

**ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH
SCIENCE SCHOOL OF PUBLIC HEALTH
ETHIOPIAN FIELD EPIDEMIOLOGY AND LABORATORY
TRAINING PROGRAM (EFELTP)**



Compiled Body of Works in Field Epidemiology

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Addis Ababa University, College of Health Sciences, School of Public Health, Ethiopian Field Epidemiology Training Program (EFELTP)

Compiled Body of Works in Field Epidemiology

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A Compiled Body of Work Submitted to the School of Public Health Addis Ababa University in Partial Fulfilment for the Degree of Master of Public Health in Field Epidemiology

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Table of contents

| | |
|--|----|
| Table of contents..... | iv |
| List of Abbreviation and Acronyms..... | x |
| Chapter One: Outbreak investigation..... | 3 |
| 1.1 Measles outbreak investigation and response in Robe Town Oromia region, Ethiopia, in March 2019 | 3 |
| 1.1.1 Introduction | 4 |
| 1.1.2 Objective | 7 |
| 1.1.3 Methodology and materials..... | 8 |
| 1.1.3 Results..... | 12 |
| 1.1.4 Discussion | 20 |
| 1.1.5 Limitation..... | 22 |
| 1.1.6 Conclusion | 22 |
| 1.1.7 Recommendation | 22 |
| 1.2 Descriptive epidemiology of cholera outbreak in West Arsi zone, Oromia Region, Ethiopia 2019 | 25 |
| 1.2.1 Introduction..... | 26 |
| 1.2.2 Objective | 29 |
| 1.2.3 Method and materials..... | 30 |
| 1.2.4 Results..... | 33 |
| 1.2.8 Discussion | 37 |
| 1.2.9 Limitation..... | 38 |
| 1.2.10 Conclusion | 39 |
| 1.2.11 Recommendation | 39 |
| 2. East Shewa zone five years retrospective malaria data analysis, Oromia region, Ethiopia, in 2019 | 41 |
| 2.1 Introduction | 42 |
| 2.2 Objectives | 44 |
| 2.3 Method and materials..... | 45 |
| 2.4 Results..... | 48 |
| 2.5 Discussion | 61 |

| | | |
|---|--|-----|
| 2.6 | Limitation..... | 63 |
| 2.7 | Conclusion | 63 |
| 2.8 | Recommendation | 64 |
| Chapter Three: Evaluation of surveillance system..... | | 66 |
| 3. | Evaluation of Surveillance System of Measles disease, West Arsi Oromia region, southern Ethiopia, November, 2019 | 66 |
| 3.1 | Introduction..... | 67 |
| 3.3 | Objective | 72 |
| 3.4 | Methods and materials | 73 |
| 3.5 | Results..... | 78 |
| 3.6 | Discussion | 89 |
| 3.7 | Conclusion | 91 |
| 3.8 | Recommendation | 92 |
| Chapter Four: Health Profile Description Report..... | | 95 |
| 4. | Health Profile Description of Ada’a district, East Shewa zone Oromia region, Ethiopia, 2019..... | 95 |
| 4.1 | Introduction..... | 96 |
| 4.2 | Objective | 98 |
| 4.3 | Methodology | 99 |
| 4.4 | Results..... | 101 |
| 4.5 | Discussion | 117 |
| 4.6 | Conclusion | 119 |
| 4.7 | Recommendation | 119 |
| Chapter Five: Scientific Manuscripts for Peer reviewed Journals | | 121 |
| 5.1 | “Measles outbreak investigation and response in Robe town, South-East Oromia region, Ethiopia, March, 2019” | 121 |
| 5.2 | “Descriptive epidemiology of cholera outbreak in West Arsi Zone, Oromia Region, Ethiopia 2019 “ | 136 |
| Chapter Six: Abstracts for Scientific Presentation..... | | 149 |
| 6.1. | “Measles outbreak investigation and response in Robe town, South-East Oromia region, Ethiopia, March, 2019” | 149 |
| 6.2. | Descriptive epidemiology of cholera outbreak in West Arsi Zone, Oromia Region, Ethiopia 2019 | 150 |
| Chapter Seven: Narrative Summary of Disaster situation | | 151 |

| | |
|--|-----|
| 7.1. Narrative Report of Flood Disaster Situation in Ilu district of South west Shewa zone, Oromia region, Ethiopia August, 2020 | 151 |
| 7.1.1 Introduction | 152 |
| 7.1.1.1 Back ground | 152 |
| 7.1.2 Objective | 153 |
| 7.1.3 Method, Area and period..... | 153 |
| 7.1.4 Results..... | 154 |
| Chapter Eight: Protocol/Proposal for Epidemiologic Research Project..... | 162 |
| Knowledge and Practice of Notifiable Disease Surveillance among Health-Care Workers in East Showa Zone, Oromia Region, Ethiopia | 162 |
| Chapter Nine: Additional Out puts | 188 |
| List of Annexes | 205 |

List of Tables and Figures

| | |
|--|----|
| Table 1: Common sign and symptom of cases with measles, Robe Town, Oromia Region, Ethiopia, 2019 | 12 |
| Table 2: Type of treatment given in Robe Town, Oromia Region, Ethiopia, 2019 | 13 |
| Table 3: Measles cases by Age and sex category, Robe Town, Oromia Region, Ethiopia, 2019..... | 13 |
| Table 4: Measles Attack rate by Age group and Sex specific, in Robe Town, Oromia Region, Ethiopia, 2019 | 14 |
| Table 5: Measles Attack rate (AR) and case fatality rate (CFR) by kebeles in Robe Town Oromia Region, Ethiopia, 2019..... | 14 |
| Table 6: The reasons families why did not vaccinate their children in Robe Town, Oromia region, Ethiopia in 2019..... | 16 |
| Table 7: Bivariate analysis for different exposures to measles, in Robe Town, Oromia region, in 2019... | 17 |
| Table 8: : Multivariate analysis of independent risk factors associated with contracting measles in Robe town, Oromia region, Ethiopia, in 2019..... | 18 |
| Table 9 : Distribution of cholera cases and deaths by age group of West Arsi Zone, Oromia Region, Ethiopia 2019..... | 34 |
| Table 10: Cholera Attack rates and Case-fatality rates stratified by district of West Arsi Zone, Oromia Region, Ethiopia 2019 | 35 |
| Table 11: Parasitological confirmed and clinically identified malaria cases in East shewa zone, Oromia region, Ethiopia from 2014-2018..... | 48 |
| Table 12: Total malaria cases distribution by District in East Shewa Zone Oromia Region, Ethiopia, in 2019 | 50 |
| Table 13 : Distribution of Malaria Incidence rate per 1000 population during 2014-2018 by Districts in East Shewa Zone, Oromia Region, Ethiopia, 2019..... | 51 |
| Table 14: Malaria cases and deaths during 2014-2018 by Age groups in East shewa zone Oromia region, Ethiopia in 2019..... | 53 |
| Table 15: Malaria cases by sex category from 2014-2018 in East shewa zone Oromia region, Ethiopia, in 2019 | 54 |
| Table 16: Malaria suspect and confirmed cases during (2014-2018) in East Shewa zone, Oromia Region, Ethiopia in 2019..... | 57 |
| Table 17: Indoor residual spray unit structures sprayed and population protected in East Shewa zone Oromia region, Ethiopia in 2019..... | 59 |
| Table 18: Distribution of measles cases by district of West Arsi Zone Oromia Region, Ethiopia, 2019... | 79 |
| Table 19: vaccination status of measles cases by district in West Arsi Zone Oromia Region, Ethiopia, 2019 | 79 |
| Table 20: List of immediately and weekly notifiable diseases/conditions, Ethiopia, 2019 | 80 |
| Table 21: Availability of epidemic preparedness plan and response resource in visited health institutions of West Arsi Zone, Oromia region, Ethiopia, in 2019..... | 81 |
| Table 22: Availability of resources for PHEM activities related to data management and communication in visited sites of West Arsi Zone, Oromia Region, in 2019. | 84 |
| Table 23: positive value predictive of measles case based surveillance with blood samples collected from six visited district for confirmation in West Arsi Zone Oromia Region, Ethiopia, 2019 | 88 |

| | |
|---|-----|
| Table 24: Estimated population distribution by kebeles and Age category in Ada’a district, East Shewa Zone, Oromia Region, in 2018 | 102 |
| Table 25 : Distribution of schools teachers and students in Ada’a District, East Shewa Zone Oromia region, Ethiopia in 2019..... | 104 |
| Table 26 : School Age enrolled and drop out of students in Ada’a District, East Shewa Zone, and Oromia region in 2019 | 104 |
| Table 27 : Types of water sources in Ada’a District, East Shewa zone, Oromia Region Ethiopia, in 2019 | 105 |
| Table 28 : Accessibility of infrastructures for health facilities in Ada’a district, East shewa Zone, Oromia Region, Ethiopia, in 2019 | 108 |
| Table 29 : Immunization coverage in Ada’a District, East Shewa zone Oromia region Ethiopia, in 2019 | 109 |
| Table 30 : Health care component Coverage in Ada’a District, East Shewa zone, Oromia Region, Ethiopia in 2019 | 110 |
| Table 31: Top ten Causes of Morbidity in Ada’a District, East Shewa zone Oromia region, Ethiopia, in 2019 | 111 |
| Table 32: Under Five Top ten Causes of Morbidity in Ada’a District, East Shewa zone Oromia region, Ethiopia, in 2019..... | 112 |
| Table 33 : Five years progress of malaria cases and slide positive rate in Ada’a district, East Shewa zone, Oromia region, in 2019 | 113 |
| Table 34: Human resource working in Ada’a District, East Shewa zone, Oromia region, Ethiopia in 2019 | 114 |
| Table 35: Flood Affected population and Kebeles Ilu district South West Shewa, Oromia Region, Ethiopia, 2020..... | 154 |
| Table 36: : Malnutrition cases by year and months in Ilu District, South West Shewa zone, Oromia region, Ethiopia, 2020..... | 156 |
| Table 37 : Plan of action for flood response by key thematic areas of Intervention, in Ilu district south west shewa zone, Oromia, Ethiopia August, 2020 | 157 |
| Table 38: Epi-Project Work plan East Shewa Zone, Oromia Region, Ethiopia 2020 | 183 |
| Table 39: Epi-project Budget plan in East shewa Zone, Oromia Region, Ethiopia 2020..... | 184 |
| | |
| Figure 1: Epidemiologic curve of measles outbreak, Robe Town, Oromia region, Ethiopia 2019 | 15 |
| Figure 2 : Distribution of cholera cases by age and sex of West Arsi Zone, Oromia Region, Ethiopia 2019 | 34 |
| Figure 3: Epidemic curve of the cholera cases and deaths of West Arsi Zone, Oromia Region, Ethiopia, in 2019 | 36 |
| Figure 4:Annual total reported malaria cases, malaria-related deaths and proportion of confirmed cases in East shewa zone, Oromia Region, Ethiopia, from 2014-2018..... | 49 |
| Figure 5: Annual total inpatient cases and proportion of malaria inpatient cases in East shewa zone, Oromia Region, Ethiopia, from 2014-2018 | 49 |
| Figure 6: Incidence rate of malaria confirmed cases > 5 &< 5 Age groups during (2014-2018) in East shewa Zone, Oromia Region, Ethiopia, 2019 | 54 |

| | |
|---|-------------------------------------|
| Figure 7 : Incidence rate of malaria confirmed cases by sex category during (2014-2018) in East shewa Zone, Oromia Region, Ethiopia, 2019 | 55 |
| Figure 8: Total Malaria cases during 2014-2018 by Sex in East Shewa Zone, Oromia Region, Ethiopia, in 2019 | 55 |
| Figure 9: Distribution of malaria cases by time in East shewa zone, Oromia region Ethiopia, 2019..... | 56 |
| Figure 10: Proportion of malaria slide positivity rate during (2014-2018) East Shewa Zone, Oromia region, Ethiopia, in 2019..... | 57 |
| Figure 11: Monthly distribution of plasmodium species and total confirmed malaria cases in East shewa zone, Oromia region, from 2014-2018..... | Error! Bookmark not defined. |
| 2.4.7 Figure 12: Five years average report completeness rate by year during (2014-2018) in East shewa zone, Oromia Region, Ethiopia, in 2019..... | 58 |
| Figure 13: Number of Indoor spray unit structures sprayed during 2011-2019) in East Shewa zone, Oromia region, in 2019 | 60 |
| Figure 14 : Diagrams illustrating the flow of surveillance data and information throughout a health system which adopted from public health emergency management guide line. | 69 |
| Figure 15: WHO weekly trends of Measles Cases in West Arsi Zone Oromia Region, Ethiopia 2019. | 78 |
| Figure 16 : Ada'a district health office organizational structure, East shewa Zone, Oromia Region, Ethiopia 2019 | 107 |
| Figure 17: Epidemiologic curve of measles outbreak, Robe Town, Oromia region, Ethiopia 2020 | 127 |
| Figure 18 : Epidemic curve of the cholera cases and deaths of West Arsi Zone, Oromia Region, Ethiopia 2019 | 143 |
| Figure 19 : the conceptual Framework adapted from WHO PRSM, to assessing priority disease surveillance practice..... | 172 |
| Figure 20: Schematic presentation East Shewa zone selected district and number of health facility ... | 178 |

List of Abbreviation and Acronyms

| | |
|--------|--|
| AAU | Addis Ababa University |
| AFI | Acute Febrile Illness |
| AIDS | Acquire Immunodeficiency Syndrome |
| ANC | Antenatal care |
| API | Annual Parasite Incidence |
| AR | Attack Rate |
| ART | Anti-Retroviral Therapy |
| BCG | Bacilli Chalmette- Guerin |
| CDC | Centers for Communicable Disease Control |
| CFR | Case Fatality Rate |
| CHS | College of Health Science |
| CI | Confidence Interval |
| CSA | Central Statics Agency |
| DRC | Democratic Republic of Congo |
| E.C | Acute Febrile Illness |
| EFELTP | Ethiopian Field Epidemiology and Laboratory Training Program |
| EFY | Ethiopian Fiscal Years |
| EPI | Expanded Program on Immunization |
| EPHI | Ethiopian Public Health Institute |
| ETB | Ethiopian Birr |
| F | Female |
| FDRE | Federal Democratic Republic of Ethiopia |
| FMOH | Federal Ministry of Health |
| GTFCC | Global Task Force on Cholera Control |
| HIV | Human Immunodeficiency Viruses |
| IDSR | Integrated Disease Surveillance and Response |
| IEC | Information Education and communication |
| IgM | Immunoglobulin M |
| IHR | International Health Regulation |
| IRS | Indoor Residual Spray |
| ISS | Integrated Supportive Supervision |
| LLINs | Insecticide Treated Net |
| M | Male |
| MAM | Moderate Acute Malnutrition |
| MCH | Maternal Child Health |
| MIS | Malaria Indicator Survey |
| MOP | Malaria Operation Plan |
| MUAC | Mid Upper Arm Circumference |
| NCD | Non-Communicable Disease |

| | |
|----------|--|
| NDRMC | National Disaster Risk Management Commission |
| NMSP | National Malaria Strategic Plan |
| OPD | Out Patient Department |
| OPV | Oral Polio Vaccine |
| OR | Odd Ratio |
| OTP | Out-Patient Treatment Program |
| PCV | Pneumococcal Conjugative Vaccine |
| PHEM | Public Health Emergency Management |
| PLW | Pregnant and Lactating Women |
| PMTCT | Preventing Mother To Child Transmission |
| PNC | Post Natal Care |
| RDT | Rapid Diagnostic Test |
| RHB | Regional Health Bureau |
| RRT | Rapid Response Team |
| SAM | Sever Acute Malnutrition |
| SC | Stabilization Center |
| SPH | School of Public Health |
| SIA | Supplementary Immunization Activities |
| TOR | Term of Reference |
| VCT | Voluntary Counseling Test |
| WASH | Water Sanitation and Hygiene |
| WHO | World Health Organization |
| WHO/AFRO | World Health Organization Africa Regional Office |

Executive summery

This compiled body of works has nine main chapters all of them were done at residence time of Oromia Regional Health Bureau stay which mean during the residency period of the program. These nine sections contains expected outputs during the residence time; which includes two outbreak investigation, one surveillance data analysis, one surveillance system evaluation, one description of district health profile, two manuscript for peer reviewed journal, two abstract for submission in scientific conference, two writing proposal of epidemiologic research project, one disaster situational and action plan reports.

Chapter one: - Two outbreak investigation and response were carried out. The first outbreak investigation was conducted in Robe Town Oromia region and the second outbreak was in Shashamane rural, Wando, Negelle Arsi rural, Shalla and Heben Arsi districts of west Arsi zone, Oromia regional governmental states. In the first outbreak a total of 44 measles cases with 1 death were identified in Robe Town and in the second outbreak 164 cholera cases with 3 deaths were identified in five districts of West Arsi zone. The two outbreaks were confirmed by laboratory confirmation test. To identify the risk factors case control study design was conducted for measles outbreak investigation and for cholera outbreak descriptive analysis performed. For two outbreak investigation we recommended the gab observed depending on the findings.

Chapter Two: - We analyzed a five-year descriptive epidemiology of malaria retrospectively at East Shewa zone, which collected from 2014 to2018 from East Shewa zone Oromia regional state.

Chapter three: - Measles diseases surveillance system was evaluated from October 15 to November 5, 2019. Descriptive cross-sectional study design was used. In this chapter, the surveillance core and support function assessed and described. In addition, the surveillance attributes:- simplicity, flexibility, acceptability, representativeness, timeliness, data quality, sensitivity, positive predictive value and usefulness of the surveillance system were assessed.

Chapter Four: - We describe health and health related data of Ada'a district of East Shewa zone Oromia region, which collected from February 20 to March 2, 2019

Chapter Five: - Two Manuscripts were prepared on measles outbreak investigation conducted at Robe town of Oromia regional states and Deceptive Epidemiology of cholera outbreak conducted at West Arsi zone of Oromia region.

Chapter six: - Abstracts on “Investigation of measles Outbreak in Robe Town of Oromia region, Ethiopia March 2019” and “Descriptive epidemiology of Cholera outbreak in West Arsi zone Oromia region, Ethiopia, October 2019”

Chapter seven: - Narrative summary report of Flood disaster situation in Ilu district of South west shewa zone Oromia region conducted in August 2020.

Chapter Eight: - Are an epidemiological protocol entitled “To assess the Knowledge and Practice of Disease Surveillance among health-care workers in East Showa zone, Oromia Region, Ethiopia, 2021” Notifiable disease surveillance is important for early detection of changes in the temporal, geographic and age distribution of new and known diseases that indicate outbreak of infection, or changes in the sporadic diseases. The knowledge and practice of integrated disease surveillance and response are very important for the efficient reporting of notifiable diseases. Yet, the knowledge and practice of disease surveillance among the public health care-workers has not been assessed in Oromia region. The main purpose of study is to assess the level of knowledge, practice and factors associated disease surveillance practices of public health care-workers. Facility based cross-sectional study design will be used in East shewa zone from May 21st to June 30 2021.

Chapter Nine: - Contains other addition outputs, which contain training on COVID-19 on contact tracing, RRT for district and town level contact tracers and RRT and CVD small grant projects.

The small grant project entitled “Effect Education Intervention on Health lifestyle change among hypertensive Patients Attending Outpatient Department in Bishoftu General Hospitals”. Lifestyle modifications are capable of lowering hypertension, while most of hypertensive patients do not have enough knowledge about lifestyle modification the main objective of this study will be to assess effective of education intervention on knowledge, clinical measurement and practice of healthy lifestyle change among hypertensive patients attending outpatient department. Facility based Interventional study will be used in Bishoftu General Hospital from January1st to July 30, 2021.

Chapter One: Outbreak investigation

1.1 Measles outbreak investigation and response in Robe Town Oromia region, Ethiopia, in March 2019

Abstracts

Background: - Measles is a highly contagious, vaccine-preventable, viral disease. In 2019, CDC reports 9,828,400 measles cases and 207,500 deaths global 48%, 71% in Africa region respectively. An epidemiology of measles estimated those more than 1.5 million cases of measles and 70,000 deaths with 4% CFR would occur in Ethiopia annually. In Oromia 26,908, suspected measles cases and 288 deaths were reported from January 1st, 2007 to December 31st, 2016. On March 2, 2019, Robe town reported a suspected measles outbreak. We conducted an outbreak investigation to describe the magnitude, identify risk factors and control measures.

Methods: - we conducted 1:2 unmatched case-control studies in Robe town from March 6 to 24 2019. The outbreak was confirmed by using serological laboratory test. We describe cases by using line list and collect data using structured questionnaire from all 45 cases & 90 controls by interviewing the case and control including their family. We use standard case definition to identify cases. We conducted bivariate and multivariable logistic regression by using SPSS24. Significance was stated at p- value < 0.05.

Results: - A total of 44 measles cases with case fatality rate 2.2% (1/45) were reported from Robe town. Among cases 29/45 (64%) were male and 33/45(73%) were unvaccinated, children<1 year and male were more affected with (AR=428/100,000) and (AR=78/100,000) Population respectively. Being unvaccinated with measles vaccines were risk factors (AOR = 4, 95% CI [1.65-11.46]), limited knowledge about vaccine prevention of measles (AOR=2.9, 95% CI [1.11-7.56]), contact with measles cases (AOR=3.96 , 95% CI [1.25-12.32]), presence of measles cases in the some house (AOR=5.2, 95% CI [1.18-22.99]), being less than five years age group (AOR=3.9 , 95% CI [1.4 – 10.79]) were associated with measles infection.

