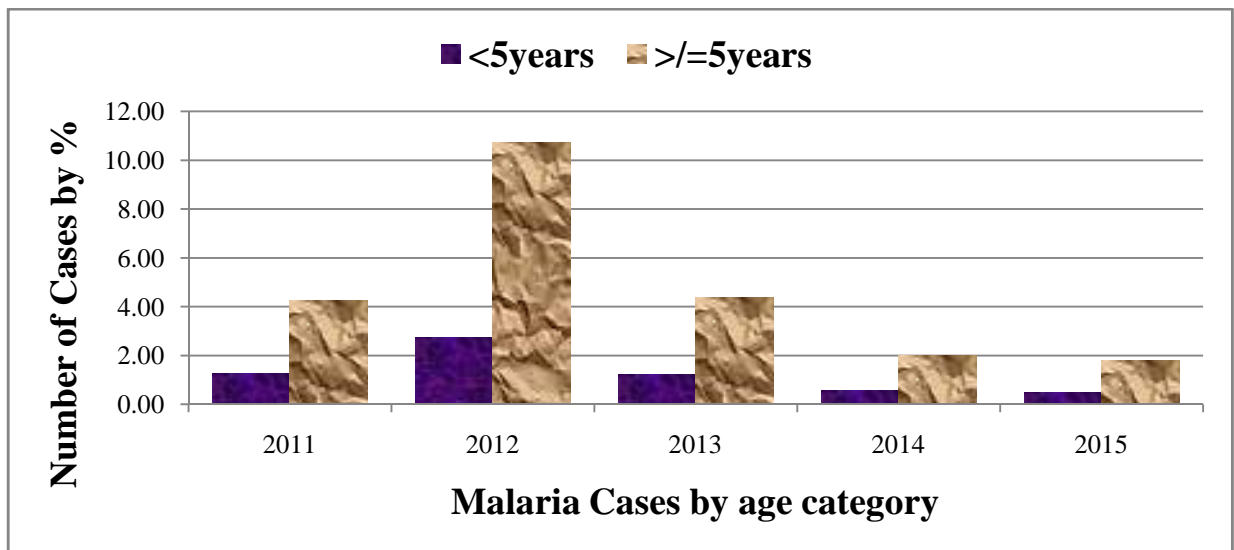


Figure 27: Total malaria cases by age in Kembata Tembaro Zone, from 2011-2015

2.1.7 Discussion

We identified total Malaria cases of 277,980 outpatients, 3840 in-patients and 17 deaths were recorded from 2011-2015 in Kembata Tembaro Zone. The most affected woredas in 2012 are Tembaro, Kachabirra, Hadero-Tunto, Durame town and Kedida-Gamella 264, 166, 163, 144 and 139 per 1000 respectively. From all woredas in the Zone, Tembaro, Kachabirra, Hadero-Tunto, Durame town and Kedida-Gamella woredas are the most affected woredas from 2011-2015 (73-166 per 1000 population). From all woredas, kedida woreda is most frequently affected woreda in the Zone from 2011-2015.

The analysis result showed that malaria occurred throughout the year regardless of the woreda in the zone with annual malaria total prevalence rate for the calendar years 2011 it starts raised and was reaches its highest point in 2012 which accounts 18 times higher than that of 2015. In addition to this the confirmed malaria prevalence rate in this zone was similarly raised from 70/1000 in 2011 to 138/1000 population in 2012 but dramatically decreased to 9/1000 population in 2015. During the year 2012, the increased number in both results might be due to the increment of the facilities and strengthen of the malaria surveillance activities at each level in the zone or else there might be increased risk of malaria transmission. This increment is consistent with study done in Kola Diba, North Gondar (17). In addition to this, the average annual incidence of reported total malaria over the five calendar years 2011 to 2015, from the overall population was 69/1000, and of confirmed malaria was 54 per 1000. Reported malaria in-patient admissions and deaths averaged 0.9/1000 and 0.4 per 100,000 per year respectively.

As of the calendar years 2011-2015 the annual incidence of total malaria report dropped from 119/1000 to 9/1000 and reported malaria in-patient admissions and deaths dropped from 1.7/1000 to 0.1 per 1,000 per year and 1.3/100,000 to Zero respectively. perhaps as a result of scaled up of interventions in malaria control and prevention strategies, although 1.6 times drop in out-patient case numbers was observed and also confirmed malaria cases similarly decreased from 70/1000 to 9/1000 over the past five years. A recent study also showed that there has been a 54% and 55 % reduction in malaria admission and death, respectively as compared to baseline period of 2001-2004 (18) and also due to improved health system delivery, better malaria prevention (LLIN and IRS coverage) and use of effective drugs. Given that Ethiopia is considering malaria elimination (19, 20).

Species of plasmodium varies from woreda to woreda. Distribution of plasmodium (ratio of plasmodium Falciparium to Plasmodium vivax) in Tembaro , Kedida, Hadero Tunto and Durame town were 63:28 ,70:21, 43:36 and 33:22 respectively and total zonal ratio is 49:34

which is relatively matches with the national standard of the plasmodium distribution of falciparum versus vivax which is 60 : 40 (21). But in some woredas, distribution of plasmodium vivax species is higher than that of the distribution of falciparum which is not match with the national guideline standards. These woredas includes Angacha, Kachabira and Doyogana. Some studies also supported these findings which dedicated an increased proportion of vivax malaria is consistent with a study at high altitude in the Butajira area (22), The increase in vivax malaria in highland-fringe areas could be explained by the high transmissibility of P. vivax.

The completeness of reporting of malaria indicators for the IDSR system in kembata Tembaro zone between 2011 and 2015, and concluded that over 95% it was of sufficient quality to provide estimates of malaria incidence by reporting woredas.

In the past five years (2011-2015) the zonal data analysis suggest that some areas of the woredas such as Tembaro, Kedida, Kachabira, Hadero Tunto and Durame town had average annual estimated incidence of confirmed malaria above 72 per 1,000 persons (Table 12). This may be due to the high number of reporting sites, arid areas and presence of irrigation projects may be influencing malaria transmission where incidence is higher than expected. The rest woredas were 28/1000 persons per year, In general, the use of incidence when comparing between woredas will improve the ability of zone to plan resources appropriately, improve targeting of malaria control efforts, and allow better evaluation of the programme

2.1.8 Limitations

- We use the secondary data/source
- The data were not completed.
- The variables were not the same before and after 2011.

2.1.9 Conclusions

We conclude that the magnitude of Malaria in Kembata Tembaro Zone declined (dropped significantly from 119/1000 to 9/1000) from 2011-2015. From all woredas, kedida woreda is most frequently affected woreda in the Zone from 2011-2015. Even though different malaria control strategies were designed to roll back to its minimum level in Kembata Tembaro Zone, still malaria cases were not decreased as expected. The prevalence rate of total malaria and confirmed malaria cases would be not only high but also rising from 2011 through 2012 and showed sharp decline from 2013 to 2015. Therefore, the zonal health department should maintain such reduction in both morbidity and mortality due to malaria. The zone also takes action on reporting and recording procedures by training zonal and woreda phem officers on

basic phem training. During data analysis, there is incomplete and inconsistent data from some woredas. Furthermore, the Zone has to be done operational research to eliminate the deadly disease from the Zone.

2.1.10 Recommendations

- ❖ The recent reporting format lacks some important indicator variables such as different age category for analysis so it should be incorporated.
- ❖ Continuous monitoring and evaluation approach of the program intervention should be mandatory to know whether it were successful or not in the zone so as to know the effectiveness of each intervention
- ❖ Close follow up and technical assistance is needed where the hot spot areas in the Zone.
- ❖ Having complete report helps the analysis and interpretation to be more meaningful and acceptable.
- ❖ The zonal health department should conduct training for the woreda PHEM officers especially on how to report and respond in emergency.
- ❖ Mobilize resources to strengthen the malaria control programme, particularly in the geographical areas of highest incidence
- ❖ Further study should be plan for prevention and control to come to elimination

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Chapter III – Evaluation of Surveillance System

1.1 3.1 Surveillance system evaluation of Malaria, Measles and Acute Watery Diarrhea in Kembata Tembaro Zone, South, Nations, Nationalities, and Peoples Region, 2017

Executive Summary

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. Despite various public health interventions in Kembata Tembaro Zone, the zone is experiencing epidemic of Malaria, Measles and Acute Watery Diarrhea, therefore the aim of this study is to assess the performance of core activities and attributes of surveillance system in Kembata TembaroZone, Feb 2016.

Methods A cross-sectional descriptive study was conducted from Jan 17-Feb 16/2017 in Kembata Tembaro Zone, Southern Nations and Nationalities People Regional State. A purposive sampling technique was utilized to select health facilities and woredas. Questionnaire was administered to focal persons; documents and reports were observed; and data was analyzed using MS-Excel. A total of 28 study sites were included in the study. Three priority diseases (Malaria, Measles and Acute Watery Diarrhea) were used as a proxy for the evaluation of the surveillance system.

Result The completeness of the selected Health posts was 86%, health centers were 95.6% and selected woredas and zone had 100% in 2016. The timeliness the zone was 80% but it is difficult to know at health facility level due to absence of time of report. Five (28%) HEW in the health post did not get any PHEM base training. Twenty-eight (100%) of respondents were accepted the surveillance system and its data was helpful to detect cases early. Written epidemic preparedness and response plan was only at two woreda offices and at zonal level. The case definition was not available in some health post visited.

Conclusion We conclude that case definition was not available in some health post visited and there is gap between report completeness at health posts, health centers and woreda level. This is due to lack of training, specific supervision, evaluation and feedback. In addition, Coordination and supervision of the surveillance activities were not frequent. From those supervised health facilities, most of them are not received feedbacks. 73 private health facilities were not included in surveillance report and absence of timely analysis and utilization of data made the existing

surveillance system weak. Therefore, it is necessary to strengthen the surveillance system by capacitating health workers at all levels to analyze and utilize available data.

3.1.1 Introduction

Public health surveillance is the 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). This will be effective through meticulous monitoring of trends of disease burdens and guiding immediate action to be taken, the health policy, planning, evaluation of health programs, formulating research hypotheses and so on (2)

Disease surveillance is essential for early detection of outbreaks, epidemics and pandemics in order to initiate timely response and it is essential to evaluate or monitor progress of ongoing interventions targeted for disease reduction. A well-functioning disease surveillance system is critical to measure the burden of diseases (health-related event), identification of populations at high risk and new or emerging health concerns to the health system, in providing evidence-based information for planning. In addition, for implementation, monitoring trends of a disease and evaluation of public health intervention programs to prevent and control disease, injury, or adverse exposure. Moreover, to evaluate program performance, prioritize the allocation of health resources, describe the clinical course of disease; and stimulate for epidemiologic research (2).

An effective communicable disease surveillance system is one of the basic strategies of the national disease prevention and control and evidence-based decision-making practices. In most developing countries, surveillance systems are often weak even though the burden of communicable disease remains major public health concern. Surveillance system evaluation answers questions like what are the successes and deficiencies of the surveillance system, Is the surveillance system meeting its public health objective?, How does surveillance both support and benefit stakeholders and what measures could improve performance and productivity of the surveillance system and the program that it supports?(3).

The public health system is challenged by recurrent and unexpected disease outbreaks and is facing the challenge of managing health consequences of natural and human made disasters, emergencies, crisis, and conflicts. PHEM is designed to ensure rapid detection of any public health threats, preparedness, and other related to logistic and fund administration. Surveillance of priority diseases is the major component of early warning. Malaria, Measles, and AWD (Acute watery diarrhea) are one of the reportable priority diseases and public health problem in Ethiopia. The overall purpose of surveillance of these diseases is to monitor the trend against the expected tolerance limits, and pick any deviation from the limit at the earliest point in time and

have prompt response. Information on the number and distribution of these diseases is critical for the design and implementation of prevention and control programs (5).

Table 15: Diseases under surveillance based on the 2009 PHEM structure

IMMEDIATELY REPORTABLE DISEASES	WEEKLY REPORTABLE
1.Acute Flaccid Paralysis	1.Dysentery
2.Anthrax	2.Malaria
3.Avian Human Influenza	3.Meningitis
4.Cholera	4.Relapsing Fever
5.Dracunculiasis (Guinea worm)	5.Typhoid Fever
6.Measels	6.Typhus
7.Neonatal Tetanus	7.Malnutrition
8.Pandemic Influenza	8.MDSR
9.Rabies	
10.Severe Acute Respiratory Syndrome(SARS)	
11.Small Pox	
12.Viral Hemorrhagic Fever	
13Yellow Fever	

The routine flow of surveillance data is usually from reporting sites to the next level up to the central level as indicated in figure 28. The community and health facilities especially health posts are the main source of information. The information will collect from the reporting sites and will compile in standard forms, analyzed and then will forward, to the woreda health office. Woreda level uses standard formats to compile aggregate, and send the data to zone/region, from which the central level receives. Feedback and information sharing will follow the same route.

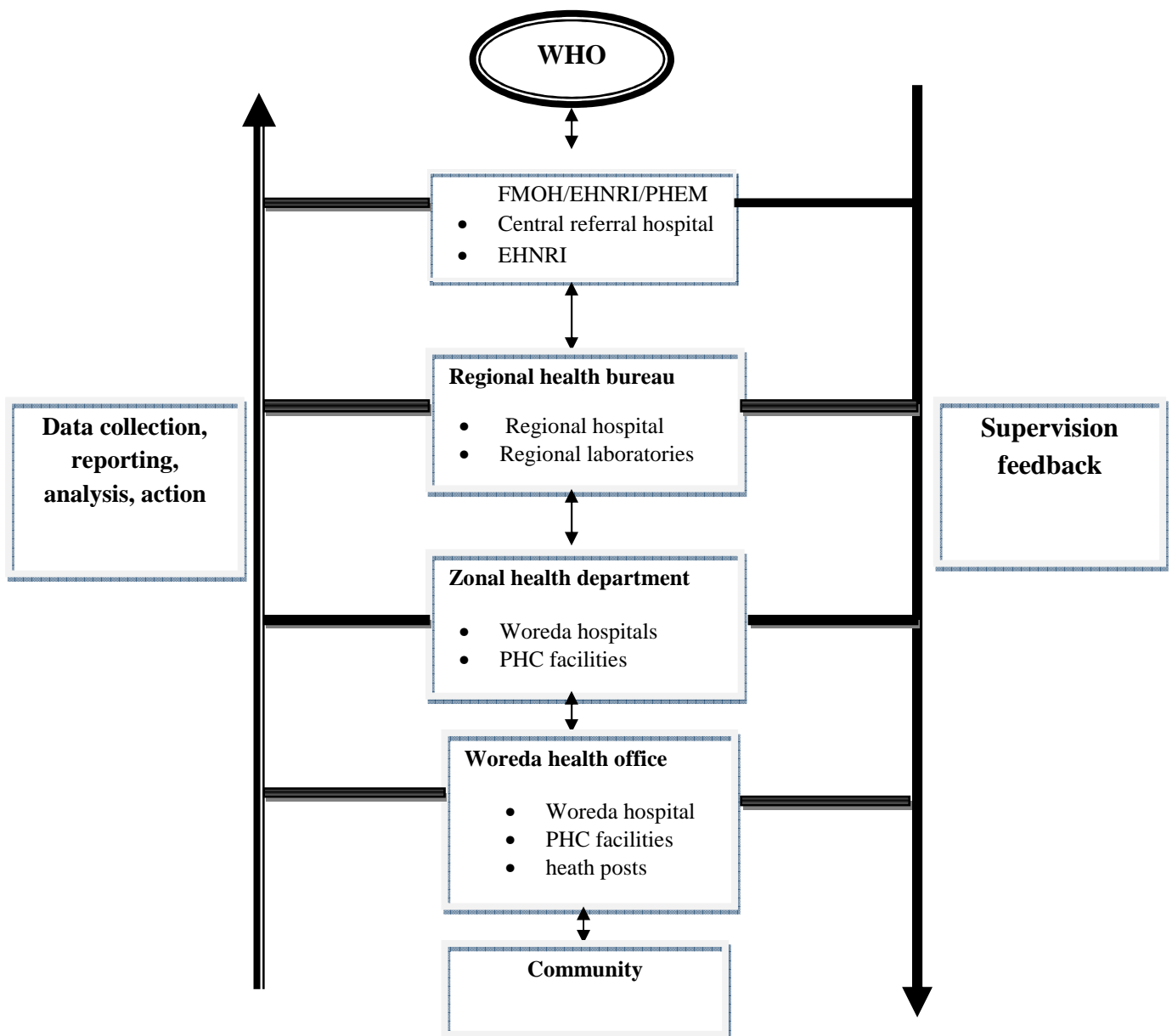


Figure 28: Data and information flow in public health surveillance indicating varying cycles at various levels.

Malaria is one of the most severe public health problems worldwide. It is a leading cause of morbidity and mortality in many developing countries, where young children and pregnant women are the groups most affected. 3.4 billion People (half the world’s population) live in areas at risk of malaria transmission in 106 countries and territories(6).Malaria kills a child somewhere in the world every minute. It infects approximately 219 million people each year (a range of 154 – 289 million), with an estimated 66,000 deaths, mostly children in Africa. 90% of malaria deaths occur in Africa, where malaria accounts for about one in six of all childhood deaths. The disease also contributes greatly to anemia among children — a major cause of poor growth and development. The cost for malaria intervention is the remaining challenge. It is estimated that a

US \$5.1 billion is required annually to achieve universal coverage and fully scale-up malaria interventions around the world(7).

Malaria is ranked as the leading communicable disease in Ethiopia, accounting for about 30% of the overall Disability Adjusted Life Years lost (10). Malaria transmission in Ethiopia is unstable. Around 68% live in malaria endemic area, mostly an altitude of below 2000 meters (8). Enhanced surveillance for malaria cases and deaths aids' ministry of health to determine which areas and/or population groups, are most affected and enables countries to monitor changing disease patterns. Strong malaria surveillance systems also help countries design effective health interventions and evaluate the impact of their malaria control programs. Malaria surveillance is currently weakest in countries with the highest malaria burden, interpreting it difficult to accurately assess disease trends and plan interventions. At present, only one tenth of the 219 million cases that are estimated to occur each year are detected and reported through national malaria surveillance systems. Only 58 of the 99 countries with ongoing malaria transmission produce sufficiently complete and consistent data on malaria that allow a reliable assessment of malaria trends over time (8).

In Ethiopia outbreaks of measles reported every year. There were 16,028 suspected measles cases in 2014 and 14,100 confirmed measles cases in the same year. This represents a steep increase on the data for 2013, when there were 6,137 confirmed measles cases in Ethiopia. Ethiopia has reported 6,137 and 14,100 totally confirmed measles cases with their respective incidence rates of 6.52 and 14.61 in 2013 and 2014 respectively (9).

Cholera is on the rise with an estimated 1.4 billion people at risk in endemic countries and an estimated 3 million to 5 million cases and 100,000-120,000 deaths per year worldwide (10). The disease is now considered to be endemic in many countries and the pathogen causing cholera cannot currently be eliminated from the environment. Regions of the world where Cholera is currently prevalent are Africa, Asia and parts of the Middle East. Sub-Saharan Africa is broadly affected by many cholera epidemics. Africa reported 211 748 cases in 1998, the highest number of cases ever reported and accounted for 72% of the global total. (10, 11, 12)

Risk for AWD spread exist in Ethiopia, which include: overcrowding in Refugee camps, increased population movements across borders, inadequate access to safe water, low personal and environmental hygiene and sanitation practices, inadequate food safety, low latrine coverage and utilization, unexpected flooding, low health seeking behavior, low community awareness on AWD prevention, and limited capacity of health system in some regions. The effect of the El-Nino also contributes to increased risks for spread of communicable diseases and disease outbreaks. (13, 14, 15)

3.1.2 Literature Review

The highest-priority public health events should be monitored closely, and surveillance systems should meet their objectives as efficiently as possible. The overall purpose of evaluating public health surveillance is to obtain feedback about the operation of the system and to promote the most effective use of health resources. The evaluation of an operating surveillance system for a high-priority health event aims to increase the system's utility and efficiency. However, most importantly, an evaluation will determine whether the system is meeting its objectives, serving a useful public health function, and operating as efficiently as possible (16).

Public health surveillance is essential to the practice of public health for prevention and control activities and evaluates outcomes of such activities. With advances in information sciences and technology, changes in methodology, data availability and data synthesis, and expanded health information needs, the question arises whether redefining public health surveillance is needed for the 21st century. The current definition is "Public health surveillance is the ongoing, systematic collection, analysis, and interpretation of health data, essential to the planning, implementation and evaluation of public health practice, closely integrated with the dissemination of these data to those who need to know and linked to prevention and control (17).

Evaluation of a surveillance system helps establish the connections between a program's deliverables and public health decision-making. Specifically, it provides an opportunity to take a systematic look at the purpose, design, management and operational characteristics of the surveillance system and its success in serving the requirements of public health action. An evaluation assesses a system's characteristics against its requirements and it can occur at many different points in the development, implementation and review of a surveillance system (18).

The evaluation of surveillance systems should promote the best use of public health resources by ensuring that only important problems are under surveillance and that surveillance systems operate efficiently. Insofar as possible, the evaluation of surveillance systems should include recommendations for improving quality and efficiency. Most importantly, an evaluation should assess whether a system is serving a useful public health function and is meeting the system's objectives (19).

Functioning surveillance systems are necessary for the success of global health initiatives. Without correct and current data, diseases are misunderstood, health programs do not accomplish their goals, and resources are incorrectly allocated. However, surveillance systems that collect useful and representative data in developing countries are often non-existent and hard to create. The failure of surveillance systems in developing countries is often due to limited available

resources, lack of knowledgeable staff, disorganization, and poor infrastructure for finding and reporting cases (20).

Public health surveillance data are used to estimate the scope and magnitude of a problem, including the geographic and demographic distribution of health events that will facilitate public health planning. Surveillance data also can be used to detect changes in health practices, monitor changes in infectious and environmental agents, evaluate control measures, and describe the natural history of a health event in a community that will generate hypotheses and stimulate applied research. In short, public health surveillance is the foundation for decision making in public health and empowers decision makers to lead and manage more effectively by providing timely, useful evidence (21).

3.1.3 Rationale of the study

The purpose of evaluating public health surveillance systems is to ensure that problems of public health importance are being monitored efficiently and effectively. Public health surveillance systems should be evaluated periodically, to assess the quality, efficiency, efficacy, usefulness and gap of the existing system accordingly to improve the surveillance system.

The public health system of the South Nations, Nationalities, and people's region is challenged by different recurrent and unexpected diseases, outbreaks and is facing the challenges of managing health consequences in different parts of the region of zones. Malaria, Measles and Acute watery diarrhea are one of the health challenges and selected priority diseases in the region. Kembata-Tembaro zone is one of the 15 zones and 4 special woreda in the region. Still Malaria, Measles and Acute watery diarrhea are the public health problems among priority diseases in the zone. Therefore, Public health surveillance system should be evaluated periodically and the evaluation should include recommendations of quality, usefulness and efficiency. Because of the presence of two hot spot woredas in the zone and the surveillance system evaluation of the zone have not yet been done in the area so far. As a result, it is difficult to estimate how much the surveillance system is strong or not to tackle these health event problems. Therefore, this cross-sectional study is designed to evaluate Malaria, Measles and Acute watery diarrhea surveillance in this zone.

3.1.4 Objectives

General:

- To evaluate the performance of the existing surveillance system of malaria, measles and Acute watery diarrhea of the Kembata Tembaro zone, SNNPR, Jan 17- Feb 16/2017

Specific:

- To investigate the implementation of core surveillance activities notifiable diseases reporting system in respect to case detection, registration, confirmation, reporting, epidemic preparedness and response.
- To assess supportive activities of surveillance system such as supervision, staff training, information feedback, equipment and financial support.
- To assess the status of surveillance system attributes like sensitivity, simplicity, positive predictive value, flexibility, completeness, timeliness, acceptability, representativeness and specificity
- To describe constraints and challenges faced in the process of implementing the surveillance system

3.1.5 Methods

Study area. The study was conducted in Kembata-Tembaro zone. It is one of the 15-zones and 4-special Woreda in the region and 240 km far from the regional town, Hawassa, and 360 km from the central town of the country. The zone has seven- Woredas (Tembaro, Hadero-Tunto, Kacha-bira, Kedida-Gamela, Doyogena, Angacha, and Damboya) and one town administration, Durame, zonal town. Except Doyogena Woreda, in all woredas and Durame town administration malaria is Endemic. Out of these, two (Tembaro and Hadero-Tunto) woredas are known malaria endemic and hot spot woredas in the region as well as in the country. In 2016 the total population of the zone was 857,375 with 130,257(15.2%) urban and 727,118(84.8%) rural. The zone has 22 urban and 119 rural kebeles. From these, 79% of kebeles are malarious (111/141). Regarding to health facility distribution in the zone, there was 1-Hospital, 33-governmental health centers, 3- NGO health centers, and 136- health posts. Zonal health department, woreda health offices, health centers, and health posts were taken as the study units of the surveillance system evaluation.

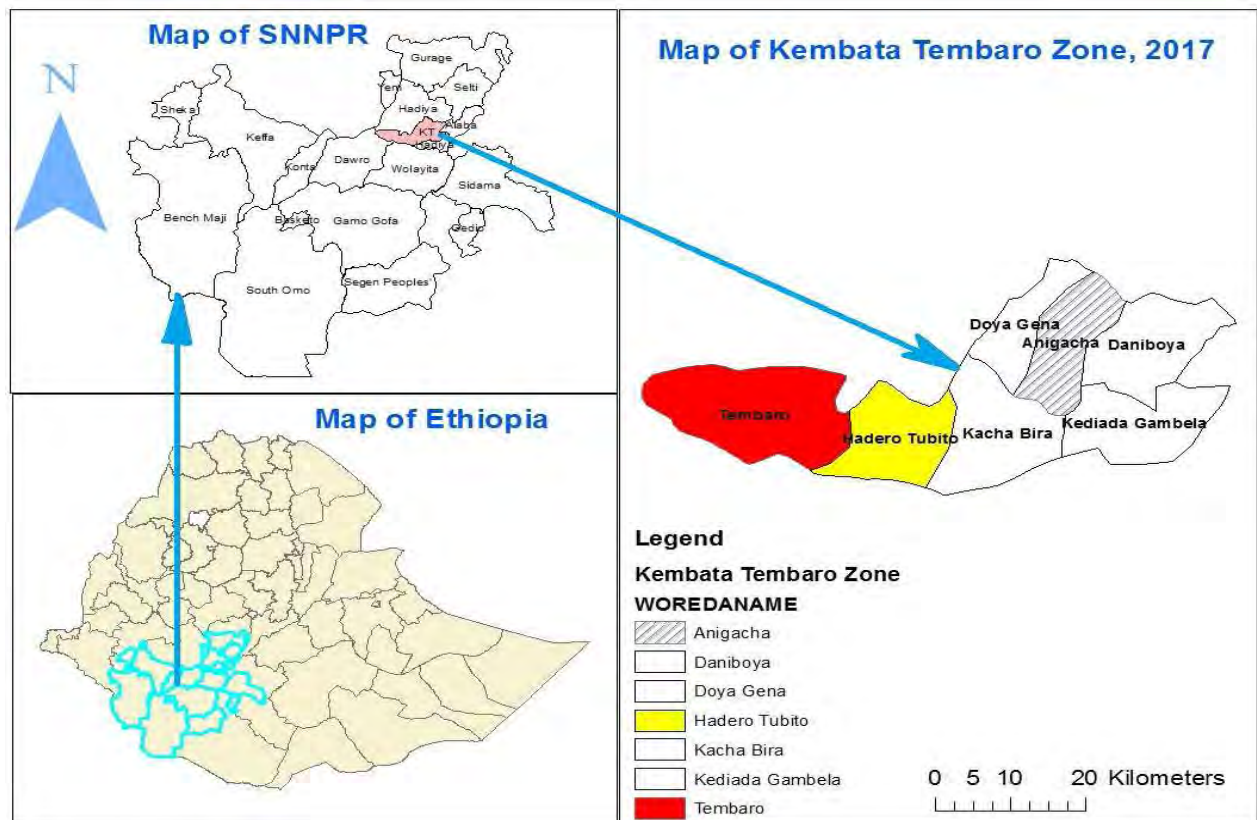


Figure 29: Area Map of selected woredas for Surveillance System Evaluation, Kembata-Tembaro zone, SNNPR, 2017

Study design.

We used a cross-sectional descriptive study design using the CDC "updated guideline for evaluating public health surveillance system" published in 2001 as a frame work for evaluation(5).

Study period. We conducted the surveillance system evaluation from Jan 17-Feb 16/2017 in Kembata-Tembaro zone, SNNPR.

Sample size determination and Sampling technique- before selection of a sample, we conducted a discussion with zonal PHEM core process for sampling selection. A total of 28-reporting units were identified for this surveillance system evaluation. Zonal health department, 3-Woreda health office, 6-health centers, and 18-health posts were selected based on their past year (2015/16) performance. Based on their performance, we identified three reporting units from each woreda health office, health centers, and health posts (1-best (Tembaro), 1-better (Angacha), and 1-poor performance (Hadero-Tunto)).

Data Collection We obtained data through observation, review of document, review of outputs, quantitative interviews of the PHEM officers, disease prevention and health promotion, and IDSR focal persons in health centers and health posts.

Data analysis and presentation we used Micro-soft Excel 2007 to calculate frequency, ratio, rate, and proportion. We also used Microsoft excel to construct tables and figures.

Ethical issue Official permission was obtained from RHB, and then from the respective selected institutions for evaluation.

Standard Cases definition

Malaria

Suspected

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

Confirmed

A suspected case confirmed by microscopy or RDT for plasmodium parasites.

Measles

Suspected

Any person with fever and maculopapular (nonvascular) generalized rash and cough, coryza or conjunctivitis (red eyes) OR any person in whom a clinician suspects measles.

Confirmed

A suspected case with laboratory confirmation (positive IgM antibody) or epidemiological link to confirmed cases in an epidemic.

Suspected case

- in an area where the disease is not known to be present, a patient aged 5 years or more develops severe dehydration or dies from acute watery diarrhoea;
- in an area where there is a cholera epidemic, a patient aged 5 years or more develops acute watery diarrhoea, with or without vomiting.

Confirmed case: A suspected case in which *Vibrio cholerae* O1 or O139 has been isolated from their stool.

Operational case definitions

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

- **Case detection:** is the process of identifying cases and outbreaks.
- **Case registration:** is the process of recording the identified cases

- **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
- **Acceptability:** Acceptability is the willingness of persons, institutions or organizations to participate in the surveillance system.
- **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 Zonal Health Department.
- **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.

3.1.6 Results

Sites visited

Prior to the evaluation of the surveillance system started, discussion and consultation was made with Zonal Public Health Emergency Core Process on how to select sites. To ensure that the evaluation of a public health surveillance system addresses appropriate questions and assesses

pertinent attributes and that its findings will be acceptable and useful. In this context, Kembata Tembaro Zone Health Department Public Health Emergency Management focal person and Woreda Health Office Public Health Emergency Management focal persons were participated in the evaluation of the surveillance system of the zone.

The purpose of the document review was to understand and assess the data reporting process, and to compare data across different sources to identify any problems with data quality, consistency, completeness, and compilation. In 2016 Kembata-Tembaro zone received a surveillance report from a total of 173 reporting units (136-health posts, 33-governmental health centers, three non-governmental health centers, and one Hospital, no private health facilities were included in the reporting units).

Table 16: Population under surveillance for malaria, Measles and AWD disease surveillance in Kembata Tembaro Zone, SNNPR 2016

Se No	Area under assessment	Populaion (Projected from the 2007 cense)
1	Tembaro	131411
2	HaderoTunto Zuria	125377
3	Angacha	109804
4	Zone	857375

The visited site includes Zonal health department, 3 woreda health offices, 6 health centers and 18 health posts accordingly. In the surveillance systems assessment checklist, three epidemic-prone diseases were included. A total of 28 sites were visited, of which 3(37.5%) Woredas, 6(18%) health centers, 18(13%) health posts, and 1(5%) zonal PHEM were our study subject. The woreda's incorporated were Tembaro, Hadero Tunto and Angacha Woreda.

Table 17: Number of sites assessed in Kembata Tembaro Zone, SNNPR, Feb 2017.

S.No	Name of woreda	of Woreda office (n=3)	Health No. of HC (n=6)	No, of HP (n=18)	Total (n=28)
1	Tembaro	1(100%)	2(67%)	6/21(29%)	9(36%)
2	Hadero Tunto	1(100%)	2(50%)	6/20(30%)	9(37.5%)
3	Angacha	1(100%)	2(40%)	6/20(30%)	9(36%)

4	Zone	-	-	-	1/19(5%)
5	Total	3/8(37.5%)	6/36(17%)	18/136(13%)	28/173(16%)

Core Function of Surveillance System

Case detection

Case detection is the process of identifying cases and outbreaks. For malaria case detection, the WHO malaria standard case definitions was available in 24(85.7%) evaluated reporting units. Fifty-three (1.9%) suspected Measles cases were detected in the zone. 24(85.7%) of site were using standard case definition. Moreover, 20(74%) the visited site were sent report based on national public health emergency guidelines, where as the rest health facilities have no public health emergency guidelines.

Table 18: Health facilities with Public Emergency management Guideline in Kembata Tembaro Zone- SNNPR Feb 2017

S/No	Name of health facility	Health Facility with manual	Health Facility without manual	%
1	Zonal	1	0	100
2	Woreda	3	0	100
3	HC	6	0	100
4	HP	14	4	78
	Total	24	4	85.7

To Verify and evaluate the Performance of public health Emergency management system in the zone I tried to state some of the weekly and immediately reportable cases in the zone.

Malaria- Kembata Tembaro Zone in 2006 (EFY) a total 16,616 of malaria cases were reported to the Region. Of total malaria confirmed cases, 9,540(58%) were *P.falciparum* and 6,814 (42%) were *P.vivax*. Among total cases, 138 cases were managed in-patient department and with no deaths. The rest 262(1.6%) clinical malaria cases reported to regional health bureau. The figure30 shows the single year (2016) malaria trend that seems malaria outbreak in the zone but when compared with (threshold) or as figure (32) five-year malaria data there is no epidemic in the zone.

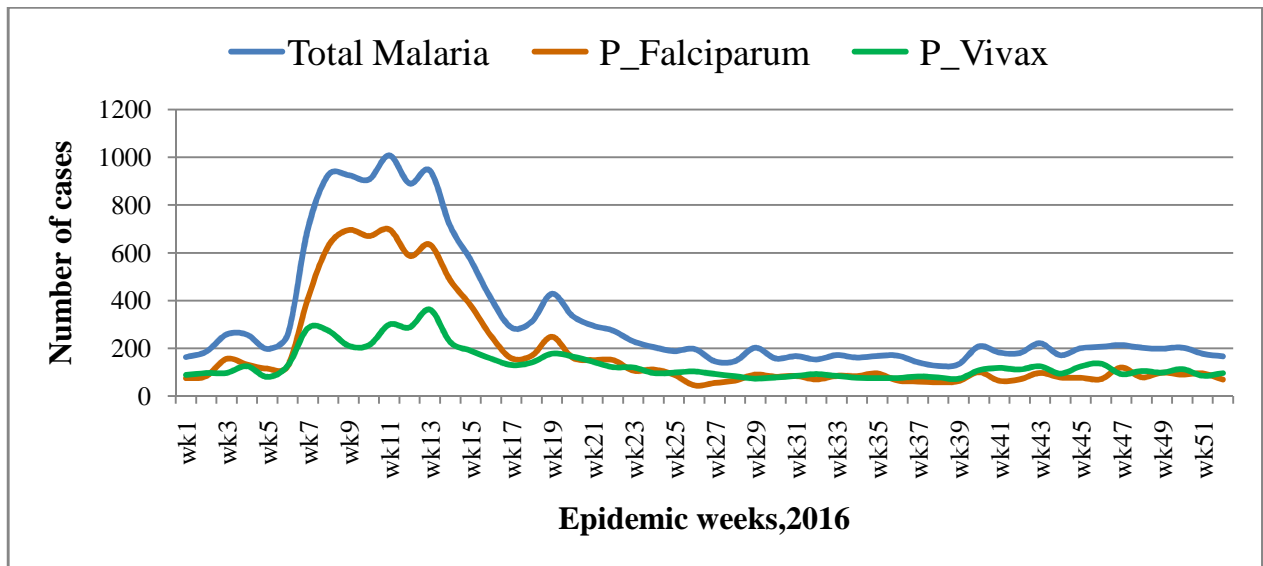


Figure 30: Malaria trend in Kembata Tembaro Zone, by WHO Epi week, 2016

As indicated in the figure30, malaria cases increased in the WHO Epidemiological week 5 to week 17/2016 then decreased up to the end of the year. As indicated in the graph plasmodium Falciparum species was the leading cause of morbidity followed by the plasmodium Vivax in all over the year.

