

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

Ethiopia Field Epidemiology Training Program
(EFETP)



Compiled Body of Works in Field Epidemiology

By

Nigatu Tarekegn Abebe

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

May 2014

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List of Abbreviations

AAU-SPH	Addis Ababa University School of Public Health
AFENET	Africa Field Epidemiology Network
AFP	Acute Flaccid Paralysis
AR	Attack Rate
AWD	Acute Watery Diarrhoea
BPR	Business Process Reengineering
CBN	Community Based Nutrition
CDC	Center for Disease Control
CFR	Case Fatality Rate
CSF	Cerebro Spinal Fluid
cVDPV	Circulating Vaccine-Derived Polio Virus
DHS	Demographic Health Survey
DPC	Disease Prevention and Control
DPHP	Disease Prevention and Health Promotion
EFETP	Ethiopia Field Epidemiology Training Program
EHNRI	Ethiopia Health Nutrition and Research Institute
ENHS	Environmental Health Science
EOS	Enhanced Outreach Strategy
EPHA	Ethiopian Public Health Association
EPI	Expanded program on Immunization

EPRP	Epidemic Preparedness and Response Plan
FELTP	Field Epidemiology and Laboratory Training Program
FMoH	Federal Ministry of Health
GoE	Government of Ethiopia
HC	Health Center
HDA	Health Development Army
HEP	Health Extension Program
HEWs	Health Extension Workers
HHs	Households
HPs	Health Posts
HSDP	Health Sector Development Plan
IDS	Integrated Disease Surveillance
IDSR	Integrated Disease Surveillance and Response
IgM	Immunoglobulin M
IRS	Indoor Residual Spray
ITNs	Insecticide Treated Bed Nets
LLITNs	Long Lasting Insecticide Treated Nets
NGO	Non Governmental Organization
NSP	National Strategic Plan
OPD	Out Patient Department
OPV	Oral Polio Vaccine

OR	Odds Ratio
ORS	Oral Rehydration Salt
OTP	Outpatient Therapeutic Program
PEA	Post Epidemic Assessment
PHEM	Public Health Emergency Management
PHL	Public Health Laboratory
PHSC	Potential Health Service Coverage
PPE	Personal Protective Equipment
RDT	Rapid Diagnostic Test
RHB	Regional Health Bureau
RRT	Rapid Response Team
SIAs	Supplementary Immunization Activities
SNNPR	South Nations Nationalities People Region
SNNPR HB	South Nations Nationalities People Regional Health Bureau
TFU	Therapeutic Feeding Unit
UN	United Nation
UNICEF	United Nations Children Emergency Fund
URTI	Upper Respiratory Tract Infection
USAID	United State America International Development
VDPV	Vaccine Derived Polio Virus
WASH	Water Sanitation and Hygiene

WHO	World Health Organization
WPV	Wild Polio Virus
ZHD	Zonal Health Department

Abstract

During my field residency as EFETP resident I have conducted the following field activities in SNNPR Field Base. These were: Outbreak investigations, surveillance data analysis report, evaluation of surveillance system, District Health profile description report, Scientific manuscript for peer review journals, abstract for scientific presentation, narrative summary of disaster situation visited, writing protocol/proposal for epidemiologic research project and post epidemic assessment; in order to achieve all the above outputs of residency we have used different epidemiological study methods.

In general, my outputs of the two years field residency in the EFETP are presented in a précised way as follow: Two outbreak investigations were investigated and well documented under **chapter one**; these are:

1. Malaria Outbreak Investigation, Chano-Mile kebele, Arbaminch Zuria Woreda, Gamogofa Zone, SNNPR

The analysis of the study shown that people who are living near to breeding site within 1km radius were 5.5 times more likely to develop clinical malaria (OR =5.5, 95% CI= 2.30-13.15). Peoples in which their ITNs worn out, are 5.2 times more likely to develop malaria (OR=5.2, CI=2.28-11.82)

2. Measles Outbreak Investigation, Shay Bench Woreda, Bench Maji Zone, SNNPR

There were 478 measles cases seen from 13 October 2013 to 28 Nov 2013 with 240 males and 238 females. Of these cases 3 deaths were registered (CFR 0.6%) and the attack rate was 331 per 100,000 populations. The finding reveals that measles cases who were vaccinated with less than 2 doses of measles antigen were more at risk of developing measles (OR = 2.569; 95% CI = 1.182, 5.733). The households who had family size with 5 persons and more were at risk for developing measles (OR = 12.27; 95% CI = 4.763, 35.68). Measles cases living with persons with symptoms of measles in the same households had more risk to develop measles (OR = 3.6; 95% CI = 1.5581, 8.2694).

Chapter II - Ten Years Malaria Surveillance Data Analysis Report, SNNPR, 2003 – 2012

Total malaria suspected fever cases examined by RDT and/or microscopy was 15,722,005. Out of these numbers of cases positive for malaria parasites either by RDT or microscopy were 4,094,332 i.e. slide positivity rate was 26%. Total malaria cases (clinical + confirmed) treated

during these periods were 12,065,332. From the total malaria cases 3,802,626 were <5 years of age. Total inpatients due to malaria were 171,701 cases and 3,580 deaths were registered. Regarding the plasmodium species, from a total 4,094,332 confirmed cases 63% was P.falciparum & 37% was P.vivax. This descriptive analysis shows that the incidence of malaria starting from 7 cases/1000 to more than 500 cases/1000 population in 2012.

Chapter III - Acute flaccid paralysis surveillance system evaluation report, Silte Zone, SNNPR, December 2013

Silte zone reported 10 AFP cases in 2013. Of these, 80% were <5 years of age, and 50% were males and 50% were females. One case was confirmed for VDPV2. The zonal average annualized non-polio AFP detection rate were 2.8 non-polio AFP cases/100,000 children <15 years in 2013. All performance indicators met the WHO-specified targets except the stool adequacy rate of 70 % (WHO target is $\geq 80\%$). The vaccination status of the cases were validated that 70% unknown.

Chapter IV - Health Profile Description Report, Sodo district, Gurage Zone, SNNPR, 2012

The potential health service coverage of the district was more than 100%. Ratio of Health center to population 1:22197; and health post to population was 1:2877. Profession wise the ratio of health officer to population 1:15538, Nurse to population 1:1992, midwife to population 1:15539 and Health Extension worker to population 1:1653. The ten top causes of under 5 morbidity were acute respiratory tract infection(4213), diarrheal disease(2400), pneumonia(1719), malaria(1244), helmenthiasis(871), eye disease(631), trauma(572), skin infection(471), otitis media(106) and severe acute malnutrition(47).

Chapter V - Scientific manuscripts for peer reviewed journals

Measles Outbreak Investigation conducted at Shay Bench Woreda, SNNPR is prepared for peer review journals as per the instructions and guidelines of CDC.

Chapter VI - Abstracts for scientific presentations

Two abstracts titled with "Chano Mile kebele malaria outbreak investigation report and AFP surveillance system evaluations" are prepared as abstract for the scientific presentations.

Chapter VII - Narrative Summary of Disaster Situation Visited

Major findings: There is multi-sectoral PHEM coordination forum at all level and different governmental and nongovernmental organizations including UN agencies are involved in the forum. At regional level the forum meet monthly however at Zonal and woreda level the forum

not meet regularly. From March to May, outbreak of Meningitis, measles and yellow fever were reported. Except yellow fever both measles and meningitis outbreak were contained. Epidemic preparedness and response plan is available in all visited zones and woredas as well as at regional level however; the plan is supported by budget only at regional level.

Chapter VIII - Protocol/Proposal for Epidemiologic Research Project

The title for epidemiologic research project is prevalence and associated risk factors of malaria among workers, Kuraz sugar factory project, Salamago district, South Omo zone, SNNPR, Ethiopia.

Malaria is a major global public health problem and a leading cause of morbidity and mortality in many countries. Malaria caused an estimated 219 (range 154–289) million cases and 660 000 (range 490 000–836 000) deaths in 2010. Approximately 80% of the cases and 90% of the deaths occur in Africa while the remaining cases and deaths occur mainly in the South-East Asia and Eastern Mediterranean Regions. Approximately 68% of the population lives in malaria risk areas in Ethiopia, primarily at altitudes below 2,000 meters. The study will be conducted from April to June 2014. The total cost estimated to implement this project is ETB birr 89,748.

Chapter IX - Yellow Fever Post Epidemic Assessment in South Omo Zone, SNNPR, Ethiopia, November, 2013

The presence of an emergency-response coordination mechanism among partners; availability of the national PHEM guide line (2012); availability of epidemic preparedness and response (EPR) plan; and existence of government financial contingency budget (though not ear marked for emergency response activities) at the SNNP region and south Omo zone level was promising. At the region level the staffing of PHEM structure is 100%. However at the onset of the recent yellow fever outbreak the proportion of PHEM officers assigned to the South Omo zone health department was 50%. In addition, the capacity of regional and zonal PHEM officers (knowledge and skills) on determination of thresholds for Yellow Fever outbreak was noticed to be encouraging (100%). At woreda level the coordination existed in 25%; PHEM guideline in 50%; EPRP in 50%; PHEM staffing was below 50% and no emergency financial access in the Woredas health offices visited. However, of the observed EPRP documents none identified population groups and areas at high risk/hazards for yellow fever outbreak. At woredas/town health office level three fourth of the PHEM officers had the capacity to determine the thresholds for yellow fever outbreak.

Finally, the above reports or outputs are compiled in this volume (Body of Work document) as per the format provided by the program.

Chapter I - Outbreak/Epidemic Investigations

1.1 Malaria Outbreak Investigation, Chano-Mile kebele, Arbaminch Zuria

Woreda, SNNPR

Abstract

Background: About 75% of Ethiopia's landmass is potentially malarious and about two thirds of the population is at risk of infection. Malaria transmission varies widely with the country's diverse topography and associated rainfall pattern. In January 2013, Gamo-Gofa Zone Health Department reported unusual increase in malaria cases. We investigated to identify risk factors for the outbreak and recommend control measures.

Method: Unmatched case control study was employed. Malaria case was defined as any person present to Chano-mile health post between Epi week 1-7, 2013 and confirmed by RDT, and one control was enrolled for each case from the closest household. Structured questionnaire was used to identify exposure to possible risk factors, and data was analyzed using Epi Info.

Result: The median age of cases was 15 years ranges from one to 67 years; and median age of the controls was 21 ranges from 2 to 52 years. People living within 1km radius of a breeding site (OR= 5.5, 95% CI: 2.30-13.15) and using worn out LLITNs (OR: 5.2, 95% CI: 2.28-11.82) were at increased risk for acquiring malaria.

Conclusion: The investigation suggested that living near to mosquitoes breeding sites within 1km radius and using a worn out LLITNs were the risk factors for malaria infection. We recommend strict environmental management of breeding sites and replacing worn out mosquito nets.

Key words: Malaria, Outbreak, Malaria investigation, Southern Ethiopia.

Introduction

Malaria is a highly prevalent tropical illness with fever following the bite of infected female *Anopheles* mosquitoes which transmit a parasite, *Plasmodium falciparum*, *P. ovale*, *P. vivax*, or *P. malariae*. Serious malarial infections are usually due to *P. falciparum* which may result in severe anaemia and vital organ involvement (1).

Globally, malaria affects the lives of 247 million people and kills close to a million each year 90 percent of which are among Africans (2). Approximately 53 million Ethiopians (63 percent of the population) live in malaria risk areas. Of these, 33 million almost 40 % of the total population are in endemic areas, and nearly one quarter of Ethiopians reside in endemic prone areas (3). Ethiopia is among the few countries with unstable malaria transmission and also is one of the most malaria epidemic-prone countries in Africa. Consequently, malaria epidemics are serious public health emergencies. In most situations, malaria epidemics develop over several weeks, allowing some lead-time to act proactively to avoid larger numbers of illnesses and to prevent transmission.

Malaria is mainly seasonal with unstable transmission in the highland fringe areas and of relatively longer transmission duration in lowland areas, river basins and valleys. On average, 60%-70% of malaria cases have been due to *P. falciparum*, with the remainder caused by *P. vivax*. *Anopheles arabiensis* is the main malaria vector. *Anopheles pharoensis*, *Anopheles funestus* and *Anopheles nili* play a role as secondary vectors. Rates of morbidity and mortality increase dramatically (i.e. 3-5 fold) during epidemics (4). To prevent malaria in areas where malaria cases are reported, the WHO recommends two main methods. First, people should sleep under mosquito nets treated with long lasting insecticides. This prevents bites from malaria-infected mosquitoes and kills them. Such nets should be used as a priority by pregnant women and children under five years of age, who are most vulnerable. Second, the inside walls of houses should be sprayed with insecticide to kill large numbers of mosquitoes (5).

Since 2005, Ethiopia has scaled-up one of the largest and most ambitious malaria control programs in Africa, designed to support the country's HSDP, the NSP and the national child survival strategy, in order to reduce under-five mortality rates by two thirds by 2015. This scaling up for impact (SUFI) phase has been possible as a result of substantial increases in resources from various funding sources and the commitment of the GoE. These resources have

enabled an unprecedented scale-up of malaria control interventions: prompt and effective treatment, case management through rolling-out of the highly efficacious anti-malaria drugs (i.e. ACTs), and selective vector control, with a special emphasis on increasing coverage and use of ITNs, and targeted and timely application of IRS of households with insecticide.

Ethiopia's malaria control program is currently shifting from the SUFI phase to consolidating and refining malaria reduction interventions, through integrated programming for impact. This will involve gradually moving from scaling-up for impact to programming (integrated within the overall health system) for sustainable and equitable long-term impact. The challenge now is maintaining the existing high LLIN coverage and increasing utilization rates. Further, targeting IRS based on an epidemiologically sound, affordable and sustainable approach continues to be a challenge (4).

Arbaminch zuria woreda is one of the fifteen woredas in Gamogofa zone found around Arbaminch town and has a total population of 195,315, 4 health centers, 36 health posts and 29 kebeles. It has a boarder with Mirab-abaya woreda in the north, Derashe woreda in the south, Chenchu woreda in the west and Oromia regional state in the east. The capital Arbaminch is found at a distance of about 275kms from Hawassa.

Chano-mille kebele is one the the twenty-nine kebeles of Arbaminch zuria woreda and found in the North direction of Arbaminch town about 10 km distance, and it has boarder with Chano-chelba kebele in the south, Chano-dorga kebele in the West, Lante kebele in the North and Lake Abaya in the East. The kebele subdivided in to three villages (01, 02 and 03) and it has a total population of 9478; and one health post.

Objective

General Objective

To investigate malaria outbreak and identify the risk factors contributing for the outbreak

Specific Objectives

To describe the outbreak by person, time & place

To identify possible risk factors for malaria transmission

To recommend prevention and control interventions

Materials and methods

Study area and period:

The investigation was conducted in Chano Mile kebele, Arbaminch zuria woreda, Gamogofa zone SNNPR. The study was conducted from 19 January to 5 February 2013.

Study design

Unmatched case-control was employed to identify potential risk factors in which exposure in subjects affected by malaria and subjects free from malaria.

Sample size

The sample size was based on power requirements at both cases and control. It is done by using two by two tables by adjusting two sided confidence level at 95%, power (% chance of detecting) was 80 %, ratio of control to case at 1, hypothetical proportion of controls with exposure at 40% and least extreme Odds Ratio to be detected was 3.00 (calculated from OpenEpi, Version 2). The total number of people included in the study were 108 individuals: 54 were cases and 54 were controls of whom 54.6% were males. Nobody refused to be interviewed.

Case definition for malaria

Case definition: An individual presenting with confirmed malaria by RDT in Chano Mile kebele from 19 January to 5 February 2013.

Control definition: An individual who was living within Chano Mile kebele (community) and who had no malaria in the specified time.

Standard cases definition for malaria

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

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

Community case definition: Any person with fever or fever with headache, back pain, chills rigor, sweating, muscle pain, nausea and vomiting or suspected case confirmed by RDT (1).

Malaria Diagnosis at Health Posts: Malaria diagnosis is performed by RDTs.

Data collection procedures:

Reviewing secondary data (Registry books, line list records, weekly surveillance data and related documents), were done in district health office and health post. Interview using structured questionnaires also applied for cases and controls.

Data processing and analysis:

Data analysis was done using Epi.Info7 and Microsoft office Excel. Hence by using 2 by 2 table Odds ratio and confidence intervals were calculated.

Report dissemination:

The malaria outbreak investigation findings Communicated to the RHB/PHEM Core process.

Results

Outbreak Summary

The Gamogofa zone health department made a report to RHB/PHEM core process with unusual increase of malaria cases at Chano Mile kebele, Arbaminch zuria district on January 2013. The regional outbreak investigation team deployed to the area in epidemiological week 3 or 19 January 2013 to investigate the outbreak. The start of the outbreak was not known; because the last five year malaria data were not available. Even though the last five year malaria data not available we made double of last year data (2012) by epidemiological weeks (as per the national malaria guidelines 3rd edition, 2012). According to these available data the epidemic started at epidemiologic week 1/2013. During the epidemiological week 1 to 7/2013, the total numbers of cases screened for malaria were 1037. Out of these screened cases the total number of plasmodium positive cases and deaths were 536 & 0 respectively. Out of 536 malaria confirmed cases 284 (53%) were males and 252 (47 %) were females and all were treated by anti-malaria drugs. Males were more affected than females.

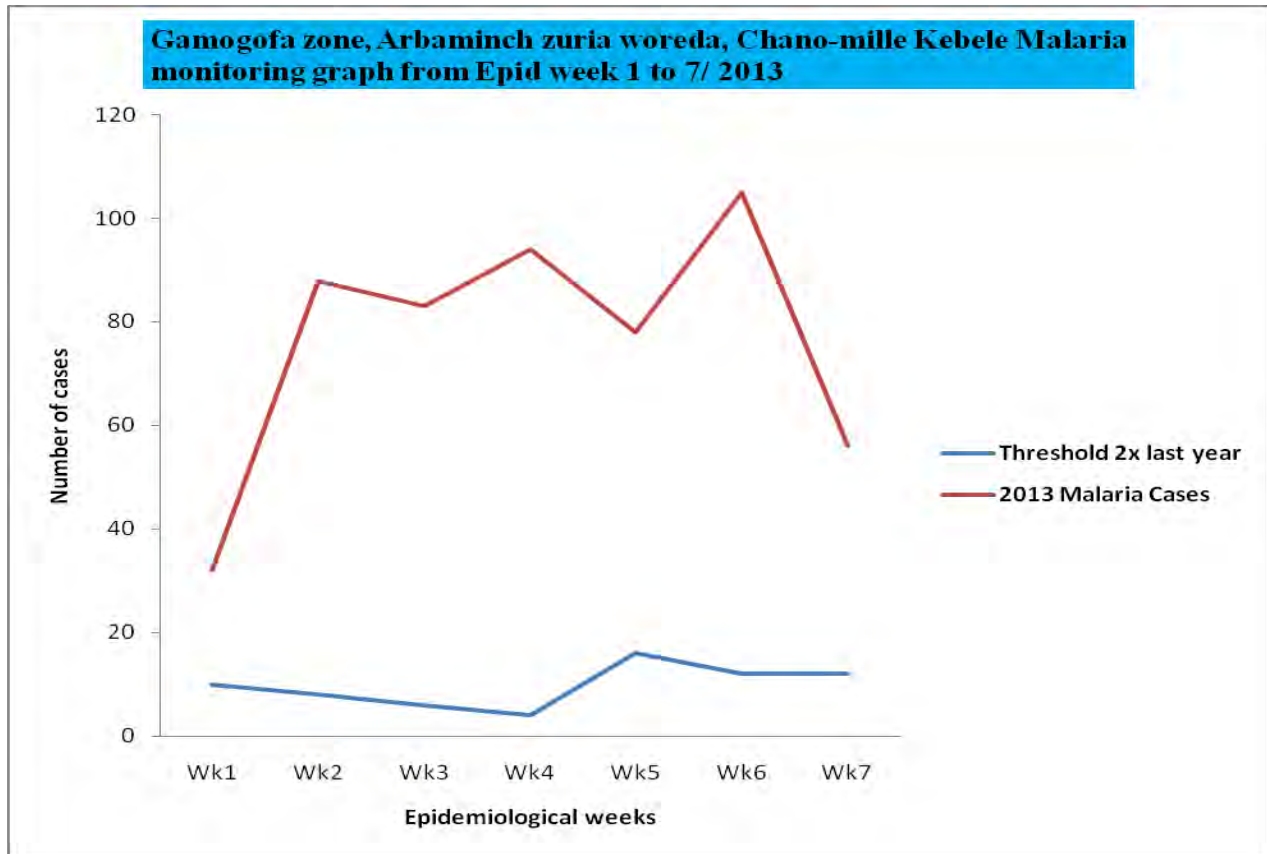


Figure 1 Malaria outbreak monitoring graph by epidemiologic week Chano-mille health Post from Epiwk 1-7 SNNPR, 2013

Data by epidemiologic week reveals that, the outbreak starts from 1st epidemiological week till the following weeks.

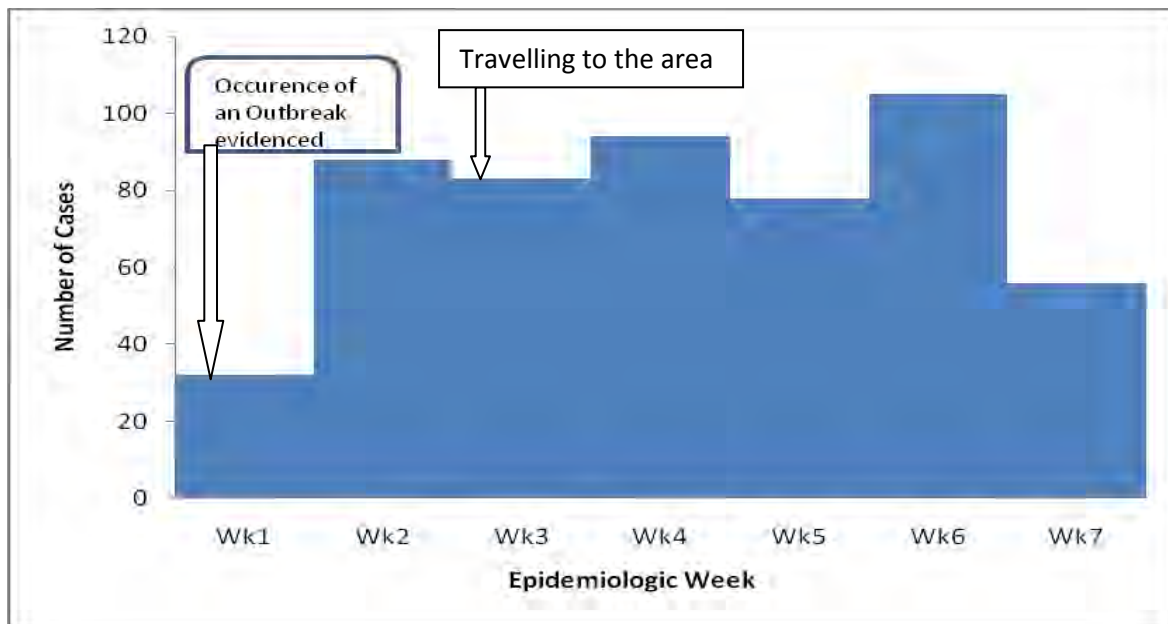


Figure 2 Malaria outbreak by epidemiologic week Chano-mille Health Post from epiwk 1-7 SNNPR, 2013

Case-control study

The total number of people included in the study were 108 individuals: 54 were cases and 54 were controls. Cases were selected randomly; but the controls were the neighbours of cases. The cases have a median age of 15, minimum 1 and maximum 67 years. On the other hand, the controls have a median age of 21, minimum 2 and maximum 52 years.

Table 1 Table Bivariate analysis

Variable	Status	Cases (n)	Controls (n)	OR(95 % CI)
Living in Chano Mile kebele for the last 2 weeks	Yes	51	50	1.36(0.29, 6.4)
	No	3	4	
Having LLITNs	Yes	8	2	4.52(0.91, 22.4)
	No	46	52	
Using worn out ITNs	Yes	36	15	<u>5.2(2.29, 11.82)</u>
	No	18	39	
Living within 1 km radius from mosquito breeding sites	Yes	30	10	<u>5.5(2.30, 13.15)</u>
	No	24	44	

The analysis of the study shown that people who are living near to mosquitoes breeding sites within 1km radius were 5.5 times more likely to develop malaria (OR =5.5, 95% CI= 2.30-13.15); and People in which their ITNs worn out, were 5.2 times more likely to develop malaria (OR=5.2, CI=2.28-11.82).

Demographic characteristics

Table 2 Educational Status

EDUCATIONALSTATUS	Frequency	Percent
Illiterate*	15	13.89%
1-8 grade	69	63.89%
9-12 grade	14	12.96%

Diploma & above	10	9.26%
Total	108	100.00%

Table 3 Sex distribution

SEX	Frequency	Percent
Male	59	54.63%
Female	49	45.37%
Total	108	100.00%

Table 4 Occupation

OCCUPATION	Frequency	Percent
Student	43	46.24%
Farmer	29	31.18%
Gov't worker	1	1.08%
Private worker	3	3.23%
Other	32	18.28%
Total	108	100.00%

Laboratory Investigation

The laboratory investigations were done by the HEWs at health post level. During this specified period there were 1037 febrile cases seen by RDT whether they had malaria or not. Out of these cases 536 were positive for plasmodium species.

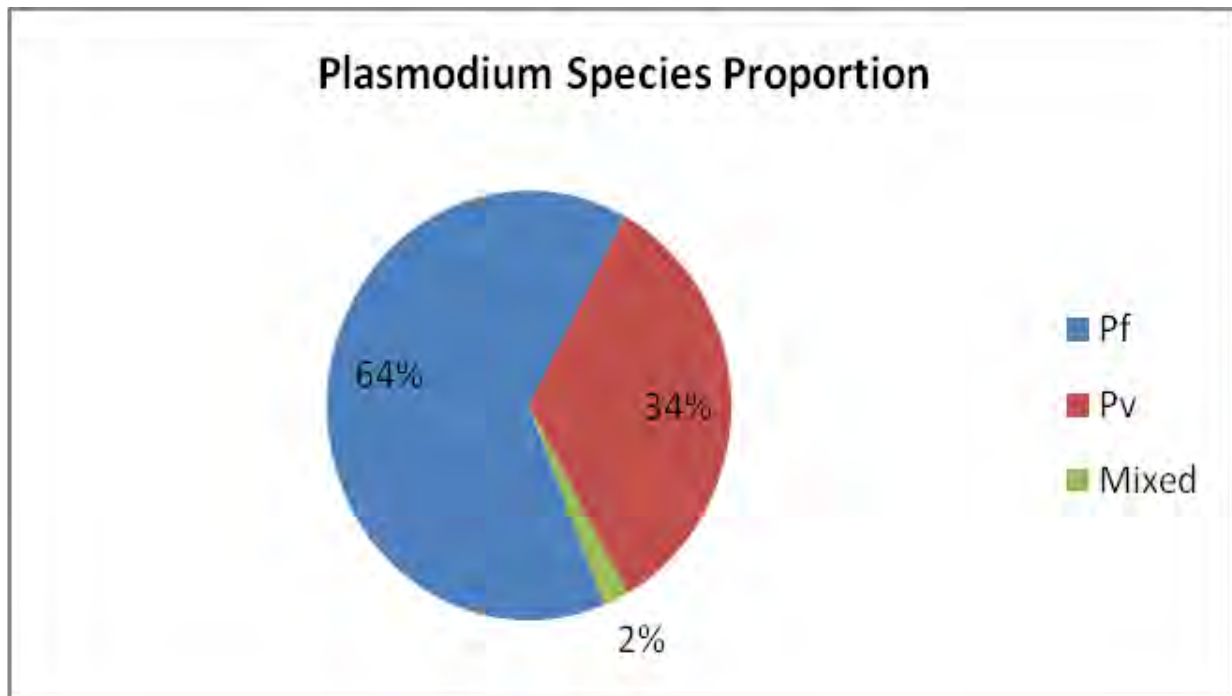


Figure 3 Percentage of malaria cases by species Chano Mile kebele from Epiwk1-7 SNNPR, 2013

The kebele has three large villages; namely village 01, 02 and 03. The proportion of malaria confirmed cases in each village were :

village 01, consists 33%,

village 02, 18 % and

village 03, 49 % of the total cases.

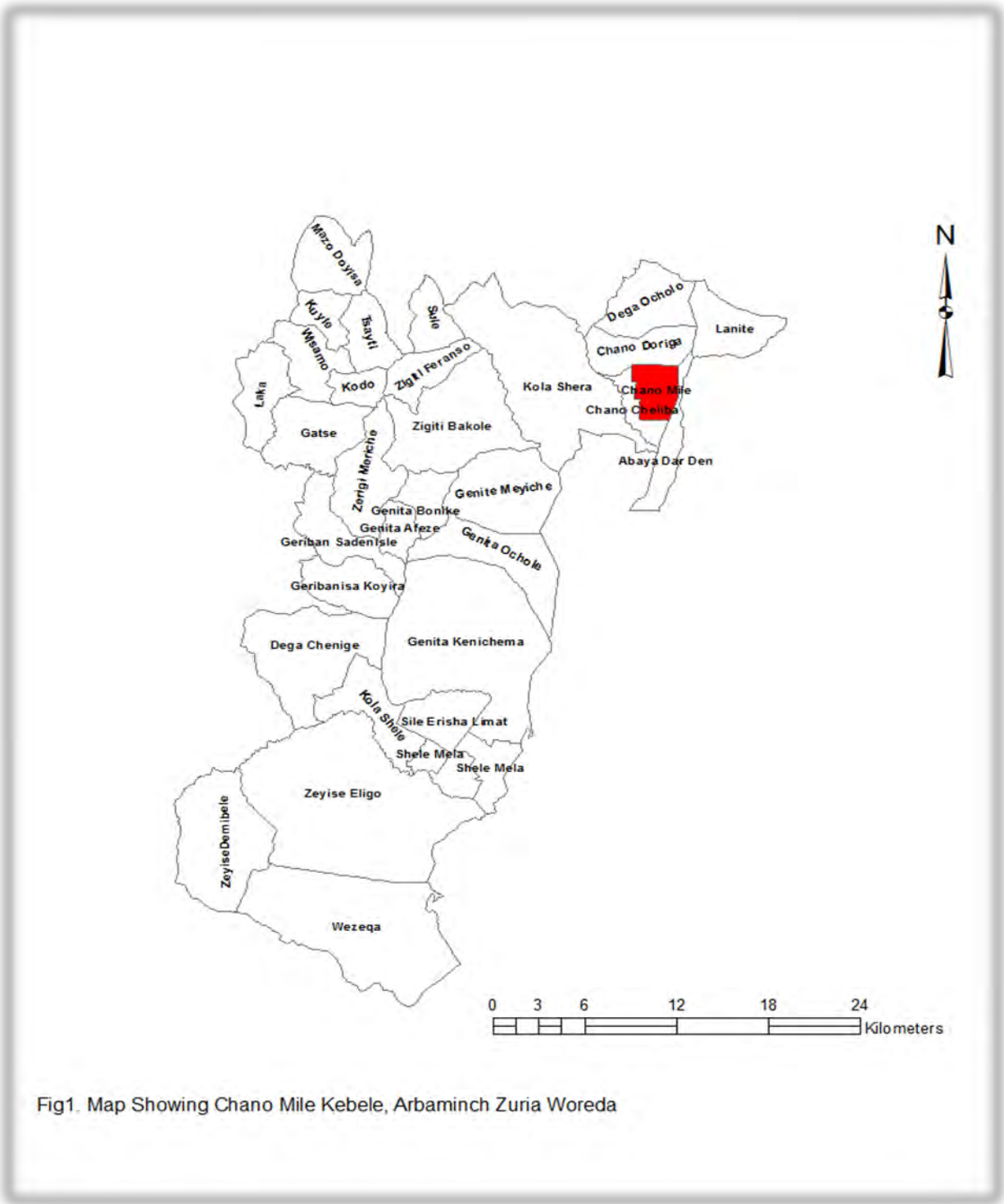


Fig1. Map Showing Chano Mile Kebele, Arbaminch Zuria Woreda

Fig1 Map showing Chano mile kebele, Arbaminch Zuria Woreda

Environmental Assessment

There were numerous small scale irrigations used to cultivate fruits, vegetables and other crops in the whole three villages of the kebele. During the outbreak investigation we have observed that small streams were flowing through the villages and in some places stagnant water have seen. Most of the stagnant water sites were starting to drain by the community during the outbreak investigation period.

Public Health Actions and Responses

Insecticide residual spray was doing during the outbreak investigation period in order to control the outbreak. As of the investigation period the IRS coverage of the kebele was 96.4%; and as a result of this approximately 8,866 people assumed to be protected from malaria. Draining of the stagnant water was performing during the outbreak investigation period. Malaria cases were treating by chloroquine and coartem according to their ages. Drugs (coartem and chloroquine), RDTs and other medical supplies were supplied from Arbaminch zuria district health office and Gamogofa zone health department. There were no shortage of drugs and medical supplies. The number of cases decline after the outbreak investigation.



Figure 4 IRS at Chano-mille kebele, Arbaminch-zuria Woreda istrict

Limitations

Irregularity of reports

There was no complete data of the last five years

Discussion

This study has shown that people who are near to breeding site within 1km radius were 5.5 times and peoples in whom their ITNs have holes or are torn were 5.2 times at increased risk to developing clinical malaria. Similar study conducted at Gilgel-Gibe dam, Ethiopia showed that children who resided in 'at-risk' villages close to the dam were more likely to have *P. vivax* infection than children who resided farther away (6) and another similar study conducted in Tigray region investigating the possible impacts of small dams on malaria transmission found an unmistakable link. The rate of infection among children near dams was seven times greater than

in communities with no dams. The study, thus, concluded that "...microdams close to villages have the potential to increase the incidence of malaria substantially among children living nearby" (7).

The infection in the outbreak is caused by both *P. falciparum* and *vivax* in which *falciparum* is the leading causative agent and leads by 64%. This didn't agree with study done in Gilgel-Gibe dam in which the author has shown that *p. vivax* is the leading causative agent by 60.3% (6).

This could be explained by the main malaria parasites in the country are *P. falciparum* and *P. vivax*, accounting for 60% and 40% of all cases, respectively being *Anopheles arabiensis* the main vector which play a great role in malaria transmission.

Draining the vectors breeding sites are protective against malaria similar to the study done in Peru by Guthmann et al which has shown the significant protection against malaria to the same risk factors. The explanation for these findings could be, draining the sites interrupts mosquitoes breeding and therefore peoples are protected from the bites of the vectors (8).

Conclusion

Malaria remains one of the public problems in Chano-mille kebele, Arbaminch-zuria woreda. The infection is caused by both *P. falciparum* and *vivax* being *falciparum* the leading causative agent. Living near to breeding site within 1km radius and having a worn out ITNs are the risk factors to develop clinical malaria; But draining the vectors breeding sites were protective. Village 03 was more affected than the other two villages (village 01 & 02). Males were more affected than females. The age group 15-44 years were more affected the other age group.

Recommendation

Insecticide Residual Spray should be strengthened and cover all villages and households in the kebele. Chano-mille health post should request ITNs from Arbaminch-zuria district to replace the worn out ITNs and to provide those who have not the ITN. There should be strict follow up activities on environmental management or control of mosquitoes breeding sites by participating the community. Surveillance activities should be carried out regularly. Capacity building for health extension workers on how to set and monitor the malaria outbreak threshold and detect outbreaks should be considered.

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1.2 Measles Outbreak Investigation, Shay Bench Woreda, SNNPR

Abstract

Introduction: Measles is a highly infectious viral disease caused by a Morbillivirus and for which humans are the only reservoirs. Transmission is primarily person-to-person via aerosolized droplets or by direct contact with the nasal and throat secretions of infected persons. In Ethiopia, the expected measles 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.

Methods: An outbreak investigation was conducted in Shay Bench woreda, Bench Maji Zone, SNNPR from 19 November to 3 December, 2013. Descriptive epidemiologic study design and unmatched case-control study designs were applied in which exposures to environmental factors were compared between diseased due to measles and subjects free from measles. Diagnosis is done using blood serum to confirm the presence of IgM anti-body. Blood specimens were collected from five cases and sent to EHNRI for laboratory investigation; and all samples, 5 (100%) were IgM positive for measles. Reviewing secondary data (Registry books, case based reports, line list records, surveillance data and related documents), were done in zonal health department, woreda health office, health center and health posts. Interview using structured questionnaires. Data was analysed using excel and further analysed by Epi Info version 3.5.3

Result: There were 478 measles cases seen from 13 October 2013 to 28 Nov 2013 with 240 males and 238 females. Of these cases 3 deaths were registered (CFR 0.6%) and the attack rate was 331 per 100,000 populations. There were 41 cases and 82 controls were participated in the study. The finding reveals that measles cases who were vaccinated for less than 2 doses of measles antigen were more at risk of developing measles disease (OR = 2.569; 95% CI = 1.182, 5.733). The households who had family size with 5 persons and more were at risk for developing clinical measles (OR = 12.27; 95% CI = 4.763, 35.68). Measles cases living with persons with symptoms of measles in the same households had more risk to develop measles (OR = 3.6; 95% CI = 1.5581, 8.2694).

Conclusion: Males and females are affected almost equally, and the age group < 5years are more affected than the other age groups. Cases living with persons with symptoms of measles in the neighbourhood were more likely develop measles disease. Cold chain management and vaccine efficacy need additional study.

Introduction

Measles is a highly infectious viral disease caused by a Morbillivirus and for which humans are the only reservoirs. Transmission is primarily person-to-person via aerosolized droplets or by direct contact with the nasal and throat secretions of infected persons [1]. The incubation period is 7 to 18 days from exposure to onset of fever [2]. Measles is a highly infectious disease that causes mortality in both developing and industrialized countries. It is estimated that in 1998 about 30 million people contracted measles and that 875 000 of them died. Measles vaccine provides long-term immunity against the disease. Adequately chosen and implemented vaccination strategies not only reduce mortality and morbidity but also interrupt the transmission of indigenous measles virus [3].

As of 2008, it was estimated that, globally, measles caused some 200,000 deaths annually, of which around 30,000 occurred in Africa. Measles is among the top causes of death in children less than 5 years of age in many African countries. Before the widespread availability of measles vaccine, virtually all children contracted the disease [1]. Infants born to mothers who have either had measles or been vaccinated are protected by trans-placental acquired maternal antibodies; that is they have passive immunity. This protection lasts six to nine months on average, after which the child becomes susceptible to measles infection. A person is naturally immune if he or she has had contact with the measles virus and has developed antibodies against it.

In the African Region, it is recommended that the first dose of measles vaccine (MCV1) be administered at 9 months – the age when most children have lost their maternal antibodies. There is virtually no contra-indication to measles vaccination. Vaccination coverage levels of 90% or more might be required before a marked reduction in incidence is seen in younger infants through herd immunity. On the other hand, epidemics of measles occur when the number of susceptible individuals in a population reaches a critical threshold. Because the risk of measles outbreaks is determined by the rate of accumulation of susceptible people in the population, programs should use data on vaccination coverage to monitor the accumulation of susceptible people and conduct follow-up SIAs before the number of susceptible children of pre-school age reaches the size of a birth cohort. This approach has been found to be programmatically useful and sufficiently accurate to prevent large outbreaks.

In developing countries the overall case-fatality rate has been estimated to be between 3% and 6%. The highest case-fatality rate occurs in infants under 12 months of age, among whom it

reaches between 20% and 30%. Malnutrition and infection with human immunodeficiency virus are risk factors for complications and mortality [3]. Natural infection produces lifelong immunity. Measles antibodies develop in approximately 85% of children vaccinated at 9 months of age, 95% of children vaccinated at 12 months of age, and 98% of those vaccinated at 15 months of age. In consideration of the age at infection and the case-fatality ratio, WHO recommends vaccination at 9 months of age in countries at the mortality reduction stage. Measles vaccine provides lifelong immunity in most people. A response is given to a second dose by a high proportion of vaccinated persons who lack detectable antibody [3].

Measles is responsible for more deaths than any other vaccine-preventable disease, killing an estimated 750,000 children each year. Over one-half of these deaths occur in sub-Saharan Africa [4]. Susceptible individuals in close contact with infected people are most likely to become infected, so transmission is more easily maintained in crowded homes, urban slum areas, and congested places than in isolated or rural situations. A person is susceptible to measles when he or she has lost maternal antibodies, has never been infected, or has not been effectively vaccinated. Maternal antibodies provide immunity to infants against measles infection until they are at least six months of age. After that, immunity begins to wane. Vaccination provides immunity if vaccine is given at an age when the child's maternal antibodies have been lost and the child can seroconvert for protection. In developing countries, the best age for most children is nine months. In both urban and rural areas in developing countries, the majority of measles cases occur in children less than five years of age, as illustrated by data from Nigeria [4].

Measles deaths occur as a result of complications, including pneumonia, acute diarrhea and dehydration, chronic diarrhea with malnutrition, and rarely, encephalitis. The disease can also cause serious disability, including permanent blindness, deafness, and brain damage [4]. Infection with measles depresses the immune system, depletes the body's stores of vitamin A, leads to weight loss, and leaves children susceptible to diseases like pneumonia and diarrhea. Because the health system receives reports of complications rather than measles disease itself, measles cases and deaths are often underestimated. In countries with low coverage, epidemics occur every two to three years. In countries with high coverage, epidemics occur at five- to seven-year intervals [4].

In areas where vaccination coverage with one dose of measles is high, if failure to seroconvert accounts for a large proportion of the remaining susceptible children. In these high coverage

areas, a second opportunity may be advisable to protect children who did not seroconvert the first time. Vaccination with measles vaccine is not usually effective before a child reaches nine months of age. In developing countries, measles vaccine should be given at nine months of age or as soon as possible thereafter. The age of vaccination may be altered in response to epidemiological and other data. For example, in refugee situations, measles vaccine is often recommended at six months and again at 12 months [4]. Countries with less than 80% measles coverage should focus on improving and expanding routine immunization services. These countries may sometimes use campaigns to reach children who do not have access to routine immunization services. All children in the target age group for these campaigns, usually from nine months of age to less than five years, should be eligible for vaccination, irrespective of past measles illness or vaccination history. Note that the upper age range may be expanded depending on the local epidemiology.

The primary objective of mortality reduction campaigns should be to reach previously unimmunized children [4]. .

Some countries that have achieved and maintained measles vaccination coverage above 80% across all districts for at least three years conduct periodic campaigns to supplement routine services in order to eliminate the disease. First, a “catch-up” campaign is carried out to interrupt chains of transmission in all children from the age of nine months through an upper age that is consistent with local epidemiology. Thereafter, “follow-up” campaigns are used periodically to reach those who have not been reached at all and to ensure that children who have been vaccinated but are still unprotected will seroconvert.

To maintain elimination, high coverage must continue with a combination of routine services and with periodic campaigns to prevent the build-up of susceptible. Supportive care includes frequent food and fluid intake and treatment of complications, vitamin A supplementation reduces the number of deaths from measles.

Measles can be transmitted from four days before rash onset (i.e., one to two days before fever onset) to four days after rash onset. Infectivity is greatest three days before rash onset. Secondary attack rates among susceptible household contacts have been reported to be 75%–90%. Due to the high transmission efficiency of measles, outbreaks have been reported in populations where only 3% to 7% of the individuals were susceptible [5]. Prior to the availability of measles vaccine, measles infection was virtually universal. Infants born to mothers who have either had

measles or been vaccinated are protected by trans-placental transferred antibody and Infants are generally protected until 5 to 9 months of age, this is passive immunity. Immunity following natural infection is believed to be life-long. Persons who have taken measles vaccine and have formed antibodies in response to the vaccine are also immune [5]. 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.

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 [5]. 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.

The Africa Region as well as Ethiopia is working towards measles elimination by 2020 (as indicated in Resolution AFR/RC61/WP/1: Measles elimination by 2020: A strategy for the African Region, 61st Regional Committee meeting 2011) [5].

Measles is one of the communicable diseases still causing preventable mortality and morbidity in the country. In 2001, countries in the World Health Organization (WHO) African Region began accelerated measles control activities to reduce measles deaths by half by 2005 compared to the estimated number of measles deaths in 1999. Implementation of the recommended strategies led to a 75% reduction in estimated measles mortality in the African Region by 2005. Following this progress, in 2006 the African Region adopted a goal to achieve 90% measles mortality reduction by 2010 compared with the estimate for 2000. By 2008 in the African Region, reported measles cases decreased 93% and estimated measles mortality decreased 92% compared with 2000. The strategies include improving routine vaccination coverage, providing a second opportunity for measles vaccination through supplementary immunization activities (SIAs), improving measles-case management, and establishing case-based measles surveillance. Since 2002, Ethiopia adopted these regional goals and strategies and has been taking important steps to control measles. The Africa Region as well as Ethiopia is working towards measles elimination by 2020 (as indicated in Resolution AFR/RC61/WP/1: Measles elimination by 2020: A strategy for the African Region, 61st Regional Committee meeting 2011) [5].

The National Immunization Program was established in the 1980s, and currently delivers service through static and outreach sites nationwide. The current routine immunization schedules recommend a dose of measles vaccination at 9 months of age. The WHO UNICEF coverage estimates for measles vaccination for Ethiopia also indicate an increase from 37% in 2000 to around 80% in 2010.

Since 2002, Ethiopia adopted these regional goals and strategies and has been taking important steps to control and ultimately to eliminate measles by 2020 [5].

Strategies for sustained measles morbidity and mortality reduction are: Routine immunization of > 90% of children aged 9 to 11 months, Provide a second opportunity for measles vaccination, Case-based measles surveillance and improved case management including provision of vitamin A. Measles vaccination is one of the most cost-effective interventions available. Since measles vaccine was developed in 1958, it has saved the lives of millions of children throughout the world. The peak antibody response occurs 6 to 8 weeks after infection or vaccination. Immunity conferred by vaccination against measles has been shown to persist for at least 20 years and is generally thought to be life-long for most individuals.

For timely measles outbreak investigation, it is imperative that routine measles data is collected, collated and analyzed regularly. Outbreaks occur when the accumulated number of susceptible individuals is greater than the critical number of susceptible individuals for a given population to sustain transmission. In addition, cases may be identified from multiple health facilities in the same woreda within 30 days, if regular analysis is not done, outbreak detection may be delayed.

All suspected outbreaks should be investigated and confirmed by collecting blood specimens from the first five reported cases. You also need to take nasopharyngeal swabs from 5 cases to isolate viruses and document strains.