Conclusion: - Confirmed measles outbreak was caused due to low measles vaccine coverage, males and < 1 years were more affected. Being vaccinated was protective, limited knowledge on vaccine prevention of measles, having contact history and presence of measles cases in the house were identified risk. Strengthening routine and supplementary immunizations were required.

Keywords: Measles, Outbreak, Case-Control, Robe Town, Ethiopia

1.1.1 Introduction

1.1.1.1 Background

Measles is an acute, highly contagious vaccine-preventable, viral disease caused by measles virus (1,2). This virus is a member of genus Morbilli virus of paramyxoviridae family (1). Measles is a vaccine preventable disease, but remains a major killer of children around the world (3). The measles virus replicated in the nose and throat of infected individuals and transmitted by primarily respiratory droplets to mucous membranes in the upper respiratory tract or conjunctiva (1,4–6).

The incubation period of measles is 7-14 days from exposure to onset of symptoms; the rash usually appears 14 day after exposure and spreads from head to trunk to lower extremities (1,4). The patients are contagious from four day before the eruption of the rash to until four day after the eruption (1,4,5). Measles spreads by coughing and sneezing in direct contact or close contacts with infected nasal or throat secretions (1). The viruses remain active and contagious in the air for up to 2 hours (1). It can be transmitted by an infected person from the 4 days prior to the start of rash to 4 days after the rash erupts (1,4).

In 2019, CDC reports 9,828,400 measles cases 207,500 deaths global 48% and 71% in Africa region respectively (7). Based on the epidemiology of measles in Ethiopia and burden of disease modeling, it is estimated that more than 1.5 million cases of measles and 70,000 deaths (assuming 4% case fatality ratio would occur in Ethiopia annually (8). Despite the availability of a safe and effective vaccine, measles remains one of the leading cause of mortality among young children around the world (3). In developing countries , case fatality rates average 3-5%, but can be as high as 10-30% (1,8). Epidemics of the measles occur when the number of susceptible individuals in a population reaches threshold or three confirmed cases in one months (1,5). During 2019, measles out breaks were reported in several countries in Africa, Eastern Mediterranean, Europeans, Americas and South-Asia region (9).

Measles is usually mild or moderately severe illness associated with long-term health problems. The severity of measles illness varies widely, depending on a number of host and environmental factors (10,11). The severity or fatality increase for these aged less than five years, living in crowded conditions, malnourished and those with immunologically disorders, such as advanced HIV infection (10). The long term health problems these includes blindness, chronic lung disease, malnutrition and recurrent inflammations (10,11).

The World Health Organization created the expanded program of on immunization in 1974 as a means to continue the great success that had been achieved earlier with the eradication of small pox (8). At that time less than 5% of the world's children in the developing countries were receiving immunizations (8).

Since the introduction of effective measles vaccines, the epidemiology of measles has changed in both developed and developing countries (8). As vaccine coverage increased, there has been a marked reduction in measles incidence, and with decreased measles virus circulation, the average age at which infection occurs has increased (12).

A single dose of measles containing vaccine at nine months of age induces immunity in 85% of infants and later at one year's increase immunity in 95% of those vaccinated (1). A second dose of vaccination is recommended by WHO based on area measles transmission, age and coverage of measles containing vaccine, supplemental immunization activities and overall capacity and performance of the routine immunization and surveillance system (2).

World Health Organization of African Region has established objectives and strategies for its member state to achieve measles elimination by 2020. However, through increasing access service in all districts, improve vaccination coverage, reduce the incidence of measles less than one case per million population in all countries and improve the quality of measles surveillance, as well as, the epidemiological and biological investigation of measles out breaks in all countries (13).

Factors associate with measles virus infection are includes: any non-immune person or who has not been vaccinated, infants who lose passive antibody before the age of routine immunization, children with vitamin "A" deficiency and immunodeficiency, corticosteroid therapy regardless of immunization status and travel history to measles endemic area or having contact with those travel to endemic area, malnourished and young children are a high risk to develop measles complication and mortality from measles infection (1).

In developing countries in which there was low vaccination coverage, epidemics often occur every two to three years and usually last to three months (10). Since the introduction of effective measles vaccines, the epidemiology of measles has changed in both developed and developing countries (11). As vaccine coverage has increased, there has been a marked reduction in measles incidence, and decreased measles virus circulation, average age at which infection occurs has increased (12)

Different case control studies on measles outbreak investigation show that the possible factors for measles infection were less awareness, being unvaccinated, malnutrition, travel history to measles

cases area, presence of measles case in neighbor or the house hold, poor cold chain management and low measles vaccine coverage were potential cause for measles outbreak in Ethiopia(14–16). In Oromia region from 1st January 2007 to 31st December 2016 a total of 26,908 suspected measles cases and 288 deaths were reported (17). According to 2019 mini- Ethiopian demographic health survey, measles containing vaccine first dose coverage was 59% (18). In 2018 about 258 confirmed 804 and epidemiologically linked measles cases reported from different Oromia regional states zone and Town administrative. Accordingly Robe town identify measles suspect case at Robe general hospital and report to Oromia regional health bureau on March 2, 2019. Beside the suspected measles case report from Robe Towns Oromia regional health bureau, organizes a team consisting of two a field epidemiology Training program residents, Regional surveillance officer and present graduate of field epidemiology residents were deployed to Robe Town and investigate the outbreak. In the last three years from this Town there was no measles suspect case report prior to now. This investigation was intended to confirm the existence of measles outbreak, describe the morbidity and mortality of measles cases, and identify risk factors associated with the outbreak and take control measures.

1.1.1.2 Rationale of the study

Measles is a contagious viral infection which is categorized to as immediately reportable disease. According to public emergency management guide line three confirmed or five suspected cases are considered as an outbreak. Investigation of suspected or confirmed measles outbreak and tackling of it was important in order to protect the outbreak locally before spreading. Early investigating and responding to measles outbreak decreases morbidity and mortality that would happen from it. Moreover, the study also helps to identify risk factors associated with outbreak, implement appropriate prevention and control measures.

1.1.2 Objective

1.1.2.1 General objective

To describe the magnitude and confirm the existence of measles outbreak, identify risk factors associated with the outbreak and undertake control measures in Robe town Oromia region, Ethiopia 2019.

1.1.2.2 Specific objectives

- To describe the outbreak by morbidity, mortality and symptoms in Robe town, Oromia region, Ethiopia 2019.
- To describe outbreak in terms of person, place and time in Robe town Oromia, region, Ethiopia 2019.
- To identify risk factors associated with measles outbreak in Robe town, Oromia region, Ethiopia 2019.
- To implementing appropriate prevention and control measures in Robe town, Oromia region, Ethiopia 2019.

1.1.3 Methodology and materials

1.1.3.1 Study Area

Measles outbreak investigation was conducted in Robe town Oromia region. Robe town established as a level of zonal administrative to be town administrative in 2009 E.C. It is located about 430km far from Addis Ababa the capital city of Ethiopia as well as Oromia Region. It is bounded by Sinana district of Bale zone in North and East, by Goba Town of Bale Zone in South, and by Sinana district of Bale zone in west. Robe Town has a total of three kebeles and has total population of 73,153. In the town there are one general hospital and one health centers.



Figure 1: Map of showing study area Robe town, Oromia region, Ethiopia, in 2019

1.1.3.2 Study period

The study was conducted from March 6 to 24, 2019

1.1.3.3 Study Design

We conducted un-matched case- control study

Descriptive epidemiology

We describe the magnitude of the disease by kebeles, age, Sex, date of onset and vaccination status.

Analytic Epidemiology

We conducted 1:2 ratio un-matched case-control study in Robe town. Case patients were identified depending on the case definition those who were suspected to have measles by health professional at health facility before conducting the study and these identified by active case searches and confirmed cases. Controls were selected from neighbors those not full fill the public health emergency management guide line case definition.

1.1.3.4 Target/source population

All population living in Robe town was the source population.

1.1.3.5 Study population

All confirmed, suspected to have measles and epidemiologically liked cases; deaths and selected unmatched community control were study population.

1.1.3.6 Sampling

All cases that were listed on line and meet standard and community case definition were included.

1.1.3.7 Data collection Tools and Procedures

We reviewed the line list and outpatient medical logbook and medical record of cases at Robe general hospital. We conducted interview the case and control as well as their partners by using a structured and semi-structured questioner's to assess the vaccination status, nutritional status, family size, and time used from the health facilities, screening of children for malnutrition was done with MUAC measurements and observation of their immunization cards would be also done. Three field epidemiology resident (including principal investigators) were participated in data collection procedures.

1.1.3.8 Inclusion and exclusion criteria

Inclusion criteria

Cases: Any resident of Robe town who had symptoms of measles (these who full fill measles national standard case definition) from January 15-March 24, 2019 and who agree to participate in the study was included.

Controls: Any resident of Robe town during the study who was a neighbor to a case and who did not develop signs and symptoms of measles within the study period and agreed to participate was included.

Exclusion criteria

Case: Those who refused to participate or were unconscious were excluded

Control: Those who refused to participate were excluded

1.1.3.9 Data quality assurance

Before the start of data collection, half-day orientation was given for data collectors. Each completed questionnaire was daily reviewed by the principal investigator to monitor the data quality. Before analysis, data was also cleaned for any missing or inconsistent value.

1.1.3.10 Data analysis

All collected data have entered and analyzed using statistical software epiinfo-7.2.6 and SPSS 24 bivariate and multivariate analysis was conducted.

1.1.3.11 Case definition and selection of cases and controls

Case definition: Public health emergency management guide line case definition has used. (2)

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

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

Epidemiologically linked case: - is a suspected case, which has contacts with laboratory confirmed case or another epidemiologically confirmed case (1).

Measles-related death: - is a death in an individual with confirmed (clinically, laboratory, or epidemiologically) measles in which death occurs within 30 days of rash onset and is not due to other unrelated causes (1).

Malnourished: children who had MUAC measurement of less than 11.5cm as a severe malnutrition and between 11.5-12.5cm moderate malnutrition and in addition, who had edema without MUAC measurement is also taken as a malnutrition.

1.1.3.12 Operational definition

Cases - Are an individual, who fulfills the public health emergency management guideline case definition and all those recorded cases on the line list.

Controls- Are an individual, who does not fulfill national public health emergency management guideline case definition of measles and selected from similar village (neighborhood) where cases were identified

1.1.3.13 Ethical clearance

A letter of permission was written for Robe town health office in order to obtain approval on data collection. Informed verbal consent was obtained from all study participants before interview by explaining the purpose of the study. Privacy and confidentiality was insured. The name of the respondents not written on the questionnaire, and the information given by study participants was not known to others. The involvement of study participants were voluntary.

1.1.3.14 Dissemination of the result

This study report was summited to Addis Ababa University, School of Public Health, Oromia Regional Health Bureau and Robe Town Health Office.

1.1.3 Results

1.1.3.1 Descriptive epidemiology

1.1.3.1.1 Morbidity, Mortality, Symptom and Treatments Given

The first (Index) case of measles disease reported from Robe town was 8-year-old female, which had a travel history to Dinsho district adjacent to Robe town, but her permanent residence area was Robe town 03 kebele. There was an epidemic in Dinsho district of Bale zone. After she came back to the residence area on February 13, 2019 and two days later on 15, 2019 go to Robe general hospital when she develops sign of fever and rash. By asking her family about vaccination status of her, they respond that, they know she did not have any vaccination history before. She may be had a history of measles infection contact with other children in Dinsho district because, from her visit place the children develops rash after she came back to her residence area.

Since from February 15, 2019 to March 22, 2019 for consecutive seven WHO weeks a total of 44 confirmed and epidemiologically linked to confirmed cases and 1 death of measles were reported from Robe town to Oromia regional health bureau public health emergency management and health research directorate. Of the three or 3/45 (6.7%) cases were confirmed by laboratory investigation (IgM positive) by test at national laboratory. Among a total measles cases 44 of them improved and one cases died with a case fatality rate 2.2%.

The available clinical information reviewed from the line list and questioned the cases and family of cases shown that 44/45 (98%) of cases had fever, 45/45(100%) develops rash, 44/45(98%) of cases had cough and 41/45(93%) percent develops Pneumonia.

Table 1: Sign and symptom of measles cases, Robe town, Oromia region, Ethiopia, 2019

| Sign and symptom | Frequency of cases | Percentage |
|-------------------------|--------------------|------------|
| Fever | 44 | 98% |
| Cough | 41 | 93% |
| Conjunctivitis/ red Eye | 39 | 86% |
| Rash | 45 | 100% |
| Runny nose | 34 | 75% |

Table 2: Treatment given for measles cases in Robe town, Oromia region, Ethiopia, 2019

| Type of treatment taken | Treatment taken | Number | Percentage |
|-----------------------------|-----------------|--------|------------|
| ORS | Yes | 14 | 31% |
| | No | 31 | 69% |
| Antibiotics | Yes | 44 | 98% |
| | No | 1 | 2% |
| TTC eye ointment | Yes | 39 | 86% |
| | No | 6 | 13% |
| Vitamin 'A' supplementation | Yes | 31 | 69% |
| | No | 14 | 31% |
| Antipyretics | Yes | 44 | 98% |
| | No | 1 | 2% |

1.1.3.1.2 Description of cases by person, place and time**Description by person**

From February 15 to March 22, 2019, which was considered as epidemic period, 43 measles cases and 1 death were identified from the line list and 1 by active case search at Robe town administrative boarders. The mean age of the cases were 6 years with standard deviation of 6.5 and 64% (29/45) of the cases were male.

Table 3: Measles cases by Age and sex category, Robe Town, Oromia Region, Ethiopia, 2019

| Age category | Sex | | Total number of cases (%) |
|--------------|----------|------------|---------------------------|
| | Male (%) | Female (%) | |
| < 1 Years | 6(13%) | 4(9%) | 10(22%) |
| 1-4 Years | 11(24%) | 6(13%) | 17(38%) |
| 5-14 Years | 6(13%) | 5(11%) | 11(24%) |
| 15-44 | 6(13%) | 1(2%) | 12(16%) |
| Total | 29(64%) | 16(36%) | 45(100%) |

The overall attack rates (AR) of the cases were 62 cases/100,000 populations. The attack rate was high in Male 78 cases/100,000 populations and in Female 45cases/100,000 populations. Children less than one year were more affected than others which were under one year AR 424

cases/100,000 Population, those 1-4years, 176cases/100,000 populations, those 5-14 years 51cases/100,000 population and those greater than15 years 18 cases/100,000 populations.

Table 4: Measles Attack rate by Age group, in Robe town, Oromia region, Ethiopia, 2019

| Age category | Population | Number of cases | AR / 100,000 Population |
|------------------|------------|-----------------|-------------------------|
| <1 Year | 2356 | 10 | 424 |
| 1-4 Year | 9641 | 17 | 176 |
| 5-14 Years | 21653 | 11 | 51 |
| >15 Years | 39503 | 7 | 18 |
| Male | 37308 | 29 | 78 |
| Female | 35845 | 16 | 45 |
| All Age category | 73153 | 45 | 62 |

Description by place

The highest attack rate have registered in Robe-02 kebele 87cases per 100,000 populations and followed by Robe-03 kebeles 75case per 100,000 population.

Table 5: Measles Attack rate (AR) and case fatality rate (CFR) by kebeles in Robe Town Oromia Region, Ethiopia, 2019

| Sr No | Name of kebeles | Total population | Number of cases | Number of Deaths | Attack rate per 100,000 | Case fatality rate |
|-------|-----------------|------------------|-----------------|------------------|-------------------------|--------------------|
| 1 | Robe-01 | 34117 | 14 | 0 | 41 | 0 |
| 2 | Robe-02 | 13825 | 12 | 0 | 87 | 0 |
| 3 | Robe-03 | 25211 | 18 | 1 | 75 | 5.6 |
| 4 | Total | 73153 | 44 | 1 | 62 | 2.2 |

Description by Time

The outbreak started on February 15 and ended on March 22, 2019. The outbreak last for five weeks. The outbreak reached peaks on 5 March of 2019 observed six cases and slowly decreased up to the end of the outbreak on 22 March of 2019 as presented in (Figure.2)

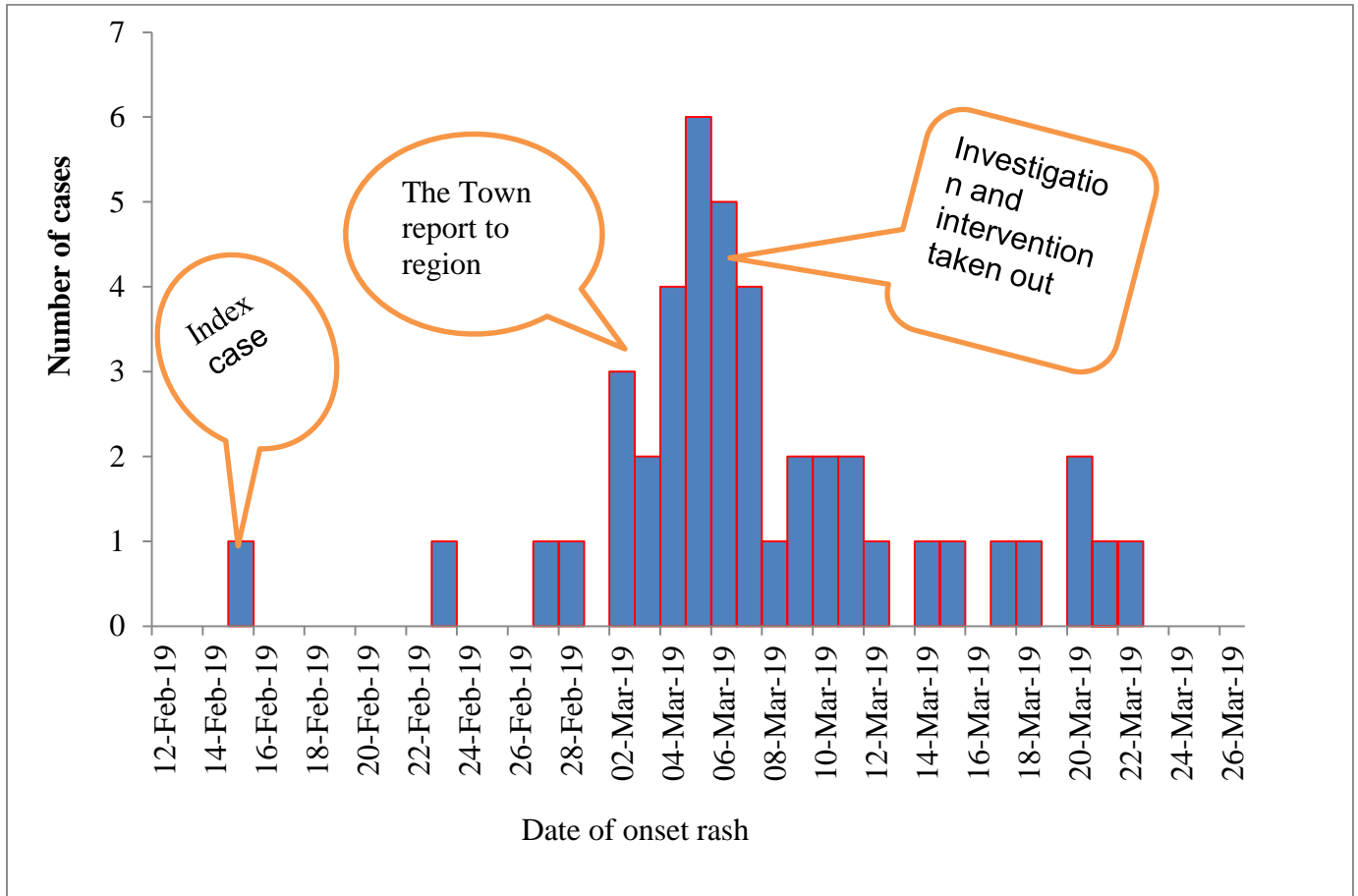


Figure 2: Epidemiologic curve of measles outbreak, Robe Town, Oromia Regional States, Ethiopia, in 2019

The last three years of measles vaccine coverage of the town starting from the establishment of the town as zonal administrative was reviewed and collected. The annual report of measles coverage of Robe town during 2016, 2017 and 2018 were 108%, 69% and 49% respectively. Accordingly, among 135 cases and controls participant included in study, 52.5% (71/135) individual had a past history of measles vaccination, of which 13 had a vaccination card. No supplemental immunization activities conducted in the town in the past three years. Due to this we assessed why not the family vaccinate their children as a result 44% (28/64) respondents had no awareness and schedule time

for vaccination 25% (16/64) were absence during the vaccination schedule, 16% (10/64) were scare vaccine to vaccinate their children and 14% (9/64) were thinks vaccination hurt their children if they vaccinate them.