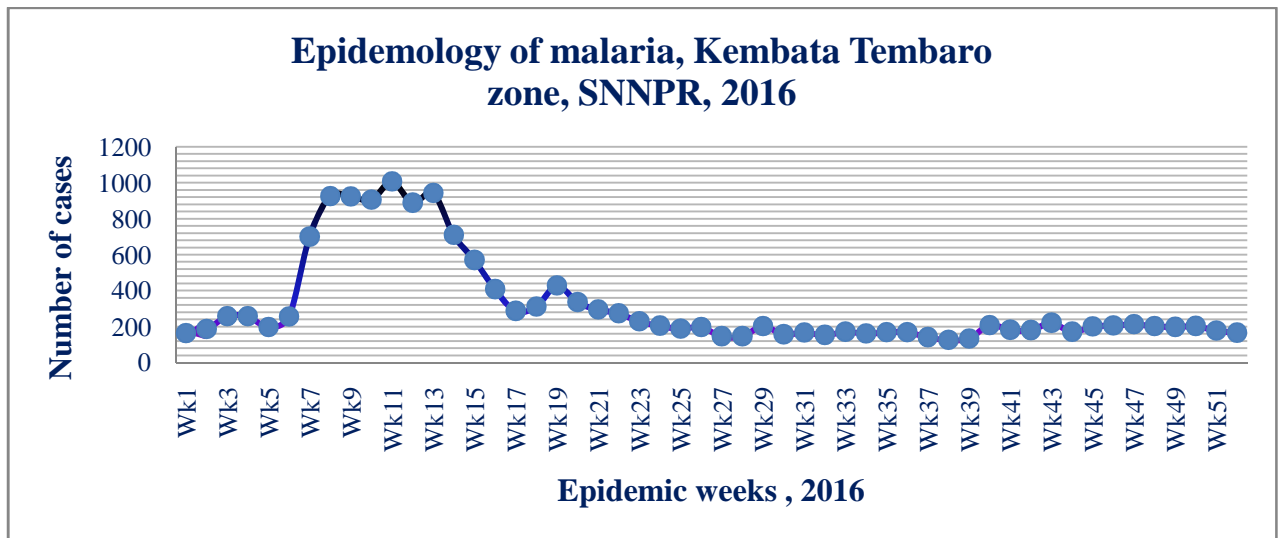


Figure 31: Malaria trend in Kembata Tembaro Zone, by WHO Epi week, 2016

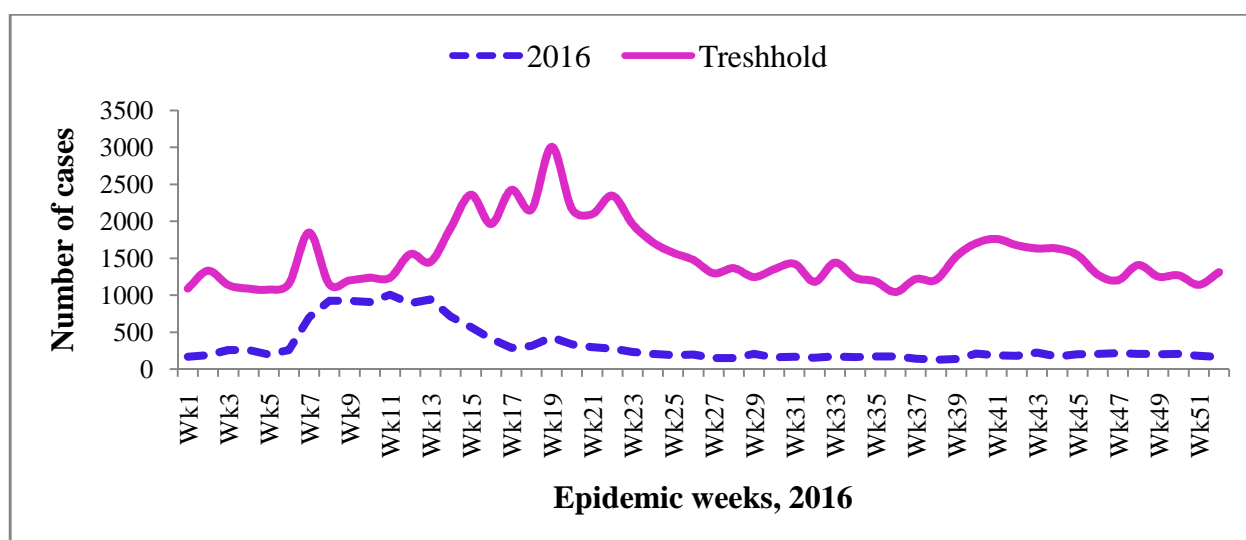


Figure 32: Malaria monitoring chart by week, Kembata-Tembaro zone, 2016

Table 19: Reported malaria cases through surveillance system, Kembata-Tembaro zone, SNNPR, 2016

Reporting unit	Outpatient Department (OPD)		IPD		
	Tested (RDT/microscopy)	Clinical	Confirmed	case	death
Anigacha WoHO	11431	30	1031	0	0
Demboya WoHO	9073	13	443	7	0
Doyo Gena WoHO	2749	6	171	0	0
Durame taHO	11530	3	69	0	0
Durame District HSP	9671	56	607	26	0
Hadero Tunto WoHO	14015	0	1597	0	0
Kacha Birra WoHO	25148	38	1590	5	0
Kedida Gamela WoHO	19040	66	2721	0	0
Tembaro WoHO	36843	50	8125	100	0
Zone	139500	262	16354	138	0

Tembaro woreda The district reported 8175 Malaria cases were reported to zonal health department. Of total malaria confirmed cases, 5551(68%) were P.falciparum and 2574 (32%) were P.vivax. Among total cases, 100 cases were managed in-patient department and with no deaths. The rest 50 (0.6%) clinical malaria cases reported from the district.

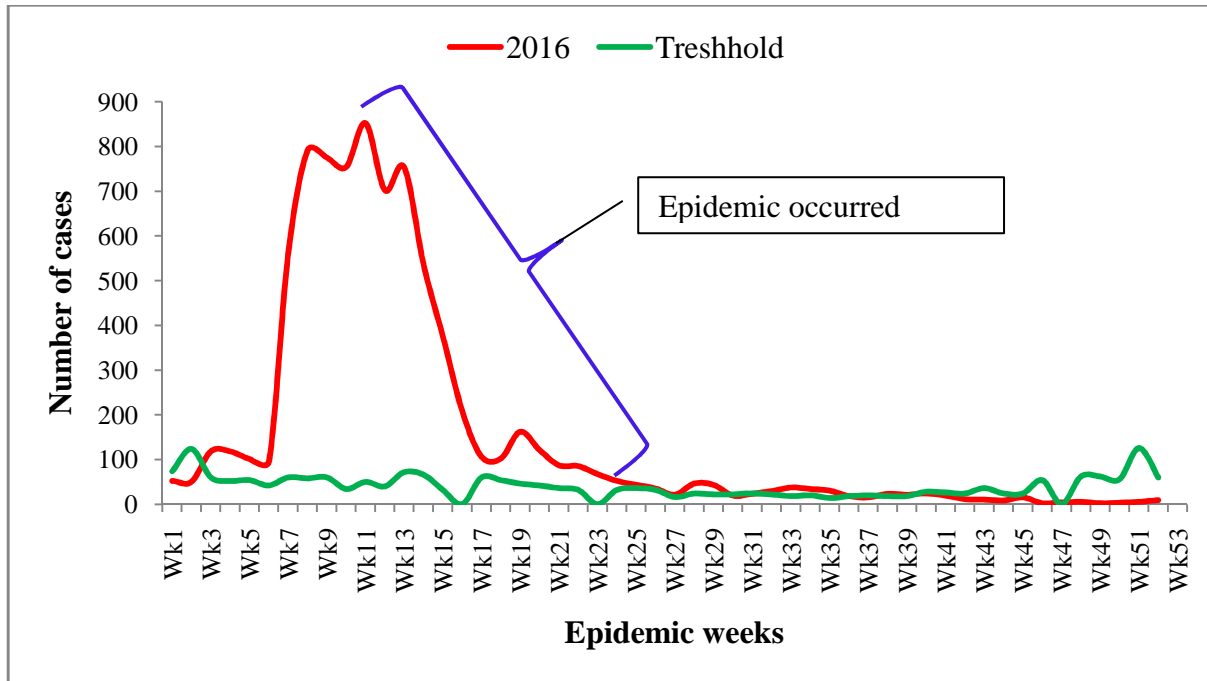


Figure 33: Malaria monitoring chart by week, Tembaro Woreda, Kembata-Tembaro zone, SNNPR, 2016

Hadero Tunto- The district reported 1530 Malaria cases were reported to zonal health department. Of total malaria confirmed cases, 504(33%) were P.falciparum and 1028 (67%) were P.vivax. Among total cases, No cases were managed in-patient department and with no deaths.

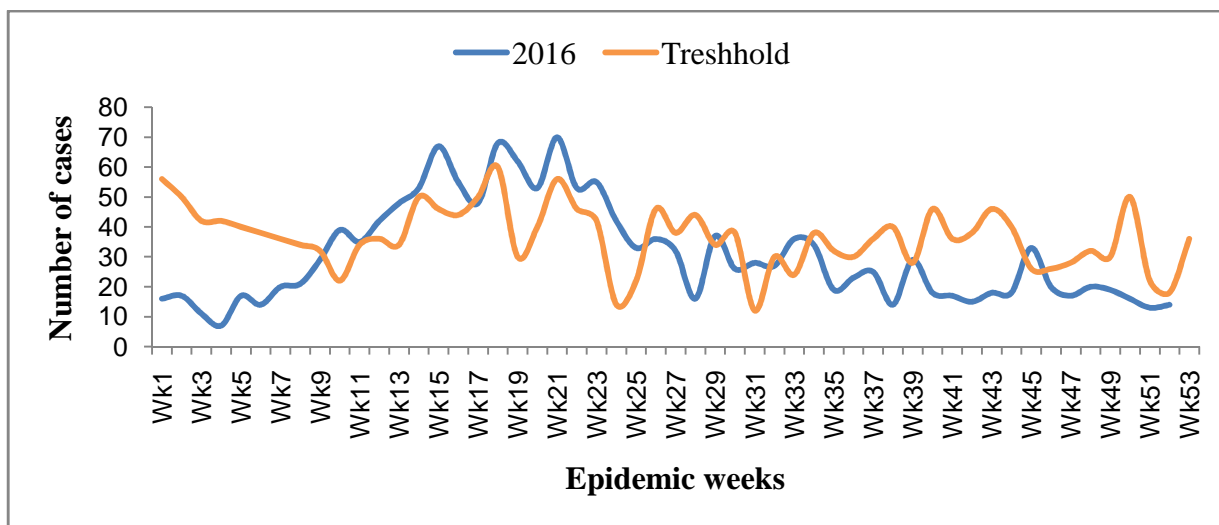


Figure 34: Malaria monitoring chart by week, Hadero-Tunto Zuria district, Kembata-Tembaro zone, SNNPR, 2016

Angacha Woreda The district reported 1061 Malaria cases were reported to zonal health department. Of total malaria confirmed cases, 88(9%) were P.falciparum and 943 (91%) were P.vivax. Among total cases, No cases were managed in-patient department and with no deaths.

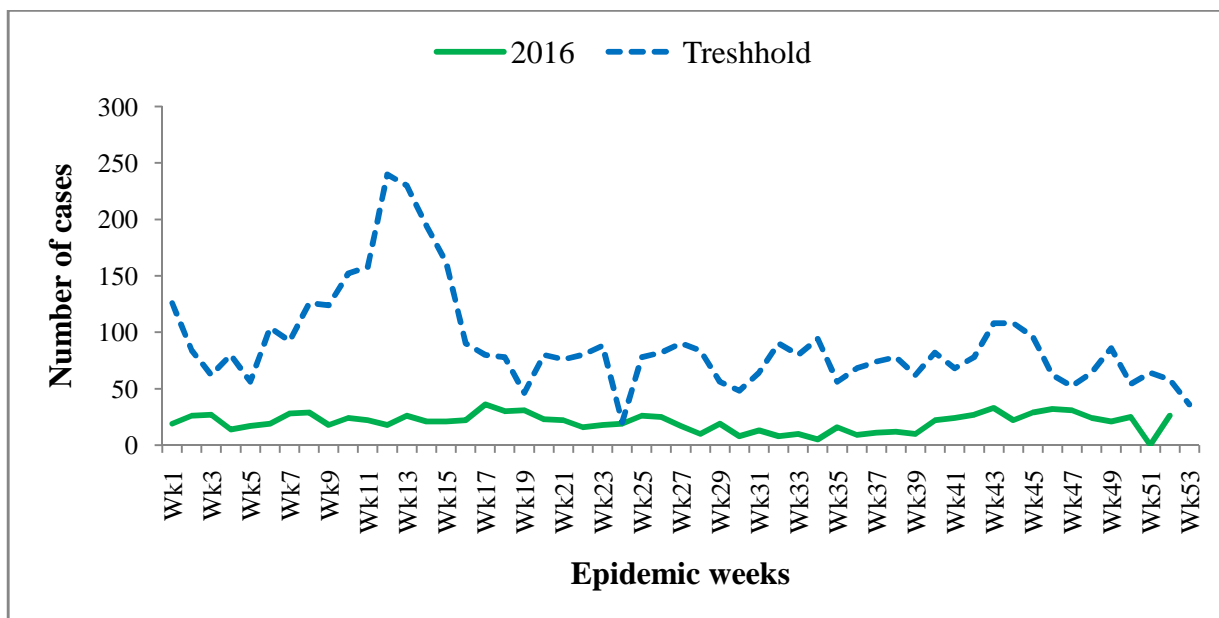


Figure 35: Malaria monitoring chart, Angacha Woreda, Kembata-Tembaro zone

Malaria prevalence In 2015/2016, Tembaro district reported malaria prevalence of 62.2 per 1000 population, Hadero-Tunto woreda reported the malaria prevalence of 12.4 per 1000 population, and Angacha district reported a malaria prevalence of 9.7 per 1000 population

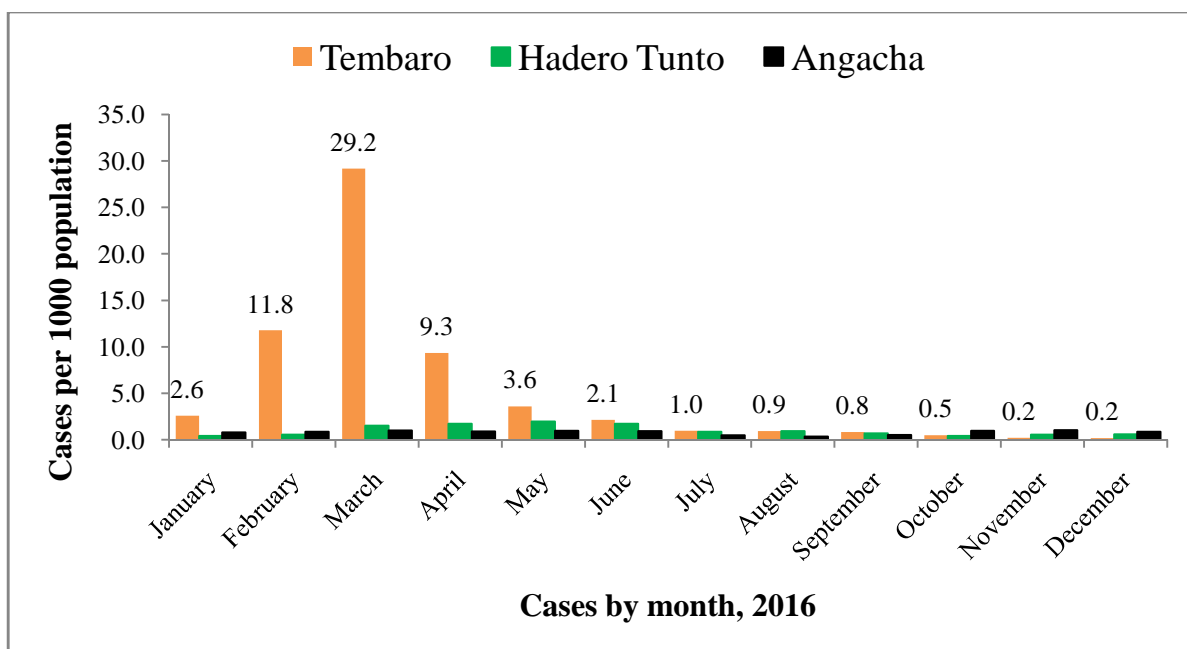


Figure 36: Malaria prevalence by month and Woreda, Tembaro, Hadero-Tunto, and Angacha, Kembata-Tembaro zone, SNNPR, 2016

From Zonal total, in these three districts a total of 60,442 (43.3%) suspected fever cases examined by RDT or microscopy, 10,688 (65.4%) confirmed cases, 78 (29.8%) clinical cases, 100 (72.5%) inpatient cases and Zero death were reported through surveillance system from evaluated reporting units (n= 28). The proportion was calculated from zonal reported cases. This shows the most malaria cases are from these woredas especially from Tembaro and Hadero Tunto woreda.

Case registration

Case registration is the process of recording the cases identified. At health post level, 18 (100%) identified cases were recorded in the family folder. 100% health centers (n=6) were using malaria registration book given by regional health bureau for laboratory results, outpatient (OPD) and inpatient (IPD) abstract books for OPD and IPD malaria cases.

Case confirmation

Case/outbreak confirmation refers to the epidemiological and laboratory capacity for confirmation. In the evaluated surveillance units /health facilities (n= 28), cases were confirmed at health post and health centers. Eighteen (100%) health posts were using RDTs; six (100%) health centers were using both RDT and microscopy. In 2008/2016 the evaluated surveillance units confirmed 10,766 malaria cases (6,143(57.5%) = PF, 4,545(42.5%) = PV). There was malaria outbreak detected and confirmed through these evaluated reporting units, which is mentioned in outbreak part. Health posts were referring sever cases to health center.

Measles: Measles was also a serious problem, which occurs as an outbreak in the region. In 2015/2016, 2775 measles cases with case fatality rate of 120(4.3%) reported to SNNP Regional Health Bureau. However, from which Kembata Tembaro Zone Health Department shared 53(1.9%) suspected cases and one death throughout the year. And also at least one case of suspected measles cases per 100,000 population is expected from each woreda. According to national target, 80% and above woredas should report at least one case of measles with a blood specimen per year. Most of the woredas were sending at least one measles suspected cases per 100,000 populations in the previous two years. Moreover, the recent performance of the zone (six months) was (100%) more than the national target.

AWD/Acute watery diarrhea: AWD was occurs as an outbreak in the region. In 2015/2016, 391 AWD cases with case fatality rate of six (1.5%) reported to SNNP Regional Health Bureau.

However, from which Kembata Tembaro Zone, Tembaro woreda, 133 cases 3 deaths (2.2%) reported in 2016.

Table 20: Means of specimen collection and Case confirmation in Kembata Tembaro zone-SNNP Region 2016

S/No	Health facilities	Health Facilities with national manual for surveillance	Capacity to transport specimens to a higher level lab?	guidelines for specimen collection, handling and transportation	fully employed focal person On PHEM
1	Zonal Health Department (n=1)	1(100%)	1(100%)	1(100%)	1(50%)
2	Woreda Health office(n=3)	3(100%)	3(100%)	2(67%)	3(100%)
3	Health center (n=6)	6(100%)	5(83%)	3(50%)	0
4	Health Post(n=18)	4(33%)	NA	NA	NA

Reporting

Reporting is the process by which surveillance data moves through the surveillance system from the point of generation. Reporting format is prepared and distributed at central level, there was some amount of shortage of reporting format in three(17%) visited health post in the past 6 months. The rest have enough amount of reporting format. All the reporting sites collect the immediately and weekly reportable cases using weekly reporting format on weekly basis and all health facilities have a remain of copy of reported cases for administrative and other official purpose. The reports were sent to the next higher level via hard copy and telephone. Zero reporting is one of the main criteria in the surveillance. There is no blank space report in the last three months.

Table 21: Completeness of reports in the health post in the past year in Kembata Tembaro zone, SNNPR, February 2016

Line	Name of Woreda	Name of Health post	Expected report	Number of reports reported	of Completeness of reports by (%)
1	Tembaro	Geacha' Health Post	52	45	87
		Gidansonga' Health Post	52	35	67

		Kealata' Health Post	52	39	75
		Ha' Zambara health post	52	46	88
		Osheto' Health post	52	42	81
		La' Zambara health post	52	42	81
2	Hadero Tunto	Mugunja' health post	52	51	98
		Lesho' Health post	52	50	96
		Ha chacho Health post	52	49	94
		Mandoye Health Post	52	45	87
		Second Tunto Health Post	52	48	92
		First Tunto Health post	52	50	96
12	Angacha	1 st Angacha Health post	52	49	94
		Kerkicho Health post	52	46	88
		Messena Health post	52	48	92
		Shino Health post	52	22	42
		Gede Health post	52	50	96
		Jeba Health post	52	49	94

The above table22 shows, actual report found during visiting period. But at woreda and zonal level their completeness considered as 100%. This may be due to lack of continuous and consistent follow up (monitoring and evaluation).

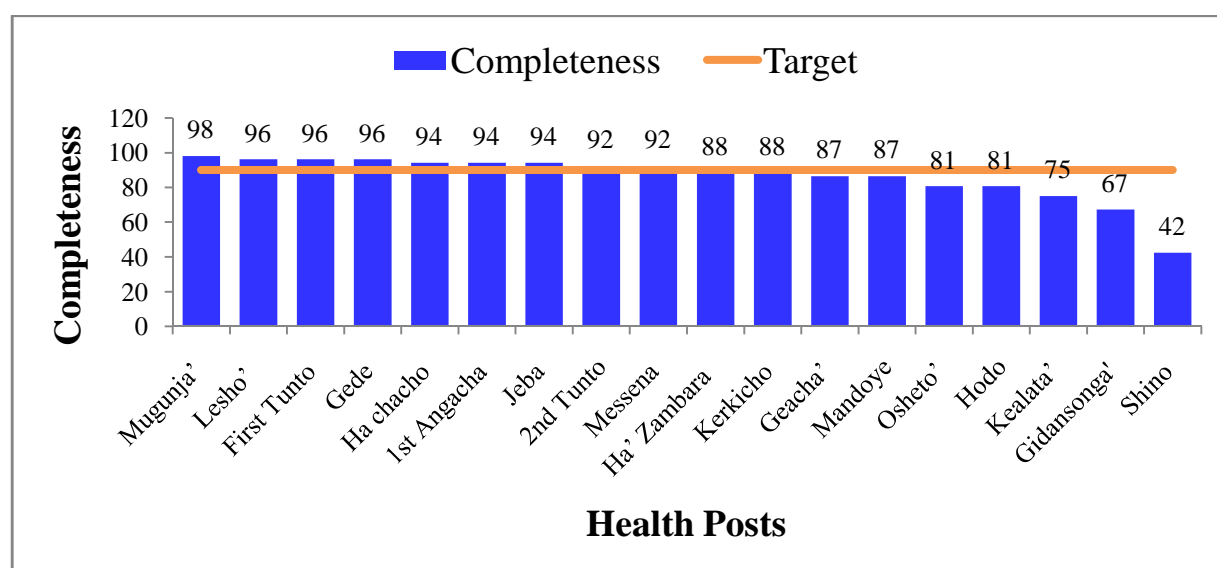


Figure 37: Completeness Report of Health posts in Kembata Tembaro zone, 2016

From the above Figure37, Health posts completeness varies with large gap. It varied from 42% in Shino health post to 98% in Mugunja health post in the last year of 2016.

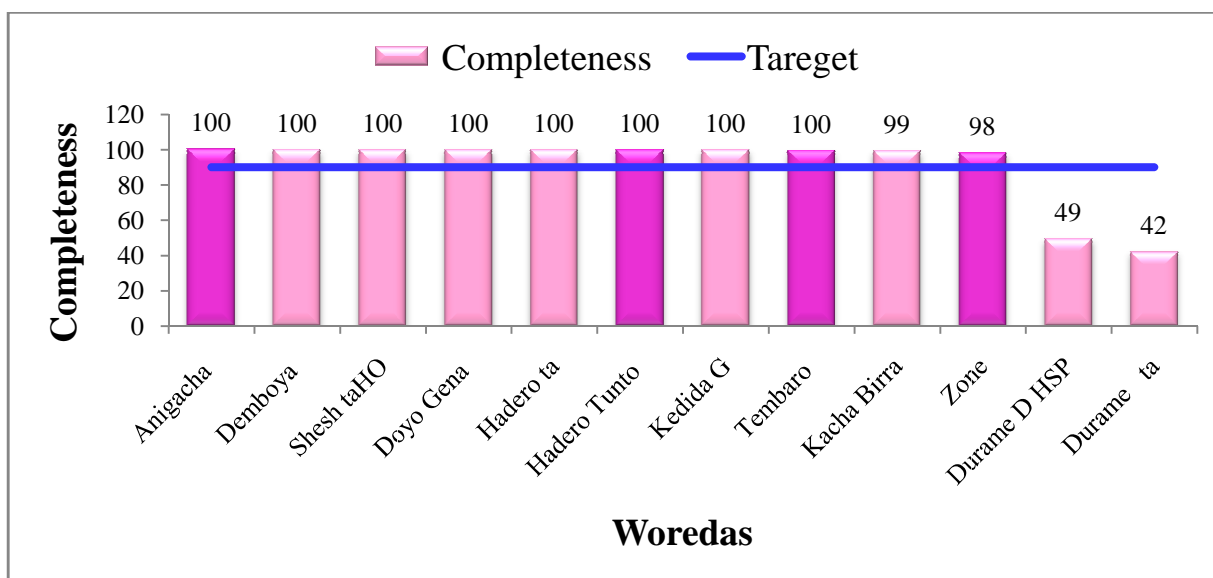


Figure 38: Percentage distribution of woreda's completeness in Kembata Tembaro zone, SNNP region, Feb 2016

* NB: - These are selected woredas

From the above two figures 37 & 38, health posts completeness were below from the reported but the selected districts (Tembaro, Hadero Tunto and Angacha) their completeness were 100%. This shows there is a gap and report inconsistency between the actual report at health post and at district level.

Table 22: Difference between weekly IDSR and HMIS report in selected wordas, Kembata Tembaro Zone, SNNPR 2016

	Tembaro		HTZ		Angacha	
	IDSR	HMIS	IDSR	HMIS	IDSR	HMIS
July	119	52	111	95	35	376
August	121	43	121	71	36	149
September	107	80	90	96	58	160
October	64	66	51	74	106	180
November	29	183	72	47	114	140
December	24	152	76	69	96	106
January	337	512	51	60	86	88
February	1516	2072	72	90	93	100
March	3837	3538	193	185	107	376

April	1223	1381	223	261	100	106
May	469	672	253	413	96	119
June	279	403	219	249	104	104
Total	8125	9154	1532	1710	1031	2004

Table23 shows difference (gap) between weekly IDSR and monthly HMIS report in selected woredas due to different reason. The data shown in the same facility but different reports may be due to coordination, integration, lack of follow up and monitoring problem.

Table 23: Three-month weekly IDSR and HMIS report in selected Health centers, Kembata Tembaro Zone, SNNPR 2016

	October		November		December	
	IDSR	HMIS/R	IDSR	HMIS/R	IDSR	HMIS/R
Geacha	16	24	37	33	42	48
Hodo	5	2	45	78	80	62
Mandoye	43	35	22	15	16	30
Lesho	7	3	9	1	7	12
Angacha	90	114	95	91	85	78
Shino	71	28	58	32	49	19

Both Table24 & Figure40 shows difference (gap) between weekly IDSR and monthly HMIS report in selected Health centers due to different reason. The data shows in the same facility but different reports.

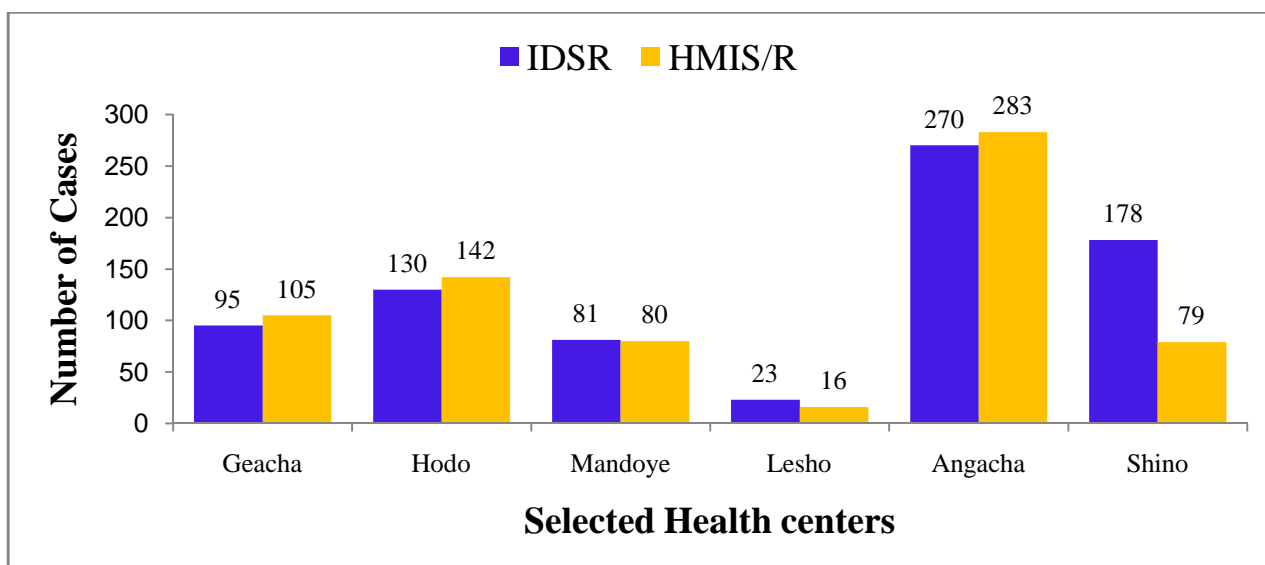


Figure 39: Three-month weekly IDSR and HMIS report in selected Health centers, Kembata Tembaro Zone, SNNPR 2016

Data Analysis

During the visit, Zonal and Woreda health offices were analyzing surveillance data but health centers and health posts were not analyze surveillance data. The zone analyzes data in terms of time, place, and person and performs trend analysis for malaria, Measles and other cases. However, from three investigated Woredas 1(33%), describe data in terms of place, time, person and two (66.7%) of them perform trend analysis for malaria and measles. Majority of health facilities did not describe data by time place, person and diseases over time. Moreover, zonal health department have an action threshold for epidemic monitoring system. At woreda level and health facilities, only a single Woreda have both alert and action threshold level for epidemic management system (Tembaro). However, the rest two Woredas and the health facilities (health centers and health posts) did not have any document expressing alert and action threshold level for early detection of an outbreak.

Districts used for surveillance data analysis in Kembata Tembaro Zone, 2016

Name Of Health Facility	Described By Place	Described by time	Described by time	Perform trend Analysis	Have an action threshold
Zonal(n=1)	1(100%)	1(100%)	1(100%)	1(100%)	1(100%)
Woreda(n=3)	1(33%)	1(33%)	1(33%)	1(33%)	1(33%)
Health Center(n=6)	0	0	0	0	0
Health Post(n=18)	0	0	0	0	0

Epidemic preparedness and Response

In 2016, one suspected malaria outbreak was observed in the zone, which is in our study area. It was investigated by respective district. Regarding to Epidemic preparedness for potential epidemic control mechanism activities 2(67%) of the visited Woreda were with epidemic preparedness and response plan. Three (100%) of the visited site has an Epidemic management committee; however none of the observed Woreda epidemic management committee evaluated their plan and preparedness and not have regular meeting schedule. All visited woreda offices have RRT committee. Concerning to emergency stock of drugs and supplies in the Woreda all of them have supplies and drugs for emergency.

Table 24: Zonal health department and Woreda health offices epidemic preparedness in kembata Tembaro Zone, SNNPR 2016

S/No	Variables	Woreda (n=3)	Zone (n=1)
1	Epidemic Management committee	3	1
2	Epidemic Management committee have regular meeting schedule	0	0
3	Availability of emergency stocks of drugs and supplies	2	1
4	Health Facility with plan for Epidemic Response	0	1
5	Drugs and supplies during epidemic	3	1
6	Presence of budget line for epidemic response	3	1
7	Conducted outbreak	1	1
8	Establishment of Rapid Response team committee(RRT)	3	1
9	Rapid Response team committee(RRT) have regular meeting	2	1
10	Partners working together	1	1

Feedback

No written feedback was given to all health development armies from health post. 18 (100%) health posts were providing oral feedbacks to health development army. 15/18 (83.3%) health posts not receive written feedback from higher supervisors, similarly 5/6(83.3%) health centers

also not have written feedback but 3(100%) woreda offices and Zonal health department have received written feedback and giving written feedbacks file. No monitoring and follow up mechanisms were applied whether the given feedbacks at health center and at health post level brought improvement or not. In addition, at woreda health office and zonal health department level, the given feedbacks are not regular and consistent.

Supervision

Supportive supervision helps to strengthen the capacity of staff and ensure that the right skills are used appropriately; the necessary logistics are in place, but that planned activities are not implemented according to schedule. From 28 health institution observed, 20(71.4%) of them were taken supervision from higher level, however 1(3.4%) health center and 3(10.7%) of the health posts didn't take any supervision in the last 6 months on the surveillance activities and integrated supportive supervision from the higher officials respectively. From these supervised health facilities, most of them are not received feedbacks.

Communication facilities

In order to support the function of reporting, appropriate and effective medium for communication at each level is advantageous for early detection of outbreak of diseases. A few Health development army (HDA) was providing the routine report from their village by means of hard copy and oral report. Health posts were providing the routine report by two means. One was by using hard copy. The other was by means of their mobile phones. The report day for health post was Monday morning up to mid-day. 18 (100%) Health posts were using mobile phone access. In addition to this, 3(100%) Woreda, 6(100%) Health center and one (100%) zone department report by telephone. On the other hand, 18(100%) of the health post sent their report to linked health center with hard copy.

Table 25: Logistics and means of reporting system in visited institutions, Kembata Tembaro Zone, SNNP region 2016

Se. No	Data management & logistics resource the Woreda	Zone(n=1)	Woreda(n=3)	Health center(n=6)	Health post(n=18)
1	Telephone	1	3	1	0
2	Calculator	1	3	6	18
3	Stationary	1	2	6	18
4	computer	1	3	0	0
5	motor cycle	1	3	6	0
6	printer	1	3	0	0
7	Car	1	3	0	0

8	Hard Copy	1	3	6	6
9	Mail	1	3	0	0
10	Bicycle	1	3	0	0
11	Electronic	1	3	0	0
12	Fax	1	3	0	0

Resource

Surveillance and response activities performed, if the required and appropriate financial, human and logistic resources are in place. Resources for data management, communication, and other logistics were comparatively available at the Zonal level. However, they all became limited down in the hierarchy. Two (67%) of the Woreda have only a single computer for overall office activities in the health office. In addition to this, 2(67%) of the woreda public health, emergency management focal person has their own computer for data management and analysis. All health institution in the respective woreda has complained the logistic and budget constraints.

Monitoring

In 2016, all level (health posts, health centers, and woredas) the health workers were assigned to monitor all planned activities. Even if they assigned at every level of the system, their support is irregular and not consistent. Malaria monitoring/ norm chart was not used at (all health posts) evaluated surveillance units.

Co-ordination

The coordination between implementers and stakeholders is important for effective and efficient implementation of surveillance and response systems. Three (100%) woreda health office and zonal health department were working along with rural development, education office, water office, NGOs like world vision, WHO etc. The mentioned stakeholders did not evaluate the performances and not had regular meeting schedule.

Training

Conduct training on disease surveillance, outbreak investigation, Surveillance data analysis and response is the backbone for early detection and confirmation of the cases, consequently 1(100%) of health personnel in zone get training on public health surveillance system. Whereas, three (100%) and six (100%) of the Woreda and health center was already get training on surveillance system respectively. While the HEWs 5 (28%) in the health post did not, got any training regarding to some of the components of surveillance but the woreda focal person

responded that all Extension workers in all site get integrated refreshment training (IRT) including Public health surveillance system.

Description of Quality and attributes of surveillance system

Surveillance quality

Completeness of reporting sites/surveillance forms

Completeness of reporting of visited sites is the proportion of reporting sites that submitted the surveillance report irrespective of the time when the report was submitted.

Health posts were reported an average of 86% completeness of reporting site ranging from 42% to 98%. The average completeness of the health center was 95.6%. The percentage completeness of reporting sites of woreda health office and zonal health department was 100%.

Timeliness of reporting

The timeliness of the zone was 80% but it is difficult to know at health facility level due to absence of time of report. It is the single most important measure of timeliness whether data are submitted in time to begin investigations and implement control measures.

Usefulness of surveillance system and surveillance data

28 (100%) of respondents were accepted as the surveillance system and its data was helpful to detect cases early, to estimate the magnitude of morbidity and mortality, permit assessment of the effect of prevention and control program, and estimate research intended to lead to prevention and control.

Simplicity

Simplicity is the structure of the system and the ease of implementation. At all evaluated surveillance units, the cases definition was easy for case detection, the surveillance formats allowed all professionals to fill data and was easy to record and report data, allowed updating data on the formats and the time to fill the format was 5-15 minutes.

Flexibility

The format can accommodate enough types of disease and still possible to add new disease in it as well to discard and to report other new cases and also possible for modification of the reporting frequency, requirement needs, etc all occurred without difficulty in visited health unit(28) in the zone .

Positive predictive value

We divided the positivity rate of total examined by RDT and microscope for malaria. PVP for malaria = Total confirmed cases by laboratory / Total suspected cases diagnosed in laboratory for confirmation

$$= 10766/50612 = 21.3\%$$

Sensitivity in surveillance case definition

Sensitivity of a surveillance system based on the level of case detection and the ability of the system to detect outbreaks, including the ability to monitor changes in the number of cases over time mentioned as follows:

In the detection of cases

Health facilities use loose case definition to detect malaria, measles and AWD cases for example those with acute febrile illness send to laboratory for confirmation. For malaria, the case detection is very good except the health posts faced lack of and expired RDTs for some days.

In detection of outbreaks

Outbreak detection depends on regular data analysis, health-seeking behavior of the society, availability of reagents and definition of thresholds, timeliness and completeness of reporting, population under surveillance. Timeliness and completeness of the report is in the acceptable range indicates good sensitivity of the system to detect the outbreak.

Acceptability

Acceptability of a system is a reflection of the willingness of the surveillance staff to implement the system, and of the end users to accept and use the data generated through the system. At all evaluated reporting sites all reporting agents accepted and well engaged. Health posts, health centers, woreda health offices, and zonal health department were using the surveillance data for prevention and control. Health professionals were using the standard case definition to identify cases. All reporting units were using the given surveillance reporting formats.

Data quality

Sixteen (88.9%) health posts reported incomplete surveillance report. 18 (100%) of them reported clear records to read and understand. 6 (100%) of health centers sent complete and clearly recorded report for woreda health office. 3 (100%) of woreda health office sent complete and clear data report to zonal health office.

Representativeness

Representativeness refers to the degree to which the reported cases reflect the occurrence and distribution of all the cases in the population under surveillance. Geographical representativeness and health service physical accessibility in the zone is particularly greater important in an early warning system to ensure detection of outbreaks nationally notifiable diseases. At health post level the surveillance report incorporated the population under surveillance. Non-governmental health facilities were also included in all surveillance reports. However, 73 private health facilities found at kebele, and woreda level were not included in surveillance report. Still people were using private health facilities for malaria and other disease treatment. So, that the surveillance system in zone was not representative.

Stability

Still the system was not interrupted by different reasons. In the absence of budget from donor, the government was running all activities along with other integrated services.

3.1.7 Discussion

Public health surveillance is the 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 (22). We confirmed that standard case definitions was not available in some (15%) health post visited. The standard cases definition is supposed to be available and posted at all health facilities and health offices for detection of suspected cases. This may lead to low detection of cases from the community. There is gap (variation) between report completeness at health posts, health centers and woreda level (Health posts were 86%, health centers was 95.6% and woreda health office and zonal health department were 100%). The data of reportable diseases were collected, but the analysis was not done in most of health facilities. Coordination and supervision of the surveillance activities were not frequent. From those supervised health facilities, most of them are not received feedbacks. Such weak performance could be due to poor monitoring, supportive supervision and feedback system at lower level in the surveillance activities. This may undermine the attention given to surveillance and response of epidemic prone diseases- like malaria, measles and Acute watery diarrhea.

Malaria cases were confirmed at all nearest health facility level. Not need to refer malaria case for confirmation to distant health facilities. By using the malaria monitoring chart at district level (figure33), malaria outbreak was seen in Tembaro district between week5 to week17, 2016. The prevalence of malaria in 2016 was high in Tembaro district relative to Hadero Tunto Zuria and Angacha districts.

At least one case of suspected measles sample per 100,000 populations is expected from each woreda. According to national target, 80% and above woredas should report at least one case of measles with a blood specimen per year (13). According to the assessment result, most of the woredas were sending at least one measles suspected cases per 100,000 populations in the previous two years. Moreover, the recent performance of the zone (six months) was more than the national target.