Objectives

General Objective

To assess the magnitude and contributing factors for the occurrence of measles outbreak

Specific Objectives

To describe measles cases by person, time and place

To identify associated risk factors for the occurrence of measles

To recommend control measures

Materials and methods

Study area and period:

An outbreak investigation was conducted in Shay Bench woreda, Bench Maji Zone, SNNPR from 19 November to 3 December, 2013.

Study design

Descriptive epidemiologic study

Unmatched case-control in which exposures to environmental factors were compared between diseased due to measles and subjects free from measles

Sampling procedure

Cases were selected randomly from the line list; and controls were the neighbors of the cases.

Diagnostic Methods for measles

Usually diagnosis is done using blood serum to confirm the presence of IgM; thus in this outbreak blood samples taken from the 1st five cases.

Data collection and procedures:

Reviewing secondary data (Registry books, case based reports, line list records, surveillance data and related documents), were done in zonal health department, health office health center and health posts. Interview of mothers/fathers/care givers of children or the cases & controls if they can respond appropriately using structured questionnaire.

Data processing and analysis tools:

Data was analysed using Microsoft office excel 2007 and further analysed by Epi Info7.

Operational definition

Case: An individual with signs and symptoms of measles in Shay Bench district who diagnosed by a clinician as a measles case using standard case definition or confirmed through serum examination from 19 November to 3 December, 2013.

Control: An individual to the same district and or living in the study area but has no clinical signs and symptoms of measles during the study period. He/ She can be the neighbourhood or family of the cases.

A standard case definition and community case definition [6]

A standard case definition of suspected and confirmed cases of measles was used as tool for detecting measles cases. These definitions must be used at all levels including the community, health professionals working at health posts, health centers, hospitals, health offices at different levels, private health facilities, other government health facilities and NGO clinics.

Standard case definition of measles to be used at health centers and above:

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

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

Epidemiologically linked case: A suspected measles case that has not had a specimen taken for serologic confirmation and is linked (in place, person and time) 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.

The other was community case definition for measles at Health Posts and community levels defined or categorized under Rashes. So the definition put like the following.

Case Definition (Rashes): Any person with fever and vesicular, maculapapular or pustular rashes on any part of the body.

Epidemic Threshold:

Occurrence of five or more reported suspected measles cases or 3 measles IgM positive cases in one month in a defined geographic area such as a kebele, woreda or health facility catchment area.

Data dissemination:

The findings were communicated to the RHB/PHEM core process

Treatment was provided to measles Cases:

Cases were treated using the national measles outbreak management guideline. All cases and children between 6 months to <5 years in affected areas were given vitamin –A” and supportive treatment; since there were no complicated measles cases admitted at the health facility level.

Result

Description of measles outbreak

There were 478 measles cases seen from 13 October 2013 to 28 Nov 2013 with 240 males and 238 females. Of these cases 3 deaths were registered (CFR, 0.6%). The attack rate was 331 per 100,000 populations. Blood specimens were collected from five cases and sent to EHNRI for laboratory investigation; and all samples, 5 (100%) were IgM positive for measles.

As we have seen from the following figure (Fig6.) more cases of measles were reported less than 5 years of age; and there were no cases above 44 years of age.

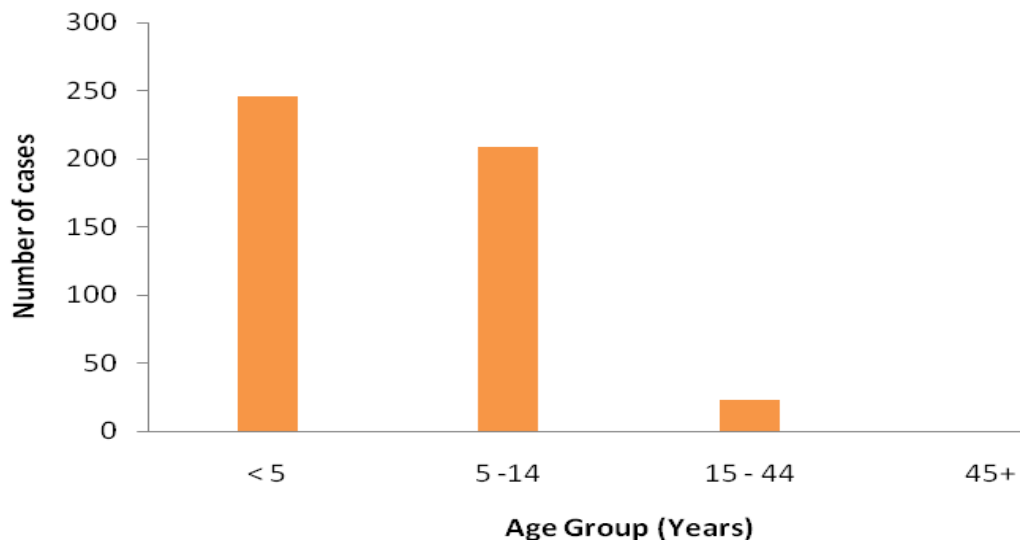


Figure 5 Measles cases by age group, Shay Bench Woreda, Bench Maji Zone, SNNPR

Vaccination Status of measles cases

From the total 478 measles cases more than 50 % of cases were vaccinated with at least 2 doses of measles vaccine; and 80 % of the total cases were vaccinated for at least 1 dose of measles antigen prior to the occurrence of the outbreak (see fig7) below.

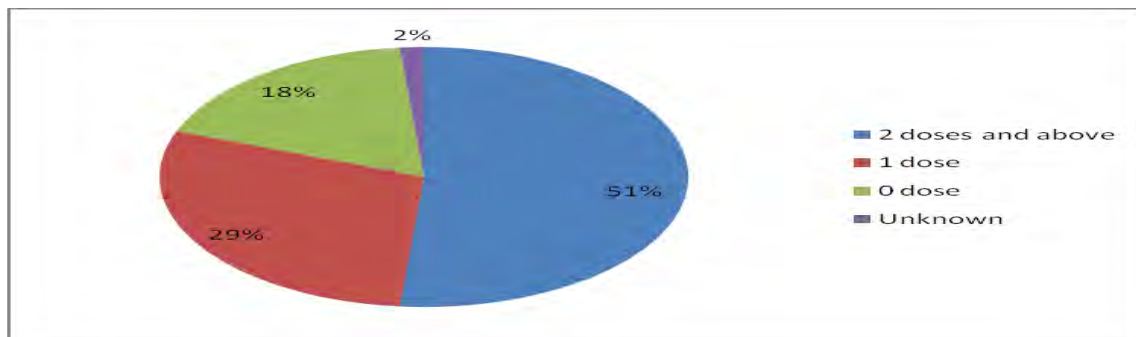


Figure 6 Vaccination status of measles cases, Shay Bench woreda

Time Course of the measles outbreak

The index cases were 2 females seen at the same date (On 14/10/ 2013) at Shay Bench health center, who were from Shay Bench town administration kebele 02 and Ziagin rural kebele with the age of 14 years and 12 years respectively and were alive. At woreda level clusters of cases starting from 15/10/2013 to 29/11/2013 and there were a total of 478 cases and 3 deaths. The woreda health office and health centers conducted nonselective vaccination campaign that aims to increase population immunity by focusing upon quickly increasing measles immunization coverage for all children aged 6 months to less than 5 years regardless of their vaccination status. The first round SIAs conducted from 20/10/2013 to 25/10/2013 in 8 kebeles which were more affected than the others.

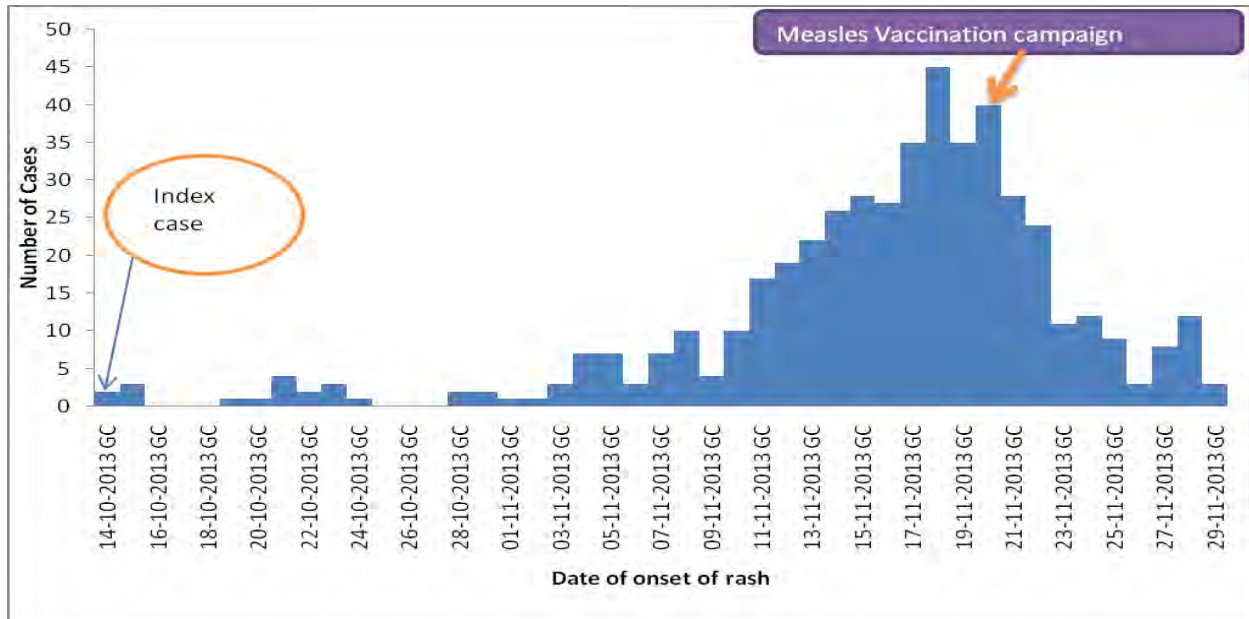


Figure 7 Depicting time course of measles outbreak in Shay Bench Woreda, Bench Maji Zone

The distribution of measles cases by kebele, Shay Bench Woreda

Out of 21 kebeles of Shay Bench woreda 16 kebeles (76.2%) were affected by measles.

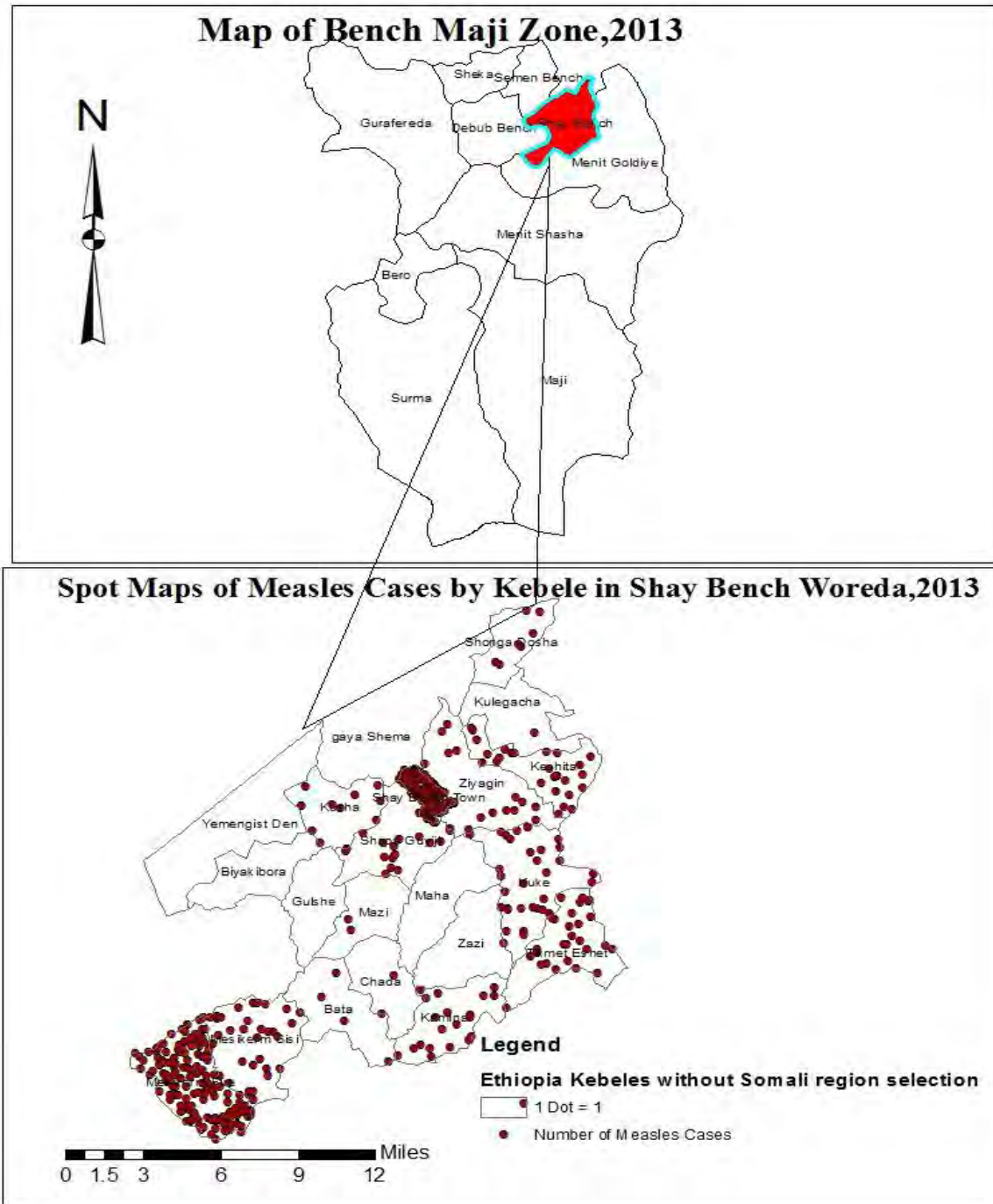


Figure 8 Spot map of Measles cases by Kebele, Shay Bench Woreda, SNNPR

Case-control Study

The demographic information were collected from cases and controls; that means it is collected from cases and controls who were adults; and for children from their parents, care givers or guardians.

Table 5 Demographic Information

Religion	Frequency	
	Number	%
Orthodox	54	43.9
Muslim	8	6.5
Protestant	57	46.3
Others	4	3.3
Total	123	100
Level of Education		
illiterate	33	27
Grade 1-4	6	5
Grade 5-8	28	23
Grade 9-12	27	22
Above grade 12	29	13
Total	123	100
Occupation		
Farmer	16	13.0
Government employee	30	24.4
Merchant	16	13.0
Private employee	3	2.4
Student	16	13.0
Others	42	34.2
Total	123	100

Of the total measles cases (42) included in the study, 18 (43.9%) were males and 23 (56.1%) were females. Median age of the study subjects was 2 years. Of the controls (82), males were 30 (36.6%) and females were 52 (63.4%). All cases were developed rash. Most cases had fever, red eye; and half of the cases had runny nose, cough and loss of appetite. Of the total 123 study subjects 21 cases and 47 controls got at least two doses of measles antigen. There were no cases that develop complications. From the total cases half, 20(50%) visited the nearest health facilities within one day. No cases were treated with traditional medicine before visiting the health facilities. A total of 123 study subjects received at least one measles vaccination prior to the outbreak. Vaccination status of the subjects were checked by vaccination card were 8 (6.5%) and by history were 115 (93.5%). Most cases and controls were vaccinated at the age of 9 months, 112 (91 %). Usually diagnosis is done using blood serum to confirm the presence of IgM antibody; thus in this outbreak blood samples was taken from the 1st five cases and all of them were IgM +ve for measles.

The finding reveals that measles cases who were vaccinated for less than 2 doses of measles antigen were more at risk of developing measles disease (OR = 2.569; 95% CI = 1.182, 5.733)

The households who had family size with 5 persons and more were at risk for developing clinical measles (OR = 12.27; 95% CI = 4.763, 35.68). Measles cases living with persons with symptoms of measles in the same households had more risk to develop measles (OR = 3.6; 95% CI = 1.5581, 8.2694).

Measles outbreak response activities done by, woreda health office Zonal health department and SNNPR HB

- ✓ Revitalized rapid response team (Woreda and Health Centers level)
- ✓ Activated woreda epidemic committee
- ✓ Active case search was done through house to house by Health Workers
- ✓ SIAs were carried out in 8 kebeles
- ✓ Vitamin —A was provided to all cases and eligible children in the area
- ✓ Prepared treatment posts at kebeles level
- ✓ Prepared brochures for key messages and distributed to the kebeles
- ✓ Strengthened measles surveillance
- ✓ Social mobilization for measles campaign
- ✓ Provide drugs and supplies (for Woreda health office & Health centers)

Discussion

The case fatality rate was 0.6% which was below the developing countries overall case-fatality rate which has been estimated to be between 3% and 6% [3, 5]. More than 50 % of cases were vaccinated at least for 2 doses of measles; and 80 % of the total cases were vaccinated for at least 1 dose of measles antigen. This finding was contradicted that when correctly administered at 9 months of age, measles vaccine confers life-long protection to approximately 85% of those vaccinated [1]. From this finding the majority of measles cases were under the age of 5 years; a similar study shows that in both urban and rural areas in developing countries, the majority of measles cases occur in children less than five years of age, as illustrated by data from Nigeria [4].

Conclusion

Males and females are affected almost equally, and the age group < 5years are more affected than the other age groups. When measles virus is introduced to a non-immune population, nearly 100% of individuals will become infected and develop clinical illness. Vaccination status of the study subjects were checked by vaccination cards was very low. The majority of cases and controls were vaccinated at the age of 9 months in the routine EPI schedule. Cases living with persons with symptoms of measles in the neighbourhood were more likely develop clinical measles. While we see the vaccination status of the cases, 51% of the cases listed under the line list vaccinated two doses of measles antigen and 29 % of the cases vaccinated for one dose of measles antigen; thus a total of 80% of the cases vaccinated at least for one dose of measles antigen. The SIAs campaign was conducted from the age of 6 months to 59 months.

Recommendation

The woreda health office should conduct SIAs for the rest adjacent kebeles which were not covered. The Bench maji Zone health department and SNNPR HB should support the Woreda health office by drugs and supplies, finance and logistics in order to strengthen the measles surveillance and case management. Potent vaccine of measles must be administered for children who are eligible for measles vaccination. As the national measles guideline 3rd edition (Ethiopia) strongly suggested that children receiving measles vaccine before the age of nine months during a campaign must be revaccinated after the age of nine months (with at least a one-month interval between the doses), since the efficacy of vaccine administered before nine months of age is likely to be low. Routine immunization should be strengthened.

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Chapter II - Ten Years Malaria Surveillance Data Analysis Report, SNNPR, 2003 - 2012

Abstract

Background: Malaria is a major global public health problem and a leading cause of morbidity and mortality in many countries. According to the FMOH, Ethiopia report of 2009/2010, malaria was the leading cause of outpatient visits, accounting for 14% of all visits, and health facility admissions, with 9% of all admissions. Since the last ten years malaria surveillance data analysis of SNNPR was not examined, we have done it for public health decision making purpose.

Methods: Descriptive cross sectional study was used for this malaria surveillance data analysis. Ten years (2003 -2012), Malaria surveillance data were collected from SNNPR Health Bureau surveillance database and FMOH/EHNRI database. Data were processed and analyzed by Microsoft Office Excel. The surveillance data analysis conducted from 20 May to 7 June 2013, Hawassa.

Result: Total malaria suspected fever cases examined by RDT and/or microscopy was 15,722,005. Out of these numbers of cases positive for malaria parasites either by RDT or microscopy were 4,094,332 i.e. slide positivity rate was 26%. Total malaria cases (clinical + confirmed) treated during these periods were 12,065,332. From the total malaria cases 3,802,626 were <5 years of age. Total inpatients due to malaria were 171,701 cases and 3,580 deaths were registered. Regarding the plasmodium species, from a total 4,094,332 confirmed cases, 2,567,716 (63%) were *P.falciparum* & 1,526,616 (37%) was *P.vivax*. This descriptive analysis shows that the incidence of malaria starting from 7 cases/1000 to more than 500 cases/1000 population in 2012.

Conclusion: The malaria cases were decreasing in SNNPR from 2004 to 2009; but from 2010 to 2012 the number of malaria cases was showing increment in these three consecutive years. However, malaria deaths become decreasing from year to year. This study finding reveals that majority of malaria cases have been due to *P. falciparum*. All administrative zones and special woredas were affected by malaria. So no zones or special woredas free from malaria. Alaba special woreda annual malaria incidence was the highest in the region; so there might be an identified malaria outbreak in some kebele/kebeles of the woreda, sometime in 2012.

Key words: malaria, surveillance data analysis, malaria incidence, SNNPR

Background

Malaria is caused by a protozoan belonging to the genus *Plasmodium*. Four species: *Plasmodium falciparum*, *P. vivax*, *P. ovale*, and *P. malariae* infect humans [1]. Malaria is a highly prevalent tropical illness with fever following the bite of infected female *Anopheles* mosquitoes which transmit a parasite. Serious malarial infections are usually due to *P. falciparum* which may result in severe anaemia and vital organ involvement [2].

Malaria is a major global public health problem and a leading cause of morbidity and mortality in many countries. Malaria caused an estimated 219 million cases and 660 000 deaths in 2010. Approximately 80% of the cases and 90% of the deaths occur in Africa while the remaining cases and deaths occur mainly in the South-East Asia and Eastern Mediterranean Regions [3]. The transmission patterns and intensity of malaria is vary greatly due to the large diversity in altitude, rainfall, and population movement in Ethiopia; areas below 2,000 meters (m) are considered to be malarious (or potentially malarious). Those areas are home to approximately 68% of the Ethiopian population and cover almost 75% of the country's landmass [4].

According to the FMOH, in 2009/2010, malaria was the leading cause of outpatient visits, accounting for 14% of all visits, and health facility admissions, with 9% of all admissions. Malaria is one of the top ten causes of inpatient deaths among children less than five years of age. In the past three decades 48 major 'epidemic episodes' have occurred, with especially large epidemics in 1988, 1991, 1992, 1998, 2003, 2004 and 2005. Unexpected population movements, local flooding and famine conditions, and emerging resistance to anti-malarial drugs and insecticides may also affect local communities' risks for local seasonal malaria transmission and for malaria epidemics [5]. Most of the malaria transmission occurs between September and December, after the main rainy season from June to August. Certain areas, largely in the western and eastern parts of the country experience a second "minor" malaria transmission period from April to May, following a short rainy season from February to March [5]. Malaria is mainly seasonal in the highland fringe areas and of relatively longer transmission duration in lowland areas, river basins and valleys [2, 4, 5, 6]. Ethiopia is also one of the most malaria epidemic-prone countries in Africa. Rates of morbidity and mortality increase dramatically (i.e. 3-5 fold) during epidemics [6].

Surveillance is the process of gathering, analyzing, and dissemination of information for the purpose of proper planning, implementation, and evaluation of health services/interventions. It is

also defined as “Information for Action” [7]. Proper understanding and use of public health surveillance helps health workers and health units to set priorities, plan interventions, mobilize and allocate resources, detect epidemics early, initiate prompt response to epidemics, and evaluate and monitor health interventions. It also helps to assess long term disease trends [7, 8].

Analyzing and interpreting public health surveillance data are the links between the design and operation of a surveillance system and the use of data from the system to implement public health action and disease control programs. Surveillance data have many uses, and the approaches to analysis and interpretation of surveillance data are tied to both the design of the surveillance system and to the intended uses of the data. For example, surveillance data are used to detect epidemics, suggest hypotheses, characterize trends in disease or injury, evaluate prevention programs, and project future public health needs [9].

We will deal with practical and sound approaches to analyzing malaria surveillance data of SNNPR and discuss the surveillance data by person, place and time. We also discuss the methodical interpretation of malaria surveillance data and presentation of the results of this surveillance analyses are through text, tabular and graphical presentations.

Since the last ten years malaria surveillance data analysis of SNNPR was not examined before, we will do it for public health decision making purpose.

2. Objectives

2.1 General objective

To analyze ten year malaria surveillance data of South Nations Nationalities and People Regional State from 2002-2012

2.2 Specific objectives

To determine malaria trend in the last ten years

To describe disease pattern by person, time and place

To present recommendations

3. Methods

3.1 Study Area, Study Population and Study Period

This malaria surveillance data analysis was conducted in SNNPR Region. The regional state city Hawassa is located 273km south of Addis Ababa. Administratively the region is divided into 14 zones, 4 special woredas (see fig.1 below), and 135 rural woredas. SNNPR bordered with Kenya in South, the Sudan in West & Southwest, Gambella region in Northwest and surrounded by Oromiya region in Northwest, North and East direction. According to the 2007 Central Statistics Agency (CSA), the total population of the region is estimated 15,042,531 total male population is 7,482,051 and total number of female population is 7,560,480 the total number of under five children in the region were estimated to be 2,346,635 based on the assumption that 15.6% of the total population is under five. The total population of the region was estimated to be 20% of the national population. Population density was 142 persons per sq.k.m and the area of the region accounts 10% of the country size (118,000sq.km). The surveillance data analysis carried out in the SNNPR, from 20 May to 7 June 2013, Hawassa.

3.2 Study Design

Descriptive cross sectional study was used for this malaria surveillance data analysis.

3.3 Data Collection

Ten years (2003 -2012), Malaria surveillance data were collected from SNNPR Health Bureau surveillance database and FMOH/EHNRI database.

3.4 Data Analysis

Data were processed and analyzed by Microsoft Office Excel 2007.

3.5 Definition

We used the Standard case definition and Community case definition of public health emergency

management guidelines for Ethiopia, which is published by Ethiopian health and nutrition research institute, February 2012.

In Ethiopia 20 diseases (13 are immediately reportable whereas 7 are weekly reportable) are selected to be included into the routine surveillance. These diseases and conditions are selected based on one or more criteria. Malaria is one of the diseases which have a significant public health importance.

☞ Standard case definition of malaria to be used at health centers and above

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

☞ Community Case Definition of malaria to be used at health post and community level

Malaria Any person with fever OR fever with headache, back pain, chills, rigor, sweating, muscle pain, nausea and vomiting OR suspected case confirmed by RDT

In Amharic: ትኩሳት ያለው ወይም ትኩሳት፣ ራስምታት፣ የጀርባ ህመም፣ ብርድ ብርድ ማለት፣ ማንቀጥቀጥ፣ ላብ ላብ ማለት፣ የጡንቻ ቁርጥማት፣ ማቅለሽለሽና ትውከት ያለው ወይም በበሽታው ተጠርጥሮ በፈጣን መመርመሪያ ኪት የተረጋገጠ ማንኛውም ሰው የወባ በሽታ

3.7 Information Dissemination

The findings were communicated to SNNPR HB/PHEM.

4. Result

Demographic Characteristics

Location of the SNNP regional state is South west part of Ethiopia. Astronomically lies between 4 °.43 - 8 °.58 North latitude and 34 °.88- 39 °.14 East longitudes. Bordered with Kenya in South, the Sudan in West, Southwest, Gambella region in Northwest and surrounded by Oromiya region in Northwest, North and East direction. Area of SNNPR is 110,931.9 sq. km. (10 Percent of the country). Population size: 15,042,531 (2007 Census), 20% of the total population of the country. Population density: 142 persons per sq.k.m. Rural population: 13,496,821 and urban population: 1,545,710. There are 56 ethnic groups.(with distinct geographical location, language, cultures, and social identities). Language families are Omotic, Cushetic, Nilo-Sahara and Semitic super language families. Administrative Divisions, 14 Zone sub-divided in to 135 woredas, 4 special woredas, 3714 rural kebeles, 238 urban kebeles, 22 town administrations, 114 certified towns (with municipality).

4.1 Malaria surveillance data analysis, SNNPR, by time

Malaria is included as weekly reportable diseases since 2009; and it is categorized as one of the diseases that have public health importance; however it was reported in a monthly base before 2009. The analysis is done using the last ten years malaria surveillance data. This malaria surveillance data analysis trend over time is presented in the following figure (Fig.10).

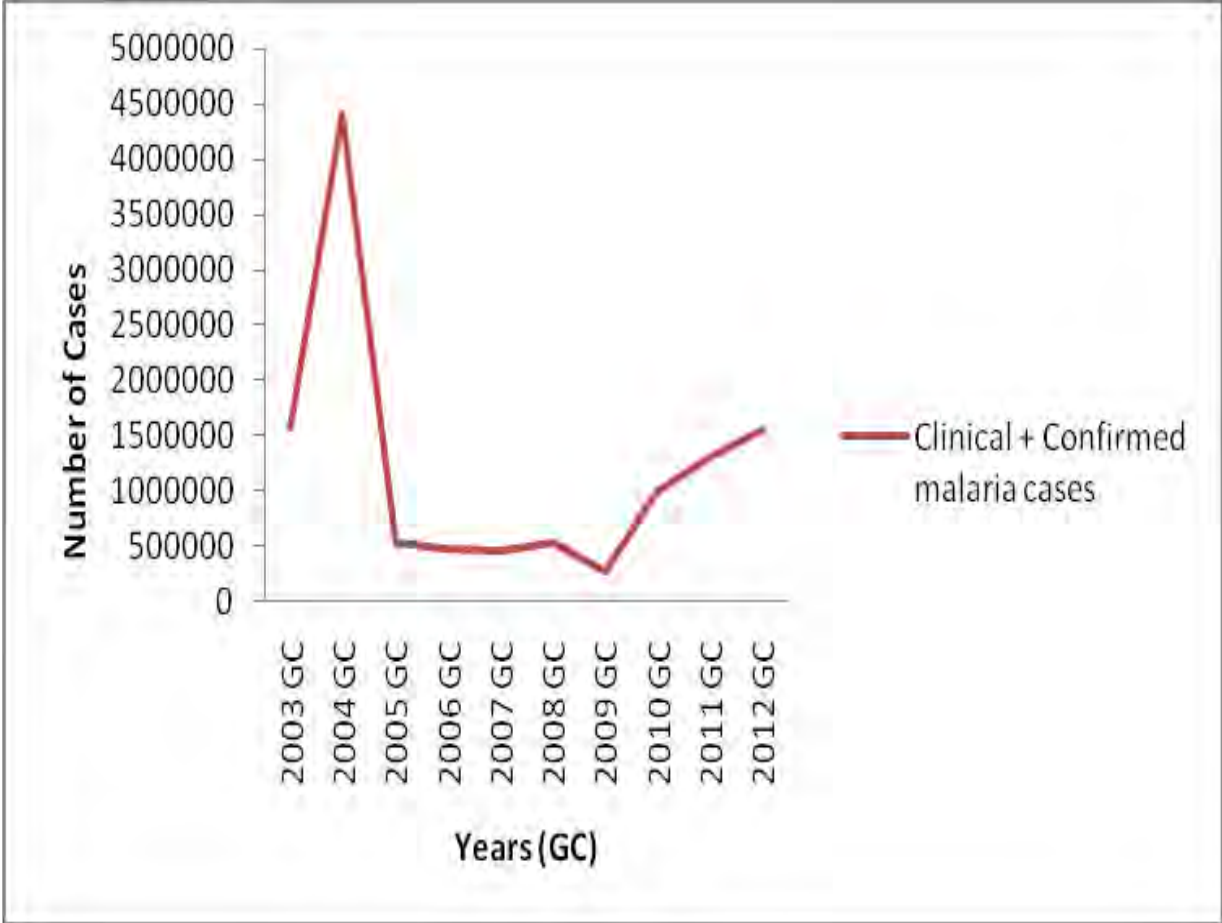


Figure 9. Total malaria Cases (Clinical + Confirmed), SNNPR.

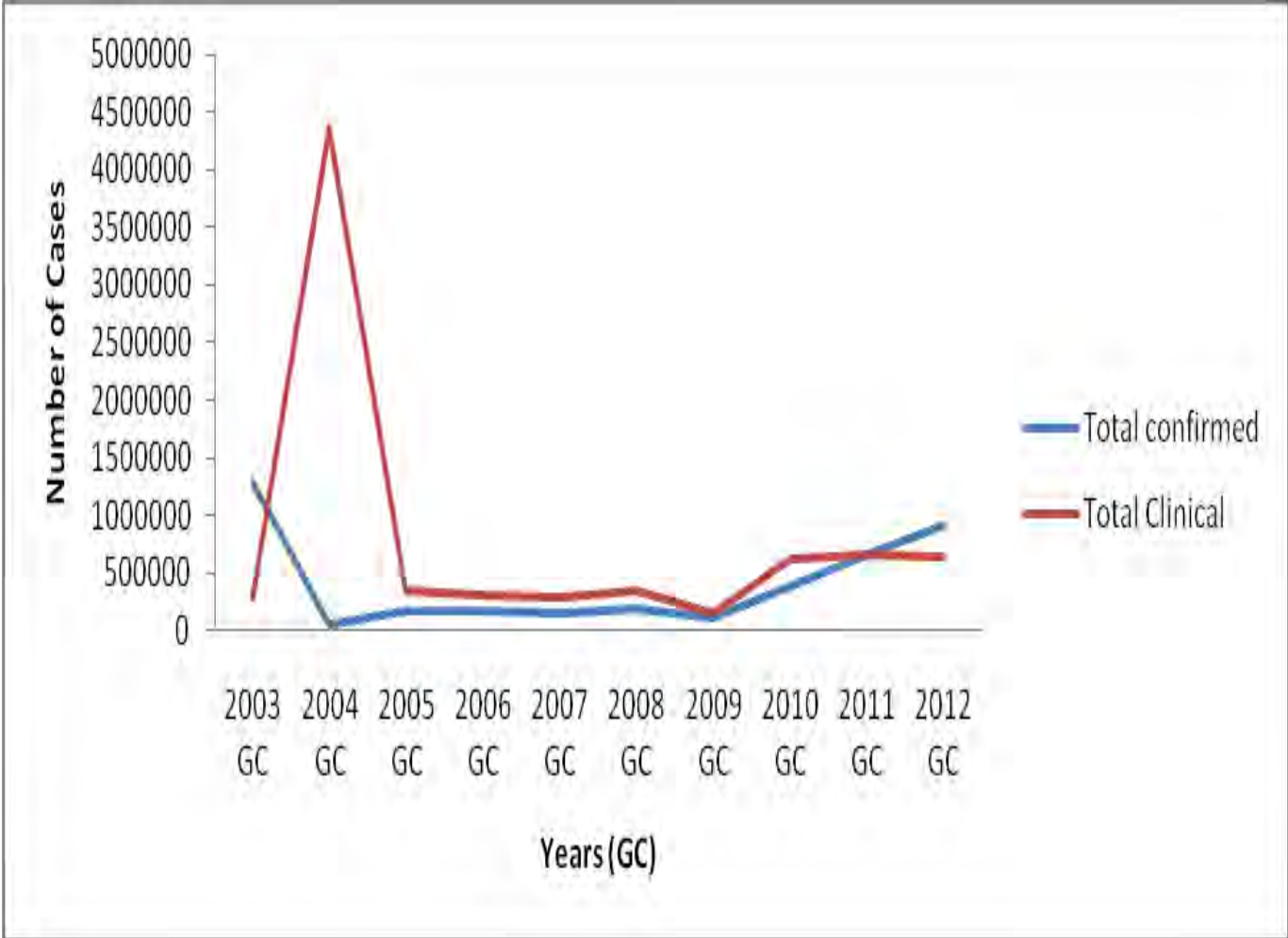


Figure 10. Showing the trend of Clinical Malaria Vs Confirmed Malaria

The status of the inpatient cases and deaths due to malaria in the past decade is presented in the following figure (Fig.13)

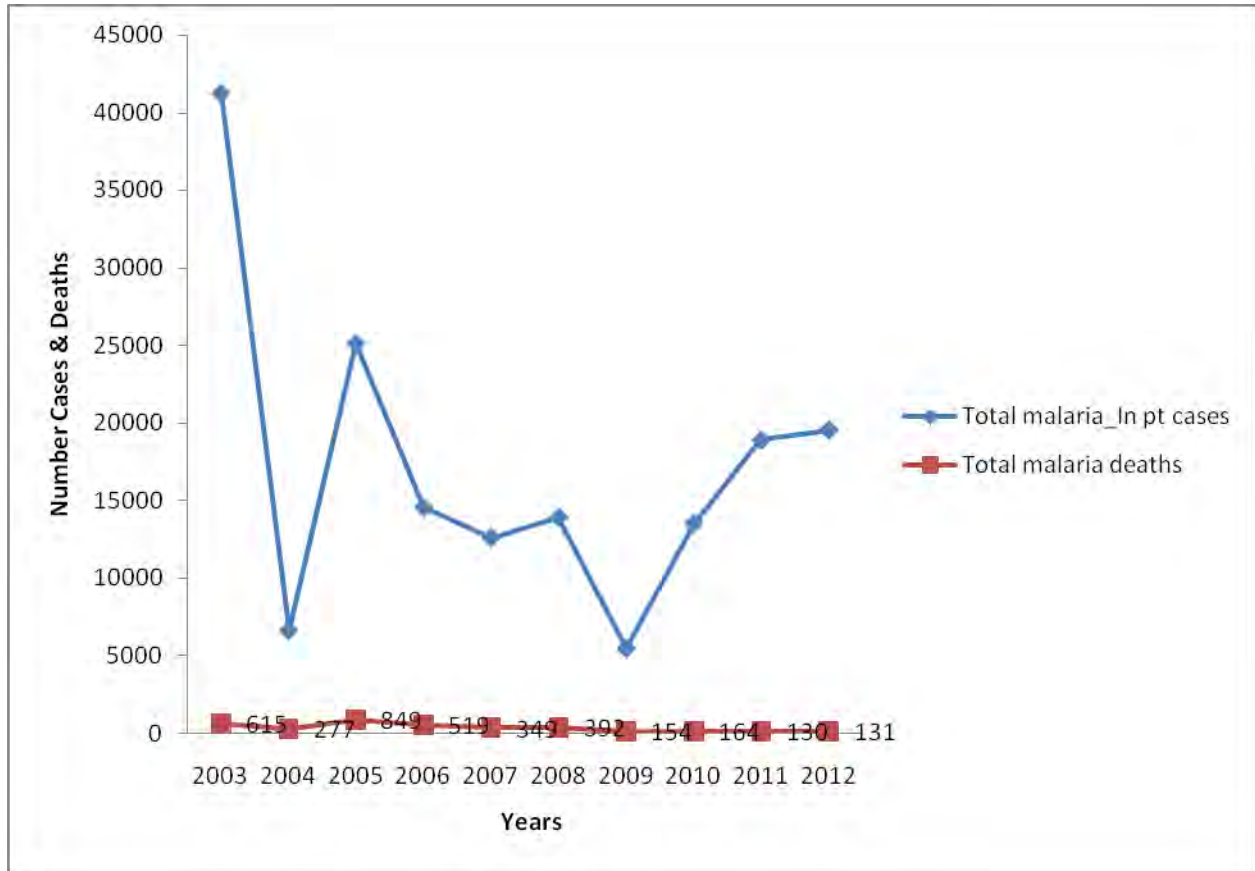


Figure 11. Malaria inpatient Cases Vs Deaths, SNNPR, 2003 - 2012

4.2 Malaria surveillance data analysis, SNNPR, by Person

During the last ten years (2003-2012): Total malaria suspected fever cases examined by RDT and/or microscopy was 15,722,005. Out of these numbers of cases positive for malaria parasites either by RDT or microscopy were 4,094,332 i.e. slide positivity rate was 26%. Total malaria cases (clinical + confirmed) treated during these periods were 12,065,332. From the total malaria cases 3,802,626 were <5 years of age. Total inpatients due to malaria were 171,701 cases and 3,580 deaths were registered. Regarding the plasmodium species, from a total 4,094,332 confirmed cases, 2,567,716 were *P.falciparum* & 1,526,616 were *P.vivax*.

Table 6 Malaria test positivity rate (RDT and/or blood slide), SNNPR, 2003-2012

Year	Number of confirmed malaria cases	Number of patients received a parasitological test	Malaria test positivity rate per 1000
2003	1,278,456	2,128,296	600.7
2004	55,285	4,410,035	12.5
2005	177,307	3,587,059	49.4
2006	162,746	484,722	335.8
2007	160,574	474,564	338.4
2008	187,194	488,054	383.6
2009	117,743	736,756	159.8
2010	391,039	717,611	544.9
2011	651,812	1,055,274	617.7
2012	912,176	1,639,634	556.3
Total	4,094,332	15,722,005	260.4

As we have seen from the above table, the malaria test positivity rate per 1000 population of 2004 and 2005 show relatively low value; but one of the most probable reason for this might be incomplete reporting.

The following figure shows that proportion of malaria cases by species for the last ten years, SNNPR, 2003-2012; which was similar with FY 2012.

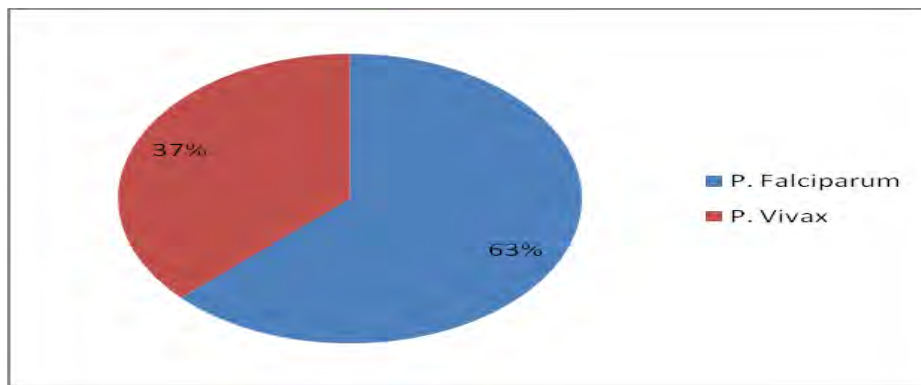


Figure 12 Shows proportion of P.f vs P.v species, SNNPR, 2003 – 2012

4.3 Malaria surveillance data analysis, SNNPR, by Place

The malaria surveillance activities were conducted in all zones and special woredas of the region i.e. the population of the region were covered by malaria surveillance. All zones and special woredas were recorded malaria cases. For example, when we see the distribution of malaria cases in 2012, no zones or special woredas were free from malaria meaning malaria cases were distributed all over the region starting from 7 cases/1000 to more than 500 cases/1000 population.

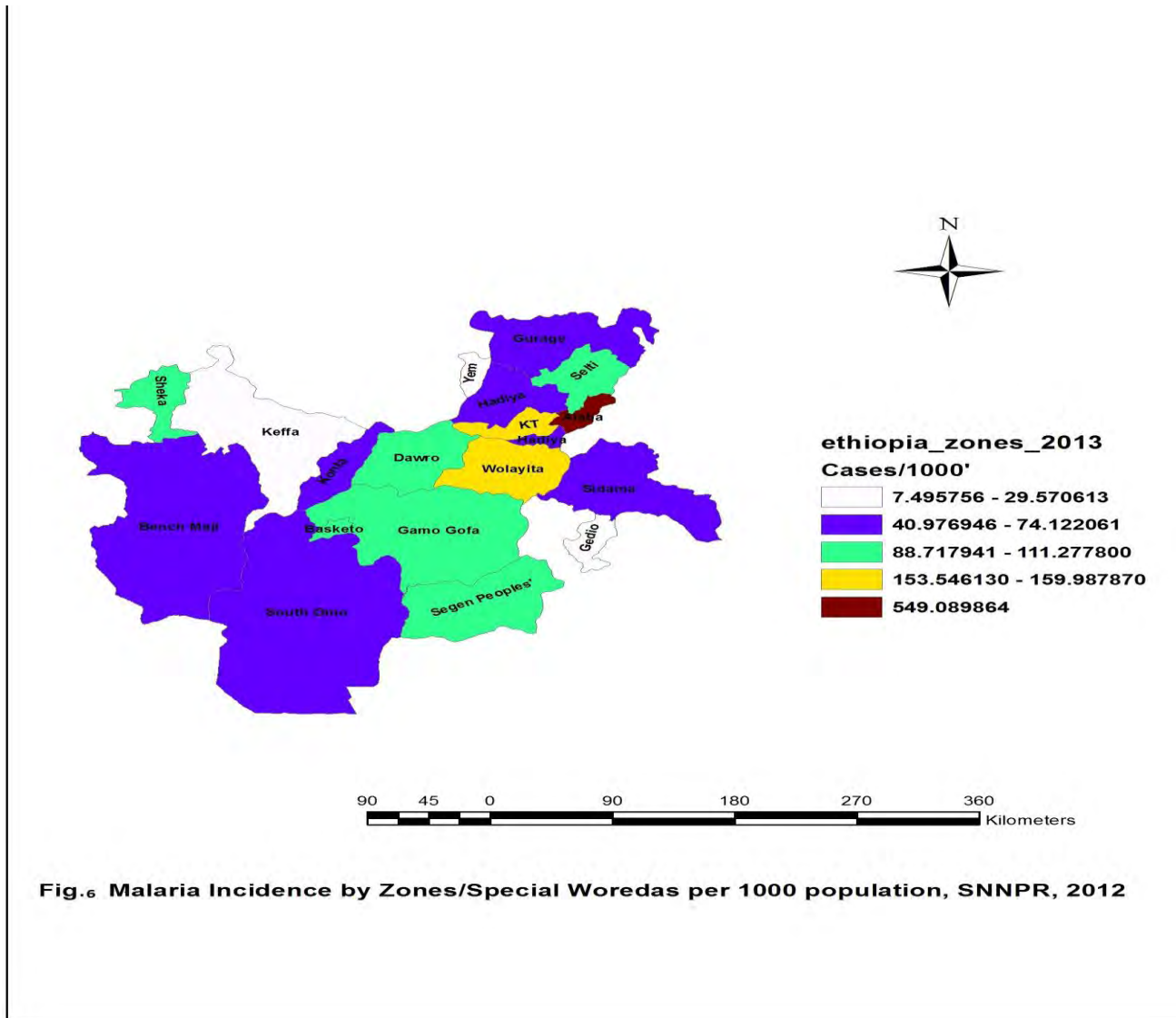


Fig.6 Malaria Incidence by Zones/Special Woredas per 1000 population, SNNPR, 2012

Figure 13 Malaria incidences by zones/Special woredas per 1000 population, SNNPR, 2012

5. Discussion

As we have seen from the finding malaria cases were decreasing from 2005 - 2009 in SNNPR; but recently malaria cases become increasing from year to year in the last three consecutive years (2010-2012); however deaths due to malaria was decreasing from year to year between 2009 - 2012; but study done previous to this study, showed that malaria prevention and control interventions have recently undergone major scale-up in Africa, and malaria disease burden is reported to be declining in several countries, including Ethiopia and other East African countries [10]. As we have seen the finding confirmed malaria Vs clinical malaria cases, confirmed cases were higher in 2003 and lower in 2004; so the probable cause for low number of confirmed cases of malaria in 2004 might be due to presence of high number of AFI cases, no or stock out of laboratory supplies, conducting mass treatment. From 2005 - 2012 the gap between total number of confirmed Vs clinical cases become narrowing; and the probable cause for this might be policy change for treatment of malaria cases and acute febrile cases, provision of laboratory supplies and number of health facilities become increasing. This study finding reveals that 60% - 70% of malaria cases have been due to *P. falciparum*, with the remainder caused by *P. vivax*, this finding was similar with the national figure for plasmodium species in Ethiopia [6].