Table 6: The reasons families why did not vaccinate their children in Robe Town, Oromia region, Ethiopia in 2019

| The reason why they not vaccinate their children | Frequency | Percent |
|---|------------------|----------------|
| Absent during vaccination campaign | 16 | 25% |
| Free effect to not vaccinate their children | 1 | 2% |
| Lacking of awareness and schedule time for vaccination | 28 | 44% |
| Scaring of vaccines to vaccinate their children | 10 | 16% |
| Thinks vaccination will hurt their child | 9 | 14% |
| Total | 64 | 100% |

1.1.3.1.3 Risk Factor Assessments

A total of forty-five cases and ninety neighborhood controls were participated in the case control investigation to identify the risk factors for measles infection in Robe town. Significance of associated variables was assessed by bivariate and multivariate analysis. Age, sex, family size, educational status of family, case and control, ventilation status of house, Vaccination status of cases and controls, presence of ill person in the house, contact and travel history, knowledge on measles vaccine availability and mode of transmission were analyzed and checked for association by bivariate analysis and finally, checked by multivariate analysis for those variables with P- value < 0.2. As shown in the (**Tables: 7**) eight variables were selected as candidate for the multivariate analysis. These are Age category, family size, and vaccination status, having knowledge on mode of measles virus infection transmission, Measles vaccine availability, having contact and travel history and presence of measles sick persons with in the some living room.

Table 7: Bivariate analysis for different exposures to measles, in Robe Town, Oromia region, in 2019

| Variables | Case n=45 (%) | Control n=90 (%) | COR (CI 95%) | P-value |
|--|---------------|------------------|--------------------|---------|
| Sex | | | | |
| Female | 16 (36) | 35 (39) | 1 | |
| Male | 29 (64) | 55 (61) | 1.15 (0.55 - 2.42) | 0.7 |
| Age | | | | |
| <5 Years | 27 (60) | 29 (32) | 3.15 (1.6 - 6.6) | 0.002 |
| >=5 Years | 18 (40) | 61 (68) | 1 | |
| Family size | | | | |
| Less than five | 17 (38) | 51 (57) | 1 | |
| Greater than or equal to five | 28 (62) | 39 (43) | 2.15 (1.03 - 4.48) | 0.04 |
| Educational status of the family | | | | |
| Illiterate | 23 (51) | 56 (62) | 1.57 (0.76 - 3.25) | 0.22 |
| Literate | 22 (49) | 34 (38) | 1 | |
| Level of education of case/control | | | | |
| Illiterate | 28 (62) | 40 (44) | 2.06 (0.99- 4.28) | 0.06 |
| Literate | 17 (38) | 50 (56) | 1 | |
| Vaccination status | | | | |
| No | 33 (73) | 31 (34) | 5.2 (2.37 -11.54) | 0.00 |
| Yes | 12 (27) | 59 (66) | 1 | |
| Knowledge on measles mode of transmission | | | | |
| No | 30 (67) | 41 (46) | 1 | 0.02 |
| Yes | 15 (33) | 49 (54) | 0.42 (0.19 0.88) | |
| Knowledge on vaccine availability to prevent measles infection | | | | |
| No | 27 (60) | 33 (37) | 2.6 (1.24 - 5.44) | 0.01 |
| Yes | 18 (40) | 57 (63) | 1 | |
| Travel history to area active measles case | | | | |
| Yes | 11 (24) | 9 (10) | 2.9 (1.01 -7.66) | 0.03 |
| No | 34 (76) | 81 (90) | 1 | |
| Contact history with measles patient | | | | |
| Yes | 21 (47) | 16 (18) | 4 (1.82 -8.87) | 0.001 |
| No | 24 (53) | 74 (82) | 1 | |
| Presence of sick person with similar case in the family | | | | |
| Yes | 16 (36) | 7 (8) | 6.5 (2.45 -17.49) | 0.00 |

| | | | | |
|--------------------|---------|---------|--------------------|------|
| No | 29 (64) | 83 (92) | 1 | |
| Ventilation status | | | | |
| Not ventilated | 28 (62) | 41 (46) | 1.97 (0.95 -4.09) | 0.07 |
| Ventilated | 17 (38) | 49 (54) | 1 | |

For those variables candidate for multivariate analysis when by bivariate analysis had been done, farther we analyzed by multivariate logistic regression to differentiate if the measles infection association was true association or due to effect modification or confounder. Accordingly, statistically significant variables on multivariate analysis were: Age category less than five years (AOR: 3.9 (1.43 -10.78), limited knowledge about measles vaccine availability (AOR = 2.9, 95% CI [1.11-7.56), being unvaccinated with measles vaccine were risk factor(AOR = 4, 95% CI [1.65-11.46]), having contact history with measles viruses infection cases AOR: 3.96 (1.27 -12.33) and presence of other measles infected person in the some living house AOR: 5.2 (1.17- 22.98) (Table:8)

Table 8: Multivariate analysis of independent risk factors associated with contracting measles in Robe town, Oromia region, Ethiopia, in 2019

| Variables | Case n=45(%) | Control n=90 (%) | COR (CI - 95%) | AOR (CI- 95%) | P-value |
|--|-----------------|---------------------|--------------------|-------------------|---------|
| Age | | | | | |
| <5 Years | 27 (60) | 29 (32) | 3.15 (1.6 - 6.6) | 3.9 (1.4 -10.8) | 0.008 |
| >=5 Years | 18 (40) | 61 (68) | 1 | 1 | |
| Family size | | | | | |
| Less than five | 17 (38) | 51 (57) | 1 | 1 | |
| Greater than or equal to five | 28 (62) | 39 (43) | 2.15 (1.03 - 4.48) | 1.8 (0.71 -4.78) | 0.2 |
| Vaccination status | | | | | |
| No | 33 (73) | 31 (34) | 1 | 1 | |
| Yes | 12 (27) | 59 (66) | 5 (2.37- 11.54) | 4 (6.65-11.46) | 0.003 |
| Knowledge on measles transmission | | | | | |
| No | 30 (67) | 41 (46) | 1 | 1 | |
| Yes | 15 (33) | 49 (54) | 0.42 (0.19- 0.88) | 0.4 (0.15 -1.07) | 0.068 |

| | | | | | |
|--|---------|---------|-------------------|-------------------|-------|
| knowledge about vaccine availability | | | | | |
| No | 27 (60) | 33 (37) | 2.6 (1.24 - 5.44) | 2.9 (1.1- 7.6) | 0.03 |
| Yes | 18 (40) | 57 (63) | 1 | 1 | |
| Travel history to active measles case | | | | | |
| No | 34 (76) | 81 (90) | 1 | 1 | |
| Yes | 11 (24) | 9 (10) | 2.9 (1.01 -7.66) | 0.6 (0.13 - 2.76) | 0.51 |
| Contact history with measles patient | | | | | |
| No | 24 (53) | 74 (82) | 1 | 1 | |
| Yes | 21 (47) | 16 (18) | 4 (1.82 -8.87) | 3.9 (1.27 -12.33) | 0.018 |
| Presence of sick person in the house | | | | | |
| No | 29 (64) | 83 (92) | 1 | 1 | |
| Yes | 16 (36) | 7 (8) | 6.5 (2.45 -17.49) | 5.2 (1.18 -22.98) | 0.029 |

1.1.3.1.4 Interventions taken to contain the measles outbreak

The investigation teams describe the measles outbreak. Support the health workers on active case search; give orientations for private clinics and community leaders and assist those fill line list how to fill the line list, those health workers in Robe general hospitals. Cases were treated to prevent further spread; and to reduce morbidity and mortality attributed due to measles infection. Active case search and surveillance system was strengthened and followed on daily bases evaluation. Health education and social mobilization was done at public gathering (religion places, schools, market places) for the community members to prevent the measles virus's transmission. Robe town administration, health center and hospital would be well communicated and coordinated to tackle the outbreak through mobilizing adjacent Bale zone and neighboring districts to prevent the outbreak from spreading to these areas and alarming the neighbors health workers and health extensions workers, as well as, community leaders to strength adjoining surveillance systems. In addition, to overcome the outbreak mass immunization campaigns were planned for the targeted children from 6 months to 15 years.

1.1.4 Discussion

Since from February 15, to March 22, 2019, a total of 44 measles cases and 1 death of measles confirmed and epidemiologically linked to confirmed cases were reported from Robe town to Oromia regional health bureau public health emergency management and health research directorate.

All most all measles cases presented with clinically by complaining with rash and fever, since from the measles cases known to be suspect depending on the case definition of measles cases, appropriate diagnosis and treatment were done in Robe general hospital by those taken orientations about measles case treatment, prevention and control .

Those have immunodeficiency, malnutrition and faced to dalliance of medical managements exposed to high risk for measles disease, in this situations case fatality rate was high in infants less than one-year age. The expected case fatality rate in Ethiopia was 3%-6% and for developing or Africa country 3-5%, in our study we calculate the case fatality rate 2.2% which, was less than the expected case fatality rate in Ethiopian and Sub-Saharan Africa (1–3). In other way it was similar with the case fatality rate of outbreak investigations conducted in Artuma Fursi district, Oromia zone, Amhara region, Ethiopia, which the cases fatality rate was 2.6% (17).

The mean ages of affected measles were 6 with 6.5 standard deviations and with over all attack rate of 62/100,000 population and males had high attack rate than females. The overall attack rate of this investigation shown that, lower attack rate than the attack rate of measles outbreak investigation conducted in Guji zone 81/100,000 and greater than the study conducted in Kabridehar town of Ethiopia Somali regional state 4/100,000 (15,20). High attack rate would be seen in less than one year of age group (AR 147/100,000 population). The result was similar to measles investigation performed in Guji zone and dissimilar with the outbreak investigation conducted in Kabrider district in which, highly affected age group were among 5-14 years (20). Measles outbreak occur in area were low immunization coverage of measles. In Robe town we observed that, three- fourth of the measles affected cases had not received measles vaccination. This finding was similar in the investigation done in Bale zone Ginir district (79%) and Guji zone(70%) affected children by measles infection were unvaccinated (14,15,20).

High vaccination coverage was the main protection of measles outbreak. In the last three years, consecutively vaccination coverage of Robe town was less than 90% which was less than national and WHO targets (12,21). This shown that, low vaccination coverage of measles occur in low

community awareness about availability of measles vaccine, community health education about benefit of vaccine and poor community mobilization as a result it contributes for the occurrence of measles outbreak (22).

Robe town administration has three kebeles and in this outbreak, all kebeles were affected. Active case search and contact tracing were done in all kebeles special in robe-03 kebele addition team from health center and health office deployed for active cases search and contact tracing because more cases found in 03- kebele and in this kebele the index cases that returns from Dinsho district also found due to her permanent residence where this area, this may be contribute the measles infection transmission started before the community aware about the outbreak to prevent them self from the measles infection by protection mechanisms.

Our study showed that presence of ill person in the some living house was contributed factors for the outbreak. Similarly, measles outbreak case-control study conducted by Field Epidemiology resident in Guji zone Liben district was revealed that, presence of measles case in the house or in neighbor indicate that, twenty eight times increases risk of contracting measles infection(21).

In this case-control study, the associated risk factor was being less than five years, which the odd of being less than five years were four fold higher than when compare to these greater than or equal to five years. This finding was similar to the case-control study conducted in Ginir district of Bale zone which less than nine months were more affected than others (15). Those individual who had contact with measles case patient was four times more likely to have measles when compared to those who had no contact history. This finding was supported by the outbreak investigation finding of case control study conducted in Kabridehar town of Somali region of Ethiopia and Ginir district of Bale zone Oromia region (15,24). This was may be the nature of measles transmission which is by respiratory droplets or by direct or indirect contact with nasal and throat secretions of infected persons and the secondary attack rate of measles is above 90% in the presence of susceptible individuals (1,5,12).

Being vaccinated against measles vaccine is protective factor. This finding is in line with the finding of case control study conducted in Kabridehar town and Kabridehar district of Somali regional state, Ethiopia (19,24),and in addition the study conducted in Ginir district of Bale zone shown that, being unvaccinated against measles is significantly associated with measles infection (15). Limited knowledge on vaccine preventability of measles infection was risk factors. Those

mothers not had knowledge on vaccine preventability of measles infection were three times increases to contracting measles infection when compared to theses have knowledge.

1.1.5 Limitation

- Lack of immunization cards for identification of exact date of vaccination and their vaccination status.
- A selected control may be become cases
- Recall bias on date of onset of sign and symptoms

1.1.6 Conclusion

We confirmed the presence of measles outbreak in Robe town of Oromia region. All cases treated at outpatient and inpatient services in Robe general hospitals. Other than one death, all cases were recovered from their illness. In this outbreak, males and age less than five years children had high attack rate. There was low immunization coverage. As a result, this investigation suggested that the low measles vaccination coverage was a contributing factor for the occurrence of the outbreak. Being less than five years, having contact with case-patients and presence of measles case in the house or neighborhood were the associated risk factors, whereas being vaccinated for measles vaccine was protective.

1.1.7 Recommendation

The town should strengthen measles routine immunization activities for less than one year's of age to reach the target of 90% and regular monitoring of routine immunization coverage. Take action before the outbreak started and date of their routine vaccination schedule passed to sustained measles routine vaccination, as well as, increase the community awareness on measles vaccine availability and strengthens active surveillance. To overcome the present outbreak, mop-up mass vaccination campaign should be conducted and Region health bureau and Federal ministry of health focuses on to reach recommended measles vaccination target, increasing of measles first and second dose vaccine should be recommended in addition to follow up and supportive supervision.

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1.2 Descriptive epidemiology of cholera outbreak in West Arsi zone, Oromia Region, Ethiopia 2019

Abstract

Introduction: Cholera is a diarrheal infection caused by gram -negative bacteria *Vibrio cholerae*, either type O1 or O139. Globally in 2019, there were 923,037 cases and 1911 deaths of cholera with case fatality rate of 0.2 and in Africa 55,087 of cases and 872 deaths with (CFR of 1.6). Since the beginning of 2017 and as of 7 May, Ethiopia has reported 32,689 acute watery diarrhea cases and 776 deaths with CFR 2.4%. Cholera could affect both Males and Females and remains a challenge to countries where access to safe drinking water and adequate sanitation cannot be guaranteed. Cholera is usually transmitted through fecal contamination of water or food. We conducted cholera outbreak investigation, characterized cases by time, place, and persons and described the morbidity and mortality due cholera outbreak in West Arsi zone, Oromia region, Ethiopia, 2019.

Methods: Descriptive study was carried out among 167 cholera patients' line list from September 29 to November 30, 2019. We defined cases, selected study participants and conducted descriptive analysis. We analyzed data using Microsoft excel 2010, calculated and described frequency, percentage, mean and median, attack rate (AR) and cases fatality (CFR).

Results: A total of 164 cases and 3 deaths with CFR 1.8% were identified from the line list. Female were 94 (56.3%) and the median age for case was 12 years with range of (1.0-85.0). Highest proportions of cases 58 (34.7%) were within 5-14 age group and list affected 24 (14.4%) >44 age groups. Age specific case fatality rate was highest in > 44 years. Highest cases were reported from Shashamane 112(67%) district. The outbreak started from 15th August and lasted over 18th December, 2019. Of the total cases 122 (73%) were severely dehydrated.

Conclusion: Cholera outbreak with relatively increased overall attack and case fatality rate was conformed. Females affected more than males and the highest proportion of affected age group was above fifteen years of age. We recommend prevention of future outbreak and implementation of response measures to reduce morbidity and mortality and prospecting future strategies to prevent cholera outbreak in the zone.

Key word: Cholera outbreak, Descriptive epidemiology, West Arsi, Oromia

1.2.1 Introduction

1.2.1.1 Back ground

Cholera is a diarrheal bacterial infection caused by gram -negative *Vibrio cholerae*, by either type O1 or O139 (1). Globally during the year 2019, a total of 55 countries reported 923,037 cases of cholera and 1911 deaths due to cholera with case fatality rate (CFR of 0.2) and in Africa from 16 countries a total of 55,087 cholera cases and 872 deaths with (CFR of 1.6) was reported (2).

Cholera could affect both sex and remains a serious challenge to countries where there is limited access to safe drinking water and there is inadequate sanitation (1). Cholera is typically transmitted through fecal contamination of water sources or food items and is a risk of infection in many countries. The risk of cholera transmission is higher among communities with increased population, poor socio economic status, insufficient water supply; poor sanitation and hygiene practices; and refugee settings/ internally displaced persons (IDP) camps and urban slum populations are highly vulnerable (1).

In Ethiopia previous studies conducted in Amhara region Raya kobo district, Oromia region (Guji, Bale and East Shewa East Wollega zones) identified that, cholera outbreak was occurred in area where the community use unsafe and open-source water for drinking, open defecation practices and low latrine coverage, In addition lack of knowledge on means of cholera transmission and contact of patient with diarrhea and vomiting in the house were significantly associated with risk for cholera outbreak (3,4).

In Ethiopia generally the main identified risk factor of cholera is contaminated water sources and low sanitation coverage that implies the national sanitation coverage in Ethiopia is 57 % which translates to more than 45 million people without access to improved sanitation facilities (5).

The incubation period of cholera is very short 2 hours to 5 days and regarding symptom of patients about 20% of infected develop acute watery diarrhea with vomiting. If cholera patients are not timely and adequately treated, the loss of large amounts of fluid and salts (> 10-20 liters/day) can lead to severe dehydration and death within an hour's. The case-fatality rate of cholera in untreated may reach 30–50% and if treated appropriately with rehydration the case-fatality rate is below 1% (1).

The Global Task Force on cholera control has established a new global strategy for cholera control at the country level and provides a concrete path toward a world and set a goal to achieve ending Cholera at 2030. By implementing the strategy between now and 2030, the global task force on cholera control (GTFCC) partners will support countries to reduce cholera death by 90 % (6).

Since the beginning of 2017 and as of 7 May, Ethiopia has reported 32,689 acute watery diarrhea cases and 776 deaths with CFR was 2.4%. The Ethiopian Somali Regional State is the region most affected, with 91% of the reported cases and 99% of the reported deaths (7). According to WHO Weekly Bulletin on Outbreaks and other Emergencies issued on 7 July 2019, from 25 April to 23 June 2019, 688 cholera cases of which 23 were laboratory confirmed and 15 deaths with case fatality rate of 2.3% were reported from five regions in Ethiopia, including Addis Ababa city administration.

In 2016, 5,232 cases of acute watery diarrhea and 59 deaths with 1.13 CFR reported from 13 zone and 10 towns of Oromia regional states to Oromia regional health bureau. Then in 2017, 3,433 cases of AWD and 21 deaths with 0.61 CFR reported namely, by North Shewa, Bale, East Hararghe, West Hararghe and West Arsi zones of Oromia Region (8). As well as, in West Arsi Zone of Oromia regional states there were a continues attack with cholera outbreak in 2016 and 2017 which is 255 cases and 4 death with CFR 1.6 and 79 cases and 1 deaths with CFR 1.27 respectively, at Shalla, Wonde, Dodola, Arsi Negelle, Adaba, Siraro and Shashemenne districts (8).

There were increase in report of acute watery diarrhea and culture confirmed cholera cases in 2019, from different zones of Oromia regional states namely, East Hararghe, West Hararghe, Oromia special zone surrounding Finfinne, Guji, Shashemenne town and West Arsi zone (8). Accordingly among 17 districts of West Arsi zone, Shashemenne rural, Arsi Negelle, Heben Arsi, Wando and Shalla districts were affected by cholera outbreak during 2019 (9).

Following requests from West Asri zone public health emergency management (PHEM) process owners to support cholera outbreak response. A malty disciplinary team composed of epidemiologist, clinicians, laboratory and environmental health personnel's deployed to the affected areas on September 29, 2019. This study was intended to describe the distribution of morbidity, mortality and symptom of cholera outbreak and to implement its control measures.

Significance of the study

Cholera is one of the immediately reportable diseases which included into the routine surveillance at national and international levels because of its significant public health importance since recognized by International Health Regulation (IHR 2005). All suspected cases of cholera must be reported immediately to the next level of concerned public health emergence management office (PHEM) department. Cholera epidemic threshold is occurred whenever a single strain of vibrio cholerae has been isolated. Even though, there was cholera outbreak in Ethiopia including Oromia region for the last six months, no cholera case was reported from Shashamane district, West Arsi zone in the previous last six months. Suspected cholera case was reported from Toga kebele of Shashamane district, West Arsi zone during August 2019. Following the request from West Arsi zone public health emergency management (PHEM) process owners to support cholera outbreak response the multidisciplinary team were deployed in to West Arsi zone. The aim of this study was intended to describe the distribution of morbidity and mortality cholera outbreak and to implement its control measures.