Even there were functioning computers, skilled personnel in different surveillance units, but the surveillance system was not using the current technologies to store, analyze and interpret data. At health centers, surveillance data not entered in to the computer and were not analyzed by person, place, and time and no surveillance data was interpreted and used for public health action. Epidemic management and rapid response team were established in almost all reporting units but not have scheduled regular meeting. From the visited health centers, none of them was used epidemic preparedness plan and not supported by budget. Communication facilities only by mobile and hard copy were accessible at all level. Human, logistic resources (computer technologies), and financial resources were available at two districts (Tembaro and Angacha) but at Hadero Tunto district and most of health centers and all health posts logistic resources (computer technologies), and financial resources were not available.

Reporting formats were easy to fill. The system was easy for modification of frequency of reporting and can be operated with other system. The formats were possible to incorporate new variables and the presence of blank columns in all the PHEM reporting formats makes the surveillance system flexible in which disease other than those, which are listed as nationally reportable, could be reported using the existing formats without major changes. The respondents accepted as the surveillance system and data was useful to detect cases early to permit accurate diagnosis, to estimate the magnitude of morbidity and mortality and so on. Case definition was understood at all levels except some (15%) health posts. Standardized tools were in place (formats, line lists). Malaria case definition was sensitive and detected cases in different geographic areas. Still incomplete data was reported from health posts. However, at woreda and zone level the report completeness above the target. Data from private health facilities were not included in the surveillance reporting system (23). Timeliness of the zonal department was 80% but health the facilities timliness but it is difficult to know at health facility level due to absence of time of report.

3.1.8 Limitation

Due to shortage of time and transport, the study was conducted on accessible health facilities which might be limited its representativeness. Date of receipt and reported is not registered in reporting format because of this we did not calculate timeliness of the report. Important data was difficult to get and to calculate the disease trend. We could not calculate sensitivity and specificity in terms of case detection because we could not get variables required for calculating sensitivity and specificity for AWD and Measles.

3.1.9 Conclusion

We conclude that a case definition was not available in some health post visited and there is gap between report completeness at health posts, health centers and woreda level. This is due to lack of training, specific supervision, evaluation and feedback. In addition, Coordination and supervision of the surveillance activities were not frequent. From those supervised health facilities, most of them are not received feedbacks. 73 private health facilities were not included in surveillance report and absence of timely analysis and utilization of data made the existing surveillance system weak. Therefore, it is necessary to strengthen the surveillance system by capacitating health workers at all levels to analyze and utilize available data. Even there were functioning computers, skilled personnel in different surveillance units, but the surveillance system was not using the current technologies to store, analyze and interpret data for public health action. Epidemic preparedness plan was not prepared in some surveillance units. Epidemic and rapid response team was not conducting scheduled regular meeting. Most of the surveillance units were not used malaria monitoring/norm chart. It is difficult to calculate timeliness from the current documentation system. Therefore, strengthening data processing capacity at all levels by providing necessary computing facilities where needed; strengthening feedback system at lower levels; strengthening documentation and document retrieval system at all levels. The surveillance system in Kembata-Tembaro zone is useful, complete, easy to implement, acceptable, flexible, and stable.

3.1.10 Recommendation

- Standard case definition should be available, posted and used consistently at health facilities
- Epidemic preparedness plan should be prepared and used by health centers, and woredas for emergency response condition
- Malaria monitoring tool should be prepared and posted on the wall at all surveillance units for easy track of malaria changes.

- Zonal health department and woreda health offices should put in place written feedback and supervision specifically to surveillance system at least quarterly.
- Training on data analysis should be given to the surveillance focal persons and reserve health professionals, including onsite training
- To capacitate the new surveillance staff, and to refresh/update the existing one training should be facilitated by woreda and zonal health department with the computer technologies
- To measure timeliness, indicators should be prepared by all surveillance units
- All private health facilities should be incorporated in to surveillance reporting units

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Chapter IV – Health Profile Description Report

1.1 4.1 Health Profile Description of Hadero-Tunto Woreda, Kembata Tembaro

Zone, South, Nations, Nationalities, and Peoples Region, 2015/16

Executive Summary

Background: health profiles provide an overview of the situation and trends of priority health problems and description of institutional frameworks, key issues and challenges. It provides evidence-based health policymaking through a comprehensive and rigorous analysis of the dynamics of the health situation and health system in the country of health system.

Methods: Cross sectional descriptive study design was used and data necessary for health profile description was collected from woreda health office, woreda administration office, agriculture office, education office, finance and economic development office, water resource office and others from February 01/2016 to February 15/2013. After data collection and compilation, and we used Micro-soft Excel 2007 to calculate frequency, ratio, rate, and proportion. We also used Microsoft excel to construct tables and figures.

Results: In 2015 there were total of 38 schools in the woreda with 100% enrolment rate (50.6% female). Of these the overall drop out was 1.5% and Female student dropout was 0.6% from total students. Potential health service coverage was 95% with total health workforce density of 0.9 per 1000 populations and one health center and health post were serving for 31,898 and 4854 populations respectively. In 2015, from adult OPD Typhoid fever was the leading cause of morbidity and malaria is still one of the causes of illness in top ten diseases. From under five OPD, sever acute malnutrition (SAM) one of the leading cause of inpatient admission and death. On the other hand, 111 all TB cases were detected with detection rate of 34% in 2015.

Conclusion and recommendation: Malnutrition is increasing from previous year and Malaria is still one of top ten causes of morbidity in the district is the major identified problems. Others such as low delivery service utilization, low outpatient per capita, high health center to population ratio, health centers and health posts were without water and electric supply, low budget allocation to health sector, very low latrine utilization (improved latrine utilization only 20%), low TB case detection rate were some of the problems. Therefore, the Woreda has to do more efforts to fill the gap mentioned above.

4.11 Introduction

Health profile description is a key for identifying and prioritizing health problem, for planning, implementation and evaluation of intervention activities. It is also important to identify and prioritize major problems at any level of health system to make decision for action and to prepare plan. Moreover, it helps in collecting, organizing, summarizing health and others health related events to describe health and health related conditions, demographic, socio-economic, political, and cultural and others aspect of a particular geographic areas. In epidemiologic point of view, it is crucial to prioritizes health and health related condition occurred within the communities. These summarized and prioritized data is important for public health surveillance officials. They can uses for planning, implementation and evaluation of public health surveillance program. Therefore, in Hadero Tunto health office in previous years health profile description was not prepared and the health status of the woreda's was not documented and compiled in organized way. So that, this study was conducted to prepare health profile of Hadero Tunto woreda and to identify the major problems of the woreda on health system.

4.1.2 Objective

General Objective:

To assess and describe health related issues about health status, health indicators, and to identify problems for priority setting of Hadero Tunto district, Kembata Tembaro Zone 2016.

Specific objective:

- To identify the health service status of Hadero Tunto District
- To indicate the major problem related to communicable diseases of the woreda
- To identify observable health problem in the woreda

4.1.3 Method

Area of study

Study setting. We conducted a rapid assessment in Hadero-Tunto district. The total population of the district was 127,590.

Study period. We conducted the rapid assessment in Hadero-Tunto district from February 01-07/2016 in Kembata-Tembaro zone, SNNPR

Study design

Descriptive cross sectional study was conducted to identify and indicate the woreda health service status as well as to identify the major health problem of the area and to set recommendations for the identified major problems.

Sample size and sampling technique

We used only Hadero-Tunto district. In the district for data collection, we included woreda health office, education office, water office, rural development, finance and economic development, and revenue authority

Data collection

Data was collected from Hadero Tunto district health office and other respective sectors like administration, woreda finance office, agriculture office, education office, animal health office, Revenu collection office, Water and energy office, Road & traffic control authority office. Others by reviewing available data from those mentioned sectors by using structured questioner and interviewing different concerned individuals from February 01/02/2016 to 07/03/2016.

Data analysis

Data was analyzed by using Microsoft office excels.

Ethical issue Official permission was obtained from the regional public health emergency core process to Kembata-Tembaro. Cooperation letter was written to Hadero Tunto district health office, then the district notified to the selected woreda office through phone calling.

4.1.4 Result

Geography & climate:

Hadero Tunto is one of the seven districts of Kembata Tembaro zone, SNNP region, and the youngest Woreda in Kembata Tembaron zone, and it was established in 1998 E.C. From derg regime until 1998E.C the district was administered by two woredas which is' Tunto' part administered by 'Omo shelloko woreda' now it is called Tembaro woreda and 'Hadero' part is administered by kacha birra woreda. Then after for the sake of easy administration Hadero Tunto woreda were reestablished with 14 rural and 02 urban kebeles in 1998 EC. The district is located 292 KM from Addis Ababa on the direction of South, 192 Km far from the capital city of SNNPR Hawassa and 32 KM from Durame, the capital town of the zone in the direction of West. Hadero Tunto is bordered on the south by Wolita Zone, Tembaro Woreda ,Hadiya Zone

and Kacha-birra woreda on the south, west, North and east respectively with a total area of 18,950 Hectar (189.5 Km²) which accounts for 13.3% of the total area (142,952 Hectare) Kembata Tembaro Zone.

In the district, there are many areas to be visited by visitors. Such as natural hot water in Ajora valley, 'Boha torra mountains', 'Sodicho cave', 'Gods Natural bridge' in Mandoye kebele and 'sarro-birra natural land-scape to appreciate Ajorra gorges and 'Omo River'(1,9).

Climatic condition

The altitude of this woreda ranges from 1100 to 2650 meters above sea level; mount Boha-Torra is the highest point. It has three Climatic zones, which is 13% Kola, 19% Dega and the rest 68% is Weyina dega. It has on average 20°C annual temperature, maximum of 32°C and minimum 8°C. In addition it has annual rain fall on average 1100 mm and ranges from maximum of 1400 mm and minimum of 850 mm and the district rainy season start from half February and extend to September.

The district land coverage shows that 69% is arable or cultivable planted in cereals, 4.6% pasture, 3.3% forest, others 3.8% and the remaining 19.3% is considered swampy, mountainous or otherwise unusable(9).

Administrative & political structure

Hadero Tunto has fourteen rural and two urban kebeles. The administrative center of the district is Hadero town. It has altitude of N37°(x-co)= 0359577-0761067 and longitude of y(y-co)=0793348-0805346) with an elevation of 1535 meters above sea level (9). There were 42 Farmer Associations and 60 Farmers Service Cooperatives with 5,281 members (11). Development of road network system is a vital to any countries socio-economic progress. The district has 39 kilometers of dry-weather and 30 kilometers all-weather road, which connect localities.

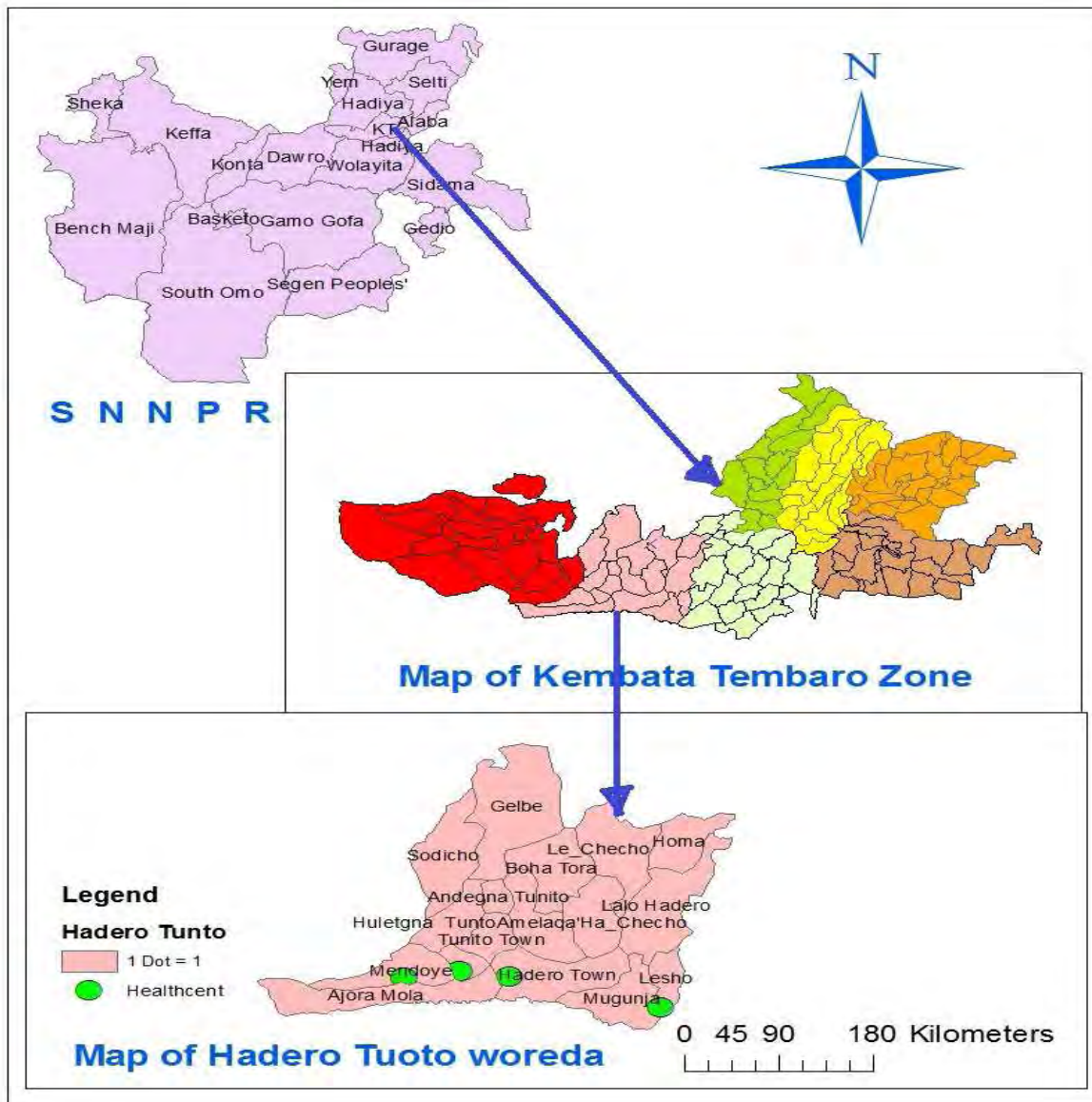


Figure 40: Map of Hadero Tunto Woreda, Kembata Tembaro zone, Ethiopia

Demographic information

According to 2007 census result report, Hadero Tunto woreda had a total population of 127,590 with growth rate of 2.9% which is Male population 62,978 (49.4%) and Female population 64,612(50.6%) in 2016. From this male to female ratio is approximately about 0.97:1 (1:1) which is similar with regional and national ratio (3). Of those total population, 97,083 (76.1%) were living in 14 rural kebeles and the rest 30507 (23.9%) were living in two urban kebeles of the woreda. Of these total population, women of reproductive age group (women 15-49 years of age) constitute 23.3% and 47.87% of the population were under 15 years of age.

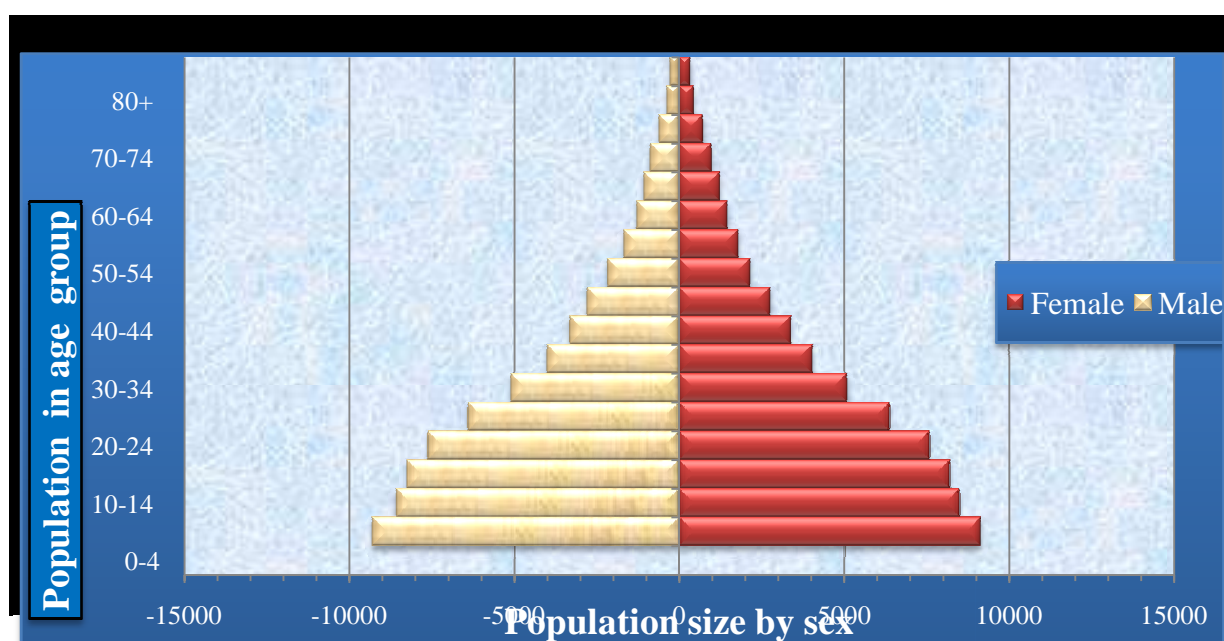


Figure 41: Population pyramid of Hadero Tunto, Kembata Tembaro Zone 2015

Ethnicity and religion

From population living in woreda about 91% of the population were Protestant, 6% were Orthodox, 1% were Muslim and the rest 2% were other religion followers and there is more than 6 different ethnic group’s composition in Hadero Tunto woreda. From the total population Donga, Kembata, Hadiya, Wolita, Tembaro, Amhara, Silte, Gurage and other ethnic groups are found. Amharic language is the official language in the woreda. However, from the total population Kembatagna was the most spoken language (10). The population density was seven people per Hectar in 2015. In the same year in the woreda there were 4070 surviving infants, 10603 under three and 26039 households. List of kebeles and other detail information is presented in table1 (28).

Table 26: Population’s distribution profile by kebele of Hadero Tunto Woreda

S.No.	Name of kebeles	Total Population	< 1 year	< 3 years	< 5 years	Pregnant	Non Pregnant	# of H.Hs
1	Hadero	23110	737	1920	3607	800	4585	4716
2	Ha-chacho	6839	218	568	1068	237	1357	1396
3	Le-chacho	6896	220	573	1076	239	1368	1407
4	Lalo	12774	407	1062	1994	442	2534	2607
5	Ajora	4703	150	391	734	163	933	960
6	Lesho	3395	108	282	530	117	674	693
7	Mugunja	7635	244	634	1192	264	1515	1558
8	Homa	4771	152	396	745	165	947	974
9	Tunto 01	7397	236	615	1155	256	1468	1510
10	Ameleka	8790	280	730	1372	304	1744	1794
11	Sodicho	9848	314	818	1537	341	1954	2010

12	Gelebe	9794	312	814	1529	339	1943	1999
13	Boha-Torra	4889	156	406	763	169	970	998
14	1 st Tunto	4627	148	385	722	160	918	944
15	2 nd Tunto	6101	195	507	952	211	1210	1245
16	Mendoye	6021	192	500	940	208	1195	1229
17	Total	127590	4070	10603	19917	4415	25314	26039

Table 27: Population Distribution of vital statistics in Hadero Tunto woreda, Kembata Tembaro zone, SNNP Region, February 2015

S/No	Target Health Indicators	Estimates SNNPR in %	Total	Remark
1	< 1year of age	3.9	4070	
2	<3 yr age group	8.31	10603	
3	Under 5 year child population	15.61	19917	
4	6 – 59 months age group	13.94	17786	
5	24 – 59 months age group	10.43	13308	
7	Total number of estimated pregnancies / Births	3.46	4415	
9	Estimated deliveries	3.46	4415	
10	<15 yr age group	47.87	61077	
12	TB Prevalence	0.9	1148	
15	IMR/1000	No data	No data	
16	CMR/1000	No data	No data	
17	MMR/100000	No data	No data	

Economy/Production

The pattern of the rainfall gives a wide opportunity for the district to produce different types of crops and use the same land twice a year. That is for Meher and Belg. However, Meher is the largest season in terms of both cultivated land area and crop production. The major annual crops grown in the district are cereals, pluses, Oil seeds and maize. From cereal crops Wheat, Barley, Teff and Maize are the most widely grown ones. In addition, it is known in producing some cash crops like Coffee, Zinger, tomato, onion, carrot, etc.

In the 'Meher' 4124 hectare, during 'belg' season 7312 hectare and by irrigation 3784 hectare of land were cultivated. Average productivity per hectares by crop type in 2007EC wheat with production of 31,161.5 quintals which is 38 quintals per hectare, Teff 18,847 quintals which is 21 quintals per hectare, Maize from 798 hectare 35 quintals per hectare was produced. In addition barley from 93.75 hectare 22 quintals per hectare, beans from 550 hectare 12 quintals per hectare and pea from 240 hectare 10 quintals per hectare was produced(9).

Most inhabitants are farmers (dependents on seasonal agriculture and animal production) 85%; Government and private sector employee 10% and the rest 5% traders or have their own business (11).

Education

Hadero Tunto woreda had 35 primary school, 2 high school and 1 preparatory school. In 2015 a total of 27,636 students were planned to be enrolled and 27,651 (100%) were registered and started class. Of these 50.6% were females and there was a difference from grade to grade.

Table 28: Student's enrolment by sex and grade in Hadero Tunto woreda, 2015

S.No.	Grade	Plan		Achievement		Percentage		Female From total
		Total	Female	Total	Female	Total	From Female	
1	1-8	25138	12173	24834	12520	98.8%	103%	49.8%
2	9-10	1876	924	2269	1209	120%	130%	64%
3	11-12	622	264	548	257	93.5%	97%	44%
	Total	27636	13361	27651	13986	100%	104.6%	50.6%

There were 6 kindergarten schools with 15 sections and the numbers of teachers were 21 with a student's of 2923. The district provides primary education by 314 male and 141 female teachers and there were a total of 455 teachers. The teacher to student's ratio was 1:52 while class room to student's ratio was 1:65

In secondary school there were 74 teachers and a teacher to student ratio was 1:35 and class room to student's ratio was 1:49. In preparatory school, there were 23 teachers. In the woreda most of the time dropout rate is high in high school than in elementary school in both sex. On the other hand, male students drop their class than female students in high school and in preparatory school. Detail information on dropout rate is presented as follow in table 31.

Table 29: Schools dropout by sex and grade Hadero Tunto woreda 2015

S.No	Grade	Total # of Students						
		Male		Female			Total	
		No.	% from total male	No.	% from total female	% from total student	No.	%
1	1 to 8	192	1.5%	150	1.2%	0.6%	342	1.4%
3	9 to 12	57	4.5%	17	1.4%	0.7%	74	3%
	Total	249	1.8%	167	1.2%	0.6%	416	1.5%

Students drop their class for different reasons like migration to abroad (South Africa), illness, lack of support; they do not have interest to learn, marriage, changing living places, death and discipline. Because of lack of data we could not figure out the number of students with their reasons who discontinued their class (8).

Facilities and infrastructure

Road is the major one in day-to-day activities. In Hadero Tunto woreda, all kebele have road access with 39 Km length of gravel all weather road type and 30 Km of asphalt road. Regarding communication, all urban and rural kebeles have supplied with mobile telephone network connection and landline telephone services. In addition, the district has one agent type of postal services in Hadero town. Among the total health posts and health centers all health facilities have road access except four (Galbe, Boha torra, la-chacho and Mugunja) health posts. The two towns of the district had supplied with electric power. On the other hand, some parts of rural areas (Mandoye, Ha-chacho, Mugunja and Lesho) had electric supply.

When we see the water supply, spring and ground water were the main source of water supply for the district. According to data obtained from water resource office, the woreda drinking water service coverage was reached 63 % (which is 70.9% in urban and 55.1% in rural). Moreover, according to annual report in 2007EC most of the populations are getting water within 2 K.ms from nearest distance and 6Km from farthest distance. In addition, the water consumption is greater than 20 L per person per day in rural and 25L/day in urban area. When we see the water supply service in health institutions, from 4 health centers two had water supply and from 20 health posts none of them except one health post (Galbe) had water supply.

Health indicators

Immunization coverage

At woreda level the dropout rate from Penta one to Penta three was 3% and from Penta one to Measles was -1%. Furthermore when we see the dropout of Penta one to PCV-one was 0.1% and Penta one to PCV-three was also 1.2%. The others vaccination coverage presented as follow by type of antigen in table 32.

Table 30: Immunization coverage by type of antigen in Hadero Tunto woreda, 2015

S.No.	Type of antigens	plan	Performance	Coverage
1	BCG	4415	4398	99.6%
2	Penta 1	4,070	4,124	101%
3	Penta 3	4,070	4,167	102%
4	Rota1	4,070	4,113	101%
5	Rota2	4,070	3,992	98%
6	OPV1	4,070	4164	102%
7	OPV3	4,070	4157	102%
8	Measles	4,070	3999	98%
9	PCV-1	4,070	4,119	101%
10	PCV-3	4,070	4,075	100%
11	Fully immunization	4,070	3,948	97%

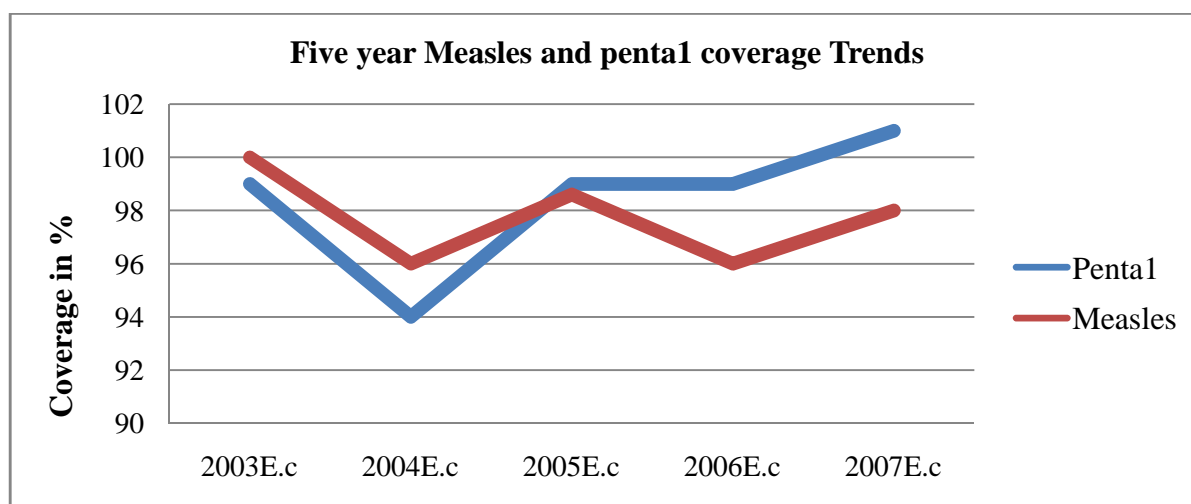


Figure 42: Trends of Measles and Penta1 Hadero tunto woreda, Kembata Tembaro Zone, SNNPR 2015

Maternal health services- To prevent maternal mortality, woreda health office is working on family planning services through health extension workers at each kebele level and also in all health centers. To estimate the prevalence of the contraceptive data were not available but we can use contraceptive acceptance rate instead of contraceptive prevalence rate. During the Last year of 2015, the contraceptive acceptance rate was 95%.

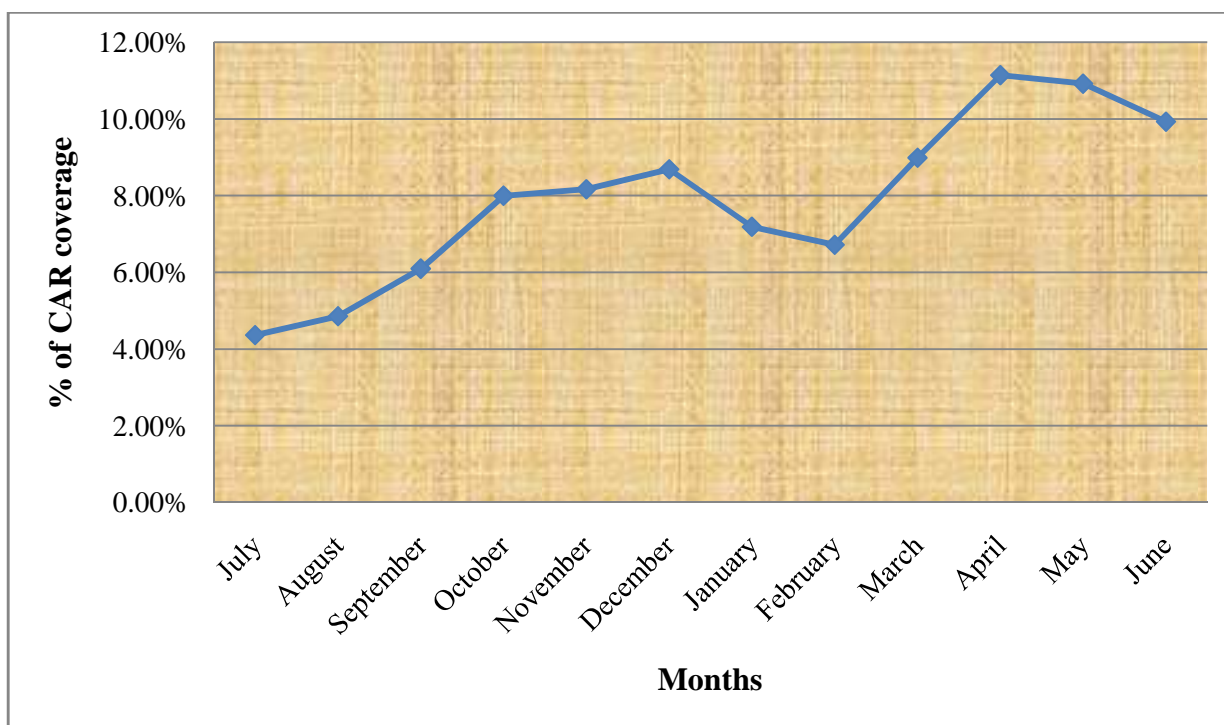


Figure 43: CAR Coverage in Hadero Tunto woreda, 2014/2015

Based on the Hadero Tunto woreda health office annual report, 1st visit antenatal care (ANC1) and ANC4 coverage was 107% and 88% respectively. On the other hand vaccination coverage of penta3 and measles were 102% and 98% respectively.

Table 31: Health Programme achievements against Targets by Type of Program

Programme	National Target (%)	Regional Achievement (%)	Woreda Achievement (%)
Contraceptive acceptance rate	85	70	95
Anti-natal Care(ANC)	90	100	108
Post Natal Care(PNC)	84	93	94
Skilled Delivery attendant	72	61	52.4
Penta valent 3	98	99.9	102
Measles Immunization	95	97.5	98
Full Immunization Coverage	95	94.3	97
OPD attendance	0.35	0.85	0.35
TB detection	81	63	34
TB success	97	93	95
TB cure rate	92	77	79

Source: FMOH 2007 EFY Annual Report and regional HSTP base line plan.

Health services

The woreda health system lies within the umbrella of the national health system, which is decentralized and community- centered system with the aim of ensuring universal access to primary health care services.

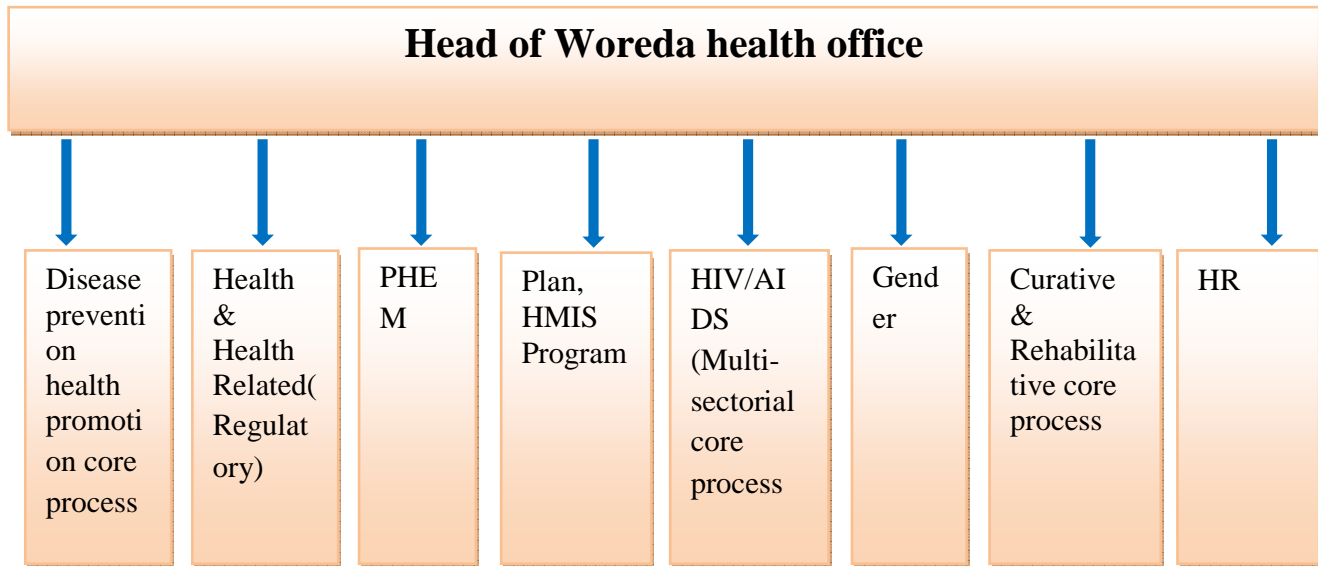


Figure 44: Organogram of district health system of Hadero Tunto woreda, 2016

The district had one type A and three type B a total of four government health centers and 20 health posts, two health extension workers in each kebeles except 4 kebeles(Lalo 6, Galbe 6, Amelleka 5, 1st Tunto 5). All health centers and health posts were functional and there were more than 22 private (Primary clinics, Medium clinics, diagnostic laboratory and drugstores) health facilities in the woreda. Furthermore, at the end of 2015 the primary health service coverage was 95%. On the other hand, at the end of year one health center was served for 1:31,898 residents and one health post served for 1:4,854 residents.

Numbers of health professionals to population ratio in Hadero Tunto woreda 2015

Considering the health professionals to population ratio, all professionals were included who are working in health facility only. In Hadero Tunto 1 health officer served for 1:6,076 population, one nurse served for 1:2,200 population, one midwife served for 1:14,177 and one health extension worker served for 1:2,200 population.

Top ten Diseases for Hadero Tunto Zuria, Kembata Tembaro Zone

In 2015 ten top causes of morbidity in outpatient department, the most frequently occurred disease was Typhoid fever and accounts about 15.18% of total cases. List of ten top diseases presented as follow in table 34.

Table 32: Top ten Diseases adult OPD of Hadero Tunto Zuria Woreda, 2015

Rank	Description	Male	Female	Total	%
1	Typhoid fever (AFI)	862	1,087	1,949	15.18%
2	Acute febrile illness (AFI)	788	964	1,752	13.64%
3	Pneumonia	652	733	1,385	10.79%
4	Trauma (injury, fracture etc.)	480	384	864	6.73%
5	Helminthiasis	323	394	717	5.58%
6	Acute upper respiratory infections	279	330	609	4.74%
7	Urinary tract infection	217	350	567	4.42%
8	Diseases of the musculoskeletal system and connective tissue	248	265	513	4%
9	Dyspepsia	202	309	511	3.98%
10	Malaria (confirmed with species other than P. falciparum)	237	265	502	3.91%
	Total of the Above Causes:	4,288	5,081	9,369	72.97%
	Total of the Other Causes:	1,514	1,957	3,471	27.03%
	Total of the All Causes:	5,802	7,038	12,840	100%

Table 33: Top 10 Diseases for Hadero Tunto Zuria Kembata Tembaro Zone, SNP Morbidity, <5 OPD of EFY 2015

Rank	Description	Male	Female	Total	%
1	Pneumonia	789	708	1,497	27.36%
2	Acute upper respiratory infections	558	464	1,022	18.68%
3	Diarrhoea (non-bloody)	573	434	1,007	18.4%
4	Acute febrile illness (AFI)	229	171	400	7.31%
5	Malaria (confirmed with species other than P. falciparum)	162	132	294	5.37%
6	Infections of the skin and subcutaneous tissue	125	114	239	4.37%
7	Helminthiasis	71	59	130	2.38%

8	Diarrhea with dehydration	74	48	122	2.23%
9	Trauma (injury, fracture etc.)	56	44	100	1.83%
10	Malaria (clinical without laboratory confirmation)	55	37	92	1.68%
	Total of the Above Causes:	2,692	2,211	4,903	89.6%
	Total of the Other Causes:	299	270	569	10.4%
	Total of the All Causes:	2,991	2,481	5,472	100%

Top 10 Diseases for Hadero Tunto Zuria Kembata Tembaro Zone, SNNP Morbidity, <5 Mortality of 2015

Rank	Description	Male	Female	Total	%
1	Severe acute malnutrition	7	0	7	100%
	Total of the Above Causes:	7	0	7	100%
	Total of the Other Causes:	0	0	0	0%
	Total of the All Causes:	7	0	7	100%

From the above tables Typhoid fever is the leading cause of adult OPD followed by AFI, pneumonia, and helementasis. In addition, malaria is one of the top ten causes of diseases in the district. On the other hand, malnutrition and diarrheal disease are the cause for in patient admission and death in adult and <5 population. However, the outpatient attendance per capita in 2015 was 0.35 per person per year.

Budget allocation for health

Regarding financing, all health centers were started health care financing and they started utilized their money. On the other hand, woreda administration allocated 5,335,130.00 birr (10.4%) of the woreda budget (51,393,643 birr) for health office including running cost, salary, and for drug in 2015 budget. From this 30,000birr only allocated for PHEM or emergency condition. This budget allocation rate was almost the same rate for the last 3 years (10).

Community health service

At this time federal ministry of health implemented developmental army in each kebele starting from 2011. Therefore, those Health developmental armies all over the district replace all Community health workers.

MCH/RH

Family planning is one of activities done under reproductive health/ MCH services. In family planning service there are choice of methods like permanent family planning, long acting family planning and short term family planning methods. In Hadero Tunto woreda injectable and pills were mostly preferred methods and now a day the need of permanent and long acting family planning is increasing. The woreda health office also working to satisfy the community needs by training of 49 health extension workers out 58 on long acting family planning insertion and by supplying logistics at health post level. Based on this in 2015 there were 4448 (15%) users of long acting family planning were given by health extension workers.

Post-natal care (PNC) service, which was given in all health centers, and health posts of a total of 4163 (94%) mothers were received post-natal care services. In 2015 a total of 2311 (52.35%) deliveries attended in health facilities and 534(12%) were attended by health extension workers in health post. There is gap between ANC1, SBA, and PNC.