All administrative zones and special woredas were affected by malaria. So no zones or special woredas free from malaria. Thus incidence rate of malaria was between 7/1000 to > 500 cases/1000 population. Alaba special woreda annual malaria incidence was > 500/1000 population; so there might be unidentified malaria outbreak in some area/areas or kebele/kebeles of the woreda, sometime in 2012.

6. Limitations

Data for more vulnerable groups were not available e.g. pregnant mothers. Some variables were not available in the database e.g. Sex of cases, the number of reporting health facilities or units was not available for some years.

7. Conclusions

The malaria cases were decreasing in SNNPR from 2004 to 2009; but from 2010 to 2012 the number of malaria cases was showing increment, in these three consecutive years. However, malaria deaths become decreasing from year to year. This study finding reveals that majority of malaria cases have been due to *P. falciparum*. All administrative zones and special woredas were affected by malaria. So no zones or special woredas free from malaria. Alaba special woreda

annual malaria incidence was the highest in the region; so there might be unidentified malaria outbreak in some kebele/kebeles of the woreda, sometime in 2012.

8. Recommendations

Since malaria cases become increasing in the recent years and the whole region is affected by malaria; malaria interventions strategies should be strengthened before the major and minor transmission seasons of malaria. Malaria surveillance data reporting format should include some important indicators e.g. pregnant cases status. Some variables should be included in the malaria surveillance reporting formats e.g. Sex. The malaria incidence rate should be reduced to the minimum level for some special woredas and zone; like Alaba special woreda, Wolaita and Kembata Tembaro zones. Malaria outbreaks should be detected by analyzing the malaria surveillance data at kebele/community, health facility catchment areas or woreda level and verified using the threshold set by the national guidelines.

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Chapter III - Acute flaccid paralysis surveillance system evaluation report, Silte Zone, SNNPR, December 2013

Abstract

Introduction: Acute Flaccid Paralysis (AFP) surveillance was adopted by World Health Organization (WHO) to monitor progress towards poliomyelitis eradication. The study discusses on the evaluation of AFP surveillance system in Silte zone 2013, evaluates performance of the AFP surveillance system, and identifies components that require strengthening.

Methods: A cross sectional descriptive analysis was conducted on secondary AFP surveillance data for Silte zone for the period of 2013.

Results: Silte zone reported 10 AFP cases in 2013. Of these, 80% were <5years of age, and 50% were male and 50% were female. One case was confirmed for VDPV2. The zonal average annualized non-polio AFP detection rate were 2.8 non-polio AFP cases/100,000 children <15years in 2013. All performance indicators met the WHO-specified targets except the stool adequacy rate of 70 % (WHO target is $\geq 80\%$). The vaccination status of the cases were validated that 70% unknown.

Conclusion: The AFP surveillance system met most WHO-specified epidemiological and laboratory performance standards. The zone had high NP-AFP rate. The surveillance system needs to address problems of low stool adequacy rate. All woreda of the zone reported at least one case of AFP. The routine vaccination program for OPV should be strengthened.

I. Introduction

The polioviruses belong to the genus Enterovirus in the family Picornaviridae and comprise three related serotypes: types 1, 2, and 3, all of which can cause paralysis. The most frequent cause of epidemic polio is poliovirus type 1, type 3 less frequently, and type 2 rarely [1, 2, 3]. All three types can cause paralysis. Polioviruses can be isolated from stool samples and typed in a laboratory. Poliovirus is highly communicable. An infected individual will probably infect all other non-immune persons in a household. The transmission of poliovirus is facilitated by crowded living conditions and poor sanitation. Transmission is primarily person-to-person via the fecal-oral route, i.e. the poliovirus replicates in the intestines and spreads through the feces [2]. Wild poliovirus was endemic in more than 125 countries on five continents, paralyzing more than 1000 children every day. As of May 2005, poliomyelitis occurs primarily in Africa and South Asia. In developing countries with low immunization coverage, poliomyelitis produces a significant amount of illness, death and disability. Where poliomyelitis is common, 5 to 10 of every 1000 children infected with poliovirus will develop paralytic disease [1].

Worldwide, 192 cases of poliomyelitis have been reported (up to 20 August 2013) compared with 123 for the same period in 2012. Five countries have reported cases in 2013: Afghanistan (4), Pakistan (24), Nigeria (43), Somalia (108), Kenya (12) and Ethiopia (1). The majority (121) occurred in three non-endemic countries facing an outbreak with WPV1 that started in May 2013: Somalia, Kenya and Ethiopia. Those 121 cases of acute flaccid paralysis with poliovirus suggest that thousands of asymptomatic people in the region carry the virus. Outbreak response measures across the region continue to be implemented. The affected area in Kenya is the Dadaab area of North Eastern province, an area with almost half a million Somali refugees and where nearly 50% of children remain under-immunized [4]. The confirmation of the case in Ethiopia underscores the risk this outbreak continues to pose to countries across the region. Supplementary immunization activities (SIAs) had already been conducted in the region.

After the initial alert in June 2013, Israel has detected 67 wild poliovirus type 1 (WPV1) positive sewage samples from 24 sampling sites, collected from 3 February 2013 to 4 August 2013. As part of subsequent ongoing stool sample survey activities WPV1 has also been isolated in stool samples from 42 carriers, representing 4.4% of all collected samples. No cases of paralytic polio have been reported. A nationwide polio immunization campaign with bivalent oral polio vaccine started on 18 August 2013 for children up to the age of nine years. WHO estimates the risk of

further international spread of WPV1 from Israel to remain moderate to high and recommends that all travelers to be fully vaccinated [4]. Initially restricted to southern Israel, wild poliovirus type 1 (WPV1) has now also been detected in a sewage sample from central Israel. Polio, a crippling and potentially fatal vaccine-preventable disease mainly affecting children under five years of age, is close to being eradicated from the world after a significant global public health investment and effort. Outbreaks such as the ongoing one in the Horn of Africa pose serious challenges to this goal [4]. The outbreak in the Horn of Africa affects now 108 cases of WPV1 in Somalia, 12 in Kenya and 1 in Ethiopia. WHO recommended that all countries, in particular those with frequent travel and contacts with polio-infected countries, strengthen surveillance for cases of acute flaccid paralysis (AFP), in order to rapidly detect new poliovirus importations and facilitate a rapid response. Countries should also analyze routine immunization coverage data to identify sub national gaps in population immunity to guide catch-up immunization activities and thereby minimize the consequences of new virus introduction. Priority should be given to areas at high risk of importations and where OPV3 coverage is <80%. WHO's international travel and health recommends that all travelers to and from polio-infected areas be fully vaccinated against polio. Three countries remain endemic for indigenous transmission of WPV: Nigeria, Pakistan and Afghanistan. Additionally, in 2013, the Horn of Africa is affected by an outbreak of WPV [4].

The global effort to eradicate polio has become the largest public health initiative in history and is spearheaded by the World Health Organization (WHO). The maximum benefits of this global eradication of polio will only be realized when immunization against poliovirus will no longer be required. Prior to stopping polio immunization it will be necessary to certify the absence of wild poliovirus circulation from every country in the world [4]. Attaining global eradication of poliomyelitis is possible; because there are no animal vectors, the presence of effective OPV, no chronic carrier and survives poorly in the environment. On the other hand, what makes global eradication of poliomyelitis difficult is most infected people do not show any symptoms e.g. out of 200 infected only 1 person can be paralyzed and many other diseases present with similar symptoms [2]. In the early stages of the disease polio may be difficult to differentiate from other forms of AFP. Therefore, to insure that no case of polio goes undetected surveillance targets a symptom (AFP) rather than a specific disease (e.g. polio). AFP surveillance is the intelligence network that underpins the entire eradication initiative. The objective of AFP surveillance is to

detect poliovirus wherever it may still circulate. It is also the key to detecting re-importation of poliovirus into polio-free countries [5].

Since 1988, when the World Health Assembly resolved to eradicate polio, the number of polio cases worldwide has decreased from 350,000 to fewer than 800 cases in 2003. This was achieved through high vaccination coverage (>90%) with at least three doses of oral polio vaccine within first year of life, supplemented by quality surveillance for acute flaccid paralysis (AFP) and mop-up vaccination campaigns [6,7]. Although the European region was certified “polio-free” in 2002, as long as wild polio continues to circulate in other parts of the world. Vaccination is key to the success of polio eradication. The surveillance of acute flaccid paralysis (AFP) is the detection of flaccid paralysis of new onset in children under 15 years (and any suspected poliomyelitis case in a person of any age), with prompt virological testing to disprove or confirm poliovirus infection. AFP occurs in about 1% of polio cases [6]. Cases are most infectious from 7 to 10 days before and after the onset of symptoms [7].

Following the widespread use of poliovirus vaccine in the mid-1950s, the incidence of poliomyelitis declined rapidly in many industrialized and developing countries. Inactivated poliovirus vaccine (IPV) was licensed in 1955 and was used extensively from that time until the early 1960s. Ninety percent or more of vaccine recipients develop protective antibody to all three poliovirus types after 2 doses, and at least 99 percent are immune following 3 doses. Trivalent OPV contains live attenuated strains of all three serotypes of poliovirus. Live attenuated polioviruses replicate in the intestinal mucosa and lymphoid cells, and in lymph nodes that drain the intestine. Vaccine viruses may spread from the recipient to contacts. Persons coming in contact with fecal material of a vaccinated person may be exposed and infected with vaccine virus. After vaccination with three doses of OPV, > 95% of recipients develops long-lasting immunity to all three poliovirus types. Approximately 50% of vaccine recipients develop antibody to all three serotypes after a single dose of OPV [7].

Stool specimen is inoculated into a cell culture for isolation and identifying which, if any, of the three serotypes of poliovirus is involved. If polioviruses grow in the cell culture, it must be differentiated from other enteroviruses possibly present. Antibodies specific to individual viruses are introduced to block the growth of these viruses. If poliovirus is isolated from a person with acute flaccid paralysis, it must be tested further, to differentiate between wild and vaccine-derived viruses, using an ELISA test method or polymerase chain reaction test method (PCR).

Once wild poliovirus has been identified, the genetic make-up of the virus must be determined. The poliovirus sequence is checked against a reference bank of known polioviruses, allowing inferences about the geographical origin of the virus [7].

The Polio Eradication Initiative (PEI) in Ethiopia started in 1996 following the declaration on Polio Eradication in Africa in the same year. Since then, Ethiopia has accelerated implementation of polio eradication strategies: routine immunization, supplemental immunization activities (SIAs), Acute Flaccid Paralysis (AFP) surveillance, and mop-ups in areas with high risk of polio importation and undetected circulation. Based on the available data Routine Oral Polio Vaccination (OPV) coverage has increased from 52% in 2003 to 80% in 2011. The polio SIAs coverage has been above 90% using administrative and independent monitoring data. The last indigenous case of wild poliovirus (WPV) was in December 2001. However, Ethiopia suffered several WPV importations from Sudan and Somalia between 2004 and 2008. Due to implementation of high quality SIAs, improvement in routine immunization and early detection of circulations, the country has been able to contain the outbreaks. The last WPV in Ethiopia was detected in April 2008; the circulating Vaccine derived polio virus (cVDPV) detected in 2008 has stopped after November 2010. Ethiopia has maintained certification level AFP surveillance since 2004 [3].

However, there is continuing risk of WPV importation from neighboring countries. Somalia, Sudan and South Sudan, which are high risk areas due to security risks affecting implementation of the PEI strategies. Despite the activities of government and including civil society organizations, surveillance in bordering regions of Ethiopia has not reached certification level NP-AFP rates or stool adequacy rates. NP-AFP rate remained unstable many times below 2.0 /100,000 individuals under 15 years of age and stool adequacy below 80%. To finish the Job of polio eradication urgently the certification level surveillance at National level must be maintained the sub national level surveillance gaps must be closed. As of October 2012, polio is endemic in only 3 countries; these three countries are the source of importation for other polio free countries. Unless all countries are free of polio all countries in the world are at risk of importation. To eliminate the last reservoir of wild polio virus circulation, mopping up vaccination campaigns with two doses of OPV separated by an interval of 4 weeks are conducted. These campaigns target identified risk areas that include recent circulation of wild poliovirus, low vaccination coverage, suboptimal surveillance, large migrant or refugee

populations and common borders with known poliovirus endemic areas, mostly children younger than 5 years of age are target age groups [3].

Surveillance by definition is the ongoing and systemic collection, analysis, interpretation, and dissemination of data about cases of a disease and is used as a basis for planning, implementing, and evaluating disease prevention and control activities. Therefore AFP surveillance is the process of detecting and investigating (including stool sample collection) of all AFP cases in children below 15 years of age. The goal of AFP surveillance is to identify and document the presence or absence of wild poliovirus in the country. This goal is best achieved by finding all cases of acute flaccid paralysis and testing stool specimens from each case for the presence of wild poliovirus. The Public Health Emergency Management core process has integrated disease surveillance including polio case based surveillance. Health offices at all levels have a responsible focal person for surveillance, including AFP surveillance and health facilities have a trained focal person responsible for surveillance including polio. Health workers and community at all levels should participate in AFP surveillance [3].

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. Data disseminated by a public health surveillance system can be used for immediate public health action, program planning and evaluation, and formulating research hypotheses. The evaluation of public health surveillance systems should involve an assessment of system attributes, including simplicity, flexibility, data quality, acceptability, sensitivity, predictive value positive, representativeness, timeliness, and stability [9]. Public health surveillance systems should be evaluated periodically [10]. The initiation and maintenance of any successful surveillance system will reflect recognition of the human element in surveillance practice: data collection, analysis and data dissemination [11].

The evaluation of a surveillance system promotes the best use of health resources and assures that systems operate effectively. Surveillance system evaluation allows us to define whether a specific system is useful for public health and is achieving that system's objectives. Any evaluation should include recommendations for the improving the quality and efficiency of the system [2].

The Government of Federal Democratic Republic of Ethiopia has embarked a country wide reform initiative aimed at bringing effectiveness and efficiency in execution of various works

using the Business Process Reengineering (BPR) as a tool. In line with this, the Federal Ministry of Health and its Agencies identified 7 core processes that will enable the fulfillment of sectoral visions and missions. Public Health Emergency Management (PHEM) is one of the core processes identified. PHEM is the process of anticipating, preventing, preparing for, detecting, responding to, controlling, and recovering from the consequences of public health threats in order that health and economic impacts are minimized. In order to cope with the challenges of recurrent and emerging public health threats, the country, therefore, formulated this dependable system to detect unusual health events timely and to institute appropriate response measures promptly.

While designing this process, best practices from around the world have been adapted, tailored to the country's context taking into consideration the national threats and the mission of the MoH. The modern principles of emergency management and the implications of the International Health Regulation (IHR) 2005 are also clearly reflected in the system.

In integrated disease surveillance, the various surveillance activities become integrated into one system within the broader national health system. It also emphasizes all functions of surveillance activities to be carried out using similar structures, processes and personnel. A functional disease surveillance system is essential for defining problems and taking action. Proper understanding and use of this essential epidemiological tool (public health surveillance) helps health workers at the woreda and health units to set priorities, plan interventions, mobilize and allocate resources, detect epidemics early, initiate prompt response to epidemics, and evaluate and monitor health interventions.

In Ethiopia 20 diseases (13 are immediately reportable whereas 7 are weekly reportable) are selected to be included into the routine surveillance [13]. It is carried out through a system which has legal support and extending from the central health authorities down to the peripheral health facilities and community level through sets of communication channels. These sets include upward and down ward reporting and feedback mechanism. The purpose of evaluating public health surveillance systems is to ensure that problems of public health importance are being monitored efficiently and effectively.

For this purpose we have evaluated AFP surveillance system. Poliomyelitis (Polio) is a highly infectious viral disease, which mainly affects young children less than 5 years. It is caused by wild poliovirus types 1,2 and 3. The virus is transmitted through contaminated food and water.

Many infected people have no symptoms, but do excrete the virus in their faeces, hence transmitting infection to others. In 2008, of the estimated 5 million un-immunized children 1 year old, 3 million (65%) reside in countries with circulating WPV or bordering a polio infected country. Thus Silte zone is one of the administrative unit in SNNPR, found around 198 km away from Hawassa city (Capital, SNNPR) in the West direction and 170 km from Addis Ababa in the south direction; and these zone is implementing surveillance under the health sector. This zone is selected for its relative high burden of the 20 selected priority diseases and conditions. However the AFP surveillance system of Silte zone has never been evaluated before. For this reason the evaluation carried out. The surveillance system status of AFP, in this zone was not evaluated before; so the evaluation was very important to identify the gaps in the system and to suggest appropriate recommendations for its improvement.

II. Objectives

General objective

To evaluate surveillance system of acute flaccid paralysis and overall surveillance system evaluation of Silte zone and forward useful solutions for its improvement

Specific Objectives

To describe the system itself

To evaluate the overall system

To assess the attributes of the surveillance system

To identify major gaps of the system

III. Methods and Materials

Study area and period

Silte administrative Zone is one of the 14 zones of SNNP Regional State and it is found around 198 km away from Hawassa (Capital, SNNPR) in South West direction. The study was conducted from 09 - 23 December 2013.

Study Design

Descriptive cross-sectional study design was carried out. We also used the CDC updated surveillance evaluation guideline, the national PHEM guideline, and Ethiopia field epidemiology training program resident manual.

Study units

The study units were health centers, health posts, woreda health offices and zonal health department. Hence the zonal health department, three woreda health offices, four health centers and seven health posts were included in the study.

Sampling

From the zone three woredas were selected based on their annual performance of report completeness ranked by Silte zone health department by three categories, low, medium and high performed and these woreda health offices were included in the study randomly from each performance level. Of those selected woredas four health centers were selected randomly based on their last year performance, 1 from low performed, 2 from medium and 1 from high performed health centers. Seven health posts were selected randomly from the catchment of the four health centers, based on their performance level; 3 from low, 2 from medium and 2 from high performed health posts.

At last, one zonal health department, three woreda health offices, four health centers, and seven health Posts; a total of 15 institutions were included in the evaluation.

Data collection tools and data sources: Data collected using questionnaire by interviewing and observation of some practical tools which were applying for surveillance; and the respondents for the primary data were PHEM coordinators/officers at zonal and woreda level, and IDSR focal persons at health facilities level. The secondary data sources were patient registers, line lists; case based reporting formats and weekly PHEM reports.

Data Analysis Tool: Data entered and analyzed using Epi-info 7.

Operational definition

Surveillance system: A system includes the surveillance of AFP from the community to the Silte zone health department level.

Low performance: Woredas or health facilities which had annual report completeness were less than 80%.

Medium performance: Woredas or health facilities which had annual report completeness were between 80-85%.

High performance: Woredas or health facilities which had annual report completeness were above 85%.

Ethical considerations

Oral permission were gained from the respective organizations and willingness to participate on the surveillance data collection process of the respective zonal, woredas and health facilities PHEM officers and IDSR focal persons were obtained.

Dissemination of the Findings

The final result of the study will be submitted to the Field Epidemiology Training Academic Coordination office, SPH-AAU, Regional health bureau/PHEM core process and Silte zone health department with a soft copy and hard copy. These findings also will be published in local or international journals for the consumption of the national or international scientific community. The preliminary report is submitted to SNNPR HB field supervisor for immediate decision making purpose.

IV. Result

The annual plan of AFP cases report for Silte zone was 8; however the zone reported 10 cases of AFP. The average annualized NP-AFP rate of this zone was 2.8 with the stool adequacy rate of 70%. Number of woreda expected to report at least one case of AFP were 7; the proportion of woreda reported at least one AFP case was 100%. Sankura woreda reported a male 1 year child case with AFP and the final outcome of the case was VDPV2. This case vaccinated for 2 doses of OPV before the onset of paralysis. Date of onset of paralysis of the VDPV case was on 20 July 2012.

Table 7 Acute Flaccid Paralysis performance indicators for Silte zone by woreda, 2012

Woreda	Expected AFP cases	Reported AFP cases	Annualized NP-AFP case	Number of adequate specimens	Stool adequacy rate (%)
Alicho Wuriro	1	1	2.4	0	0
Dalocha	1	1	2.4	1	100
Misrak Azernet	1	0	0	0	-
Lanfuro	1	2	5	2	100
Mirab Azernet	1	1	2.4	1	100
Sankura	1	1	2.4	1	100
Silti	2	4	5	2	50
Worabe TA	0	0	Low U15 popu.	0	-
Silte zone Total	8	10	2.8	7	70

As we have seen the performance status (Table 6), woredas with high NP-AFP rate and high stool adequacy rate were: Dalocha, Lanfuro Mirab Azernet and Sankura; and woredas with high NP-AFP rate and low stool adequacy rate were: Alicho Wuriro and Silti. Silent or no AFP case reported woreda was Misrak Azernet.

Table 8 Background characteristics of AFP cases reported

Characteristics	Frequency	
	number	%
1. Sex		
Male	5	50
Female	5	50
2. Age group		
< 1 year	0	0
1-5 years	8	80
6-10 years	1	10
11-15 years	1	10
3. Polio vaccination status		
Zero dose/not vaccinated	0	0
One dose	0	0
Two doses	1	10
Three doses and above	2	20
Un known	7	70

The purpose of the AFP surveillance system evaluation was how the system functioning efficiently and effectively. The objectives of this surveillance system were describing the whole surveillance system partially and identify the AFP surveillance system gaps and recommend for its improvement in the study area. The case definition used in this document was the definition used in PHEM guide line and the national draft guide line of AFP. That is the standard case definition of AFP.

Suspected: Any child under 15 years of age with AFP or any person with paralytic illness at any age in whom the clinician suspects poliomyelitis.

Confirmed: A suspected case with wild poliovirus isolation in stool.

Community case definition

Acute Flaccid Paralysis: Any person with sudden onset of paralysis of the limbs.

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The operational flow of surveillance data in the study area start from the community (health post) to regional health bureau level; and the feedback vice versa. The major components of the system were the community, health workers, health facilities, woreda health offices, zone health department, private health facilities and stalk holders.

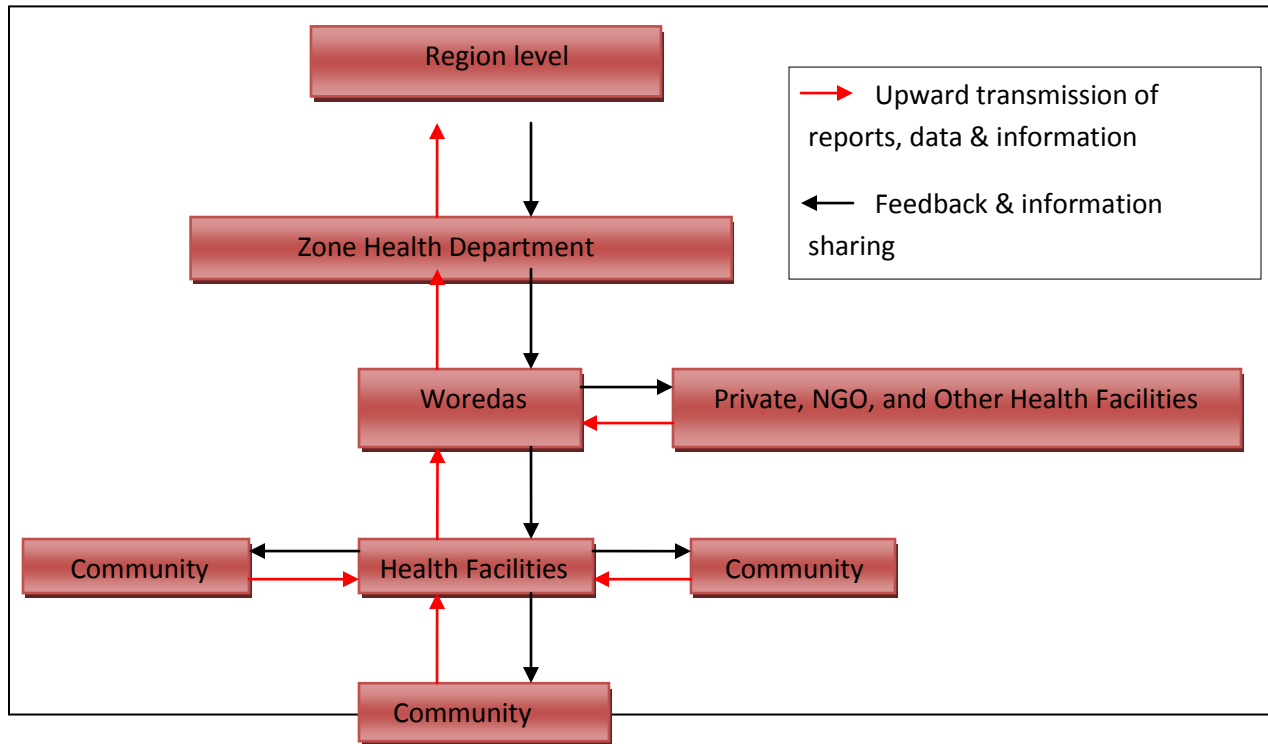


Figure 14 showing surveillance data flow of Silte zone

Reporting mechanism

There was no shortage of report formats for the last 6 months at woreda level. Percentage of health facilities submitted their weekly report on time to the woreda health offices were 93%. Concerning woredas that have means for reporting to next level, all woredas had not mail, fax and electronic reporting system; but they were reporting surveillance data to the next level by using telephone and reporting formats (hard copy). To strengthen the reporting system 2 out of 3 woredas said it is well established system, so keep it up; but 1 woreda suggested that we need fax machine and establishment of electronic reporting system.

There were no shortage of appropriate surveillance reporting forms at any time during the last 6 months and all HCs, 4 (100%) reported accurately cases from the registry into the summary report to go to higher level also the last monthly report agreed with the register for 4 diseases (1 for each targeted group [eradication; elimination; epidemic prone; major public health

importance]). These were AFP (polio), Measles, AWD and Malaria. Percent of HCs that reported each reporting period to the next higher level/Woreda health offices during the past 3 months were 95.8%. Number of weekly reports submitted on time were 46 (95.8%) during the past 3 months. Percent of HCs that have means for reporting to next level were: by e-mail 0%, telephone 50%, fax 0%, electronic 0% and paper based 100%.

Out of 7 health posts only 1 health post lacked appropriate surveillance forms at any time during the last 6 months. All health posts reported accurately cases from the registry into the summary report to go to higher level (health center). Numbers of reports submitted in the last 3 months compared to expected number were 98.8%. Number of weekly reports submitted on time was 94%. All health posts had means for reporting to next level by filling the reporting formats and sending them to the health centers.

To strengthening/to improve reporting the following points were raised:

It should be electronic

Skill gaps should be addressed through basic training at health extension workers level

The reporting date should be every Friday to avoid delays of the weekly IDS report

To compile weekly report, the weekly reporting format of health posts should be the same as to the health centers weekly reporting format

Evaluation of the system

1. Availability of a National Surveillance Guideline

There was a national guideline for priority diseases surveillance at zonal health department level. Last update of the guideline is February 2012 and diseases included in the guideline: as **immediately reportable diseases** were - Acute flaccid paralysis (AFP), Anthrax, Avian Human Influenza, Cholera, Dracunculiasis, Measles, NNT, Pandemic influenza A, Rabies, Smallpox, SARS, VHF & Yellow fever; and as **weekly reportable diseases** - were Dysentery, Malaria, Meningococcal Meningitis, Relapsing fever, Severe malnutrition, Typhoid fever & Typhus. The case definition for each priority disease were listed and posted in the Zonal health department PHEM office.

The surveillance and control of these diseases were integrated. Numbers of reports in the last 3 months compared to expected number were 36 (100%) from the 3 woredas and one immediately report was presented to zonal health department. Out of 36 reports 33 (91.7%) were submitted to zonal health department on time in the last 3 months. There was a report of immediately

reportable disease in the past one month and the report received after detection of the case or disease within 1-2 days. All woredas had means and capacity for reporting to the next level by telephone, but all of them had not means for reporting to next level by e-mail or fax.

All woredas, 3(100%) which were included in the study had national PHEM guidelines for the IDSR activities; all had the capacity to transport specimens to a higher level laboratory for case confirmation; and all of them had guidelines for specimen collection, handling and transportation to the next level. Out of 4 health centers only 1(25%) health center had national surveillance manual and out of seven health posts none of them had national manual for surveillance.

2. Case detection and registration

All health centers have a clinical register and all of them correctly register cases during the previous 30 days; and all health centers 4 (100%), have standardized case definitions and posted in the wall of the HCs for the country's priority diseases and they were using standardized case definitions.

However, when we asked how they diagnosed one of the priority diseases from the facility's clinical register using standardized case definition, only 25% of the respondent correctly mentioned the standard case definition (the focus was on AFP, Measles, NNT, and Malaria). Case definition of AFP was posted at the wall of each health facilities.

All or 7 (100%) health posts had a clinical register in their facilities. Six health posts were filling correctly the clinical register during the previous 30 days. Health posts that have community case definitions for the country's priority diseases were 6 (85.7%). The health extension workers were posted the community case definition in their health posts.

3. Case confirmation

All health centers have the capacity to collect specimens of sputum, stool and blood/serum; but not CSF; and all had the materials required to collect Stool, Blood/serum; but not for CSF. They have the capacity to handle sputum, stool, blood/serum and CSF until shipment and all have functional cold chain at each health facility. All health centers have transport media for stool at their health facility to ship specimens to a higher level laboratory.

4. Data analysis

The surveillance data of Silte zone health department were described by person, place and time and they performed trend analysis. List of diseases for which line graphs observed were malaria, typhoid fever, dysentery and epidemic typhus. For most priority diseases action threshold were

defined. E.g. measles, malaria, AWD, AFP. PHEM officers and coordinators were responsible for the analysis of the collected data and it was analyzing on weekly basis. The analysis had appropriate denominators or demographic data (E.g. Population by woreda, < 15 years of age).

Two woredas described the surveillance data by person, place and time; but one woreda didn't analyze any of these variables. Only one woreda perform trend analysis (line graph of malaria cases by time). Two woredas had an action threshold for any of the country priority diseases. Two woredas respondent mentioned the action threshold value of malaria, meningitis, measles and AWD/cholera; but one respondent couldn't mention the action threshold for any priority diseases. All woredas have demographic data. E.g. population < 5 year, population by Kebele, less than 1 year population, total population etc. PHEM coordinators/officers were responsible for surveillance data analysis in all woredas. Two woredas were analyzing the surveillance data on weekly bases but the other woreda was not analyzing on weekly bases rather it analyzed on monthly bases. No woredas analyzed the collected data on daily, every two weeks and quarterly bases.

Only one health center described data by person, place and time. This HF analyzed the collected data on weekly bases. The other 3 HCs didn't describe the surveillance data using the above variables. Two (50%) of the HCs performed trend analysis using line graph for malaria cases by time. Two HCs have an action threshold for each priority disease. In 4(100 %) of HCs IDSR focal persons were considered as responsible for data analysis. All HCs had demographic data and posted on the wall of each institution (E.g. population <5 yr, population < 1 yr, total population of each catchment etc).

None out of 7 health posts describe surveillance data by person and place; but 4 (57.14%) health posts were monitoring malaria cases using line graph by time.

5. Outbreak investigation

Number of outbreaks suspected in the past year was three. These were malaria, measles, cVDPV and meningitis. Of these meningitis and cVDPV was investigated at zonal level. There were no woredas that have ever conducted an outbreak investigation.

6. Epidemic preparedness

The zonal health department had written epidemic preparedness and response plan document. However, the zone had not emergency stocks of drugs, vaccines and supplies at all times in past one year. But there was no shortage of drugs, vaccines or supplies during the most recent

epidemic; because the regional health bureau responded as soon as possible. There were written standard case management protocols for malaria, measles, AWD and meningococcal meningitis. There is no budget line for epidemic response. There was zonal epidemic management committee; but this committee had been functional during outbreak. The zonal health department had a rapid response team for epidemic control.

All woredas 3(100%) have a plan for epidemic preparedness and response plan; but all of them didn't had emergency stocks of drugs and supplies at all times in past one year and in addition to this they didn't had the stocks of drug and supplies at time of assessment. There was no a budget line or access to funds for epidemic response. One woreda had an epidemic management committee; but the rest two woredas had not epidemic management committees. Two woredas had established rapid response team for epidemics in their offices. Seventy-five percent of health centers had a standard case management protocol at least for one epidemic prone disease.

7. Response to Epidemics

The Silte zone health department didn't respond within 48 hours of notification of most recently reported outbreak i.e. meningococcal meningitis. The epidemic management committee has evaluated its preparedness and response activities during the past year.

All woredas implemented prevention and control measures based on local data for at least one reportable disease. i.e. all of them for malaria while the number of cases show unusual increment. None of the epidemic management committees had evaluated their preparedness and response activities during the past year (2012) at woreda level. Two woredas received at least one feedback or report from a higher level during the past year on the data they have provided; but one woreda didn't receive. The health centers and health posts implemented prevention and control measures based on local data for at least one epidemic prone disease i. e Measles.

8. Feedback

The zonal health department had not prepared bulletins; but feedback reports were produced to disseminate the surveillance data. However, feedback reports were not regular. All HCs received at least one report from a higher level during the past year on the data they have provided. Three HCs conducted 2 meetings and one HC conducted one meeting with the community members in the past six months evidenced with the minutes.

Six health posts got at least one feedback report from a higher level during the past year on the data they have provided. Four health posts conducted 6 meetings and the rest three health posts

conducted 2, 4 and 12 meetings each with the community members in the past six months; however 5(71.4%) health posts had the minutes or report of at least one meeting between the health facility teams and the community members within the past six months.

9. Supervision

The zonal health department had a plan to supervise twice and two supervisory visit were carried out in all woredas of the zone in the past six months. Each woreda supervised twice in the last six months and it was evidenced with supervision reports. Of these supervisions only one woreda surveillance practices appropriately reviewed to their level. The other two woredas surveillance practices were not revised separately. Two HCs (50%) supervised twice and the rest two HCs have been supervised three times and six times each in the last 6 months of 2005 EFY and also 50% of the HCs had supervision report or evidence for appropriate review of surveillance practices.

In the last six months, 4 health posts supervised twice, 1 health post six times, 1 health post four times and the other 1 health post have been supervised once. Five health posts had filed supervision report in the last six months; but only 2(28.6%) health posts had evidence for appropriate review of surveillance practices.

10. Training

All subordinate personnel have been trained in surveillance at ZHD level. The training carried out in 2011, 2012 & 2013 by regional health bureau in collaboration with WHO and all of the trainings were conducted at Butajira town. The zonal PHEM officers have received post basic training in epidemic management on AWD, measles, and malaria. The content of the surveillance and epidemic management training were supported by the appropriate guidelines and treatment protocols; but the trainings were given for short period of time. All woredas PHEM coordinators and officers were trained in disease surveillance. The trainings were conducted in 2012 and 2013 at Butajira town on average for 6 days. These trainings were organized by RHB/PHEM core process. Proportion of woredas with staff trained in surveillance and epidemic management was reached 100%.

Three (75%) of the HCs IDSR focal persons have been trained in disease surveillance and epidemic management. The trainings were conducted in 2012 and 2013 Butajira and Worabe for 3 days on average by regional health bureau/PHEM and Silte zone health department, but only one health center focal person didn't take any training. Six out of seven health extension workers

have been trained in disease surveillance and epidemic management between 2011 & 2012, at Woreda town for 4 days on average by respective woreda health offices.

11. Resources

The zonal health department have computer with statistical package (recently); but didn't have printer, photocopier and data manager for data management. Regarding communications the zonal health department has telephone service; but no fax. The budget line and the provision of logistics were from gov't (RHB), UNICEF and WHO.

All woredas health offices had electricity; but all woredas health offices PHEM core processes didn't have bicycles, motor cycles and vehicles. All woredas PHEM core processes had stationery and one woreda had calculator; but any of the woredas PHEM core processes had not computers which were used for data management. Regarding communication all PHEM core processes at woreda level had access for telephone services; but not for fax, radio and computers that have modems. Posters and megaphone were provided for 3 and 1 woredas respectively; but flipcharts, TVs, generators, projectors (movies) which were used as information education and communication materials.

All health centers have electric service and 3(75%) of the HCs had motor cycles, but none of the HCs had vehicles. Concerning data management tools 75% of the HCs had Stationeries, 50% calculators, and 25% had computer. None of the HCs had data management software and printers. All HCs had telephone services, but none of them had fax and computers that have modems. All HCs, 75% of the HCs and 25% of the HCs had posters, megaphone and flipcharts& TV respectively, used as information education and communication materials. But none of the HCs had generator and projector. All HCs used disinfectants as hygiene and sanitation materials. The personal protective materials used at the HCs were gown, glove, apron and mask.

Concerning logistics only 2 health posts had electric service and only 1 health post had bicycle. For data management purpose 5 health posts had stationery and only one health post had calculator. All (7/100 %/) health posts had network service for mobile phone; but none of them had fixed phone line within their health facilities. All health posts had posters and 3 health posts had flipcharts; but none of the health posts had megaphone for Information education and communication materials.

The zonal health department had not a computerized surveillance network. The zone allocated budget for surveillance and the proportion was 2% of the total budget allocated for the zonal

health department. The surveillance had opportunities to be strengthened through providing training for zonal health department head, rapid response team and epidemic management committee. There were surveillance coordination focal units or persons within the woreda epidemic management committees in all woredas.

12. Surveillance Coordination

There was a focal unit for surveillance at zonal level which is called public health emergency management core process.

13. Satisfaction with surveillance system

The Zonal health department and all woredas were not satisfied with existing surveillance system. They were suggested the following points for its improvement, the major are:

IDSR database should be established at woreda level

Data management tools such as computers, printers and statistical packages are required

Training should be provided for office heads, health workers and health extension workers

Transportation and budget support should be considered

Only 1(25%) of the HCs satisfied with the existing surveillance system; but 75% of the HCs suggested that the existing surveillance system needs improvement. Hence trainings, budget, and provision of supplies were suggested for the improvement of surveillance system.

Three (42.9%) health posts satisfied with the existing surveillance system. The rest 4 health posts suggested that, the surveillance system can be improved through training, supportive supervision and provision of field materials such as Umbrella, boots, bicycles and calculators.

Opportunities for integration of surveillance activities and functions were listed as follow:

*the presence of:

- 1 to 5 health development army
- Health extension program implementing at the community level
- Health work force
- National PHEM guidelines
- Supportive supervision
- Internet service
- Implementation of HEP at community level
- Training provided
- support of partners especially, WHO

14. Attributes and level of Usefulness

The whole populations of the zone were covered under surveillance. The surveillance System help:

- to detect outbreaks of priority diseases
- to estimate the magnitude of morbidity and mortality; including identification of factors associated with these diseases
- permit assessment of the effect of prevention and control programs

Description of each system attributes

14.1 Simplicity

The standard case definition of AFP was easy to understand by all level health professionals. The organization which need to receive reports of the surveillance data were health posts, HCs, Woreda health offices, SZHD, SNNPR HB, EHNRI and WHO. Additional data collection on a case were not time consuming; and the time taken to fill the format was about 10-15 minutes. The reporting formats were easy to fill out. Any of the requested information was not difficult to obtain, except exact date of birth for some cases. Laboratory confirmation result report of AFP take several months even sometimes no laboratory results send back to ZHD.

14.2 Flexibility

The current reporting formats used for other newly occurring health events or disease without much difficulty. The surveillance system was using standard data formats with blank variables which were prepared by national level. Any change in the existing procedures of case detection, reporting formats will not be difficult to implement or it can accommodate changes.

14.3 Data quality

The data collection formats for the priority diseases were clear and easy to fill for all the data collectors or reporting sites. The data collectors were supervised regularly. When we were reviewing the last months report of priority diseases there were no unknown or blank responses to variables in each of the reported forms. Thus the report completeness was 100%; i.e. with no blank or unknown responses from the total reports.

14.4 Acceptability

All reporting agents accept and well engaged to the surveillance activities that means 8 rural woredas, one town administration and the health providers at the government health facility were

accepting the surveillance activities. The private health care providers have the willingness to participate in this system.

14.5 Representativeness

Hundred percent of the zone population is covered by the surveillance system. The rural population was well represented by the surveillance data. The populations under surveillance have good health seeking behavior for the priority diseases.

14.6 Timeliness

The estimated time from the occurrence of the health event until a report of it reaches to zonal health department was one hour. Timeliness of the zonal health department were 92%, 2013.

14.7 Stability

The new BPR restructuring didn't affect the procedures and activities of the surveillance of the priority diseases; rather it helps to gain especial attention by government and it is established as one of the core processes in the zonal health department.

14.8 Predictive value positive (PVP)

There were a number of written standardized case definitions for surveillance and they were developed by FMOH/EHNRI. The PVP for AFP was calculated as follow:

$$\text{PVP} = \text{Tp} / (\text{Tp} + \text{Fp});$$

Where, Tp (True positive) = suspected cases confirmed for polio virus

Fp (False positive) = suspected cases that were negative for polio virus

Thus, Tp = 1, Fp = 9 ; PVP calculated as: $\text{PVP} = 1/10 * 100 = 10\%$

V. Discussion

The finding reveals that the annualized NP-AFP rate of Silte zone was 2.8 which was the same as the national NP-AFP rate per 100, 000 populations of < 15 years of age, but it was greater than the national target (2.0/100,000 < 15 years); however it was less than the annual performance rate of SNNPR (3.3/100,000 < 15 years). The stool adequacy rate of this zone was 70 %; but the stool adequacy rate of SNNPR and national was 97% and 90 % respectively [8]. This stool adequacy value was also less than the WHO standard ($\geq 80\%$). All woreda of the zone reported at least one case of AFP; this finding was similar with the national and SNNPR expectation.

Under the IHR 2005, four conditions that must be notified to WHO: smallpox, poliomyelitis due to wild-type poliovirus, human influenza caused by a new subtype, and SARS [13, 14] were included under the 20 priority diseases surveillance system of SZHD. Timeliness of the zonal

health department were 92%, 2013 which was more than the national PHEM guidelines (80%) [13]. The Silte zone health department didn't respond within 48 hours of notification of most recently reported outbreak i.e. meningococcal meningitis which was below the national guidelines. Three (75%) of the HCs IDSR focal persons have been trained in disease surveillance and epidemic management; but all IDSR focal persons must be trained [14]. All reporting agents accept and well engaged to the surveillance activities. The reporting formats were easy to fill out; this finding was matched with the CDC, updated guideline that is the simplicity of a public health surveillance system refers to both its structure and ease of operation. Any change in the existing procedures of case detection, reporting and formats will not be difficult to implement or it can accommodate changes; this finding was the same as that of flexible systems can accommodate, for example, new health-related events [9]. When we were reviewing the last month's report of priority diseases there were no unknown or blank responses to variables in each of the reported forms; Data of high quality will have low percentages of such responses [9]. All reporting agents accept and well engaged to the surveillance activities this finding fulfils the CDC updated guideline of acceptability, reflect the willingness of persons and organizations to participate in the surveillance system [9]. Three HCs (75%) out of 4 HCs health centers should have the newly published national PHEM guidelines and out of seven health posts none of them had national manual for surveillance; so guidelines for health post level have been prepared. All woredas have a plan for epidemic preparedness and response plan; but all of them didn't had emergency stocks of drugs and supplies at all times in past one year and in addition to this they didn't had the stocks of drug and supplies at time of assessment. There was no a budget line or access to funds for epidemic response. So the respective organization should solve this problem in the next year (2014). There was 1 case of cVDPV in Sankura woreda; this shows that routine or supplementary immunization activities (SIAs) were poorly conducted and a population is left susceptible to polio virus.

VI. Recommendations

The stool adequacy rate of the zone should meet at least the national target. The problem of silent woreda (Misrak Azernet) should be addressed by the zonal health department. The routine vaccination of OPV should be strengthened. All woredas health offices PHEM core processes didn't have bicycles, motor cycles and vehicles; so it should be solved. The zone and woreda health offices should have been supplied with emergency stocks of drugs and supplies. The

surveillance practices were not appropriately reviewed to all level. So it should be revised separately as a program. There should be a budget line for epidemic response at all levels of the zone. Regarding response, the zonal health department should respond within 48 hours of notification for reported outbreaks. There should be bulletin or report that is regularly produced to disseminate surveillance data. To integrate the surveillance activities, training have to be given for ZHD head, epidemic management committee, and RRT at each level. Laboratory confirmation result report of priority diseases such as measles, AFP... take several months even sometimes no laboratory results send back to ZHD; so laboratory result should be sent back to the lower level on time since it helps to take an appropriate interventions.

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Chapter IV - Health Profile Description Report, Sodo district, Gurage Zone, SNNPR, 2012

Abstract

Introduction: Sodo district is found 261 km East of zonal town Wolkite (Gurage Zone), 198 km North of SNNPR capital Hawassa and 103 Km South of Addis Ababa. This District also found in 8.095173-8.453552⁰ latitude and 38.375395-38.714232⁰ longitude. The health profile description includes geographic, demographic, socio-economic, health system and health status and others aspect of a district. It helps in prioritizing health and others health related condition occurred within the communities.

Method: The data sources were health offices and health institutions, Finance, Education, Agriculture, Culture & Tourism, Water offices. Interviews and discussions were carried out with concerned office heads and officers and the data collected by using questionnaires. The data were analyzed using micro soft excel and the findings will be disseminated.

Result: The potential health service coverage of the district were more than 100%. Ratio of Health center to population 1:22197; and health post to population was 1:2877. Profession wise the ratio of health officer to population 1:15538, Nurse to population 1:1992, midwife to population 1:15539 and Health Extension worker to population 1:1653. The ten top causes of under 5 morbidity were acute respiratory tract infection(4213), diarrheal disease(2400), pneumonia(1719), malaria(1244), helimenthiasis(871), eye disease(631), trauma(572), skin infection(471), otitis media(106) and severe acute malnutrition(47).