1.2.2 Objective

1.2.2.1 General objective

To describe the distribution, morbidity and mortality of cholera outbreak and control measures implemented in West Arsi zone, Oromia regional state, Ethiopia, 2019

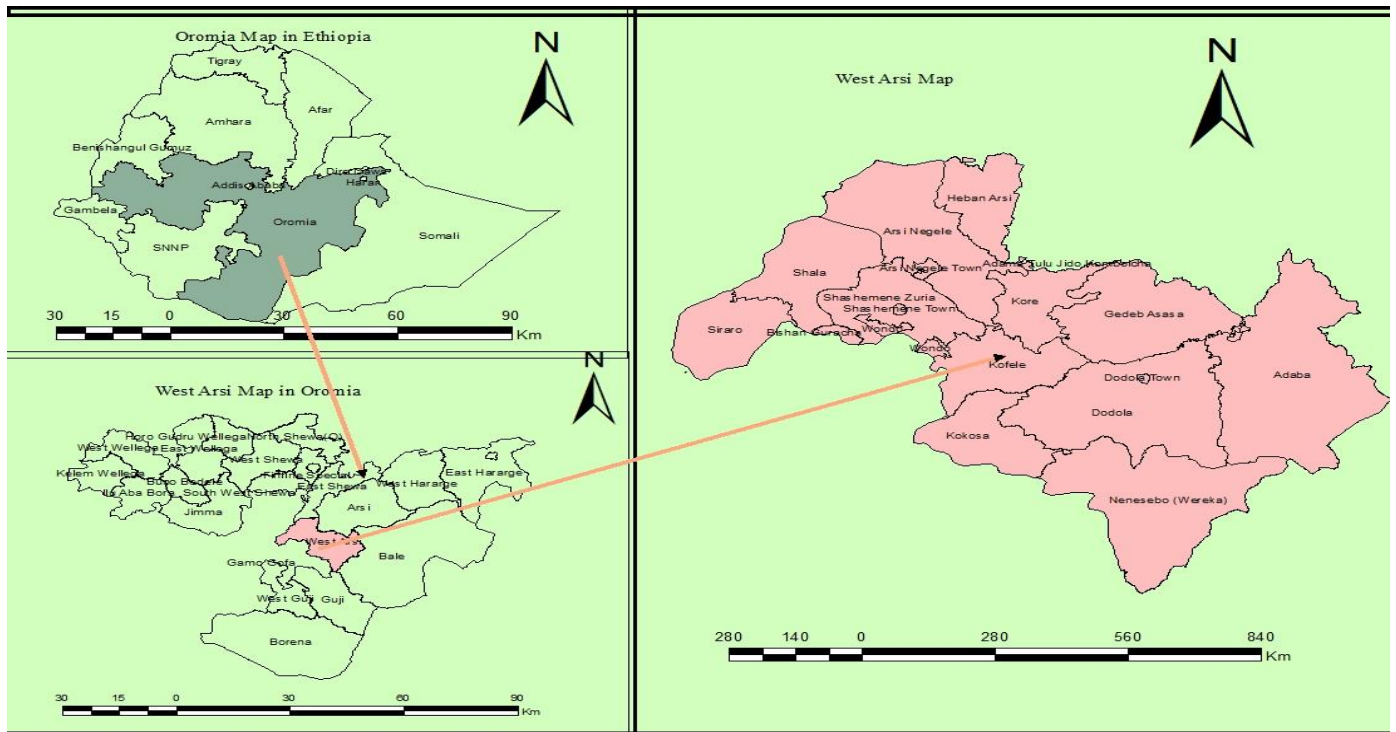
1.2.2.2 Specific objective

- ❖ To describe the morbidity, mortality and symptom of cholera outbreak in West Arsi zone, Oromia region, Ethiopia, in 2019
- ❖ To describe the outbreak by person, place and time in West Arsi zone, Oromia region, Ethiopia, in 2019
- ❖ To describe outbreak control measures and challenges in West Arsi zone, Oromia region, Ethiopia, in 2019

1.2.3 Method and materials

1.2.3.1 Study Area

West Arsi is one of the twenty zones of Oromia regional state. It is located in rift valley region. Shashamane Town is the administrative center of the zone it located at 250 km from Addis Ababa. The Astronomical location of West Arsi zone lies between 6012'29" to 7042'55" latitude and 38004'04" to 39046'08" longitude and has three has three geographical climatic zones, highland “Dega” >2500m altitude accounts for 45.5%, Mid-land “Weyinadega”(2000-2500m) altitude constitutes 39.6% and low land “Kola” <2000m accounts for the remaining 14.9% with mean annual rainfall between 800 mm and 1400mm and average annual temperature in the zone varies between 15 and 20. West Arsi Zone bordered with East Shewa to the north, SNNPRS to the west and south, Arsi to the northeast, Guji to the South East and Bale zones to the east. Most parts of the zone have elevation of ranging from 1500 to over 3300m and the total area of zone is 12556 km². According to national population census of 2007, in 2019 the total population of the zone is 2,691,913 of which male is 1,319,037(49%) and female is 1,372,876(51%). There re functional 4 hospitals and 84 health centers in the zone. West Arsi zone has 15 districts and 2 urban administrative.



Map 2: Showing study area, West Arsi zone Oromia region, Ethiopia, in 2019

1.2.3.2 Study design and Period

Descriptive study design was conducted from September 29 to November 30, 2019

1.2.3.3 Study participant procedures

A total of 167 study participant's cases which consisted to 164 diseased cases and 3 deaths in the registered in the line list were included in the study. All cases with incomplete information and those travelled from other district and not part of the zonal administrative were excluded from the analysis.

1.2.3.4 Data collection tools and procedure

Secondary surveillance data were reviewed and line list was used to collect and describe cases and deaths. The line list includes socio demographic variables such as, age, sex, and address of patients, admission status, date of onset and date seen at health facilities. In addition, clinical and laboratory information, such as symptoms, medications used, specimen collection, outcome status of cases was included.

1.2.3.5 Data quality control and analysis

Specific checks were made categorization of variables; these include matching date formats or change it into Gregorian calendar. Incomplete data on the line list were identified and excluded from the analysis. Using a line list, we calculated frequencies, proportions, attack rates and age specific attack rates and analyzed data in time, place and person by using Microsoft Excel 2010. The study was approved by Oromia Regional health bureau, public health emergency management directorate.

Case definition

We use Ethiopian cholera management guideline 2nd edition, 2016

Suspected case: a cholera case was defined a patient aged 5 years or more develops severe dehydration or dies from acute watery diarrhea in West Arsi zone residents from 15 August 2019 November 2019 (1).

Probable case: a clinically compatible case that is epidemiologically linked to a confirmed case (1)

A confirmed case: a suspected case in which *Vibrio cholerae* O1 or O139 has been isolated from their stool (1)

1.2.3.6 Laboratory Results

Cholera Rapid Diagnostic Test (RDT) was performed for the five initial cases recorded at the Bulchana cholera treatment center (CTC and all of them were positive for *Vibrio cholerae* O1 antigen). Then, stool sample were taken from two RDT confirmed cases and sent to Hawassa Regional Laboratory for culture confirmation. On August 18th, 2019 the laboratory results were reported as confirmed Cholera for *vibrio cholerae* sero-type O1 for both cases. Sample of water in all five district from nine public stand pipe and storage container were tested six of them bacteriologically positive for *E. coli*.

1.2.3.7 Data dissemination

We prepared written report of soft and hard copies and shared to Addis Ababa University, School of Public Health, Oromia Regional Health Bureau, West Arsi zone health department.

1.2.4 Results

1.2.5 Mortality, Morbidity and Symptoms

The cholera outbreaks were reported from Shashamane district in West Arsi zone. The causative agent for this outbreak was conformed to be cholera serotype O1. The first case was a six years old child who developed sudden onset of acute watery diarrhea and vomiting two days after her mother had travel history to cholera affected district. The case was registered on the 15th of August, 2019 with onset of diarrhea on 13th August, 2019 and diagnosed at Togo health center in Shashamane district. Another male child of 10 years old from the first case household presented with similar sign and symptoms and admitted to cholera treatment center (CTC) on the 16th August, 2019. A total of 164 cases with overall 1.9 attack rate per 10,000 populations and 3 deaths case fatality rates (CFR 1.8%) were recorded in respective order during the 2019 cholera outbreak in West Arsi zone Oromia regional states, Ethiopia.

The reviewed clinical information on the line list indicate that 45 (27%) of cases had sign of some dehydration eye sunken, dry mouth and tongue, restless, pulse rapid and weak, drinks eagerly, skin pinch goes back slowly and 122 (73%) had sign of severe dehydration in addition to signs and symptoms of some dehydration, there were sunken eye, dry mouth and tongue. sever dehydrated cases were treated with ORS, IV ringer- lactate fluid and antibiotics according to their indication and some dehydrated cases were treated with only ORS.

1.2.6 Description of Cases by Person, Place and Time

1.2.6.1 Description by person

A total of 164 cases with 1.9 attack rates per 10,000 population and 3 deaths CFR 1.8% were recorded during the 2019 cholera outbreak in West Arsi zone. There were 94/167 (56.3%) female and 73/167 (43.7%) male cases. The median age for cases was 12years, with an age [range: 1.0-85.0 years old]. The highest proportions for total cases 58/167 (34.7%) of cases were within 5-14 years age group, followed by 15-44 years age group 50/167 (29.9). In Female the highest proportions was seen 32/167 (34%) within 5-14 year age groups and followed by 15-44 year age groups 30/167 (31.9%). Whereas the least proportion affected age groups were 24/167 (14.4%) those greater than 44 years old. The Age and sex Specific Case Fatality Rate (ASCFR) was identified. Accordingly, Age Specific Case Fatality Rate (ASCFR) of under five years (2.9%), 5-14 years of age group (1.7 %) and greater than forty four age group (9.1%) and Sex Specific Case Fatality Rate (2.1%) in Female and (1.4%) in Male.

Table 9 : Distribution of cholera cases by age groups and Age specific deaths in West Arsi zone, Oromia region, Ethiopia 2019

| Age group | Male | | Female | | Total | |
|-----------|------|-------|--------|-------|-------|-------|
| | case | % | case | % | case | % |
| under 5 | 16 | 22.2 | 18 | 19.4 | 35 | 21.0 |
| 5 to 14 | 28 | 38.9 | 29 | 31.2 | 58 | 34.7 |
| 15 to 44 | 18 | 25 | 32 | 34.4 | 50 | 29.9 |
| > 44 | 10 | 13.9 | 13 | 14.0 | 24 | 14.4 |
| Sub-total | 71 | 100.0 | 93 | 100.0 | 164 | 100.0 |

| Age group | Male | | Female | | Total | |
|-----------|-------|-------|--------|-------|-------|-------|
| | Death | ASCFR | Death | ASCFR | Death | ASCFR |
| under 5 | 0 | 0 | 1 | 5.3 | 1 | 2.9 |
| 5 to 14 | 0 | 0 | 1 | 3.3 | 1 | 1.7 |
| 15 to 44 | 0 | 0 | 0 | 0 | 0 | 0 |
| > 44 | 1 | 9.1 | 0 | 0 | 0 | 0 |

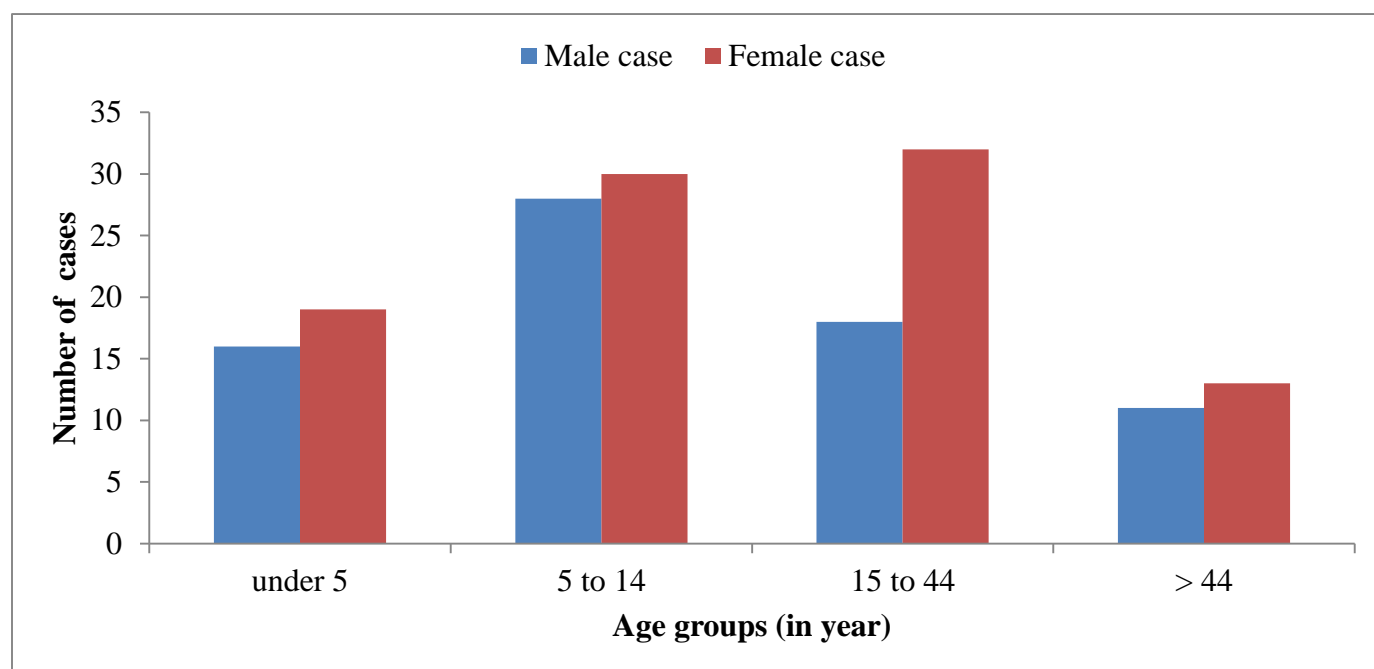


Figure 3 : Distribution of cholera cases by sex and age groups of West Arsi zone, Oromia Region, Ethiopia 2019

1.2.6.2 Description by Place

Out of the total districts exists in west Arsi zone, cholera outbreak being notified by five districts namely, Shashamane, Shalla, Heben Arsi, Wando and Arsi Negelle district. Of those districts the highest cases were reported from Shashamane that contribute 112/167 (67%) followed by Shalla district, which accounts 51/167(30.5%).

Table 10: Cholera Attack rates and Case-fatality rates stratified by district of West Arsi Zone, Oromia Region, Ethiopia 2019

| Districts | Case | Death | Projected population in 2019 | Attack rate/10,000 population | Case fatality rate (%) |
|------------------|------|-------|---------------------------------|----------------------------------|---------------------------|
| Shashamane rural | 110 | 2 | 272342 | 4.1 | 1.8 |
| Shalla | 50 | 1 | 207228 | 2.5 | 2.0 |
| Heben Arsi | 2 | 0 | 75601 | 0.3 | 0.0 |
| Arsi Negelle | 1 | 0 | 210335 | 0.0 | 0.0 |
| Wando | 1 | 0 | 118314 | 0.1 | 0.0 |
| Sub-total | 164 | 3 | 883820 | 1.9 | 1.8 |

1.2.6.3 Description by Time

The outbreak started on August 13, 2019 and ended on December 18, 2019. The outbreak last for seventeen WHO weeks or five months. The epidemic pattern shown that continues common source and person to person transmission outbreak, with the epidemic curve and have two distinct peaks. The first peak was in September 18th day 7 cases. These cases were reported 6 cases from Shashamane and 1 from Wando districts. The second peak was in November 8th day 11 cases. Of these 10 reported from Shashamane and 1 from Shalla districts.

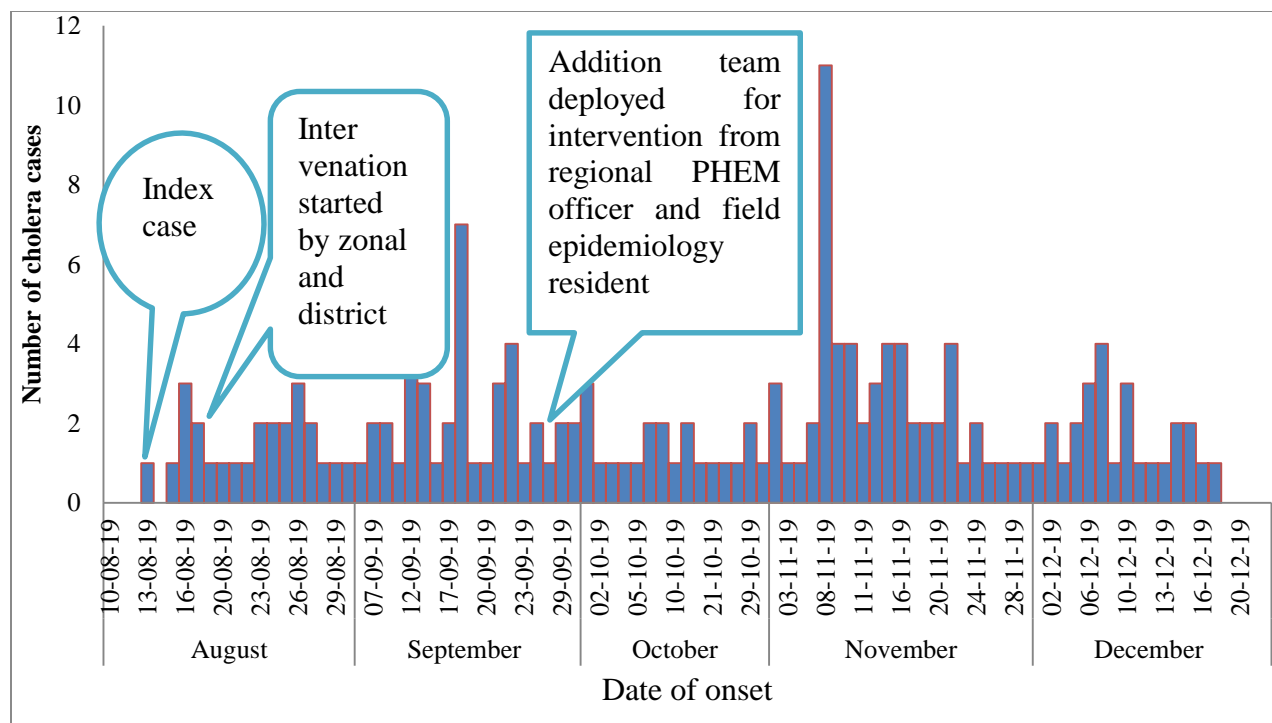


Figure 4: Epidemic curve of the cholera cases and deaths of West Arsi Zone, Oromia Region, Ethiopia, in 2019

1.2.7 Outbreak Response Measures and Challenges

1.2.7.1 Outbreak Response Measures

We activated district outbreak rapid response team and established coordination team composed of case management, water sanitation and hygiene (WASH), social mobilization, surveillance, logistics and monitoring and evaluation (M&E) as per the cholera outbreak response guide. We conducted active case search at health facility and community, followed and disinfected infectious sources. We implemented personal hygiene and sanitation measures, such as, construction of latrine, awareness creation on latrine utilization, water sources inspection and disinfection, chemicals distribution for households and treatment centers. We used car with van at public gathering (religion places, schools, market places), distributed learning materials (cholera leaflets and posters) and used local FM media to disseminate key cholera prevention and control messages.

1.2.7.2 Challenges Encountered

The zonal and district epidemic preparedness plan was not updated with the involvement of sectors and stockholders. There was not sufficient evidence with regard to latrine coverage, latrine utilization and drinking water source and coverage; there was shortage of water treatment chemicals.

1.2.8 Discussion

The overall attack rate of current cholera outbreak was 1.9/10,000 population. Our finding is greater than the attack rate of cholera outbreak 1.6/10,000 in 2017 of this zone and the study done in Oromia Regional State, 2010 of 3 zone of Bale, Guji, East Shewa zone (4, 8). The difference may be at the time the cholera cases not reported as cholera rather than acute watery diarrhea at that time, because of that all cases may be not reported since the country not declared cholera outbreak, on the other side the current cholera outbreak attack rate was smaller than the attack rate of cholera outbreak determined by Gerald Pande, Alex Rioplexus Ario and Joseph K. B. Matovu, in 2018 at Western Uganda with attack rate (2.6%). This difference may be due to the cholera outbreaks were occurring simultaneously in Democratic Republic of Congo on both sides of the border were unwell coordination of prevention mechanisms (13).

The case fatality rate of cholera outbreak in current study was 1.8%. This is higher than what WHO recommends. World Health Organization recommended that CFR due to cholera should not be more than 1% (1). The case fatality rate was more than WHO acceptable rate this type of high case fatality rate a lot of time described by poor quality of case management. Also our finding was greater than the finding of outbreak investigation conducted in Yemen, 2016 that revealed the CFR of (0.07%) (14). This difference might be due to under report in Yemen due to the emergence of the armed conflict in March 2015 in Yemen. Similarly the case fatality rate is less than the cases fatality rate recorded in Brong Ahafo Region, Ghana, 2017 that reported as CFR due to cholera outbreak was 2.4% (10).

The current cholera outbreak showed that, more females were affected than male this finding was consistence with the finding of outbreak investigation conducted in Kaduna state, Northwest Nigeria, 2014 which revealed that, female were predominantly affected by cholera outbreak (15). But our finding is contradicting with the outbreak investigation conducted in Raya Kobbu district, Amhara region, Ethiopia, 2017 which indicated that, majority 6 (60%) of cholera cases were male (3). This difference might be due to that, the sample size of Raya kobo district was small, that means, the total sample under this study was 10 whereas the sample size of our study was 167 their sample size was very small when compare to our sample size. However, our finding is inconsistence with the finding of the study conducted in Brong Ahafo Region, Ghana, 2017 that reported as male were affected more (53.4%) by cholera outbreak (10). This deviation might be

due to, the life style difference between two country like place of getting eating and drinking establishment, especially for those who used out of their home and also it depends on the sanitation of food and drink handlers.