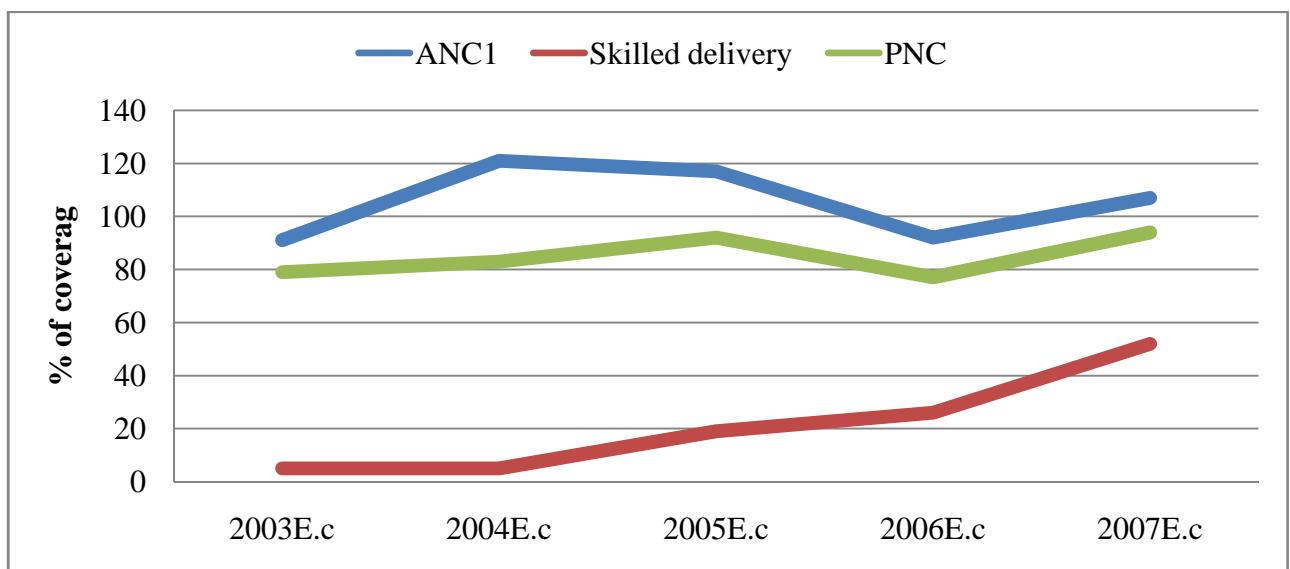


Figure 45: Trends of ANC1, Skilled delivery, PNC in Hadero Tunto Zuria, Kembata Tembaro Zone, 2015

Environmental health/ Water supply & sanitations

Hadero Tunto woreda had a total of 26,039 households in 2015. Of these all have (100%) had have latrine coverage 100%. However, those who have improved latrine coverage are 20% only. One communal latrine in Hadero town, which is built by concrete. From the total households until January 2016 there were 22,858(88%) households had waste disposal from this currently only 12,464(55%) HHs have functional solid waste disposal. In addition, until January 2016

there was 14 open defecation free (ODF) rural kebeles except hadero and tunto towns but planned these kebeles to be free in this year.

On the other hand, in all kebeles there were safe drinking water supply and as woreda water and energy office annual report the safe drinking water supply coverage was 63%. Hand pump total 19, from these 4hand pumps are only functional, shallow wel-45, from these 14 are functional, water point-124, from these 101 are functional.

Endemic diseases

Malaria

Hadero Tunto woreda has all 16 malarious kebeles with at risk population of 127,590. The district health office performed different activities to prevent and control malaria transmission. From the performed activities in the last year were case management, indoor residual spray, health education on ITNs utilization and environmental management on mosquito breeding sites. In 2014 and 2015, ITNs were distributed to all households (100%). Furthermore, IRS was performed once per year and the last year coverage was 94% and 10 kebeles were covered.

In addition to prevention measures, curative service also given for those affected with malaria. To diagnose malaria RDT and microscope were using in health posts and health centers. Within the last year, a total of 1249 cases were diagnosed and treated with anti-malarial drugs and the malaria load decreased by 51% from previous year (2447). In 2012 and beginning of 2013 there were malaria epidemic history in the district but there is no document or minute book which shows how much people were affected, number of death, date of on set, and population at risk not documented properly. There are two irrigation sites and 5 major swampy areas which are important for mosquitoes breeding and cause for malaria increase and epidemic in the past years.



TB & Leprosy

There were 111 tuberculosis cases in the district. Out of these, 59(53.2%) were pulmonary positive, 27(24.3%) were pulmonary negative, 22(19.8%) were extra-pulmonary and 3(2.7%)

were relapse cases. The annual district target was 70%. In 2007 E.C 111/329 (34%) all Tb cases were registered and start anti TB drug and 59 of them are pulmonary positive patients. The success rate was 95% and the cure rate was 79% (both cure rate and success rate were greater than 2006 E.C national report) but the detection and cure rate are below the targets and also in 2007 E.C there were 59 TB cases were screened for HIV/AIDS from these 3 patients were positive for HIV. There were no registered leprosy patients in 2007 E.C.

HIV/AIDS

In prevention and control measure of HIV/AIDS program, counselling and testing services, health education, condom distribution and others services were given to the community. In 2007 E.C a total of 13842 (70%) tests were performed in VCT room, OPD and other service units. In 2007 within 12 months, 33,117 tests were performed in different service units (Fig. 47).

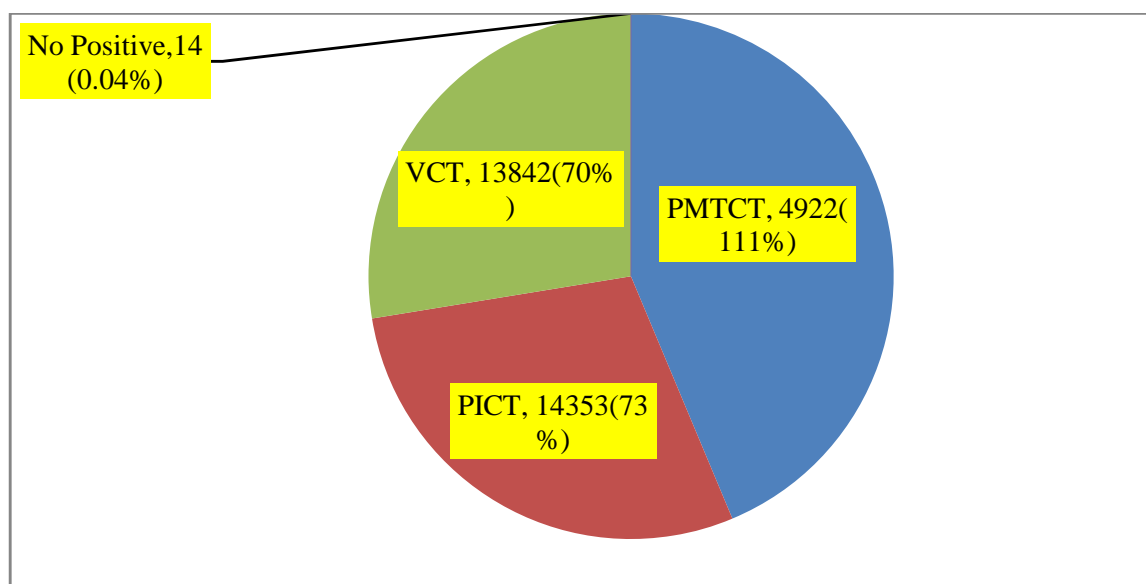


Figure 46: Percent of HIV counseling and testing rate 12 months in Hadero Tunto woreda, Kembata Temaro Zone, SNNPR 2015

Number patients on ART service was (ever started 122, enrolled on ART 108, and currently on ART 79) and on Pre-ART there were 4 patients available in the woreda. In all health centers VCT and PITC services were given to the community and also there were 13 trained health professionals on VCT. In addition, in all health centers health education was given on HIV/AIDS for the costumers. On the other hand in all health posts, health extension workers gave health education to the community and at the same time they facilitate schedule for VCT service in the health post. Community conversation (CC) was conducted in all kebeles. From all kebeles (16 kebeles) a total of 508 groups conducted CC and 11352 participants were participated. Furthermore, CC conducted from 38 schools only in seven schools continuously with 13 groups and 1563 participants were participated. On the other hand, in all schools, anti-AIDS club was

established and there is KMG, Non-Governmental organization working on HIV/AIDS prevention and control program.

Nutritional status and disasters

Malnutrition problem is usual in this woreda. Until January 2008 there were 16 OTP sites, which give therapeutic feeding service weekly. In OTP, there were 50 new admission cases and 79 cases at hand until February 13, 2016. In addition, there were two SC sites and zero cases at sc.

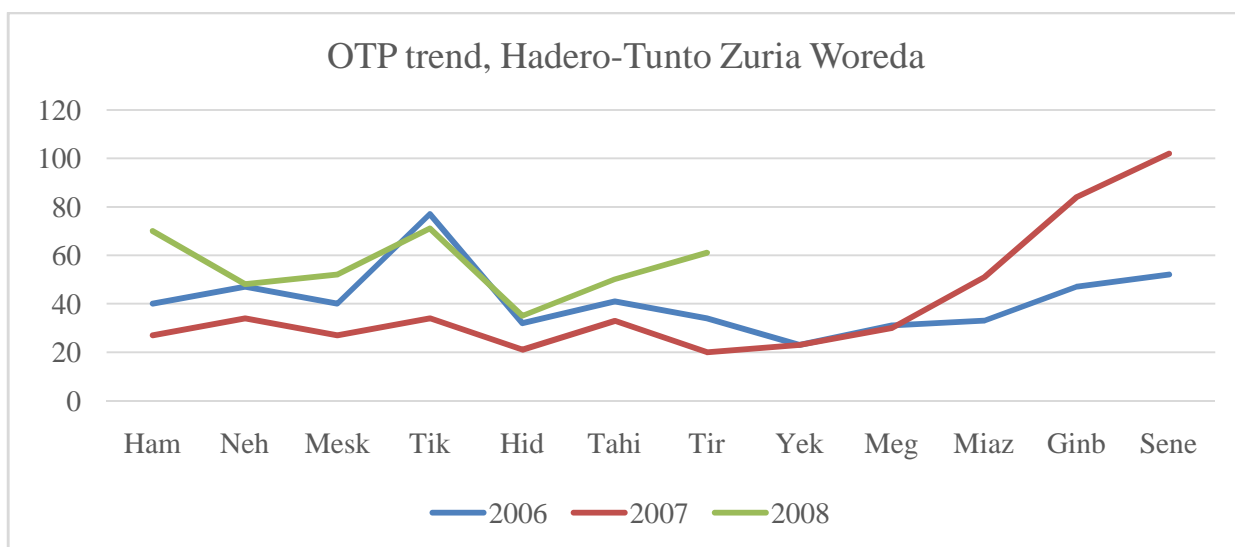


Figure 47: OTP Trends in Hadero Tunto Woreda, Kembata Tembaro Zone, 2016

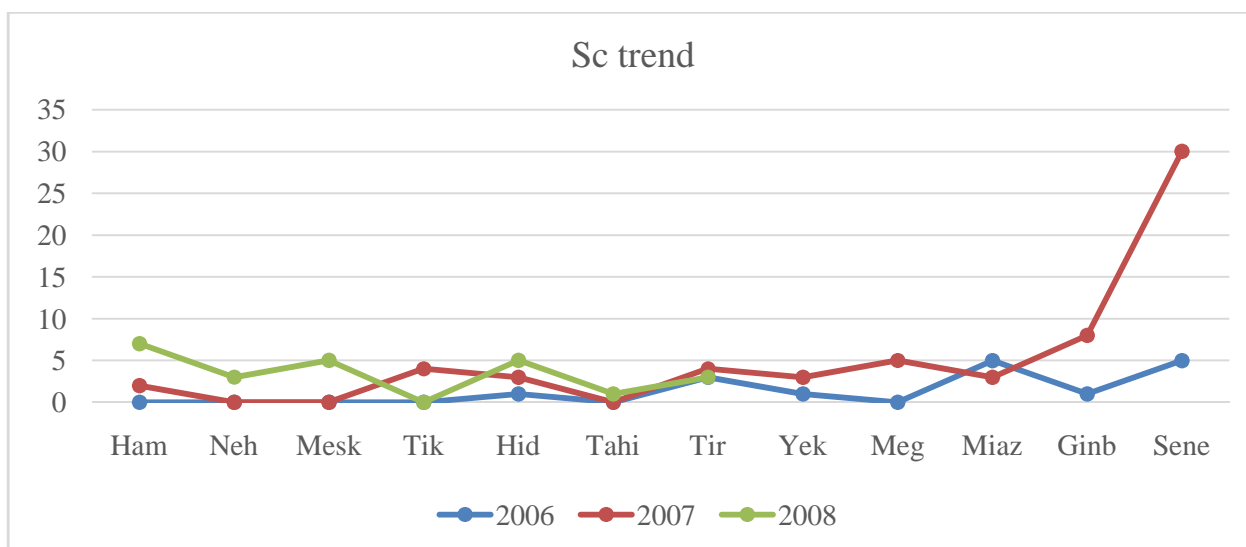


Figure 48: SC Trends in the past 3 years in Hadero Tunto Woreda, Kembata Tembaro Zone, SNNP region, Feb 2016

In the last 10 years there were no disaster occurred, but malaria epidemic in 2012 and in addition, in 2011, 2014 and 2015 there were measles epidemic occurred. In 2011, there were 168 cases in hadero catchment, in 2014 and 2015 Measles epidemic in Lalo kebele and in la-chacho kebele 37, 13 cases were seen respectively. Moreover, in 1998 and 1999 acute watery diarrhea epidemic was occurred but there is no Written document which show the index case, date of onset, total population were affected, the number of kebele affected and whether the investigation done or not.

4.1.5 Discussion

In Hadero Tunto woreda Typhoid fever was most frequently occurred disease in 2015 but it was 4th place in ten top diseases of 2014 Followed by Acute febrile illness, Pneumonia, Helmentiasis, AURTI and Malaria were most frequently occurred diseases in the woreda. In addition, the ten top diseases were not only the major problems but also Malnutrition, TB/Leprosy and HIV/AIDS had their impact on the community health. However, those diseases have their prevention and control department in woreda health office. In 2015, Malaria cases were decreased by 51 % compared to previous year of reporting period of 2014 cases.

TB smear positive case detection rate in 2015 were 43% and the detection all type of TB is 34% rate is very low compared to 53.7% national performance of 2014. in addition, when compared to WHO case detection rate standard or target, it was very low than 70% but the success rate was 95% and the cure rate was 79% (both cure rate and success rate were greater than 2014 national report) but the detection and cure rate are below the targets(4). On the other hand, HIV counseling and testing was conducted in all health centers. In addition there were 13 trained health personnel on VCT in 4 of health centers but the turnover of trained health professionals was high which affect the program. According to the guideline, the counselor should take the training before counseling.

Expanded immunization program is one of preventions and control measures program performed under child health department. Hadero Tunto woreda in 2015, the overall EPI performance was greater than the target. Penta 3 (102%) coverage was greater than national performance of 2015, which was 94.4%. In addition, the district perform measles 98% and fully immunization coverage (97%) was also greater than national coverage (90.3% of measles and 86.4% fully immunization coverage at national level (5).On the other hand, the dropout rate of Penta 1 to Penta 3 and Penta 1 to measles was less than 10% and it is in the acceptable range. Also the pneumococcal conjugate vaccine PCV3 (100%) coverage was greater than national performance 85.7% and dropout rate of PCV-1 to PCV-3 was in acceptable range which is 1.06%. To reduce

maternal mortality different activities are delivered at health post and health center level in the woreda. ANC service is one of the activities done in all health facilities which is 108% of the pregnant women in the woreda were taken 1st visit ANC and 88% of ANC4 services in 2015 which shows the high dropout rate between ANC1 and ANC4 was 19% but the service is greater than national performance, 96.9% compared to 2015 national report. On the other hand, PNC coverage was 94% and it was also greater than national, 90% performance of 2015(5).

In the district, the coverage of delivery services attended in health facility was very low, which was, SBA 2311(52.3%) and by HEW and 534(12%). Skilled delivery attendance of national 60.7% and by HEW and 3.9% performance in 2015 this indicates still HEW delivery service is greater than from national performance and shows the referral linkage is still not strong (5).

To increase the coverage of the health service, constructing one health center to serve 5 kebeles or 25000 populations. In Hadero Tunto woreda one health center was served for 1:31,898 populations, this is greater than compared to that of the standard (1:25,000) and national performance, 1:30794 populations. So according to government policy there is 1 health center gap to reach one health center for 25,000 population target (12). Furthermore, to give good services water and electric supply is must in each health center. However, in Hadero Tunto woreda two health centers have water supply, and 3 of health center had electric power. In addition, in the woreda primary hospital were not constructed yet (1).

As HSDP plan, at the end of 2015 one health post was constructed in each kebele. In Hadero Tunto woreda one health post serve for 1:4,854populations and it meet the HSDP target (1:5000 populations).In Hadero Tunto 1 health officer served for 1:6,076population, one nurse served for 1:2,200 population, one mid wave served for 1:14,177 and one health extension worker served for 1:2,200 population. This is better than the SSNP region (HO-1:11496, Midwife-1:18492, Nurse-1:2466) as HSTP base plan report of 2015.

According to the assessment of the woreda at the beginning of 2015, there were health workforce densities of about 0.9 per 1000 population for HO 0.16 per 1000 population, for nurse 0.5 per 1000 population, for midwife 0.07 per 1000 population, for health extension worker 0.5 per 1000 population. This is better than the national work force densities (HO 0.02/1000, Nurse 0.26/1000, Midwife 0.02/1000 and HEW 0.39/1000. Furthermore, based on BPR human resource structure at health center level 2 health officer, 8 nurse (BSc and Diploma), 2 mid wife, 2 pharmacy, 2 laboratory and 1 health information technician (HIT) with a total of 17 health professionals are needed in one health center. Based on this BPR structure in Hadero Tunto in all health centers 8 HO, 32 nurses (BSc and Diploma), 8 midwives, 8 pharmacies, 8 laboratories and 4 HIT with a total of 68 health professionals are needed to give complete health services to the community.

However, the available health workers are 21 HO, 58 nurses (BSc and Diploma), 9 midwives, 13 pharmacies, 15 laboratories and 1 HIT with a total of 117 health workers are working in health institutions.

Health budget allocation in Hadero Tunto woreda was 10.4% in 2015 less than that of the percentage of total budget allocated in the health sector at federal level was (11.1%) of 2015.

4.1.6 Challenges and Limitations

- ✓ Some essential health and economic indicators like maternal mortality, child mortality and per capital income were not documented.
- ✓ Responsible bodies did not found at the woreda during data collection time in some sectors due to ‘tfassas limat’
- ✓ Absence of long-term year data at visited area to describe the trend.
- ✓ There was no relevant information regarding district background from culture and tourism office in the district and there was no compiled deaths report at health facilities as well as at district level.

4.1.8 Conclusion

We conclude that keeping the good works (health service utilization) like ANC, immunization coverage, contraceptive acceptance rate, health workers to population ratio is fairly good, registered, and documented. On the other hand, some health indicators are below the target or the standard and it needs improvement. Those gaps which needs improvements such as malnutrition is increasing from previous year and malaria is still one of ten top causes of morbidity in the district are the major identified problems. Others such as low delivery service utilization, low outpatient per capita, high health center to population ratio, health centers and health posts were without water and electric supply, low budget allocation to health sector, very low latrine utilization (improved latrine utilization only 20%) , low smear positive TB case detection rate were some of the problems. Therefore, the Woreda has to do more efforts to fill the gap mentioned above.

4.1.9 Recommendation

- ✎ Despite of high coverage of immunization, there is measles epidemic in the district for 3 consecutive years so the woreda find out what and where the problem is?
- ✎ There is no specific feedback and regular follow up mechanism and poor documentation should be given emphasis on documentation.
- ✎ The woreda prioritize the problems (Malnutrition, malaria, shortage of transport...) but did not make any action to solve the problem (no assessment was done) so special attention should be given for prioritized ones.
- ✎ E-IDSR is not functional for the last six month and RRT is not functional or active, so emphasis should be given for the problems.
- ✎ TB detection rate is very low from the target and the presence of treatment failure and defaulter risk for Multi-Drug Resistant (MDR) TB that is dangerous and very difficult to treat in nearby health facilities. Therefore, Special attention should be given on defaulter tracing mechanism and DOT strategy should be fully implemented and strict follow up is needed in the area.

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Chapter V – Scientific Manuscripts for Peer reviewed Journals

5.1 Title:- Measles Outbreak Investigation in Cheta district, Kefa zone, Southern Nations, Nationalities and Peoples' Region, Ethiopia, February 2016

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Abstract

Background: Measles is a highly infectious viral disease that can cause permanent disabilities and death. We investigated measles outbreak to identify the magnitude and factors associated with measles in Cheta district, Kefa Zone, SNNPR 2016.

Methods: We investigated 50 cases and 100 controls. We used un-matched 1:2 cases to controls were conducted from February to March 2016. Cases were identified by using WHO standard case definition. The outbreak was confirmed by laboratory. Data collection instrument was prepared. Multivariate logistic regression analysis was conducted by using Epiinfo 7 and odd ratio with 95% confidence interval (C.I.) and P-value < 0.05.

Result: A total of 136 cases with attack rate (AR 10.6/1000) and five deaths (CFR 3.6%) were identified. The median age of the cases was 3 years and IQR age was between 2 and 5 years. Thirty-five of the cases (70%) and thirty-four (34%) of the controls were not vaccinated. Twenty-nine (58%) cases and 45 (45%) controls were males. The risk factors for contracting measles are - history of contact with cases (AOR=18.00 CI 4.31-80.46). Peoples living in one house more than five (AOR= 4.00 CI 1.34-11.98), Being vaccinated (AOR= 0.30 CI 0.10-0.78), Knowledge about measles (AOR= 0.27 CI 0.10-0.73).

Conclusion: The most affected age group under 15 years of age. History of contact with suspected or confirmed cases, Un-vaccination, living people more than five members and Lack of knowledge of mother or caretaker were associated risk factors. We recommended supplementary measles vaccination for under 15 children, strengthening of routine immunization defaulter tracing, strengthening of cold chain management and awareness creation in the community.

Key words: Measles; Immunization; Outbreak Cheta

5.1.1 Introduction

Measles is an acute, highly contagious viral disease caused by measles virus and it is a member of the genus *Morbillivirus* of the *Paramyxoviridae* family. Transmission is primarily person-to-person via aerosolized droplets or by direct contact with the nasal and throat secretions of infected persons. It is characterized by fever, runny nose, cough, red and watery eyes; and a generalized, maculopapular erythematous rash (1). Incubation period is approximately 10–12 days from exposure to the onset of fever and other nonspecific symptoms and 14 days (a range of 7–18 days) from exposure to the onset of rash(2).

Globally, before widespread vaccination, measles caused an estimated 2.6 million deaths each year. It is among the top five causes of death in children less than 5 years of age in many African countries, despite the availability of a safe and effective vaccine. Before the widespread availability of measles vaccine, virtually all children contracted the disease. Approximately 134 200 people died from measles in 2015 and about 367 deaths every day or 15 deaths every hour. Mostly children under the age of five are affected. Measles is still common in many developing countries – particularly in parts of Africa and Asia. The overwhelming majorities (more than 95%) of measles deaths occur in countries with low per capita incomes and weak health infrastructures but accelerated immunization activities have had a major impact on reducing measles deaths. During 2000-2015, measles vaccination prevented an estimated 20.3 million deaths. Global measles deaths have decreased by 79% from an estimated 651 600 in (2000) to 134 200 in 2015 (3, 4).

Epidemics of measles occur when the number of susceptible individuals in a population reaches a critical threshold. Outbreaks could occur in a community with lower vaccination coverage and higher malnutrition problem. As immunization coverage increases, the size of epidemics decreases. In addition, the inter-epidemic period lengthens, and the proportion of cases among older children increases (5).

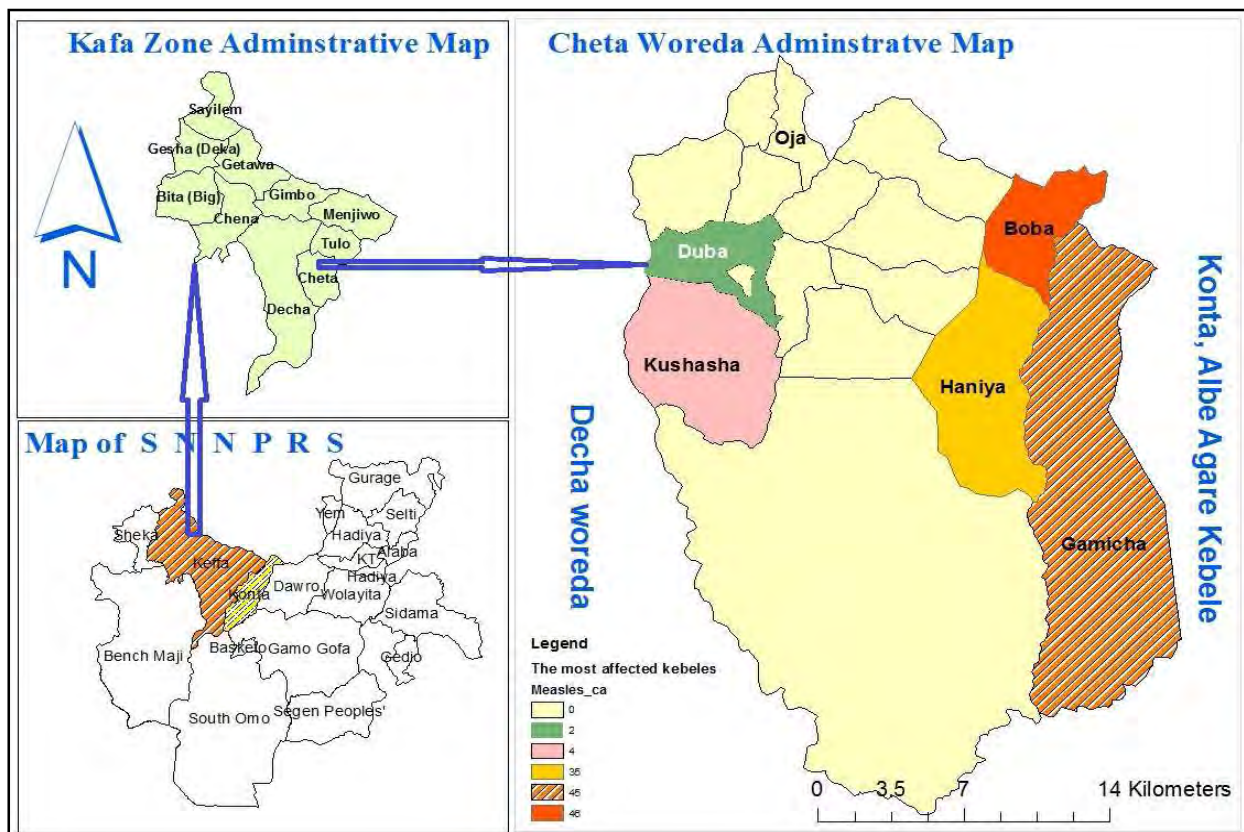
In Ethiopia, the expected case-fatality rate is between 3% and 6%; the highest case-fatality rate occurs in infants 6 to 11 months of age, with malnourished infants at greatest risk. These rates may underestimate the true lethality of measles because of incomplete reporting of outcomes of measles illness. In certain high-risk populations, case-fatality rates as high as 30% have been reported in infants aged less than 1 year of age. Malnutrition (including vitamin A deficiency), underlying immunodeficiency and lack of access to medical care are all factors leading to the high case-fatality rates observed in many parts of the world (6).

In Ethiopia outbreaks of measles reported every year. There were 16,028 suspected measles cases in 2014 and 14,100 confirmed measles cases in the same year. This represents a steep increase on the data for 2013, when there were 6,137 confirmed measles cases in Ethiopia. Ethiopia has reported 6,137 and 14,100 totally confirmed measles cases with their respective incidence rates of 6.52 and 14.61 in 2013 and 2014 respectively. (7)

Measles was also a serious problem, which occurs as an outbreak in SNNP region. According to 2015/2016 Annual regional health bureau report 18 woredas affected and 2775 measles cases with case fatality rate of 120(4.3%) reported. In addition, in the last 7 years, SNNPR experienced measles outbreaks each year. There are different measles vaccination programs (Routine, SIA, NID, and outbreak response vaccinations). However, there are outbreaks of measles in different corners of the region. Measles outbreak is one of the health events that required outbreak investigation. This study designed to investigate suspected measles outbreak in Cheta woreda to confirm the etiology and determine possible risk factors associated with contracting measles in the district.

5.1.2 Methods

This study was conducted in Kefa Zone, which is one of the 15 Zones & 4 Special Woredas in SNNPR. Cheta district is one of the 10 districts and 1 town administration in kefa Zone, which is 741 km away from regional town, Hawassa. It has a total population of Males (20021) and Females (20425) total 40,446. The capital of the district is Shama. Administratively the Woreda has two urban & 16 rural Kebeles. In the Woreda there were 15 HP and 2 HC are found.



Map of Cheta woreda with affected kebele, Kefa zone, February 2016

Study design

We conducted a 1:2 unmatched Cases to controls study design was used to identify risk factors for the occurrences of the outbreak.

Sample Size

Unmatched case control study in the ratio of 1:2(50 cases-100 controls) was conducted

Study subjects

Individuals admitted and treated in their catchment health centers, health posts and at their home. During active search, one case is included in the line list and their controls with ratio of 1:2 from the community.

Data collection

Registration book of the Health center OPD was reviewed retrospectively to evaluate for previous outbreak and determine the baseline rate of disease. A Structured questioner was used to interview both the cases and controls group. An active search was conducted using line listing of cases. Discussion were made with district health office head and health promotion and disease

prevention case team, head of the center, health worker at health centers, HEW at health post and care givers about the disease. Additional data was collected such as observation of cold chain management and case management reports. MUAC was used to identify malnourished children during cases to controls study. Cases were identified by using WHO case definition.

Data processing and analysis

Collected data was entered in to Computer. By using Epi-info version 7.1.4.0 and Microsoft excel for calculating frequency, ratio, proportion, rate, odds ratio.

Data quality control

We used line listing for describing measles cases interms of time, place and person . In addition, all data were checked for completeness before data entry and analysis.

Ethical consideration

Ethical clearance was obtained as a form of supportive letter from SNNP Regional Health Bureau.

Definition

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

Confirmed Case:- defined as a suspected case with laboratory confirmation (positive IgM antibody) or epidemiological link to confirmed cases in an epidemic.

Controls: - a child in the district without sign and symptom of the disease

5.1.3 Result

Descriptive epidemiology

A total of, 136 (59 females and 77 males) suspected and confirmed measles cases with five (which was 4 male under five years of children and one adult a 25 years old female patient) death rate (3.6%) were reported by the district. The attack rate were 10.6 per 1000 population. Investigation team identified the index case in epidemiological week-2. There were no reported measles cases from epidemiological week-4 to epidemiological week-5 because the patients were treated and diagnosed as AFI cases.

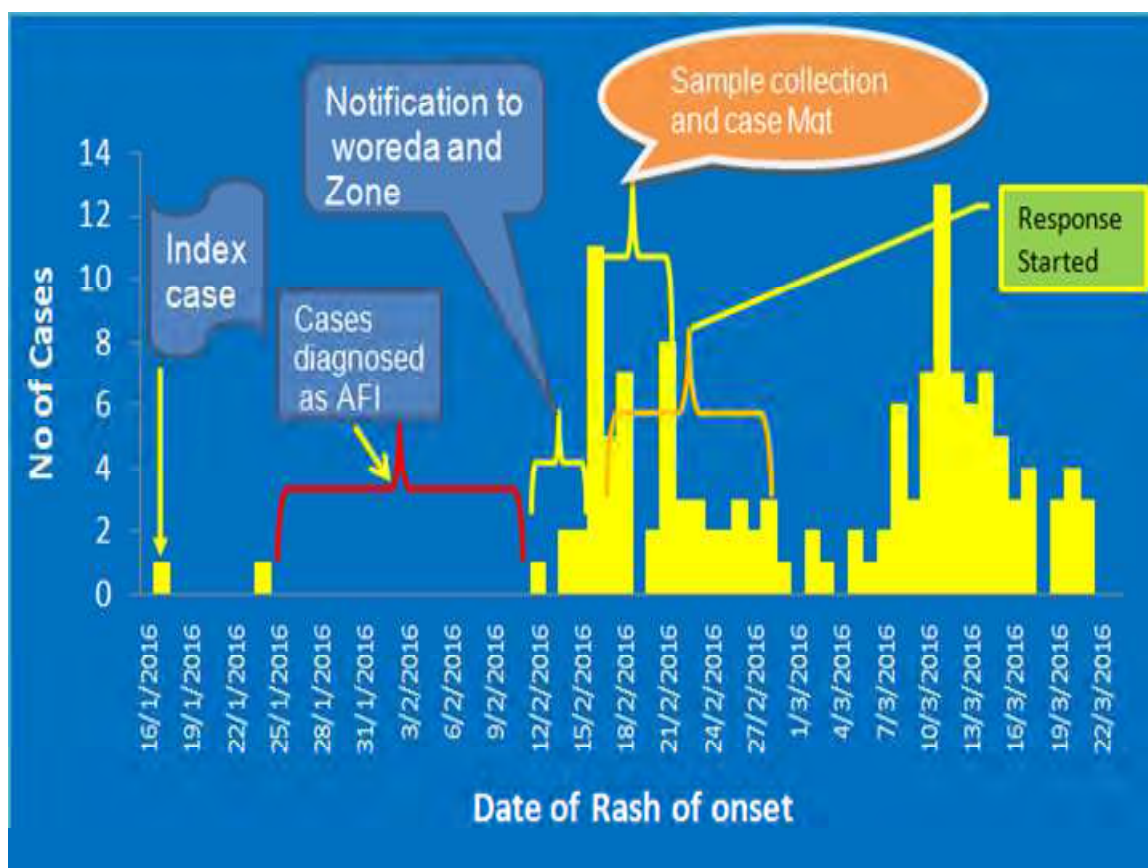


Figure 49: EPI Curve of Measles cases by Date of Rash of onset, Cheta Woreda, Kefa Zone, SNNPR 2016.

A 25-year-old female was an index case identified during investigation period by investigation team. Her relative, who is affected and living in Konta woreda, Albe Agare kebele (Measles active area) come to their house due to fear of death in her kebele. She stayed for one week and return back to her kebele. After a week later (on 17/1/2016), the patient (index case) developed sign and symptom of measles and followed by death of the patient after one week (on 25/1/2016). The most affected age groups from reported cases were one to four year age group, which were 64 (47%) followed by 5-14years of children 43 (32%) cases.

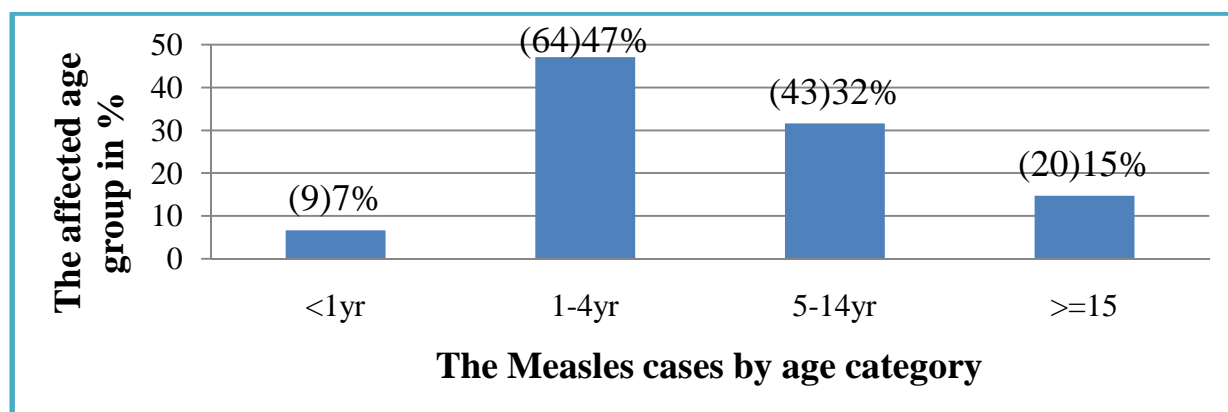
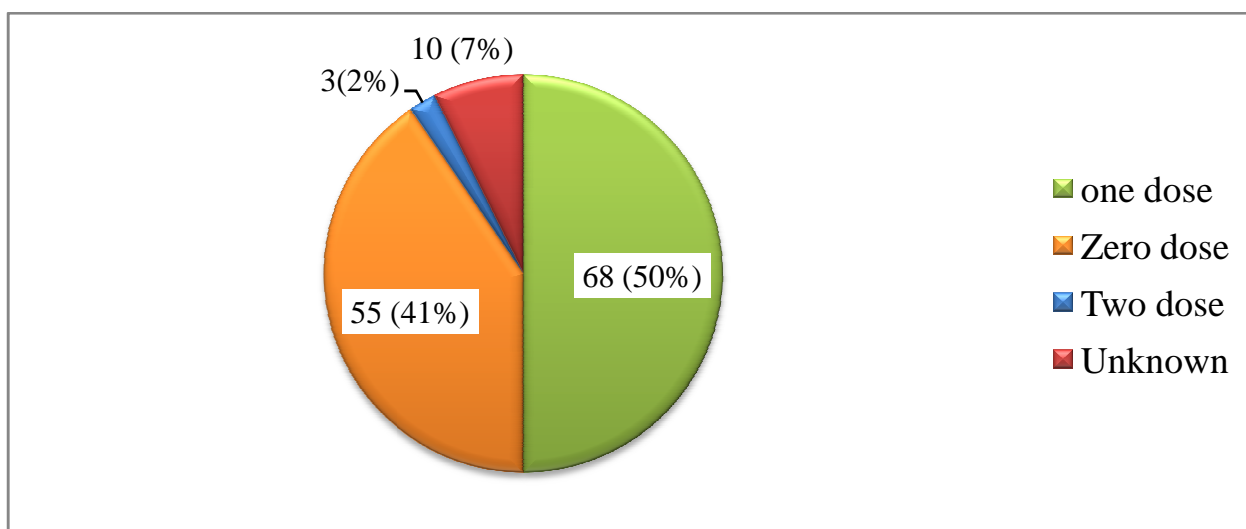


Figure 50: The Measles cases by Age group, Cheta Woreda, Kefa Zone, 2016.

Among 136 measles cases reported in the line list of the district, 55 (41%) measles cases received no measles vaccine, 68 (50%) cases received one measles doses, 3(2%) cases received two measles doses and 10 (7.2%) measles cases has unknown vaccination history. The administrative coverage for the EFY of 2012, 2013, 2014, and 2015 was >100%, 99.8%, 90% and, 99% respectively. (Half year of 2008E.C was 136%). However, there is a gap between district report, health posts and on registration book.



Number of measles cases by vaccination status for Cheta district in 2016, SNNPR-Ethiopia

Case-control study

We conducted a 1: 2 unmatched 50 cases and 100 controls in this study. The median age of the cases was 3 years ranging from 7 month to 23 years and IQR was between 2 and 5years, while that of controls was also 3 years, ranging from 4-month to 23 years. Twenty-one (21) /42.0%/ cases and Fifty-five (55) /55.0%/ controls were females.