Conclusion: The children vaccination dropout rate penta 1 to Penta 3 and Penta 1 to Measles were within acceptable level; this showed that the defaulters were traced and vaccinated timely or there were no defaulters alive or they left the district. The prevention and control strategies of Malaria had shown its effectiveness; because malaria becomes the 6th causes of morbidity in the district. Tuberculosis case detection rate was low. Safe water supply coverage was below the acceptable level; so from the ten top causes of morbidity intestinal parasites, diarrheal diseases and typhoid fever might be due to this low coverage of safe water supply. Three schools didn't have latrines. This situation encourages open field defecation. The operational cost allocated for the health sector decreased from year to year.

Introduction

After the 1978 Alma-Ata International Conference on Primary Health Care, PHC remains central to the health policy of most African countries. But centralized health systems are no longer in a position to provide even the minimum of care required at all levels. Thus there was a clear recognition that unless a realistic alternative is created to manage the delivery of PHC the objectives set at Alma Ata would not be met. This recognition resulted in the development of the district health system concept that has been promoted by the World Health Organization (WHO) and World Bank

'A District health system or DHS based on PHC is a more or less self-contained segment of the national health system. It comprises first and foremost a well-defined population living within a clearly delineated administrative and geographic area. It includes all the relevant health care activities in the area, whether governmental or otherwise'.

The first principle of the Ethiopian health policy is decentralization of the health care system as a basic mechanism to assess, understand and resolve major local and community health problems. The primary strategy used for improving health services delivery in Ethiopia is also the decentralization of authority and accountability of managing health services to sub national levels. This strategy was part of a broader government decentralization policy across sectors. Decentralization was carried out in the form of devolution of authority to the regional level in 1996 and to the district (district) level in 2002. Devolution in the health sector consists of giving power and authority to local governments in deciding on the delivery and financing of health care services. Assessing the district health systems should be done periodically to provide necessary information or district health profile which is used for the planning, monitoring and evaluation of district health services. The objectives of the assessment of the district health system are: To identify the strengths and weaknesses in the organizational structures, the managerial process, the provision of priority health activities, community participation and empowerment, and the management of resources in the district health system.

Thus the Sodo district health profile provides information about the district in an organized manner and in one document. This district health profile assists to pick up and interpret important features about the district. Considering the importance of the district health profile in the planning and management of district health services, the document should be updated regularly, preferably on annual basis, and before the planning sessions inaugurates.

Rationale of the study

Describing health profile of Sodo district is helpful to address the current gap of community health of the district, and for stakeholder's priority setting; and it is important to understand the demographic, socio-economic, morbidity and mortality and other data of the district. Health profile generates data which can be used at community level. The finding from the health profile description project will help the district and other stakeholders for public health decision making.

II. Objectives

General objective

To describe the health profile of the district for priority setting

Specific objectives

To describe the district health system

To assess health status and indicators of the district

To describe disease burden/magnitude and other health related events

To identify priority health problems

To produce a health profile of the district with recommendations

III. Method

Study setting and Period

The study area/ Sodo district/ is found in Gurage zone, SNNPR, Ethiopia. The data sources were health office and health institutions, Finance, Education, Agriculture, Culture & Tourism, Water offices and data reviewed. Publications and literatures about the area also reviewed. The data were collected through interviews, reviewing the documents and discussions with concerned office heads, process coordinators and officers by using structured questionnaires. The study was done from 12-23 April 2013.

Study design

Descriptive cross sectional study design was applied.

Data Collection

Data was collected using checklist and it was collected from different sectors of the district.

Data Analysis tool

Data were analyzed using Microsoft office excel 2007

Dissemination of the findings

The finding was presented for the SNNPR HB/PHEM core process

IV. Results

1. Geographic and Demographic Characteristics

There was no evidence how and why the name sodo is given to this district. The district is found 261 km East of zonal town Wolkite (Gurage Zone), 198 km North of SNNPR capital Hawassa and 103 Km South of Addis Ababa. This District also found in 8.095173-8.453552⁰ latitude and 38.375395-38.714232⁰ longitude. The District has 58 kebeles; of which 54 are Rural and 4 are Urban. The District is bordered with West Oromiya zone in the North, Meskan district in the South, East Oromiya zone in the East and West Oromiya Zone & Kokir Gedebano Gutazer district in the West. The total area of the district is 881.50 Square km and has a population of 155,378. Population density was 177/squ.km. The size of the rural population was 140,078 (90.2 %) and the remaining 9.8% is Urban. When we see the religious composition Orthodox 93.35%, Muslim 3.30%, Catholic 0.03% Protestant 3.28% and Traditional & others were 0.04%. Main source of income of the population is farming; yearly income per household estimated 6000 birr and average income per capita was estimated to be birr 1333. There were 20 budgeted government sectors in the district.

This district has the Northern tourist attraction site of SNNPR, Tiya stele. Megalithic site of Tiya is one of the nine world heritage sites in Ethiopia. This site is registered as world heritage site in 1980 G C by UNESCO.

The male & female population was 76,135 and 79,243 respectively; and Sex ratio (Male to Female) of the district is 0.96:1. Proportion of children <1 year of age 6060, <5years of age 24239 and < 15 years of age was 74379. The number of old people aged 65 and above was estimated to be 62. The proportion of Women in the child bearing age was 36,203 and women expected to be pregnant were 6060. The dependency ratio was estimated to be 47.9%.

The health service coverage was more than 100%. The average annual rain fall was 14.4mm and the temperature ranges from 10^{0c}-27^{0c}.

2. Health System and the Health status

The potential health service coverage of the district was more than 100%. There were 7 health centers, 54 rural health posts (government), 8 private clinics, 3 drug stores/rural drug venders, and 1 diagnostic laboratory providing health services to the district population. In addition to this one primary hospital was under construction which is considered as a component of Primary Health Care Units (PHCUs) in the HSDP IV.

Ratio of Health center to population reached 1:22197; and health post to population was 1:2877. Profession wise the ratio of health officer to population 1:15538, Nurse to population 1:1992, midwife to population 1:15539 and Health Extension worker to population 1:1653.

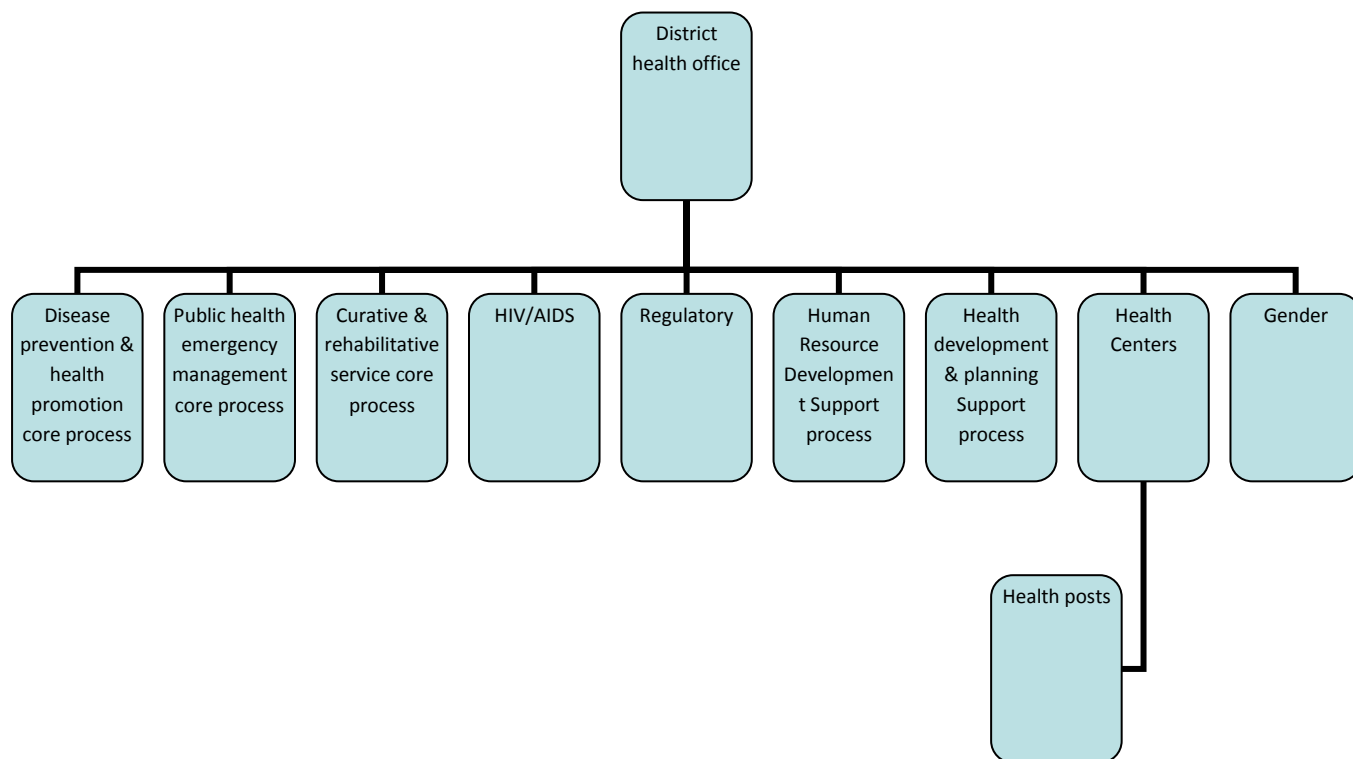


Figure 15 Showing Sodo District Health office organization chart (Organogram)

Table 9. Man power of Sodo district health office and health facility

Sr. no	Type	Number
1	Physicians	0
2	Health officers	13
3	Laboratory technician/technologist	10
4	Pharmacy technician/Pharmacist	8
5	Nurses	71
6	Midwife	8

7	X-Ray technician	0
8	ENHS	9
9	HEWs	95= 89 rural & 6 urban
10	TBA	None, due to new structure is established at Kebele level i.e. Health Extension program
11	CHA	5; but not functional due to new structure is established at Kebele level i.e. Health Dev't army

Table 10. Top ten leading causes of OPD visit (morbidity)

Sr. no	Adult	N ^o of cases	Under 5 children	N ^o of cases
1	Acute upper respiratory infection	8238	Acute upper respiratory infection	4213
2	Pneumonia	5281	Diarrheal Disease	2400
3	Parasitic Disease (IP)	5087	Pneumonia	1719
4	Diarrheal Disease	3695	Malaria	1244
5	Acute febrile illness	3570	Helmentiasis	871
6	Malaria	3425	Eye diseases	631
7	Typhoid fever	2930	Trauma	572
8	Disease of Digestive system	2616	Infection of skin and sub-cutaneous	471
9	Trauma	2544	Otitis Media	106
10	Urinary tract infection (UTI)	2103	Severe Acute malnutrition	47

Source: Sodo District Health office 2004 EFY Annual Report.

Table 11. Top ten causes of admissions

Sr. no	Causes of admissions	Adult № of cases	Under 5 age children № of cases
1	Typhoid fever	14	No admission
2	Pneumonia	8	
3	Malaria	6	
4	Unspecified Disease	6	
5	Acute febrile illness	5	
6	Diarrhea	5	
7	Poison	4	
8	Dyspepsia	4	
9	Septicemia	3	
10	Relapsing Fever	3	

Source: Sodo District Health office 2004 EFY Annual Report.

No admission of under 5 age cases, they were referred to hospitals. Concerning Top ten causes of death (mortality) data were not available at all level; because severe cases were not managed at health center level rather they were referred to the next higher level health facilities or referral Hospitals.

3. Vital statistics

The population growth rate was estimated to be 2.9% i.e. SNNPR estimate of CSA. The other vital statistical indicators like CDR, NMR, IMR, and MMR data were not available during the data collection period.

4. Status of Primary health care components

4.1. MCH and EPI coverage of the district

The contraceptive acceptance rate was recorded as 69%. The antenatal care coverage of the district was 132 %; and the delivery service coverage and postnatal care coverage were 25 % and 89 % respectively. Less than one year of age children vaccination schedule had covered the whole kebeles of the district. The vaccination was carried out by each kebele HEWs and supported by the catchment health center staffs. So the vaccination coverage of BCG 98%,

Measles 105%, Penta1 105% and Penta3 were 103%. The dropout rate penta 1 to Penta 3 was 1.6% and Penta 1 to Measles was 1.2%.

4.2. Environmental sanitation and availability of safe drinking Water

The estimated numbers of households in the district were 31,710. The numbers of households with latrines were 29641 (93.5%). The numbers of kebeles accessed to protected water supply were 24 and safe water supply coverage was 41.4%.

4.3. Endemic Diseases and Other Diseases

Malaria prevention and control program of Sodo district Malaria is the 6th causes of morbidity in the district with total cases of 3425. There are 37 malarious kebeles in the district which comprises 63.8%. The ITNs coverage reached 69.2%. Eighty-one percent of households were covered by IRS. Cases which had plasmodium falciparum were 662 /19.3%/, plasmodium vivax 2513 /73.4%/ and mixed 250 /7.3%/. Of these confirmed cases 651 (19%) were children less than 5 years of age.

Prevalence of TB/Leprosy:

Tuberculosis (TB) and Leprosy prevention and control program was implementing in the district since the program established in the SNNPR. New cases registered in 2004 EFY were 177. Of these cases 95 pulmonary TB smear positive, 33 pulmonary TB smear negative and 49 extra pulmonary TB cases were registered.

In 2003 EFY 54 new smear positive, 103 new smear negative cases and 77 new extra pulmonary TB cases were registered. These 234 cases evaluated in each quarter of 2004 EFY. When we evaluated the TB treatment outcome status of the cases the following result were registered. These were TB detection rate, treatment completion rate, TB cure rate and TB treatment success rate were 41%, 85.7%, 72%, 57.1% and 74% respectively. Seven cases were registered as defaulters. Deaths during TB treatment were 7(3%) out of 234 cases. Total TB patients screened for HIV were 141 and 3 of them positive for HIV.

Two new cases of leprosy were reported.

HIV/AIDS Situation

Clients who were provided VCT service were 19,035. Total people screened for HIV were 45,221. People who have HIV in their blood were 90 (30 males and 60 females) and 6781 PMTCT Service were provided. People put on Pre ART were male 111 and female 200 sum up

311. Patients on ART were males 58 and females 92 total 150. A total of 381,293 condoms distributed in the district.

4.4. Nutritional intervention

This district is one of food insecure districts of the region. The production rate of 2003/2004 EFY reduced by 3% while comparing it with the last year [2]. The Enhanced Outreach Strategy (EOS) campaign was conducted once in the year 2004 EFY. A total of 1256 children less than 5 years of age and 279 mothers were screened for malnutrition. The district was included in community based nutrition program /CBN program/ and nutritional intervention activities were implementing. All rural kebeles /54/ had OTP sites.

5. Educational status

There were 64 Schools in the district. School enrollment between age 7-18years reached 82.3 % (Grade 1-12) [4].

School health activities:

There were 64 Schools in the district. Of them 12 /18.8%/ schools had protected water supply and 61(95.3%) of them had functional pit latrines. Out of 61 Schools who had functional pit latrines 34 had separate latrines for males and females. Forty two (65.6%) schools had health clubs.

6. Communication and Utilities

This part of the profile tells us how many of the health facilities and kebeles have access to: Transportation, Telecommunication and Electric power.

Transportation: Out of 58 kebeles of the district 37 kebeles and Health facilities had transportation access that means 63.8% of them had all weather roads. But over all road coverage was 25.08% according to the district road and transport office report of 2004 EFY /2012/2013/.

Telecommunication: In general the district covered with /accessed with/ mobile net work service. Four towns and 4 health centers had full automatic fixed phone service; and all rural Kebeles and health posts had access to wireless phone service.

Electric power: Even though the effort to access some Kebeles of the district with hydro electric power continuing; there were 4 urban & 9 rural kebeles had 24 hours hydro electric power service during 2004 EFY. As the same time 4 /57%/ health centers and 9 /16.7%/ health posts accessed to 24 hours hydro electric power. The overall hydro electric power coverage of the district reached 22.4%.

Budget Allocation of the District

Sodo district had 20 budgeted sectors in 2004 and 2005 EFY. For purpose of comparison among sectors the operational or recurrent budget allocation for sectors was as seen in the following figure.

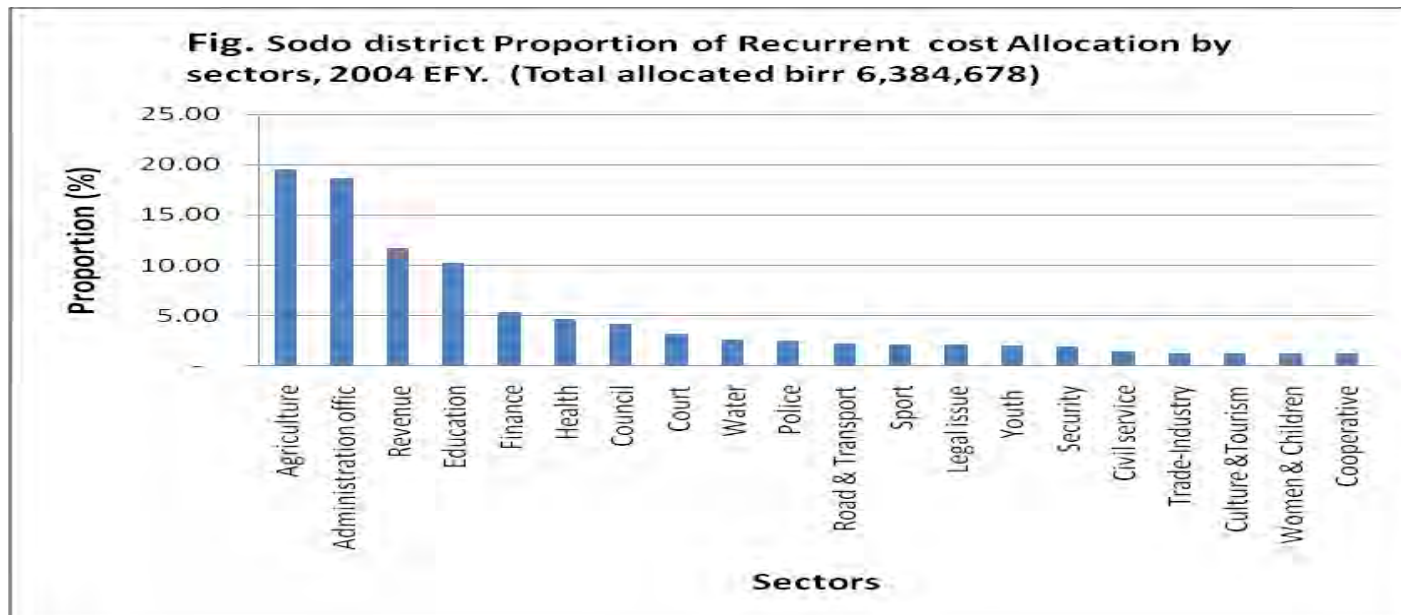


Figure 16. Showing Sodo district proportion of recurrent budget allocation by sectors, 2004 EFY.

Table 12. Health sector Budget Distribution (2003- 2005 EFY)

Sr. no	Health institution	2003 EFY		2004 EFY		2005 EFY	
		Salary (birr)	Recurrent (birr)	Salary (birr)	Recurrent (birr)	Salary (birr)	Recurrent (birr)
1	Sodo Health Sector	3,324,232	801,025	4,699,425	300,000	6,105,384	290,000

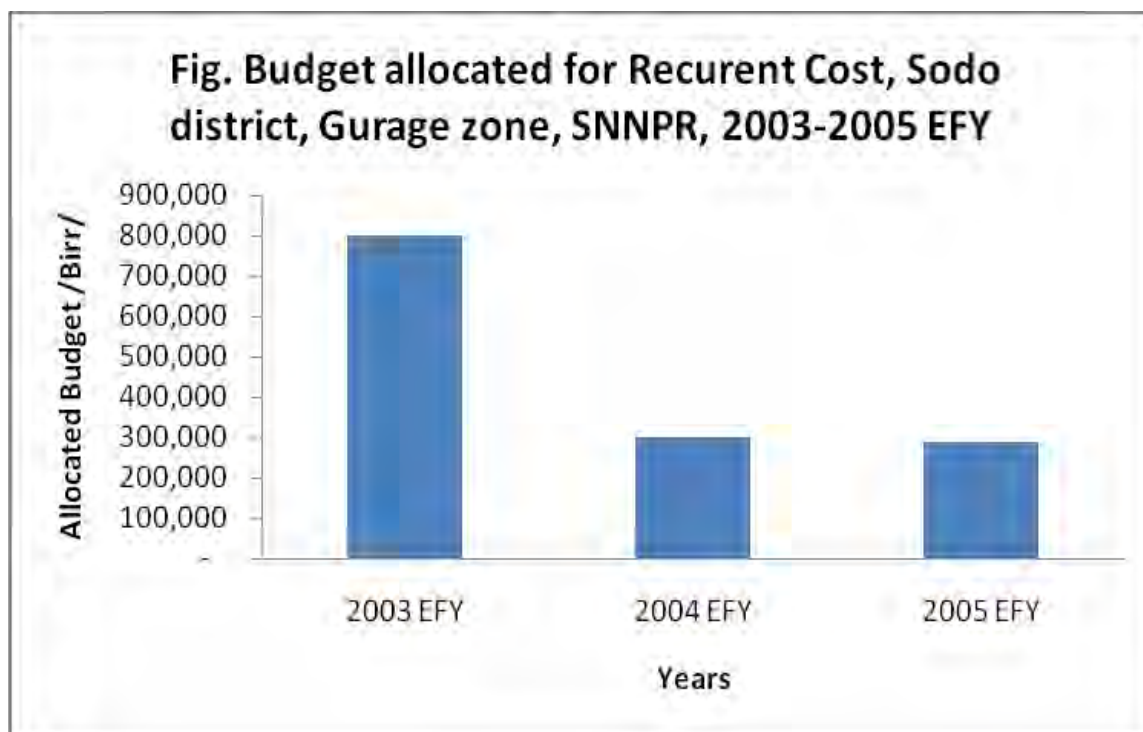


Figure 17. Showing budget allocated for recurrent cost, Sodo district health office, Gurage zone, 2003-2005

7.2 Health Care financing /HCF/ (2003 to 2005 EFY)

Table 13. Revenue Retention and Utilization

Sr. no	Name of the Health HFs	HCF Started at (EFY)	Budget Allocated (birr)			Budget Utilized (birr)		
			2003	2004	2005	2003	2004	2005
1	Buee HC	2003	629,455.22	323,429	464,708	350,000.32	319,468.47	327,051.40
2	Kella HC	2003	509,454	313,500	382,874	474,466	279,254.36	123,172.35
3	Wulawula HC	2003	160,525	180,273	278,897	59,978.43	152,461.47	127,682.79
4	Geraeno HC	2003	94,000	51,796	97,125	67,344	35,714.35	47,903
5	Adele HC	2004	-	132,061	85,121	-	78,509.22	68,413.94
6	Tiya HC	2004	-	155,967.18	164,609	-	81,830.62	63,653.87
7	Endebeyo HC	2004	-	20,907	11,493	-	0	9,368
	Total		1,393,434.22	1,177,933.18	1,484,827	951,788.75	947,238.49	767,245.35

The detail of Health care financing data were seen as above; but the budget utilization of the health centers were:

- ✚ 68.30 % in 2003 EFY
- ✚ 80.42 % in 2004 EFY
- ✚ 51.67% in 2005 EFY /9 months utilization/

Fee Waiver (FW)

Fee waiver is giving health service without payment those who are poor or who couldn't pay for service they got. The main purpose of this strategy is to bring equity in health utilization among the relatively rich and poor people. The budget should be allocated by the District administration office for health facilities who had agreement to give the required health services.

Since 2003 EFY, Sodo district had an agreement with 7 health centers which are found in the district and Butajira Hospital. In 2003 EFY birr 17,000 allocated and utilized for fee waiver; but the number of people (patients) who got the service is unknown (not recorded). Due to screening problem encountered for 2004 EFY the district didn't allocate any budget for fee waiver. In this Ethiopian fiscal year (2005) birr 15, 000 is allocated and 3 diabetic patients got the service in Butajira hospital.

Exempted Health services:

These services are providing to anybody without charge. These services are:

EPI services, TB treatment (DOTS), Leprosy treatment and care, Family planning services, Ante natal and post natal services, Delivery services at PHCU, PMTCT of HIV/AIDS, Fistula, Epidemic control, and other services as per future government decision.

Disaster situation in the district

There was not any disaster (natural or manmade) in the district in the last one year. But there was an outbreak of rubella occurred in 7 kebeles of the district. The numbers of suspected cases were 100 and blood specimens were collected from 5 cases and 4 cases were confirmed for rubella. There was no death reported during the outbreak period.

V. Discussion

The health profile description revealed that the potential health service coverage of the district reached more than 100%. This description is similar with the HSDP III target to attain 100 % of potential health service coverage at national level [5].

Ratio of Health center to population reached 1:22197; and health post to population was 1:2877 which were above the national standards, 1: 25,000 and 1: 5,000. Profession wise the ratio of health officer to population 1:15538, Nurse to population 1:1992, midwife to population 1:15539 and Health Extension worker to population 1:1653. But the national available human resource for health during HSDP III were health officer to population 1:20638, Nurse to population 1:4895, midwife to population 1:57354 and Health Extension worker to population 1:2437 [5].

The contraceptive prevalence rate was recorded as 69%. This coverage is more than the national coverage /32%/ of 2010. The antenatal care coverage of the district was 132 %; and the delivery service coverage was 25 %; While the national antenatal care coverage 71.4 % in EFY 2002 and On the other hand, the percentage of deliveries attended by skilled health personnel 16.8% in this period. The vaccination coverage of Penta3 was 103% and Measles-105%. The National vaccination coverage was Pentavalent 3- 86% and measles- 82% in EFY 2002. Hence the performance of the district was much higher than the national [6].The dropout rate penta 1 to Penta 3 was 1.6% and Penta 1 to Measles was 1.2%. These dropout rates were found in the acceptable level i.e. less than 10%. The numbers of households with latrines were 29641 (93.5%). The addition of the new latrines (2,596,031) constructed in EFY 2002 plus the baseline of 9,878,199 resulted in a cumulative total of 12,474,230 households with latrine, with a coverage of 73.7%. So the district household with latrines coverage of the district was greater than the national [6]. The ITNs coverage of the district reached 69.2%. At national level households in malarious areas who own at least one LLIN were 65.6%. Eighty-one percent of households were covered by IRS. The national annual report showed that households in IRS targeted areas that were sprayed in the last 12 months were 55%.

Cases which had plasmodium falciparum were 662 /19.3%/, plasmodium vivax 2513 /73.4%/ and mixed 250 /7.3%/. This finding didn't match with the national malaria guideline as the distribution of plasmodium species, PF 60% and PV 40%.

The district TB case detection rate, TB cure rate and TB treatment success rate were 29%, 72% and 74% respectively. The National annual report of 2002 EFY showed that TB case detection rate was 36% (HSDP III target: 50%), TB treatment success rate 84.0% (HSDP III target=85%), and TB cure rate was 65.2% in the same period. Therefore, TB case detection rate in Ethiopia is still far below HSDP III target.

Twelve /18.8%/ schools had protected water supply and 61(95.3%) out of 64 schools had functional pit latrines. Out of 61 Schools who had functional pit latrines 34 had separate latrines for males and females.

VI. Limitation

No admission of under five cases, they were referred to hospitals. Concerning top ten causes of death (mortality) data were not available. In general data used for calculating were not available.

VII. Conclusion

The children vaccination dropout rate penta 1 to Penta 3 and Penta 1 to Measles were <10 %; this showed that the defaulters were traced and vaccinated timely or there were no defaulters alive or they left the district. The prevention and control strategies of Malaria had shown its effectiveness; because malaria becomes the 6th causes of morbidity in the district. Tuberculosis case detection rate was low. Safe water supply coverage was below the acceptable level; so from the ten top causes of morbidity intestinal parasites, diarrheal diseases and typhoid fever might be due to this low coverage of safe water supply. Three schools didn't have latrines. This situation encourages open field defecation. The operational cost allocated for the health sector decreased from year to year.

VIII. Recommendations

The delivery service coverage needs special attention

The reasons for School dropout have to be addressed (Female students from Grade 9-10 and Male students Grade 11-12)

The remaining three schools should have latrines i.e. they should Construct latrines as soon as possible

Screening for Malnutrition should be strengthened

The operational cost allocated decreased from year to year; so it should be increased based on the increase of gross district budget annually.

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Chapter V - Scientific Manuscripts for Peer reviewed Journals

Authors: Nigatu T.Abebe, D. Desalegn (Ethiopia Field Epidemiology Training Program)

Correspondence: tanigatu@yahoo.com, desalegnju@yahoo.com

Title: Measles Outbreak Investigation, Shay Bench Woreda, SNNPR

Abstract

Introduction: Measles is a highly infectious viral disease caused by a Morbillivirus and for which humans are the only reservoirs. Transmission is primarily person-to-person via aerosolized droplets or by direct contact with the nasal and throat secretions of infected persons. In Ethiopia, the expected measles 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.

Methods: An outbreak investigation was conducted in Shay Bench woreda, Bench Maji Zone, SNNPR from 19 November to 3 December, 2013. Descriptive epidemiologic study design and unmatched case-control study designs were applied in which exposures to environmental factors were compared between diseased due to measles and subjects free from measles. Diagnosis is done using blood serum to confirm the presence of IgM anti-body. Blood specimens were collected from five cases and sent to EHNRI for laboratory investigation; and all samples, 5 (100%) were IgM positive for measles. Reviewing secondary data (Registry books, case based reports, line list records, surveillance data and related documents), were done in zonal health department, woreda health office, health center and health posts. Interview using structured questionnaires. Data was analysed using excel and further analysed by Epi Info version 3.5.3

Result: There were 478 measles cases seen from 13 October 2013 to 28 Nov 2013 with 240 males and females. Of these cases 3 deaths were registered (CFR 0.6%) and the attack rate was 331 per 100,000 populations. The finding reveals that measles cases who were vaccinated for less than 2 doses of measles antigen were more at risk of developing measles (OR = 2.569; 95% CI = 1.182, 5.733). The households who had family size with 5 persons and more were at risk for developing measles (OR = 12.27; 95% CI = 4.763, 35.68). Measles cases living with persons with symptoms of measles in the same households had more risk to develop measles (OR = 3.6; 95% CI = 1.5581, 8.2694).

Conclusion: The descriptive analysis shows that males and females are affected almost equally, and the age group < 5years are more affected than the other age groups. Vaccination status of the study subjects were checked by vaccination cards was very low. The majority of cases and controls were vaccinated at the age of 9 months. Cases living with persons with symptoms of measles in the households were more likely develop measles disease. Cold chain management and vaccine efficacy need additional study.

Introduction

Measles is a highly infectious viral disease caused by a Morbillivirus and for which humans are the only reservoirs. Transmission is primarily person-to-person via aerosolized droplets or by direct contact with the nasal and throat secretions of infected persons ^[1]. The incubation period is 7 to 18 days from exposure to onset of fever ^[2]. Measles is a highly infectious disease that causes mortality in both developing and industrialized countries. It is estimated that in 1998 about 30 million people contracted measles and that 875 000 of them died. Measles vaccine provides long-term immunity against the disease. Adequately chosen and implemented vaccination strategies not only reduce mortality and morbidity but also interrupt the transmission of indigenous measles virus ^[3].

As of 2008, it was estimated that, globally, measles caused some 200,000 deaths annually, of which around 30,000 occurred in Africa. Measles is among the top causes of death in children less than 5 years of age in many African countries. In developing countries the overall case-fatality rate has been estimated to be between 3% and 6%. The highest case-fatality rate occurs in infants under 12 months of age, among whom it reaches between 20% and 30%. Malnutrition and infection with human immunodeficiency virus are risk factors for complications and mortality ^[3]. Natural infection produces lifelong immunity. Measles antibodies develop in approximately 85% of children vaccinated at 9 months of age, 95% of children vaccinated at 12 months of age, and 98% of those vaccinated at 15 months of age. In consideration of the age at infection and the case-fatality ratio, WHO recommends vaccination at 9 months of age in countries at the mortality reduction stage. In countries with low coverage, epidemics occur every two to three years. In countries with high coverage, epidemics occur at five- to seven-year intervals ^[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. 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 ^[5]. 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. Since 2002, Ethiopia adopted these regional goals and strategies and has been taking important steps to control and ultimately to

eliminate measles by 2020 ^[5]. Strategies for sustained measles morbidity and mortality reduction are: Routine immunization of > 90% of children aged 9 to 11 months, provide a second opportunity for measles vaccination, Case-based measles surveillance and improved case management including provision of vitamin A.

For timely measles outbreak investigation, it is imperative that routine measles data is collected, collated and analyzed regularly. Outbreaks occur when the accumulated number of susceptible individuals is greater than the critical number of susceptible individuals for a given population to sustain transmission. In addition, cases may be identified from multiple health facilities in the same woreda within 30 days, if regular analysis is not done, outbreak detection may be delayed.

All suspected outbreaks should be investigated and confirmed by collecting blood specimens from the first five reported cases. You also need to take nasopharyngeal swabs from 5 cases to isolate viruses and document strains.

Methods

Study area and period:

An outbreak investigation was conducted in Shay Bench woreda, Bench Maji Zone, SNNPR from 19 November to 3 December, 2013.

Study design

Unmatched case-control in which exposures to environmental factors were compared between diseased due to measles and subjects free from measles

Diagnostic Methods for measles

Usually diagnosis is done using blood serum to confirm the presence of IgM anti-body. Thus in this outbreak 5 blood samples taken all revealed IgM +ve for measles.

Data collection and procedures:

Reviewing secondary data (Registry books, case based reports, line list records, surveillance data and related documents), were done in zonal health department, woreda health office, health center and health posts. Interview using structured questionnaires.

Data processing and analysis:

Data was analysed using excel and further analysed by Epi Info version 7

Operational definition

Case: An individual with signs and symptoms of measles in Shay Bench district who diagnosed by a clinician as a measles case using standard case definition or confirmed through serum examination from 19 November to 3 December, 2013.

Control: An individual to the same district and or living in the study area but has no clinical signs and symptoms of measles during the study period. He/ She can be the neighbourhood or family of the cases.

A standard case definition and community case definition [6]

A standard case definition of suspected and confirmed cases of measles was used as tool for detecting measles cases. These definitions must be used at all levels including the community, health professionals working at health posts, health centers, hospitals, health offices at different levels, private health facilities, other government health facilities and NGO clinics.

Standard case definition of measles to be used at health centers and above:

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

Confirmed: A suspected cases with laboratory confirmation (positive IgM antibody) or epidemiologically link to confirmed cases in an epidemic.

Epidemiologically linked case: A suspected measles case that has not had a specimen taken for serologic confirmation and is linked (in place, person and time) 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.

The other was community case definition for measles at Health Posts and community levels defined or categorized under Rashes. So the definition put like the following.

Case Definition (Rashes): Any person with fever and vesicular, maculapapular or pustular rashes on any part of the body.

Epidemic Threshold:

Occurrence of five or more reported suspected measles cases or 3 measles IgM positive cases in one month in a defined geographic area such as a kebele, woreda or health facility catchment area.

Data dissemination:

The findings were communicated to the RHB/PHEM core process, AAU, School of Public Health, EFETP.

Result

I. Description of measles outbreak

There were 478 measles cases seen from 13 October 2013 to 28 Nov 2013 with 240 males and females. Of these cases 3 deaths were registered (CFR 0.6%) i.e. the outcome were: cases alive 475 and number of deaths 3. The attack rate was 331 per 100,000 populations. Blood specimens were collected from five cases and sent to EHNRI for laboratory investigation; and all samples, 5 (100%) were IgM positive for measles.

As we have seen from the following figure (Fig1.) more cases of measles were reported under 5 years of age; and there were no cases above 44 years of age.

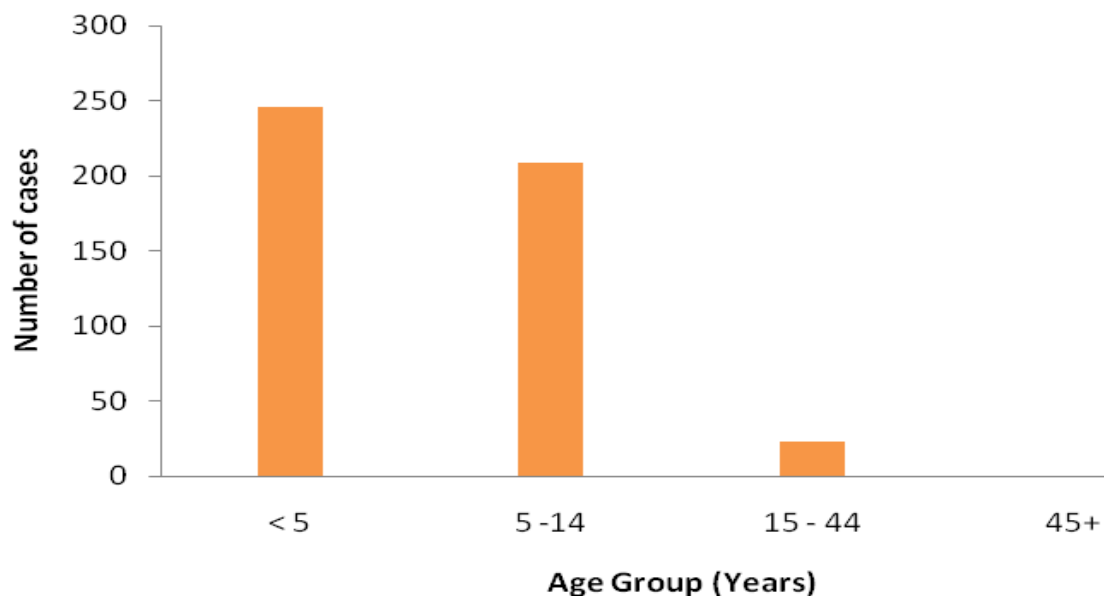


Fig1. Measles cases by age group, Shay Bench Woreda, Bench Maji Zone, SNNPR

Vaccination Status of measles cases

From the total 478 measles cases more than 50 % of cases were vaccinated at least for 2 doses of measles; and 80 % of the total cases were vaccinated for at least 1 dose of measles antigen (see fig2) below.

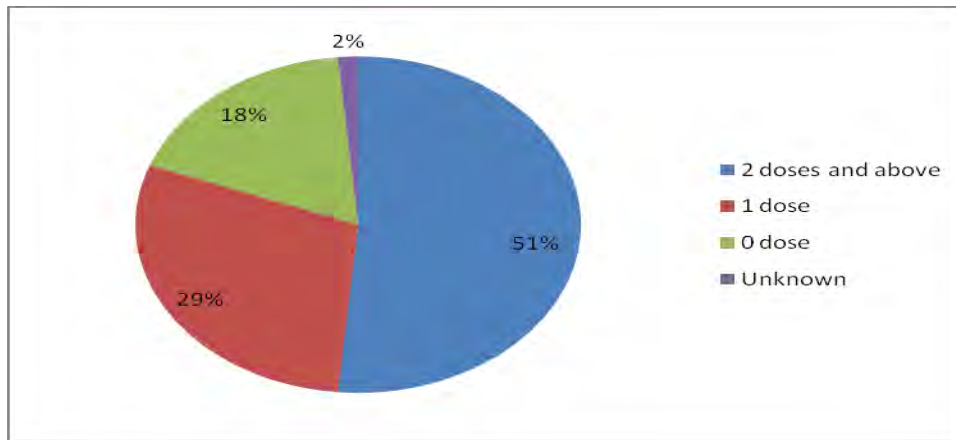


Fig2. Vaccination status of measles cases, Shay Bench woreda

Time Course of the measles outbreak

The index cases were 2 females seen at the same date (On 14/10/ 2013) at Shay Bench health center, who were from Shay Bench Town administration kebele 02 and Ziagin rural kebele with the age of 14 years and 12 years respectively and were alive. At woreda level clusters of cases starting from 15/10/2013 to 29/11/2013 and there were a total of 478 cases and 3 deaths. The woreda health office and health centers conducted nonselective vaccination campaign that aims to increase population immunity by focusing upon quickly increasing measles immunization coverage for all children aged 6 months to less than 5 years regardless of their vaccination status. The first round SIAs conducted from 20/10/2013 to 25/10/2013 in 8 kebeles which were more affected than the others.

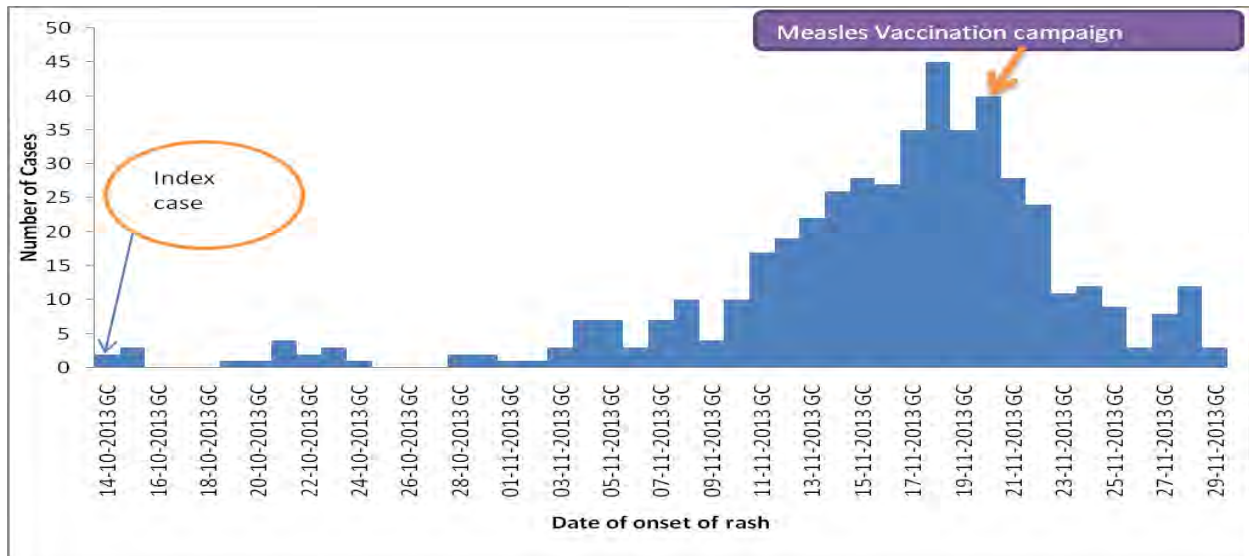


Fig3. Depicting time course of measles outbreak in Shay Bench Woreda, Bench Maji Zone

The distribution of measles cases by kebele, Shay Bench Woreda

Out of 21 kebeles of Shay Bench woreda 16 kebeles (76.2%) were affected by measles.

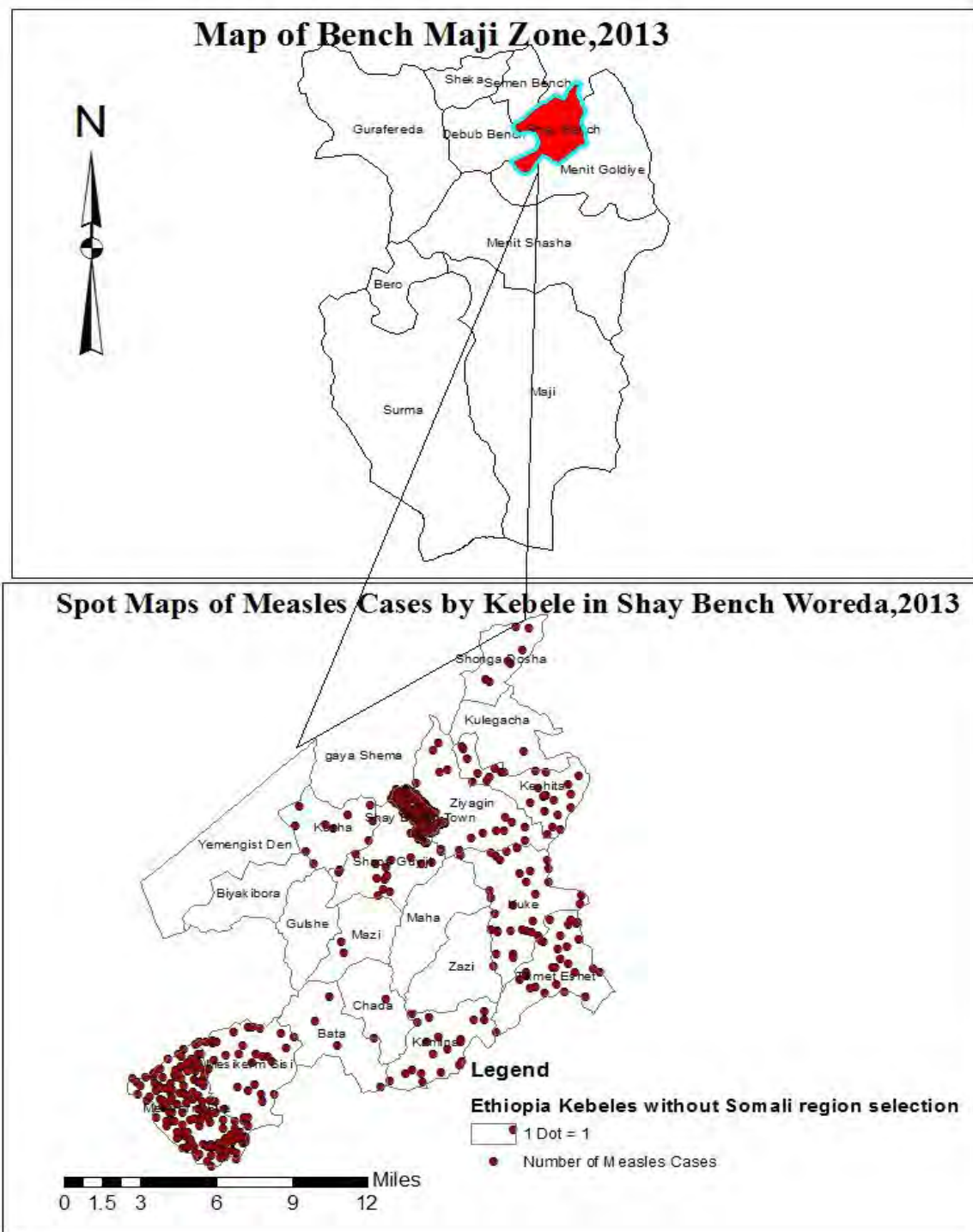


Fig4. Spot map of Measles cases by Kebele, Shay Bench Woreda

II. Case-control Study

Demographic Information

The demographic information were collected from cases and controls; that means it is collected from cases and controls who were adults; and for children from their parents, care givers or guardians.