The current cholera outbreak investigation provided that, 44.3% out of total cases were recorded in age group of ≥ 15 years old. This finding is line with the study conducted in Republic of Congo that showed age ≥ 15 account the highest number of cases (11). Also our finding is agreed with the study finding conducted in Raya Kobbo district, Amhara Region that the greater affected age group was 21-25 years old (3). This age group is more vulnerable to be exposed to food and drink sold at market place, vendors and other public place where a level of food hygiene cannot be well handled by food and drink handlers.

In the last three years there were repeated cholera outbreaks in West Arsi zone, this may be due to low latrine coverage & utilization, and shortage of clean water coverage's. In this year cholera outbreak attacks five districts, of these the highest attacked districts were Shashamane followed by Shalla district.

The current cholera outbreak in West Arsi zone was occurred in the mid of August 2019. The causative agent for this outbreak was cholera serotype O1. This finding is line with finding of outbreak investigation conducted in Ghana by Charles Lwanga Noora in 2014, that was with cholera outbreak was occurred summer season 30th July, 2014 by cholera sero type O1(10). Again our finding is similar with the finding of the study conducted in Kasa'i Oriental province at Diulu HZ (Mbuji-Mayi City) in Democratic Republic of Congo, Cholera outbreak was occurred during month of February to December and caused by cholera sero type of O1(11). Similarly Cholera outbreak investigation conducted in Raya Kobbo, Amhara Region, Ethiopia shown that, cholera outbreak was occurred during (16th - 22nd August 2016) with cholera causative agent of Sero type O1(3). American Microbiologist in 1995 James B. Kaper and etal clearly stated that, V. cholerae sero type O1 can produces Cholera toxin that has long been associated with epidemic following rainy season (12). This finding implies that, cholera endemic and epidemic area was susceptible to suffer with the outbreak during rainy season.

1.2.9 Limitation

There may be potential inclusion of false positive cholera cases this means the case may be not meet the cholera case definition like under five was included this was due to as line list was filled

by different health workers at different cholera treatment centers of lower level and all community death may be not reported this also lowers the case facility rate of cholera outbreak.

1.2.10 Conclusion

We confirmed cholera outbreak with overall high attack and case fatality rate. The causative agent for this outbreak was cholera serotype O1. Females affected more than males. The highest proportion of affected age group was above fifteen years of age and highest attacked district was Shashamane followed by Shalla districts, as well as, insubstantial evidence with regard to latrine and drinking water coverage in the zone.

1.2.11 Recommendation

In West Arsi zone for consecutive three years, there were repeatedly cholera outbreak. Because of this, a plan should be needed for prevention of future outbreak, as well as, for the existed cholera outbreak to reduce morbidity and mortality different response measures implemented. Conduct follow up studies to understand the risk factors, and identifying latrine and water coverage and utilization and prospecting future strategies to prevent cholera outbreak in the zone. Zonal and district epidemic preparedness plan would be updated regularly to contain for any epidemic and emergence management. For the current epidemic regional and zonal health office with concerned stack holders and non-governmental organization must avail the water treatment chemicals.

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Chapter two: Surveillance data analysis

2. East Shewa zone five years retrospective malaria data analysis, Oromia region, Ethiopia, in 2019

Abstracts

Introduction: Malaria is a life threatening disease caused by parasites of the Plasmodium family and transmitted by the bite of female Anopheles mosquitoes. According to World Health Organization report of 2018, a total of 219 million malaria cases and 435,000 malaria deaths reported globally and 92 % of deaths occur in World Health Organization of Africa Region and 61% deaths were children under five years globally. Malaria data analysis was important to observe trends and distribution of the disease that help to design and focused to improve the future intervention and control strategies against the disease.

Methods: A retrospective descriptive secondary data of Malaria cases and deaths in the last five years from 2014-2018 were analyzed by reviewing East Shewa zone health office data from March 18-28/2019. We analyzed to describe descriptive epidemiology of malaria transmission and to identify the positivity rate and species of the malaria parasite. Incidence rate/1000 and death rate/100,000 populations at risk were calculated using the total population at risk of each year.

Results: We identified the average five years of malaria cases of East Shewa zone were 30,275 and the incidence rate of confirmed malaria cases were decreases from 43/1000 population to 9 /1000 population in 2014 to 2018 respectively. Highest malaria cases were reported from Adama districts followed by Fentale 23% and 21.6% respectively and high incidence rate recorded in less than five years of age groups (mean incidence =28/1000) and in males. Plasmodium falciparum are dominant species which were 57% and the positivity rate decreased by 76% through five years from 2014 to 2018. Average report completeness rate of the zone was 76% and IRS and LLINs used to prevent and control malaria transmissions in the zone.

Conclusion: Male and less than five years age groups are more affected and the highest number of case reported from Adama and Fentale districts and the positivity rate decrease and plasmodium falciparum was dominant species. East Shewa zone health office gives priority for Fentale, Matahara and Adama to allocate malaria commodity and strengthen routine surveillance for early identification of risk population and prevention activities.

Key: Trend, surveillance data, Analysis, Malaria, East Shewa, Oromia, Ethiopia

2.1 Introduction

2.1.1 Background

Malaria is a life threatening disease caused by parasites of the Plasmodium family and transmitted by the bite of female Anopheles mosquitoes. The five main species of malaria infect humans are plasmodium falciparum (P.f), plasmodium vivax, plasmodium malarias, plasmodium ovale and plasmodium Knowlesi. Plasmodium falciparum is the most highly virulent species and responsible for the death of 1.7-2.5 million worldwide (1,2). Globally in 2018, there were a total of 219 million malaria cases and 435,000 malaria deaths reported from those 92 % of deaths occur in World Health Organization of Africa region and 61% deaths are children under five years.

Malaria was primarily prevented by malaria prevention and control strategies and in addition had treatment. Malaria was eliminated in almost from the western countries more than 50 years ago; now days, more than fifty percent of all estimated malaria cases occur in almost five African countries such as Nigeria, Democratic republic of Cong, Ethiopia, United republic of Tanzania and Kenya. Malaria mostly affects these not access to get prevention materials and rural community in which there were poor drainage and stagnant waters was present. Plasmodium falciparum and vivax were the two dominant parasite species causing malaria in Ethiopia. They are prevalent in all malaria endemic areas in the country with P. falciparum representing about 66 % (HMSI 2015) of a total reported malaria cases and relative frequency varies in time and space within a given geographical range. P.malariae and P. ovale were rare and account for <1% of all confirmed malaria cases and the left are P. Vavix. This distribution is varying from place to place and season to season (1,3,4) .

Malaria was one of the leading of public health problem in Ethiopia, where estimated 52 million people (68%) of the populations lives in malarious areas, which corresponding to the altitude below 2000 meters (m) to can also occasionally affects up to 2300 meters now day and three-fourth of the total land mass was considered as malarias (1). Its transmission mainly depends on altitude and rainfall with lag time varying from few weeks before the beginning of the rainy season to more than month after the end of the rainy season(1,4). It was serious disease and remains an important public health problem in many developing countries. Ethiopia was among developing country which, had seasonal and unstable transmission in high lands fringes and relatively longer duration in low land areas like river basins and valleys. Malaria epidemic exists over many weeks, which allows some lead-time to act proactively to avoid a number of illness and to prevent

transmission. Peak malaria transmissions occur between September and December in most parts of Ethiopia, after the main rainy season from June to August. In addition, some areas experience a second minor malaria transmission period from April to June, following a short rainy season from February to March. January and July typically represent low malaria transmission seasons in most communities. Since peak malaria transmission often coincides with the planting and harvesting season, it was public health important diseases in Ethiopia (1,5).

Malaria has been a major cause of both morbidity and mortality in Oromia regional state, and primarily occurs in epidemic forms from the months of September to December, peaking in October and November. Rainfall, temperature and humidity play a significant role in the transmission of malaria, and temperature is the most important factor in the highlands while rainfall and humidity determine its transmission in midland and lowland areas of the Region (2,5). Malaria is the major public health problem in East Sshewa zone, that was described by 91% of the districts were considered as malaria risk area. To describe the magnitude and trained of malaria transmission in this zone a five year malaria surveillance data analysis was designed to analyzed.

Rational of the study

Malaria is one of the public health problem and priority weekly reportable diseases under surveillance. According to the national strategic plan for malaria prevention, control and elimination goal, surveillance data analysis was the main strategy to know how to approach for malaria elimination, and eventually interrupting its transmission. Actual surveillance of malaria cases and deaths were essential for identifying which area and population groups are at risk of malaria to develop priority strategic prevention and control program. Therefore, analysis of malaria data is very important to see trends and distribution of the disease that help to design and focused to improve the future intervention and control strategies for the disease. Due to this study was designed to analyze the five-year from 2014-2018 East Shewa zone malaria descriptive epidemiology analysis was performed.

2.2 Objectives

General objective

To describes Malaria cases, deaths, positivity rate by species and its trends by person, time and place from 2014 -2018 in East Shewa zone, Oromia region, Ethiopia, 2019.

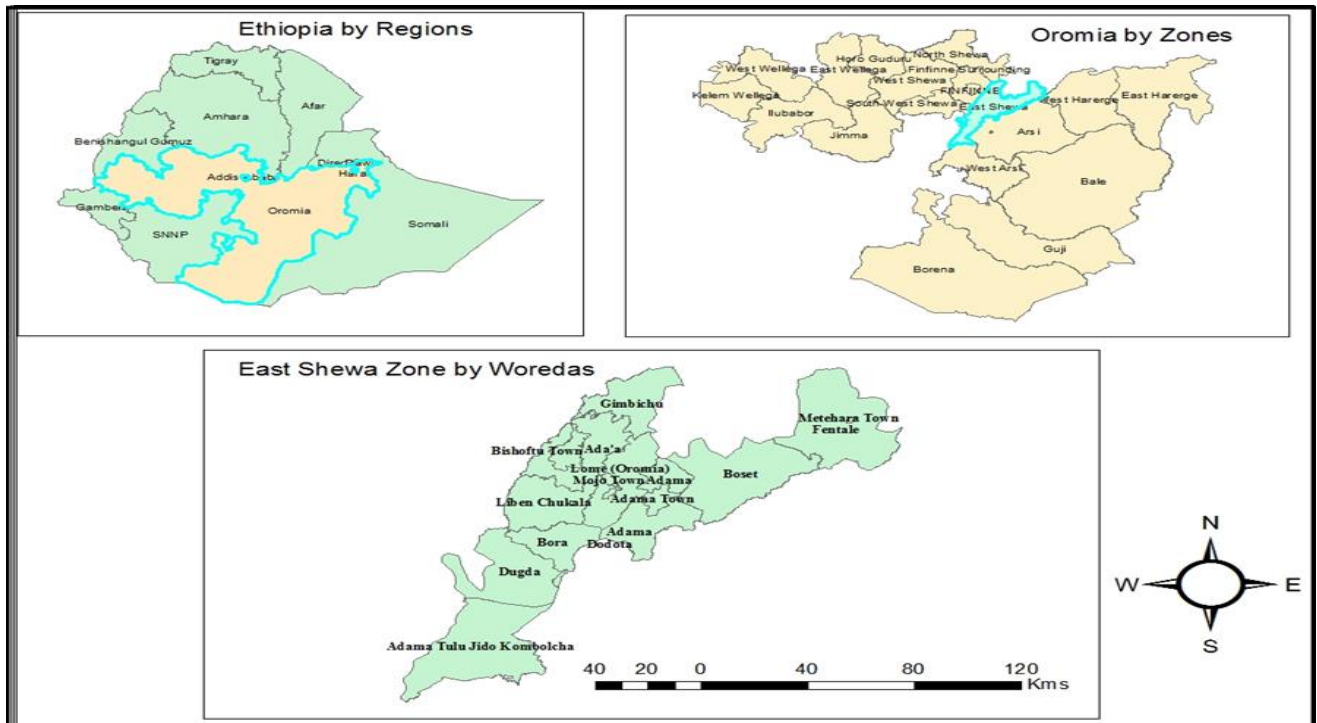
Specific objectives

- ❖ To assess the morbidity and mortality of malaria cases in East Shewa zone Oromia region, Ethiopia in 2019
- ❖ To describe malaria cases by place, time and person in East Shewa zone, Oromia region , Ethiopia in 2019
- ❖ To assess malaria positivity rate and distribution of malaria species in East Shewa zone, Oromia regional , Ethiopia, 2019

2.3 Method and materials

2.3.1 Study Area

Malaria surveillance data analysis was conducted in East shewa Zone. East Shewa zone was one of the twenty Zones in Oromia regional state situated in the Great Rift Valley between 9°N to 14° latitude and 40°E to 42°E longitudes far from Addis Ababa 100 Km to East. The Zone has low level topography with altitude ranging from 120 -2500m above sea levels. The zone has estimated area of 10, 232 km^2 and has three geographical climatic zones, highland “Dega” $>2500\text{m}$ altitude accounts for 5%, Mid-land “Weyinadega” (2000-2500m) altitude constitutes 25% and low land “Kola” $<2000\text{m}$ accounts for the remaining 70%. East Shewa zone bordered on the north by the Amhara Region, on North east by the Afar Region, on the south and south east by Arsi Zone, on the west by South west Shewa and Finfinnee Surrounding special zone, on the south by west Arsi Zone, on Southwest by the Southern Nations, Nationalities and people Region. The zone has 11 administrative Districts which one is structured Town administrative and has 327 rural and urban kebeles from these 91% (10/11) Districts and 88% (287/327) kebeles are malarias respectively. According to the population and housing census report of CSA 2007, the projected total population of the zone was 1,477,789 among this 90.17% of population living in malarias area in 2018.



Map 3: Shawn study area of East Shewa zone in Oromia Regional State of Ethiopia 2020

2.3.2 Study period

Secondary data of total malaria cases and deaths of five years from January 2014 to December 2018 East Shewa zone collected from February 10-28/2019

2.3.3 Study Design

Retrospective surveillance data analysis design was employed.

2.3.4 Source population

The source population was all peoples at risk of malaria in the zone.

2.3.5 Study population

Study population was any people that affected by malaria and obtain health care services within the zone.

2.3.6 Study unit

All individuals these suspected and confirmed case and deaths reported to zonal health department were the study unit.

2.3.7 Sample size

All malaria cases and deaths reported to East Shewa zonal health department during 2014-2018 years period.

2.3.8 Data collection tools and procedure

Dummy tables which have indicators used for malaria control and prevention strategy were developed, using malaria national guideline and WHO Malaria surveillance, monitoring and evaluation reference manual. Using softcopy of five years data base from 2014-2018 individual data like, total confirmed and clinically treated malaria cases in month and year's type of malaria species, total and malaria admissions and address of patients were collected from the data base. Also, age classification of cases and deaths less than five years and above or equal to five years identified from East Shewa zone communicable disease and control department.

2.3.9 Data quality management

The content completeness of all five years secondary data was checked for their , Age , sex, districts of the patient, type of malaria species which was not recorded were excluded from the analysis.

2.3.10 Data analysis and procedure

Microsoft excel 2010 version used to organize and analyze five years monthly collected malaria surveillance data from 2014-2018. The nominator was number of malaria cases from 2014-2018

and the denominator was demographic data of population at risk of malaria in each districts of East Shewa Zone. The incidence rates was calculated as malaria cases per 1000 population malaria mortality cases were calculated as malaria deaths per100,000 using at risk population of the districts and zones. Population at risk projected based on 2007 Ethiopian central static agency districts based projection of 2014 to 2017.

2.3.11 Inclusion and exclusion criteria

All clinical and confirmed malaria cases in addition to deaths from 2014-2018 reported data were included and incomplete data of cases and deaths were excluded

2.3.12 Case definition

We use national PHEM guide line case definition.

Suspected malaria cases: a patient who has fever or history of fever in the 48 hours and lives in malaria-endemic areas or has history of travel within the last 30 day to malaria-endemic areas (1).

Confirmed malaria case definition: Suspected malaria case confirmed by microscopy or RDT for plasmodium parasites

Population at risk: all population geographically living below 2300m above sea level at list for more than one year

2.3.13 Ethical consideration

Letter was written for East Shewa zonal health office from Oromia regional health bureau and first permission was obtained from zonal health office. Upon getting permission from zonal head, we communicate with communicable disease prevention and control department and finally accessed five year malaria data to carry out this analysis.

2.3.14 Data dissemination

The result of malaria surveillance data trend analysis was shared to East Shewa zone health office, Oromia regional health bureau research and public health emergency management directorates and Addis Ababa University School of Public Health Field Epidemiology Training Program.

2.4 Results

2.4.1 Description of malaria morbidity and mortality

During the last five years period from January 2014-December 2018 total clinical and confirmed malaria cases of secondary data of East Shewa zone has been collected and analyzed, the data includes totally eleven districts which containing ten districts and one town administrative borders. During the study periods about 151,368 confirmed and clinically treated malaria cases with mean annual malaria cases of 30,275 were reported. Of the total malaria, cases 149,401 malaria cases were confirmed with mean annual cases 29,881.2 while 1,967 cases were identified clinically and reported to East Shewa zonal health office. Over all through five years the total deaths were reported only in 2014 five malaria related deaths. The overall annual malaria incidence rates per 1000 populations were 43.5 in 2014 and decreased to 8.6 in 2018 and average incidence rate 24/1000 populations whereas the mortality rate per 100,000 populations in the zone were 0.42 in 2014 and become to zero through the rest of four years.

Table 11: Parasitological confirmed and clinically identified malaria cases in East Shewa zone, Oromia region, Ethiopia from 2014-2018

| Years | Total malaria cases (confirmed +Clinical) | Total confirmed malaria cases n (%) | Clinical malaria cases n (%) |
|-------|--|--|---------------------------------|
| 2014 | 52242 | 51496 (98.6) | 746 (1.4) |
| 2015 | 35304 | 34691 (98.3) | 613 (1.7) |
| 2016 | 31065 | 30590 (98.5) | 475 (1.5) |
| 2017 | 21340 | 21226 (99.5) | 475 (0.5) |
| 2018 | 11417 | 11398 (99.8) | 114 (0.2) |
| Total | 151368 | 149401(98.7) | 1967 (1.3) |

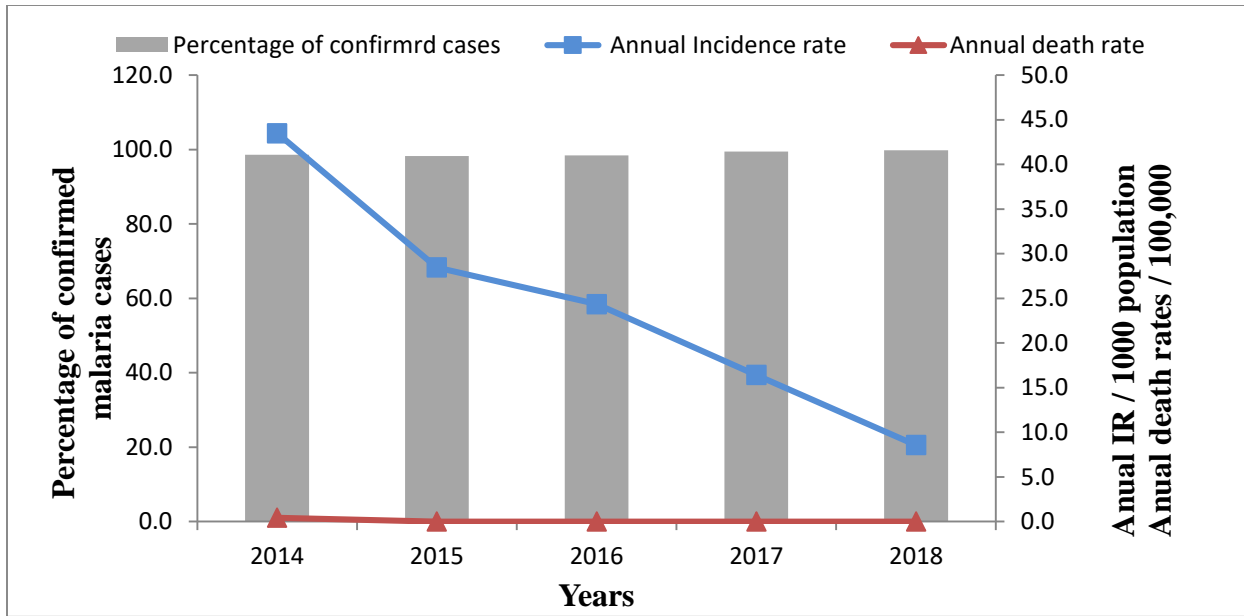


Figure 5: Annual total reported malaria cases, malaria-related deaths and proportion of confirmed cases in East Shewa zone, Oromia Region, Ethiopia, from 2014-2018

Five years from 2014-2018 East Shewa zone malaria data analysis shown the proportion of malaria inpatient cases were decreased whereas total inpatient cases increases.