Bi-variate analysis was performed to determine the strength of association of potential risk factors for measles cases as compared to controls. The statistically significant variables were found to be associated with measles as listed below in annex2:

Educational status /Illiterate/ (OR= 1.8 CI 0.36-9.03), occupation /being farmer/ (OR= 0.55 CI 0.27-1.08), daily laborer (OR= 4.12 CI 0.36-46.62) and marital status/being housewife/ (OR= 1.49 CI 0.75-2.96) were not significant risk factors (Annex 2). However, in multi-variate logistic regression analysis, the risk factors that are statistically significant association for contracting measles disease: history of contact with suspected or confirmed cases (AOR=18.00 CI 4.31-80.46). Family size peoples living in one house more than five (AOR= 4.00 CI 1.34-11.98).

Being vaccinated (AOR= 0.30 CI 0.10-0.78). Knowledge about measles disease is vaccine preventable (AOR= 0.27 CI 0.10-0.73)

Multivariate logistic regression analysis of risk factors for measles, Cheta Woreda, Kefa Zone, SNNPR, 2016

Variable	Response	Cases	Control	Crude OR(95%CI)	AOR	95% CI
*Being vaccinated	yes	15	66	0.22(0.11-0.46)	0.30	0.10-0.78
	no	35	34			
*Do you know measles is vaccine preventable?	yes	14	67	0.19(0.09-0.40)	0.27	0.10-0.73
	no	36	33			
*Family size>5	yes	29	82	3.29(1.54-7.04)	4.00	1.34-11.98
	no	21	18			
*Any contact history with measles cases	yes	17	8	5.92(2.34-15.01)	18.00	4.31-80.46
	no	33	92			
*Educational status(able to write and read)	yes	10	40	0.37(0.17-0.83)	0.24	0.07-0.70
	no	40	60			
Hose Ventilation	Yes	5	33	0.23(0.08-0.62)	0.51	0.14-1.95
	No	45	67			
Cases/family prefer Health Facility during illness	Yes	23	65	0.46(0.23-0.92)	0.41	0.15-1.05
	No	27	35			
Do you know Modes of transmission	Yes	10	37	0.43(0.19-0.95)	0.3162	0.08-1.14
	No	40	63			

5.1.4 Public health action

Community mobilization was very strong from zonal health department to kebeles HDA during the epidemic. They evaluate daily surveillance activities and follow up of the affected cases or progress of the treatment at community level. Vitamin-A supplementation and measles vaccination were given in eight kebeles for < 5 years in affected and high-risk areas to control the outbreak. Active case searching, case management at Health centers, health posts level, and at community level by Zonal, district, health centers and health post professionals.

5.1.5 Discussion

We identified factors associated with measles outbreak in Cheta district, Kefa zone 2016. The most affected age group under 15 years of age. The identified risk factors associated with measles outbreak during the investigation period were History of contact with suspected or confirmed cases; Un-vaccination, living people more than five members and Lack of knowledge of mother or caretaker were associated risk factors.

According to this study, not vaccinated children are at higher rates of disease acquiring than vaccinated. Individuals not vaccinated for measles have 70% of high chance of likely to develop measles than vaccinated. The vaccination history in the line list of the district shows that around 68 (50%) of the cases were vaccinated at least one doses of measles vaccine before this measles infection. However, the districts' the last five consecutive years (2012 to 2016) administrative coverage of at least one measles dose was above 90%. The possible explanations for the contradiction were false report that we identified during the outbreak investigation. EPI reports and EPI registration books read differently. On the other hand; the vaccination status of cases and controls involved in the case control study; and the vaccination status in the line list implies that the actual immunization coverage of the district was lower than the administrative coverage. Even though children got at least one dose of measles vaccine there are different factors that compromise the quality of the vaccine. During the investigation, less number of refrigerators (1/19) was functional. There are more than - outreach vaccination sites in the district. This mentioned all affected the cold chain management that result the accumulation of measles susceptible group in the population. This is Consistent with the report confirmed cases were reported to the CDC (8). Other study also shown in 2014, Philippines experienced a large ongoing measles outbreak. According to the WHO report, most of the cases were among unvaccinated. Many children in ultra-Orthodox Jewish communities were affected due to low vaccination coverage (9, 10).

The other identified risk factors are any contact with measles cases and living in a room with more than five people was significantly associated with higher rates of contracting the disease. Those who have any contact with measles cases, 18 times more likely to contract measles than who were not have contact history. In addition, People live in a house more than five, 4 times more likely to contract measles than those who were live in less than five family sizes. It is common to have large family size composed of extended family in the rural community that results crowded living condition. Overcrowding is one of the risk factors for measles transmission. Similar study found that close contact with an infected person increased measles

transmission since measles is a highly infectious communicable disease. 75%–90% household contacts have been reported to be overcrowded (11, 12-13).

The most affected age groups from reported cases were one to four year age group, which were 64 (47%) followed by 5-14years of children 43 (32%) cases which was similar as indicated by WHO and other literatures(1, 2). The measles case fatality rate (CFR) in this outbreak was 3.6%. This is consistent with expected case-fatality rate is between 3% and 6% on national guideline. The case fatality from measles is estimated to be 3-5% in developing countries but may reach more than 10% in outbreaks especially when it is compounded by malnutrition. The likely contributory and aggravating factors to the death include delayed detection of cases, lack of Health facility and lack of health Extension Worker in the nearby community, inaccessibility and delayed treatment of cases (14).

Lack of Knowledge of mother or caretaker on measles also was significantly associated with measles outbreak. Children whose mothers don't know about mode of transmission of measles were 73% of high chance of likely affected by measles than who were know modes of transmission (15, 16).

5.1.6 Limitations

Shortage of time and during the study time of home to home visiting for data collection vaccination card was not available in most of interviewed households. Because of that, vaccination history was taken by simply asking the family. This may introduce bias on the vaccination status.

5.1.7 Conclusion

A confirmed measles outbreak occurred in Cheta district, Kefa Zone, SNNPR 2016. The most affected age group is under 15 years of age. The identified risk factors associated with measles outbreak during the investigation period were History of contact with suspected or confirmed cases, Un-vaccination with measles vaccine, living five and more household members in rooms, poor cold chin management and Lack of knowledge of mother or caretaker were associated risk factors for occurring measles outbreak in the district.

5.1.8 Recommendation

- Increase routine immunization coverage (>90%) in the target age group
- Conduct mop up campaign (Supplementary immunization activities) for Measles vaccine for less than fifteen years of age.
- Woreda health office should give special attention for hard to reach areas to strengthen routine vaccination.
- Establish restriction measures for visitors and movement of cases to the community during outbreak period.
- Poor maintenance of cold-chain system, lack of electric power and shortage of kerosene should be solved at each level.
- Strengthen Routine measles surveillance system for early detection of any measles outbreak and early response.
- Deliver health education to the community to create awareness regarding measles mode of transmission and control mechanisms.

5.1.9 Reference

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Chapter-VI Abstracts for Scientific Presentation

6.1 Measles Outbreak Investigation in Cheta district, Kafa zone, Southern Nations, Nationalities and Peoples' Region, Ethiopia, February 2016

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Abstract

Background: Measles is a highly infectious viral disease that can cause permanent disabilities and death. We investigated measles outbreak to identify the magnitude and factors associated with measles in Cheta woreda, Kafa Zone, SNNPR 2016.

Methods: We investigated 50 cases and 100 controls. We used a descriptive study followed by un-matched 1:2 cases to controls were conducted from February to March 2016. Cases were identified by using WHO standard case definition. The outbreak was confirmed by laboratory. Data collection instrument was prepared. Multivariate logistic regression analysis was conducted by using Epiinfo 7 and odd ratio with 95% confidence interval (C.I.) and P-value < 0.05.

Result: A total of 136 cases with AR 10.6/1000 and five deaths (CFR 3.6%) were identified. The median age of the cases was 3 years and IQR age was between 2 and 5 years. Thirty-five of the cases (70%) and thirty-four (34%) of the controls were not vaccinated. Twenty-nine (58%) cases and 45 (45%) controls were males. The risk factors for contracting measles are - history of contact with suspected or confirmed cases (AOR=18.00 CI 4.31-80.46). Family size people living in one house more than five (AOR= 4.00 CI 1.34-11.98), Being vaccinated was protective effect from acquiring measles (AOR= 0.30 CI 0.10-0.78), Knowledge about measles disease is vaccine preventable (AOR= 0.27 CI 0.10-0.73).

Conclusion: The most affected age group under 15 years of age. History of contact with suspected or confirmed cases, Un-vaccination, living people more than five members and Lack of knowledge of mother or caretaker were associated risk factors. We recommended supplementary measles vaccination for under 15 children, strengthening of routine immunization defaulter tracing, strengthening of cold chain management and awareness creation in the community.

Key words: Measles; Immunization; Outbreak; Cheta

6.2 Acute watery diarrhea Outbreak Investigation in Gedeo zone, Southern Nations, Nationalities and Peoples' Region, Ethiopia, August 2016

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Name of FETP: Ethiopia FETP, FETP Entry/Graduation: 2015/16

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Abstract

Background: - AWD is an acute diarrheal disease caused by the bacterium, *Vibrio cholerae*. We investigated AWD outbreak to identify the magnitude and factors associated with AWD in both Dilla Town and Dilla zuria district, Gedeo Zone, SNNPR July- August 2016.

Methods: - We investigated 68 cases and 136 controls. We used un-matched 1:2 cases to controls were conducted from July 5/2016 to August 7/2016. We defined a case of suspected AWD based on National/WHO AWD guideline case definition. Data collected on socio-economic, age, sex, place of residence, household hygiene, personal hygienic practices, and on food and water consumption or water exposures practices using a structured questionnaire. We used advanced statistics in Epi-Info to calculate multi-variate logistic regression analysis.

Results: - Males are the most affected group from cases 43 (63.2%). The median age was 25 years and IQR age was between 18 and 30years. The AR was 6 per 10,000 with no fatality. Risk factors that are significantly associated with contracting AWD disease were- Drinking river water (AOR=20.58 CI 5.05-83.81). Eating raw fruits and vegetables (AOR= 4.14 CI 1.49-11.52). Contact history (AOR= 9.11 CI 1.29-64.44). Low educational status (AOR= 5.43 CI 1.89-15.75). Daily laborers (AOR= 3.18 CI 1.15-8.76), and those who have knowledge of how to prevent AWD are 89% less likely to contract AWD than those who were not knowledgeable and Purifying drinking water (AOR= 0.028 CI 0.0008-0.9386,) have protective effect.

Conclusion: - Risk factors are drinking river water, eating raw vegetables and fruits, low educational status, daily laborers, contact with cases, have associated with the risk of AWD in the Gedeo Zone. We recommended that to prevent transmission of AWD: preparation and consumption of food under hygienic conditions, avoid eating raw fruits and vegetables, use toilet

facilities, maintaining effective hygiene standards regarding safe water supply, water disinfection, disinfecting vegetables and fruits, and education the community in each level.

Keywords: AWD; Risk factors; Epidemic; Attack rate; Gedeo

Chapter-VII Narrative Summary of Disaster Situation Visited

1.1 7.1 Human Health and Nutrition Need Assessment in Sidama and Gedeo Zone South, Nations, Nationalities, and Peoples Region, 2016(Belg Assessment)

Introduction

Different types of Hazards including the recurrent drought, malnutrition, disease outbreaks and WASH related diseases have affected the livelihood of SNNPR. Because of drying of water schemes, occurrence of water borne diseases, acute drinking water shortages and malnutrition school dropouts are among major WASH related problems in the region.

As a result the federal and regional government with the collaboration of humanitarian actors organize multi sectoral Emergency Needs Assessment. The assessment team mainly composed of Government organizations (SNNPR Disaster and Risk Management Bureau, Ministry of Water, Irrigation and Electricity, Ministry of health, National Metrology Agency), Non-Governmental Organizations (Goal) and UN agency (World Food Program, UNICEF, WHO).

The assessment was conducted using a nationally standardized multi sectoral emergency needs assessment checklist. Information was collected by using the formatted checklists, observations and discussions made with Zone and Districts Administrations and Sector Offices and concerned experts. Existing and or potential emergencies of health, nutrition, WASH & Education were explored. Experts from Ministry of Water, Irrigation and Electricity (MOWIE) and UNICEF participated during the assessment.

7.1.1 Objectives

General objective

- Human health and nutrition need assessment in Sidama and Gedeo zone, SNNPR from June 05-19/2016.

Specific objectives

- To assess the extent, types, magnitude, severity and likelihood of different risks in the most “vulnerable” districts
- To assess the existing capacity of the health system to address those Risks
- To determine gaps in the capacity of the health system to address anticipated/impending risks and existing threats

7.1.2 Methodology and data collection

Rapid non-food emergency need assessment was undertaken on Health, Nutrition and WASH in the most vulnerable districts of the zone. Both secondary and primary non-food related data were collected using different checklists as an assessment tools. Zonal and district level briefing and discussions were held prior and after data collection together with the food assessment team. In addition, concerned zonal officials and respective district sector offices were interviewed during data collection.

Study period: -The assessment was conducted from June 05-19/2016 in Sidama and Gedeo zone, SNNPR

Data analysis and presentation: -We used Microsoft excel to compile, and analyse data. We also used Microsoft PowerPoint for findings presentation.

Vulnerability mapping across the sidama & Gedeo zones

Following the El'no climate change some districts of Sidama & Gedeo zones have been affected by drought and disease outbreak in the previous year. As an effect of the drought & erratic nature of the rainfall, prevalence of malnutrition, malaria and measles was increasing. Population density, poor child feeding practice & low utilization of latrines were also remaining as a main challenges of health & nutrition status of the population. Therefore Wonago, Kochere, Loka Abaya, Boricha & Bona zuria districts were selected for assessment.

7.1.3 Result

Gedeo Zone:

Back ground: Gedeo is one of the 15 zones of the SNNPR which consists 8 districts (6 rural & 2 town admin) and a total of 150 kebeles with estimated total population of 1,087,768 (Male female ratio 49:51). According to the zonal population data, age distribution of the population for women in reproductive age group (15 to 49 years), pregnant women & under 5 children is 253,450, 37637 & 169,800 respectively. Gedeo zone has 01 referral hospital, 03 primary hospital, 39 health centers & 144 health post with potential health coverage of 90.7%.

7.1.4 Health Emergency

Coordination & public health emergency management;

According to zonal health, department report the multi-sectoral coordination forum was established at zonal & district level, mainly public sectors were participating & the forum was led by administrators. Health & nutrition emergency preparedness & response plan (EPRP) was also developed. However, there was no guiding TOR and a specific meeting schedule. Meetings were also held during occurrence of epidemics or nutrition emergencies. The plan was not budgeted & fund not allocated at zonal level, it was assumed to use the zonal reserve budget as necessary & direction was given to all districts to secure some fund for emergency conditions. Coordination was the same in visited districts, Wonago & Kochere, but about 80-100 thousand birr was allocated. For emergency drugs & medical supplies, data was not available to verify emergency fund allocation in other districts.

The rapid response team was also similarly established at zone, district & health facility level and it has at least one PHEM based trained person & comprises different departments at facility and sectors at zonal & district level, but coordination was very weak and usually re-activated during outbreaks.

Disease distribution & occurrence of outbreaks:

As of the 2016 OPD morbidity data of the zonal health department, the top 5 causes of morbidity in adults were acute febrile illness, Urinary tract infection, typhoid fever, other unspecified GI diseases & all respiratory tract infections (45% of other illnesses). Where as in under 5 children, pneumonia, diarrhea, helminthiasis, acute febrile illness and all respiratory diseases were the commonest & contributes 74 % of all other childhood illnesses. (Annex 1)

Within the period from March to May 2016, malaria & measles were identified as health threats in this zone. Dilla town and Dilla zuria were highly affected by malaria outbreak and a total of 6,701 cases were reported, there was no death report. In Kochere & Bule districts, 33 measles cases & 2 deaths were also reported. Based on the report from zonal health department, both outbreaks were managed accordingly and there is no current ongoing outbreak. Though the trend of malaria transmission was declining & it was becoming out of the 10 top diseases for the year 2016, following the belg rain, malaria was suddenly increased. The possible aggravating factors suggested by zonal experts were, the current road construction in Dila town & the rainfall increases temporary mosquito breeding sites and existing sites were not managed well, especially in the campus of Dilla University, population increase due to deployment of daily laborers & poor utilization of bed nets and coverage below 80%.

Measles outbreak was also recurrent across the year particularly in Kochere, Gedeb & Bule, and it was controlled by providing supplementary vaccines in selected districts during the outbreaks and the national immunization campaign conducted on April 2016.

Anticipated Epidemics/Health Risks:

Even though there is no current ongoing disease outbreak & effective measures, like the indoor residual spray (IRS), bed net distribution, measles supplementary vaccinations, high latrine coverage & awareness creation activities were taken place to manage the previous epidemics & to prevent re-emergence of potential outbreaks, such interventions were only done for selected districts. The rainfall condition at the end of the belg & beginning of meher season might also favor mosquito breeding & increase malaria transmission. Gedeo zone was remaining susceptible for AWD outbreak since the last one year, because of districts in the neighboring region were affected & there is high population movement across regions, therefore Malaria, AWD, Malnutrition and Meningitis are the anticipated outbreaks for the coming six months. (Annex II)

Availability of drugs & medical supplies:

The EPRP of the zonal health department indicates the required amount, availability & gap of emergency drugs & medical supplies, however except the nutrition supplies & few antimalarial drugs almost all items in the list were showing gaps as it was summarized in the table below.

Table 34: Estimated emergency drugs & medical supplies in Gedeo zone, 2016

Drug & Medical Supplies	Item description	Unit	Total requirement	Available	Gap
1.Meningitis Vaccine	with necessary supplies	Dose	869,752	0	180,500
2.Anti malaria Drugs	Coartem	PK	7,000	80	6,920
	Artesunate(rectal)	PK	2,587	0	2,587
	Artesunate(inj)	PK	7,000	0	7000
	Quinine of 1,000 tabs	Tin	69	0	69
	Quinine IV of 100 amps	Box	14	0	14
	Ceftriaxione	Vials	1400	0	1400
	Oily CAF		500	0	500
	Doxycycline	caps	2,442	0	2,442
	Ringer Lactate	Bags	4,000	0	4,000
	ORS	Sachet	3,968	0	3,968
3.Nutrition TFP	F100	CTN	120	35	85

supplies &antibiotics	F75		130	15	115
	RUTF		2,800	900	1900
	Resomal	Sachet	300	60	240
Routine antibiotics at SC/OTP	Amox/125mg	bottle	3,000	0	3,000
	Follic acid 1000 cps	Tin	200	0	200
	Gentamycine	Vial	1,000	0	1,0000
	Cotimoxazole	Strip	2,000	0	2,000
4. Lab. supply	Pastorex	Kit	10	10	0
	LP set		20	0	20
	TI bottle		10	0	10
	CTC kit (AWD)		24	1	23
Medical Supply	Gloves 100 pairs	Box	62	0	62
	Syringe of 100 pces	Box	560	0	560
	PPE		24	1	23

According to zonal experts, suggestion drugs & medical supplies are directly distributed to districts & usually the ZHD will not store drugs for a long period. However, it was not complying with the stock status of visited districts.

In wonago district the stock of emergency drug & medical supplies for AWD, measles & malaria was found adequate for 1 month but in Kochere district there was stock out of ringer lactate, ORS, vitamin A & anti-malaria drugs. Generally, preparedness with regard to availability of emergency drugs & medical supplies in Gedeo zone was not adequate.

7.1.5 Nutrition: - SAM & MAM management in Gedeo zone.

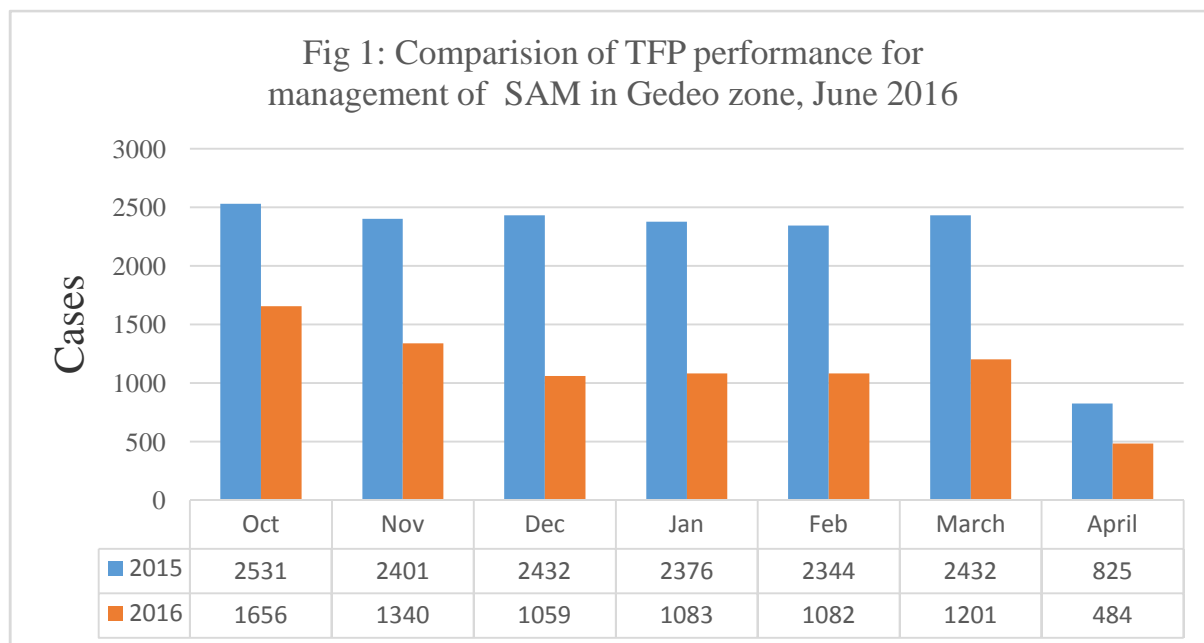
Facility with SAM management in the zone:

There are a total of 43 functional health facilities (hospitals & HCs) & 145 health posts in the zone. Only 32.5% (n=14) of the existing facilities are providing SC service, no new SC site was opened for the last 6 months. All HPs are OTP sites (100%) and the overall reporting rate for the last 6 months was 100% except for December, which was 88%.

In Wonago district 4 (67%) out of the 6 HCs are providing SC services and all HPs (20) are OTP sites. In Kochere district 3 (50%) out of the 6 HCs are SC sites & all the 23 HPs are running the OTP. The reporting rate in both districts was found 100% for the last 6 months.

Admission and performance of TFP for SAM management

SC Admission was much lower in 2016 compared for the same period of last year & the highest number of admission for the current year was seen in October & it was declining consecutively for the last 6 months of the year (Fig 1).



Comparison of TFP performance for management of SAM in Gedeo zone, June 2016

SC admission data in Wonago district shows declining similar to the zonal health department, but this was different for Kochere district, where the SC admission showing slight increase in December, February & March of 2016 compared for the same period of last year. Possible causes for the increase in SC cases as mentioned by district officials were, extended family size as a result of the polygamy cultural practices, low labor cost & poor HH food security. Cure rate in both districts was ranging from 85 – 95% and the proportion of defaulter, death & non respondent was insignificant. Data was not available to compare proportion of children in SAM to other children.

Availability of Nutrition therapeutic supplies

Some amount of therapeutic supplies were available at zonal stock, which was not adequate for three months to all facilities, it is summarized in table 37 above. The routine antibiotics for SC & OTP management was stocked out. Fortunately the visited districts (Wonago & Kochere) were confirming availability of adequate nutrition supplies & antibiotics.

TSFP program & MAM management: - In Gedeo zone, there are three priority 1 districts (Wonago, Kochere & Yirgachefe) however there was no adequate information on TSFP performance at zonal level & the zonal data on MAM admission was incomplete and it was available only for December & March for both years.

Wonago is priority 1 district, where the TSFP program is functioning. Supplies were distributed for beneficiaries in the last month & there is sufficient amount of supply to distribute for the next one month. There is also district level storage of TSFP supplies at least for the next two months. Children discharged from OTP were referred to TSFP & the program has been supported by NGO. Last year this district was not priority 1 and there was no MAM admission, but this year, children were admitted for OTP in the last 6 months, except interrupted for two months. Similarly In Kochere district, TSFP program is undergoing supported by NGO and supplies has been distributed in the last month and it is readily available for 2 months. MAM admission was done since November 2016.

Screening, Vitamin A supplementation & deworming

Within the period of October to March 2016, Vit A & deworming was conducted only in 2 districts and the zonal coverage was 17 & 18.9% respectively and this was very poor performance. One of the 2 districts was wonago district & the coverage in this specific district was more than 100% for vitamin A and 81 % for deworming. The screening modality was routine in all districts of the zone and the last screening was conducted on May 2016. Screening for under five children was performed well in the last five months except in December as it was depicted in table 2 below. The screening performance for pregnant & lactating women was also regularly conducted for the last five months, but the coverage was low (Maximum 63%).

Table 35: Nutrition screening performance of Gedeo zone, June 2016

Month	Target Children 6-59 months	# of screened children	Screening Coverage (%)	# of Children with		% Proxy GAM for children	% Proxy SAM for children
				No odema and MUAC <11 cm	No oedema and MUAC 11-11.9CM		
				#SAM	#MAM		

				MUAC <11 cm	ode ma	Tota l			
Nov	151,495	132,008	87	418	60	478	3,359	2.9	0.36
Dec		24,579*	16*	46*	2*	48*	230*	1.13	0.19
Jan		136,608	90	530	14	544	5,143	4.16	0.39
Feb		139,078	92	467	36	503	6,871	5.3	0.36
Mar ch		128,672	85	505	35	540	6,166	5.2	0.41

*only 2 district data was aggregated for this month.

Table 36: Mothers (P/L) screening performance of Gedeo zone, 2016

Month	Target PLW	# of screened PLW	Screening Coverage (%)	# of PLW MUAC below 23.0 cm*	% Proxy GAM for PLW
Nov	37602	19385	51.6	2557	13.2
Dec	37602	3680	9.8	254	6.9
Jan	37602	20638	54.9	3119	15.1
Feb	37602	22198	59	2262	10.2
Mar	37602	23744	63.1	2900	12.2

According to the recent month zonal screening result, the proxy GAM and proxy SAM rate for under 5 children was 5.2 & 0.41% respectively. For pregnant & lactating women it was 12.2%.

Flood situation

In Gedeo zone there was no flood accident in the last 6 months.

Table 37: Summary of Health emergency required finance in Gedeo zone, 2016

Type of health & nutrition emergency	Total estimated beneficiaries	Required finance in bir
AWD	895,200	2,145,876
Malnutrition	274,200	2,498,162
Measles	46,200	2,658,277
Menegitis	114,629	Not estimated
Malaria	35,000	2,813,000
District at risk	Type of risk	At risk population
All districts of the zone	AWD	895,200
All districts	Malnutrition	274,200
Bule & Wonago	Measles	46,200
All districts	Menegitis	114,629
Excluding Dila town & Dila zuria*	Malaria	35,000

*Dila town & Dila zuria was covered by IRS

7.1.6 WASH assessment findings

Water supply

Currently there is no drinking water supply emergency in the zone, however chronic problem was the major issue in some districts like in Bule, Gedeb & in some kebele of wonago districts (mokonisa kebele). The zonal water supply coverage was 58.9% but coverage in districts was within the range of 35.6%-75% inclusively. The highest water coverage was in Dilla town where as lowest coverage was found in Bule district. The water supply coverage of the two visited districts (wonago & kochare) was 47.5%, 49.9% respectively. The Community travels an average distance of 1.75Km radius to collect water in each districts of the zone. Gedeo zone has a total of 953 water supply schemes. Out of these water schemes 750 (78.6%) are functional and 203(21.4%) are nonfunctional.

The number and types of water schemes include 25 Deep well, 320 shallow well, 540 springs on spot, 28 spring with distribution, 19 rope pump, 21 water harvest. The other challenging in the zone is shortage of water treatment chemicals. Therefore, using water treatment chemicals in the community is not commonly known, although there is no critical water problem in the assessed

districts. Generally the findings of the Belg assessment shows Gedee zone WASH is in a normal WASH condition and there is no emergency WASH need in the next six months.

Institutional WASH situation

In Gedee zone there are a total of 266 primary & 27 secondary schools, of these only 11(4%) of the primary & 1(3%) of the secondary schools were found with water supply. Regarding health institution there are a total of 146 health posts & none of them were having water, whereas from the total of 38 health centers 17(44.7%) were with water supply. Types of water sources in schools & health institutions were spring & Deep well. Some of the health institutions without water were using the roof water harvesting. This indicates that drinking water and sanitation condition in the schools and health institutions is very critical, therefore the school community & clients visiting health institutions are at risk of different communicable diseases.

Hygiene and Sanitation in the community

Latrine coverage of districts in Gedee zone ranges between 87%-100%, in the visited two districts, Wonago & Kochere, it was found 97 & 95% respectively, despite this successful achievement utilization & the hygiene & sanitation practice of the community was low. As obtained from sectoral officers' communities have low awareness of using latrine.

Water supply and latrine coverage of Gedee zone districts 2016

No.	District	Water supply coverage (%)	Latrine coverage (%)
1.	Gedeb	36.6	95
2.	Kochore	49.98	95
3.	Y/chafe	40.16	95
4.	Wonago	47.56	97
5.	Bule	35.64	100
6.	Dilla town	75	87
7.	Dilla zuria	54.78	97

Sidama zone

Back ground: Sidama zone is one of the 15 zones of SNNP region with 21 districts and the total population was estimated to be 3,628,716 in 2008, with 49:51 male to female ratio. Of this population about 845,490 were women in reproductive age group (15-49yrs) & 566,442 were under five children.

In this zone there are 8 hospitals, 127 health centers & 524 health post, with 93% potential health service coverage.

7.1.7 Health Emergency

Coordination & public health emergency management;

The zonal level multi sectoral coordination forum was established & it comprises of government sectors & all partners working in the zone. However the forum was not met regularly, usually meetings were conducted during emergency conditions. Although no budget was allocated for emergency preparedness, it was suggested that the zonal government is highly committed to allocate fund for emergency when it happens. The zone has established trained rapid response team and the total number of PHEM based trained professionals was 26 which was distributed at zone & district level. The ZHD has developed the public health & nutrition emergency response plan (EPRP) but it was not budgeted & not utilized as per the plan. Coordination was also weak in the sample districts, Loka abaya, Boricha & Bona zuria districts, the forum meeting was not regular & fund was not allocated.

Disease distribution & occurrence of outbreaks:

Based on the health service statistics of 2008, the five top causes of morbidity for adults were acute febrile illness, typhoid fever, urinary tract infection, trauma & helminthiasis, which contribute 49.7% of other illnesses. There was only measles outbreak in Aroresa, Chire & Bensa districts in the last six months of this year and it was prevented from farther spread by providing measles vaccination for under five children in non-affected kebeles & neighboring districts. In addition to this as a national program, supplementary measles immunization was provided for under 15 children in all districts of the zone with more than 100% coverage (101%). The routine immunization is also in place. Therefore, Measles will not be a health threat at least for the coming one year, but as an effect of the weather condition Malnutrition, AWD & Malaria were identified as the most likelihood health threats in some districts listed on the summery part.

In the visited districts, Loka abaya, Boricha & Bona zuria there was no report of disease outbreak in the last six months & none of them were have ongoing epidemics. However, since Loka abay & Boricha were categorized as high malaria risk districts and due to existing risk factors both are anticipating malaria epidemic in the coming few months.

Despite the high latrine, coverage of all visited districts (80.5, 92 & 97 % respectively), the poor hygiene & sanitation practice & low safe water coverage of these districts favors occurrence of AWD. Malnutrition is also anticipated in all visited districts if the belg rain will not be good in the remaining weeks.

Availability of drugs & medical supplies

Emergency drug requirement was summarized in the table below. Data was not found for the routine antibiotics of malnutrition and laboratory supplies. Meningitis was not also considered as risk & supplies not planed.

Availability of drugs & medical supplies for sidama zone

Drug & Medical Supplies	Item description	Unit	Total requirement	Availabl e	Gap
1.Meningitis Vaccine	with necessary supplies				
2.Anti malaria Drugs	Coartem different dosage	PK	600	46	536
	Artesunate(rectal)	PK	1,000	0	1,000
	Artesunate(inj)	PK	1,000	0	1,000
	Quinine of 1,000 tabs	Tin	1,000	0	1,000
	Quinine IV of 100 amps	Box	1,000	0	1,000
	Chloroquine of 1,000 tabs	Tin	100	0	100
	Ceftriaxone	Vials	8,000	0	8,000
	Oily CAF		1,000	0	1,000
	Doxycycline of 200caps	Box	2,00	0	2,00
	Ringer Lactate	Bags	5,00	0	500
	ORS	Sachet	10,000	0	10,000
3. Nutrition TFP supplies & antibiotics	VitA 100,00 iu of 500 caps	Tin	4,000	0	4,000
	F100	CTN	100	30	40
	F75		100	30	40
	RUTF		15,000	1000	14,000
	Resomal	Sachet	100	10	90
	CTC kit (AWD)	Kit	10	0	10
Medical Supply	Gloves 100 pairs	Box	1,000	0	1,000
	Syringe of 100 pces	Box	100	0	100

In Loka abaya district except the CTC kit all emergency drug were available for a minimum of one month. Similarly, Boricha district was securing majority of the items, but there was stock out of doxycycline & RDT. Bona zuria district was missing majority of listed drugs. The only available stocks were ringer lactate, consumables, Amoxicillin suspension and vitamin A.

7.1.8 Nutrition: - SAM & MAM management in Sidama zone.

Facility with SAM management in the zone:

Of the total 135 health facilities (Hospitals & HCs) in the zone 30% (n=41) were found SC sites & OTP was running in 484 of the 524 health posts. The reporting rate of SC sites was 100% for the last six months & SC was functioning well. The ratio of SC sites in Loka abaya, Boricha & Bona zuria district was 1:7, 5:11 & 2:6 respectively. This data indicated uneven distribution of SC sites among kebeles & community was not equally accessed.

Admission and performance of TFP for SAM management

SC admission of the 2016 was increasing in November, compared to similar months of last year (2015), starting from December it was relatively reducing as it is illustrated in Fig.52 below. The trend was also similar in visited districts, this might be due improved performance of screening & availability of relief food in priority 1 districts, suggested from zonal & district officials. The proportion of cured SAM children was within the range of 85 -97% and the death rate was as high as 2.5 - 5% in January & February 2016. The Maximum defaulting rate was 1.2% in November.

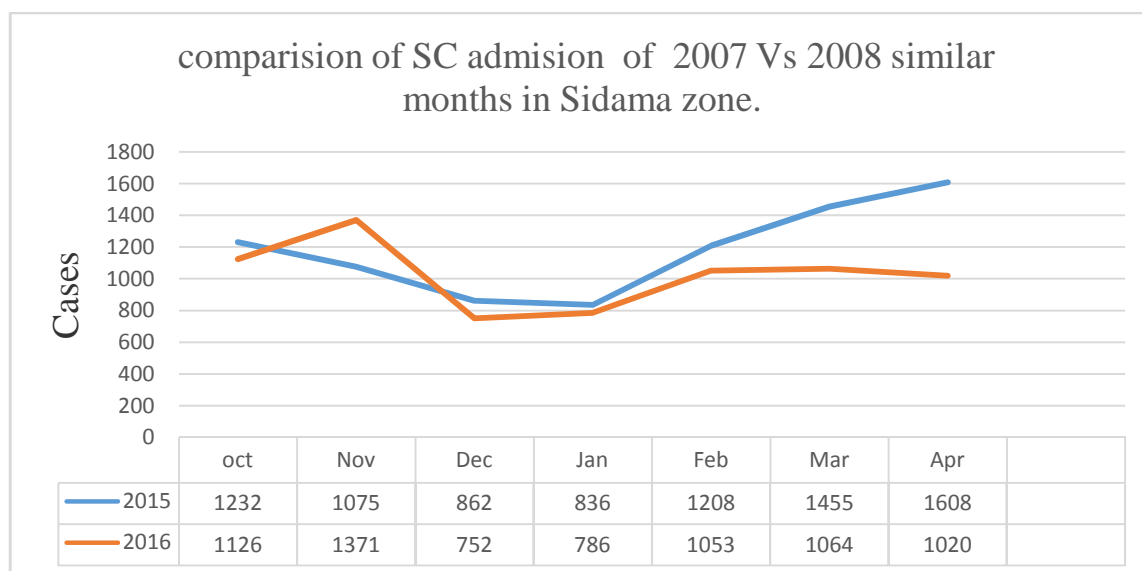


Figure 51: Comparison of SC admision of 2015 Vs 2016 similar months in Sidama zone, SNNPR, Ethiopia.

Availability of Nutrition and therapeutic supplies

At the time of visit, therapeutic supplies were not available at zonal level, it was distributed to districts, but the three visited districts were with full supply of these products.

TSFP program & MAM management

The report from zonal health department shows that TSFP was functioning well in Sidama zone, last month food was distributed as per the schedule & a total of 995 quintal food was deposited at district warehouse, which is estimated to be adequate for two months. The program is supported by NGO & there are 39 distribution sites. Unfortunately, data for MAM admission was not available at zonal level. Like the zonal level support in Loka abaya and Boricha district TSFP was supported by NGOs & it was managed properly, there was adequate stock of supply every time & was distributed. The district officials were also suggesting the program has contributed in reducing the number of SC cases. However, in Bona zuria district food was not distributed in the last month and there was no adequate stock. Children discharged from OTP were linked to safety- net program.

Screening, Vitamin A supplementation & deworming

The screening modality was routine & it was regularly conducted for children, pregnant & lactating women. The last screening was done on April 2016. Vitamin A supplementation & deworming was conducted and the coverage was 87 & 113% of the target population.

Table 38: Under five children Nutrition screening performance of Sidama zone, 2016

Month	Target Children 6-59 months	# of screened children	Screening Coverage (%)	# of Children with				% Proxy GAM for children	% Proxy SAM for children	
				No odema and MUAC <11 cm		No oedema and MUAC 11-11.9CM				
				#SAM			#MAM			
				MUAC <11 cm	odema	Total				
Oct	426346	370916	87%	2162	226	2388	16108	4.9	0.6	
Nov	505843	461564	90%	2664	213	2877	18033	4.5	0.5	
Dec	512000	457920	92%	1538	117	1635	12441	2.7	0.3	
Jan	512000	452052	91%	1492	120	1612	12859	2.8	0.3	

Feb	512000	425651	84%	1551	104	1655	15061	3.2	0.3
Mar	512000	425018	83%	1654	165	1819	15142	3.3	0.4
Apr	512000	359074	70%	1510	103	1613	12050	2.6	0.3

Table 39: Women (P/L) screening performance of Sidama zone, 2016

Month	Target PLW	# of screened PLW	Screening Coverage (%)	# of PLW MUAC below 23.0 cm*	% Proxy GAM for PLW
Oct	116124	96740	83	10757	11.1
Nov	141520	114503	81	13100	11.4
Dec	139045	112307	81	11053	9.8
Jan	139045	110945	79	13045	11.7
Feb	139045	106079	76	4576	4.3
Mar	139045	106717	77	6013	5.6
Apr	139045	87558	63	10110	11.5

The recent month zonal screening data shows, the proxy GAM and proxy SAM rate for under 5 children was 2.6% & 0.3% respectively. For pregnant & lactating women it was 11.5%.