Table 14 Demographic Information

Religion	Frequency	
	Number	%
Orthodox	54	43.9
Muslim	8	6.5
Protestant	57	46.3
Others	4	3.3
Total	123	100
Level of Education		
illiterate	33	27
Grade 1-4	6	5
Grade 5-8	28	23
Grade 9-12	27	22
Above grade 12	29	13
Total	123	100
Marital Status		
Married	94	76.4
Single	26	21.2
Widow	1	0.8
Divorced	1	0.8
Others	1	0.8
Total	123	100
Occupation		

Farmer	16	13.0
Government employee	30	24.4
Merchant	16	13.0
Private employee	3	2.4
Student	16	13.0
Others	42	34.2
Total	123	100

The finding reveals that measles cases who were vaccinated for less than 2 doses of measles antigen were more at risk of developing measles disease (OR = 2.569; 95% CI = 1.182, 5.733)

The households who had family size with 5 persons and more were at risk for developing clinical measles (OR = 12.27; 95% CI = 4.763, 35.68). Measles cases living with persons with symptoms of measles in the same households had more risk to develop measles (OR = 3.6; 95% CI = 1.5581, 8.2694).

There were no cases that develop complications. From the total cases half, 23(50%) visited the nearest health facilities within one day.

No cases were treated with traditional medicine before visiting the health facilities. A total of 98 study subjects received measles vaccination prior to the outbreak. Of these subjects 34 (34.7%) were cases and 64 (65.3%) were controls. Vaccination status of the subjects were checked by vaccination card were 8 (8.2%) and by history were 90 (91.8%). Most cases and controls were vaccinated at the age of 9 months, 86 (87.8 %). Subjects living with persons with symptoms of measles in the neighbourhood were more likely develop clinical measles (OR = 22.5; 95% CI = 2.78, 182.4). Controls who had measles infection in their life were 6 (4.7%).

Study subjects who receive vitamin A at 6 months were 86 (67.2 %); of these study subjects 35 (32.8 %) were cases and 51 (%) were from the controls. Either of the cases or the controls was not on OTP and with bilateral edema.

Discussion

The case fatality rate was 0.6% which was below the developing countries overall case-fatality rate which has been estimated to be between 3% and 6% [3, 5]. More than 50 % of cases were vaccinated at least for 2 doses of measles; and 80 % of the total cases were vaccinated for at least 1 dose of measles antigen. This finding was contradicted that when correctly administered at 9

months of age, measles vaccine confers life-long protection to approximately 85% of those vaccinated [1]. From this finding the majority of measles cases were under the age of 5 years; a similar study shows that in both urban and rural areas in developing countries, the majority of measles cases occur in children less than five years of age, as illustrated by data from Nigeria [4]. Males and females are affected almost equally, and the age group < 5 years are more affected than the other age groups. When measles virus is introduced to a non-immune population, nearly 100% of individuals will become infected and develop clinical illness. Vaccination status of the study subjects were checked by vaccination cards was very low. The majority of cases and controls were vaccinated at the age of 9 months. Cases living with persons with symptoms of measles in the neighbourhood were more likely develop measles disease.

The woreda health office should conduct SIAs for the rest adjacent kebeles which were not covered. The Bench maji Zone health department and SNNPR HB should support the Woreda health office by drugs and supplies, finance and logistics in order to strengthen the measles surveillance and case management. As the national measles guideline 3rd edition (Ethiopia) strongly suggested that children receiving measles vaccine before the age of nine months during a campaign must be revaccinated after the age of nine months (with at least a one-month interval between the doses), since the efficacy of vaccine administered before nine months of age is likely to be low. Routine immunization should be strengthened.

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Chapter VI - Abstracts for Scientific Presentation

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6.1 Malaria Outbreak Investigation-Gamogofa zone, Southern Ethiopia, 2013

Background: About 75% of Ethiopia's landmass is potentially malarious and about two thirds of the population is at risk of infection. Malaria transmission varies widely with the country's diverse topography and associated rainfall pattern. In January 2013, Gamo-Gofa Zone Health Department reported unusual increase in malaria cases. We investigated to identify risk factors for the outbreak and recommend control measures.

Method: A case control study was employed. Malaria case was defined as any person present to Chano Mile health post between Epi week 1-7, 2013 and confirmed by RDT, and one control was enrolled for each case from the closest household. Structured questionnaire was used to identify exposure to possible risk factors, and data was analyzed using Epi Info.

Result: We identified 54 confirmed cases and 54 controls. The median age of cases was 15 years ranges from one to 67 years; and median age of the controls was 21 ranges from two to 52 years. People living within 1km radius of a breeding site (OR= 5.5, 95% CI: 2.30-13.15) and using worn out LLITNs (OR: 5.2, 95% CI: 2.28-11.82) were associated with the disease.

Conclusion: The investigation suggested that living near to mosquitoes breeding sites within 1km radius and using a worn out LLITNs were the risk factors for malaria infection. We recommend strict environmental management of breeding sites and replacing worn out mosquito nets.

Key words: Malaria, Outbreak, Chano-Mile, Southern Ethiopia.

Word count: 221

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6.2 Acute flaccid paralysis surveillance system evaluation report, Silte Zone, SNNPR, December 2013

Abstract

Introduction: Acute Flaccid Paralysis (AFP) surveillance was adopted by World Health Organization (WHO) to monitor progress towards poliomyelitis eradication. The study discusses on the evaluation of AFP surveillance system in Silte zone 2012, evaluates performance of the AFP surveillance system, and identifies components that require strengthening.

Methods: A cross sectional descriptive analysis was conducted on secondary AFP surveillance data for Silte zone for the period of 2013.

Results: Silte zone reported 10 AFP cases in 2013. Of these, 80% were <5years of age, and 50% were male and 50% were female. One case was confirmed for VDPV2. The zonal average annualized non-polio AFP detection rate were 2.8 non-polio AFP cases/100,000 children <15years in 2013. All performance indicators met the WHO-specified targets except the stool adequacy rate of 70 % (WHO target is $\geq 80\%$). The vaccination status of the cases were validated that 70% unknown. The performance status, woredas with high NP-AFP rate and high stool adequacy rate were: Dalocha, Lanfuro Mirab Azernet and Sankura; and woredas with high NP-AFP rate and low stool adequacy rate were: Alichu Wuriro and Silti. Silent or no AFP case reported woreda was Misrak Azernet.

Conclusion: The AFP surveillance system met most WHO-specified epidemiological and laboratory performance standards. The zone had high NP-AFP rate. The surveillance system needs to address problems of low stool adequacy rate. All woreda of the zone reported at least one case of AFP. The routine vaccination program for OPV should be strengthened.

Word count: 238

Chapter VII - Narrative Summary of Disaster Situation Visited

Abstract

The government of Ethiopia has been conducting emergency health and nutrition assessment in the past years to address the emergency health and nutrition need of the country, the assessment is conducted twice in a year following post harvesting season Belg and Meher. The assessment is lead by Federal Disaster Response Management and Food Security Coordination office in collaboration with MOH, MOW,NMA and NGOS (MSF-S,SC) and UN Agencies (WHO,UNICEF and WFP).

This year (2013) Belg assessment was conducted from June 16-30/2013, the main objective of the assessment was to identify areas where emergency health and nutrition assistance needed for the upcoming six months and to determine the gap in the capacity of the health system in addressing anticipated risks so as to develop response plan. To address this objective, standard checklists classified by Region/Zone and woreda level were used to collected health and nutrition data. The assessment was conducted in 3 Zones, from each Zone two woredas was selected based on emergency health and nutrition problems in consultations with the FMOH, RHB and ZHDs.

Finding: There is multi-sectoral PHEM coordination forum at all level and different governmental and nongovernmental organizations including UN agencies are involved in the forum. At regional level the forum meet monthly however at Zonal and woreda level the forum not meet regularly.

From March to May, outbreak of Meningitis, measles and yellow fever were reported. Except yellow fever both measles and meningitis outbreak were contained.

Epidemic preparedness and response plan is available in all visited zones and woredas as well as at regional level however; the plan is supported by budget only at regional level.

At regional level AWD, malaria, meningitis and measles are the anticipated epidemics for the upcoming months and a total of 465,906 people were estimated to be at risk and 8,298,890 required addressing the anticipated health & health related emergencies.

Section I: General Information

Background

Southern Nations, Nationalities and People Region is one of the big and diversified region of the country with a total of 15 zones and 136 woredas with 4 special woredas. The region is located Southern and South-Western part of Ethiopia. The total area of the region estimated to be 110,931.9 Sq. Km which is 10% of the country and inhabited by a population size of about 17,353,928 in 2012 G.C, 20% of the total population of the country. The population density of the region became 142 persons per sq.km, which makes the region one of the most populous parts of the country.

In the region there are 8 Zonal Hospitals, 12 District Hospitals, 165 Health Centers, 237 developing health centers, & 2,720 health posts, totally 3,142 health facilities are available in the region. The potential health service coverage of the region reaches 80%.

The Ethiopian Ministry of Health in collaboration with SNNP regional health bureau, Ministry of Agriculture, National Metrology Agency and respective bureaus, WHO, UNICEF, MSF-S conducted emergency health and nutrition need assessment (Belg assessment) in SNNP region from June 16-30/2013. The main objective of this assessment was to identify areas where emergency health and nutrition assistance needed for the upcoming six months and to determine the gap in the capacity of the health system in addressing anticipated risks so as to develop response plan.

General objective

The overall purpose of the assessment was to project emergency sectoral requirements in Belg-dependent areas of Sidama, Segen area people and south Omo zones, SNNPR during the second half of 2013.

Specific Objectives

To assess the extent, types, magnitude, severity and likely of the different hazards (drought, human epidemics, floods, etc) and risks to the populations in the most vulnerable Woredas (including to identify the most vulnerable populations) for Health, Nutrition and WASH emergencies in Sidama, Segen area people and south Omo zones

To determine the shortcoming in the capacity of the existing health services to address health and nutrition emergencies likely to occur in the coming six months

To identify areas where emergency health assistance might be needed during the next six months of 2013 in Sidama , Segen area people and south Omo zones

Based on the findings, to develop response plan

Methods

Secondary and primary health and health related data were collected using checklists prepared at National level. Zonal and Woreda level briefing and discussions were held at the administrator's office prior to data collection together with the food assessment team. Concerned Zonal officials and respective Woreda sector offices were interviewed during data collection. Based on the national hot spot Woredas identification criteria, the direction from the region and zone level briefing hot spot Woredas identified for rapid seasonal assessment were Boricha & Hulla Woredas (Sidama zone), Konso & Burji Woredas (Segen area people zone), and South Ari & Benatsemay Woredas of South omo zone.

Briefing by different sectors of the zone was the initial activity before departing to the selected woredas and also debriefing by the assessment team was done at last and discussions were under gone about the findings of the assessment.

Duration of the assessment

The assessment was conducted from 16 to 30 June 2013.

Assessment findings

Section II: Health

A. SNNP regional summary

1. Coordination

The region has a functional multi - sectoral coordination forum for emergency preparedness and response in which all government, NGO's and UN agencies are represented and it is going on in a monthly basis. Public health emergency preparedness and response plan is available and budget is allocated for it.

2. Disease outbreak

During the last 3 months period, Meningitis, Measles and Yellow fever out breaks occurred in different parts of the region (see fig.1).

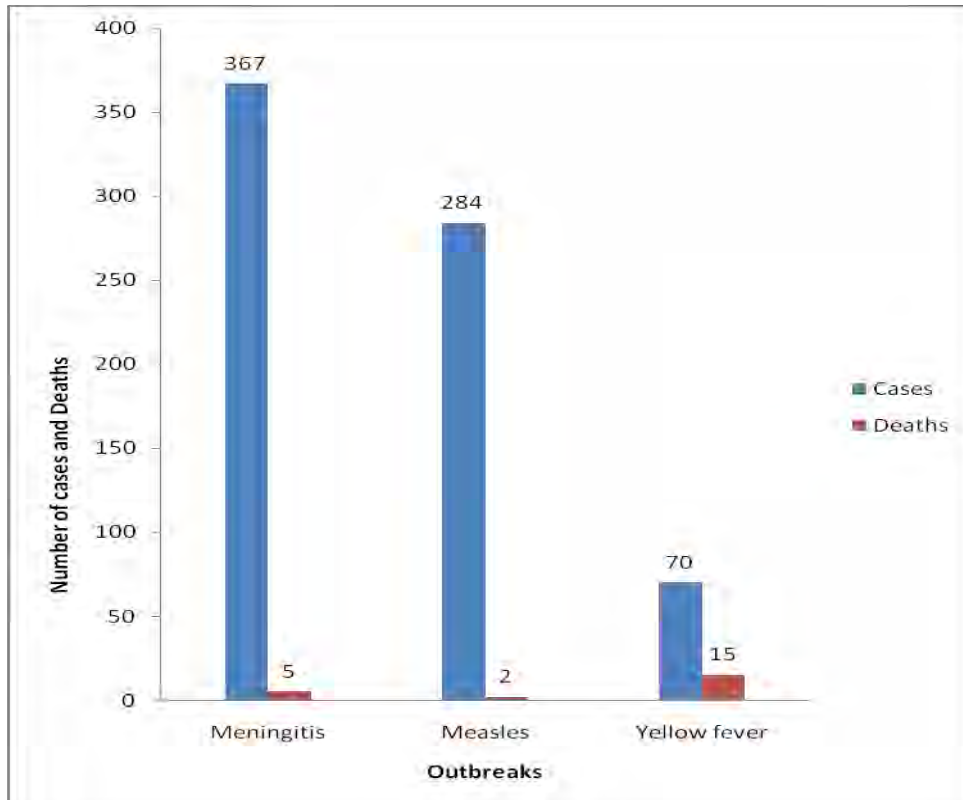


Figure 18. Outbreaks Occurred in SNNPR, March to May 2013

3. Anticipated epidemics/emergencies in the region

Acute Watery diarrhoea (AWD), Measles, Meningitis and Yellow fever are the ones considered as risks for epidemics as clearly stated in the below table.

Table 15. Types of emergency and estimated affected populations, 2013

S. No	Type of emergency	Zones at risk	Woredas at risk	Estimated affected population
1	Acute Watery Diarrhoea (AWD)	Sidama, Gedio, Kembata Tembaro, Hadya, Alaba, Gurage, Wolayta, South Omo	Gedeb, Kochere, Alaba special woredas, Alaba town, konso, Mirab Abaya, Mareko , Lanfuro, Sankura, Siltie, Damot Fullasa, Humbo, Hawassa Zuria, Boricha, Wondo Genet, Loka Abaya, Shashego, Banatsemay, Dassenech, Hamer, Gngangatom, Salamago, Surma	5, 412 expected cases
2	Flood	South omo, Hadya, alaba, Wolayta, Gamo Gofa, Selti, Sidama	Dasenech, Gngangatom, Shashego, Alaba, Humbo, Weito, Bena- Tsemay, Arba Minch Zuria, Denba, Gofa, Mirab Abaya, Lanfuro, Sankura, Siltie, Arbore, Loka Abaya, Arroresa	69,549
3	Drought	Sidama, Wolayta, Gedio, Hadya Kembata Tembaro, Segen , Silte, Gurage and Halaba special woreda	45 woredas in the region	97, 500
4	Malaria	Gedio, Halaba, Segen , Gamo gofa, Gurage, Silte, Wolayta , Sidama, Hadya, South omo, Bench maji	Kochere, wonago, Alaba spec. Woreda, Alaba town , Konso, Arba Minch, Mirab Abaya, Mareko, Lanfuro, Sankura, Siltie, Damot, Fulliasa, Humbo, Hawassa zuria, Boricha , Wondo Genet, Loka Abaya, Shashego, Banatsemay, Dasenech, Hamer, Gngangatom, Salamago, Surma	413,734 expected cases
		Gamo gofa	Bonkie, Chench, Denba Gofa, Gezie, Gofa, Kucha, Mirab Abaya, Oyida, Sawel TA, Zala	
		Wolayta	Boditi Town, Boloso Bombe, Damot Galle, Damot Sore, damotwoid, Humbo	
		Hadya	Misrak and Mirab Badewacho	

5	Meningitis	Gedio	Wonago, Bulle, Yirga Chefie	5, 580,448 for vaccination and 5580 for case management
		Sidama	Aleta Wondo Town, Arroresa, Hawassa Zuria, Bensa, Boricha, Dara, Gorchie, Shebedino	
		Gurage	Butajira TA, Enemur Ener, Mareko , Meskan	
		Bench maji	Maji, Mizan Aman town, North Bench	
		South Omo	Male, Benatsemay, Jinka town admin., South Ari	
		Silte	Dalocha, Sankura , Siltie	
6	Measles	Dawro, Gedio, Segen Bench Maji, Gamo gofa, Sidama, Keffa, Hadya , South omo	Tocha, Wenago, Konso, North Bench, Arbaminch Town, Arba Minch Zuria, Bonkie Chench, Dara Malo, Denba, Gofa, Dita, Gezie Gofa, Kemba, Kucha, Sawla TA, Uba Debre tsehay, Zala, Boricha, Loka Abaya, Bitta, Chena, Decha, Gessha, Gewata, Gimbo, Sylam, Tello, Adiyo, East and west Badewacho, Banatsemay, Malie, Salamago, South Ari	4, 289, 626 < 15 years of age at risk popn (2% expected cases – 41, 180)

Source: SNNPR/PHEM 2013 EPRP Document

Table 16. Showing anticipated emergencies, total estimated beneficiaries & required finance, SNNPR, 2013

Region	Type of health emergency	Total estimated beneficiaries	Required finance
SNNPR	AWD	5,412	116,148
	Malaria	413,734	7,179,218
	Meningitis	5,580	119,753
	Measles	41,180	883,771
	Emergency reproductive health needs	833,086	1,700,000

4. Public Health emergency Management

The SNNPR/PHEM had a public health emergency preparedness and response plan which was supported by budget and the staffs were trained on PHEM. But there were not trained staff on minimum Initial Service Package for reproductive health.

Table 17 Depicting Drugs and Medical Supplies Gaps

S. No	Description	Total requirement	Available	Gap
Vaccine				
1	Meningitis vaccines	11,161 vials	100	11,061
Drugs				
2	Coartem	3548 pack	14,790 pack	---
3	Artesunate /rectal/	-	0	-
4	Artesunate/inj/	-	17,600 vials	--
5	Artemether(IM)	-	0	-
6	Quinine /po/	11,921 tin	174 tin	11,747 tin
7	Quinine/Iv/ of 100 ampoule box	-	982	-
8	Chloroquine (Tin)	11,354	1,644	9,710
9	Ceftriaxone (Vial)	-	2,800 (1gm) + 600 (0.5 gm)	-
10	Oily CAF	-	0	-
11	Doxycycline (Tin)	10,768	216	10,552
12	Ringer Lactate(Bag)	21,536	2,578	18,900
13	ORS (sacket)	116,653	159, 974	-
14	Vit A (500 capsule tin)	-	616	-
Lab Supplies				
15	RDT (Malaria)	1,703	20,600 box	-
16	Pastorex (Meningitis)	-	4 kit	-
17	LP set	-	7 box (22G)+ 7 box (18G)	-
18	TI Bottle	-	-	-
CTC kit				
19	CTC kit (AWD)	11	50	-

Medical Supplies				
20	Gloves (100 pcs)	-	984 box	-
21	Syringe	-	-	-
22	PPE	-	30 kit	-
23	Clinical Delivery assistance kit PART A: Reusable Equipment	-	-	-
24	Clinical Delivery assistance kit PART B: Drugs Disposable Equipment	-	-	-
25	Mgt. of complication of Abortion kit (manual vacuum Asp. set)	-	216 kit	-

B. South Omo zone, SNNPR, June 2013

1. Coordination

There was no functional multisectoral coordination forum for the health sector.

2. Outbreak

There was ongoing outbreak of yellow fever in some woredas of the South omo zone. The total numbers of cases were 130 and out of these 53 deaths were registered. The case fatality rate was 40.8%.

3. Anticipated epidemics

Anticipated epidemics identified by the zonal health department were malaria, AWD, measles, flood and yellow fever.

4. Public health emergency management

There was a public health emergency preparedness and response plan at zonal level; but it was not supported by budget. The staffs were not trained on PHEM; but the zonal rapid response team was trained. There were no trained staffs on minimum initial service package for reproductive health.

Table 18. Showing drugs and medical supplies gap, South omo zone, SNNPR. (For the next 3 months)

Drugs & Medical supplies	Total required	Available	Gap
Coartem	690	642	48
Artesunate (rectal)	230	230	0
Artesunate (inj)	2400	600	1800
Artesunate (IM)	0	0	0
Quinine (PO)	900	0	900
Quinine (IV)	300	0	300
Chloroquine	100	78	22
Ceftriaxione	150	0	150
Oily CAF	100	0	100
Doxycycline	0	0	100
Ringer lactate	120	0	120
ORS (100 sachet)	180	80	100
Vit. A	200	0	200
RDT (Malaria)	1640	640	1000
Gloves	100	30	70
Syringe	20,000	10,000	10,000

Table 19. Depicting types of risks by woredas, South Omo zone, SNNPR, June 2013

Ser.no	Woreda at Risk	Type of risk	At risk population
1	Salamago	Malaria, AWD & Yellow Fever	34,293
2	Dasenech	Malaria, AWD, Flood and Measles	62,548
3	Gnangatom	AWD and Flood	20,819
4	Hammer	Malaria, AWD	70,772
5	South Ari	Malaria, Yellow fever & Measles	226,131
6	Benatsemay	Malaria, Yellow fever & Measles	65,992

B1. South Ari Woreda, South Omo zone, SNNPR, June 2013

1. Socio-Demographic Profile

Total population of the woreda estimated to be 226,131. Of these population male 112387, female 113744, children under 5 years of age 35,276, number of women of reproductive age (15-49) 52010, number of pregnant women 8141, and number of lactating women were 7462.

2. Health Profile

2.1 Coordination

There was no functional multi-sectoral PHEM coordination forum. The woreda had PHE preparedness and response plan without emergency response fund; and also there was no fund allocated for preparedness activities.

Table 20. Top five causes of Morbidity

Ser.no	Morbidity below 5 years	Morbidity above 5 years
1	URTI	URTI
2	Malaria	Malaria
3	Diarrheal disease	Diarrheal diseases
4	Skin infection	Fighting
5	Ear infection	Intestinal Parasites

2.3 Number of cases and Deaths for major epidemic prone diseases, January to May 2013

There were no AWD and Meningitis cases reported from any of the reporting sites of IDS. The total number of malaria cases registered during these 5 months were 4,674 and with no death. There were 6 cases of measles during April to May 2013 with no death.

2.4 Outbreak

There was ongoing outbreak of Yellow fever starting from Tir 5/2005 E C. The total number of cases were 104 with 36 deaths (CFR= 34.6%).

2.5 Preparedness

Some of the drugs & supplies were available and enough for one month; but some drugs will be provided by the regional health bureau during any emergency.

3. Risk factors for epidemics to occur

3.1 Malaria

The presence of 36 malaria endemic kebeles with a total population of 154,790 (68.5%), mosquitoes breeding sites, LLITNs coverage < 80 %, and the IRS coverage 40 % will increase the possibility of malaria outbreak in the woreda.

3.2 Meningitis

There was no meningitis epidemic and there were no vaccination conducted in the last 3 years.

3.3 AWD

There was no AWD epidemic in the last 3 years. The latrine coverage was 85 %; but the latrine utilization rate was not known. Safe water supply coverage of the woreda was --- % which was low. So there is a risk of AWD.

3.4 Measles

There was no ongoing measles outbreak. The measles vaccination coverage of 2004 EFY was 86 % and SIA has been conducted in December, 2004 EFY (31,348 children aged 9-59 months vaccinated).

B2/ Benatsemay Woreda, South omo zone, SNNPR, 2013

1. Socio-Demographic Profile

Total population of the woreda estimated to be 67,674. Of these population male 33,634, female 34,040, children under 5 years of age 10,557, number of women of reproductive age (15-49) 15,768, number of pregnant women 2,436; and concerning special population, pastorals 49,181 (72.7 %) of the total population and around 3000 migrant workers (Omo sheleko Agro-industry) were living in the woreda.

2. Health Profile

2.1 Coordination

There was no functional multi-sectoral PHEM coordination forum. The woreda had PHE preparedness and response plan without emergency response fund; and also there was no fund allocated for preparedness activities.

Table 21. Top five causes of Morbidity

<i>Ser.no</i>	<i>Morbidity below 5 years</i>	<i>Morbidity above 5 years</i>
1	Malaria	Malaria
2	Pneumonia	Acute respiratory infection
3	Diarrheal disease	Accidental injuries
4	Skin infection	Diarrheal disease
5	Tonsillitis	Skin infection

2.3 Number of cases and Deaths for major epidemic prone diseases, January to May 2013

There were no AWD and Meningitis cases reported from any of the reporting sites of IDS. The total number of malaria cases registered during these 5 months were 1,499 and with no death. There were 5 cases of measles during April to May 2013 with no death.

2.4 Outbreak

There was ongoing outbreak of Yellow fever starting from 29/4/2005 E C. The total number of cases were 16 with 16 deaths (CFR= 100%).

2.5 Preparedness

Some of the drugs & supplies were available and enough for one month; but some drugs will be provided by the regional health bureau while there were any emergency.

3. Risk factors for epidemics to occur

3.1 Malaria

The presence of 32 malaria endemic kebeles with a total population of 67,674, mosquitoes breeding sites, LLITNs coverage < 80 %, and the IRS coverage 65 % will increase the possibility of malaria outbreak in the woreda.

3.2 Meningitis

There was no meningitis epidemic and there were no vaccination conducted in the last 3 years.

3.3 AWD

There was no AWD epidemic in the last 3 years. The latrine coverage was 45 %; and the latrine utilization rate was only 19%. Safe water supply coverage of the woreda was 45.8 % which was low. So there is a risk of AWD.

3.4 Measles

There was no ongoing measles outbreak. The measles vaccination coverage of 2004 EFY was 69 % and SIA has been conducted in November/Hidar, 2004 EFY; during this campaign 27,391(92.4%) children aged 9-59 months vaccinated.

Recommendations

South omo Zone

Since there was no functional multisectoral coordination forum for the health sector at zonal level; so multisectoral coordination forum should be established by representing all relevant government, NGOs and UN agencies. The type of risk and population at risk should be

separately planned per anticipated risk. The public health emergency preparedness and response plan should be supported by budget.

South Ari and Benatsemay Woredas

There was no functional multi sectoral PHEM coordination forum. So multisectoral coordination forum should be established at the woreda level. The woreda had PHE preparedness and response plan without emergency response fund; and also there was no fund allocated for preparedness activities. So these plan & activities should be supported by budget.

C. Segen Zone

1. Coordination

There were a functional multi-sectoral PHEM coordination forum, PHE preparedness & response plan, accessible emergency response fund & there is allocated fund for preparedness activities in Konso woreda but comparatively there is no coordination activities in Burji woreda except PHE preparedness & response plan.

2. Morbidity

Malaria and diarrhea were the leading causes of morbidity for below 5 years in Konso and Burji respectively and next to that pneumonia was the second cause of morbidity for both woredas. The rest are intestinal parasite, tonsillitis and URTI. In above 5 years, typhoid fever and malaria were the leading cause of morbidity in Burji and Konso respectively and diarrhea and intestinal parasite comprise the second place. The rest are pneumonia and gastritis.

3. Number of cases/deaths

Since January to May 2013 there were no cases seen in AWD, Measles, and Meningitis in both woredas but there were a total of 17748 Malaria cases from Konso and Burji and 6 deaths from Konso were reported.

4. Outbreak

There was no outbreak reported in the last three months.

5. Preparedness

In both woredas most of the emergency drugs and supplies were enough and accessible. But some drugs and supplies like coartem, chloroquine ,Artesunate (rectal & injection), Artemether, Quinine PO, RDT for meningitis ,CTC kit, Assistance kit PART A & PART B, abortion kit were not accessible.

There was allocated budget for emergency rapid response by the Woreda Health office and PHEM guideline distributed to all health institutions in Konso woreda only but there was no trained woreda Rapid Response Team and no trained staffs on Minimum Initial Service Package for Reproductive Health in both woredas.

6. Weekly Timeliness and Completeness (%)

Regarding weekly timeliness and completeness of Surveillance report from August to October, 2012 it is almost >85% in Konso and it is 70%- 80% in Burji woreda.

7. Risk factors

7.1 Malaria

Both woredas (43 kebele Konso & 26 kebele Burji) are malaria endemic areas and there is presence of malaria breeding site, interrupted or potentially interrupting rivers, and also there is unprotected irrigation in Konso woreda. Their LLITNs coverage is >80% which implies the malaria prevention activity might be strong. All health workers were trained on the new malaria guideline and it has been distributed for all health facilities.

7.2 Meningitis

There was no meningitis epidemic in the last 3 years.

7.2 AWD

There was AWD epidemic in the last 3 years in Konso woreda on 21/04/04. Latrine coverage in both woredas was 85% and their latrine utilization is 60% in Konso and 78% in Burji. Safe water supply coverage was 52% in Konso and 44% in Burji. Cholera outbreak control guideline was distributed to all HFs of Konso woreda.

7.3 Measles

There was no ongoing measles outbreak and their measles vaccination coverage of 2004 was 93% & 98% in Konso and Burji woredas respectively. Health workers were trained on measles and measles guideline has been distributed to all health facilities which are found in Konso woreda but not for Burji woreda. SIA has not been conducted in 2004 EFY.

8. Recommendations

In general, some challenges were mentioned by woreda health offices. These are:

IRS was not conducted in 2004EFY & 2005EFY due to lack of budget, as a result there is a threat on malaria epidemic in Burji woreda.

Shortage of coartem supply due to the supply calculation matched with the number of cases.(Burji)

Training should be considered especially on malaria prevention and control (Burji)

D. Sidama Zone

There were no major human diseases outbreak occurred in the zone with in the last three months and one of the major achievements of the zone in terms of health during the last year is the activities done to control malaria. Out of the total 21 Woredas of the zone 9 Woredas are endemic for malaria in most of their kebeles. Even though a major part of the zone is malarious with the implementation of a strong malaria control program through the health extension program there was no outbreak recorded for long time.

Due to the current drought the zone has noticed major build-up of malaria case in the visited hot spot Woredas.

The zone health department in collaboration with Woredas is working very hard for the current budget year to accelerate the graduation of health development army families.

Malaria will continue to be a threat in the coming season in the lowland Woredas of the Zone.

The zone health department in collaboration with the respective Woreda health offices is taking appropriate measures to prevent any build-up of malaria by implementing the basic activities to control malaria.

All Woredas are continuing breeding site assessment and continuous health education to the public and making malaria control activities one of the major practical activities in the health development army trainings.

During the current assessment period we were able to visit three Woreda health offices of the zone.

In respect to the other disease conditions that may happen during such drought time are AWD, Meningitis and measles. The zone has not reported any outbreak of Acute Watery diarrhoea, meningitis or measles during the assessment period in the visited Woredas.

NB: The last Meningitis outbreak from the zone was reported before March 2013 and most affected Woredas were Shebedino, Dale, Wonsho and Wondo-genet.

Vulnerability Mapping across Sidama Zone

In terms of health consequences 13 Woredas have an increase in the number of reported Malaria cases.

The major risk identified during the current assessment as reported by the zone health department is the build-up of Meningitis, Measles and severe shortage of water in Boricha and Loka Abaya Woredas.

Table 22. Showing vulnerable Woredas for different hazards, in Sidama zone Period from July, 2013 to December, 2013

Table showing vulnerable Woredas for different hazards in Sidama zone, Period from July, 2013 to December, 2013					
Zone	Type of risk	Woredas at risk	At risk population	Cases expected	Remark
SIDAMA	Malaria	Boricha,L/abaya,A/Chuko,H/Zuria,W/genet,Shbedino,Dale,A/wondo,Dara,Wonsho,Bensa, Malga & Bona.	1,447,638	115,811(8%)	
	Meningitis	All Woredas		730(0.03%)	
	AWD	Dale,Wonsho,Arbegona,Chire,Bensa,L/Abaya,Aroresa,Boricha,W/genet,Bursa,Hula & Bona.		3,471(0.1%)	
	Measles	All Woredas	1,660,000	4,720(1%)	<15 years
	Flood	L/Abaya & Aroresa	37,300	37,300	

Gaps identified

Even though there is a public health emergency preparedness and response plan there is no documented budget set aside for the management of any emergency that may come in the coming months.

Due to Shortage of Delthametrine to spray all kebeles, some Woredas has delayed spraying part of the Woreda house holds

There are no adequate CTC kits for AWD, Meningitis taste kits, Oily chloramphenicol and ORS at zone level

Recommendations

Public Health emergency preparedness and response plan should be supported by budget at Woreda level

The zone health department need to prioritize and support the hot spot Woredas to supply the needed Delthametrine

Pre-position emergency medical supplies

The water sources in Boricha and Loka Abaya Woredas need to be treated to minimize the risk of AWD, which is very high in these Woredas.

Section III: Nutrition

1. South Omo Zone

A. South Ari Woreda, South Omo zone, SNNPR, June 2013

There were 51 OTP sites; but no SC. The total numbers of new SAM cases were 368 starting from January to May 2013. Concerning the therapeutic supplies RUTF was available for one month. Some OTP sites didn't report monthly report in a regular base.

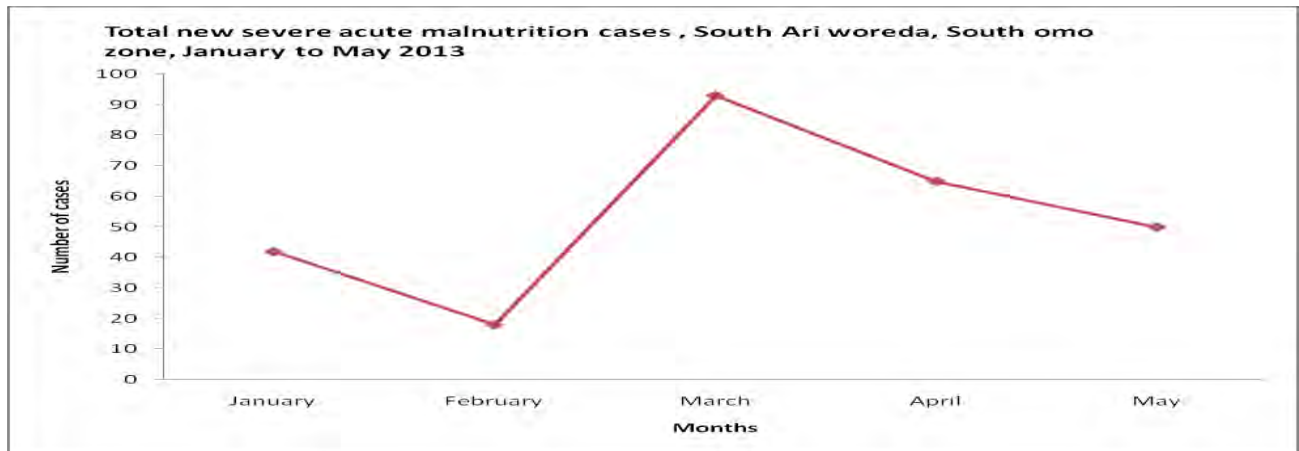


Figure 19. Shows Trend of Severe Acute Malnutrition during January to May 2013.

B. Benatsemay Woreda, South omo zone, SNNPR, 2013

There were 25 OTP sites; but no SC. The total numbers of new SAM cases were 156 starting from January to May 2013. Concerning the therapeutic supplies, it is enough for the next one month. All OTP sites were reporting regularly on monthly bases.

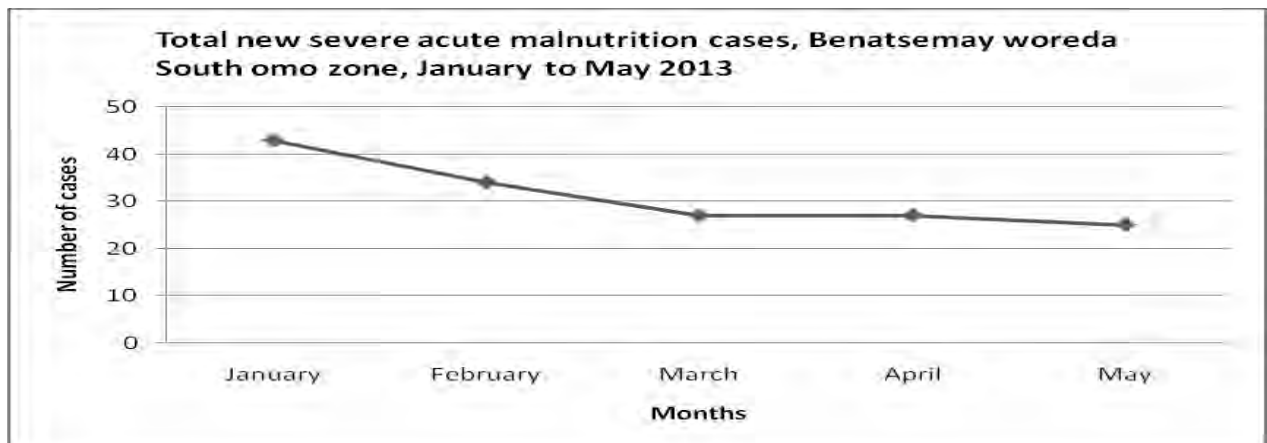


Figure 20. Shows Trend of Severe Acute Malnutrition in Benatsemay woreda during January to May 2013.

2. Segen Zone

There were a total of 731 new SAM cases from Jan to May/2013 with an increased trend especially on May, reported in Konso woreda. Total numbers of OTP/SC sites were 56 in Konso and 26 in Burji woreda. No adequate therapeutic supplies were available in Konso woreda and there is only RUTF has been available in Burji woreda.

In general, some challenges were mentioned by woreda health offices. These are:

Shortage of RUTF, F100 ,F75 ,NG tube and other supplies(Konso)

Shortage of budget

Shortage of transportation

3. Sidama zone

The nutrition condition has improved compared to previous months. The rates of admissions of children to therapeutic feeding programs are showing a generally declining trend in all Woredas of the zone. In general the nutrition situation of the zone as compared to last year the same months has been decreasing. Over the months starting from March 2013 the number of newly admitted children to OTP/SC has dropped from 1,958 in March, 1,486 in April and 1,641 in May. But due to the ongoing delay in the rain and failure to grow the fast growing foods at home the number of malnourished children will be high in some Woredas like Boricha. The reported new admissions in Sidama zone in general and specifically for Boricha Woreda are shown in the graphs below.

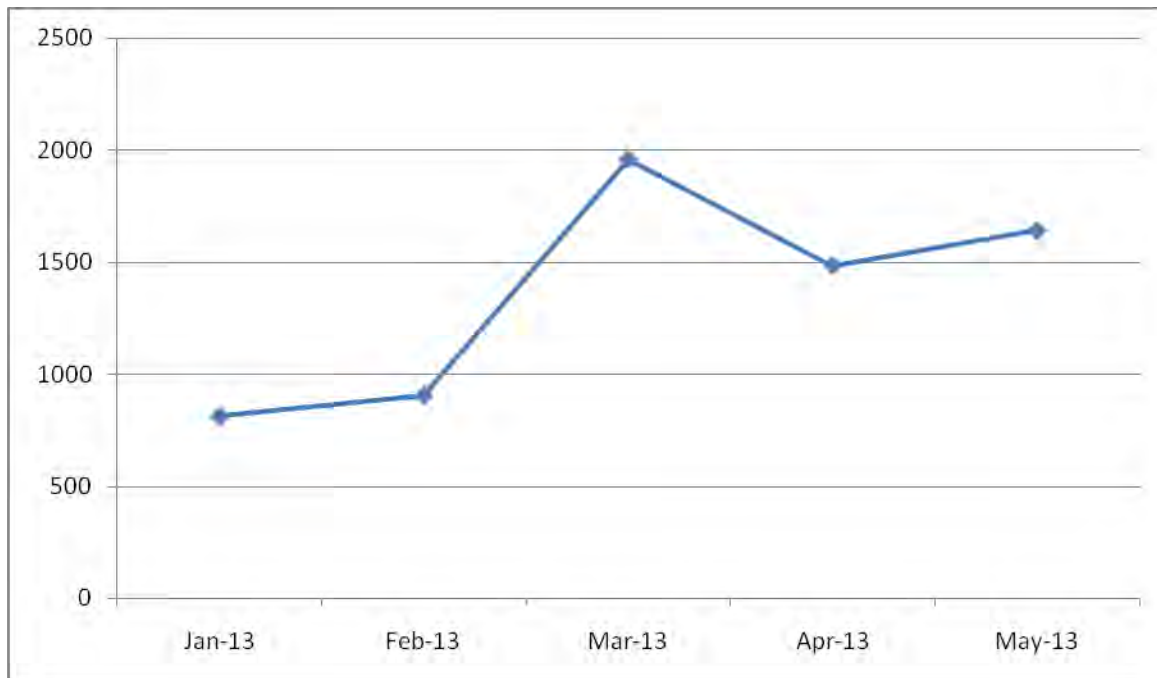


Figure 21 Sidama zone total OTP/SC Admissions by Month Starting from Jan 2013 to May 2013.

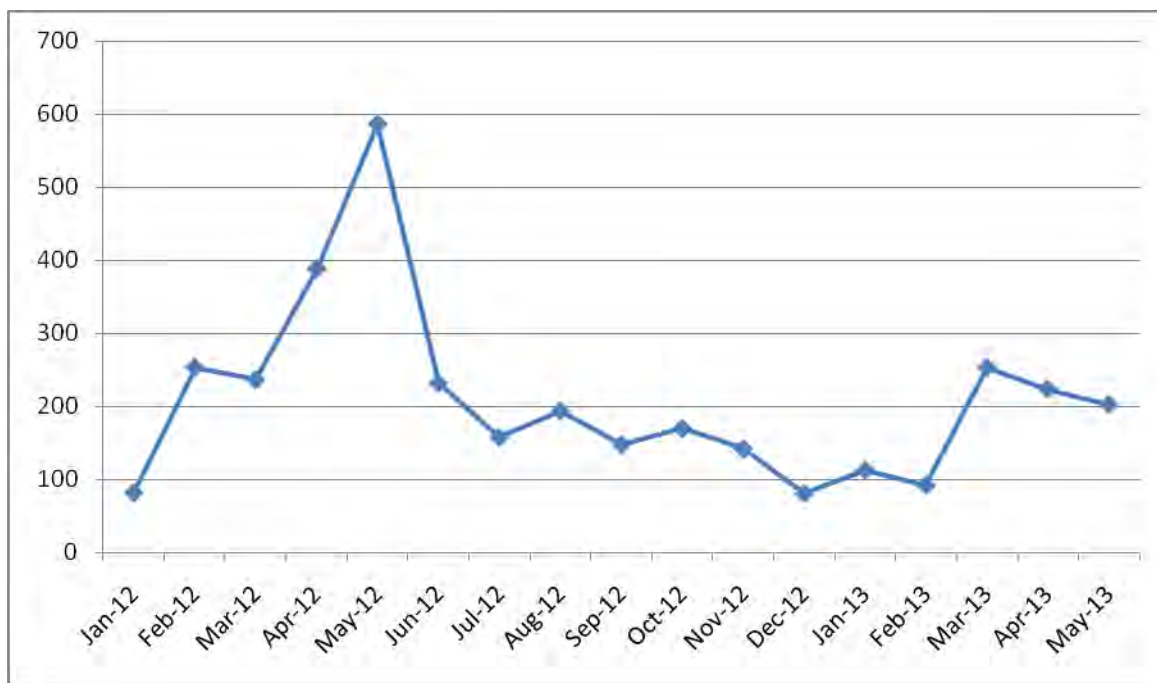


Figure 22. Boricha Woreda total OTP/SC Admissions by Month Starting from Jan 2012 to May 2013

The above graph shows the malnutrition admission trend as compared to last year the same month declining for instance last year in May 2012 it was 586 but in this year it is 202 the same is true in March and April.

Recommendations

In South Ari woreda, there were OTP sites which didn't report in a regular bases/monthly/; so it is very difficult to determine whether SAM cases become decreasing or not; but the trend showed that starting from march 2013 number of SAM cases decreasing. As a result of this each site should report to South Ari Woreda health office.

Since all OTP sites were reported in Benatsemay Woreda and the number of SAM cases decreasing starting from January 2013 to May 2013. Thus the program should be strengthened in such a way in the following months.

There were shortage of nutrition supplies such as RUTF, F100, F75 and NG tube in Konso Woreda. So these supplies should be supplied as soon as possible. Shortage of operational cost and transportation also mentioned (Konso & Burji Woredas); so the concerned sectors should solve these issue and the program should be integrated with other programs to access the transportation.

Section IV: Water, Sanitation and Hygiene (WASH)

1. Sidama Zone

The main sources of water in Sidama Zone are said to be springs, hand pumps, hand dug wells, lake water, traditional ponds and rivers. The 2013 belg rains in most of the woredas started on time (between the first and third weeks of March). Initially both the amount and the distributions were said to be good. This improved the water recharge in most places of the zone however, in many of the woredas it stopped before the usual time but this had not very much affected the usual physical access of the above mentioned water sources. Since many kebeles in some of the woredas depend on pond water the quality of water available for drinking was further deteriorated.

Some woredas in the zone are said to have water supply coverage of less than of 40%. This of course had been a major concern for those woredas (Loka-Abaya and Boricha). Even though it was difficult to obtain information on the latrine coverage many of the woredas, this seemed to be much less than the water supply coverage.