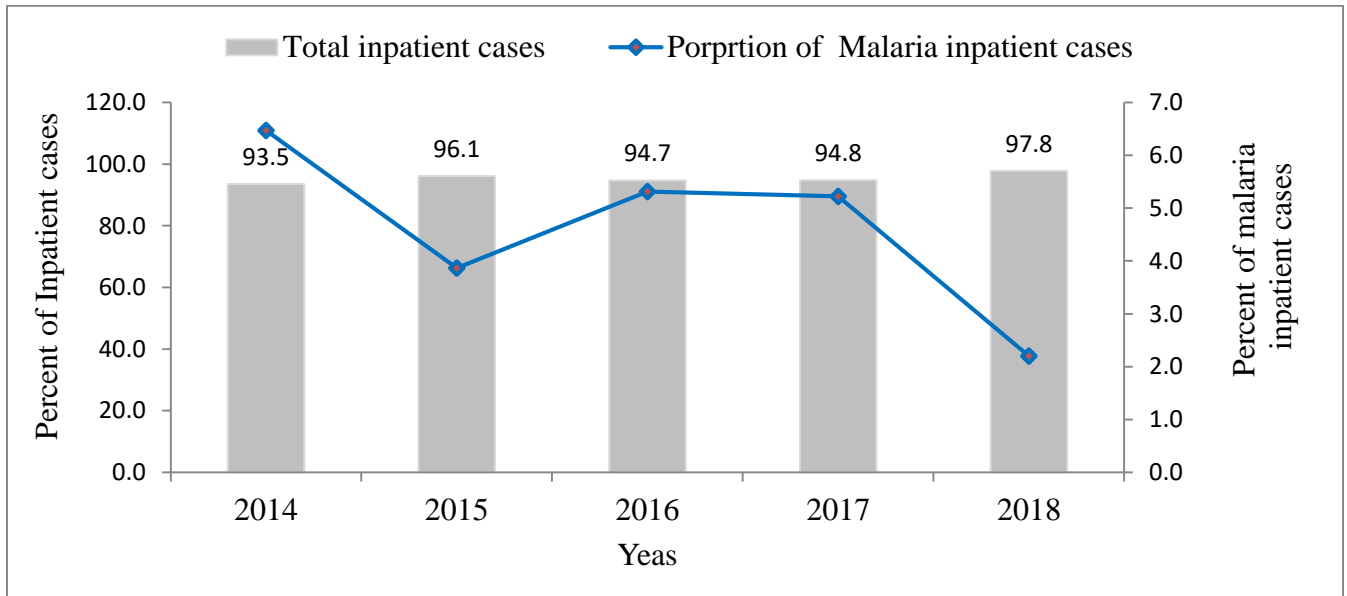


Figure 6: Annual total inpatient cases and proportion of malaria inpatient cases in East shewa zone, Oromia Region, Ethiopia, from 2014-2018

2.4.2 Description of malaria cases by place

The distribution of malaria cases varies in East Shewa zone district which depends on the geographically location and presence of irrigation area that brings favorable conditions for mosquito breeding site due to presence of stagnant waters. Accordingly the highest cases were reported from Adama districts followed by Fentale which accounts from the total malaria cases of the East Shewa zone 23% (35,069/151368) and 21.6% (32,743/151368) respectively. Conversely, the least malaria cases were reported from Gimbichu followed by Ada'a districts (Table: 12).

Table 12: Total malaria cases distribution by District in East Shewa Zone Oromia Region, Ethiopia, in 2019

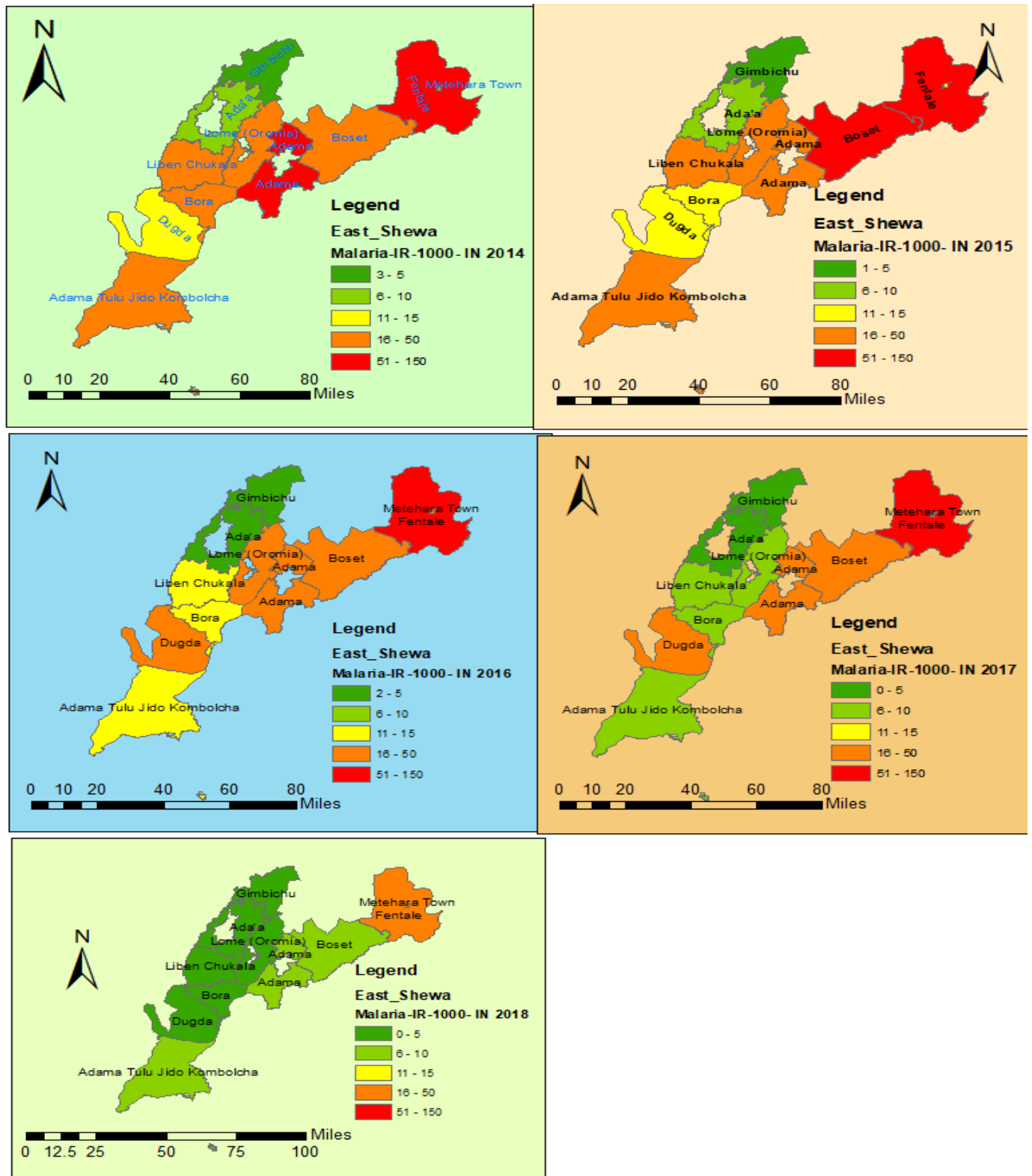
| Districts | Total malaria cases | | | | | Total cases n (%) |
|--------------|---------------------|--------------|--------------|--------------|--------------|----------------------|
| | 2014 | 2015 | 2016 | 2017 | 2018 | |
| Ada'a | 668 | 746 | 356 | 146 | 51 | 1967 (1.3) |
| Adama | 15188 | 8312 | 5576 | 3778 | 2215 | 35069 (23.2) |
| Adami tulu | 6033 | 3032 | 2451 | 1815 | 1121 | 14452 (9.5) |
| Bora | 1752 | 1132 | 1044 | 538 | 313 | 4779 (3.2) |
| Boset | 8438 | 9455 | 6423 | 3549 | 1736 | 29601 (19.6) |
| Dugda | 2166 | 1716 | 4622 | 2704 | 639 | 11847 (7.8) |
| Fentale | 11241 | 6413 | 6426 | 5397 | 3266 | 32743 (21.6) |
| Gimbichu | 34 | 12 | 22 | 4 | 3 | 75 (0.049) |
| Liben | 2939 | 1906 | 1171 | 919 | 515 | 7450 (4.9) |
| Lume | 2390 | 2118 | 2400 | 760 | 339 | 8007 (5.3) |
| Metehara | 1393 | 462 | 574 | 1730 | 1219 | 5378 (3.6) |
| Total | 52242 | 35304 | 31065 | 21340 | 11417 | 151,368 (100) |

The distribution of incidence rate of malaria in East Shewa zone district varies through five years of period which indicated that Fentale district was the highly affected district with incidence rate 150/1000 population in 2014 and decreases consecutively through five years to incidence rate of 39/1000 population in 2018 and followed by Adama districts from 80/1000 to 10/1000 population in 2014 and 2018 respectively, while in Matahara Town the incidence rate was raised in 2017 from 41 to 46 per 1000 population (Table:13). Over all through five years distribution of malaria incidence rate was varied from district to district as shown in the table below. Low malaria

incidence rate had seen in Gimbichu followed by Ada'a district and high incidence rate of malaria cases seen in Fentale district. Except Matahara district almost the others all districts had shown decreasing in malaria incidence rate from 2014-2018 of five years.

Table 13 : Distribution of Malaria Incidence rate per 1000 population from 2014-2018 by districts in East Shewa Zone, Oromia Region, Ethiopia, 2019

| Districts | 2014 Years | 2015 Years | 2016Years | 2017 Years | 2018Years |
|--------------------|-------------------|-------------------|------------------|-------------------|------------------|
| Ada'a | 6 | 6 | 3 | 1 | 0 |
| Adama | 80 | 42 | 28 | 18 | 10 |
| Adami tulu | 35 | 17 | 13 | 10 | 6 |
| Bora | 24 | 15 | 13 | 7 | 4 |
| Boset | 47 | 51 | 34 | 18 | 9 |
| Dugda | 14 | 11 | 28 | 16 | 4 |
| Fentale | 150 | 83 | 81 | 66 | 39 |
| Gimbichu | 3 | 1 | 2 | 0 | 0 |
| Liben | 32 | 20 | 12 | 9 | 5 |
| Lume | 30 | 26 | 29 | 9 | 4 |
| Metehara | 41 | 13 | 16 | 46 | 32 |
| Zonal level | 44 | 29 | 25 | 17 | 9 |



Map 4: Special distribution of malaria cases in East Shewa zone Oromia region, Ethiopia, 2019

2.4.3 Description of malaria morbidity and mortality by person

2.4.3.1 Trend of Confirmed Malaria Cases by Age Group

Secondary data analysis of malaria cases and deaths in East Shewa zone, in the last five years shown that, all age groups registered due to malaria and greater than three-fourth of cases were recorded in greater than five years of age and one-fourth of them recorded in less than five years age groups. In addition deaths recorded only in 2014 in the age groups greater than five years.

Table 14: Malaria cases and deaths during 2014-2018 by Age groups in East Shewa zone Oromia region, Ethiopia in 2019

| Yeas | Total malaria cases | Age category | | | |
|--------------|---------------------|---------------------|----------------------|----------------|------------------|
| | | Malaria cases | | Malaria Deaths | |
| | | <5 Years n (%) | ≥ 5 year n (%) | <5 Years n (%) | ≥ 5 year n (%) |
| 2014 | 52242 | 10056 (19.2) | 42186 (80.8) | 0 | 5 (0.009) |
| 2015 | 35304 | 6816 (19.3) | 28488 (80.7) | 0 | 0 |
| 2016 | 31065 | 5893 (19) | 25172 (81) | 0 | 0 |
| 2017 | 21340 | 4160 (19.5) | 17180 (80.5) | 0 | 0 |
| 2018 | 11417 | 2354 (20.6) | 9063 (79.4) | 0 | 0 |
| Total | 151368 | 29279 (19.3) | 122089 (80.7) | 0 | 5 (0.003) |

The five years of confirmed malaria incidence rate shown that less than five years age groups were consecutively through five years higher than greater than five years age groups and the mean five years of less than five years and greater than five years age groups were 28 per 1000 population and 26 per 1000 population respectively.

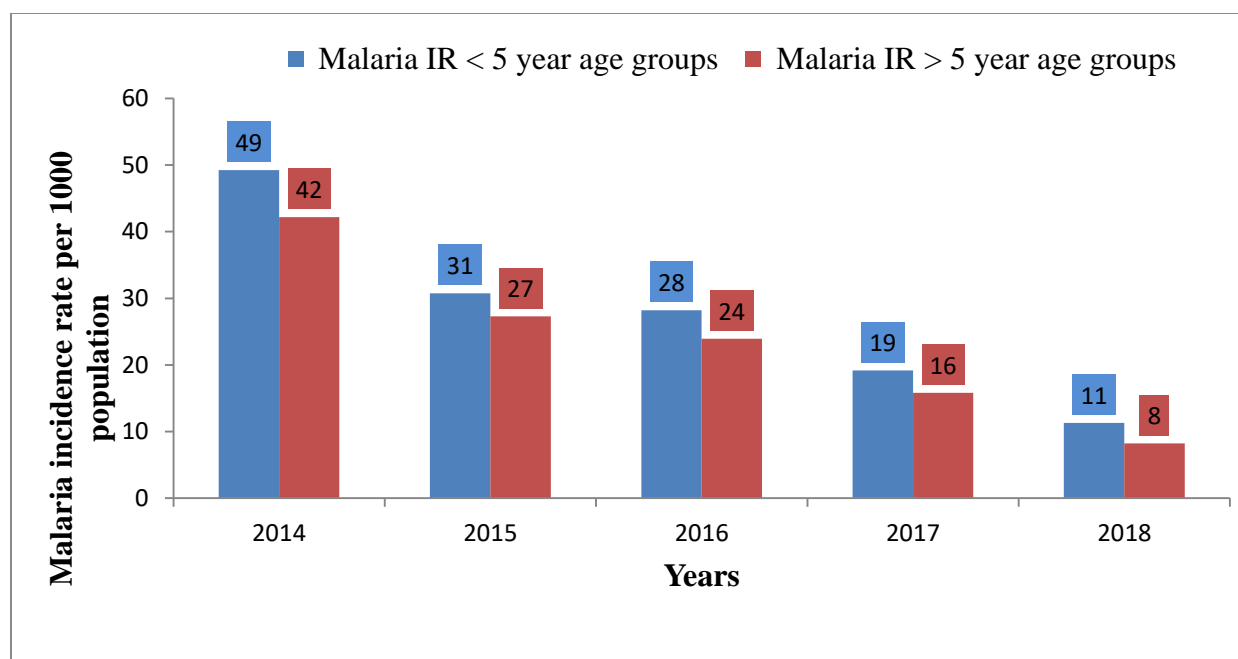


Figure 7: Incidence rate of malaria confirmed cases > 5 & < 5 Age groups during (2014-2018) in East Shewa Zone, Oromia Region, Ethiopia, 2019

2.4.3.2 Distribution of Malaria cases by Sex.

In the last five years our secondary data analysis of confirmed malaria cases by sex category in East Shewa zone Oromia region shown that greater than half percent of malaria cases registered in Males than Females through five years period (Table:15).

Table 15: Malaria cases by sex category from 2014-2018 in East Shewa zone Oromia region, Ethiopia, in 2019

| Years | Number of malaria cases | Number of Male cases n (%) | Number of Female cases n (%) |
|--------------|-------------------------|-------------------------------|---------------------------------|
| 2014 | 52,242 | 30217 (59) | 22025 (42) |
| 2015 | 35,304 | 19955 (58) | 15350 (43) |
| 2016 | 31,065 | 18285 (59) | 12781 (41) |
| 2017 | 21,340 | 12487 (59) | 8853 (41) |
| 2018 | 11,417 | 6721 (59) | 4697 (41) |
| Total | 151,368 | 87664 (58) | 63705 (42) |

The incidence rate of malaria in East Shewa zone by age category through five years Males were higher than Females and decreased from 49.5 to 9.8 in Male and from 38.4 to 7.3 in Female per 1000 population in 2014 and 2018 respectively.

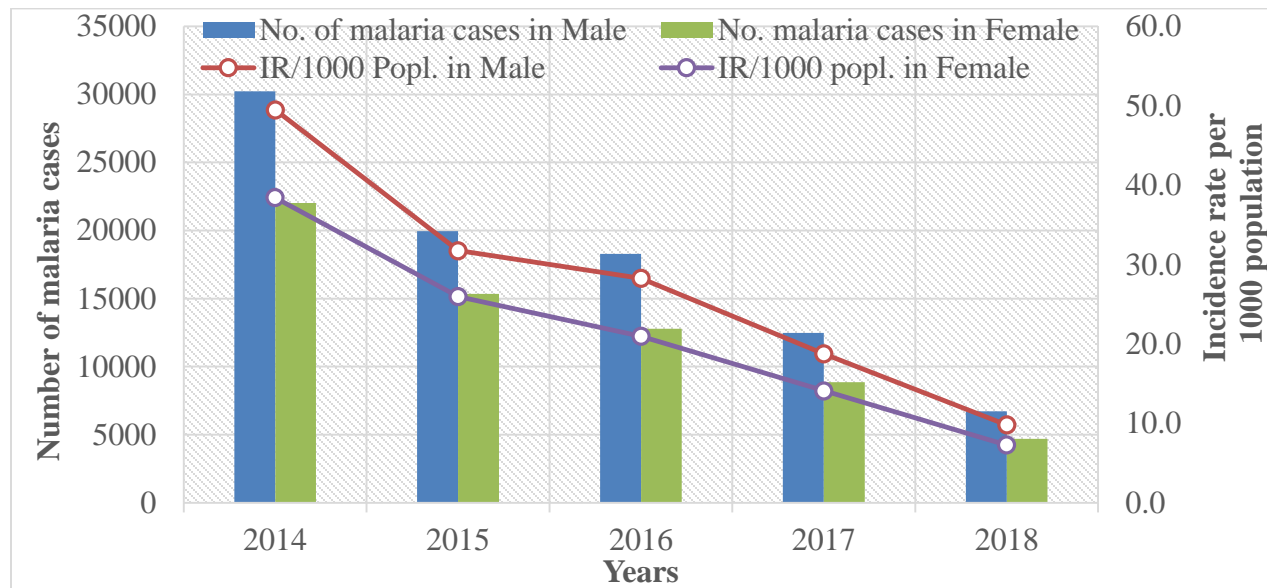


Figure 8 : Incidence rate of malaria confirmed cases by sex category during (2014-2018) in East Shewa Zone, Oromia Region, Ethiopia, 2019

The overall malaria cases in East Shewa zone disaggregated by sex category shown that, the total cases in number higher in Males than Females (Fig: 9).

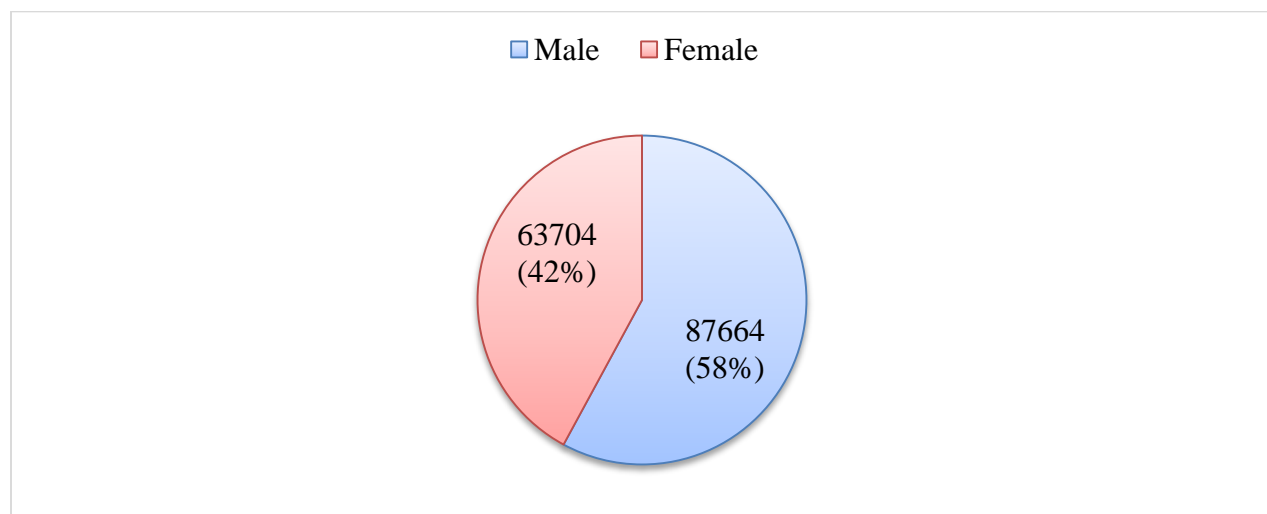


Figure 9: Total Malaria cases during 2014-2018 by Sex in East Shewa Zone, Oromia Region, Ethiopia, in 2019

2.4.4 Description of Malaria Morbidity Trends by Time

In the last five years period as shown from (Fig.10) the case load of malaria decreased though consecutive five years. The highest malaria cases which were recorded in May month 5,893 malaria cases in 2014 and the lower malaria cases were also registered in 2018 March 590 malaria cases. Consecutively three month from April to June the number of malaria cases were increases and reach its peak and decreases up to August and again it peaks in Septembers then starting to decreases in the rest of months. In addition malaria transmission is seasonal in East Shewa zone as shown in the (Figure.10) high transmission observed in September and July months and minor transmission also seen April, May, August and Decembers. In the rest of the months the transmissions of malaria cases were fluctuated.