Flood:

There was flood catastrophe in 3 districts of Sidama zone and about 2,158 households were displaced. A total of 8,988 population was affected, but data was not disaggregated for women & under 5 children. There was also 2 human death due to flood. Affected districts includes Loka Abaya, Boricha & Bona Zuria. There was no disease outbreak due to flood.

Table 40: Summary of Health emergency Fincial needs for Sidama zone, 2016

Type of health & nutrition emergency	Total estimated beneficiaries	Required finance in bir
Malnutrition	50,000	2,494,482.00
Malaria	25,000	2,298,340
AWD	132,000	3,423.112
District at risk	Type of risk	At risk population
Bona zuria Boricha Bensa Aleta chuko Loka Abaya Shebedino Dara Hawassa zuria	Malnutrition	50,000
Loka Abaya Aleta chuko	Malaria	10,000 15,000
Loka Abaya Hawassa zuria Boricha	AWD	90,000 12,000 30,000

7.1.9 WASH assessment findings

Water supply

The zone water coverage is 65.9% and the coverage in districts ranges between 27.5%-98% inclusively. The water supply coverage of the three visited districts (Loka abaya, boricha & Bona zuria) was also 35.5%, 27.5% and 56% respectively. The average distance to collect water is 1.5km radius in the zone. Sidama zone has a total of 4428 water schemes. Out of these water schemes 3830(86.5%) are functional and 598(13.5%) are non-functional. Generally, the current water condition in this zone is better because of the good belg rain, there is no need for WASH emergency in under normal circumstance.

Institutional WASH situation

There are a total of 954 schools in Sidama zone, 879 primary schools and 75 secondary schools, of these 558(63.5%) primary schools and 37(49.3%) secondary schools have shortage of water. Similarly, there are 561 totals of health institution, 129 health centers, 524 health post and 8 hospitals. Regarding WASH for HI, (25%) health centers and 524(100%) of health post have not water. The major sources for institutions with water include HDW, deep well, ponds & pipes

Hygiene and sanitation situation

In all assessed district of Sidama zone the hygiene and sanitation condition in the community is not active. Generally, the latrine coverage of the districts range between 80%-100%, but utilization in the community is low. As obtained from sectoral officer's communities have low awareness of using latrine.

7.1.10 Major challenges identified

- ✓ Population density resulting low production of food & poor house hold food security.
- ✓ Erratic distribution TSFP supplies (not on regular bases, all food items not arrived at the same time).
- ✓ Stock out of basic antibiotics & other drugs to manage malnutrition.
- ✓ Shortage of meal for care takers.
- ✓ Poor community awareness & health seeking behavior on malnutrition (delay to seek treatment).
- ✓ EPRP was not budgeted & it was difficult to provide timely response in the occurrence of outbreak.

7.1.11 Conclusion & recommendations:

- The zonal level coordination in outbreak preparedness & management was weak in both zones & across visited districts, it should be strengthened & fund has to be mobilized for preparedness activities.
- Risk of Malaria was very high in both zones, because, it is malaria season; bed net utilization was low, environmental management not consistent & no adequate stock of

antimalarial drugs. Take measures to mobilize should be in place for prevention & control.

- Acute watery diarrhoea was one of the anticipated health threats in both zones, strengthening the surveillance system & prepositioning of necessary supplies.
- SC sites were not evenly distributed among kebeles of all districts, the service was not equally accessed and it needs to expand more sites in both zones. As much as possible finishing the started projects on time
- Provisions of adequate supplies and spare parts to maintain the non-functional water supply schemes
- Provisions of skill based training of woreda water technicians on operation and maintenance of water schemes by recruiting additional skilled staffs.
- Allocate adequate budget to establish new water supply schemes and for maintenance of existing non-functional schemes.
- Establish/strength WASH committee for every district considering the representation of women.
- Access schools and health institutions with safe water supply through constructing reservoirs for Schools and health institutions
- New water supply schemes development should consider the location of schools and health institution.
- Construction of communal latrines and hand washing facilities in schools and health institutions

Reference

1. Wonago woreda health office 2016 Mid-year plan versus performance report
2. Kochore woreda health office 2016 Mid-year plan versus performance report
3. Gedeo Zone health department 2016 Mid-year plan versus performance report
4. Borricha woreda health office 2016 Mid-year plan versus performance report
5. Bona Zuria woreda health office 2016 Mid-year plan versus performance report
6. Sidama Zone health department 2006/2013 Mid-year plan versus performance report

Chapter VIII -Proposal for Epidemiologic Research Project

1.1 8.1 Factors that Contribute for Low Measles Immunization Coverage in 9-59 month Children Cheta District, Kefa Zone, South, Nations, Nationalities, and Peoples Region, Ethiopia, 2017

Summary

Background: By 2015, 126 countries had reached at least 90% vaccination coverage. By the end of 2015, 85% of children had received 1 dose of measles vaccine by their second birthday, and 160 countries had included a second dose as part of routine immunization and 61% of children received 2 doses of measles vaccine according to national immunization schedule. Because two doses of the vaccine are recommended to ensure immunity and prevent outbreaks, as about 15% of vaccinated children fail to develop immunity from the first dose. In 2015, According to the World Health Organization report, significant rise in measles cases and in many countries not enough children having received measles vaccination. Epidemics of measles occur when the number of susceptible individuals in a population reaches a critical threshold. Outbreaks could occur in a community with lower vaccination coverage and higher malnutrition problem. As immunization coverage increases, the size of epidemics decreases.

Objective: The main purpose of this study is to identify factors that contribute for low Measles immunization coverage in the district.

Methods: A cross-sectional community and health facility based study will be conducted in Cheta district from June to October 2017. This study will obtain data from community and health facility using a pretested and structured questionnaire. There are 18 Kebeles in the district. The kebeles will be selected randomly (those kebeles which are affected by measles outbreak in 2016 are included). From nine kebeles, 422 Children from 9-59 months and their mothers or caretakers will be interviewed about their children immunization status and will be recruited in this study. Data will be entered and analyzed to assess factors contribute to low measles vaccination coverage by using EPI-Info version 7.1

Work plan: Data collection will be started July- August 2017. The study will be completed in October 30, 2017.

Budget: The required cost for the study is estimated 75,773.5 ETH Birr.

8.1.1 Introduction

Measles is an acute, highly contagious viral disease caused by measles virus and it is highly outbreak-prone disease (1). The measles virus is a member of the genus *Morbillivirus* of the *Paramyxoviridae* family (2). Transmission is primarily person-to-person via aerosolized droplets or by direct contact with the nasal and throat secretions of infected persons (3). The virus remains active and contagious in the air or on infected surfaces for up to 2 hours. In a non-immune person exposed to measles virus, after an incubation period of about 10 to 12 days (range 7-18 days). It is characterized usually by high-grade fever, runny nose, cough, red and watery eyes, and small white spots inside the cheeks can develop in the initial stage. After several days, a rash erupts, usually on the face and upper neck. Over about 3 days, the rash spreads, eventually reaching the hands and feet. The rash lasts for 5 to 6 days, and then fades. On average, the rash occurs 14 days after exposure to the virus (within a range of 7 to 18 days). It is transmitted from four days before rash onset and four days after rash onset (4, 5).

Immunization averts an estimated 2 to 3 million deaths every year from vaccine preventable diseases; however, an additional 1.5 million deaths could be avoided if global vaccination coverage improves. Global vaccination coverage – the proportion of the world’s children who receive recommended vaccines – has remained steady for the past few years. During 2015, about 86% (116 million) of infants worldwide received vaccine, protecting them against infectious diseases that can cause serious illness and disability or be fatal. By 2015, 126 countries had reached at least 90% vaccination coverage. By the end of 2015, 85% of children had received 1 dose of measles vaccine by their second birthday, and 160 countries had included a second dose as part of routine immunization and 61% of children received 2 doses of measles vaccine according to national immunization schedule. Because two doses of the vaccine are recommended to ensure immunity and prevent outbreaks, as about 15% of vaccinated children fail to develop immunity from the first dose (6).

Epidemics of measles occur when the number of susceptible individuals in a population reaches a critical threshold (the number of susceptible individuals exceeds the current cohort population). Outbreaks may occur in pockets of low coverage, which are likely to occur in certain geographic areas, such as urban slums, remote rural areas or islands, and in certain population groups with habitually low vaccination coverage rates such as ethnic and racial minorities, nomadic peoples, or persons with religious or philosophical objections to immunization (7, 8).

Despite considerable improvement in measles immunization coverage in Ethiopia, Measles outbreaks continue to occur in most parts of the country and becoming a cause of significant number of under-five mortality and morbidity. Low sub national routine measles coverage , prevailing poor nutritional conditions, accumulation of unvaccinated children in highly populated areas accompanied by seasonal hot weather between December and February have contributed for the frequent measles outbreaks occurring in different parts of the country(7).

Routine measles vaccination for children combined with mass immunization campaigns in countries with high case and death rates are key public health strategies to reduce global measles deaths. The measles vaccine has been in use for over 50 years. It is safe, effective and inexpensive (9).

In Ethiopia due to low awareness of parents, socio-demographic characteristics of the general population, cultural factors and accessibility of services influence childhood immunization coverage. Estimated the first dose of measles vaccine coverage in Ethiopia was 56% in 2010 and 57% in 2011; the percentage of districts reporting $\geq 80\%$ MCV1 coverage was 45% in 2010 and 43% in 2011. A nationwide measles SIA targeting approximately 9.1 million children aged 9–47 months was conducted in two phases; seven regions were targeted in October 2010 and the four remaining regions in February 2011. Administrative coverage was 106%, and coverage based on a population-based survey was 88.2%, 87 (91%) districts reported $>95\%$ administrative coverage. During 2010–2011, annual reported measles incidence decreased from 75 to 42 per 1 million population; the percentage of reported cases among children aged <5 years decreased from 45% to 31% (10).

To prevent large measles outbreaks and ultimately reach measles elimination goals by 2020, vaccination strategies must be implemented to achieve and maintain uniformly high 2-dose MCV coverage to reach the 93%–95% population immunity threshold that can provide herd immunity (10).

In SNNPR, 2015/2016 annual regional health bureau report stated that 18 woredas affected and 2775 measles cases with case fatality rate of 120(4.3%) reported. From these cases, many of them were not vaccinated the first dose of Measles vaccine. Therefore, this study will conduct to assess factors that affect and contribute for low Measles immunization coverage in 9-59 month of children in cheta district, Kefa Zone.

8.1.2 Statement of the problem

Globally, before widespread vaccination, measles caused an estimated 2.6 million deaths each year. The disease remains one of the leading causes of death among young children, despite the availability of a safe and effective vaccine. Approximately 134 200 people died from measles in 2015 and about 367 deaths every day or 15 deaths every hour. Mostly children under the age of five are affected. Measles is still common in many developing countries – particularly in parts of Africa and Asia. The overwhelming majorities (more than 95%) of measles deaths occur in countries with low per capita incomes and weak health infrastructures but accelerated immunization activities have had a major impact on reducing measles deaths. During 2000-2015, measles vaccination prevented an estimated 20.3 million deaths. Global measles deaths have decreased by 79% from an estimated 651, 600 in (2000) to 134, 200 in 2015(9).

In Ethiopia, outbreaks of measles reported every year. They were 16,028 suspected measles cases in 2014 and 14,100 confirmed measles cases in the same year. This represents a steep increase on the data for 2013, when there were 6,137 confirmed measles cases in Ethiopia. Ethiopia has reported 6,137 and 14,100 totally confirmed measles cases with their respective incidence rates of 6.52 and 14.61 in 2013 and 2014 respectively (11).

In addition, in South, Nations, Nationalities, and Peoples Region, Measles was also a serious problem, which occurs as an outbreak. According to 2015/2016, annual regional health bureau report 18 woredas affected and 2775 measles cases with case fatality rate of 120(4.3%) reported. Measles was also a serious problem, which occurs as an outbreak in SNNP region. In addition, in the last 7 years, SNNPR experienced measles outbreaks each year. There are different measles vaccination programs (Routine, SIA, NID, and outbreak response vaccinations). However, there are outbreaks of measles in different corners of the region. From these cases, most of them were not vaccinated. During recent (2016) measles outbreak investigation, despite the high administrative measles vaccine coverage (>90%), there was an increase of measles morbidity in the Woreda but the actual performance Measles coverage were not more than 50%. Due to this reason, there was high measles burden and positive cases than other woredas in the zone. The actual low vaccine coverage identified during out break investigation from February to March in 2016 (50%) in the district is unknown and no study has conducted in the area until today. Therefore, this study will be conducted to assess factors that contribute for low Measles immunization coverage in 9-59 month Children in Cheta District and identify gaps that need to be addressed to enhance vaccine coverage and prevent further spread of disease.

8.1.3 Literature review

Factors affecting and contribute for low vaccination coverage is mostly related with health facilities readiness and family knowledge and attitude towards vaccination and not vaccinating their child that were identified in a study conducted in the district of Magude located in southern Mozambique were: Reasons associated with health services delivery (38.3%) including long waiting time. No personnel at the health facility, no vaccines available on the day, no information about the day for vaccination and no vaccination given due to child sickness; Forgetting the day of immunization (17.8%); Difficulties in accessing the health facility (15.6%); Mother's sickness on the day of vaccination (3.7%); Migration (2.1%); Concomitant treatment by a traditional healer 1.6% (12).

A study showed why children are not vaccinated: a review of the grey literature, the main reasons for under-vaccination was related to immunization services and to parental knowledge and attitudes. The most frequently cited factors were access to services, health staff attitudes and practices, reliability of services, false contraindications, and parents' practical knowledge of vaccination, fear of side effects, conflicting priorities and parental beliefs. Some family demographic characteristics were strong, but underlying, risk factors for under-vaccination (13).

Study shows in Sweden, most people choose to vaccinate according to the national vaccination programme and are therefore, well protected against ten contagious diseases. However, in the last few years, limited outbreaks of measles and rubella have occurred after spreading from people infected abroad, highlighting that there are areas with low vaccination coverage (14).

A case control study was conducted in lahore, Pakistan, risk factors associated with the outbreak of measles: Low vaccination coverage/lack of vaccine, cold chain, lack of awareness of expanded program of immunization, malnutrition, movement of refugees, travelling history to epidemic area, Lack of vitamin A intake, Lack of awareness about measles in parents were associated with the outbreak (15).

Vaccine-preventable diseases are the most common cause of childhood mortality, with an estimated three million deaths each year. Over 20 million children across the globe are unvaccinated against measles, tetanus, rubella or polio. Half of these children come from ten countries, five of which are in Africa. Nigeria, Ethiopia, the Democratic Republic of Congo, Uganda, and South Africa have the largest numbers of unvaccinated or under-vaccinated children on the continent (16).

Several rounds of measles campaigns have been conducted in the past as part of the regular follow up preventive campaign and also response to outbreak. The measles vaccination

campaigns were conducted in 2010/11 (measles best practice campaign) and 2013, targeting children below 9 years of age. However, measles outbreaks continue to occur in most parts of the country with nearly 70% of the reported cases among children less than 15 years. Epidemiologic data from the past several years show a decreasing proportion of measles cases in children under five. This age group made up 56 % of measles cases reported in 2008 but only 30% of cases in 2014(17).

According to the World Health Organization, report (2015) significant rise in measles cases and in many countries not enough children having received measles vaccination, especially those who are now between the ages of 10 and 19. The measles vaccine not only protects the individual who has received it but also helps to protect the whole population because once 95% of the population is immunized, the disease dies out. As the numbers of unvaccinated children has risen, the “herd” immunity for the population has been lost. This results in the disease spreading quickly among those who have reduced immunity or are unvaccinated causing severe illness and sometimes death. Children who are too young to be vaccinated are at a much higher risk of catching the disease when herd immunity is lost (18).

According to EDHS 2016 survey, report in Ethiopia revealed children whose mothers have secondary education are more likely to be fully immunized (Vaccination coverage) increases with mother’s education. About 3 in 10 (31 percent) of children whose mothers have no education are fully vaccinated compared with more than 7 in 10 (72 percent) of children whose mothers have more than a secondary education. Similar patterns are observed by household wealth (19).

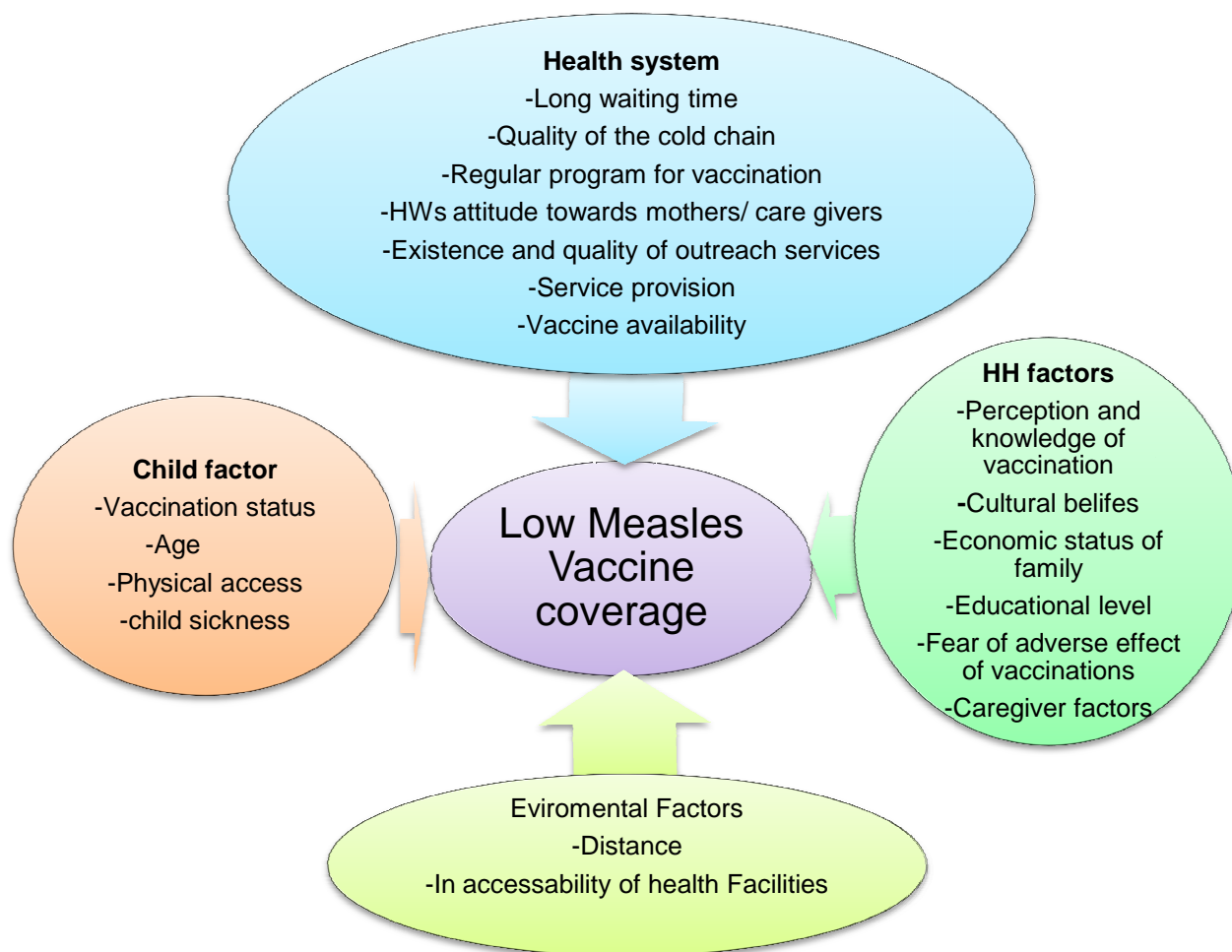


Figure 52: Conceptual framework of factors that contributes for low Measles coverage in Children 9-59 months of age

8.1.4 Justification of the study: - Measles is one of the notifiable diseases, which have high epidemic potential. However, the districts' the last five consecutive years (2012 to 2016) administrative coverage of at least one measles dose was above 90% but the actual performance of Measles vaccination coverage is not more than 50%. This actual low vaccine coverage identified during outbreak investigation from February to March in 2016 in the district is unknown and no study has conducted in the area until today. The results obtained from this study will be used for program managers working in every level (at National, Regional and district) to improve strategies and prevent future outbreak. It is expected that these results will be incorporated during planning of how to prevent, control the disease and enhance the vaccine coverage. Therefore, this study will be conducted to assess factors that contribute for low Measles immunization coverage in 9-59 month Children in Cheta District and identify gaps that need to be addressed to enhance vaccine coverage and prevent further spread of disease.

8.1.5 Objectives

General Objective

- ✚ To Assess Factors that Contribute for Low Measles Immunization Coverage in 9-59 month Children Cheta District, Kefa Zone, SNNPR, Ethiopia, 2017

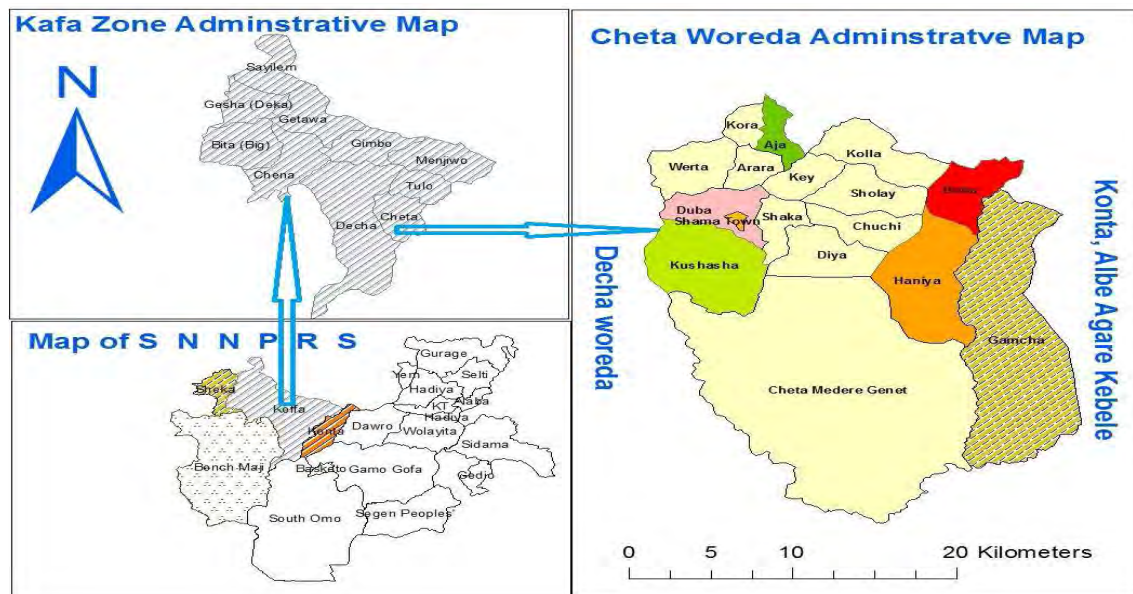
Specific objectives

- ✚ To describe Risk Factors that Contribute for low Measles vaccine coverage in the District

8.1.6 Methods

Study area and population

This study will be conducted in Cheta district, which is one of the 10 districts and one town administration of kefa Zone, and it has 2 urban and 16 rural kebelles. It has a total population of 41,420. (49.5% males and 50.5% comprises females) projected from the 2007 housing and population census. From under five children, 6314 of the total population segment are under five years of children. It is 741 Km far from Regional town. Most of the people in the district are engaged in farming practice as their source of economy. The administrative coverage of the district was 99% for measles vaccine.



Map of Cheta woreda, Kefa zone, March 2017

Study population: The study will be conducted in nine villages (Kebelles) in the village that will be selected by the Woreda Health office based on their performance in measles vaccination. Five of these villages will be those which have good performance and the rest four will be villages with poor performance. The study populations of this study will all children in the age

group of 9-59 month living within eligible household in nine randomly selected kebelles in the district. Mothers'/caretakers will also be studied about their socio demographic status and knowledge on the child immunization.

Study subjects:

Children 9-59 months of children found in selected nine kebeles and their mothers or caretakers will be interviewed about their children immunization status and will be recruited in this study.

Inclusion criteria: Selected households, those who are voluntary to participate in the study and responded to the questions will be included.

Exclusion criteria: Selected households, those who will not agree to participate in the study and will not respond to the questions will be excluded from the study.

Study design:

We will use cross-sectional community and health facility based study in Cheta district from July to October. A simple random sampling method will be used to recruit study subjects. Household registry or family folder will be used as sampling frame. Randomly selected households with targeted age group will be included in the study. The interviewer will randomly select the first house to visit in a village by spinning a pen and follow the direction where it pointed. The lists and number of households for each kebele will be found from the district health extension worker of the respective kebelles for all selected kebelles. In addition, the cold chain system and the vaccination procedures will be assessed by direct observation in all Health Centers and respective health Posts. Health Professionals and Health Extension Workers (HEW) will be interviewed on the vaccination process and procedures.

Sample size determination

A single proportion formula with a 95% confidence interval (CI) Proportion for Risk factors for low measles vaccination coverage (Lack of Knowledge 34%, Lack of health service delivery 38%, Lack of access to health facilities 16%, Mothers educational status (Illiterate 31%), Missed opportunity 46%, and Mothers not informed about vaccination day 54% are some of the risk factors (18,19,20). By using Margin of error 5.0% and power of 80% will be used to calculate sample size, based on this the sample size can be calculated as follows. The Sample size of the households will be determined by using single population proportion formula (Daniel 1999):

$$n = Z^2 \times P(1-P)/d^2$$

Where: - n = sample size, Z = z statistic for a level confidence, P = expected prevalence or proportion d = Absolute precision/ marginal error

1. Lack of Knowledge $N = z^2 pq/d^2 = (1.96)^2 * 0.34(1-0.34) / (0.05)^2 = 345$.
2. Lack of health service delivery $N = z^2 pq/d^2 = (1.96)^2 * 0.38(1-0.38) / (0.05)^2 = 362$
3. Lack of access to health facilities $N = z^2 pq/d^2 = (1.96)^2 * 0.16(1-0.16) / (0.05)^2 = 207$
4. Missed opportunity $N = z^2 pq/d^2 = (1.96)^2 * 0.46(1-0.46) / (0.05)^2 = 382$

Among the above risk factors, missed opportunity was selected since it gave maximum sample size as compared to other factors.

And also we will add 10% contingency to overcome non response rate = $382 * 0.1 = 38.2$

We will have a total sample size of $382 + 38.2 = 420.2 \approx 420$

Data quality, collection and management

The questionnaire will be prepared originally in English and then will be translated in to kefigna and back to English to ensure reliable information. Data will be collected by using semi-structured questionnaire. Respondents are mothers or caretakers of eligible children. Vaccination status of a child will be recorded based on the available immunization card or from the mother or care taker recall if the card is missed. In situation where a child is not vaccinated, information will be collected on reasons for non-vaccination. The quantitative component will comprise of a household survey that include questions on household socio-demographic and economic characteristics. Knowledge and practice factors, Behavioral factors, and Geographic factors will be assessed. Qualitative component of the household survey will include observation of the presence vaccination card, open-ended question related to Measles vaccination. The questionnaire will be pretested in one kebelles of the district which will not be select for the study to determine its appropriateness on the local context.

Training will be given for both data collectors and supervisors, how to select households, how to approach each interviewee, how to ask question, regarding ethical issues and how to collect important information. Three supervisors will be assigned for each nine data collectors. This study will obtain data from community and health facility using a pretested and semi-structured questionnaire. Data completeness will be verified first by field supervisor to ensure all questionnaires are completed every week, then by principal investigator. Data entry and cleaning will be done by using Epi Info version 7.1. Descriptive statics analysis will be performed by using Epi Info and Microsoft excel. Findings will be communicated to all concerned bodies for possible interventions and corrections.

Ethical clearance

Ethical approval will be obtained from the Research Ethical Review Committee of Addis Ababa University and permission will be get from Addis Ababa University Field Epidemiology

program coordinators, from SNNP regional health bureau and from Cheta district health office. All the study participants will be informed about the objective and importance of the study and will be informed about their right of not participating in the study at any time. Interview will be carried out only with full consent of the person being interviewed. All respondents will free to withdraw from the study at any time. Confidentiality to participants will be guaranteed by using only codes and their information will not reveal to anyone. No one will be obliged to participate unless otherwise agreed to participate in the study.

Study variables

Dependent variable

- Measles vaccination status in children aged 9-59 months will be the dependent variable.

Independent variable

- Socio-demographic variables such as (age, sex, occupation, educational level, marital status, ethnicity, religion, occupation), educational status of mother/ caretaker, Number of child ever born and experience of child death
- Knowledge and practice factors (Vaccine coverage, Knowledge of mothers/caretakers about vaccinations and its importance)
- Behavioral factors
- Geographic factors (Distance from health post, Distance from health center or time of travel to reach the nearest health facility etc will be our independent variables.

Operational definitions

Unvaccinated- A child who does not receive any dose of measles vaccines

Vaccinated- Child who take at least one dose of the measles vaccines

Knowledge of measles: If mother/care taker have awareness about, vaccine preventable diseases, sign and symptoms of measles diseases, the right age at the child begin vaccine, complete measles vaccination at right age considered as knowledgeable.

Illiterate: person who cannot read and write

Primary: person who complete 1-8 grades

Secondary: person who complete high school (9-10 or 12) grade

Tertiary: Person who complete college and above

Far from health facility: if person travel above five kilometer to get health facility

Near to health facility: If a person travel less than five kilometer to access health facility

Finding dissemination

Written report, both hard and soft copies, will be prepared and shared to Addis Ababa University, School of Public Health, Ethiopian Field Epidemiology Training Program Resident coordinators, mentors, advisors, public health emergency management of core process(PHEM) of South, Nations, Nationalities, and regional health bureau(SNNP RHB), Cheta district and other concern body.

8.1.7 Budget and implementation time

A total of 75,773.5ETB will be needed to conduct the study. Break down is here below on the table 2. The project will take about two months including from data collection to preparation of final report. Study will be started within two weeks after grant released.

8.1.8 Work plan

Table 41: Work plan for Factors that Contribute for Low Measles Immunization Coverage in 9-59 month Children Cheta District

Activities	Month/2017					
	March	April	July	August	September	October
Proposal preparation						
Literature review						
Proposal writing & submission						
Accept and incorporate comments and suggestions from mentors						
Supervisors and data collector training						
Data collection and entry						
Data analysis						
Draft report preparation						
Final report submission						

8.1.9 Budget breakdown for Factors that Contribute for Low Measles Immunization Coverage in 9-59 month Children Cheta District

S.N	Activity	Quantity	Unit	days	Unit cost	Total cost in birr
1	Data collectors training	9	Birr	2	171	3078
2	Perdium for data collection	9	Birr	12	50	18468
3	Supervisors training	3	Birr	2	171	1026
4	Perdium for supervision	3	Birr	12	171	6156
5	For investigator training	1	Birr	2	171	342
6	For investigator supervision	1	Birr	14	171	2394
7	For investigator data analysis	1	Birr	24	171	4104
8	For data entry	1	page	12	171	2052
9	Fuel cost of 900 liter	32.51	liter	15	20	9752
10	Car rent	1	Birr	15	1350.50	20257.50
11	A4 Paper 1390x4 page	23	page	1	278	6394
12	Clerk for writing	1	Birr	12	50	600
13	Printing and padding of 10 pc.	1	pc	1	50	1150
	Grand total		Birr			75773.5

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Annexes

Informed consent form

Objective: To determine Factors that Contribute for Low Measles Immunization Coverage in 9-59 month Children Cheta District, Keffa Zone, SNNPR, Ethiopia, 2017.

Procedure: This project will take about 30 minutes of your time. There are two parts. First, we will clearly explain you the purpose, benefits and risks of the study. We will give you a chance to ask questions and gate answers about the study. Second, we will ask you about vaccination status of your children. All information collected during this study will be kept private and will only be known by the investigators.

Benefits: This project will help the government and the community scale up the effort of Measles prevention and control.

Risks: There is no risk to you from answering the questions or being participated in this study. I will give you a copy of this consent.

Privacy: We will keep information about you private. We will not collect your name. Only the investigators will have access to the data and only for study purpose. We will not use any information that might identify you when we present or publish the study's results.

Payment: There is no cost to you for being part of the project. The approximate time that this study will take is 30 minutes. There will be no involvement past today.

Participant Agreement: The project has been explained for me. I have been given a chance to ask questions. I feel that all my questions have been answered. Being in this study is my choice. I may change my mind and leave the study any time during the interview. The purpose of the study and confidentiality procedures has been explained to me and me on my own consent: a) Agree _____ b) Disagree_____

Participant Signature _____ Date _____

Name of persons obtaining consent _____

Signature of persons obtaining consent _____ Date _____

Annex 5: Questionnaires Factors that Contribute for Low Measles Immunization Coverage in 9-59 month Children Cheta District, Kefa Zone, SNNPR, Ethiopia, 2017

1. Cluster number: _____

2. Interviewer name and number:
Name_____

3. Supervisor name and number: -----

Name_____

4. Day/Month/Year of Interview

____/____/____

Socio-demographic Characteristics

S. No	Questions	Alternatives	Skip
101	Sex of the child	1. Male, 2. Female	
102	Age of the child	years_____ Months_____	
103	Occupation of the Mother/care taker	a. Farmer b. House wife c. Student d. Unemployed e. Daily laborer f. Merchant g. Gov't h. Other (specify)_____	
104	Family Occupation(HH head)	a. Farmer b. Housewife c. Student d. Unemployed d. Daily laborer e. Merchant f. Gov't employee g. Other (specify)_____	
105	Religion	a. Orthodox b. Protestant c. Muslim d. Catholic e. Other (specify)_____	
106	Ethnic group	a. kafa b. Chara c. Nao' d. Dawuro e. Sheka f. Other (specify)	
107	Educational level of the respondent	a. Illiterate b. Read and write c. Elementary d. Secondary e. Above secondary	
108	Educational level of the family	a. Illiterate b. Read and write c. Elementary d. Secondary e. Above secondary	
109	Marital status of parent	a. Single b. Married c. Divorced d. Widowed e. Separated,	
110	Family size	_____	
111	Family monthly income per month	_____	

Questions related to Risk factors for measles Vaccination

112	Do you know about Measles vaccination?	1. Yes 2.No	If no, skip to Q115
113	If yes to above question, from where do you heard about the vaccination?	a) Radio b)Television c) from friends/peers d)from school e) Health personnel f) other, specify _____	
114	Can you explain the benefit vaccination?	a. to prevent the disease b. for specific disease c. don't know d. for child health d) other, specify_____	
115	At what age you (she/he) vaccinated first dose of measles vaccination?	_____	
116	If not vaccinated, why?	a. Health facility far apart b. lack of knowledge about vaccination day c. Absence during vaccination day d. Site of vaccination unknown e. Fear of Pain of vaccination f. No need of measles vaccination for child g. She/he took other vaccine differ from measles h. other, specify_____	
117	How many vaccine preventable diseases do you know?	a. Measles b. Tetanus c. Pertussis d. Tuberculosis e. Diphtheria f. Polio g. Hepatitis b h. Homophiles influenza b I. PCV10	
118	How many vaccination sessions are needed for a child to be fully protected?	a, one b, two c, five d, don't know e. four e, others_____	
119	Do you think vaccination will make your child sick?	1. Yes 2. No 3. I Don't know	
120	Do you bring a sick child for vaccination?	1. Yes 2. No	
121	Do you have a vaccination card for	1. Yes 2. No	

	your child?		
122	Write down immunization data from the card.	a. Day b. Month c. Year	
123	Did experience your child any reaction after receiving the measles vaccine?	1. Yes 2. No	
124	Where did you go first when your child get ill?	a. Health Facility b. Traditional Healers c. Holy Water d. Stayed at home e. Other :(Specify) _____	

Questions Access to vaccination service

125	Does the health post provide vaccination service regularly?	1. yes 2. No	
126	If yes to above question which health facility yes, When?	A. Daily basis B. Weekly C. Monthly	
127	How much time take health facility from your house?	A. Less than 15 minutes B. 15-30 minutes C. 30-1hour minute 1. D. > 1 hour	

Qualitative questions:

1. How do maintain the cold chain system?
2. Is there separate room for fridges and cold boxes?
3. What activities are taken to improve the Measles vaccination status children in your catchment area?
4. What are the main challenges experienced in Measles vaccination Programme?
5. What measures should be taken to improve the Measles vaccination coverage in your area?

Kebele Information

129	Total population ofthe kebele	A. No. of people from census: _____ B. No. of people from local data _____	
130	Number of of HH in this kebele	A. No. of household from census: _____ B. No. of household from local data: _____	

131	Distance of the nearest health facility from your house in km?	No. of kilometers:_____	
132	Is there Health post in the kebele?	1. Yes 2. No 3. I Don't know	
133	Are there health extension workers (HEW) living in the kebele?	1. Yes 2. No 3. I Don't know	
134	Does Health facility provide routine immunization services?	1. Yes 2. No 3. I Don't know	
135	Is there monitoring and evaluation mechanism of immunization coverage in your kebele?	1. Yes 2. No 3. I Don't know	
136	Do you know the Measles vaccination coverage in your kebele?	1. Yes 2. No 3. I Don't know	

Chapter IX – Other Additional Outputs Report

1.1 9.1 The Rapid Need Assessment and Response for IDPs in Konso District, Segen Zone, South, Nations, Nationalities, and Peoples Region, Sept 2016

INTRODUCTION

Globally people internally displaced by violence; armed conflict; natural disaster; inter alia; stood at 26.4 million, a number that surpasses global estimates of refugees. This number is approximately 6 million larger than the figure at the fall of 1999. Internally displaced people are people or groups of people who have forced or obliged to flee or to leave their homes or places of habitual residence. In particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognized State border.

Ethiopia has been affected by natural (drought, disease outbreaks, flooding) and manmade disasters (internal and external conflicts). Regarding the armed conflict, the country faced quite a number of ethnic conflicts in various parts of the country and for generations violent conflicts have been serious threat for development and stability in various communities. The nature and trends of such recurrent violent conflict within and between tribal, clan, religious and other groups of different communities vary depending on the contributing social, economic and political and linguistic factors. Such conditions are known to increase and aggravate the incidence of diseases and effect of health threats including the spread of communicable diseases, diseases outbreaks, and malnutrition in a given population. Children and mothers are the most at risk for increased morbidity and mortality from these diseases. In Ethiopia, emergencies of natural and manmade cause are very common, among which the major ones are disease outbreaks, IDPs and severe acute malnutrition. Therefore, ensuring adequate shelter, water, sanitation and food and providing basic health care are the most effective means of protecting the health of those affected by emergencies. A systematic approach to the control of communicable diseases and malnutrition are a key component of humanitarian response, and is crucial to protect the health of affected populations. This requires co-operation among agencies working at local, national and international levels, and collaboration among all sectors involved in the emergency response – health, food and nutrition, shelter, water and sanitation.