During these assessment three sample woredas, namely Hulla, Loka-Abaya and Boricha were visited by team members. Of these three Hulla with water supply coverage of 48% seemed to have less serious emergency water supply problems. However, Loka-Abaya woreda reported to have 34% water supply coverage and Boricha reported to have 9.4% supply coverage were

reported to have serious shortage of potable water supply for humans as well as for animals. The source of water supply for most of the seasons in these two woredas and some others is from open ponds both for humans and animals. When these ponds dried people and animals travel to far rivers for search water. For HH consumption the community is said to put one Bishangary for one litter of pond water. It was also reported that there is usually shortage of these water treatment chemicals. The biggest hope of these two woredas regarding safe drinking water is the Awada-Boricha Water Supply Project which is almost there in the seven kebeles of Loka-Abaya woreda through which it passes while advancing to Borcha Woreda. The Loka-Abaya Woreda officials also indicated that there was no budget allotted for extending the pipe line to the remaining twenty kebeles of the woreda and have reminded the assessment team to pledge on these communities behalf for budget allotment from the government or other sources. Boricha woreda hopes that the pipe line would cover all its kebeles once it reaches it in a year or so.

2. South Omo zone

In South Omo the assessment team members visited Bena-Tsemay and South Ari woredas. Bena-Tsemay reported water coverage of 45.8% and HH latrine coverage of 45%.

South Ari reported 47% water supply coverage. In both South Ari and Bena-Tsemay it was reported that there are many functional hand dug and protected springs and NGOs operating in the zone are said to have contributed towards the construction and maintenance of these water sources. However, with the follow-up of the situations and coordination of the NGOs operating in the Zone, the Woreda and Zonal water Offices could very much improve the maintenance of the few non-functional water sources and improve both the water supply and household latrine coverage and improve the lives of the people there.

3. Segen area People Zone

The main water supplies in this zone were pointed out to be ground water springs, ponds, and pipe lines. In Konso Woreda the water supply coverage is give as 46.7%. Out of the 7 shallow wells constructed 2 are nonfunctional 5 are functional. Most of the community members use ponds for water source during most of the rainy seasons and the river when these dry. In Burji Woreda water supply coverage of 44% and HH latrine coverage of 76.2 was given by the woreda. Problem of access to potable water especially for 6 kebeles in the woreda was also reported. Distance from the rivers and absence of any other source of water supply was given as

the main problem. Lack of skilled manpower and shortage of transportation in the woreda was also reported.

The water supply coverage for Amaro, Derashe, and Alle were given to be 46%, 47.5%, and 44% respectively. Further the zone reported that drinking water problems were encountered in some kebeles of Konso, Amaro, Derashe, Alle and Burji woredas during the year.

Recommendations

Technical trainings for the WASH Committees and training to raise the awareness of the community members about the use of clean water for healthy life is very important for the rural and especially for the pastoral communities. Allotment of budget for treatment and Water treatment chemicals is very important and necessary. Maintenance/rehabilitation of damaged or non-functional water schemes should be given due attentions. Provision of spare parts and transportation facilities especially where there are no NGOs and follow up of these NGOs whenever they exist in these remote areas should be of prime importance.

Chapter VIII - Protocol/Proposal for Epidemiologic Research Project

Title: Prevalence and associated risk factors of malaria among workers, Kuraz sugar factory project, Salamago district, South Omo zone, SNNPR, Ethiopia

Abstract

Background: Malaria is a major global public health problem and a leading cause of morbidity and mortality in many countries. Malaria caused an estimated 219 (range 154–289) million cases and 660 000 (range 490 000–836 000) deaths in 2010. Approximately 80% of the cases and 90% of the deaths occur in Africa while the remaining cases and deaths occur mainly in the South-East Asia and Eastern Mediterranean Regions. Approximately 68% of the population lives in malaria risk areas in Ethiopia, primarily at altitudes below 2,000 meters.

Objective: The purpose of this study is to assess the prevalence and associated risk factors for malaria among workers of Kuraz Sugar factory project site.

Methods: Cross-sectional study design will be conducted. The total numbers of study subjects which will be included in the study will be 358 workers; and they will be selected by simple random sampling technique using list of workers as a sampling frame. The data will be collected using structured questionnaire by interviewing the participants. A blood sample will be collected by taking finger-prick blood from participants for malaria test microscopically.

Time schedule: The study will be conducted from April to June 2014.

The total Cost: The total cost required to implement this project will be birr 89,748.

1. Introduction

Malaria is a major global public health problem and a leading cause of morbidity and mortality in many countries. Malaria caused an estimated 219 (range 154–289) million cases and 660 000 (range 490 000–836 000) deaths in 2010. Approximately 80% of the cases and 90% of the deaths occur in Africa while the remaining cases and deaths occur mainly in the South-East Asia and Eastern Mediterranean Regions.

The World Health Assembly and Roll Back Malaria (RBM) targets for malaria control and elimination are to achieve at least a 75% reduction in malaria incidence and deaths by 2015[1].

A malaria surveillance system consists of the tools, procedures, people and structures that generate information on malaria cases and deaths, which can be used for planning, monitoring and evaluating malaria control programs [2].

Ethiopia is among the few countries with unstable malaria transmission. Consequently, malaria epidemics are serious public health emergencies. In most situations, malaria epidemics develop over several weeks, allowing some lead-time to act proactively to avoid larger numbers of illnesses and to prevent transmission.

Approximately 52 million people (68%) live in malaria risk areas in Ethiopia, primarily at altitudes below 2,000 meters. Malaria is mainly seasonal with unstable transmission in the highland fringe areas and of relatively longer transmission duration in lowland areas, river basins and valleys.

Historically, there have been an estimated 10 million clinical malaria cases annually. Since 2006, however, cases have reduced substantially. On average, 60% -70% of malaria cases have been due to *P. falciparum*, with the remainder caused by *P. vivax*. *Anopheles arabiensis* is the main malaria vector; *An. pharoensis*, *An. funestus* and *An. nili* play a role as secondary vectors.

Ethiopia is also one of the most malaria epidemics-prone countries in Africa. Rates of morbidity and mortality increase dramatically (i.e. 3 -5 fold) during epidemics [3].

Sixty five percent of the populations of SNNPR live in malaria endemic areas (2005, Annual report of SNNPR HB). The study area is Kuraz sugar factory project site which is found in Salamago district, South Omo zone, South Nations Nationalities People Regional state, Ethiopia. This project site is located around 675 km away from SNNPR capital Hawassa in South West direction and 910 km from Addis Ababa in the South direction. The project site comprises 5,000 workers who came from different areas of the country. In 2012, due to high number of cases in

the area, the project coordination office requested the SNNPR HB to supply with ITNs and conduct IRS for the project sites in order to reduce malaria cases. We have doubt that the development corridors are well addressed in Ethiopia by the existing surveillance system and the prevalence of malaria was not determined before.

We hope that this project will contribute novel and effective strategies for improving malaria surveillance and control program for the development corridors in Ethiopia.

Statement of the problem

In Ethiopia: So-called “epidemic years,” occurring every five to eight years, have been the typical pattern of malaria in Ethiopia, with the last such epidemic years occurring in 2003-2004. The western, central and eastern highlands, as well as the highland-fringe areas along the Rift Valley are especially vulnerable to epidemics. In the past three decades 48 major “epidemic episodes” have occurred, with especially large epidemics in 1988, 1991, 1992, 1998, 2003, 2004 and 2005. Unexpected population movements, local flooding and famine conditions, and emerging resistance to anti malarial drugs and insecticides may also affect local communities’ risks for local seasonal malaria transmission and for malaria epidemics. While no epidemics were reported in 2006 or 2007, several district level outbreaks have been reported in 2008 through 2012. The unstable and largely unpredictable epidemiology of malaria in Ethiopia makes accurate, timely surveillance of paramount importance [1]. Most of the malaria transmission occurs between September and December, after the main rainy season from June to August. Certain areas, largely in the western and eastern parts of the country experience a second “minor” malaria transmission period from April to May, following a short rainy season from February to March (1). Ethiopia is also one of the most malaria-epidemic prone countries in Africa and malaria contributes up to 20% of under-five deaths [2].

Ethiopia’s Child Survival study showed that on average, out of 470,000 child deaths per year, 94,400 are attributable to malaria. However, if the available malaria control interventions are implemented correctly and effectively, it has been estimated that these malaria related deaths could be reduced by a massive 75%, saving the lives of around 70,000 children every year [2].

Literature review

Malaria is seasonal in most parts of Ethiopia, with unstable transmission that lends itself to the outbreak of epidemics. The transmission patterns and intensity vary greatly due to the large diversity in altitude, rainfall, and population movement; areas below 2,000 meters (m) are

considered to be malarious (or potentially malarious). Those areas are home to approximately 68% of the Ethiopian population and cover almost 75% of the country's landmass [3].

The updated 2010 National Strategic Plan for Malaria Prevention, Control, and Elimination 2011–2015 is embedded in the health sector's overarching framework, the Government of Ethiopia's Health Sector Development Plan Four (HSDP IV) 2011–2015. The goals of the national strategic plan are [3]:

By 2015, achieve malaria elimination within specific geographical areas with historically low malaria transmission.

By 2015, achieve near-zero malaria deaths in the remaining malaria-endemic areas of the country.

When we see the national MIS 2011, Compared to the MIS 2007 results, the MIS 2011 microscopic blood-smear test results for altitudes <2,000m showed a small increase in malaria prevalence, from 0.9% to 1.3%, respectively. There was very little malaria (0.1%) detected by microscopy at altitudes >2,000m, and the malaria detected there was almost exclusively found to be *P. vivax*. The 13-fold higher malaria prevalence detected by microscopy in areas <2,000m compared to areas >2,000m confirmed the long-standing FMOH practice of using altitude as a proxy for malaria risk and, therefore, as a basis for targeting malaria-related resource allocations [3].

Among the potential determinants regarding utilization of LLINs, several were found to be significantly associated with LLIN utilization. Household leads by people above 60 years were 7.7 times more likely to let their children under five and pregnant women sleep under a net. Finally, household radio possession was again inversely related to LLIN possession. Children under five and pregnant women in households without a radio were 0.4 times less likely to sleep under an LLIN than those from households with a radio [4].

A study conducted at Gilgel-Gibe hydroelectric dam in Ethiopia, the overall, 194 (10.5%) of the sampled children were positive for malaria, of which, 117 (60.3%) were positive for *P. vivax*, 76 (39.2%) for *P. falciparum* and 1 (0.5%) was positive for both *P. vivax* and *P. falciparum*.

Moreover, in a multivariate analysis controlling for age, sex and time of data collection, it appeared that children who resided in 'at-risk' villages close to the dam were more likely to have a *P. vivax* infection than children who resided in 'control' villages (OR = 1.63, 95% CI = 1.15, 2.32) [5].

The low educational level of malaria sufferers most of whom live in the countryside and have never been to school or received adequate guidance regarding dosage, fail to adhere to prescription requirements, or stop medication all together up on feeling well. As is the case elsewhere where malaria is endemic drug-resistance has been the inevitable outcome in many parts of Ethiopia [6]. The economic cost of malaria in Africa is estimated to be more than \$12 billion a year in lost productivity.

The study done by Ministry of Health summarizes Malaria's socio-economic impacts in Ethiopia shows that: The high morbidity and mortality rate in the adult population significantly reduces production activities; The prevalence of malaria in many productive parts of the country prevents the movement and settlement of people in resource-rich low-lying river valleys; on the flip side, the concentration of population in non-malaria risk highland areas has resulted in a massive environmental and ecological degradation and loss of productivity, exposing a large population of the country to repeated droughts, famine and overall abject poverty; The increased school absenteeism during malaria epidemics significantly reduces the learning capacity of students; Coping with malaria epidemics overwhelms the capacity of the health services in Ethiopia to focus on other diseases, and thus substantially increases public health expenditures.

This makes malaria in Ethiopia not just a health issue but a food-security and environmental issue as well. The malaria season coincides with peak economic activity in rural Ethiopia when both rainfall levels and temperature are high and conducive for the growing of subsistence crops [7]. A study done in south-eastern Bangladesh shows that, Malaria prevalence across all subdistricts in the monsoon season was 30.7% (95% CI: 28.3-33.2) and 14.2% (95% CI: 12.5-16.2) by PCR and microscopy, respectively. Of the 1,418 samples collected 435 (30.7%, 95% CI: 28.3-33.2) were PCR-positive [8].

A study done in Chennai, association with environmental parameters: To further investigate this spatial pattern, population density and elevation of the wards have been considered. It was seen that densely populated and clusters of moderately populated areas showed high average prevalence of malaria during 2005-2011. These areas coincided perfectly with the malaria hot spots. Though there did not emerge a direct relationship between the elevation and malaria prevalence, the moderately elevated malaria prevalent regions were surrounded by low elevation areas that might have served as a reservoir for mosquito breeding [9].

A study conducted in China, from 2001 to 2011, 918 malaria cases and six malaria deaths were due to malaria imported from other countries, accounting for 12.4% of all malaria cases and 100% of all malaria deaths. During this time period the annual number of indigenous cases decreased from 1,163 to 13 while the number of imported cases increased from 86 to 366. The relative proportion of cases imported from other countries versus other provinces also increased from 0.0% (0/86) to 97.0% (350/361). The most affected demographic groups were males (897 cases, 97.7%) and adults (20–50 years old: 857 cases, 93.4%). All 918 cases had a recent travel history to malaria-endemic areas and the main purpose for travel was overseas labour (848 cases, 92.4%). The cases were mainly acquired from African countries (855 cases, 93.1%). *Plasmodium falciparum* was the most common species (733 cases, 79.8%). The increase in malaria cases imported from other countries was associated with the growth of investment to Africa from Jiangsu ($R^2 = 0.8057$) and the increasing number of exported labourers to Africa from Jiangsu ($R^2 = 0.8863$) [10].

A research done in Kenya, Uganda and Tanzania, urban Human population movement (HPM) and malaria movement networks Migrant and malaria networks in East Africa showed various differences and similarities in patterns and magnitudes between countries, age groups, genders and urban/rural settings.

When examining the differences in connectivity of migrant networks between age groups (measured using mean network degree), the 20–30 year old age group had the highest values, illustrating that this age group was likely to migrate between the largest variety locations within each country.

Short-term travel and bed net use differed within migrant groups and between immigrants and non-migrants. Within migrant groups, the highest proportions of travellers were <5 years old, followed by 10–20 year olds. In general, short-term travel in younger immigrant females (<5 and 5–10 year olds) was more likely than in immigrant males, but for older age groups short-term travel was more likely in males. It is important to emphasize that the 10–20 year old age group was estimated to have the highest likelihoods of malaria movement compared to other age groups, along with relatively high likelihoods of short-term travel [11].

Bed net usage was higher in female immigrants compared to males for younger age groups, and higher for males in older age groups. Bed net use in the 10–20 year old age group was relatively low compared to other age groups, further emphasizing the importance of this age group in

malaria movement. The analyses show that the RDT result was significantly associated with age and gender. Other significant covariates confounding variables are source of water, trip to obtain water, toilet facility, and total number of rooms, material used for walls, and material used for roofing. The prevalence of malaria for households with clean water found to be less. Malaria rapid diagnosis found to be higher for thatch and stick/mud roof and earth/local dung plaster floor. Moreover, spraying anti-malaria to the house was found to be one means of reducing the risk of malaria. Furthermore, the housing condition, source of water and its distance, gender, and ages in the households were identified in order to have two-way interaction effects [12].

Individuals with poor socio-economic conditions are positively associated with malaria infection [12]. Improving the housing condition of the household is one of the means of reducing the risk of malaria. Children and female household members are the most vulnerable to the risk of malaria. Such information is essential to design improved strategic intervention for the reduction of malaria epidemic in Ethiopia.

The problem of malaria is very severe in Ethiopia where it has been the major cause of illness and death for many years [13, 14]. According to records from the Ethiopian Federal Ministry of Health, 75% of the country is malarious with about 68% of the total population living in areas at risk of malaria [13, 14].

Significance of the study

Human factors in Ethiopia contributing to the spread of malaria include population growth and movements, urbanization, water development schemes, agricultural development, conflicts, and improper use of drugs and the attendant consequences of the emerging drug-resistant malaria parasites. An article that titled with malaria in Ethiopia revealed that, what is good for crops like sugarcane – high temperature and plenty of water – is also a heaven for the malaria vector. “The relation between irrigated crops and the presence of malaria has long been noted in the Awash Valley plantations of sugarcane, fruit, and cotton...and the introduction of irrigated rice cultivation in parts of Gambella has been suggested as an important contributing factor in malaria transmission” [6].

The findings of this study will help to design strategies for improving malaria surveillance in the development project areas in Ethiopia.

General Objective:

To assess the prevalence and associated risk factors for malaria among workers of Kuraz Sugar factory project site.

Specific objectives:

To determine prevalence of malaria among the factory workers

To identify the associated risk factors for the occurrence of malaria

To recommend malaria prevention interventions

Methods**Study Area:**

The study area is Kuraz sugar factory project site which is found in Salamago district, South Omo zone, South Nations Nationalities People Regional state, Ethiopia. This project site is located around 675 km away from SNNPR capital Hawassa in South West direction and 910 km from Addis Ababa in the South direction; and the study will cover all project sites of the factory. Almost all workers of the sugar factory project came from different areas of the country. The Salamago district communities reside around the sugar factory project sites are entirely pastoralist.

Study Population:

The Kuraz sugar factory project workers will be involved in the study. The total population of the project is estimated to be 5000.

Study Design:

Cross-sectional study design will be applied.

Sample size determination: The minimum sample size required, for a very large population ($N > 10,000$) is:

$$n = Z^2 p (1-p) / w^2 = (1.96)^2 \times (0.5 \times 0.5) / (0.05)^2 = 3.8416 \times 0.25 / 0.0025 = 3.8416 \times 100 = 385.14 = 386;$$

Where; $Z = 1.96$ $P = 50\%$ $w = 5\%$, Confidence limits = +5% or 95% CI

Since, the above sample is taken from a relatively small population ($N = 5000$), the required minimum sample will be obtained from the above estimate by making some adjustment.

Thus, $385.14 / (1 + (385.14 / 5000)) = 385.14 / (1 + 0.077028) = 385.14 / 1.077028 = 357.59516 = 358$

So the sample size is 358 persons.

Sampling methods:

Simple random sampling technique will be applied by using the list of workers as sampling frame.

Data Collection Plan:

The data collectors will be trained on data collection tools. In order to collect blood specimens and conduct interview as the same time from the study subjects, the data collectors will be laboratory technicians who are diploma holders. Data will be collected using structured questionnaires. We will collect primary data from the project workers by interviewing them.. These data will be collected during the 2nd malaria transmission season of Ethiopia (April - May, 2014). To ensure accuracy, the questionnaire will be originally prepared in English, translated to Amharic, and then translated back to English.

Data analysis Plan:

The collected data will be cleaned and the data will be entered and analyzed using Epi-Info and SPSS. For Statistical analysis we will use univariate, bivariate and multivariate data analysis.

Ethical consideration

Ethical clearance will be obtained from the Ethical review board of SNNPR Health Bureau. Communication with the different office administrators will be made through formal letter obtained from the regional Health Bureau. Oral permission will be asked for sugar factory project office authorities for their cooperation. After the purpose and objective of the study have been informed, verbal consent will be obtained from each study participants. Participants will also be informed that participation will be on voluntary basis and they can stop or leave from the participation at any time if they are not comfortable about the questionnaire. In order to keep confidentiality of any information provided by study subjects, the data collection procedure will be unidentified/unnamed and keeping their privacy during the interview by interviewing them alone.

Results Dissemination plan:

The findings of this project will be disseminated to the study area (SNNPR State Health Bureau/Public Health Emergency Management Core process, South Omo Zone health department, Salamago district health office and Kuraz sugar factory project coordination office), Federal Ministry of health of Ethiopia/EHNRI, EFETP coordination office; and for the scientific

community, an attempt will be made to present the findings in different conferences and workshops and will be sent to publication on scientific journals.

3.5. Inclusion criteria: Participants should live in the project sites at least for the last 15 days.

3.6. Exclusion criteria: Workers who were seriously ill or couldn't respond for questions.

3.7. Data variables:

3.7.1. Dependent variable: Occurrence of malaria

3.7.2. Independent Variable: Age, Sex, income

3.8. Operational definition:

Educational level:

Illiterate: person who cannot read and write

Primary: person who complete 1-8 grades

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

Tertiary: Person who complete college and above

Distance of health facility:

Far from health facility: If a person travels above five kilometer to get health facility

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

3.12. Validity/Reliability: The data collectors will be trained on the data collection tool. Two supervisors will make supervision. Data cleaning will be done by the field supervisors and investigators.

Table 23 Budget proposal Summary

Ser. No	Descriptions	Sub total cost (ETB)
1	Personnel costs	
1.1	Data collectors Training	18900
1.2	Data Collection on field	32400
1.3	Field supervisor	5400
1.4	Driver	3240
Personnel sub total		59,940
2	Travel to field	

2.1	To collect the questionnaires with data	10962
Travel sub total		10,962
3	To disseminate results	16200
Disseminate sub total		16,200
4	Supplies	
4.1	Stationeries for data collection	2646
Supplies Sub total		2,646
Grand Total		89,748

Table 24 Work Plan

Activity	R.P	Time frame																			
		Feb.				Mar.				Apr.				May.				Jun.			
		weeks				weeks				weeks				weeks				weeks			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Topic selection	P.I.	■	■																		
Proposal development	P.I.			■	■	■	■														
First draft proposal submission	P.I.					■	■	■	■												
Prop. Defense & Final proposal submission	P.I.									■	■										
Ethical clearance from SNNPR HB and study sites	P.I.											■	■	■							
Preparation of supplies and tools												■	■	■							
Training of data collectors	P.I.												■	■							
Pretest	D.C													■	■						
Data collection	D.C														■	■					
Data entry & cleaning	P.I.															■	■				
Data analysis	P.I.																	■	■		
Report write up and First draft submission	P.I.																		■	■	
Submission of final paper	P.I.																			■	

Key: P.I = Principal Investigator, R.P= Responsible Person, D.C. = Data Collectors

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Chapter IX - Yellow Fever Post Epidemic Assessment in South Omo Zone, SNNPR, Ethiopia, November 2013

Abstract

A yellow fever Post Epidemic Assessment (PEA) was conducted in three woredas namely South ari, Benanatsemai, & Salamago and one town administration, Jinka, of the South Omo zone in SNNP region from October 14 - 28, 2013 to evaluate the quality of yellow fever epidemic preparedness, epidemic detection and reporting, adequacy of epidemic response, status of implemented yellow fever control interventions, epidemic monitoring and evaluation; and based on the identified gaps, to recommend the required actions to be taken for future similar outbreaks management. The post epidemic evaluation included visits to the region health bureau, South Omo zone health department, and four woreda health offices affected by the outbreak, Jinka hospital, Jinka PHL, four HCs from the affected woredas/town, six HPs from highly affected kebeles and 80 households in eight highly affected kebeles. The data collection methodologies used was: Interview with key informants, direct observation & Household survey.

Key Findings of the Assessment

The presence of an emergency-response coordination mechanism among partners; availability of the national PHEM guide line (2012); availability of epidemic preparedness and response (EPR) plan; and existence of government financial contingency budget (though not earmarked for emergency response activities) at the SNNP region and south Omo zone level was promising. At the region level the staffing of PHEM structure is 100%. However at the onset of the recent yellow fever outbreak the proportion of PHEM officers assigned to the South Omo zone health department was 50%. In addition, the capacity of regional and zonal PHEM officers (knowledge and skills) on determination of thresholds for Yellow Fever outbreak was noticed to be encouraging (100%). The status of the epidemic management committee meeting as part of the epidemic response to review/monitor the status of management as witnessed by the available minutes: In all the visited institutions the Epidemic management working committee's meeting did not take place regularly leaving gaps in communication & addressing problems.

At woreda level the coordination existed in 25%; PHEM guideline in 50%; EPRP in 50%; PHEM staffing was below 50% and no emergency financial access in the Woredas health offices visited. However of the observed EPRP documents none identified population groups and areas

at high risk/hazards for yellow fever outbreak. At woredas/town health office level three fourth of the PHEM officers had the capacity to determine the thresholds for yellow fever outbreak.

At health facility level there were no coordination existed among partners; no PHEM guideline; no EPR plan; and no emergency financial access among all visited health facilities. Among the visited health facilities none observed to have yellow fever standard case definition posted on the wall of OPD and in hospital ward. No allowed PHEM structure at Jinka town administration and health facilities level. The availability of standard yellow fever case management guideline/protocol on the desk/shelf of all HF's visited was not witnessed during field assessment. Furthermore, there was shortage of access to emergency stocks of drugs and medical and laboratory supplies at all health facilities at the onset of the outbreak. Furthermore, available core laboratory tests in the visited health centers were inadequate for further investigation of viral hemorrhagic fever cases. At health facility level 60% of the IDSR focal persons and only one third of the HEWs interviewed were aware of the cross line for yellow fever outbreak determination. In kebele level, none of the visited health posts have yellow fever community case definition at their facility.

The probable date of onset of the index case from Geza kebele of South Ari woreda is Week 49, 2012. In between the epidemic continued to spread over three woredas/town, namely Benanatsemai woreda (week 50, 2012) and Jinka town (week 51, 2012) and Salamago woreda (week 12, 2013). The two woredas (South Ari & Benanatsemai) and Jinka Hospital reported the occurrence of unusual cluster of cases and deaths to the zonal health department between February and March 2013. The cumulative interval between date of onset of occurrence of unusual cluster at the community to notification to the zone/region was about nine weeks indicating a dalliance in detection of the outbreak (Target: <7 days).

Laboratory blood specimens collected to date confirmed YF with six samples positive for IGM (antibody test) were received by the zone health department one month after the blood specimens collected from 17 suspected cases by the staffs from central lab/EHNRI. This one month interval between sending laboratory specimens and receipt of results by the zone considered as adequate laboratory confirmed surveillance diagnosis. However, of the four woredas/town affected by the OB South ari (25%) is the only to confirm the causative agent through laboratory diagnosis. According to the health facilities report, (up to week 39) the epidemic affected 35 kebeles in

three woredas and one town administration and a total of 141 cases 56 deaths were reported indicating cumulative CFR of 39.7%.

The post epidemic assessment has also identified the epidemic response, epidemic field investigation, mainly implemented with Rapid Response Team organized at Zonal level with technical supports from field staff of WHO was conducted in April 2013. Hence the cumulative interval between date of notification to the zone (February/March 2013) and date of epidemic field investigation (April 3-5, 2013) conducted was about two weeks (Target: within 48 hours) indicating a dalliance of epidemic response. According to the post epidemic assessment the key findings regarding the status of the major yellow fever control interventions mainly implemented in the eligible kebeles, woredas and the zone were as below: Enhanced Epidemiological Surveillance during the outbreak- All the health facilities including the health posts visited had accelerated the epidemiological surveillance during the outbreak and were reporting on daily bases including zero report using daily epidemic reporting format. However, none of the HFs used the case based forms for reporting of the yellow fever cases; however, reporting by line listing was used by ZHD, the affected woreda health offices (except Salamago) and Jinka hospital for reporting to the next higher level.

Analyzing surveillance data - At the region and zone level surveillance data during the outbreak were analyzed using the variables: Place (Woreda/Kebele) on daily; Person (age, sex, vaccination status, and outcome) and Time (day, week, and month) on weekly basis. However the practice and capacity to analyze surveillance data during the outbreak at woredas and health facilities visited cannot be ensured as there were no variables analyzed witnessed.

The quality of case management – According to the health facilities report, (Week 49,2012 up to week 39,2013) the epidemic affected 35 kebeles in three woredas and one town administration and a total of 141 cases 56 deaths were reported indicating cumulative CFR of 39.7%, > the acceptable level 20-30%.

Yellow fever mass Vaccination campaign- Accordingly, the assessment identified

Vaccine potency was maintained, monitored and recorded through functioning cold chain system in all (100%) of the visited institutions before, during and after the campaign;

Administrative vaccination coverage at zone level indicates 89.4%; and 586410 doses of yellow fever vaccine has been utilized to vaccinate 543558 eligible's indicating zonal vaccine wastage rate of 7.4%;

According to the results of the household survey conducted in 8 kebeles there was better achievements in terms of vaccination coverage. In all the kebeles surveyed the vaccination coverage was high, > 90%. Yellow fever vaccination coverage on average was 96.2%.

Community awareness creation - According to the results of the community survey conducted, among the respondents 96.3% had had been addressed with yellow fever related health education heard. Accordingly, Health Extension Workers, Public announcers, One to five HDA, Kebele Administrator, and Jinka Radio Fana were the main important sources of information.

Reduction of exposure to mosquitoes- Among the households surveyed 61% had at least one ITN before the occurrence of the outbreak; No house hold received bed nets during the outbreak; and of the total family members surveyed 42.1% were utilizing bed nets during the outbreak.

IRS (Indoor residual Spraying) - The community household survey has indicated that IRS during the yellow fever outbreak was conducted in 53.8% of the households surveyed.

Environmental management- According to the household survey, during the outbreak 85% participated in environmental vector control measures conducted in their respected kebeles which mainly has included draining of water bodies and covering of mosquito breeding sites with soil.

Adequacy of implemented Yellow fever Outbreak control interventions- Outbreak containment with an acceptable time cannot be ensured as the OB lasted more than two months after the key intervention, mass vaccination against YF (Target – 2 weeks after control intervention).

Gaps and Challenges

In conclusion, when analyzing the yellow fever post epidemic assessment field data collected in South Omo zone, the identification of gaps reveals the following major weaknesses and challenges:

Appropriate utilization of PHEM guideline cannot be ensured, as evidenced by absence of the guideline during field visits in some woredas and all HFs;

Poor utilization of Standard Case Definition for YF which is adopted and printed on the PHEM guideline. In the same way, community case definition for Hemorrhagic diseases is also printed;

Health Workers in the HFs adherence to the treatment protocol cannot be ensured as witnessed by the guideline/protocol for the management of yellow fever not available on the desk/shelf;

Government financial access is poor as evidenced by no ear marked budget/fund for emergency response activities, in all Woredas. This may be because of high reliance on donors and partners;

Dalliance of outbreak detection due to poor recording and reporting of unusual cluster of deaths in the health facilities which resulted in insufficient information surveillance data;

Yellow Fever case-based surveillance is part of the national PHEM's system but was not implemented in all the visited woredas during the outbreak;

Failure to indicate identified population groups and areas at high risk/hazards for yellow fever outbreak on the EPRP;

Delay of epidemic response due to low capacity to conduct epidemic investigation and shortage of operational cost for deployment of RRT at zone/woreda level; and Low capacity and trend to analyze Outbreak data at woreda and HFs level.

Recommendations

Therefore, after analyzing the identification of gaps reveals the following major weaknesses and challenges the PEA team members recommend the following immediate, intermediate and long actions:

Immediate actions needed (Quick Wins)

Train health workers including PHEM officers on yellow fever surveillance, case management and vaccination so as to adequately respond to increased demand of the community;

Scale up the ongoing interventions- Indoor residual spraying; Community mobilization for environmental management;

Avail standard yellow fever case definition at all HFs and community case definitions at health posts;

RHB has to disseminate the Post Epidemic Assessment (PEA) final report to the zone, woredas & partners and organize a yellow fever outbreak review meeting/workshop at zone & region level.

Recommendations for Intermediate and long actions

Support to the Zone and Woredas from the federal and region to increase through donors to provide technical support to prepare EPR plan;

Ensure availability of essential emergency drugs, medical supplies, laboratory facilities mainly at health facilities and Jinka public health laboratory;

Strengthen coordination mechanisms between zone and partners with due consideration to mobilize local resources;

Pre position essential supplies like IRS chemicals and ITN;

Make contingency funding for emergency response activities available at all level;
Avail standard yellow fever case management guidelines/treatment protocols mainly at all HF's levels;
Strengthen YF surveillance at all levels to ensure early detection, notification and monitoring of the performance of prevention and control programs;
Conduct mapping of specific areas and actual number of population at risk of yellow fever;
Use of the PHEM guideline to be intensified at all levels; and
Intensify the community awareness creation activities through existing HEWs and one to five HAD.

Introduction and Back ground

Introduction

Yellow fever is a viral hemorrhagic disease caused by a flavivirus transmitted human-to-human via *Aedes* mosquitoes (urban epidemics) or via forest mosquito species and forest primate reservoirs (jungle cycle). Incubation period is 3 to 6 days after the bite from an infected mosquito. Risk factor: sporadic cases often linked to occupation or village location near woods or where monkeys are numerous. Also non-vaccinated persons are at risk. Large scale epidemics can occur every three to ten years in villages or cities. Sporadic cases can occur regularly in endemic areas. There is resurgence of the disease in Africa since mid-1980s. True incidence far exceeds reported cases.

The disease is untreatable, while only the minorities of cases are severe, case fatality rate may be 25% to 50% among patients with syndrome of hemorrhage, jaundice, and renal disease. VHF and other infections causing hemorrhage may mimic yellow fever. Yellow fever can be prevented through immunization with the 17D yellow fever vaccine. The vaccine is safe, inexpensive and reliable. A single dose provides protection against the disease possibly life-long. There is high risk for an explosive outbreak in an unimmunized population and children are especially vulnerable if even one laboratory confirmed case of yellow fever occurs in the population. Yellow fever is one of the twenty diseases identified by PHEM and is under surveillance. It is one of the immediately reportable diseases and identified as weekly zero reporting case. Yellow Fever Case detection and reporting follows the Public Health Emergency Management Center's rules and regulation. Effective activities for disease surveillance remain the best tool for prompt detection and response to an outbreak of yellow fever especially in

populations where coverage rates for yellow fever vaccine are not high enough to provide protection against yellow fever. International reporting to WHO required within 24 hours.

Background to South Omo Zone

South Omo is one of the fourteen Zones of the SNNP region that is geographically located in Rift Valley area at 775km and 525km South of Addis Ababa and South West of Hawassa respectively. The area of the zone is 23,535km square and most of the surface area of the Zone has low lands with hot climatic conditions. Administratively the zone is divided into eight woredas (Benanatsemai, Dassenech, Hammer, North ari, Salamago, South ari, Maale, and Gnyangatom), one town administration (Jinka) and 254 kebeles (242 rural). The woredas are the basic units of planning and political administration. The zone share territories with Gamo Gofa, Kaffa, Segen and Bench Maji zones and Basketo special woreda; Kenya in the south and Sudan in the south west. Based on the 2007 census, the projected total population of the zone is estimated at 686616 (91.1% resides in rural area).

Currently, the general population of the zone gets health service from one zonal hospital, 27 functional health centers, 2 NGOs clinics, 209 health posts and 43 private clinics. This indicates that the potential health service coverage (PHSC) of the zone had reached 98.3%. In addition, the proportion of rural kebeles with at least one HP in the zone is 86.4%. Thus we can say that both the population & geographical health service coverage of the zone are high.

National Overview of Yellow fever epidemic

An epidemic of severe and fatal illness with jaundice occurred in Daghabor in 1943 without clinical observation by competent observers or laboratory tests. The first confirmed reports of YF occurred in 1959 in Wollega Province, an extension of an outbreak in bordering areas of Sudan in the same year. Available publications and documents showed that the largest sylvatic yellow fever epidemic ever recorded in Ethiopia was in 1960-1962, affecting 10% of the 1,000,000 residents of south-western Ethiopia (Kaffa and Gamogofa provinces), a population without background immunity. The epidemic caused about 30,000 deaths from nearly 100,000 suspected cases, indicating AR of 10% and CFR of 30%. The disease reappeared in 1966 slightly to the east of this region (Arba-Minch District), suggesting persistence of the virus between 1959-66. No subsequent cases have been recognized.

A serological survey after the 1943 epidemic found 4 out of 29 (13.8%) of adults in 1943 and 3/22 (14%) in 1944 with neutralizing antibodies. None of 36 children under 15 years were

positive. A survey in the same general region (Shoa Plateau) and elsewhere in Ethiopia in 1953-54 was negative. It might be concluded that the appearance of YF in southwestern Ethiopia in 1959-62 was a virgin soil outbreak following introduction from Sudan, which underwent an outbreak in adjacent areas to the east in 1959. However, approximately 10 years after the 1960 - 66 outbreaks, specific neutralizing antibodies were found in unvaccinated people (22%), including a child born after the outbreak, as well as in baboons and monkeys in outbreak site, suggesting persistence of (silent) YF virus transmission. However, there is insufficient evidence to clearly differentiate areas of high and absent risk. From an ecological perspective, the area of highest risk corresponds to the western half of the country.

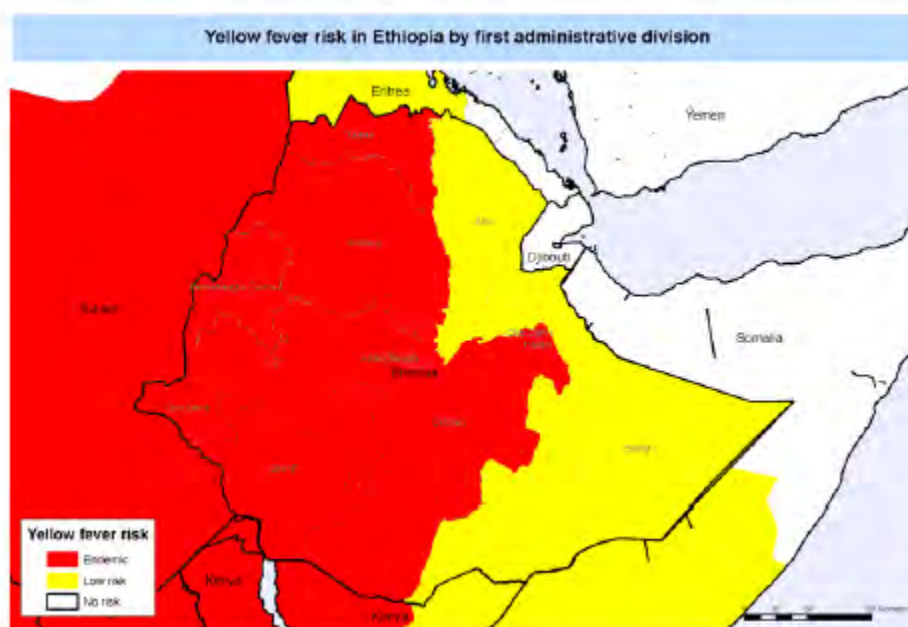


Figure 23 Current situation yellow fever risk

The leading causes of morbidity in all age groups in south Omo zone are malaria, dysentery, helminthiasis, acute respiratory infections, accidents, skin and subcutaneous tissue diseases, typhoid fever, gastritis and deudentitis. However, the zone experienced unusual cluster of cases and deaths which affected 4 woredas/town namely South ari, Benanatsemai, Jinka town & Salamago. Thus unusual death rumors have been reported through the national surveillance programme to the South Omo Zone Health Department, SNNP/RHB/PHEM and PHEM centre at EHNRI since February/March 2013. These reports have warranted, as a response, field investigation with Rapid Response Team organized at Zonal level with technical supports from

field staff of WHO- Ethiopia (April 3-5, 2013). Jinka Hospital rapid response team comprising medical doctors, lab personnel and surveillance focal persons also conducted a retrospective medical record review of upper GI bleeding cases that were admitted to medical ward from October 2012 to March 2013.

Laboratory blood specimens collected to date confirmed YF with six samples positive for IGM (antibody test). The laboratory confirmation was done by Institute of Pasteur in Senegal, a WHO regional reference laboratory for yellow fever. Differential diagnosis for other flaviviruses was negative. The index case was a 30 year old man from Geza kebele of South ari woreda who presented with fever, jaundice and hemorrhagic signs in December 2012. The recent major epidemic (2012/2013) affecting three woredas and one town administration in South Omo zone of the SNNP region recorded a total 56 deaths from 141 cases (AR=5 cases per 10,000 population; CFR=39.7%). The most affected woreda was South ari of the South Omo zone contributing to 74.5% of the total reported cases. In response to the reported laboratory confirmed yellow fever epidemic, the FMOH of Ethiopia launched an emergency mass vaccination campaign against yellow fever in June 2013.

This yellow fever post epidemic assessment document has tried to show how the system from Zone to Woredas and health facilities addressed the recent yellow fever epidemic in south Omo zone of the SNNPR. It also tried to indicate the challenges and weaknesses of the system in confirming the epidemic (surveillance and investigation), status of preparedness and the timing and impact of the intervention measures (proper case management, vaccination) and the participation of the community and other partners. The PEA team members' hopes that this will benefit the system to appreciate and maintain the good works and practices done as well as help to rectify weaknesses and improve the epidemic response system. On top of that, other zones and woredas which did not encounter the outbreak can also learn from the efforts done in the control of the yellow fever outbreak through information dissemination workshop.

Yellow fever affected wereda of S Omo Zone, SNNP 2012-2013

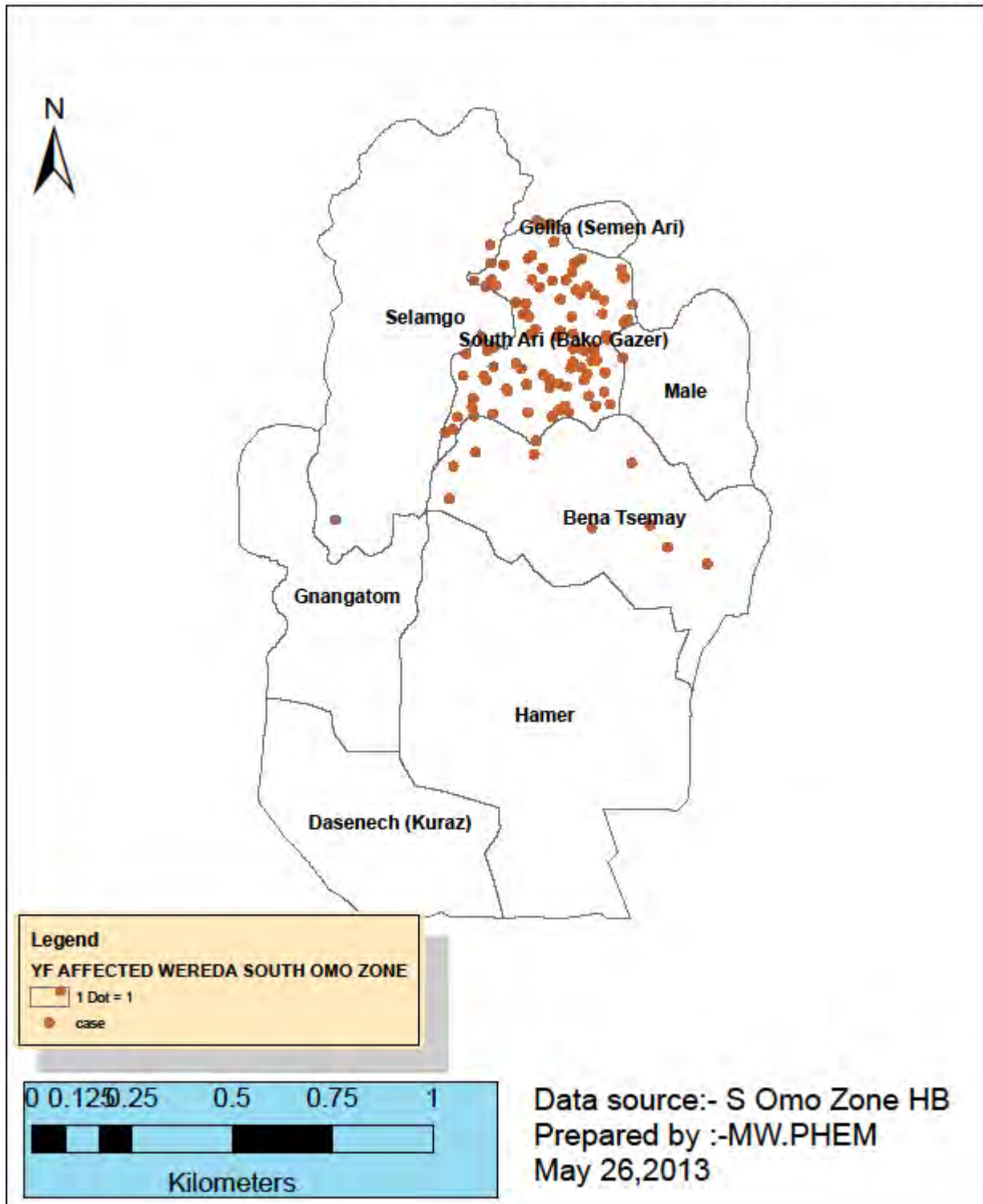


Figure 24 Yellow fever affected wordedas, South Omo zone SNNPR

Objectives

2.1. General Objective

The General objective of the yellow fever post epidemic assessment was to document best practices/efforts done as well as identifies gaps in performances in all aspects of the epidemic management at all levels of the health system in South Omo zone of the SNNP region.

2.2. Specific Objectives

To evaluate the quality of yellow fever epidemic preparedness,

To evaluate adequacy of yellow fever epidemic detection and reporting,

To evaluate the adequacy of epidemic response- investigation,

To evaluate the status of implemented yellow fever control interventions,

To evaluate yellow fever epidemic monitoring and evaluation; and

Based on the identified gaps, to recommend the required actions to be taken for future similar outbreaks management

Methods

The post epidemic evaluation included visits to the region health bureau, Zone health Department, woreda health offices affected by the outbreak, Jinka hospital and selected HCs, HPs and households survey in the outbreak area. The Yellow fever post epidemic assessment team has included representatives from regional Health Bureau/PHEM, South Omo Zone Health Department/PHEM, and WHO/DPC. The dates for the field visit were 14- 28, October 2013. Specifically, the assessment has addressed the major areas of epidemic preparedness and responses in the context of the recent yellow fever epidemic affected woredas in the zone.

The data collection methodologies used for the data collection were, Interview with key informants, direct observation & Household survey.

3.1. Interview with key informants

At the region, Zone and woreda level/Health facility level the team members conducted discussion with the key informants from (PHEM and/or DPHP core process officers; health facility heads and IDSR focal persons). The discussions focused on epidemic detection, outbreak investigation and outbreak preparedness & implemented response interventions.

The following steps were followed while conducting the interview at health institutions:-

At least one day before the selected woreda and hospital and health centre heads contacted (mostly by telephone) for the necessary arrangements.

Interview was conducted by the working language, Amharic, that was convenient for all key informants.

Before the interview the interviewer introduced ourselves & explained the purpose of the interview, guaranteed the confidentiality and appreciation for their timely devotion for the interview. Interviewees were also allowed to introduce themselves & proofed oral consent.

When one of the PEA team members interviews the key informants, the others were recorded points that were answered by the interviewees. In addition, the interviewer was taking key bullet notes and the note taker also addressed not clarified and missed questions relevant at the end of the interview.

After each interview, the PEA team discussed and documented the data's.