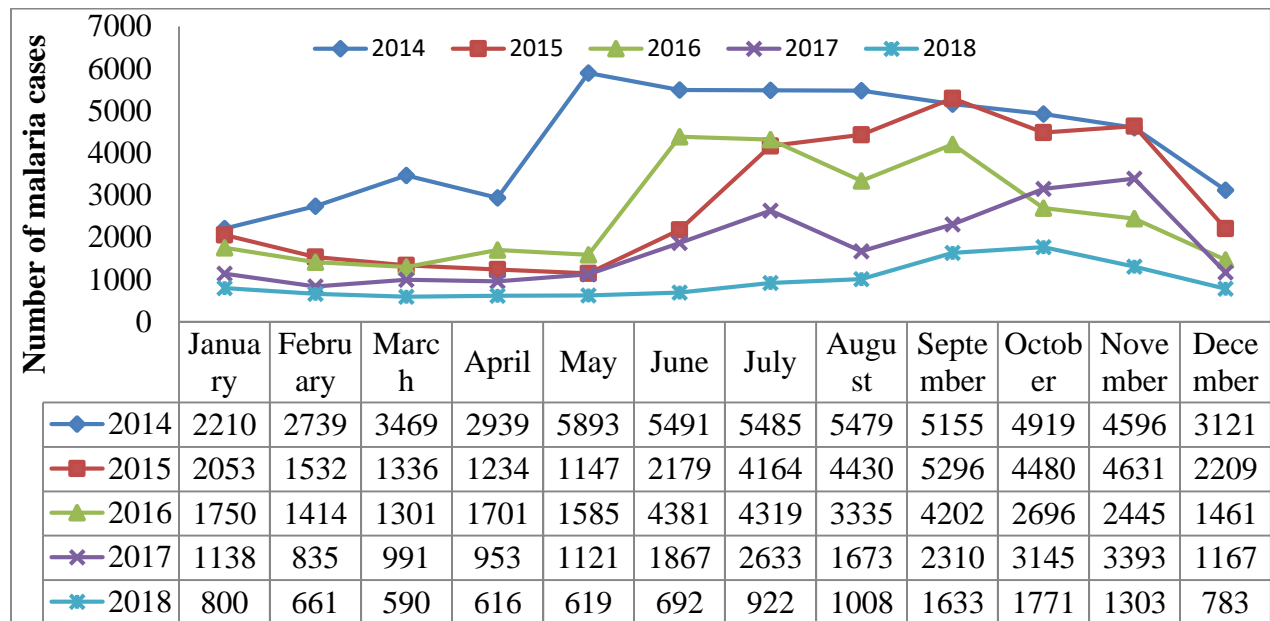


Figure 10: Distribution of malaria cases by time in East Shewa zone, Oromia region Ethiopia, 2019

2.4.5 Malaria slide positivity rate and species distributions

The retrospective malaria data analysis of East Shewa zone indicated that from the total five year suspect cases 149,401/788162 (19%) were confirmed which indicated that the slide positivity rate decreased from 24.8% to 10% in 2014 and 2018 respectively (Table:16). This was the positivity rate decreased by 76% through five years. Regarding to seasonal malaria transmission, the proportion of slide positivity rate of East Shewa zone gradually fluctuated through five years as shown in the (Fig.11), high slide positivity rate was observed in July, August and September

(25.6 %, 24.3% and 23.1%) percent respectively and low positivity rate observed in February and January ,12.4% and 13.8% respectively.

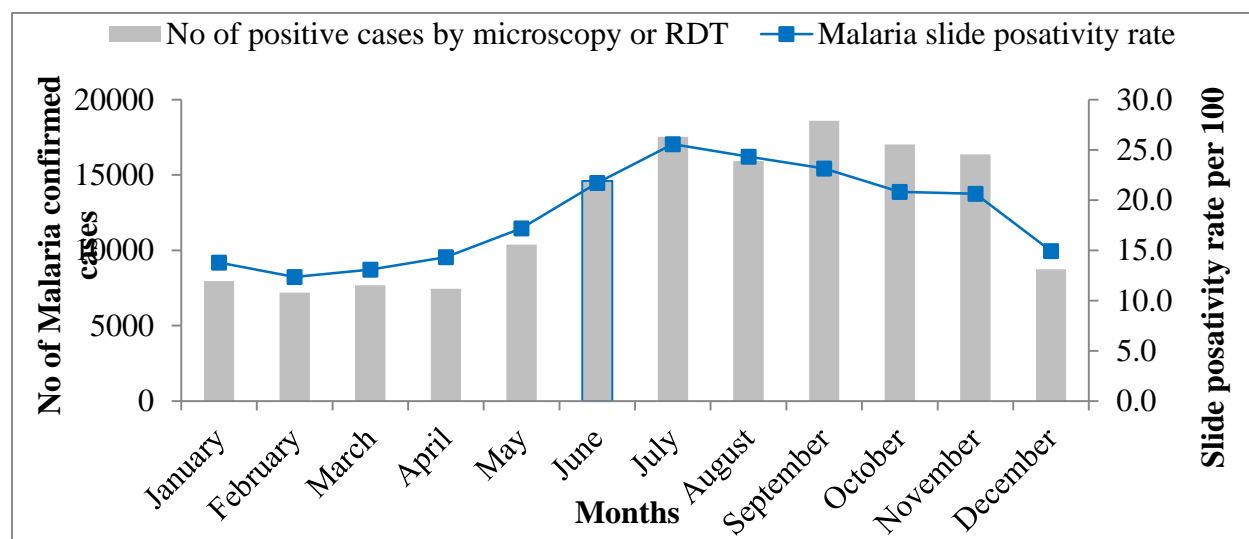


Figure 11: Proportion of malaria slide positivity rate during (2014-2018) East Shewa Zone, Oromia region, Ethiopia, in 2019

Among the confirmed slide positive for malaria at East Shewa zone districts regard to species distribution, the number of Plasmodium falciparum cases were dominant when compare to the Plasmodium vivax and mixed. From the total, it accounted for 57% (85398/149,401) and Plasmodium vivax 38% (56801/149,401) whereas mixed plasmodium falciparum and plasmodium vivax 5% (7202/149,401).

Table 16: Five years malaria suspect and confirmed cases in East Shewa zone, Oromia Region, Ethiopia, in 2019

| Years | Total malaria suspect cases examined | No of positive cases by Microscopy or RDT | P. falciparum n (%) | P. vivax n (%) | Mixed n (%) |
|--------------|--------------------------------------|---|---------------------|-------------------|----------------|
| 2014 | 207621 | 51496 (24.8) | 29823 (58) | 19998 (39) | 1675 (3) |
| 2015 | 165752 | 34691 (20.9) | 18044 (52) | 14217 (36) | 2430 (7) |
| 2016 | 166997 | 30590 (18.3) | 16991 (56) | 11128 (34) | 2471 (8) |
| 2017 | 134196 | 21226 (15.8) | 13167 (62) | 7605 (36) | 454 (2) |
| 2018 | 113596 | 11398 (10) | 7373 (65) | 3853 (34) | 172 (2) |
| Total | 788162 | 149401 (19) | 85398 (57) | 56801 (38) | 7202(5) |

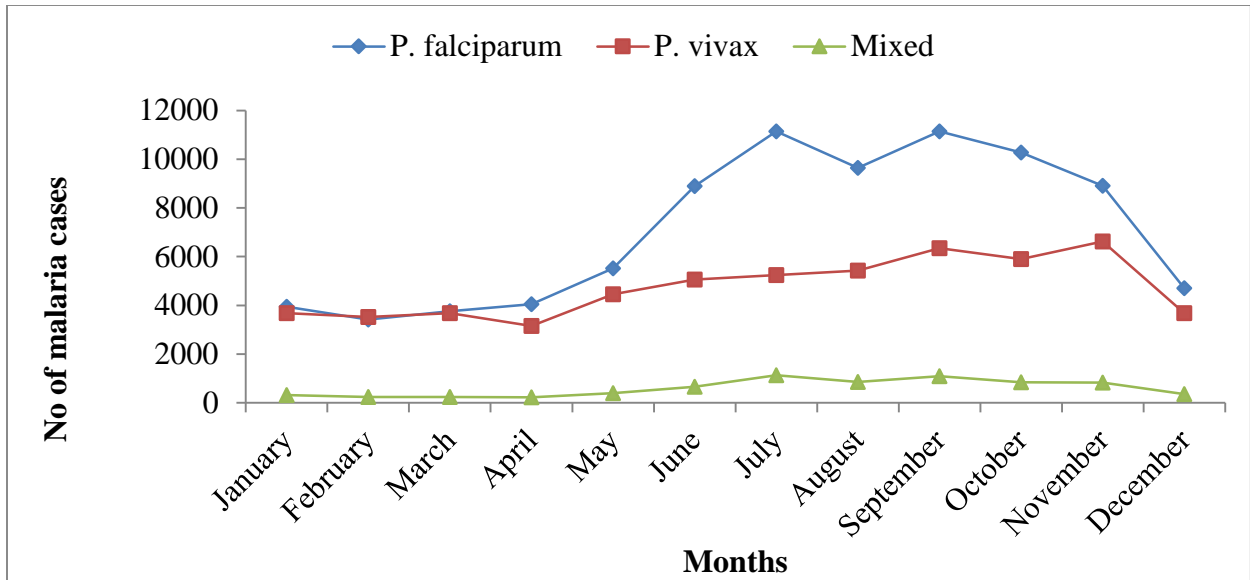


Figure 12: Monthly distribution of plasmodium species malaria cases in East Shewa zone, Oromia region, from 2014-2018

2.4.6 Report completeness

Completeness rate was shown as that the participation of health facilities by reporting during the specified period of time reported divide by number of expected health facilities to be report in the same time period times hundred. According to this analysis in the five years report completeness rate were less than national standard in 2015&2016 at this time more health posts closed because of security problem in East Shewa zone of some districts and kebeles at that time. Five years average report completeness rate was 76% which was below the national standard (80%).

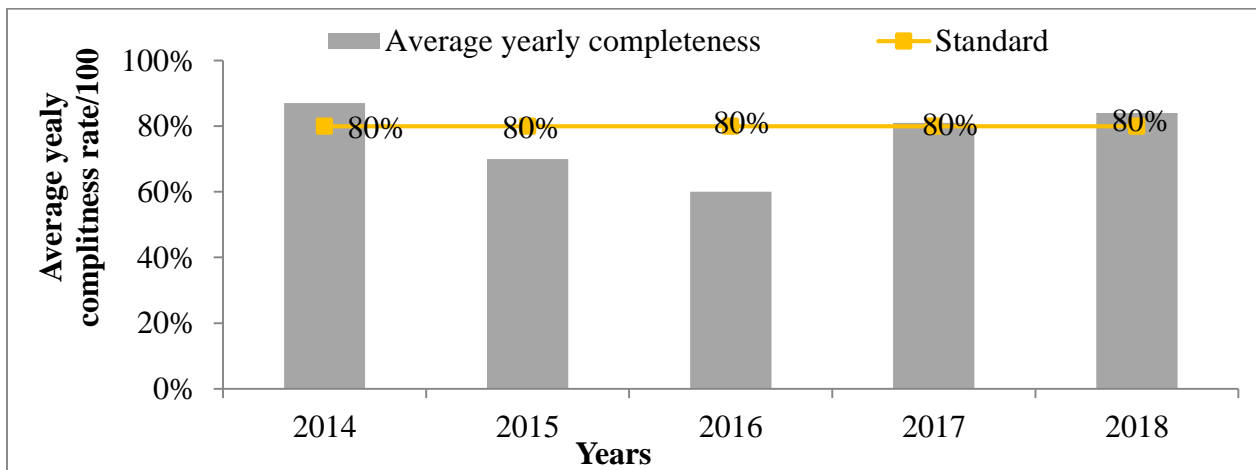


Figure 13: Five years average report completeness rate by year during (2014-2018) in East Shewa zone, Oromia Region, Ethiopia, in 2019

2.4.7 Malaria prevention and control activities in the last five years in East Shewa zone Oromia region

Since 2005 Ethiopia starts to scale-up malaria control strategies in Africa, However, in East Shewa zone in the last five years there were distributions of insecticides bed net and indoor residual spray for malarias districts to prevent and decreases the malaria transmission. According to East Shewa zonal health office Annual reports shown that, in 2019 there were 69,5497 insecticides bed net distributed for 1,282,557 peoples and 156,516 unit structures indoor residual spray was sprayed whereas the LLINs distributions were done previously in 2016 and indoor residual spray was did in yearly based. According to this report a total of 415,378 populations of East Shewa zone protected from malaria parasite infection as a result of receiving 89% of their annual plan LLINs distribution and indoor residual spray.

Table 17: Indoor residual spray unit structures sprayed and population protected in East Shewa zone Oromia region, Ethiopia in 2019

| Districts Name | Number of unit strictures sprayed | | | population protected | | |
|-------------------|-----------------------------------|---------------|-----------|----------------------|----------------|-------------|
| | plan | Achieved | % | plan | Achieved | % |
| Adama | 35444 | 28850 | 81 | 73627 | 73502 | 99.8 |
| Ada'a | 15765 | 12673 | 80 | 24575 | 24575 | 100 |
| Adami Tulu | 14645 | 14617 | 100 | 46541 | 46348 | 99.6 |
| Boset | 25034 | 21116 | 84 | 49888 | 49550 | 99.3 |
| Bora | 14361 | 13353 | 93 | 40449 | 37784 | 93.4 |
| Dugda | 20574 | 17752 | 86 | 47860 | 47860 | 100 |
| Fentale | 19551 | 19746 | 101 | 52094 | 52091 | 100 |
| Lume | 8825 | 8843 | 100 | 17027 | 16729 | 98.2 |
| Liben | 21380 | 19566 | 92 | 66939 | 66939 | 100 |
| Total | 230160 | 204160 | 89 | 419,000 | 415,378 | 99.1 |

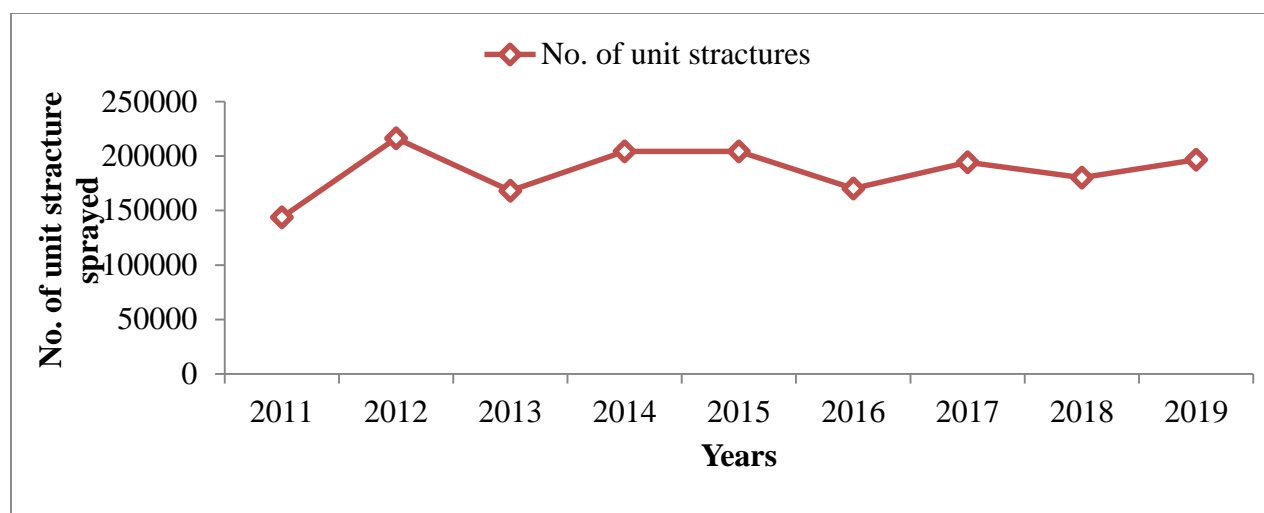


Figure 14: Number of Indoor spray unit structures sprayed during (2011-2019) in East Shewa zone, Oromia region, in 2019

Table 18: Distribution of LLINs in 2016 and 2019 in East Shewa zone, Oromia region, Ethiopia, 2019

| Districts | No of LLINs distributed in 2015-2016 | Percent from target | No of LLINs distributed in 2019-2020 | percent from target |
|--------------|--------------------------------------|---------------------|--------------------------------------|---------------------|
| Adama | 91,200 | 100 | 98352 | 100 |
| Adami tulu | 108,900 | 94 | 118636 | 98 |
| Adea | 57,300 | 96 | 70202 | 97 |
| Bora | 40,500 | 100 | 41979 | 100 |
| Boset | 92,150 | 93 | 102732 | 92 |
| Dugda | 101,700 | 92 | 105593 | 98 |
| Fentale | 41,000 | 100 | 42148 | 100 |
| Liben | 52,700 | 100 | 54028 | 95 |
| Lume | 42,100 | 97 | 45554 | 100 |
| Metehara | 15,200 | 100 | 16273 | 100 |
| Total | 642,750 | 98 | 695497 | 89 |

2.5 Discussion

In East Shewa zone trend in malaria morbidity and mortality has shown significant reduction over the last five years. Accordingly, the number of confirmed malaria cases decreased by 77.9 % from 51,496 to 11,398 between 2014 and 2018. Similarly the annual incidence has declined by 80% from 43.5/1000 population to 8.6/1000 population between 2014 and 2018. This reduction is in line with the national malaria strategic plan target that aims at reducing malaria cases by 40% by the end of 2020 from the base line of 2016 and in WHO Africa region, case incidence levels declined from 294 in 2010 to 229 in 2018, representing a 22% reduction in incidence (4,6). Reduction of malaria cases might be due to the strategies of malaria control in Ethiopia, which designed to support by health sectors developmental plan, national malaria strategic plan and highly effective malaria prevention measures like long lasting insecticide-treated mosquito nets (LLINs); indoor residual spraying (IRS) and environmental management. This finding is similar to those of a previous study showing the effect of malaria control intervention reduction of malaria incidence (7). In East Shewa zone, there were high coverage of long last impregnated nets and indoor residual sprays which would be expected to decrease malaria transmission further. In another way, there were under report of malaria morbidity and mortality in East Shewa zone. This was shown by the average report completeness of East Shewa zone was less than national targets this may be for artificial reduction of malaria cases in the year of 2014 and 2016 respectively (8). Five years average proportion of malaria admissions were 4.6% and in 2014 five malaria deaths. Decreasing of malaria deaths in East Shewa zone were mainly may not be by high performance of malaria intervention it may be due to low rate of complicated malaria admissions at health center level rather than they had referred to Adama, Batu, Bishoftu and Modjo hospitals, these hospitals data were not included in this analysis because these hospitals were directly report to Oromia regional health Bureau.

Malaria trend analysis of East Shewa zone, Oromia regional states shown that the majority of the case were reported from Fentale district next to Adama district, and the least malaria cases reported from Gimbichu district next to Ada'a district. High malaria cases report in Fentale district may be due to presence of irrigation schemes on Awash River which could be the potential breeding sites for Anopheles mosquitoes. Unless irrigation schemes were properly managed, it was favorable for high larvae and adult vector which were high in malaria prevalence and transmission. In addition due to availability of large irrigation farm lands daily laborer came from high land area and

participated on farm land including at night times. This may be results for high exposure to mosquito bite in those districts (9).

Over the last five years during (2014-2018) among confirmed malaria cases less than five years age groups were more affected than greater than five years age groups, which accounts the average less than five year and greater than five year age groups incidence rate were 28/1000 populations and 24/1000 populations respectively. This may be due to less than five year age groups exposed to the stagnant water during stay in surrounding of their house, malnutrition and have low immunity for malaria infection than general population and more affected in seasonal malaria transmission areas.

In the last five years during (2014-2018) from the total malaria cases, males were more affected than females, accounting average annual incidence 27 per 1000 population and 21 per 1000 population respectively. This finding was aligned with the study done in Ataye district Hospital, North Shewa, Amhara Region, between 2013 and 2017, 5% in male and 3.4% in female (10). Males were more affected as the result most of the time males spent their time during night for different agricultural activities since those areas were investment areas and used water irrigation for cultivation of different fruits and crops production. Additionally there were dispersed of peoples for temporary daily laborers to the area for the cultivation of onions, tomato and sugarcane plantation and those peoples spend their times in farm lands and easily bite by mosquito during night time.

In Oromia malaria is highly seasonal, Peak malaria transmission occurs between September and November in most parts of Oromia, after the main rainy season from June to August. In case of our surveillance data analysis from May to June decreases and reach the peak in July then decreases up to August and the second peak was observed in Septembers. This was in line with the survey done in Ethiopia by President's Malaria Initiative that shows malaria is highly seasonal in Ethiopia it peaks in September and decrease up to December following main summer rain and the second season was from April to June following minor spring rain (1,4,5).