Background

Segen area people zone is one among 15 Zones of SNNPR state region. According to 2008 fiscal year data, the total population of this zone are 718,887(Male= 353694 & Female=365196) and it covers 5.8% area of the region. Administratively, this zone comprises of five woredas namely: Konso, Amaro, Burji, Alle and Derashe Woredas.

Konso woreda is one of the five woredas of Segen Area People's zone in the region. The woreda has an estimated projected population of 262,812 in 2008 EFY and administratively divided in 52 kebeles. Before few years back, the current administrative woredas of Segen zone were nominated as special woredas. However, after time, the government brought all of these five special woredas together in order to make the administrative system more easier and nominated Segen as a capital town of a zone. As some of the konso people explained, this type of administrative structure and nomination of the capital town (Segen) was not convincing & gave comfort for their people; they regularly requested government for the need to promote their woreda in to zonal.

Situation of Armed conflict in Konso Woreda of Segen Area People's Zone, SNNPR

On Sept 15/2016, there was a conflict between Konso people themselves at Aba Roba kebele and within the same week near to zonal town. As some people explained, the conflict was between community members who are support the government and those who are against the government Locally they called them "Konsita" =meaning extreme konso supporter), which has 23 members and one leader called "KALA". The woreda has no functional governmental structure for the last 8 months due to conflict and almost all health facilities were closed. During at this conflict time a number of house completely burned and a significant number of people displaced from their environment/habitat/.

During the Conflict more than 14,402 (Male accounts 6443 and Female 7959) and a total of 2880 house hold heads have been displaced internally and 5 people died due to fire of individual homes. Most affected kebeles of the woreda were Addis Gabare, Bacho, Hailota Dukuto, Biribriso and Aba Roba; Moreover Hailota Dukuto, Biribriso and Aba Roba were burnt by fire.

In the last five months, the health situation across the woreda has further deteriorated, and over 95% of health facilities (except karat hospital) remain closed and not accessible to the population. More mothers are giving birth at home without any assistance.



According to zonal early warning office data, by this crisis, a total of 1408 house hold heads are internally displaced (Male IDPs=5156 and female IDPs = 6844 Total number of IDPS are 12,000).

From these IDPs under-five children counts 1846 children as well as there are 27pregnant mothers. The IDPs are initially settled around Segen town and Teletla woreda. However, IDPs who were settled at Telitele temporarily are returned & settled in there kebele““Aba roba””.

Table 42: Konso IDPs damaged villages and not affected villages in Abaroba Kebele, Segen Zone, SNNPR, Sept 2016

Se No	Totally burnt (Damaged) Villages	HHs	Not Damaged Villages	HHs	Remar k
1	Amera	150	Gebo	160	

2	Negnlahule	60	Korimale	297	
3	Oribha	180	Seba dara	143	
4	Menkile	160	Goieynada	197	
5	Sebaforo	60	Dimo	137	
6	-		Galga	146	
	Total	610	Total	1080	

NB: - Maximum HHs has contained 14 family members and Minimum HHs has 2-4 family members.

Objectives

- ✓ To Perform Rapid Need Assessment and Response for IDPs in Konso District, Segen Zone, SNNP, Sept 2016
- ✓ To reduce mortality, morbidity, health influences due to conflicts and rehabilitate the displaced community in Abaroba kebele, September 2016

Current Emergency response

Coordination

- To address the basic need of IDPs, we are implementing every activity in a coordinated manner. Functional coordination committees established by dividing it in to main & Sub-technical committees
- Interagency coordination meeting established which is leading by Health Departement head and it is conducting every day starting from 4:30PM. Members of this multiagency meeting are Health office, water office, early warning, Security/protection office, Animal science, Agriculture, Education, women and young children.
- Further, all sectors established the coordination committees per thematic areas. besides, they are evaluating their daily performance with their immediate coordinators
- The emergency response plan prepared at zonal level and is on track for utilization

Emergency Health service

- * In order to proved the emergency health service for IDPs four emergency clinics established at two of their settlement areas of a zone.
- * In Aba roba kebele, Initially, Regional health bureau representatives, UNICEF consultants and zonal health department representatives are coordinating the overall health activities

- ✱ The health team established functional health coordination committee into three basic thematic areas (Team 1- Case management, surveillance and logistics, Team 2- Social mobilization and psychosocial support team and Team 3- Hygiene and sanitation team); the sub-committee is evaluating its daily activities in a regular bases.
- ✱ The regional health bureau and zonal health department supplied adequate amount of drugs and 5000 ITNs
- ✱ In order to implement emergency health service zonal health department assigned two clinical nurses and one health officer together with one overall coordinator.
- ✱ Provision of the clinical consultation started on Sept 21/2016 and within the successive four days, the clinical case management team seen a total of 464 patients both in adult and pediatric OPD. Of the total consultations, 89% patient who visited the facility were above five year and the remaining visitors were under five children. Moreover, within specified four days of all patients who visited the facility 279(60%) of the patients were men`s while 185(40%) cases were women.



- ✱ At this community currently out of all consultations seen, the top five leading morbidities in both pediatric and adult OPD chronologically were AFI, Intestinal parasite (IP), AURTI, UTI and Diarrheal Diseases.
- ✱ Health education is providing for all patients and clients who visited the facility. As a result so far we have given for 389 patients and clients. The main theme of Health education were about the prevention of communicable diseases, promoting the practice of proper hygiene and sanitation, proper use of given drugs, prevention of malaria prevention and etc
- ✱ Together with political leaders we facilitated the provision of psychosocial support for 3482 individuals and psychological counseling given for two mentally ill patients too



- * Mobilizing 4853 the IDPs concerning on proper use of latrines, keeping of their personal and environment hygiene & etc
- * Preparing the Health center for the displaced community (by essential drugs and cleaning the Health center environment)
- * Carried out the environmental sanitation campaigns and currently 18 latrines are providing service for IDP community



- * Data collected, analyzed and disseminated about the extent of the fire event
- * All disease and health condition from emergency clinics tracked daily in order to detect changes /outbreaks.
- * Systems for communicable disease surveillance and early warning to detect and respond outbreaks have been established in the shelters.

Support by Water bureau

- Three broken water points by conflict were maintained and water treated at point, pipeline functioned and 03 Rotos established at temporary shelters. So that there is no water problem in Aba roba kebele

- New generator which consume 120 litre fuel was installed to access water at Aba Roba kebele



The zonal and regional water bureaus provided the following type & amount of hygiene and sanitation materials:

- ✓ Bishangary = 1600
- ✓ Jeri cans = 5000



- ✓ Water gaurds =8 pack
- ✓ Soaps = 65 cartons
- ✓ 10,000 litter Rots = 03
- ✓ Aqua tabs

Early warning

- They are providing emergency food for all IDPs
- They are ready to provide one month supplies
- So far, they distributed food like wheat, oil and non-food items like utensils, blankets, plastic sheets and etc



Observed/Identified gaps during assessment and response

- Shortage of medications and supplies (Annex)
- Poor data handling practice in order to know the exact number of program beneficiaries
- Absence of ambulance to transport patients who need hospitalization
- Shortage of Man power (Health professionals)
- Poor utilization of Latrines (Open defecation)
- Shortage of functional health facilities (due to fear of conflict) in neighboring kebeles too
- Inadequate data about displaced population from all affected kebeles
- Non-functional governmental structure at the Woreda for communication and assistance
- Limited freedom of movement and access to resources caused by conflict-affected populations reinforces vulnerability (most shops closed, no market)
- More mothers are giving births at home and bushes without any assistance, under five mortality and morbidity rates increasing
- Shortage of Vehicles
- Shortage of Anti malaria drugs
- Inadequate coordination of the emergency task force

Recommendations

- Zonal health department should assign enough staffs with different profession at Aba Roba temporary clinic/Health center for quality service
- Ensure essential drugs and medical equipment supplies at Aba Roba temporary clinic, because currently other kebeles also utilizing the clinic due to the absence of health service in the area.
- Strengthen data management and sharing system at all level
- Resource mapping, mobilizing, distribution and proper utilization
- Zonal health department should avail Ambulance for Aba Roba catchment through discussion with Regional health bureau
- Priority interventions to pregnant, lactating mothers and under five children from the District health office, RHB and other stakeholders
- Re-establish damaged HHs
- Strengthening active surveillance in all affected Gots
- Further risk mapping and vulnerability assessment for better risk mitigation and early warning
- Governmental security should be provided to help disaster-affected communities to be engage in risk reduction, and to allow them for increased political opportunities
- Coordination, Monitoring and Evaluation on humanitarian assistance to be further strengthened

Annex 6: List of drugs and supplies needed for Konso IDPs in Aba Roba Health center, sept 2016

Se No	Items	gaps	On hand	Remark
1	Magnesium trisilicate(MTS)	✓	No	
2	Silk or Cut gut	✓	No	
3	Plasil tabs or injection	✓	No	
4	Hyocine tabs or injection	✓	No	
5	Paracetamol 100mg or Syrup	✓	No	
6	Cloxacilline suspension	✓	No	
7	Cloxacilline 250mg caps	✓	No	
8	Water for injection	✓	No	
9	plapynet	✓	No	
10	G.V	✓	No	
11	Alcohol	✓	No	
12	Diclophenac tabs or inje.	✓	No	
13	Iuboprofen 400mg tabs	✓	No	
14	Clotrimazole oint	✓	No	
15	Fluconazole oint	✓	No	
16	Nitrofurazone oint	✓	No	
17	Zinc oxide oint	✓	No	
18	Cimetidine inje.	✓	No	
19	Gentamycine inje	✓	No	
20	Crystalline inje.	✓	No	
21	Iodine Tincture	✓	No	
22	Berakina 5% (blech)	✓	No	
23	COC tabs	✓	No	
24	Promethazine tabs/inje.	✓	No	
25	Cord tie	✓	No	
26	4x4 A type paper	✓	No	
27	Registration books	✓	No	

9.2 Bulletins



South Nations Nationalities and People's Regional State Health Bureau

Public Health Emergency Management (PHEM) Core Process

WEEKLY PHEM bulletin

Epidemiological Week 45, 2016 (05/03/09 - 11/03/2009 E.C); Hawassa; Tele:0462120281; phemsnnpr@gmail.com

Outline of the bulletin

- ▶ Background
- ▶ Weekly surveillance completeness
- ▶ Brief data analysis on PHEM targeted diseases

Background: PHEM is the process of anticipating, preventing, pre-paring for, detecting, responding to, controlling and recovering from consequences of public health threats in order that health and economic impacts are minimized. Analyzing weekly surveillance data and sharing to different stakeholders and to those who can support could strengthen PHEM in the region as well in the country.

Weekly surveillance report completeness

In the 45th epidemiological week of 2016, the RHB received weekly surveillance reports from all 15 zones and 4 special woredas. Out of expected 4,635 governmental health facilities in the region, 4,377 health facilities submitted IDSR report, representing 94 % of report completeness which meet the regional target, 90%..

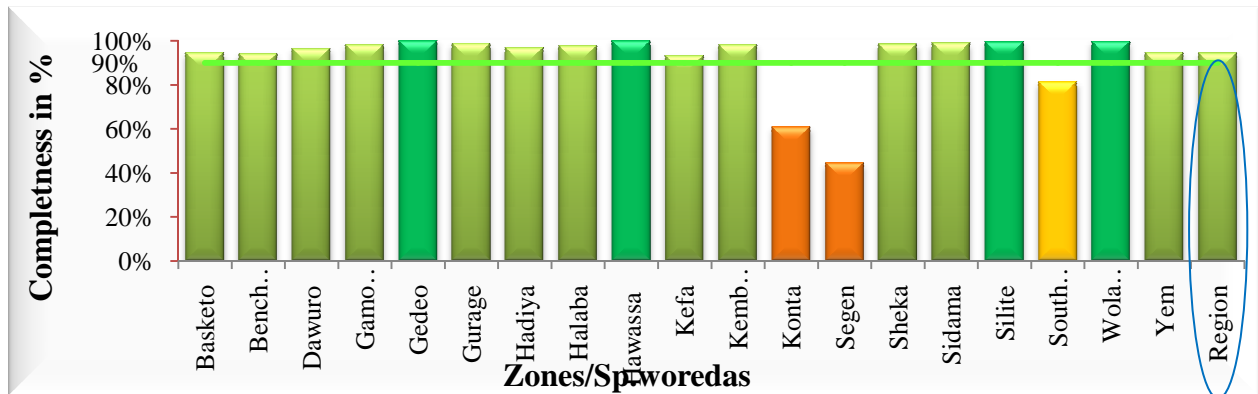


Fig.1: PHEM report completeness by zones/special woredas in SNNPR, Week 45, 2016

As it is presented in figure 1 above, four zones namely Silite, Hawassa, Gedio, and wolayita reported 100% while Segen zone and Konta special woreda reported far below the target of report completeness in the week. In addition, South omo Zone is declining from previous week's performance and did not meet the regional target. Therefore, Low performing special Woredas and zones need support from the RHB.

Malaria

In this week, a total of 34,759 suspected malaria cases were examined by RDT/microscopy and 4,651 cases were reported as confirmed malaria. Of which *P.falciparum* cases were 2,602 (56 %) and *P.vivax* cases were 2,049 (44%). In general, a total of 4,753 confirmed and clinical cases of malaria were reported in the region. Of these cases, 4,724 (99.4 %) were outpatients and 29 (0.6%) were inpatients.

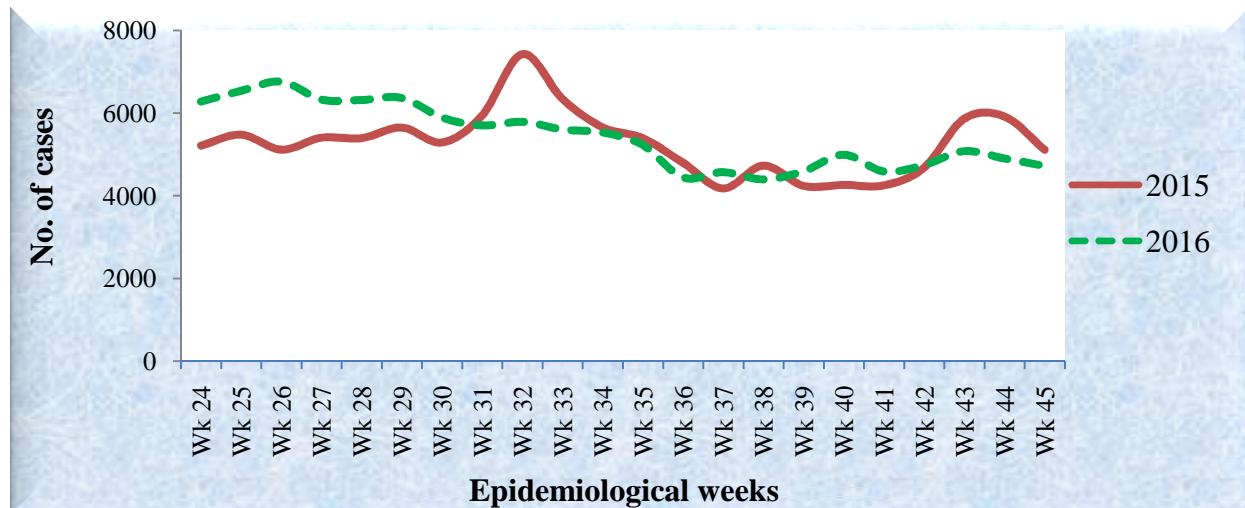


Fig.2: Trend of Malaria cases over the last 22 weeks in SNNPR, week 45, 2016

The number of malaria cases during the week decreased by 150 compared to the previous week (a total of 4,905 total malaria cases were reported in week forty four). As it is depicted in figure two above, the number of malaria cases remains stable since week 36. However, the number of cases in week 45 is a little bit lower than the same week of last year.

Basketo special woreda reported the highest malaria incidence rate with 135 cases per 100,000 populations in the week. The incidence rate has increased in the week in the zone as compared to last week. Previously Basketo special woreda reported 107 cases per 100,000 populations in week 43. Konta special woreda and Soth Omo Zone reported the second and third highest cases with 74 and 63 malaria cases per 100,000 populations in the week respectively.

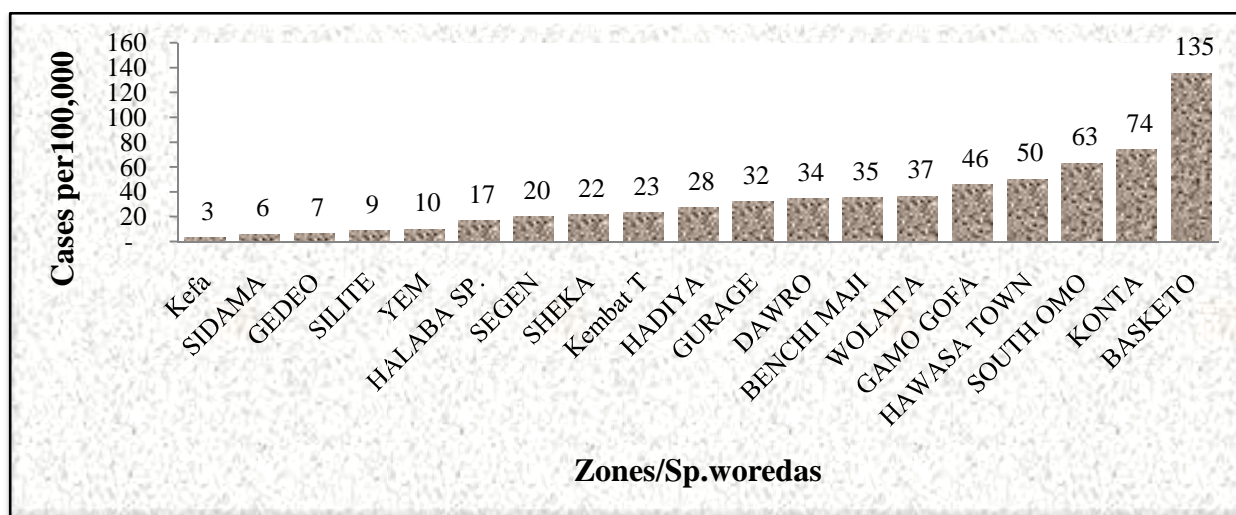


Fig.3: Malaria cases per 100,000 populations by zones/Sp.woredas in SNNPR, week 45, 2016

Among woredas, Salamago woreda from South omo zone reported the highest malaria case in the week with 189 cases. The woreda also reported previously 278 and 220 cases in week 43 and 44 respectively. Hawassa sub city and Arba minch town are among top three woredas in the week with 127 and 110 cases in the week respectively. (See fig 4).

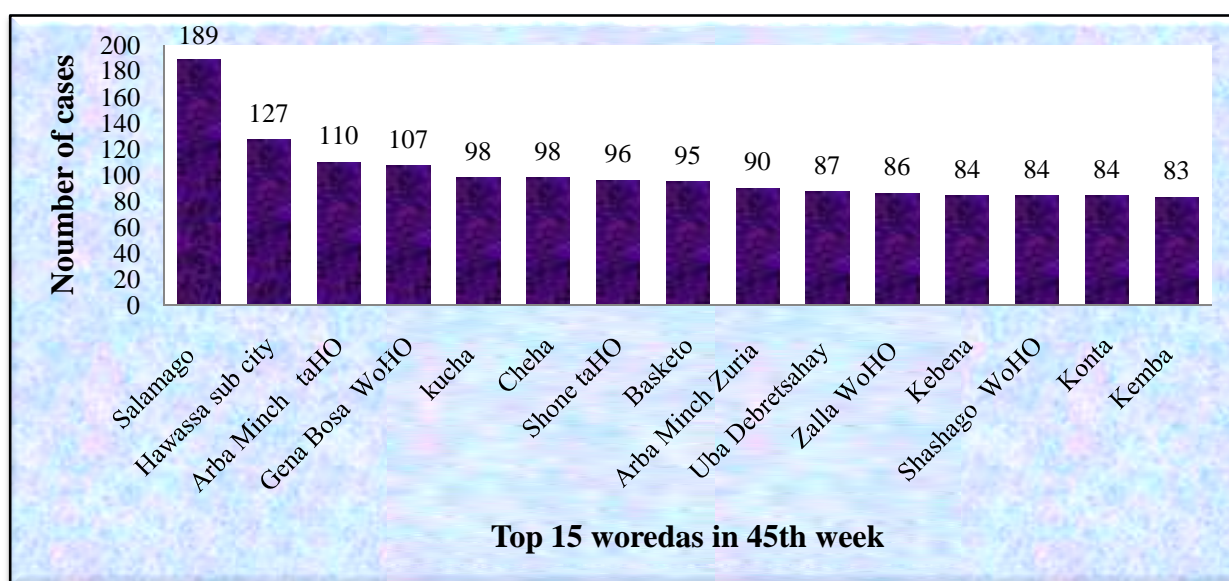


Fig.4: Number of malaria cases in 15highest reporting woreda in SNNPR, Week 45 in 2016.

In the last one month, Salamago reported the highest malaria case in the region with 859 cases. Kucha woreda and Arba Minch town reported the second and third highest malaria case with 471 and 440 cases.

<i>s.no.</i>	<i>Woredas</i>	<i>week 42</i>	<i>week 43</i>	<i>week 44</i>	<i>week 45</i>	<i>Total</i>
1	Salamago	172	220	278	189	859
2	kucha	116	130	127	98	471
3	Arba Minch town	85	102	143	110	440
4	Shone town	98	90	123	96	407
5	Uba Debretsahay	101	150	146	87	484
6	Abeshge	97	100	125	81	403
7	Hawassa sub city	98	97	108	127	430
8	Daramalo	90	92	120	66	368
9	Zalla	84	86	92	86	348
10	Cheha	96	86	107	98	387

Table1: Top 10 woredas with highest malaria cases, SNNPR, week 45, 2016

Meningitis

In this week, 17 suspected meningitis cases with one death were reported in the region. The cases are reported from Hawassa referral Hospital (8), Dilla Hospital (6), Basketo (1), Durame Hospital (1), and Jinka Hospital(1). The number of meningitis cases increased by 7 compared to week 44 (10 cases were reported in week 44).

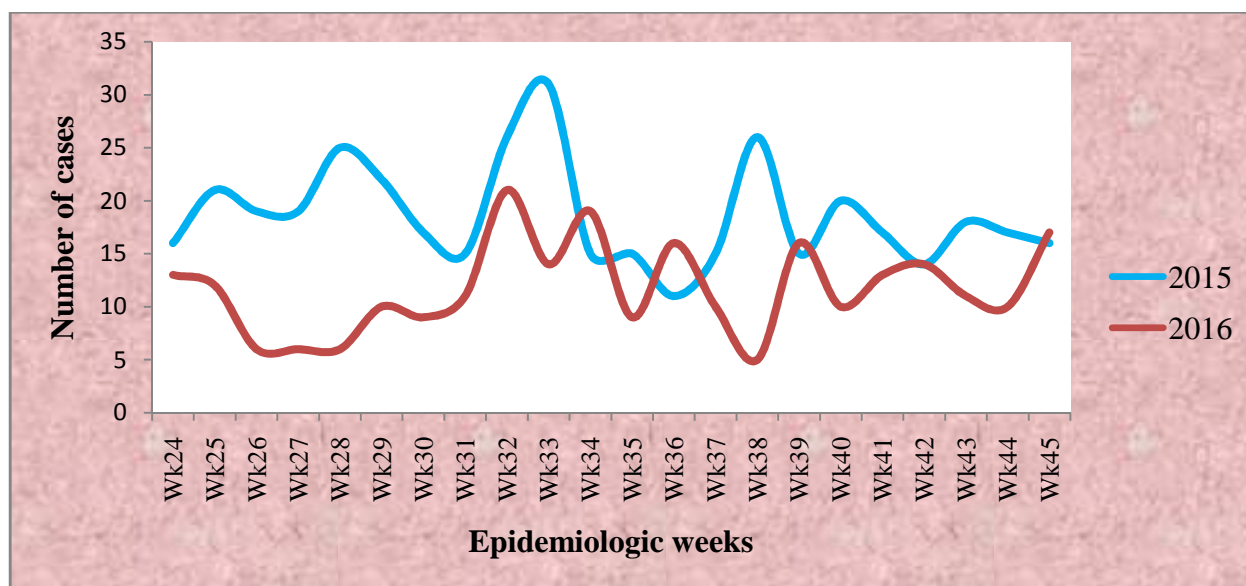


Fig.5: Trend of suspected meningitis cases over the last 22 weeks in SNNPR, week 45, 2016

Dysentery

There was a total of 537 reported cases of dysentery with zero death in this week. There is no inpatient case in the week. The number of dysentery cases increased by 62 as compared to the previous one week (475 cases were reported in week 44).

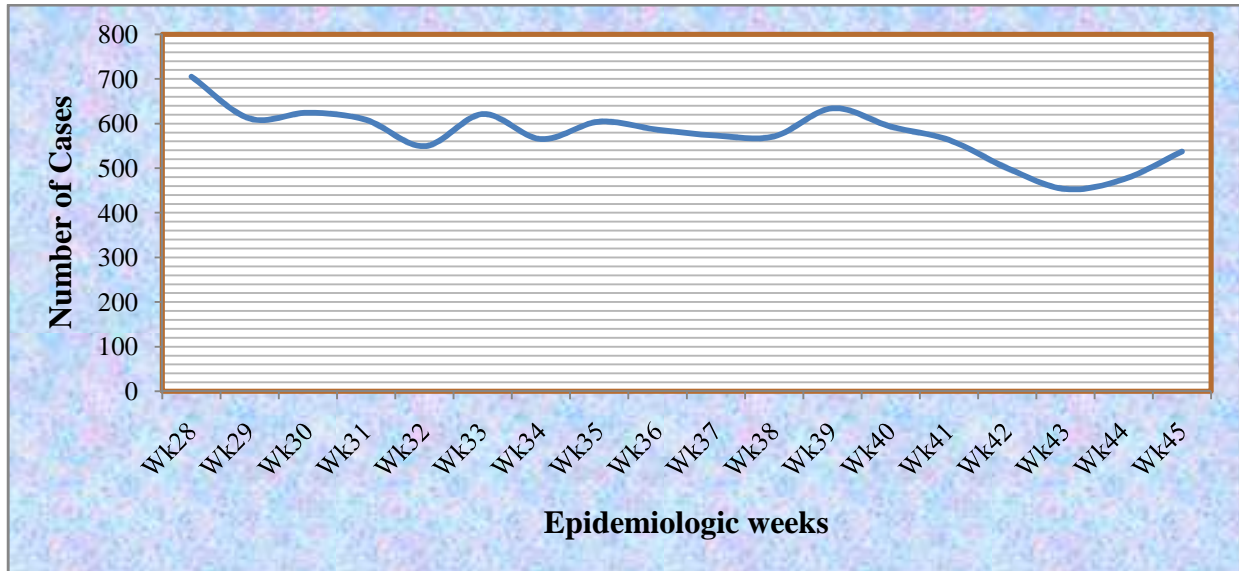


Fig. 6: Trend of dysentery cases for the last 20 weeks, SNNPR, week 45, 2016

During the week, Basketo woreda reported the highest number with 31 dysentery cases followed by Hawassa sub city and Enemor Ener 26 and 18 cases respectively in the region.

Severe Acute Malnutrition

A total of 688 severe acute malnutrition (SAM) cases were reported in the region. Of these 598 were outpatient and 90 were inpatient cases with two deaths during the week. Each death was reported from Dilla Hospital and Hawassa referral Hospital. Generally, the number of SAM cases decreased at the regional level by 76 when compared to week forty four (n= 764). As shown in figure 7, the outpatient SAM (OTP) case (598) decreased in the week by 84 compared to week 44(682). However, the number of inpatient SAM (SC) case has increased by 8 in the week.

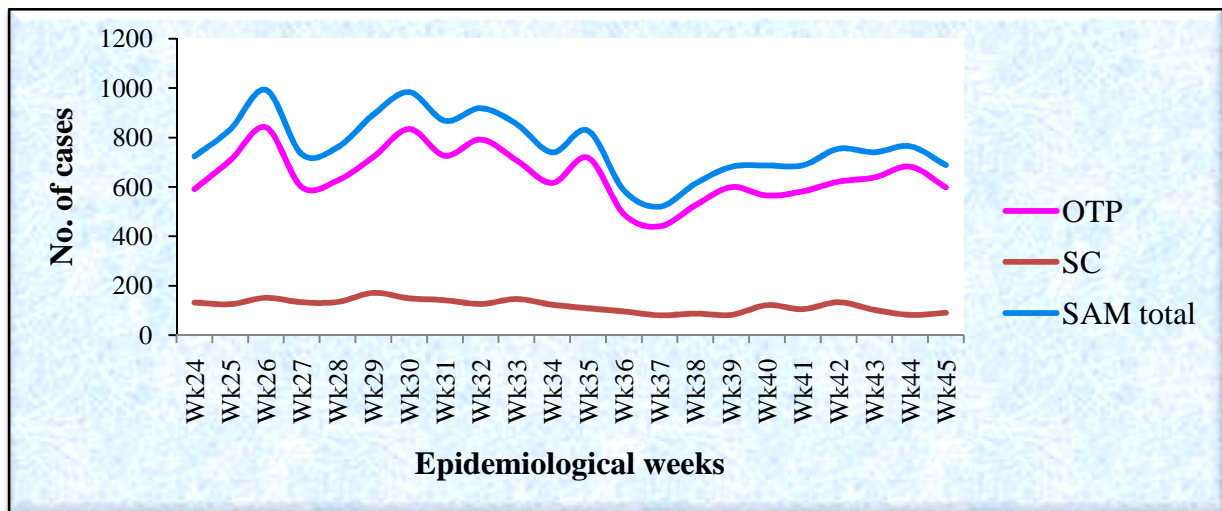


Fig.7: Trend of Severe Acute Malnutrition (SAM) cases over the last 22 weeks in SNNPR week 45, 2016

Figure 8 depicts that Sidama zone reported the highest number of SAM cases (n= 177) followed by Gamo Gofa and Hadiya zone with 92 and 77 case in the week respectively.

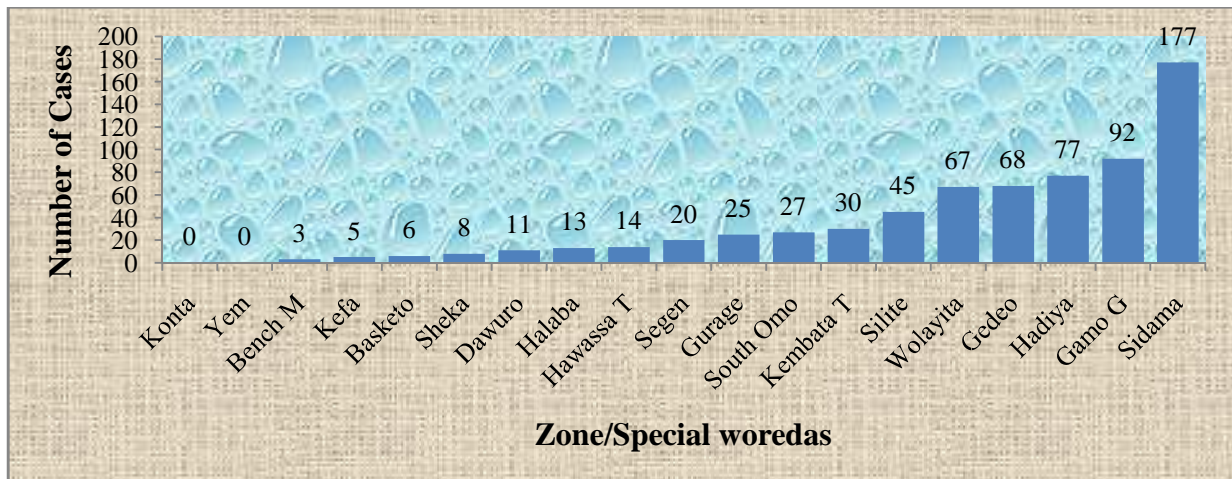


Fig. 8: Number malnutrition cases by zones/ Sp.woredas, SNNPR, week 45, 2016

When disaggregated by woreda, Bensa Woreda, Kemba, and Aroressa, are top threes for SAM cases during the week in the region with 36, 28, and 22 cases respectively.

Scabies

In week 45, the total number of scabies cases reaches 48,896 in the region. Its attack rate was 152 per 100,000 populations at regional level.

So far, Twenty seven woredas are affected in the region. Figure 8 depicts that Halaba special woreda reported the highest number of scabies cases with 1,077 per 10,000 followed by East badawacho and Loma woredas with 251 and 212 per 10,000 cases in the week respectively.

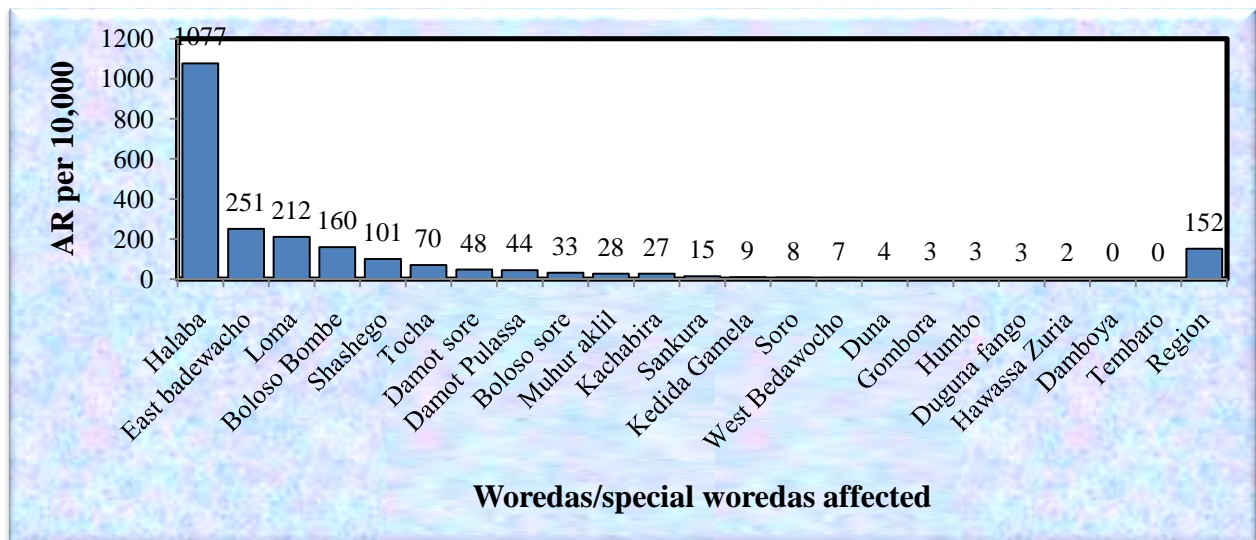


Fig. 9: Scabies cases rate per 10,000 populations by woredas/special woreda in SNNPR, week 45, 2016.

AFP

During the week, three suspected AFP case was reported in the region. The cases were reported from Hawassa referral Hospital, Yirgalem Hospital, and Hamer woreda from south omo Zone.

Measles cases

During the week, three suspected measles case was reported in the region. The cases were reported from Halaba Hospital, Yirgalem Hospital, and Enamore ener woreda from Guragae Zone.

Epidemic Typhus

There were a total of 2,041 suspected outpatient epidemic typhus cases re-reported in this week. The number of cases increased by 687 as compared to wek 44 (1384). Yirgalm town, Ezha, and Sodo woreda from Guragae Zone have reported the highest number of case with 144, 118 and 90 cases respectively

Typhoid Fever

There were a total of 8,324 suspected typhoid fever cases were reported in this week, of which 8,304 were outpatient cases and 20 were inpatient cases with zero death report. The number of cases increased by 418 as compared to wk 44 (7,909). Dilla town, Hossana town, and Yirgalem town have reported the highest number of case with 238, 240 and 188 cases respectively

AWD

Three AWD cases are reported from Wondo genet woreda in the region during the week. While Hawassa town reported zero case in the week.

Maternal Death

Zero maternal death was reported in the region in the week.

NB; - No case or death of NNT, yellow fever, Anthrax, AHI, SARS, Pandemic influenza, Viral Hemorrhagic Fever, Guinea worm, Smallpox, and Rabies reported in the region in this reporting period.

Preparedness

RHB in collaboration with save the children conducting orientation on scabies prevention and management for PHEM and DPHP officers from affected zones, and their woredas in the Region. The orientation aims to capacitate the health workers to contain the outbreak as well as to control the spread of the disease in the region.

The PHEM bulletin is the weekly bulletin of the south Nations nationalities and People's Regional State Health Bureau, Public health emergency management core process. It is prepared and disseminated on a weekly basis.