The interview were carried out among purposely selected informants from different platforms which includes-

PHEM Officers- RHB; ZHD and WoHOs (DHPH officer in case of Jinka town administration);

M/Director, HC heads and/or IDSR focal person- Jinka Hospital and Health centres visited

Medical Laboratory technologist- Jinka public health laboratory; and

Health Extension Workers - Health Posts in highly yellow fever epidemic affected kebeles.

Family member – House hold survey

3.2. Observation

During the visits to the health institutions the team members conducted review/observation of available data and reports:- EPR plan, epidemic management committee minutes, weekly surveillance data, filled line lists, outbreak investigation reports, and daily epidemic reports.

3.3. Community level house hold survey

The PEA team conducted household survey by visiting 80 houses in 8 highly yellow fever epidemic affected kebeles from three woredas (Dehub Ari, Benatsemai and Jinka town).

Other activities

Capacity building- At the region, Zone woreda and Health facility level the team members also conducted capacity building in the identified gaps (debrief after visit to discuss gaps).

Data Entry and Analysis- The data entry were done using Epiinfo statistical software version 3.2.7; and the qualitative and quantitative data were descriptively analyzed to determine the adequacy of preparedness for yellow fever epidemic response capacities, epidemiological and laboratory surveillance diagnosis, adequacy of epidemic response, status of implemented control interventions and the epidemic monitoring and evaluation.

Findings of the assessment

4.1. Coverage of the assessment

Coverage for Health institution assessment - The health assessment covered a total 18 health institutions: one regional health bureau, one zonal health department, four woreda/town health offices, five Health facilities (4 Health centers & 1 Hospital), one Jinka public health laboratory, and six health posts.

Coverage for Community household's survey- At the community level:- 8 highly yellow fever epidemic affected kebeles; 80 households in the 8 kebeles; A total of 435 family members in the 80 houses visited, and 417 family members eligible (9 months to 60 years) for yellow fever vaccination were surveyed.

4.2. Preparedness for Yellow Fever epidemic response

4.2.1. Emergency response Coordination mechanism

There was an emergency-response coordination mechanism among partners at region and zone level (100%) as evidenced by the presence of epidemic preparedness and response committee/task force established prior to the outbreak. At woreda level the coordination existed only in 25% (n=1) of the woredas visited. The status of existing emergency-response coordination mechanism at the zone and South Ari woreda was low as the assessment identified the two committees were not having any meeting prior to the outbreak and meetings throughout the period of the outbreak was irregular. At health facility levels there were no coordination existed among partners. Main issues noted on the observed task force minutes were information sharing and resource mobilization.

4.2.2. Guidelines and protocols

PHEM guide line- The national PHEM guide line (2012) was available both at the RHB and South Omo ZHD (100%). PHEM guideline was available in only 50% (n=2) of the woreda health offices and in none of the health facilities visited. The overall availability of PHEM guideline among the visited health institution was 36.4% (n=4)

Epidemic Preparedness and Response Plan (EPRP)- The presence of epidemic preparedness and response (EPR) plan at RHB and ZHD level is 100%. However EPRP was available in only 50% (n=2) of the woreda/town health offices visited and the absence of EPR plan in all of the health facilities were prevailing problem. The overall availability of EPRP among the visited institution was 36.4% (n=4). Of the observed EPRP documents none identified population groups and areas at high risk/hazards for yellow fever outbreak.

Yellow fever standard case definition- Among the visited health institutions none observed to have yellow fever standard case definition posted on the wall of OPD and in hospital ward. In addition, none of the visited health posts have yellow fever community case definition at their facility.

4.2.3. Resources/Inputs for emergency response activities

Emergency financial access- There is government financial contingency budget/fund at the region and zone level though not ear marked for emergency response activities. However there was no emergency financial access in all the Woredas and health facilities visited.

Availability of emergency drugs and supplies- There was shortage of access to emergency stocks of drugs and medical and laboratory supplies at zonal, woreda and health facilities levels at the onset of the outbreak.

Human Resources for PHEM- The presence of a PHEM structure at region, zone and woreda level is promising. At the region level the RHB/PHEM core process the staffing is 100% as per the standard kept. However at the onset of the recent yellow fever outbreak the proportion of PHEM officers assigned to the South Omo zone health department and all woredas health offices were 50% and less than 50% respectively as compared to the standard. No allowed PHEM structure at Jinka town administration and health facilities level.

Status of Yellow fever Epidemiological and Laboratory Surveillance diagnosis

Epidemiological surveillance and documentation

Onset of the Epidemic- The probable date of onset of the index case from Geza kebele of South Ari woreda is 03/12/2012 (Week 49, 2012). In between the epidemic continued to spread over three woredas/town, namely Benatsemai woreda (week 50, 2012) and Jinka town (week 51, 2012) and Salamago woreda (week 12, 2013).

Date of reporting of the epidemic- Date of the two woredas (South Ari & Benanatsemai) and Jinka Hospital reported the occurrence of unusual cluster of cases and deaths to the zonal health department were between February and March 2013.

Reporting- None of the HFs used the case based forms for reporting of the yellow fever cases; However, reporting by line listing was used by ZHD, the affected woreda health offices (except Salamago) and Jinka hospital for reporting to the next higher level.

Case finding - According to the health facilities report, (up to week 39) - The epidemic affected 35 kebeles in three woredas and one town administration (35.0%); A total of 140 cases 56 deaths were reported (Cumulative CFR was 40.0%). (See table 1)

Communication- Telephone call was the most frequently reported means of receiving and transferring unusual cluster of rumors in all visited health institutions. In addition the zonal health office was reporting using electronic means (fax)

Adequacy of early detection and timely reporting of the yellow fever outbreak- The cumulative interval between date of onset of occurrence of unusual cluster at the community to notification to the zone/region was about nine weeks (Target: <7 days) indicating a dalliance in detection of the outbreak.

Laboratory confirmed surveillance diagnosis

Specimen collection and transportation- A total of 17 laboratory blood specimens were collected by staffs from the central lab/EHNRI from suspected cases from South ari, Benanatsemai and Jinka town. Laboratory results were received by the zone one month after the date of blood specimens collected by the EHNRI

Adequacy of Laboratory confirmed surveillance diagnosis- The Interval between sending laboratory specimens and receipt of results by the zone was one month. Of the woredas affected by the OB 25% (n= 1woreda) confirmed the causative agent through laboratory diagnosis (Target 50% of affected woredas).

Capacity for determination of yellow fever outbreak

The capacity of the entire region and zone PHEM officers (knowledge and skills) on determination of thresholds for Yellow Fever outbreak was noticed to be encouraging (100%); At woredas/town health office level three fourth of the PHEM officers had the capacity to determine the thresholds for yellow fever outbreak; At health facility level, 60% (n=3) of the IDSR focal persons interviewed had the capacity to determine the thresholds for yellow fever

outbreak, and only one third of the HEWs interviewed were aware of the cross line for yellow fever outbreak determination.

4.4. Status of Yellow Fever Epidemic response

The post epidemic assessment has evaluated the adequacy of epidemic response mainly implemented by yellow fever epidemic affected woredas and the zone health department as below:

4.4.1. Rapid Response Team (RRT)

RRT was activated both at the region and zone level (100%) at the beginning of the outbreak. At woreda level RRT was activated in 50% (n=2) of the health offices visited. At health facility level, only 40% (n=2) activated the RRT at the beginning of the outbreak. On average 54.5% (n=6) of the health institutions visited activated their RRT. RHB and ZHD participated in the field epidemic investigation with RRT organized at zonal level. Jinka Hospital RRT also conducted retrospective study of the medical record review.

4.4.2. Epidemic investigation

Epidemic field investigation was conducted with Rapid Response Team organized at Zonal level with technical supports from field staff of WHO (April, 2013). Jinka Hospital rapid response team comprising medical doctors, lab personnel and surveillance focal persons conducted a retrospective medical record review of upper GI bleeding cases that were admitted to medical ward from October 2012 to March 2013. The observed available epidemic investigation reports at South Omo zone and Jinka Hospital has included analysis of epidemic data by time, place and person; established the existence of an epidemic by verifying the occurrence of unusual clusters; and Suggested AHF as the possible cause of the OB with recommendations.

However the activated south ari and Benanatsemai woredas RRT were not participated in the field investigation

4.4.3. Adequacy of the epidemic response

Date of the two woredas (South Ari & Benanatsemai) and Jinka Hospital reported the occurrence of unusual cluster of cases and deaths to the zonal health department are between February and March 2013;

Date of the epidemic investigation conducted with Rapid Response Team

At Zonal level with technical supports from WHO was between April 3 and 5, 2013.

At Jinka Hospital rapid response was on April/May 2013.

The cumulative interval between date of notification to the zone (February/March 2013) and date of field investigation (April 3-5, 2013) conducted was about two weeks (Target: within 48 hours) indicating a dalliance of epidemic response.

Status of Implemented yellow fever control Interventions

The post epidemic assessment has identified the status of the major yellow fever control interventions mainly implemented in the eligible kebeles, woredas and the zone health department as below:

Enhanced Epidemiological Surveillance during the out break

All the health facilities including the health posts visited had accelerated the surveillance during the outbreak and were reporting on daily bases including zero report. Daily epidemic reporting format was utilized for recording and reporting of surveillance data

Yellow fever case management

The availability of standard yellow fever case management guideline/protocol on the desk/shelf of all HFs visited was not witnessed during field assessment. There was shortage of access to emergency stocks of drugs and medical supplies at woreda and health facilities levels at the onset of the outbreak. (Except Jinka Hospital). Furthermore, available core laboratory tests in the visited health centers were inadequate for further investigation of viral hemorrhagic fever cases. The quality of case management – The overall yellow fever CFR (Case fatality rate) during the epidemic was 40.0% indicating CFR not maintained at an acceptable level (10-20%).

Yellow fever Vaccination

According to the assessment conducted at the health institutions level

Woreda level micro plan was prepared by the South Omo zone health department without the involvement of the woredas and health facilities,

The South Omo Zone received a total of 591,816 doses of yellow fever vaccine (According to the micro plan the total target population for the yellow fever vaccination was 607462),

Emergency yellow fever immunization campaign was conducted in all the catchment areas of the visited institutions in South Omo zone.

Two third of the health posts (n=4) provided yellow fever vaccination card to those vaccinated during the immunization campaign;

Vaccine potency was maintained, monitored and recorded (all kept the vaccines at 2-8 °C temperature) through functioning cold chain system in all (100%) of the visited institutions before, during and after the campaign;

All visited health institutions discarded opened vials not used within six hours;

In all kebeles vaccination team composition mainly has included vaccinator, recorder, crowd controller and social mobilize,

Target age group during the vaccination campaign in all the visited institutions was those between the ages of 9 months to 60 years, excluding pregnant. The number of those non eligible but vaccinated was negligible (n=2),

Average number of daily performance per each vaccination team in the visited health facilities was 460 ranging from 300 to 550,

All health posts returned left vaccines immediately after the campaign except Alga HP of South ari woreda which kept 20 left vials within the health post up to the day of the PEA team visit.

Results/Outcome of the Vaccination campaign- Administrative vaccination coverage at zone level indicates 89.4% (n=543,558); and 586410 doses of yellow fever vaccine has been utilized to vaccinate 543558 eligible's indicating zonal vaccine wastage rate of 7.4%. In all the health facilities visited administrative yellow fever vaccination coverage was not calculated as they were unaware of their total number of the target groups.

The main challenges encountered by the visited health institutions during the vaccination were: Shortage of cold chain equipment – Ice packs; Absence of tally sheets and reporting format; Absence of yellow vaccination card for quality evaluation; Shortage of supplies- Mixing syringe; and High Crowding on first day of the campaign

The summary of the results of survey indicated as below:- According to the results of the community survey conducted in a total of 80 houses with 417 eligible's (9 months to 60 years) from 8 kebeles in the three epidemic affected woredas of the Zone there was better achievements in terms of vaccination coverage. In all the kebeles surveyed the vaccination coverage was high, > 90%. Yellow fever vaccination coverage on average was 96.2% (n=401).

Reasons for missed eligible- Of the total eligible's surveyed only 3.8% (n=16) of them missed the vaccination. According to the survey the main reasons for missing the vaccination were: Absence of family member during immunization campaign days - 81.3 % (n=13); and other

reasons were - Knew the campaign but too busy (n=1), family member was ill (n=1), and was caring for sick family member (n=1).

Community awareness creation

According to the results of the community survey conducted in 80 households in the 8 kebeles of the three yellow fever epidemic affected woredas in the Zone, among the respondents 96.3% (n=77) had had been addressed with yellow fever related health education heard. Accordingly, the **main important sources of information were**: Health Extension Workers 70.1% (n=54); Public announcers (Criers) 22.1% (n=17); One to five HAD (health development army) 10.4 % (n=8); Kebele Administrator 7.8% (n=6); and News media (Jinka Radio Fana) 6.5% (n=5).

Reduction of exposure to mosquitoes/ITN utilization and distribution

According to the results of the house hold survey conducted in 8 kebeles of the three yellow fever epidemic affected woredas in the Zone:- Among the households surveyed 61% (n=49) had at least one ITN before the occurrence of the outbreak; No house hold received bed nets during the outbreak; and among the total family members surveyed 42.1% (n=183) were utilizing bed nets during the outbreak.

Control of vector

IRS (Indoor residual Spraying) - The community household survey conducted in the highly selected kebeles has indicated that IRS (Indoor residual Spraying) during the yellow fever outbreak was conducted in 53.8% (n=43) of the households surveyed.

Environmental management- Of the respondents interviewed during the community house hold survey 85% (n=68) during the outbreak participated in environmental vector control measures conducted in their respected kebeles which mainly has included draining of water bodies and covering of mosquito breeding sites with soil.

Adequacy of implemented Yellow fever Outbreak control interventions

Was outbreak diseases contained with an acceptable containment time?

Date YF outbreak intervention (mass YF vaccination) implemented was on June 2013;

Date the last suspected YF case reported was on Sept 9/2013;

Hence, outbreak containment with an acceptable time cannot be ensured as the OB lasted more than two months after the key intervention, mass vaccination against YF.

Status of Yellow Fever Epidemic Monitoring and Evaluation

Epidemic meeting

The status of the epidemic management committee meeting as part of the epidemic response to review/monitor the status of management as witnessed by the available minutes was: In all the visited institutions the Epidemic management working committee's meeting did not take place regularly leaving gaps in communication & addressing problems.

Analyzing surveillance data

At the region and zone level surveillance data during the outbreak were analyzed using the following variables: Place (Woreda/Kebele) on daily basis; Person (age, sex, vaccination status, and outcome) on weekly basis; and Time (day, week, and month) on weekly. However the practice and capacity to analyze surveillance data during the outbreak at woredas and health facilities visited cannot be ensured as there were no variables analyzed witnessed.

Supportive supervision

Supervision conducted was conducted in all the visited institutions from the higher level during the outbreak. However written feedback was given only to the zone health department and Jinka Hospital which in turn failed to disseminate the document to next lower levels including woreda health offices and facilities (HCs and HPs). However, all the woreda health offices, health centers and health posts visited were debriefed by the supervision and field investigation team members after visit?

Epidemic evaluation

Post epidemic evaluation, Final Report and other aspects- Post epidemic assessment conducted by the regional health bureau in collaboration with WHO within two week from end of the epidemic , October 14-28, 2013 (Target: 2 wks). However South Omo zone health department, Jinka Hospital and the Woreda health Offices not yet conducted yellow fever post epidemic assessment or submitted final outbreak report to the next higher level.

Conclusions and Recommendation

5.1. Conclusion

In conclusion, when analyzing the yellow fever post epidemic assessment field data collected in South Omo zone, the identification of gaps reveals the following major weaknesses and challenges in the context of the yellow fever epidemic affected woredas setting:

In some woredas and all HFs, appropriate utilization of PHEM guideline cannot be ensured, as evidenced by absence of the guideline during field visits;

Standard Case Definition for Yellow Fever is adopted and was printed on the PHEM guideline.

In the same way, community case definition for Hemorrhagic diseases is also printed and distributed. But the assessment identified under utilization of the standard case definition

Health Workers in the HFs adherence to the treatment protocol cannot be ensured as witnessed by the guideline/protocol for the management of yellow fever not available on the desk/shelf;

Government financial access is poor as evidenced by no ear marked budget/fund for emergency response activities, in all Woredas. This may be because of high reliance on donors and partners;

In all the woredas, no or inadequate computers at both programmatic and implementation levels

Dalliance of outbreak detection- The dalliance was due to poor recording and reporting of unusual cluster of deaths in the health facilities which resulted in insufficient information surveillance data.

Yellow Fever case-based surveillance is part of the national PHEM's system but was not implemented in all the visited woredas during the outbreak. Failure to indicate identified population groups and areas at high risk/hazards for yellow fever outbreak on the EPRP.

Dalliance of epidemic response due to low capacity to conduct epidemic investigation at zone, woreda and HFs level due to absence and/or shortage of trained manpower on management of yellow fever outbreak; and shortage of operational cost to conduct field level OB investigation as well as deployment of RRT, Absence and/or shortage of PHEM personnel at woreda level; Low capacity and trend to analyze Outbreak data at woreda and HFs level.

Recommendations

Therefore, after analyzing the post epidemic evaluation field data the PEA team members recommend the following actions to be taken by all health system levels and partners

Immediate actions needed (Quick Wins)

Assignment of a PHEM officer to Salamago WoHO and Jinka town

Train health workers including PHEM officers on yellow fever surveillance and case management

Scale up the ongoing interventions

Indoor residual spraying

Community mobilization for environmental management

Train adequate number of health staff of neighboring zones and woredas on YF surveillance, case management, and vaccination so as to adequately respond to increased demand of the community;

Avail standard yellow fever case definition at all HFs and community case definitions at health posts;

Disseminate Post Epidemic Assessment (PPE) final report to the zone and all affected woredas
RHB has to organize a yellow fever outbreak review meeting/workshop at zone & region level

Recommendations for Intermediate and long actions

Support to the Zone and Woredas from the federal and region to increase through donors to provide technical support to prepare EPR plan;

Ensure availability of essential emergency drugs, medical supplies, laboratory facilities mainly at health facilities and Jinka public health laboratory;

Strengthen coordination mechanisms between zone and partners with due consideration to mobilize local resources;

Pre position essential supplies like IRS chemicals and ITN;

Make contingency funding for emergency response activities available at all level;

Avail standard yellow fever case management guidelines/treatment protocols mainly at all HFs levels;

Strengthen YF surveillance at all levels to ensure early detection, notification and monitoring of the performance of prevention and control programs;

Conduct mapping of specific areas and actual number of population at risk of yellow fever;

Use of the PHEM guideline to be intensified at all levels;

Recruit and deploy a data manager for PHEM activities at least for RHB and Zone health department;

Equip each woreda with computers/Laptop and train WoHO PHEM officers on basic computer knowledge;

Orient NGOs operating in the area of health and secure continuous involvement in emergency response and surveillance activities;

Intensify the community awareness creation activities through existing HEWs and one to five health development armies;

Shift towards procurement of motorbikes for each woreda PHEM activities;

Conduct operational research in collaboration with research institutions & universities/Arbaminch - Retrospective study on determinants of yellow fever epidemics

Table 25. Yellow Fever Surveillance and Morbidity report, Extent of Yellow Fever cases and deaths by woreda, South Omo Zone, SNNPR (Dec. 2012 - Sep. 2013)

S N	Details	South Ari Woreda	Benatsemai Woreda	Salamago Woreda	Jinka Town	Total
1	Total Population (2013)	226131	62825	33066	26851	348873
2	Total Kebeles	52	25	16	6	99
3	Kebeles affected	21	9	2	3	35
4	Health facility based					
	Date of onset of the OB	03/12/2012 (week 49)	12/12/2012 (week 50)	24/03/2013 (week 12)	22/12/2012 (week 51)	
	Total cases	105	17	2	16	140
	Deaths	42	14	0	0	56
	CFR %	40.0	82.4	0.0	0.0	40.0

Table 26. Yellow Fever vaccination Achievement and Coverage by Woreda, South Omo Zone, SNNPR, June 2013

S.N	Woreda	Target Population For YF vaccination	Total number of Population Vaccinated yellow fever	Coverage (%)	Yellow Fever vaccine usage	
					Vials	wastage Rate
1	Gnyangatom	22285	17217	77.3%	17280	0.4
2	Salamago	36103	30782	85.3%	31080	1.0
3	Jinka City	26027	23034	88.5%	24400	5.6
4	North Ari	67482	65282	96.7%	65485	0.3
5	South Ari	182389	175674	96.3%	207815	15.5
6	Bena Tsmay	63882	51242	80.2%	51600	0.7
7	Dasenech	56293	48018	85.3%	52070	7.8
8	Malle	94542	80352	85.0%	80350	0.0
9	Hammer	58458	52130	89.2%	56330	7.5
10	Zonal Total	607462	543731	89.5%	586410	7.3

Annexes

Annex 1. Malaria outbreak investigation Questionnaire

Demographic Information

Case status 1. Case 2. Control

Name-----

Age-----

Ethnicity-----

Economical status

Sex: 1. Male 2. Female

Religion: 1. Protestant 2. Orthodox 3. Islam 4. Catholic 5. Others

Educational status 1. Illiterate 2. 1-8grade 3. 9-12grade 4. Diploma and above

Occupation 1. Student 2. Gov't worker 3. Farmer 4. Private worker 5. Others

Number of household members-----

Risk Assessment

1. Where were you for the last 2weeks? 1. in this woreda 2. In other woreda

2. Did you have malaria? 1. Yes 2. No

3. If yes, date of onset-----

4. What are the symptoms you faced? 1. Fever 2. Chills 3. Sweating 4. Vomiting 5. Others

5. Blood smear taken 1. Yes 2. No

6. If taken, what was the result? 1. PF 2. PV 3. others

7. Did you get treatment? 1. Yes 2. No

8. If yes, date of treatment started-----

9. If treated, improved within 1. Three days 2. More than 3 days 3. Not yet improved

10. Do you have LLITN? 1. Yes 2. No

11. If yes how many? -----

12. If yes, how often did you use? 1. Daily 2. Some times 3. When I remember 4. Not using at all

13. Last date of receiving ITN 1. One year and below 2. Two years 3. Three years back

14. Is it worn out? 1. Yes 2. No

15. If yes, was it replaced immediately? 1. Yes 2. No

16. Are there children below 5 years of age in this household? 1. Yes 2. No

17. If yes, how many? -----

18. Is there a pregnant mother in this household? 1. Yes 2. No
19. If yes, how many? -----
20. Is there breeding sites (water) for mosquito near within 1km radius to your house? 1. Yes 2.
21. If yes, did you drain it? 1. Yes 2. No
22. Did your house sprayed? 1. Yes 2. No
23. If yes when? -----

Knowledge

24. Do you know about malaria? 1. Yes 2. No
25. If yes, what are the signs and symptoms?
1. Sweating 2. Head ache 3. Chills 4. Back ache 5. Vomiting 6. Joint pain
25. Do you know the factors of Malaria? 1.Yes 2.No
26. If yes, what are they
1. Mosquito bite 2. Poor personal and environmental hygiene 3. I don't know
27. If yes, where did you get information?
1. Through radio 2. TV 3. Health education
28. Do you believe that modern medicine can cure malaria? 1. Yes 2. No 3. Don't know

Attitude

29. Do you believe that environmental sanitation like draining collected stagnant water and clearing water collecting other materials prevent malaria transmission? 1.Yes 2.No
30. Do you believe that using ITN during sleeping time prevent from malaria infection?
- 1.Yes 2.No
31. Do you believe that wearing long sliver and covering head with clothing prevent malaria transmit ion? 1. Yes 2. No 3. don't know
32. If you have only one ITN-for whom you give priority to use it?
1. Mother 2. Children <5years 3. Myself
33. If one of your family member infected with malaria what is your measure?
1. Taking in to local traditional heeler 2. Giving local medicine at home 3. Taking to holly water
4. Taking to nearest health facility 5. Buying medicine from pharmacy and giving to him

Annex 2. Questions for Investigation of measles Outbreak

1. Demographic Information

Id number --- Cases Status—A/ Cases B/ Control Date of birth-----Age-----
Name of the child ----- Sex A/ Male B/ Female
Date of interview-----
Occupation -----Level of Education -----
A/ Zone -----B/Woreda-----C/Kebele -----
Religion A/Orthodox B/Muslim C/ Protestant D/Catholic E/ Others/ Specify/
Ethnicity ----- Economical Status/of family-----
Number of persons in the HH----- Marital status-----House size-----

Risk Factors and Clinical Features

1. Did the child has illness of measles A/ yes B/ No
2. If yes, did you take him/her to the health institution? A/ yes B/ No
3. If yes, did he/she admitted A/yes B/no
4. If yes, date of Admission-----Day of stay-----
5. Duration of illness before visiting the health facility -----in days/hours-----
6. Did the child treated with traditional medicine before health facility? A/ yes B/ No
7. What symptoms does he/she have?
 - 7.1 Fever A/ yes B/ no
 - 7.2 Runny nose A/ yes B/ no
 - 7.3 Cough A/ yes B/ no
 - 7.4 Rash A/ yes B/ no
 - 7.5 Red eyes A/ yes B/ no
 - 7.6 loss of appetite A/ yes B/ no
8. If he/she has a rash, date of rash onset -----
9. Did the child have contact with someone having rash within 1 wk back? A/ yes B/ no
10. Did the child develop complication? A/ Yes B/ No
11. If yes, is it? A/ diarrhea B/ pneumonia C/ otitis media D/ others/specify/
12. Did the child receive measles vaccine? A/ Yes B/No
13. If yes, at what age? -----
14. If yes, Check card----- see if A/ by card B/by History
15. If yes, how many times /for measles only? -----
16. Date of last measles vaccination-----
17. Are there other persons with similar symptoms within the household? A/ Yes B/ No

18. Are there other persons with similar symptoms in the neighborhood/? A/ Yes B/ No
19. Have you measles infection in your life? A. Yes B. No
20. Have you any contact with suspected/confirmed measles case? A/ Yes B. No

Nutritional status

21. Did the child receive Vit A at 6 month? A/ Yes B/ No
22. Is the child on OTP A/ Yes B/ No
23. Is there bilateral edema? A/ Yes B/ No

Knowledge

24. For what reason do somebody vaccinate her/his child with measles vaccine?
A/ To prevent measles disease B/ To prevent hunger C/ I don't know
25. What is the right age of vaccinating the child with measles vaccine in our country?
A/ at 9 months B/ 6months C/ 3months D/ other E/ I don't know
26. By what mechanism does the healthy child get measles disease from the sick child?
A/ Droplet B/ body contact C/ Food D/ Water E/Other/specify/

Attitude

27. Do you think vaccination can prevent measles disease? A/ Yes B/No
28. Do you think medical treatment helps measles patient? A/ Yes B/No
29. Do you believe that the child with rash should get medication? A/ Yes B/No
30. Do you believe that feeding and extra fluid is important for the child with measles?
A/ Yes B/No

Practice

31. What can somebody do if the child gets measles?
A/ Taking to HF B/ taking to local healer C/ keeping in home D/ I don't know
32. What care can be given to measles patient at home?
A/ Giving food/fluids B/ giving local medication C/ leaving alone D/ I don't know
33. What can you do to prevent your family from measles disease?
A/Vaccinating B/ keeping at home C/giving local medication D/I don't know
34. Can you isolate the child with measles rash from other children? A/ Yes B/ No

Annex 3. Socio-demographic profiles of study participants Kuraz sugar factory project.

Socio-demographic behavioral profiles	N _o (%)
Age in years	
Mean age +SD	
15-24	
25-34	
35-44	
>45	
Sex	
Male	
Female	
Residence	
Urban	
Rural	
Marital status	
Single	
Married	
Divorced	
widowed	
Level of education	
Illiterate	
Primary	
Secondary	
Tertiary	
Religion	
Muslim	

Orthodox	
Protestant	
Catholic	
Others	
Employment status	
Working full time	
Working part time	
Not working due to illness	
Unemployment	

Identifiers:

Assessment team

Respondent

Date

Surveillance System

Interviewer

General

I. Availability of a National Surveillance Manual

1. Is there a national manual for surveillance?

A. Yes B. No C. Unknown C. Not applicable

2. **If yes**, describe (last update, diseases included, case definitions, surveillance and control, integrated or different for each disease):

II. Case Detection and Registration

3. Do you have standard case definitions for AFP [**Observed** the standard case definition for (AFP)]

A. Yes B. No C. Unknown C. Not applicable

III. Data reporting::

Presence of recommended reporting forms in the zone at all times over the past 6 months

4. Is the regional PHEM providing surveillance forms to the Zone?

A. Yes B. No C. Unknown C. Not applicable

5. **If yes**, have you lacked appropriate surveillance forms at any time during the last 6 months?

A. Yes B. No C. Unknown C. Not applicable

6. What are the reporting entities for the surveillance system?

A. Public health facilities

B. NGO health facilities

C. Military health facilities

D. Private health facilities

E. Others _____

7. Percent of district reports (either directly or through an intermediate level) received each reporting period at the zonal level during the past 3 months:

Number of reports in the last 3 months compared to expected number

Weekly: _____ /12 times the number of districts

Immediately: _____ /----- times the number of districts

8. On time (use national deadlines)

Number of weekly reports received on time: _____ /12 times the number of districts

9. Was there any report of the immediately reportable diseases in the past 1 month?

A. Yes B. No

10. If yes, with in what time is the report received after detection of the case/ diseases?

A. Less than 1 hour

B. 2-24 hour

C. 1- 2 days

D. 3- 7 days

E. After 1 week

11. Percent of districts(zones) that have means for reporting to next level by e-mail, telephone, fax or radio

12. Capacity to report to next level by e-mail, telephone, fax or radio:

How do you report?

A. Mail

B. Fax

C. Telephone

D. Radio

E. Electronic

F. Other

IV. Data analysis

Does the regional level:

13. **Describe data by person** (case based, outbreaks, and sentinel)?

(Obs) Observed description of data by age and sex:

- A. Yes B. No C. Unknown D. Not applicable

14. **Describe data by place?**

(Obs) Observed description of data by district (tables, maps)

- A. Yes B. No C. Unknown D. Not applicable

15. **Describe data by time?**

(Obs) Observed description of data by time:

- A. Yes B. No C. Unknown D. Not applicable

16. **Perform trend analysis?**

Obs Observed line graph of cases by time

- A. Yes B. No C. Unknown D. Not applicable

17. List disease(s) for which line graph is observed

18. **Have an action threshold defined for each priority disease?**

Do you have an action threshold defined for Measles, AFP, Typhoid fever AWD, AFP

(polio),? A. Yes B. No C. Unknown D. Not applicable

19. Who is responsible for the analysis of the collected data?

20. How often do you analyze the collected data?

- A. Daily
- B. Weekly
- C. Every 2 weeks
- D. Monthly
- E. Quarterly
- F. As needed.....

21. **Have appropriate denominators?**

ObsObserved presence of demographic data (E.g. population by district and hard to reach groups)

- A. Yes B. No C. Unknown D. Not applicable

V. **Outbreak Investigation**

Percent of suspected outbreaks that were investigated in the past 6 months

22. Number of outbreaks suspected in the past year: _____

23. List the diseases: _____

24. Of those, number investigated: _____

(Observe reports and take copies if possible)

Of the investigated outbreaks in the past 1 year, percent in which risk factors were looked for:

25. Number of outbreaks in which risk factors were looked for: _____

Of the investigated outbreaks in the past 1 year, percent in which findings were used for action

26. Number of outbreaks in which findings were used for action: _____

[Observe report]

27. **Of districts that investigated an outbreak, percent that looked for risk factors**

Number of districts that looked for risk factors [observe in reports]

28. **Of districts that investigated an outbreak, percent that used the data for action**

(action include containing outbreak, improving surveillance, community actions)

Number of districts that used the data for action [observe in final report]

VI. **Epidemic preparedness(relevant for epidemic prone diseases)**

29. **Existence of a Regional/Zonal plan for epidemic preparedness and response**

ObsObserved a written plan of epidemic preparedness and response

- A. Yes B. No C. Unknown D. Not applicable

30. Existence of emergency stocks of drugs, vaccines, and supplies at all times in past 1 year:

Has the region had emergency stocks of drugs, vaccines, and supplies at all times in past 1 year? A. Yes B. No C. Unknown D. Not applicable

31. Experience of a shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)

Has the country experienced shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)? A. Yes B. No C. Unknown D. Not applicable

32. Existence of a standard case management protocol for AFP (polio), Obs Observed the existence of a written case management protocol

33. **If yes**, list: _____

34. Presence of a budget line for epidemic response

Is there a budget line for epidemic response? A. Yes B. No C. Unknown D. Not applicable

35. I. Existence of a zonal epidemic management committee

Observed minutes (or report) of meetings of epidemic management committee
A. Yes B. No C. Unknown D. Not applicable

36. Existence of a zonal rapid response team for epidemics

Does the country have a rapid response team for epidemic?
A. Yes B. No C. Unknown D. Not applicable

VII. Response to epidemics

37. Ability of the zonal level to respond within 48 hours of notification of most recently reported outbreak:

Obs Observed that the central level responded within 48 hours of notification of most recently reported outbreak (from written reports with trend and intervention)
A. Yes B. No C. Unknown D. Not applicable

38. Ability of the zonal epidemic management committee to evaluate its preparedness and response activities:

(Obs) Has epidemic management committee evaluated its preparedness and response activities during the past year (Observe written report to confirm)?

- A. Yes B. No C. Unknown D. Not applicable

VIII. Feedback

Existence of a report or bulletin that is regularly produced to disseminate surveillance data:

39. How many feedback bulletin or reports has the regional level produced in the last year?

40. **Obs:** Observed the presence of a report or bulletin that is regularly produced to disseminate surveillance data

- A. Yes B. No C. Unknown D. Not applicable

IX. Supervision

Percent of supervisors that made the required number of supervisory visits in the past 6 months

41. How many supervisory visits have you made in the last 6 months? _____

Obtained required number of visits from zonal level _____

42. If No, the most usual reasons for not making all required supervisory visits. (Text)

X. Training

Percent of health personnel trained in disease surveillance

43. What percent of your subordinate personnel have been trained in surveillance?

44. Have you been trained in disease surveillance?

- A. Yes B. No C. Unknown D. Not applicable

45. **If yes**, specify when, where, how long, by whom?

Percent of health personnel that have received post-basic training in epidemic management

46. Have you received any post-basic training in epidemic management?

- A. Yes B. No C. Unknown D. Not applicable

47. *If yes*, specify when, where, how long, by whom?

48. **Obtain and analyze the content of the surveillance and epidemic management training**

Strengths _____

Weaknesses _____

Opportunities _____

Threats _____

XI. Resources

Percent of sites that have:

49. **Data management**

- A. Computer
- B. Printer
- C. Photocopier
- D. Data manager
- E. Statistical package

50. **Communications**

- A. Telephone service
- B. Fax
- C. Radio call
- D. Satellite phone
- E. Computers that have modems

51. **Budget line** _____

52. **Logistics** _____

XII. Surveillance

Have a functional computerized surveillance network

53. Do you have a computerized surveillance network at this level?

- A. Yes B. No C. Unknown D. Not applicable

Budget for surveillance

54. Is there a budget line for surveillance in the zonal Health department budget?

- A. Yes B. No C. Unknown D. Not applicable

55. *If yes*, what is the proportion: %

Opportunities for strengthening surveillance

56. How could surveillance be improved?

XIII. Surveillance Co-ordination

Existence of focal unit for surveillance at Zone level

57. **Obs**Is there a focal unit for surveillance at the FMOH central level? [Observe organogramme of FMOH to confirm]

- A. Yes B. No C. Unknown D. Not applicable

Opportunities for integration

58. What opportunities are there for integration of surveillance activities and functions (core activities, training, supervision, guidelines, resources etc.)?

Questionnaire for Attributes and level of Usefulness:

59. Total population under surveillance_____

60. What is the incidence / Prevalence of -----in your area/region

- a. AFP(polio) _____ cases _____ Deaths _____

I. Level of Usefulness of the Surveillance System for these selected priority disease

Does the surveillance system help?

61. To detect outbreaks of these selected priority disease early? A. Yes B. No

62. To estimate the magnitude of morbidity and mortality related to this disease, including identification of factors associated with this disease? A. Yes B. No

63. Permit assessment of the effect of prevention and control programs? A. Yes B. No

Observe (confirmation):

- a. interventions and disease trends analyzed --- Available /Not available

II. Describe Each System Attributes:

i. Simplicity:

64. Is the case definition of AWD, AFP, AFP (polio), and measles easy for case detection by all level health professionals? A. Yes B. No

65. What are the organizations which need to receive reports of the surveillance data _____

66. Do you feel that additional data collected on a case are time consuming? A. Yes B. No

67. How long it takes to fill the format? a, <5 minute b-10-15minuts c- >15 minutes

68. How long does it take to have laboratory confirmation of AFP (Polio)

ii. Flexibility:

69. Can the current reporting formats be used for other newly occurring health event (disease) without much difficulty? A. Yes B. No

70. Do you think that any change in the existing procedure of case detection, reporting, and formats will be difficult to implement? A. Yes B. No

Comment: _____

iii. Data Quality: (Completeness of the reporting forms/and validity of the recorded data)

71. Are the data collection formats for these priority diseases clear and easy to fill for all the data collectors/ reporting sites? A. Yes B. No

72. Are the reporting site / data collectors trained/ supervised regularly? A. Yes B.No

73. **Observe:** Review the last months report of these diseases

A. Average number of **unknown or blank responses** to variables in each of the reported forms

B. Percent of reports which are complete(that is with no blank or unknown responses) from the total reports

iv.Acceptability:

74. Do you think all the reporting agents accept and well engaged to the surveillance activities? A. Yes B. No

75. If yes, how many are active participants (of the expected to)? _____

76. If No, what is the reason for their poor participation in the surveillance activity?

C. Lack of understanding of the relevance of the data to be collected

D. No feedback / or recognition given by the higher bodies for their contribution; i.e. no dissemination of the analysis data back to reporting facilities

E. Reporting formats are difficult to understand

F. Report formats are time consuming

G. Other: _____

iv. Representativeness:

77. What is the health service coverage of the district/ zone/ region? ____%

78. Do you think, the populations under surveillance have good health seeking behavior for these diseases? A. Yes B. No

79. Who do you think is well represented by the surveillance data? A. urban B. rural

v. Timeliness:

80. -----

vi. Stability:

81. Was the new BPR restructuring affect the procedures and activities of the surveillance of this disease? A. Yes B. No

82. Was there lack of resources that interrupt the surveillance system? A. Yes B. No

Identifiers

Assessment team	District
Date	region/province
Interviewer	country
Respondent	surveillance system

Percent of districts with available national surveillance manual

1. Is there a national manual for surveillance at this site?

ObsObserve national surveillance manual:

- A. Yes B. No C. unknown D. Not Applicable

I. Case confirmation

Percent of districts that have the capacity to transport specimens to a higher level lab

2. Does the district have the capacity to transport specimens to a higher level lab?

- A. Yes B. No C. unknown D. Not Applicable

Percent of districts with guideline for specimen collection, handling and transportation to next level

3. Does the district have guidelines for specimen collection, handling and transportation to the next level?

- A. Yes B. No C. unknown D. Not Applicable

II. Data reporting

Percent of sites that have forms recommended for the country for that site at all times over the past 6 months

4. Have you lacked forms recommended for the country at any time during the last 6 months? A. Yes B. No C. unknown D. Not Applicable

Percent of health facilities that reported each reporting period to the district level during the past 3 months:

5. Number of reports received in the last 3 months compared to expected number

Weekly: _____ /12 times the number of health facilities

Immediately: _____/----- times the number of health facilities

On time (use national deadlines)

- 6. Number of weekly reports submitted on time: ____/12 times the number of health facilities
- 7. Number of immediately reports submitted on time: _____/3 times the number of health facilities
- 8. **Percent of districts that have means for reporting to next level by e-mail, telephone, fax or radio**

How do you report:

- A. Mail
- B. Fax
- C. Telephone
- D. Radio
- E. Electronic
- F. Other

Strengthening reporting

- 9. How can reporting be improved?
-

III. Data analysis

10. I. Percent of sites that:

Describe data by person (case based, outbreaks, sentinel)

ObsObserved description of data by age and sex

- A. Yes B. No C. unknown D. Not Applicable

11. Describe data by place

ObsObserved description of data by place (locality, village, work site etc)

- A. Yes B. No C. unknown D. Not Applicable

12. Describe data by time

ObsObserved description of data by time A. Yes B. No C. unknown D. Not Applicable

13. **Perform trend analysis**

Obs Observed line graph of cases by time A. Yes B. No C. unknown D. Not Applicable

14. List: _____

15. **Have an action threshold for each priority disease**

Do you have an action threshold for any of the country priority diseases?

A. Yes B. No C. unknown D. Not Applicable

16. **If yes**, what is it? _____ cases _____% increase _____ rate
(Ask for 2 priority diseases) _____

17. **Have appropriate denominators**

Obs Observed presence of demographic data at site (E.g. population <5 yr, population by village, total population)

A. Yes B. No C. unknown D. Not Applicable

18. Who is responsible for data analysis? _____

19. How often do you analyze the collected data?

- A. Daily
- B. Weekly
- C. Every 2 weeks
- D. Monthly
- E. Quarterly
- F. As needed.....

IV. Outbreak investigation

20. **Percent of suspected outbreaks that were investigated in the past 6 months:**

Number of outbreaks suspected in the past year 6 months: _____

Obs Of those, number investigated (Observe reports and take copies if possible): _____

21. **Percent of districts that have ever conducted an outbreak investigation**

[Number of districts assessed that have ever conducted an outbreak investigation,
Number of districts assessed to obtain indicator]

22. Has your district ever investigated an outbreak?
A. Yes B. No C. unknown D. Not Applicable

V. Epidemic preparedness

23. **Percent of districts that have a plan for epidemic preparedness and response**

(Obs) Observed a written plan of epidemic preparedness and response

- A. Yes B. No C. unknown D. Not Applicable

24. **Percent of districts that have emergency stocks of drugs and supplies at all times in past 1 year**

Has the district had emergency stocks of drugs and supplies at all times in past 1 year?

Obs Observed the stocks of drugs and supplies at time of assessment

- A. Yes B. No C. unknown D. Not Applicable

25. **Percent of districts that experienced a shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)**

Has the district experienced shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)?

- A. Yes B. No C. Unknown D. Not Applicable

26. **Presence of a budget line for epidemic response or access to funds for epidemic response**

Is there a budget line or access to funds for epidemic response?

- A. Yes B. No C. Unknown D. Not Applicable

27. **Percent of districts that have an epidemic management committee**

Obs Observed minutes (or report) of meetings of epidemic management committee

- A. Yes B. No C. Unknown D. Not Applicable

28. **Percent of districts that have rapid response team for epidemics**

Does the district have a rapid response team for epidemics?

- A. Yes B. No C. Unknown D. Not Applicable

VI. Responses

29. Percent of sites that implemented prevention and control measures based on local data for at least one reportable disease or syndrome

Has the district implemented prevention and control measures based on local data for at least one reportable disease or syndrome?

A. Yes B. No C. Unknown D. Not Applicable

30. Percent of districts that responded within 48 hours of notification of most recently reported outbreak

ObsObserved that the district responded within 48 hours of notification of most recently reported outbreak (from written reports)

A. Yes B. No C. Unknown D. Not Applicable

31. Percent of districts that achieved acceptable case fatality rates (e.g. 10% for Meningococcal CSM 1% for Cholera) during the most recent outbreak

ObsObserved that the district achieved an acceptable case fatality rate for most recent outbreak (Observe from outbreak report)

A. Yes B. No C. Unknown D. Not Applicable

32. Percent of epidemic management committees that have evaluated their preparedness and response activities during the past year 2004

ObsHas epidemic management committee evaluated their preparedness and response activities during the past year? (observe written report to confirm)

A. Yes B. No C. Unknown D. Not Applicable

VII. Feedback

Percent of sites that have written report that is regularly produced to disseminate surveillance data

How many feedback written reports has the district produced in the last year?

ObsObserved the presence of a written report that is regularly produced to disseminate surveillance data (district and higher)

A. Yes B. No C. Unknown D. Not Applicable

33. **Percent of sites that have received a report or bulletin from a higher level during the past year on the data they have provided**

How many feedback bulletin or reports has the district received in the last year?

ObsObserved at least 1 report or bulletin at district from a higher level during the past year on the data they have provided

A. Yes B. No C. Unknown D. Not Applicable

VIII. Supervision

34. **Percent of individuals supervised in the past 6 months/2004(EC)**

How many times have you been supervised in the last 6 months?

ObsObserved supervision report or any evidence of supervision in last 6 months

A. Yes B. No C. Unknown D. Not Applicable

35. **Of those supervised in the previous 6 months, percent of individuals for which the supervisor from the next higher level reviewed surveillance practices appropriate to their level**

ObsObserved supervision report or any evidence for appropriate review of surveillance practices A. Yes B. No C. Unknown D. Not Applicable

36. **Percent of supervisors that made the required number of supervisory visits in the past 6 months**

How many supervisory visits have made in the last 6 months?(from central level) _____
(Obtain required number of visits from central level)_____

37. The most usual reasons for not making all required supervisory visits. (Text)

Reason 1 _____

Reason 2 _____

Reason 3 _____

IX. Training

38. **Percent of health personnel (in position of responsibility) trained in disease surveillance**

Have you been trained in disease surveillance?

A. Yes B. No C. Unknown D. Not Applicable

39. *If yes*, specify when, where, how long, by whom?

40. **Proportion of districts with staff trained in surveillance and epidemic management**

What percent of your personnel in the district have been trained in surveillance and epidemic management? _____

X. Resources

41. **I. Percent of sites that have:**

Logistics

A. Electricity B. Bicycles C. Motor cycles D. Vehicles

42. **Data management**

A. Stationery B. Calculator C. Computer D. Printer E. Statistical package

43. **Communication**

A. Telephone service B. Fax C. B radio D. Computers that have modems

44. **Information education and communication materials**

A. Posters B. Megaphone C. Flipcharts or Image box D. VCR and TV set
E. Generator F. Screen G. Projector (Movie) H. Other:

XI. Surveillance co-ordination:

45. **Existence of a surveillance co-ordination focal unit or person at district level**

Is there a surveillance co-ordination focal point within the district epidemic management committee?

XII. Satisfaction with surveillance system

46. **Satisfaction with the surveillance system**

Are you satisfied with the surveillance system?

A. Yes B. No C. Unknown D. Not Applicable

47. *If no*, how can the surveillance system be improved?

48. Opportunities for integration

What opportunities are there for integration of surveillance activities and functions (core activities, training, supervision, guidelines, resources etc.)