Annex 7: Measles outbreak investigation case control study Questionnaire for of Cheta District 2016

Status of Respondent: 1, Case 2' Control

Patient/Respondent Name _____ Date of Data collection _____

Region _____ Zone _____ Woreda _____ Kebele _____ Got
 _____ Phone _____

Respondent Status Case _____ Mother _____ Father _____ Other _____

I. Socio-demographic Characteristics

S. No	Questions	Alternatives
1.1	Sex	1. Male 2. Female
1.2	Age	years _____ Months _____
1.3	Occupation of the patient/respondent	1. Farmer 2. House wife 3. Student 4. Unemployed 5. Daily laborer 6. Merchant 7. Gov't 8. NA (for under 5 child) 9. Other (specify) _____
1.4	Family Occupation(HH head)	1. Farmer 2. House wife 3. Student 4. Unemployed 5. Daily laborer 6. Merchant 7. Gov't 8. Other (specify) _____
1.5	Religion	f. Orthodox g. Protestant h. Muslim i. Catholic j. Other (specify) _____
1.6	Ethnic group	1,kafa 2,Chara 3, Nao' 4, Dawuro 5, Sheka 6, Other (specify)
1.7	Educational level of the patient /respondent	f. Illiterate g. Read and write h. Elementary i. Secondary j. Above secondary 6.N/A
1.8	Educational level of the family	f. Illiterate g. Read and write h. Elementary i. Secondary j. Above secondary
1.9	Marital status of parent	f. Single g. Married h. Divorced i. Widowed j. Separated, 6 N/A
1.10	Family size	_____

1.11	Is there any sick person with rash, fever, running nose/conductivities (illness)in the family?	1. Yes 2. No
1.12	If yes, number of sick person	_____
1.13	Age(s) of sick person(s)	_____

II. Clinical History of Diseases:* for the case only

2.1	What was the symptom?	1.fever 2.Rash 3.cough, 4.coryza (runny nose), 5. conjunctivitis (red eyes) 7. Ear discharge 8. pneumonia10. Vomiting 11. Others_____
2.2	Ask ONLY if complication	Pneumonia: 1.yes 2. no Cornea: 1. yes 2. no Blindness : 1. yes 2. no Convolution 1.Yes 2.No Otitis media (ear discharge): 1.Yes 2.No diarrhea :1. yes 2. no Feeding problem 1.Yes2.No Encephalitis 1. Yes 2. No
2.3	Date of rash on set	/ / Duration of rash_____
2.4	Wherethe rash was started (location)?	District_____Kebele_____ _____ Got _____HDA leader _____
2.5	Have you (has she/he) Visited health facilities?	1. yes2. no,
2.6	If yes, who told to go health facility?	1. Neighbors 2. HDA leader 3. HCW 4. HEW 5. Kebeleleaders 6. FBOs 7. Others (specify) _____
2.7	Type of Health Facility visited	1. Hospital 2. Health center 3. Health post 4.private clinic 5.local drug holder 6. Drug retailer 7.others_____

2.8	Date seen at health facility	/ /
2.9	Illness duration before visiting the health facility	_____ in days/hours
2.10	Did you (he/she) take treatment?	1.Yes 2.No
2.11	If yes, treatment taken	1.ORS 2.Antibiotics 3.Vitamin A 4. Supplementary food 5. TTC ointment 6.Anti pyretics 7.Others given_____
2.12	Did you (she/he) recovered after the treatment?	1.recovered / cure 2. partially improved 3. referred to next level HF 3. disabled after illness 4.death

III. Questions related to Risk factors for measles illness

3.1	Did you have (she/he has) been vaccinated for measles?	1.Yes 2.No skip to Q3.5 3.Unknow 4.Not applicable
3.2	If yes, last vaccination date	1.parent recall_____ 2. vaccination card_____ //d
3.3	Number of vaccine doses received	1.one dose 2. two dose 3.three and above 4. Not know
3.4	At what age you (she/he) vaccinated first dose of measles vaccination?	_____
3.5	If not vaccinated, why?	1.Health facility far apart 2.lack of knowledge about vaccination campaign, 3.absence during vaccination campaign, 4. Site of vaccination unknown 5. Fear of Pain of vaccination 6. No need of measles vaccination for child 7. She/he took other vaccine differ from measles 8. other, specify
3.6	Did you have any travel history 7-18 days to areas with active measles cases before onset of symptoms?	1.Yes 2.No If Yes where _____
3.7	Did you contact with a person with measles symptoms within the last 2-3 weeks?	1. yes 2. No If yes, where_____

3.8	Do you have any travel history four days before and after rash onset	1.Yes 2. No If yes where _____
3.9	Do you have any contact history with someone else four days before and after rash onset	1.yes 2.No If yes with whom_____
3.10	If Yes to question 3.5 place of travel	1.School 2.Neighbor 3.Market 4.Other_____
3.11	Do you know modes of transmission for measles?	1.Yes 2.No If yes specify_____
3.12	Did you ever have measles infection?	1.Yes 2. No 3. Don't know
3.13	Nutritional status of the cases (use MUAC and weight for <5 children)	1.Normal 2.Moderate 3.Severely malnourished
3.14	What is the estimated area of the house in sq. m?	_____
3.15	Is the house well ventilated?	2. Yes 2. No
3.16	Distance from house to HC?	1. <1km 2. Between 1 – 5km 3. >5km
3.17	Where did you go first when you get ill?	f. Health Facility g. Traditional Healers h. Holy Water i. Stayed at home j. Other :(Specify)_____
3.18	How do you think people get measles?	2. Contact with a virus from ill person 3. From God 4. Bad attitude of other people 5. Bad weather condition 6. Other(Specify)
3.19	How could you (she/he) suffer from Measles?	1. Contact with a virus from ill person 2. From God 3. Bad attitude of other people 4. Other(Specify)
3.20	Do you know how could spread/infection of measles be stopped?	1.by vaccination 2. By modern treatment 3. By isolation of infected ones /minimizing contact with infected person 4. By doing traditional practice 5. By pray /spraying holy water/ 6. by keeping infected one in dark place in the house 7. Others specify_____.

3.21	Do you Know measles is vaccine preventable?	1. Yes 2. No 3. I don't Know
3.22	Who do you think can be affected by measles?	4. Children of aged less than 5 years 5. Children of aged less than 18 years 6. Women of any ages 7. Any age groups of both male and women 8. Other (specify):_____
3.23	How do you think measles can be cured?	1. Using modern medicine 2. Using traditional Medicine 3. Holly water 4. By feeding nutritious foods 5. Keeping the sick person indoor 6. Other(Specify)_____

Annex 8: AWD outbreak investigation case control study Questionnaire for of Dilla town and Dilla zuria District 2016

Patient/Respondent Name _____ Date of Data collection _____
Phone Number-----

No.	Question	Coding Classification	Go To
1. Demography			
1.1	Status	1. Case. 2. Control	
1.2	Responder	_____	
1.3	Address	Region _____ Zone _____ Woreda _____ Kebele _____ Got _____ House No _____	
1.4	GPS coordinate of the house	Latitude _____ Longitude _____	
1.5	Ethnicity	1 Gedeo 2. Oromo 3.Silite 4.Gurage 5.Amhara 6.Wolayita 8.Other(Specify)_____	
1.6	Age	_____ Year (s) _____ Month(s)	
1.7	Sex	1.Male 2.Female	
1.8	Occupation	1.Farmer 2.Merchant 3.Student 4. House wife 5.Unemployed 6. Pastoralist 7. Gov't Employee 8.Private Employee 9. Daily Laborer 10. Not applicable 11.Other _____	
1.9	What is your religious	1. Orthodox 2. Protestant 3. Muslim 4.Catholic 5. other _____	
1.10	What is your marital status?	1. Single 2. Married 3.Widowed 4.Divorced 5. NA	
1.11	Level of Education	1.Illiterate 2.Read and writing only 3.Elementary school(1-8) 4.Secondary School(9-12) 5.Tertiary School(college+)	

No.	Question	Coding Classification	Go To
3.7	Age of family members affected.	Male 1____ 2____ 3____ 4____ Female 1____ 2____ 3____ 4____	
3.8	Was there death in your family due to AWD in the past 5 years?	1.Yes 2.No	
4. Clinical Pictures(Current infection)			
4.1	Do you have history of acute watery diarrheal disease recently?	1.Yes 2.No	If No skip to Q 4.7
4.2	Date of onset (When did the symptoms begin?)	_____ dd/mm/yyyy _____ hour	
4.3	Frequency of defecation per day	_____	
4.4	Do you have the following symptoms?	1.Watery diarrhea 2.Vomiting 3.General body weakness 4.Loss of consciousness 5.Muscle cramp 6.Other(specify)_____	
4.5	Have you been treated with antibiotic for your recent complaints?	1.Yes 2.No	
4.6	What antibiotics did you take?	1. _____ 2. I don't know	
4.7	Where did you take the antibiotics?	_____	
4.8	Where did you admit	1. CTC 2. Hospital 3. Private clinic 4. Others, _____	
4.9	Is there any sick other person in your house?	1. Yes 2. No	
4.10	If yes, is that before or after your symptoms began?	1, Before, 2 After 3. At the same time	
4.11	Is there AWD sick person in your village?	1. Yes 2. No 3 I don't know	
4.12	Did you have contact history with the same compliant in the past 7days before your symptoms onset	1.Yes 2.No	
5. Travel and Exposure History			
5.1	Did you travel in the past 7days outside of your village before your symptoms onset?	1.Yes 2.No	
5.2	If, yes where	_____	
5.3	Did you participate in funeral ceremony of AWD death	1.Yes 2.No	If no skip to Q No. 5.6
5.4	When did you participate in funeral	_____ dd/mm/yyyy	

No.	Question	Coding Classification	Go To
	ceremony of AWD death		
5.5	Where did you participate in funeral ceremony of AWD death	_____	
5.6	Did you attend other public ceremonies /events(wedding, religious, bather , telethon)	1.Yes 2.No	If No skip to Q No. 6.1
5.7	What kind of food did you served at the ceremonies/ event?	5.8 _____	
5.8	What kind of drink did you served at the ceremonies/ event? (if water mention sources)	_____	
6. WASH			
6.1	Where do you defecate?	1. Toilet 2. open field	If No Skip to Q 6.4
6.2	If answer to Q6.1 is “toilet” who own it?	1. Private 2. Communal 3. Public	
6.3	show me the toilet	1. Clean 2.Unclean 3.Ventilated 4.Sign of utilization	
6.4	If the answer to question number 6.1 is Open field defecation, can you tell me the reason?	1. No toilet 2. Culture 3.Bad odor 4. Fear of falling down 5.Too far from my house 6. Physically damaged (toilet) 7.Other(specify)_____	
6.5	Is there facility to wash your hand after defecation near toilet?	1.Yes 2.No	
6.6	When do you wash your hand (none proving)?	1.After toilet 2.Before food 3.After cleansing child 4.Before preparing food 5.Before feeding child 6.Other(specify) _____	
6.7	What items are you using for hand washing?	1. Plain water 2. Soap 3. Ash 4.Other(specify)_____	
6.8	What is the water source for your house hold for drinking purpose?	1. River 2.Spring 3.Hand dug well 4. Deep- well 5.Pond 6. Pipe water 7. Lake 8. Bottled water 9.Other(specify) _____	
6.9	What is the water source for your house hold for washing utensils?	1.Pipe water 2.Spring 3.Hand dug well 4.Deep well 5.Pond 6.River 7.Lake 8.Other(specify) _____	
6.10	What is the water source for your house hold for cooking food?	1.Pipe water 2.Spring 3.Hand dug well 4.Deep well 5.Pond 6.River 7.Lake	

No.	Question	Coding Classification	Go To
		8.Other(specify) _____	
6.11	How many hours/minutes will take you or your family to fetch water from the water source?	_____ hours _____ minute 98. I cannot estimate	
6.12	What type of container are you using to fetch water from the source?	1.Jerry cane 2.Bucket 3.Ensira(Gan) 4.Other(specify) _____	
6.13	What type of water container are you/your family is using in your house for storage?	1.Jerry cane 2.Bucket 3.Ensira(Gan) 4.Rotto 5. Other(specify) _____	
6.14	How was the water accessed from the storage container?	1.Pour 2.Dip with cup 3.Other(specify)_____	
6.15	Does the container have cover/lid (observe)?	1.Yes 2.No	
6.16	Do you clean your water containers regularly?	1.Yes 2.No	If No skip to Q6.19
6.17	What materials do you use to wash your water containers?	1.Soap 2.Only water 3.Ash 4.Other(specify) _-----	
6.18	How often do you wash your water containers?	1.Every day 2.Every other day 3.Once per week 4.Other(specify) _____	
6.19	Do you think the water you are using is safe?	1.Yes 2.No	
6.20	Could you purify the water?	1.Yes 2.No	
6.21	What methods of water purification do you use (none proving)?	1.Boiling 2.Filtration 3.Sedimentation 4.Water chemicals 5.Other(specify)_____	
6.22	For what purposes do you purify water (none proving)?	1.For drinking 2.For cooking 3.For washing hand 4.For cleaning food utensils 5.Other(specify) _____	
6.23	Is there water purification chemical available in your community?	1.Yes 2.No	
7. Feeding			
7.1	What is the cultural food in your area?	1.Rice 2.Enjera with wot 3.Porridge 4. Meat 5. Bread 6. Other(specify) _____	
7.2	Do you eat raw/uncooked food?	1.Yes 2.No	If No skip to Q 7.4
7.3	In the past 7 days of your symptoms onset what kind of uncooked food did you eat?	1. Raw meat 4. Raw green vegetables 2. Raw tomato 5. Raw fish meat 3. Raw milk 6. Other(specify) _____	

3. Did you have standard case definition for all country priority diseases? Yes No
4. Was the case definition posted? Yes No
5. If answer for Q2 is No, for which disease(s) did you lack the case definition?
6. Did you have case based reporting formats? Yes No
7. Was there guide line for specimen collection, handling and transportation to the next level?
8. Did you have line list for reporting cases? Yes No
9. If no, for which disease/event you lack?
10. Did you have outbreak investigation guideline? Yes No
11. If no, how do you prevent, control, and investigate it?
12. Did you have a rumor logbook? Yes No
13. Fill the table below for question #2

B. Epidemic Preparedness, and response assessment

1. Did you have plan for epidemic preparedness and response plan and Yes No
2. If no, how did you implement public health priorities? -----
3. Did you have emergency stocks of drugs and supplies? Yes No
4. If No, how did you control emergency events? -----
5. Have you experienced shortage of supplies (drugs, ITNs) in 2008 EFY? Yes no
6. Was an epidemic management committee at zonal level? Yes No
7. Did the epidemic management committee have regular scheduled meeting time? Yes No
8. Was Rapid response team (RRT) in your office? Yes No
9. Did the RRT have regularly scheduled meeting time during epidemics? Yes No
10. If no, how did/do you control and prevent emergency events? -----
11. Did you have case management protocol for epidemic prone diseases? Yes No
12. Did your PHEM have multi-sectorial emergency preparedness and response task force?
Yes No I do not know
13. Did the partners are working together with your office on emergencies? Yes No
14. If yes, what type of supports did you get for emergency?
15. Did the budget allocated for epidemic/emergency responses? Yes No
16. Who had the authority to mobilize the emergency finance? woreda head woreda health
department experts other-----
17. Did you have a vehicle for emergencies (PHEM)? Yes No
18. If answer for Q17 is NO, how did you address emergencies?

C. Case detection, reporting, confirmation and Outbreak investigation

1. Do you have standard case definitions for the Country's priority diseases like malaria, Measles and AWD? Yes / No / Unknown
2. What are the reporting entities for the surveillance system? public facility private Facility NGOs Health facility Others
3. Was there any report of the immediately reportable diseases in the past 1 month? Yes/ No what was the disease_____?
4. If yes, for Q 11, with in what time is the report received after detection of the diseases? Less than 1-hour 2-24 hrs 1-2 days 3-7days after a week
5. If the answer is yes for Q #6, observe the presence of the standard case definition for each priority disease. Yes No Unknown
6. Did you detect any priority diseases case in 2008 EFY Yes No
7. Did/ do you register any detected cases Yes No
8. Did/ do you report any case to the higher level? Yes No
9. Have you investigated any outbreak in 2008 EFY? Yes No , list if any and response time

S.N o	Name of outbreak	Place(Kebele /woreda	N ^o of cases			N ^o of deaths			Start date of the outbreak	Investigation date	Remark
			M	F	U5	M	F	U5			
1											

10. Where did confirmation of laboratory cases? regional lab Hospital EPHI HC other---
11. Who is responsible to investigate an outbreak? RRT HEWs staffs of woreda health office experts organized randomly health facility staffs other----
12. Have you faced any challenge in outbreak investigation in 2008 EFY? Yes No
13. If yes, list the challenges and action taken-----

D. Communication and reporting system assessment

1. Which communication material did you have? E-mail, fixed line, mobile, radio, fax other---

2. Number of HP, HC, woreda, and hospitals that have communication facilities -----
3. Did you have address of Hf, woreda, Hospital and regional PHEM officers? Yes No

4. How frequently you communicate with woreda and regional PHEM officers on emergencies and other daily activities? Daily weekly every 2 week monthly quarterly every 6 month yearly others-----
5. When are you expected to send weekly report to the regional PHEM unit? Monday Tuesday Wednesday Thursday Sunday
6. When are you expected to receive weekly report from woredas/town administration? Monday Tuesday Wednesday Thursday Sunday
7. 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
8. If yes to who did, you send? -----
9. If no, why? -----

E. Training, Computer skill, and Data analysis assessment

1. Number of PHEM officer assigned based on the structure -----
2. Number of trained surveillance officer on PHEM? Yes No
3. Did you give any onsite orientation about surveillance system for officers? Yes No
4. If no, why? -----
5. Did you have computer, photocopier, printer, data manager?
6. Do you have a computerized surveillance network? Yes No
7. Was surveillance data compiled? 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 including trend analysis? Yes No
11. If yes, did you describe data by time place person
12. If no, how did you use data for action? -----
13. Did you have denominators for data analysis? total pop male female <5
14. Please indicate the frequency of your data analysis. weekly Monthly every two week quarterly every 6 month annually No regular time
15. Did you notify the results of your analysis to the lower level? Yes No
16. If no, why? Less attention, lack of knowledge, time shortage, not familiar, shortage of material, other

F. Supervision and feedback assessment

1. Did you have supervision plan in 2008 EFY? Yes No
2. If yes, did you supervise HHs, HPs, HCs, woredas, and Hospitals? Yes NO

3. If no, how did you supervise? -----
4. Did you notify your supervision plan prior to supervision? Yes No
5. If no, why? -----
6. Did you have supervision checklist? Yes No
7. If No, how did you supervise wordas and health facilities? -----
8. Did you send feedback to the lower level indicating their strong and weak sides? Yes No
9. If No, why? -----
10. If yes, for how many of them did you send a feedback in 2008 EFY_____
11. Did you have a follow up mechanism to improve limitations indicated by supervision?
Yes No
12. Have you reviewed about surveillance practice by higher level supervision in 2008? Yes
No
13. How many times did you supervised by higher level officers in 2008 EFY? -----
14. Have you received schedule of supervision from higher level in 2008?
15. Have you received feedback from higher level supervisors in 2008 EFY? Yes No
16. What action did you take to improve the limitation of the feedback given by higher level? ----

17. Did you have active case search plan in 2008 EFY? Yes No
18. If no, how did you implement case searching plan activities?
19. Have you faced any challenge on supervision and feedback in 2008 EFY? Yes No
20. If yes, list the challenges and actions taken? -----

PART 2

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:

I. 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 to 15 min >15 min
7. How long does it take to have laboratory confirmation? -----

II. 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

III. Data quality

1. Are all reported forms Complete? Yes No
2. If No, how many unfilled spaces are in your 2008 EFY report? -----
3. Percentage of unknown or blank responses to variables from the total reports of 2008 EFY report-----
4. Percent of reports which are complete(that is with no blank or unknown responses) from the total -----
5. Is the recorded data clear to read and understand? Yes No
6. If No, how many records are not clear/are difficult to understand in 2008 EFY report?
Percent of records which are difficult to read/ understand. -----

IV. 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
- 7. Were all the health professionals aware about the surveillance system? Yes No
- 8. Was all PHEM officers send report on time? Yes No

V. Representativeness

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

VI. Timeliness

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

VII. Completeness

- 1. Are all reporting sites reporting? Yes No
- 2. Percent of HF/woreda that send report of each week in 2008 EFY. -----

VIII. 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 yes, explain why? -----

Weekly Zonal reports received on time in the last 11 months in 2008 EFY report (July 2015- May, 2016

WHO epidwk	N ^o of woredas expected to report	N ^o of woredas that report on time	N ^o of Hospital s expected	N ^o of Hospitals that report on	WHO epidwk	N ^o of woredas expected to report	N ^o of woredas that report on time	N ^o of Hospital s expected	N ^o of Hospitals that report on
------------	--	---	---------------------------------------	--	------------	--	---	---------------------------------------	--

			to report	time				to report	time

Annex 10: Questionnaire for evaluation of Woreda PHEM Malaria, Measles and AWD surveillance system.

Respondent(s) -----Woreda _____ Total population -----Kebele-----

Urban _____ rural _____ Male ____ Female -----HC----- HP ---- HAD -----

Number of private health facilities ----- NGOS----- Phone number -----e-mail -----

PART 1: Observe all documents and reports

A. Assessment of availability of Surveillance Documentation, Registers, and Forms

14. Were there a National Guide line/manual for surveillance? Yes No unknown

15. If no, what did you use for priorities health events?

16. Did you have standard case definition for all country priority diseases? Yes No

17. Was the case definition posted? Yes No

18. If answer for Q2 is No, for which disease(s) did you lack the case definition?

19. Did you have case based reporting formats? Yes No NA

20. Was there guide line for specimen collection, handling and transportation to the next level?

Yes No NA

21. Did you have line list for reporting cases? Yes No Not Applicable

22. If no, for which disease/event you lack?

23. Did you have outbreak investigation guideline? Yes No

24. If no, how do you prevent, control, and investigate it?

25. Did you have a rumor logbook? Yes No

B. Epidemic Preparedness, and response assessment

19. Did you have plan for epidemic preparedness and response Yes No

20. If no, how did you implement public health priorities? -----

21. Did you have emergency stocks of drugs and supplies? Yes No
22. If no, how did you control epidemics? -----
23. Have you experienced shortage of drugs, ITNs and supplies in 2008 EFY? Yes No
24. Was an epidemic management committee built in your office? Yes No I do not know
25. Did the epidemic management committee have regularly scheduled meeting time Yes No
26. Was Rapid response team (RRT) built in your office? Yes No I do not know
27. Did the RRT have regularly scheduled meeting time during epidemics? Yes No
28. If no, how did/ do you control emergency events? -----
29. Did you have case management protocol for epidemic prone diseases? Yes, No I do not know
30. Did your PHEM have multi-sectorial emergency preparedness and response task force? Yes No Not Applicable
31. Did the partners working together with your office on emergencies? Yes No
32. If yes, what type of supports did you get for emergency?
33. Was the budget allocated for epidemic/emergency response? Yes No I do not know
34. Did you have a vehicle for emergencies (PHEM)? Yes No Not applicable
35. If no, how did you address emergencies?

C. Case detection, reporting, confirmation and Outbreak investigation

1. Did you detect any priority diseases case in 2008 EFY Yes No
2. Did/ do you register any detected cases Yes No
3. Did/ do you report any case to the higher level? Yes No
4. Have you investigated any outbreak in 2008 EFY? Yes No , if yes, the response time--

5. Where did confirmation of laboratory cases? regional lab Hospital EPHI HC
6. Who is responsible to investigate an outbreak? RRT HEWs staffs of woreda health office experts organized randomly health facility staffs other-----

7. Did you faced any challenge in outbreak investigation in 2008 EFY? Yes No
8. If yes, List the challenges and action taken-----

D. Communication and reporting system assessment

10. Which communication material did you have? E-mail, Fixed phone, mobile, radio, fax other-----
11. Number of HPs, and HCs that have communication facilities (list)-----

12. Did you have address of HP, HC, zonal PHEM officers? Yes No
13. How frequently you communicate with the zonal PHEM officers and HC on emergencies and other daily activities? Daily weekly every 2 week monthly quarterly every 6 month yearly others-----
14. When are you expected to send weekly report to the zonal PHEM unit? Monday Tuesday Wednesday Thursday Friday Saturday Sunday
15. When are you expected to receive weekly report from HCs/HPs? Monday Tuesday Wednesday Thursday Friday Saturday Sunday
16. 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
17. If yes, to whom did you send? -----
18. If no, why-----

E. Training Computer skill, and Data analysis assessment

17. Number of PHEM officer assigned based on BPR structure -----
18. Number of trained surveillance officer on PHEM? Yes No
19. Did you give any onsite orientation about surveillance system for Hc and HEWs? Yes No
20. If no, why? -----
21. Did you have computer, photocopier, printer, data manager?
22. Do you have a computerized surveillance network? Yes No
23. Did you compile surveillance data? Yes No
24. How the data entry and compilation is accomplished? Manual Computer other----
25. Did you have computer skill on Ms. word Ms. excel MS power point Epi-info
26. Did you analyze data of the surveillance system including trend analysis Yes No
27. If yes, did you describe data by time place person
28. If no, how did you use data for action? -----
29. Did you have denominators for data analysis? total pop -----male-----female-----
30. Please indicate the frequency of your data analysis. weekly Monthly every two week quarterly every 6 month annually No regular time
31. Did you notify the results of your analysis to the lower level PHEM? Yes No
32. If no, why? Less attention, lack of knowledge, time shortage, not familiar, shortage of material, other

F. Supervision and feedback assessment

21. Did you have supervision plan in 2008 EFY? Yes No

22. If yes, did you supervise the HHs, HPs, and HCs according to your plan in 2008 EFY? Yes No
23. If no, how did you give a support? -----
24. Did you notify your supervision plan prior to supervision? Yes No
25. If no, why-----
26. Did you have supervision checklist? Yes No
27. If no, how did you supervise the health facilities without checklist? -----
28. Did you send feedback to HCs and HPs indicating their strong and weak sides? Yes No
29. If no, why? -----
30. If yes, for how many of HP and HCs did you send a feedback in 2008 EFY_____
31. Did you have a follow up mechanism to improve limitations indicated by supervision? Yes No
32. Did you review about surveillance practice by higher level supervision in 2008? Yes No
33. How many times did you supervised by higher level officers in 2008 EFY? -----
34. Have you received schedule of supervision from higher level in 2008?Yes No
35. Have you received feedback from higher level supervisors in 2008 EFY?Yes No
36. What action did you take to improve the limitation of the feedback given by higher level? ----

37. Did you have active case search plan in 2008 EFY? Yes No
38. If no, how did you implement case searching plan activities?
39. Have you faced any challenge on supervision and feedback in 2008 EFY? Yes No
40. If yes, list the challenges and actions taken? -----
41. What is the incidence / Prevalence of 2008 -in your area/region
- a. Malaria _____Laboratory done _____cases P.F _____ P.v _____Deaths _____
- b. Measles _____cases _____Deaths _____
- c. AWD _____cases _____Deaths _____

PART 2

IS THE SURVEILLANCE SYSTEM HELPFUL?

5. To detect outbreaks early on time to permit accurate diagnosis? Yes No
6. To estimate the magnitude of morbidity and mortality? Yes No
7. Permit assessment of the effect of prevention and control programs? Yes No
8. To estimate research intended to lead to prevention and control? Yes No

Describe Each System Attributes:

G. Simplicity:

- 8. Is the case definition easy for case detection by all level health professionals? Yes No
- 9. Does the surveillance system allow all levels of professionals to fill data? Yes No
- 10. Does the surveillance system help to record and report data on time? Yes No
- 11. Does the surveillance system have necessary information for investigation? Yes No
- 12. Does the surveillance system allow updating data on the cases? Yes No
- 13. How long does it take to fill the format? <5 min 5 to 10 min 10 to 15 min >15 min
- 14. How long does it take to have laboratory confirmation? -----

H. 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

I. Data quality

- 7. Are all reported forms Complete? Yes No
- 8. If No, how many unfilled spaces are in your 2008 EFY report? -----
- 9. Percentage of unknown or blank responses to variables from the total reports of 2008 EFY report---
- 10. Percent of reports which are complete(that is with no blank or unknown responses) from the total--
- 11. Is the recorded data clear to read and understand? Yes No
- 12. If No, how many records are not clear/are difficult to understand in 2008 EFY report?
- 13. Percent of records which are difficult to read/ understand. -----

J. Acceptability

- 4. Do you think all the reporting agents accept and well engaged to the surveillance activities? Yes No

5. If yes, how many are active participants (of the expected)? -----
6. 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

K. Representativeness

5. Was the surveillance system enabled to follow the health and health related events in the whole community? Yes No
6. If no, who do you think is well benefited by the surveillance system? urban rural both
7. Are all the Socio demographic variables included in the surveillance reporting format? Yes No
8. If No, which a) Sex---- b) age group---C) ethnic group----d) religion---- is less represented?

L. Timeliness

3. Are all reporting sites reporting on time? Yes No
4. Percent of reporting sites that report on time. -----

M. Completeness

3. Are all reporting sites reporting? Yes No
4. Percent of Health facilities that send report of each week in 2008 EFY. -----
5. Total weekly reports received from H.C/health posts (including late reports. from july2015— may 2016)

WHO epid. Wk	N° of HCs expected to report	N° of HCs reported	N° of HPs expected to report	N° of HPs reported	WHO epid. wk	N° of HCs expected to report	N° of HCs reported	N° of HPs expected to report	N° of HPs reported

N. Stability

- 5. Was any new restructuring affected the procedures and activities of the surveillance? Yes No
- 6. Was there lack of resources that interrupt the surveillance system? Yes No
- 7. Was there any time /condition in which the surveillance is not fully operating? Yes No
- 8. If yes, explain why? -----

O. Sensitivity

- 1. Does the malaria case definition able to pick all cases? Yes No
- 2. What was the total Malaria cases occurred in your woreda in 2008 EFY? _____
- 3. What were the total numbers of suspected malaria cases examined by RDT or Microscopy? -----

Annex 11: Questionnaire for evaluation of Health centers Malaria, Measles and AWD surveillance system.

PART 1: Observe all documents and reports

A. Assessment of availability of Surveillance Documentation, Registers, and Forms

- 1. Were there a National Guide line for surveillance? Yes No If No, what did you use for priority health events? -----
- 2. Did you have standard case definition for all country priority diseases? Yes No
- 3. Was the case definition posted? Yes No
- 4. If no, for which disease(s) did you lack the case definition?
- 5. Did you have case based reporting formats? Yes No NA
- 6. Was there guide line for specimen collection, handling and transportation to the next level?
Yes No
- 7. Did you have line list for reporting outbreaks? Yes No Not Applicable
- 8. If No, for which diseases you lack? -----
- 9. Did you have outbreak investigation guide line? Yes No
- 10. If no, how did you prevent, control, and investigate it? -----
- 11. Did you have a rumor logbook? Yes No

A. Epidemic Preparedness, and response assessment

- 1. Did you have plan for epidemic preparedness and response Yes No
- 2. If No, how did you implement priority problems? -----

3. Did you have emergency stocks of drugs and supplies? Yes No
4. If No, how did you control epidemics? -----
5. Have you experienced shortage of drugs, vaccines and supplies in 2008 EFY? Yes No
6. Was Rapid response team (RRT) built in your office? Yes No
7. Did the RRT have regularly scheduled meeting time during epidemics? Yes No
8. If no, how did you control emergency events? -----
9. Did you have case management protocol for epidemic prone diseases? Yes No
10. Did partners working together with your office on emergencies? Yes No
11. If yes, what type of supports did they give to your office?
12. Was there a budget for epidemic response? Yes No
13. Did you have a vehicle assigned for emergencies (PHEM)? Yes No
14. If answer for Q17 is NO, how did you address emergencies?

B. Case detection, reporting, case confirmation and Outbreak investigation

15. Did you detect any priority diseases case? Yes No
 - a. Malaria _____ Laboratory done _____ cases P.F _____ P.v _____ Deaths _____
 - b. Measles _____ cases _____ Deaths _____
 - c. AWD _____ cases _____ Deaths _____
16. Did/ do you register any detected cases Yes No
17. Did/ do you report any case to the higher level? Yes No
18. Have you investigated any outbreak in 2008 EFY? Yes No , if yes the response time -----
19. Where was laboratory confirmation of cases? regional lab Hospital EHNRI HC other----
20. Who is responsible to investigate an outbreak? RRT HEWs staffs of woreda health office experts organized randomly health facility staffs other-----
21. Did you face any challenge in outbreak investigation in 2008 EFY? Yes No
 yes, List the challenges and action taken-----

C. Communication and reporting system assessment

1. Which communication material did you have? E-mail, fixed phone, mobile, radio, fax other-----
2. Number of health posts that have access of communication facilities-----

3. If No, how did you communicate-----?
4. How frequently you communicated with the Woreda PHEM officers on emergencies and other daily activities? Daily weekly every 2 week monthly quarterly every 6 month yearly others-----
5. Did you have address of HP and woreda PHEM focal persons? Yes No
6. When are you expected to receive weekly report from HPs? Monday Tuesday Wednesday Thursday Friday Saturday Sunday
7. When are you expected to send weekly report to the woreda PHEM unit? Monday Tuesday Wednesday Thursday Friday Saturday Sunday
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 yes, to whom did you send? -----
10. If no, why -----

D. Training, computer skill, and data analysis assessment

1. Did you have IDSR focal person in 2016? Yes No
2. If yes, did he conduct training? Yes No
3. Did you give any onsite orientation about surveillance system for your staff and HEWs? Yes No
4. If no, why -----
5. Did you have a computer, photocopier, printer, data manager?
6. Do you have a computerized surveillance network? Yes No
7. Did you compile surveillance data? 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 including trend analysis? Yes No
11. If yes, did you describe data by time place person
12. If no, how did you use data for action-----
13. Did you have denominators for data analysis? Total pop, male, female, <5 , PW, < 1years
14. Please indicate the frequency of your data analysis. weekly every two week Monthly quarterly every 6 month annually No regular time
15. Did you notify the results of your analysis to lower level PHEM? Yes No

16. If no, why? Less attention, lack of knowledge, time shortage, not familiar, shortage of material, other

E. Supervision and feedback assessment

Did you have supervision plan in 2008 EFY? Yes No

If yes, did you supervise HHs, and HPs according to your plan in 2008 EFY? Yes No

If No, how did you support them? -----

Did you notify your supervision plan prior to supervision? Yes No

If no, why? -----

Did you have a supervision checklist? Yes No

If no, how did you supervise without checklist? -----

Did you send feedback of supervision to HP indicating their strong and weak sides? Yes No

If No, why? -----

If yes, for how many HPs did you send a feedback in 2008 EFY_____?

If yes, did you have the follow up mechanism check list? Yes No

Did you review about surveillance practice by higher level supervision? Yes No

How many times did you supervise by higher level officers/woreda/zone in 2008 EFY?

Have received supervision plan from higher level? ? Yes No

Have you received feedback from higher level supervisors in 2008 EFY? Yes No

Did you have a mechanism for improving the weakness of feedback given? Yes No

What action did you take to improve the limitation of the feedback given by higher level?

Did you have active case search plan in 2008? Yes No

If no, how did you implement case searching?

Have you faced any challenge on supervision and feedback in 2008 EFY? Yes No

If yes, list challenges and action taken-----

PARYT2

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

System Attributes:

I. 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 easy 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 to 15 min >15 min
- 7. How long does it take to have laboratory confirmation/RDTs? -----

II. 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

III. Data quality

- 1. Are all reported forms Complete? Yes No
- 2. If answer for Q1 is No, how many unfilled spaces are in your 2008 EFY report? -----
- 3. Percentage of unknown or blank responses to variables from the total reports of 2008 EFY report-----
- 4. Percent of reports which are complete(that is with no blank or unknown responses) from the total-----
- 5. Is the recorded data clear to read and understand? Yes No
- 6. If no, how many records are not clear/are difficult to understand in 2008 EFY report?
- 7. Percent of records which are difficult to read/ understand. -----

IV. 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

V. Representativeness

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

VI. Timeliness

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

VII. Completeness

1. Are all reporting sites reporting including private facilities? Yes No
2. Percent of Health posts that send report of each week in 2008 EFY. -----

VIII. Stability

9. Was any new restructuring affected the procedures and activities of the surveillance? Yes No
10. Was there lack of resources that interrupt the surveillance system? Yes No
11. Was there any time /condition in which the surveillance is not fully operating? Yes No

12. If the answer for Q3 is yes, explain why? -----

IX. Sensitivity

1. Does the malaria case definition able to pick all cases? Yes No
2. What was the total Malaria cases occurred in your HC catchment in 2008 EFY?
3. What were the total numbers of suspected malaria cases examined by RDT or Microscopy in 2008 ---
4. How many of those cases were laboratory confirmed? PF_____ PV_____ Mixed_____ Total_____
5. Was there Malaria epidemic in your catchment are in 2008EFY? Yes No
6. If yes, how many out breaks? -----

Annex 12: Questionnaire for evaluation of Health post Malaria, Measles and AWD surveillance system.

Respondents _____ Date of data collection -----

Woreda _____ HP ----- Catchment population ----- M----- F -----

Address phone no _____ e-mail _____

PART ONE: Observe all documents and reports

A. Assessment of availability of Surveillance Documentation, Registers, and Formats

1. Do you have National Guide line for surveillance? Yes No
2. If No, what did you use for priority health events? -----
3. Did you have standard case definition for all country priority diseases? Yes No
4. Was the case definition posted? Yes No
5. If answer for Q2 is No, for which disease(s) did you lack the case definition?
6. Did you have line list for reporting outbreaks? Yes No Not Applicable

B. Case detection, reporting, confirmation and assessment

1. Had you detected any case in 2008 EFY? Yes No , list if any
 - a. Malaria _____ Laboratory done _____ cases P.F _____ P.v _____ Deaths _____
 - b. Measles _____ cases _____ Deaths _____
 - c. AWD _____ cases _____ Deaths _____
2. If yes, did you report it on time? Yes No
3. Did you have case detection check list (guide line)? Yes No

4. If no, how did you know possible factors for the outbreak?
5. Who was responsible to detect any case? HDA HEWs Hc woreda other---

6. Had you faced any challenge in case detection in 2008 EFY? Yes No
7. If yes, list the challenges and action taken -----

C. 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 HC/Woreda PHEM officers? Yes No
3. How frequently you communicate with the HC/ Woreda PHEM officers on emergencies and other daily activities? Daily weekly every 2 week monthly quarterly every 6 month yearly others-----
4. When are you expected to receive weekly report from HPs? Monday Tuesday Wednesday Thursday Friday Saturday Sunday
5. When are you expected to send weekly report to the HC/ Woreda PHEM unit? Monday Tuesday Wednesday Thursday Friday Saturday Sunday
6. 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
7. If yes, to whom did you send? -----

D. Training, computer/ calculator, data analysis assessment

1. Have you trained on surveillance system? Yes No
2. How the data entry and compilation is accomplished? Manual calculator/Computer other-----
3. Did you analyze data of the surveillance system? Yes No
4. Did you have denominators for data analysis? total pop male female <5 pregnant
5. Did you notify the results of your analysis to the health development armies Yes No

E. Supervision and feedback assessment

1. Had you reviewed about surveillance practice by HCs, Woreda or partner? Yes No
2. Were you supervised by higher level officers in 2008EFY? Yes No
3. If yes how many times in 2008 EFY? -----

4. Had you received feedback from higher level supervisors in 2008 EFY? Yes No
5. If is yes how many feedbacks did you received in 2008 EFY? -----
6. How did you improve the weakness of supervision given by feedbacks? -----

PARYT2

IS THE SURVEILLANCE SYSTEM HELP FUL?

1. To detect cases 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

Describe Each System Attributes:

I. Simplicity:

1. Is the case definition easy for case detection by HEWs and HDAs? 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 to 15 min >15 min

II. 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

III. Data quality

1. Are all reported forms Complete? Yes No
2. If answer for Q1 is No, how many unfilled spaces are in your 2008 EFY report? -----
3. Percentage of unknown or blank responses to variables from the total reports of 2008 EFY report-----

4. Percent of reports which are complete(that is with no blank or unknown responses) from the total -----
5. Is the recorded data clear to read and understand? Yes No
6. If No, how many records are not clear/are difficult to understand in 2008 EFY report?
7. Percent of records which are difficult to read/ understand. -----

IV. 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. Did all participants using the community case definition to identify cases? Yes No
5. Did all the reporting agents send their report using the current and appropriate surveillance reporting format? Yes No
6. Did all the health development armies aware about the surveillance system? Yes No

V. 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?

VI. Timeliness

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

VII. Completeness

1. Are all reports sent complete? Yes No
2. Number of weekly reports sent in 2008 EFY. -----

VIII. 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? -----

IX. Sensitivity

1. Does the case definition able to pick all cases? Yes No
2. What was the total Malaria cases occurred in your HP in 2008 EFY? _____
3. What was the total numbers of suspected malaria cases examined by RDT in 2008 EFY?
4. Was there Malaria epidemic in your catchment are in 2008 EFY? Yes No
5. If yes, how many out breaks? -----

Declaration

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

Name: _____

Signature: _____

Place: _____

Date of Submission: _____

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

Name of advisor: _____

Signature: _____

Date: _____