Identifiers

Assessment team	Type of health facility
Date	District
Interviewer	Region/province
Respondent	Country
Name of health facility	Surveillance system

1. Percent of health facilities with national surveillance manual

Is there a national manual for surveillance at this site?

ObsObserve national surveillance manual:

A. Yes B. No C. Unknown D. Not Applicable

1. Case detection and registration

2. Percent of health facilities that have a clinical register

ObsObserved the existence of a clinical register

A. Yes B. No C. Unknown D. Not Applicable

3. Percent of health facilities that correctly register cases

ObsObserved the correct filling of the clinical register during the previous 30 days

A. Yes B. No C. Unknown D. Not Applicable

4. Percent of health facilities that have standardised case definitions for the country's priority diseases

Do you have a standard case definition for: (each priority disease) AWD, AFP (polio), measles, AFP?

A. Yes B. No C. Unknown D. Not Applicable

5. ObsObserved the standard case definition for: (each priority disease)

A. Yes B. No C. Unknown D. Not Applicable

6. **Percent of health facilities that use standardised case definitions for the country's priority diseases**

Obs Observed the respondent correctly diagnosing one of the country's priority diseases using a standard case definition

- A. Yes B. No C. Unknown D. Not Applicable

(Select one of the priority diseases in the facility's clinical register and ask how they diagnosed it — interviewer should have the standard case definition from MOH)

II. Case confirmation

7. **Percent of health facilities that have the capacity to collect specimens (sputum stool, blood/serum and CSF)**

Are you able to collect sputum Y N U N/A

Stool Y N U N/A

Blood Y N U N/A

CSF at this facility? Y N U N/A

8. **Obs** Observed the presence of materials required to collect

Stool Y N U N/A

blood/serum Y N U N/A

CSF Y N U N/A

9. **Percent of health facilities that have the capacity to handle specimens until shipment**

Do you have the capacity to handle sputum, stool, blood/serum and CSF until shipment at this facility?

- A. Yes B. No C. Unknown D. Not Applicable

10. **Obs** Observed presence of functional cold chain at health facility

- A. Yes B. No C. Unknown D. Not Applicable

11. **Percent of health facilities that have the capacity to ship specimens to a higher level lab**

12. **Obs** Observed presence of transport media for stool at health facility

- A. Yes B. No C. Unknown D. Not Applicable

13. **Obs** Observed presence of packing materials for shipment of specimens at health facility

- A. Yes B. No C. Unknown D. Not Applicable

III. Data reporting

14. Percent of sites that have appropriate surveillance forms for that site at all times over the past 6 months

Have you lacked appropriate surveillance forms at any time during the last 6 months?

- A. Yes B. No C. Unknown D. Not Applicable

15. Percent of sites that reported accurately cases from the registry into the summary report to go to higher level

Observed that the last monthly report agreed with the register for 4 diseases (1 for each targeted group [eradication; elimination; epidemic prone; major public health importance])

- | | | | | |
|--------------------------|---|---|---|-----|
| A. ObsMeasles | Y | N | U | N/A |
| B. ObsAFP | Y | N | U | N/A |
| C. ObsAFP (polio) | Y | N | U | N/A |
| D. ObsAWD | Y | N | U | N/A |

16. Percent of sites that reported each reporting period to the next higher level during the past 3 months

Number of reports in the last 3 months compared to expected number

ObsWeekly: /12 times the number of sites

Obsimmediately: /-- times the number of sites

17. On time (use national deadlines)

ObsNumber of weekly reports submitted on time:- ____ /12 times the number of sites

ObsNumber of immediately reports submitted on time: ____ /-- times the number of sites

18. Percent of HF that have means for reporting to next level by e-mail, telephone, fax or radio

How do you report?

- A. Mail B. Fax C. Telephone D. Radio E. Electronic F. Other

19. Strengthening reporting

How can reporting be improved?

IV. Data analysis

Percent of sites that:

20. Describe data by person (outbreaks, sentinel)

ObsObserved description of data by age and sex

A. Yes B. No C. Unknown D. Not Applicable

21. **Describe data by place**

ObsObserved description of data by place (locality, village, work site etc)

A. Yes B. No C. Unknown D. Not Applicable

22. **Describe data by time**

ObsObserved description of data by time

A. Yes B. No C. Unknown D. Not Applicable

23. **Perform trend analysis**

ObsObserved line graph of cases by time

A. Yes B. No C. Unknown D. Not Applicable

24. **Have an action threshold for each priority disease**

Do you have an action threshold for any of the Country priority diseases?

A. Yes B. No C. Unknown D. Not Applicable

25. **If yes**, what is it (Ask for 2 priority diseases)? _____ cases ____ % increase _____rate

26. Who is responsible for data analysis? _____

27. How often do you analyze the collected data?

A. Daily B. Weekly C. Every 2 weeks D. Monthly E. Quarterly F. As needed.....

28. **Have appropriate denominators**

ObsObserved presence of demographic data at site (E.g. population <5 yr., population by village, total population)

A. Yes B. No C. Unknown D. Not Applicable

V. Epidemic preparedness

29. **Percent of health facilities that have a standard case management protocol for epidemic prone diseases**

ObsObserved the existence of a written case management protocol for 1 epidemic prone disease

A. Yes B. No C. Unknown D. Not Applicable

VI. Epidemic response

Percent of sites that implemented prevention and control measures based on local data for at least one epidemic prone disease

Has the health facility implemented prevention and control measures based on local data for at least one epidemic prone disease?

A. Yes B. No C. Unknown D. Not Applicable

30. Percent of sites that achieved acceptable case fatality rates (e.g. 10% for Meningococcal CSM 1% for Cholera) during the most recent outbreak

ObsObserved that the health facility achieved an acceptable case fatality rate for most recent outbreak

A. Yes B. No C. Unknown D. Not Applicable

VII. Feedback

31. Percent of sites that have received a report or bulletin from a higher level during the past year on the data they have provided

How many feedback bulletin or reports has the health facility received in the last year? ___

ObsObserved at least 1 report or bulletin at the health facility from a higher level during the past year on the data they have provided

A. Yes B. No C. Unknown D. Not Applicable

32. Percent of health facilities that conducted at least semi-annual meetings with community members to discuss results of surveillance or investigation data

How many meetings has this health facility conducted with the community members in the past six months? _____

ObsObserved the minutes or report of at least 1 meeting between the health facility team and the community members within the six months

A. Yes B. No C. Unknown D. Not Applicable

VIII. Supervision:

33. Percent of individuals supervised in the past 6 months

How many times have you been supervised in the last 6 months? _____

Obs Observed supervision report or any evidence of supervision in last 6 months

- A. Yes B. No C. Unknown D. Not Applicable

34. Of those supervised in the previous 6 months, percent of individuals for which the supervisor from the next higher level reviewed surveillance practices appropriate to their level

Obs Observed supervision report or any evidence for appropriate review of surveillance practices

- A. Yes B. No C. Unknown D. Not Applicable

IX. Training

35. Percent of health personnel trained in disease surveillance and epidemic management

Have you been trained in disease surveillance and epidemic management?

- A. Yes B. No C. Unknown D. Not Applicable

36. *If yes*, specify when, where, how long, by whom? _____

X. Resources

Percent of sites that have:

37. Logistics

- A. Electricity B. Bicycles C. Motor cycles D. Vehicles

38. Data management

- A. Stationery B. Calculator C. Computer D. Software E. Printer G. Statistical

39. Communications

- A. Telephone service B. Fax C. Radio call D. Computers that have modems

40. Information education and communication materials

- A. Posters B. Megaphone C. Flipcharts or Image box D. VCR and TV set
E. Generator F. Screen G. Projector (Movie) H. Other:

41. **Protection materials (list)** _____

XI. Satisfaction with surveillance system

42. Satisfaction with the surveillance system

Are you satisfied with the surveillance system?

- A. Yes B. No C. Unknown D. Not Applicable

43. **If no**, how can the surveillance system be improved? _____

44. Opportunities for integration

What opportunities are there for integration of surveillance activities and functions (core activities, training, supervision, guidelines, resources etc.)

Identifiers

Assessment team	Type of health facility
Date	District
Interviewer	Region/province
Respondent	Country
Name of health facility	Surveillance system

1. Percent of health facilities with national surveillance manual

Is there a national manual for surveillance at this site?

ObsObserve national surveillance manual:

A. Yes B. No C. Unknown D. Not Applicable

1. Case detection and registration

2. Percent of health facilities that have a clinical register

ObsObserved the existence of a clinical register

A. Yes B. No C. Unknown D. Not Applicable

3. Percent of health facilities that correctly register cases

ObsObserved the correct filling of the clinical register during the previous 30 days

A. Yes B. No C. Unknown D. Not Applicable

4. Percent of health facilities that have standardised case definitions for the country's priority diseases

Do you have a standard case definition for: (each priority disease) AWD, AFP (polio), measles, AFP?

A. Yes B. No C. Unknown D. Not Applicable

5. ObsObserved the standard case definition for: (each priority disease)

A. Yes B. No C. Unknown D. Not Applicable

6. **Percent of health facilities that use standardised case definitions for the country's priority diseases**

Obs Observed the respondent correctly diagnosing one of the country's priority diseases using a standard case definition

- A. Yes B. No C. Unknown D. Not Applicable

(Select one of the priority diseases in the facility's clinical register and ask how they diagnosed it — interviewer should have the standard case definition from MOH)

II. Data reporting

7. **Percent of sites that have appropriate surveillance forms for that site at all times over the past 6 months**

Have you lacked appropriate surveillance forms at any time during the last 6 months?

- A. Yes B. No C. Unknown D. Not Applicable

8. **Percent of sites that reported accurately cases from the registry into the summary report to go to higher level**

Observed that the last monthly report agreed with the register for 4 diseases (1 for each targeted group [eradication; elimination; epidemic prone; major public health importance])

- | | | | | |
|---------------------------|---|---|---|-----|
| A. Obs Measles | Y | N | U | N/A |
| B. Obs AFP | Y | N | U | N/A |
| C. Obs AFP (polio) | Y | N | U | N/A |
| D. Obs AWD | Y | N | U | N/A |

9. **Percent of sites that reported each reporting period to the next higher level during the past 3 months**

Number of reports in the last 3 months compared to expected number

ObsWeekly: /12 times the number of sites

Obsimmediately: /-- times the number of sites

10. **On time (use national deadlines)**

ObsNumber of weekly reports submitted on time:- ____ /12 times the number of sites

ObsNumber of immediately reports submitted on time: ____ /-- times the number of sites

11. **Percent of HF that have means for reporting to next level by e-mail, telephone, fax or radio**

How do you report?

- A. Mail B. Fax C. Telephone D. Radio E. Electronic F. Other

12. **Strengthening reporting**

How can reporting be improved?

III. Data analysis

Percent of sites that:

13. Describe data by person (outbreaks, sentinel)

Obs Observed description of data by age and sex

- A. Yes B. No C. Unknown D. Not Applicable

14. **Describe data by place**

Obs Observed description of data by place (locality, village, work site etc)

- A. Yes B. No C. Unknown D. Not Applicable

15. **Describe data by time**

Obs Observed description of data by time

- A. Yes B. No C. Unknown D. Not Applicable

16. **Perform trend analysis**

Obs Observed line graph of cases by time

- A. Yes B. No C. Unknown D. Not Applicable

IV. Epidemic response

17. **Percent of sites that implemented prevention and control measures based on local data for at least one epidemic prone disease**

Has the health facility implemented prevention and control measures based on local data for at least one epidemic prone disease?

- A. Yes B. No C. Unknown D. Not Applicable

V. Feedback

18. **Percent of sites that have received a report or bulletin from a higher level during the past year on the data they have provided**

How many feedback bulletin or reports has the health facility received in the last year? _

ObsObserved at least 1 report or bulletin at the health facility from a higher level during the past year on the data they have provided

A. Yes B. No C. Unknown D. Not Applicable

19. **Percent of health facilities that conducted at least semi-annual meetings with community members to discuss results of surveillance or investigation data**

How many meetings has this health facility conducted with the community members in the past six months? _____

ObsObserved the minutes or report of at least 1 meeting between the health facility team and the community members within the six months

A. Yes B. No C. Unknown D. Not Applicable

VI. Supervision:

20. **Percent of individuals supervised in the past 6 months**

How many times have you been supervised in the last 6 months? _____

ObsObserved supervision report or any evidence of supervision in last 6 months

A. Yes B. No C. Unknown D. Not Applicable

21. **Of those supervised in the previous 6 months, percent of individuals for which the supervisor from the next higher level reviewed surveillance practices appropriate to their level**

ObsObserved supervision report or any evidence for appropriate review of surveillance practices

A. Yes B. No C. Unknown D. Not Applicable

VII. Training

22. **Percent of health personnel trained in disease surveillance and epidemic management**

Have you been trained in disease surveillance and epidemic management?

A. Yes B. No C. Unknown D. Not Applicable

23. *If yes*, specify when, where, how long, by whom? _____

VIII. Resources

Percent of sites that have:

24. Logistics

A. Electricity B. Bicycle C. Motor cycles D. Vehicles

25. Data management

A. Stationery B. Calculator C. Computer D. Software E. Printer B. Statistical package

26. Communications

A. Telephone service B. Fax C. Radio call D. Computers that have modems

27. Information education and communication materials

A. Posters B. Megaphone C. Flipcharts or Image box D. VCR and TV set E. Generator F. Screen G. Projector (Movie) H. Other:

28. Protection materials (list) _____

IX. Satisfaction with surveillance system

29. Satisfaction with the surveillance system

Are you satisfied with the surveillance system?

A. Yes B. No C. Unknown D. Not Applicable

30. *If no*, how can the surveillance system be improved? _____

31. Opportunities for integration

What opportunities are there for integration of surveillance activities and functions (core activities, training, supervision, guidelines, resources etc.)

Annex 8. Questionnaire for prevalence and risk factors of malaria in Kuraz sugar factory project

Questionnaire No

Part I- Socioeconomic status of study participants

Questions	Choice of Answers
101. Name of project site	_____
103. Age of the participant	_____
104. Sex of the participant	1. Male 2. Female
105. Religion	1. Orthodox 3. Protestant 2. Muslim 4. Catholic 5. Other
106. Ethnicity	1. Bodi 2. Mursi 3. Ari 4. Wolaita 5. Hadya 6. Kembata 7. Amahara 9. Others Specify _____
107. Marital status	1. Single 2. Married 3. Divorced 4. Widowed

108. Educational status of the participant	<ol style="list-style-type: none"> 1. Illiterate 2. Read and write 3. Primary school (1-8) 4. Secondary school (9-12) 5. Above Secondary school
109. Household size	_____
111. Your income in a month (ETB)	<ol style="list-style-type: none"> 1. <100birr 2. 101-300birr 3. 301-500bir 4. >500birr
112. Educational status of spouse	<ol style="list-style-type: none"> 1. Illiterate 2. Read and write 3. Primary school (1-8) 4. Secondary school (9-12) 5. Above Secondary school (12+)

Part II - Questions Related to Risk factors for malaria occurrence

201. How long does it take to reach the nearest health institution on foot?	<ol style="list-style-type: none"> 1. <15 minutes 2. 15-30 minutes 3. 30-45minutes 4. 45-60 minutes 5. > 1 hr
202. Is there insecticide treated bed net in the household?	<ol style="list-style-type: none"> 1. Yes 2. No... skip to No 205
203. If yes how many ITNs do you have?.....	<ol style="list-style-type: none"> 1. 01 2. 02 3. 03 4. >3
204. Who uses the ITNs?	<ol style="list-style-type: none"> 1. Children only 2.mother only 3. Father only 4. Father and mother only 5. The whole family 6. Children and mother
205. Is there anyone in the family who had fever within the last month?	<ol style="list-style-type: none"> 1. Yes 2. No
206. If yes, Where did you go for treatment?	<ol style="list-style-type: none"> 1. Drug vendor 2. Health center 3. Health post 4. Health station 5. Hospital

	6. Traditional healers 7. Nowhere (managed at home)
207. Distance of the nearest health institution?	1. <5km 2. 5-10km 3. >10km
208. Type of house roof?	1. Thatch 2. Corrugated Iron sheet 3. Mud 4. Other specify
209. Is there an opening on the eave?	1. Yes 2. No
210. Number of windows available?	1. 0 2. 1 3. 2 4. ≥ 3
211. Type of wall	1. Mud 2. Thatch 3. Other
212. Is there an opening on the wall?	1. Yes 2. No
213. Distance of the house from lake shore	1. <1km 2. 1-3km 3. 3-5km 4. >5km
214. Was the house sprayed with insecticide in the last 3 months?	1. Yes 2. No \longrightarrow skip to part III

215. If yes, what type of insecticide was sprayed?	<ol style="list-style-type: none"> 1. DDT 2. Deltamethrine 3. Bendocurb 4. Prophoxur 5. Malathion 6. others specify_____
216. When was last sprayed?	<ol style="list-style-type: none"> 1. 3 months back 2. 6 months back 3. other specify_____

Questions	Choice of Answers
401. When do you join this project site?	<ol style="list-style-type: none"> 1. 15 days - 1month 2. > 1month - 6 months 3. > 6 months - 1 year 4. > 1 year
402. Have you ever been infected by malaria before you joined this project site?	<ol style="list-style-type: none"> 1. Yes 2. No
403. If yes, for Q.No 02, when?	<ol style="list-style-type: none"> 1. before 15 days 2. Before 1 month 3. 2 - 3 months 4. > 3 months
404. Have you infected by malaria after you joined this project site?	<ol style="list-style-type: none"> 1. Yes 2. No
405. If yes Q4, how many times ?	<ol style="list-style-type: none"> 1. Once 2. Twice 3. More than two times
406. If yes Q4, when?	DD-MM-YY

407. If yes Q4, for how many days do you absent from work?	<ol style="list-style-type: none"> 1. < a week 2. for 1 week 3. for 2 weeks 4. more than 2 weeks
408. Your monthly wage/salary or income	<ol style="list-style-type: none"> 1. 100-500ETB 2. 501-1000ETB 3. 1001-1500ETB 4. 1501-2000ETB 5. > 2000 ETB
409. Do you have fever at this moment?	<ol style="list-style-type: none"> 1. Yes 2. No
410. Do you have ITN ?	<ol style="list-style-type: none"> 1. Yes 2. No
411. If yes Q10, do you use it ?	<ol style="list-style-type: none"> 1. Yes 2. No
412. If yes Q11, how frequent do you use the ITN ?	<ol style="list-style-type: none"> 1. always/every day 2. as required
413. Do you stay outside home during night time for work?	<ol style="list-style-type: none"> 1. Yes 2. No
414. If yes Q13, for how many hours/day?	<ol style="list-style-type: none"> 1. 1-3 hrs 2. 3-6 hrs 3. The whole night

Questionnaire No _____

HH Head ID No _____

Participant ID No _____

Part III. Clinical History and Examination

301. Age of the participant in completed years	_____
302. Sex	1. Male 2. Female
303. Do you have history of fever in the last 3 days?	1. Yes 2. No
304. Do you have chills?	1. Yes 2. No
305. Do you have rigors?	1. Yes 2. No
306. Do you have sweating?	1. Yes 2. No
308. Temperature in degree Celsius	1. <37.5 2. ≥ 37.5
309. Laboratory diagnosis	1. P. Falciparum 2. P. Vivax 3. Mixed infection 4. No haemoparasite 5. Other specify _____

Thank you!!

Part IV: Laboratory results reporting format

S. No	Project site	HH No	ID	Participant ID No	Blood Film Result					
					1. P.F	2. P. V	3. Mixed	4.No H/P	5. Other	Remark
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

Annex 9. List of Institutions Visited by the PEA team members during the field work

1. RHB/PHEM Core Process, SNNPR
2. South Omo Zone Health Department, SNNPR
3. Jinka Zonal Hospital, South Omo Zone Health Department
4. Jinka Public Health Laboratory, South Omo Zone Health Department
5. Jinka town Administration Health Unit, South Omo Zone
6. South Ari Woreda Health Office, South Omo Zone
7. Benanatsemai Woreda Health Office, South Omo Zone
8. Salamago Woreda Health Office, South Omo Zone
9. Gazer Health Centre, South Ari Woreda
10. Millenium Jinka Health Centre, Jinka town Administration
11. Kako Health Centre, Benanatsemai Woreda
12. Hanna Health Centre, Salamago Woreda
13. Shepi Health Post, South Ari Woreda
14. Alga Health Post, South Ari Woreda
15. Aida Health Post, South Ari Woreda
16. Aikamer Health Post, South Ari Woreda
17. Health Post, South Ari Woreda
18. Chale Health Post, Benanatsemai Woreda

**Annex 10. Assessment tool -Yellow Fever Post Epidemic Assessment Data Collection
Questionnaire (Region, Zonal & Woreda Level)**

Region _____ Zone _____ Woreda _____ Date _____

No	Question	Coding Classification	Go To
Coordination			
	Was epidemic preparedness and response committee/Task Force activated?	1.Yes 2.No	
	When were the epidemic preparedness and response committee /Task Force activated?	1. Prior to the outbreak 2. At the beginning of the outbreak 3. At the middle of the outbreak 4. other, specify _____	
	Was the epidemic preparedness and response committee/Task Force had regular meeting?	1.Yes 2.No	
	How frequently the epidemic preparedness and response committee/Task Force conducted meeting	1. Every day 2. Twice per week 3. Every week 4. Every two weeks 5. Every month 5. Other	
	Was there documented meeting minutes? Observe	1.Yes 2.No	
	If yes, What were the main issues that the epidemic preparedness and response committee/Task Force discussed on?	1.Resource mobilization 2.Planning 3. Response 4. Information sharing	
	Is there shared responsibility	1.Yes	

No	Question	Coding Classification	Go To
		verification 4. Other	
	Did you verify the report?	1.Yes 2.No	
	If yes, how?	1. Calling to the affected area 2. Sending investigation team 3. Communication with surveillance officer 4. Other	
	Did you report to the next higher level?	1.Yes 2.No	
	If yes, how quickly you reported to the next level?	1. Within 30 minute 2. Within 2 hours 3. Within 12 hours 4. Within 24 hours 5. Other, specify _____	
	What is the threshold for Yellow Fever to be said an outbreak?	_____	
	Do you know that Yellow Fever is one of the Immediately reportable diseases?	1.Yes 2.No	
	If yes, did you accelerate the surveillance for Yellow Fever during the outbreak?	1.Yes 2.No	
	If yes, How frequent did you report to the next level?	1. Every day 2. Every other day 3. Every three days 4. Every four days 5. Only if there is new cases	
	How did you report the first 5-10 cases to the next level?	1. Using case based reporting format 2. Using line list 3. Using daily epidemic reporting format 4. Through weekly report	

No .	Question	Coding Classification	Go To
		5. Other, specify _____	
	If the answer for question 2.13 is using case based reporting format why?	1. For laboratory investigation 2. To avail detail clinical information 3. Other specify, _____	
	After you reported the first 5-10 cases through case based reporting format what kind of reporting format did you use for reporting?	1. Using case based reporting format 2. Using line list 3. Using daily epidemic reporting format 4. Just through weekly report 5. Other, specify _____	
	Did you aggregate the daily reports into weekly summary report?	1.Yes 2.No	
	Do you have separate database for Yellow Fever OB report?	1.Yes 2.No	
	If yes, how did you keep the database?	1. Using Microsoft word 2. Using Microsoft excel 3. Using Microsoft access 4. hard copy 5. Other, specify _____	
	How many Yellow Fever cases were reported through weekly report? Observe	_____	
	How many Yellow Fever cases were reported by line listing on daily basis? Observe the database	_____	
	If the number of cases reported through line listing exceeds the number of cases reported through weekly report, Why?	_____	
	Did you analyze the outbreak surveillance data?	1.Yes 2.No	
	If Yes, how frequently?	1. Every day 2. Every other day	

No	Question	Coding Classification	Go To
		3. Every week, 4. Every month 5. Other, specify _____	
	What were the variables of interest for data analysis?	1. Time (day, week, month) 2. Person (sex, age, vaccination status, Clinical picture etc.) 3. Place (village, kebele, woreda, zone) 4. Other specify _____	
	Did you give feedback on the outbreak to the lower level?	1.Yes 2.No	
	If Yes, show me copy of it? observe	Comment _____	
	Did you get feedback about the outbreak from higher level?	1.Yes 2.No	
	If Yes, show me copy of it? observe	Comment _____	
Outbreak Investigation			
	Do you have rapid response team (RRT)	1.Yes 2.No	
	If yes, composition of the team?	1.Clinician(MD/HO/Nurse) 2.Public Health specialist/PHEM Officer 3.Epidemiologist 4.Environmental Health Expert 5. Medical Laboratory Expert 6. Other (Specify) _____	
	Were they trained on Yellow Fever outbreak management?	1.Yes 2.No	
	When was the first date that you received Yellow Fever cases?	DD/MM/YYYY _____	

No	Question	Coding Classification	Go To
	How quickly you made the first call to the affected site for verification?	1. Within 30 minutes 2. Within two hours 3. Within one day 4. Other, specify _____	
	Was investigation team sent to the site?	1.Yes 2.No	
	If Yes, how quickly was the team deployed to the site?	1. Within 12 hours 2. Within 24 hours 3. Within 72 hours 4. Other, specify _____	
	Was investigation report prepared and documented? Observe	1.Yes 2.No	
	Were there other investigation teams from higher level?	1.Yes 2.No	
	If yes, did they provide feedback of their findings to your office?	1.Yes 2.No	
	Were there any partners participated on the investigation?	1.Yes 2.No	
	If Yes, list	_____	
Case Management			
	Do you have Yellow Fever case treatment protocol? Observe	1.Yes 2.No	
	Were patients requested to pay for treatment?	1.Yes 2.No	
	If Yes, Why?	_____	
	What kinds of treatments were provided?	1. Antibiotics 2. Antimalarial drugs 3. Antipyretics 4. ORS 5. IV fluids 6. Blood transfusion 7. Other, Specify_____	
	How many cases were treated for Yellow Fever in your jurisdiction?	_____	

No	Question	Coding Classification	Go To
	How many deaths of Yellow Fever were in your jurisdiction?	_____	
	What was the case fatality rate?	_____	
	Have you been trained on case management?	1.Yes 2.No	
	If Yes, how many experts were trained?	_____	
	When was the training held?	1. Prior to the outbreak 2. At the beginning of the outbreak 3. In the middle of the outbreak 4. At the end of the outbreak	
	Who did provide the training?	_____	
Laboratory Investigation			
	How many Blood specimens were collected for laboratory Investigation?	_____	
	What kind of laboratory tests did you do at your level?	1. Blood Film 2. WBC Count 3. Culture 4. PCR 5. Not at all	
	What did you do with the left over sample?	1. Discard 2. Store at lab 3. Sent to regional/national lab 4. Other, Specify _____	
	Where did you keep Blood Samples?	1. In refrigerator 2. At room temperature 3. Other, specify _____	
	How many samples did you send to the reg/ national laboratory?	_____	
	How did you transport samples to the regional/national laboratory?	1. Using cold box/Vaccine Carrier (2- 8 °C)	

No	Question	Coding Classification	Go To
		2. Using Vaccine Carrier at room T° 3. Other, specify_____	
	Did you receive laboratory results from regional/national Labs?	1.Yes 2.No	
	If Yes, within how many days after you sent to the lab?	_____	
	From whom did you receive laboratory results?	_____	
	What minimum information of the patient should be written on Sample sent?	1. Name 2. Age 3. Sex 4. Health Facility 5. Date sample take 6.Time 7. Pt's Address 8. Other Specify_____	
	Were there shortages of laboratory supplies during the outbreak?	1.Yes 2.No	
	If Yes, what were they? List	_____	
	Did you receive training on Blood sample collection, storage, transportation and sample processing techniques?	1.Yes 2.No	
	What were the main challenges and weaknesses that you encountered during outbreak management in terms of laboratory?		
Vaccination			
	Did you provide vaccination against Yellow Fever?	1.Yes 2.No	
	If Yes, how many doses of vaccine did you receive?	_____	
	Within how many days did you get vaccine after your request?	_____	
	At what temperature you kept the	_____	

No	Question	Coding Classification	Go To
	vaccine?		
	Did you develop vaccination micro plan?	1.Yes 2.No	
	How many people were in one vaccination team?	_____	
	List the composition of vaccination team?	_____	
	During vaccination, how many people were vaccinated by one team per day on average?	_____	
	What was the wastage rate?	_____ %	
	What was the vaccination coverage that you achieved?	_____ %	
	After you opened the vial within what time interval you used?	1. within 3 hours 2. within 6 hours 3. within 12 hours 4. within 24 hours 5. Other Specify _____	
	What were the main challenges that you faced during vaccination?		
Logistics and Supplies			
	Did you get adequate drugs & supplies for case management?	1.Yes 2. Not adequate 3. No	
	From where did you get drugs & supplies?	1. Procurement 2. Supplied by woreda, 3. Supplied by zone 4. Supplied by region 5. Supplied by MOH 6. partners	
	If you get from higher level through request, within how many days did you receive after you request?	_____	

No	Question	Coding Classification	Go To
	Is there any left vaccines?	1.Yes 2.No	
	If yes, what did you do with the left vaccines?	_____	
	What challenges and weakness you encountered regarding drugs and medical supplies during outbreak management? _____		
Preparedness			
	Do you have epidemic preparedness and response plan?	1.Yes 2.No	
	Do you have emergency budget?	1.Yes 2.No	
	If Yes, what was the source of the budget?	_____	
	Was yellow fever included in the EPRP document?	1.Yes 2.No	
	Was Yellow Fever case definition distributed to health facilities?	1.Yes 2.No	
	Do you have PHEM guideline?	1.Yes 2.No	
Monitoring and Evaluation			
	How did you monitor the outbreak?	1. Through daily data analysis (CFR, AR) 2. Close follow up of interventions 3. Through Supportive supervision 4. Other, specify_____	
	Have you ever been supervised by higher level during Yellow Fever outbreak?	1.Yes 2.No	
	If yes, did they send feedback of supervision? Observe	1.Yes 2.No	
	Have you ever conducted supportive supervision to the lower level?	1.Yes 2.No	

No .	Question	Coding Classification	Go To
	If Yes, did you send feedback? Observe	1.Yes 2.No	
	Did you evaluate your intervention for future recommendations (Surveillance, OB Investigation & Management, Case management, vaccination, etc...)? Observe	1.Yes 2.No	

N.B: Multiple answers are possible. Thank you for your cooperation!!

Annex 11. Assessment tool-Yellow Fever Post Epidemic Assessment Data Collection

Questionnaire-HCs & Hospital

Region _____ Zone _____ Woreda _____ Health Facility _____
 _____ Date _____

No.	Question	Coding Classification	Go To
Coordination			
	Was Rapid Response Team (RRT) established?	1.Yes 2.No	
	If yes, composition of the team?	1.Clinician(MD/HO/Nurse) 2.Public Health specialist/PHEM Officer 3.Epidemiologist 4.Environmental Health Expert 5. Medical Laboratory Expert 6. Other (Specify) _____	
	Was Rapid Response Team (RRT) activated?	1.Yes 2.No	
	When was the Rapid Response Team (RRT) activated?	1. Prior to the outbreak 2. At the beginning of the outbreak 3. At the middle of the outbreak 4. other, specify _____	
	Was the Rapid Response Team (RRT) had regular meeting?	1.Yes 2.No	
	How frequently the Rapid Response Team (RRT) conducted meeting?	1. Every day 2. Twice per week 3. Every week 4. Every two weeks 5. Every month 5. Other	
	Was there documented meeting minutes? Observe	1.Yes 2.No	
Surveillance and Documentation			
	How did you identify the existence of Yellow Fever outbreak?	1. Through Surveillance data analysis 2. Regional/Zonal/Woreda/ PHEM	

No.	Question	Coding Classification	Go To
	Do you know that Yellow Fever is one of the Immediately reportable diseases?	1.Yes 2.No	
	If yes, did you accelerate the surveillance for Yellow Fever during the outbreak?	1.Yes 2.No	
	If yes, How frequent did you report to the next level?	1. Every day 2. Every other day 3. Every three days 4. Every four days 5. Only if there is new cases	
	How did you report the first 5-10 cases to the next level?	1. Using case based reporting format 2. Using line list 3. Using daily epidemic reporting format 4. Through weekly report 5. Other, specify _____	
	If the answer for question 2.13 is using case based reporting format why?	1. For laboratory investigation 2. To avail detail clinical information 3. Other specify, _____	
	After you reported the first 5-10 cases through case based reporting format what kind of reporting format did you use for reporting?	1. Using case based reporting format 2. Using line list 3. Using daily epidemic reporting format 4. Just through weekly report 5. Other, specify _____	
	Did you aggregate all the reports that you reported on daily basis into weekly summary report?	1.Yes 2.No	
	Do you have separate database for Yellow Fever outbreak report?	1.Yes 2.No	
	If yes, how did you keep the database?	1. Using Microsoft word 2. Using Microsoft excel	

No.	Question	Coding Classification	Go To
		3. Using Microsoft access 4. hard copy 5. Other, specify _____	
	How many Yellow Fever cases were reported through weekly report? Observe the database	_____	
	How many Yellow Fever cases were reported by line listing on daily basis? Observe the database	_____	
	If the number of cases reported through line listing exceeds the number of cases reported through weekly report, Why?	_____	
	Did you analyze the outbreak surveillance data?	1.Yes 2.No	
	If Yes, how frequently?	1. Every day 2. Every other day 3. Every week, 4. Every month 5. Other, specify _____	
	What were the variables of interest for data analysis?	1. Time (day, week, month) 2. Person (sex, age, vaccination status, Clinical picture etc.) 3. Place (village, kebele, woreda, zone) 4. Other specify _____	
	Did you give feedback on the outbreak to the lower level?	1.Yes 2.No	
	If Yes, show me copy of it? observe	Comment _____	
	Did you get feedback about the outbreak from higher level?	1.Yes 2.No	
	If Yes, show me copy of it? observe	Comment _____	
Outbreak Investigation			
	Were rapid response team (RRT) members trained on Yellow Fever outbreak management?	1.Yes 2.No	

No.	Question	Coding Classification	Go To
	When was the first date that you observed Yellow Fever cases?	DD/MM/YYYY _____	
	How quickly you made the first call to the affected site for verification?	1. Within 30 minutes 2. Within two hours 3. Within one day 4. Other, specify _____	
	Was investigation team sent to the site?	1.Yes 2.No	
	If Yes, how quickly was the team deployed to the site?	1. Within 12 hours 2. Within 24 hours 3. Within 72 hours 4. Other, specify _____	
	Was investigation report prepared and documented? Observe	1.Yes 2.No	
	Were there other investigation teams from higher level?	1.Yes 2.No	
	If yes, did they provide feedback of their findings to your facility?	1.Yes 2.No	
	Were there any partners participated on the investigation?	1.Yes 2.No	
	If Yes, list	_____	
Case Management			
	Do you have Yellow Fever case treatment protocol? Observe	1.Yes 2.No	
	Were patients requested to pay for treatment?	1.Yes 2.No	
	If Yes, Why?	_____	
	What kinds of treatments were provided?	1. Antibiotics 2. Antimalarial drugs 3. Antipyretics 4. ORS 5. IV fluids 6. Blood transfusion 7. Other, Specify _____	
	How many cases were treated for Yellow Fever in your	_____	

No.	Question	Coding Classification	Go To
	facility?		
	How many deaths of Yellow Fever were in your facility?	_____	
	What was the case fatality rate?	_____	
	Have you been trained on case management?	1.Yes 2.No	
	If Yes, how many health workers were trained?	_____	
	When was the training held?	1. Prior to the outbreak 2. At the beginning of the outbreak 3. In the middle of the outbreak 4. At the end of the outbreak	
	Who did provide the training?	_____	
Laboratory Investigation			
	How many Blood specimens were collected for laboratory Investigation?	_____	
	What kind of laboratory tests did you do at your level?	1. Blood Film 2. WBC Count 3. Culture 4. PCR 5. Not at all	
	What did you do with the left over sample?	1. Discard 2. Store at lab 3. Sent to regional/national lab 4. Other, Specify _____	
	Where did you keep Blood Samples?	1. In refrigerator 2. At room temperature 3. Other, specify _____	
	How many samples did you send to the regional/national laboratory?	_____	
	How did you transport samples to the regional/national laboratory?	1. Using cold box/Vaccine Carrier (2- 8 ⁰ C) 2. Using Vaccine Carrier at room	

No.	Question	Coding Classification	Go To
		temperature 3. Other, specify_____	
	Did you receive laboratory results from regional/national Labs?	1.Yes 2.No	
	If Yes, within how many days after you sent to the lab?	_____	
	From whom did you receive laboratory results?	_____	
	What minimum information of the patient should be written on Sample sent?	1. Name 2. Age 3. Sex 4. Health Facility 5. Date sample take 6. Time 7. Pt's Address 8. Other Specify_____	
	Were there shortages of laboratory supplies during the outbreak?	1.Yes 2.No	
	If Yes, what were they? List	_____	
	Did you receive training on Blood sample collection, storage, transportation and sample processing techniques?	1.Yes 2.No	
	What were the main challenges and weaknesses that you encountered during outbreak management in terms of laboratory?		
Vaccination			
	Did you provide vaccination against Yellow Fever?	1.Yes 2.No	
	If Yes, how many doses of vaccine did you receive?	_____	
	Did you provide Yellow Fever vaccination card to those vaccinated?	1.Yes 2.No	
	Within how many days did you get vaccine after your request?	_____	
	At what temperature you kept the vaccine?	_____	
	Did you develop vaccination micro plan?	1.Yes 2.No	

No.	Question	Coding Classification	Go To
	How many people were in one vaccination team?	_____	
	List the composition of vaccination team?	_____	
	During vaccination, how many people were vaccinated by one team per day on average?	_____	
	What was the wastage rate?	_____%	
	What was the vaccination coverage that you achieved?	_____%	
	After you opened the vial within what time interval you used?	1. within 3 hours 2. within 6 hours 3. within 12 hours 4. within 24 hours 5. Other Specify _____	
	What were the main challenges that you faced during vaccination? _____		

Logistics and Supplies

	Did you get adequate drugs & supplies for case management?	1. Yes 2. Not adequate 3. No	
	From where did you get drugs & supplies?	1. Procurement 2. Supplied by woreda, 3. Supplied by zone 4. Supplied by region 5. Supplied by MOH 6. partners	
	If you get from higher level through request, within how many days did you receive after you requested?	_____	
	Is there any left vaccines?	1. Yes 2. No	
	If yes, what did you do with the left vaccines?	_____	
	What challenges and weakness you encountered regarding drugs and medical supplies during outbreak management?		

Preparedness

	Do you have epidemic preparedness and response	1. Yes 2. No	
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No.	Question	Coding Classification	Go To
	plan?		
	Do you have emergency budget?	1.Yes 2.No	
	If Yes, what was the source of the budget?	_____	
	Was yellow fever included in the EPRP document?	1.Yes 2.No	
	Do you have Yellow Fever standard case definition at your health facility?	1.Yes 2.No	
	Do you have PHEM guideline?	1.Yes 2.No	
Monitoring and Evaluation			
	How did you monitor the outbreak?	1. Through daily data analysis (CFR, AR) 2. Close follow up of interventions 3. Through Supportive supervision 4. Other, specify_____	
	Have you ever been supervised by higher level during Yellow Fever outbreak?	1.Yes 2.No	
	If yes, did they send feedback of supervision? Observe	1.Yes 2.No	
	Have you ever conducted supportive supervision to the lower level?	1.Yes 2.No	
	If Yes, did you send feedback? Observe	1.Yes 2.No	
	Did you evaluate your intervention for future recommendations (Surveillance, Outbreak Investigation & Management, Case management, vaccination, etc...)? Observe	1.Yes 2.No	

N.B: Multiple answers are possible. Thank you for your cooperation!!

Annex 12: Assessment tool -Yellow Fever Post Epidemic Assessment Data Collection

Questionnaire (Health Post)

Region _____ Zone _____ Woreda _____ Health Post _____
 _____ Date _____

No.	Question	Coding Classification	Go To
Surveillance and Documentation			
	How did you identify the existence of Yellow Fever outbreak?	1.Through Surveillance data analysis 2. Zonal/Woreda/PHEM officers notification 3.Health Facility Report 4.Patient/community report 5.Other specify _____	
	When was the first date you observed the existence of Yellow Fever outbreak?	____ / ____ / _____	
	Through which communication channels did you inform the report?	1.Telephone (mobile or land line) 2. Other specify _____	
	What did you do After you observed the first yellow fever case?	1.Register the case 2. Notify to the next higher level 3. Other specify _____	
	How quickly you reported to the next level?	1. Within 30 minute 2. Within 2 hours 3. Within 12 hours 4. Within 24 hours 5. Other, specify _____	
	What is the threshold for Yellow Fever to be said an outbreak?	_____	
	Do you know that Yellow Fever is one of the Immediately reportable diseases?	1.Yes 2.No	

No.	Question	Coding Classification	Go To
	If yes, did you accelerate the surveillance for Yellow Fever during the outbreak?	1.Yes 2.No	
	If yes, How frequent did you report to the next level?	1. Every day 2. Every other day 3. Every three days 4. Every four days 5. Only if there is new cases	
	Have you been supervised by higher level during the outbreak?	1.Yes 2.No	
	If Yes, did you get feedback about the outbreak? Observe	1.Yes 2.No	
Outbreak Investigation			
	When was the first date you observed suspected Yellow Fever cases?	DD/MM/YYYY _____	
	Were there investigation teams from higher level?	1.Yes 2.No	
	If yes, did they provide feedback of their findings to your facility?	1.Yes 2.No	
Vaccination			
	Did you provide vaccination against Yellow Fever?	1.Yes 2.No	
	Did you provide YF vaccination card to those vaccinated?	1.Yes 2.No	
	At what temperature you kept the vaccine during campaign?	_____	
	How many people were in one vaccination team?	_____	
	List the composition of vaccination team?	_____ _____ _____	
	No. of people were vaccinated by one team per day on average?	_____	
	Target Age group for Yellow Fever vaccination campaign?	_____	

No.	Question	Coding Classification	Go To
	Target Population for YF vaccination in your catchment?	_____	
	Total Population vaccinated in your catchment?	_____	
	What was the vaccination coverage that you achieved?	_____ %	
	After you opened the vial within what time interval you used?	1. within 3 hours 2. within 6 hours 3. within 12 hours 4. within 24 hours 5. Other Specify _____	
	What were the main challenges that you faced during vaccination? _____		
Logistics and Supplies			
	Is there any left vaccines?	1.Yes 2.No	
	If yes, what did you do with the left vaccines?	_____	
Preparedness			
	Do you have Yellow Fever community case definition at your health facility?	1.Yes 2.No	

N.B: Multiple answers are possible. Thank you for your cooperation!!

Annex 13. Assessment tool -Yellow Fever Post Epidemic Assessment (Community house hold survey)

Region _____ Zone _____ Woreda _____ Kebele _____
 Date _____

No.	Question	Coding Classification	Go To
Health education and Prevention			
	Have you heard about yellow fever disease/Outbreak in your kebele?	1.Yes 2.No	
	If yes, through which communication channels did you get the information?	1. Health Extension workers 2. Kebele administrators 3. 1 to 5 health development army 4. Mass media (especially radio) 5. Crier (Megaphone announcement) 6. Other specify _____	
	What types of messages were provided to prevent yellow fever outbreak?	1. Transmitted via mosquito 2. Draining mosquito breeding sites 3. Using bed net 4. Any febrile cases should visit health facilities 5. No messages were provided 6. Other specify _____	
	What types of messages were provided for vaccination?	1. Where the vaccination post 2. Date of immunization campaign 3. Vaccination given for free 4. No messages were provided 5. Other, specify _____	
	Family size of the Household.	_____	

No.	Question	Coding Classification	Go To
	Have you had ITNs before the occurrence of the outbreak?	1.Yes 2.No	
	If yes, how many bed nets did you have?	_____	
	Did you get bed nets during the outbreak?	1.Yes 2.No	
	If Yes, how many bed nets? Observe	_____	
	Did you use bed nets during the outbreak?	1.Yes 2.No	
	The number of family members who used bed nets during the outbreak.	_____	
	Was your house sprayed with IRS during an outbreak?	1.Yes 2.No	
	Have you participated in vector control measures in your kebele?	1.Yes 2.No	
	If yes, what type of vector control measures did you do?	1. Drainage of water bodies 2. Covering of the breeding sites with soil 3. Other specify _____	
	If no, why didn't you participate in vector control measures?	_____	
Vaccination			
	Were you vaccinated for Yellow Fever?	1.Yes 2.No	
	Total number of family members eligible for yellow fever vaccination	_____	
	Family size of the Household by age.	1. < 9months _____ 2. 9 month – 60 yrs _____ 3. > 60 years _____ 4. Total family size _____	
	Total number of family members vaccinated by age.	1. < 9months _____ 2. 9 month – 60 yrs _____	

No.	Question	Coding Classification	Go To
		3. > 60 years _____ 4. Total vaccinated _____	
	Were there eligible family members who were not vaccinated?	1.Yes 2.No	
	If yes, number of eligible family members unvaccinated for Yellow fever.	_____	
	If yes, what were the reasons for being unvaccinated?	_____	

N.B: Multiple answers are possible. Thank you for your cooperation!!

Annex 14. Privileged Woredas with NGOs Support, Analysis involved in health sector

Catholic church	Hammer, and Maale woreda
GTLI (global team local imitative)	Hammer
SIM	Salamago woreda
AMREF	Salamago, south Ari , Maale , Benna Tsmaye
EPARDA	Hammer and Benna Tsmaye woredas
NLM	Jinka zonal hospital
SWS(south west snoods')	Benna Tsmaye
IFHP(integrated family health program)	Benna Tsmaye, south Ari, north Ari, and Jinka town
SAVE the children	Hammer and Dassenech districts
WHO	All woredas
UNCIEF	All woredas

Annex 15. List of Yellow fever Post Epidemic Assessment (PEA) team members

SN	Name	Responsibility
1	Ato Nigatu Tarekegn	RHB/PHEM Officer ; EFETP Resident (Team Leader)
2	W/ro Misgana Matusala	RHB/PHEM Officer
3	Dr. Kiflu Bereda	WHO/ DPC, Consultant
4	Ato Erkeyehun	ZHD/ PHEM Officer
5	Ato Getachew Alemu	RHB/ PHEM Officer (During the assessment tool preparation)
6	Ato Abebe Worku	WHO/DPC/Driver

Annex 16 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: _____