Malaria positivity rate was decreased through five years consecutively from 24.8% to 10% in 2014 and 2018 respectively which changes in 59.7% in five years, also total malaria suspected to examine would be decreased. Of the total laboratory confirmed malaria cases, greater than half reported species was Plasmodium falciparum specious with 57% then 38% Plasmodium vivax and mixed with plasmodium falciparum and vavix (5%) was reported during the past five years in East

Shewa zone. This finding was similar with the study conducted in Armachoho district North west Ethiopia shows that from the total confirmed malaria cases, the predominantly reported species was Plasmodium falciparum, accounting for (70.4%) of the overall prevalence, followed by Plasmodium vivax and mixed infection with Plasmodium falciparum and Plasmodium vivax, each constituting 9.9%, 19.9% (11). In addition the recently retrospective analysis of urban malaria cases due to plasmodium falciparum and vavix conducted in case of Batu Town Oromia region and descriptive malaria analysis of Harar region conducted from 2013-2019 also similar with our finding plasmodium species was predominantly reported species followed by plasmodium vivax (7,12). The finding was also in line with the Ethiopian national malaria guide line and national malaria indicator survey of 2015 which indicates that plasmodium falciparum are dominant and followed by plasmodium vivax all over the country (2,4).

Data completeness rate is one of the indicators of data quality. The five years average zonal completeness rate was below the national and WHO minimum requirement for data completeness rate which is 80%. Though it was below minimum standard in the year of 2015 (70%) and 2016 (60%) it was not representatives for the malaria cases reported from East Shewa zone and also it miss leads to show the threshold of the malaria cases to flow malaria epidemics monitoring chart because all the expected cases in east Shewa zone not reported as a result of more health posts closed or not functional due to security problems during that years.

2.6 Limitation

Age category was limited to two age groups to calculate different age specific incidence rate. There were incomplete reports in 2016 and 2017 due to this it may be under estimation of malaria cases and deaths. In addition those wants to admission cases due to complication or for farther investigation referrers near to Hospitals and their outcome could not be sent as feedback for health centers this may be under estimate the malaria death (case facility rate) in East Shewa zone.

2.7 Conclusion

Through the past last five years' malaria cases and deaths decreased and highest in male and less than five years age group. The highest malaria incidence rate has registered in Fentale district followed by Adama districts and the low malaria cases seen in Gimbichu district and Ada'a district. In East Shewa zone highly seasonal, peak malaria transmission occurs in Septembers and July. Malaria positivity rate decreased through the last five years and Plasmodium falciparum species was the predominate species in East Shewa zone.

2.8 Recommendation

- ✚ Sustain the malaria interventions so as to keeping the current achievements.
- ✚ Prioritize high-risk malaria districts like Fentale and Adama to strengthening for malaria prevention and control activity preprograms.
- ✚ District health office should advise temporary daily laborers came from highlands to wear cover all clothes during night times.
- ✚ Early diagnosis and appropriate treatment, continuous utilization of LLINs, avoiding re-plastering of the wall sprayed, actively engagement of community on cleaning of mosquito breeding site.
- ✚ Priority should be given in case of short LLINs possession for under five children.

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Chapter Three: Evaluation of surveillance system

3. Evaluation of Surveillance System of Measles disease, West Arsi Oromia region, southern Ethiopia, November, 2019

Abstract

Background: The evaluation of surveillance systems helps for the use of public health resources effectively and efficiently surveillance systems were used both to determine the need for public health action and to assess the effectiveness of the programs. Globally, in 2017 there were 6.7 million cases of measles cases and 110,000 deaths were reported to WHO from 2014 out of 114,900 measles deaths occurred 73,914 (63%) were from Africa. In Ethiopia, a seasonal pattern of measles outbreak has been observed over the years. The purpose of conducting this system evaluation was to identify the status of core and support activities of the measles surveillance system and its attributes.

Methods: West Arsi surveillance system was evaluated from October 15 to November 5, 2019 descriptive cross sectional study design was used. The zone was purposively selected depending on the prevalence of measles in the zone and absence of system evaluation in that zone previously.

Results: A total of 31 health institution visited in this system evaluation. Average data completeness and timeliness rates of the zone were 88% and 76% respectively. At all districts there were an emergency epidemic preparedness and responses plan including task force committees. One fourth of the surveillance officers were not trained on public health emergency management. Data analysis was not practiced at health facility and health post, but 33% of the district analysis and 100% at zonal level. Specific support supervision and written feedback were not given for all visited health institution. There were no tracing mechanisms for timeliness at some districts and health centers. At all level budget was not allocated for public health emergency management activities. The surveillance system was found to be simple, useful, flexible and acceptable

Conclusion: In West Arsi zone there was a need to improving timelines report and the system were somewhat simple, flexible and acceptable and there should need regular supportive supervision and feedback.

Keywords: Measles, Evaluation, Surveillance, West Arsi, Oromia, Ethiopia

3.1 Introduction

3.1.1 Background

Public health surveillance system is the ongoing, systematic collection, analysis, interpretation and dissemination of data regarding disease and other health-related event for use in public health action and monitoring a health event. Surveillance system evaluation is helps to use health resources in efficient way and assures that systems operate effectively (1–3). Its purpose is to promote effective use of public health resources through development of effective and efficient surveillance systems (2). It defined as the Surveillance data are used both to determine the need for public health action and to assess the effectiveness of programs. The evaluation of surveillance system should involve an assessment of system attributes, including simplicity, flexibility, data quality, acceptability, sensitivity, predictive value positive, representativeness, timeliness and stability and it should be established at the beginning of public health activities set up in response to an emergency (4–6).

Public health surveillance systems should be evaluated periodically for improving quality, efficiency, and its usefulness, as well as, to be needs timely dissemination of information for early action to prevent disease and its consequence (2).

Lack of functional surveillance system that can guide timely and effective health intervention has been a common problem to the African region Thus, African region adopted the Integrated Disease Surveillance and Response (IDSR) strategy as a regional strategy in, 1998 in order to effectively control priority communicable diseases in the African region (7).

Effective communicable disease control relies on effective surveillance and response systems that promote coordination and integration of surveillance function. Knowing this, the initiative to strength the disease surveillance system that promotes the integration of surveillance activities in Ethiopia was started in 1996 and introduced as Integrated Disease Surveillance and response (IDSR) in 1998 (8–10)

Federal Ministry of Health had prioritized 23 (15 are immediate reportable whereas 8 are weekly reportable) notifiable diseases which are prone for epidemic, had international concern and diseases on eradication, elimination and other disease of public health importance programs in Integrated Disease Surveillance and Response activities. Those diseases are selected based on: Diseases which have high epidemic potential, that have available effective control and prevention

measures for addressing the public health problem they pose and required internationally under IHR 2005 (1,11)

Reporting time period

The identified 23 disease are classified in to two reporting time period depending on their epidemic potential, these disease selected for eradication and elimination are decided to reported as immediate report for the next reporting level, as soon as, suspected or confirmed depending on the case definition suited in Ethiopian public health emergency management. According to the PHEM and disease specific guide line fifteen diseases selected for immediate report which is a single suspected case is considered as a suspected outbreak. A suspected outbreak should be notified within thirty minute difference from the identified level of report up to the national reporting unit. There were eight diseases which are classified as weekly reporting and fifteen diseases were reported as daily or immediately as suspected depending on the standard case definition. The deaths and cases reported within the week from Monday to Sunday depending on their scheduling of reporting date according to their reporting unit level. Facilities report weekly data Monday to Sunday to districts every Monday till midday; districts report to zone/ region every Tuesday till midday; zone report to region every Wednesday till midday; region report to Federal or for national emergence management and response sections Thursday till midday (1). Reporting mechanism may be by verbally or by telephone or use an electronic method such as Email, Fax and Mobile short message (1).

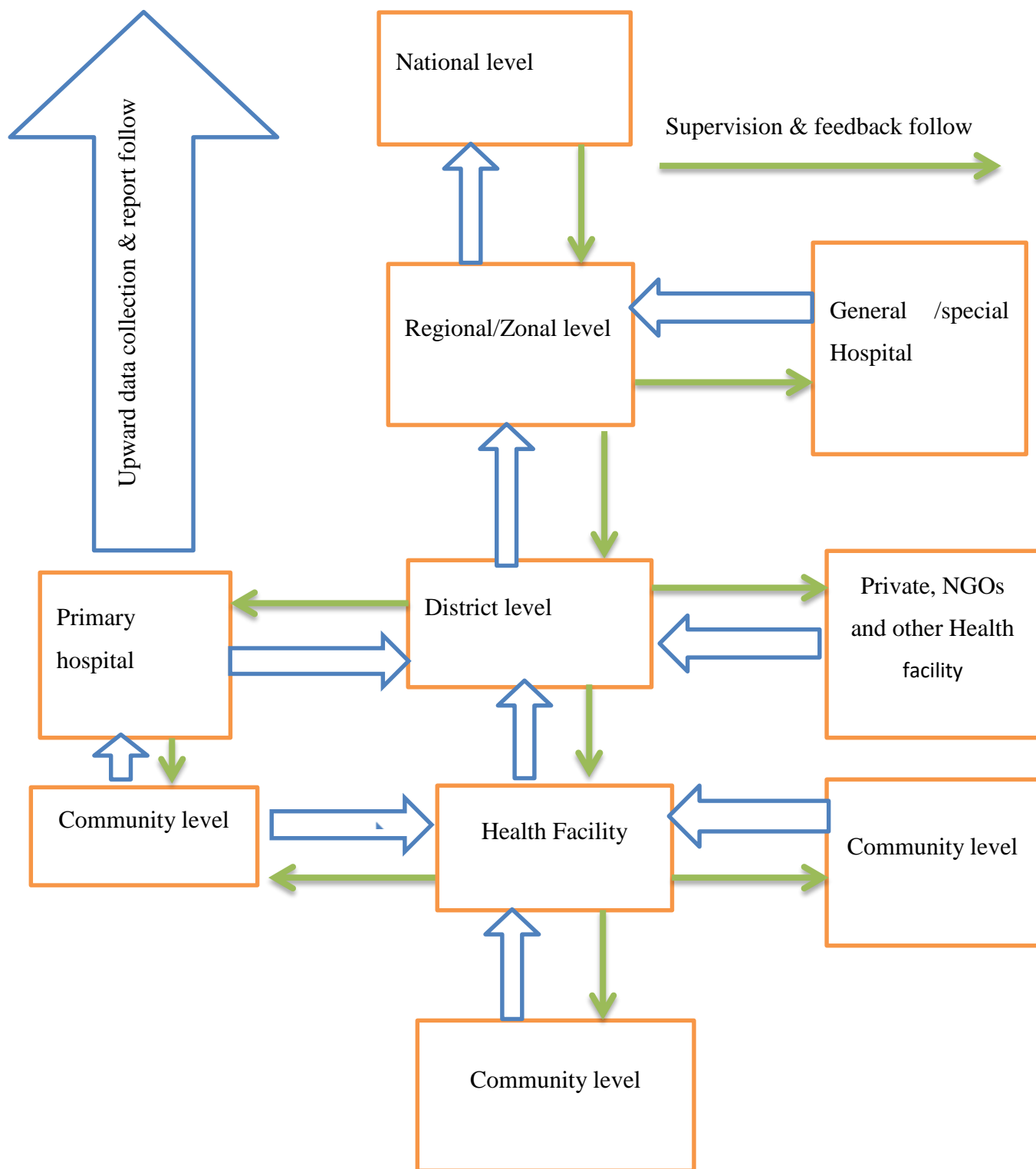


Figure 15 : Diagrams illustrating the flow of surveillance data and information throughout a health system which adopted from public health emergency management guide line.

The main sources of information for surveillance activities were community and health facilities. At community level the information would be collected from community representative or female army leaders which a small team (5-30) members organized at all kebele level and then, send to health facility at health facility level it would compiled in standard forms and send to district health office. At district also by using standard formats, collect from all health facility those categorized under their catchment area and compile it, then send to the zonal health office. Feedback and supportive supervision were followed from higher level for the lower levels and information sharing and rumor investigation would be follow from lower level to up and from upper level to lower down simultaneously in the same route. Of selected disease for this study measles is categorized as immediately reportable disease(1).

Measles

Measles is an acute, highly contagious viral disease caused by measles virus. It is a vaccine preventable disease, but remains a major killer of children around the world. The measles virus replicated in the nose and throat of infected individuals and transmitted by primarily respiratory droplets to mucous membranes in the upper respiratory tract or conjunctiva. Measles spreads by coughing and sneezing in direct contact or close contacts with infected nasal or throat secretions(12–15).

Globally, in 2017 there were 6.7 million cases of measles cases and 110,000 deaths were reported to world health organization. Out of 114,900 measles deaths occurred 73,914(63%) were from Africa (15). During 2019, measles out breaks were reported in several countries in Africa, Eastern Mediterranean, Europeans, Americas and South-Asia region(16).

World Health Organization African Region has established a goal to achieve measles elimination by 2020 through increasing access service in all districts, improve vaccination coverage, reduce the incidence of measles in all countries and improve the quality of measles surveillance, as well as, the epidemiological and biological investigation of measles out breaks in all countries (17).

In Ethiopia, a seasonal pattern of occurrence of measles has been observed over the years, with increased number of measles cases over a years, due to the low sub national routine measles coverage and prevailing poor living and nutritional conditions, measles outbreaks continue to occur frequently in different part of the country, as well as, at Oromia region in different zones and Town administrations.

Measles surveillance system consists of the tools and structures that generate information on measles cases and deaths, which can be used for planning, monitoring and evaluating measles control programs. An effective measles surveillance system enables program leaders to identify the areas or population groups most affected trends in cases and deaths that require additional intervention and assess the impact of control measures.

3.2 Rationally of study

The purpose of evaluating measles surveillance is to trigger public health action and enhancing surveillance system. Measles is the major diseases of the West Arsi Zone with high frequency of epidemic and public health concern. Additionally, Outbreaks have occurred frequently. Consequently, this evaluation was conducted to identify the status of core and support activities of the surveillance system and to describe the specific attributes of the system.

3.3 Objective

3.3.1 General objective

To assess the core and supportive activities of surveillance system and its attributes of measles disease in West Arsi zone, Oromia region, Ethiopia, in 2019

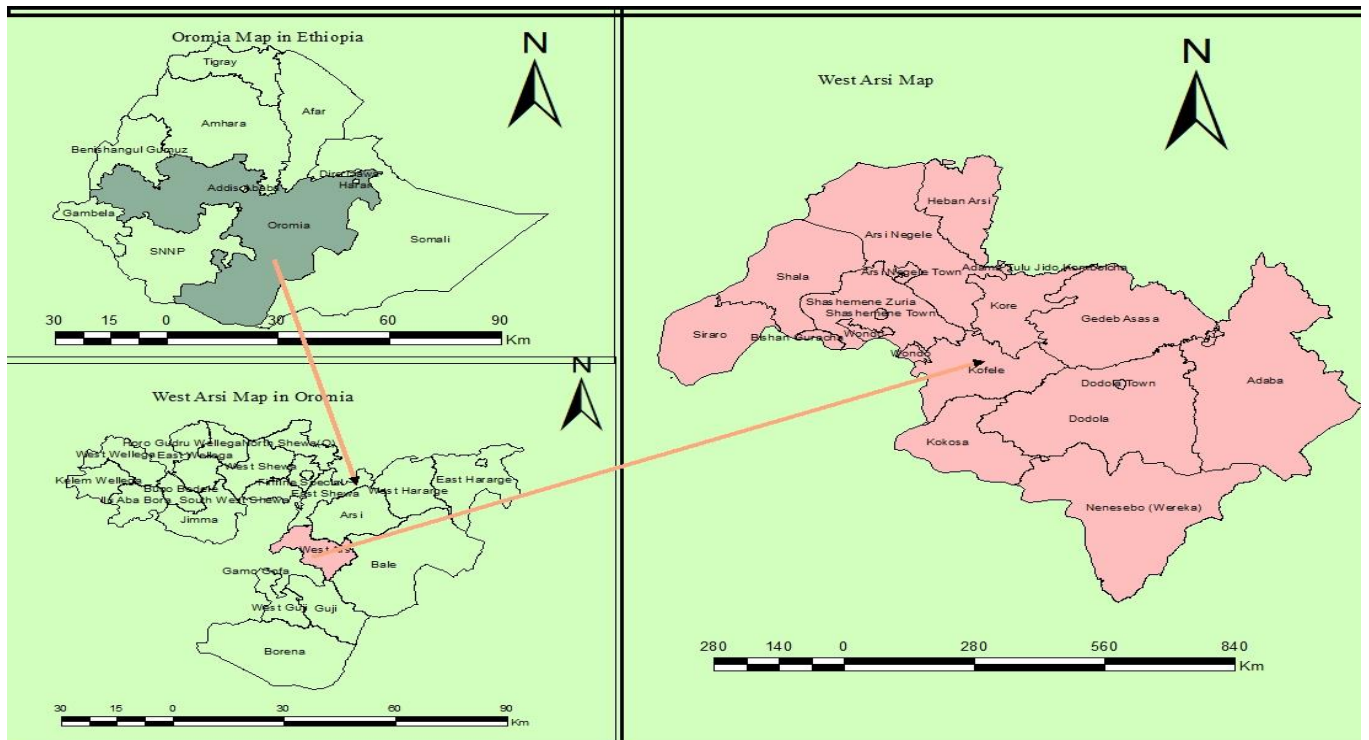
3.3.2 Specific objectives

- ✚ To assess core activities of the surveillance system in West Arsi zone, Oromia region, Ethiopia, 2019.
- ✚ To assess supportive activities of surveillance system in West Arsi zone, Oromia region, Ethiopia, 2019.
- ✚ To describe surveillance system attributes of measles in West Arsi zone, Oromia region, Ethiopia, 2019.

3.4 Methods and materials

3.4.1 Study Area

West Arsi is one of the twenty zones of Oromia regional state. It is located in rift valley region. Shashamane town is the administrative center of the zone it located at 250 km from Addis Ababa. The Astronomical location of West Arsi zone lies between 6012'29" to 7042'55" latitude and 38004'04" to 39046'08" longitude and has three geographical climatic zones, highland “Dega” >2500m altitude accounts for 45.5%, Mid-land “Weyinadega”(2000-2500m) altitude constitutes 39.6% and low land “Kola” <2000m accounts for the remaining 14.9% with mean annual rainfall between 800 mm and 1400mm and average annual temperature in the zone varies between 15 and 20. West Arsi Zone bordered with East Shewa to the north, SNNPRS to the west and south, Arsi to the northeast, Guji to the South East and Bale zones to the east. Most parts of the zone have elevation of ranging from 1500 to over 3300m and the total area of zone is 12556 km². According to national population census of 2007, in 2019 the total population of the zone is 2,691,913 of which male is 1,319,037(49%) and female is 1,372,876(51%). There are functional 4 hospitals and 84 health centers in the zone. West Arsi zone has 15 districts and 2 urban administrative boarders.



Map 3: Showing study area, West Arsi zone Oromia region, Ethiopia, in 2019

3.4.2 Study Period

The study was conducted from October 15 to November 5, 2019

3.4.3 Study Design

We conducted cross-sectional descriptive study

3.4.4 Study subject

The study subjects were zonal health office, district health office, health center and health posts which reports the notifiable disease to the zone.

3.4.5 Sample Size and sampling procedure

The zone was selected purposively out of 21 zones and 19 Town administrations in Oromia region depending on the prevalence of measles in the region and absence of system evaluation in that zone previously by discussing with Oromia regional health bureau public health emergency management health research directorate. From fifteen district of West Arsi zone six districts selected by simple random sampling. Also at district level we select health facility by simple random sampling two health centers from each district and then from each health centers we select one health posts

Table 19: List of selected districts, health facilities in West Arsi zone, Oromia region, Ethiopia, 2019

| Zone | selected district | Health Center | Health Post |
|----------------|-------------------|-----------------------------|------------------------|
| West Arsi Zone | Heben Arsi | Dawe langano Health Center | Buku Health Post |
| | | Goljota health center | Argeda Health Post |
| | Shalla | Abure health center | Albula Health Post |
| | | Awara health center | Alge Health Post |
| | Shashemenne | Chabi Dida health center | Oine Chefo Health Post |
| | | Toga health center | Daleti Health Post |
| | Wando | Buusaa health center | Shefama Health Post |
| | | Shesha health center | Borara Health Post |
| | Arsi Negele | Kersa health center | Kersa Health Post |
| | | Shala Bila health center | Alge Health Post |
| | Dodola | Negele Metema health center | Morke Health Post |
| | | Serofta health center | Alantu Health Post |

3.4.6 Data collection tools and techniques

We collect data by using semi-structured questionnaire which used previously by Ethiopian field epidemiology training program resident that, adapted from CDC system evaluation guideline of 2001 and World health Organization tools. By interviewing, district health office, health facility and health post PHEM officers or representatives. Observation of documents and copy of reports for surveillance and other secondary data review was done. In this data collection process one field epidemiology graduate and one Oromia regional health bureau PHEM officer participated.

3.4.7 Cases and operational definition

According to Ethiopia PHEM guideline, there are two types of case definition: standard case and community case definition(1).

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

Community case definition: is a case definition of disease and conditions adapted to suit to health extension workers (HEWs) and community members. The community case definitions were modified for simplicity and ease understanding by HEWs and the community members list of 14 disease or syndromes and conditions are identified to give simplified case definitions for community levels.

Measles Standard case definition

Suspected measles case definition: Any person with fever and maculopapular (non-vesicular) generalized rash, cough, coryza or conjunctivitis (red eyes) or any person whom a clinician suspects measles (1).

Confirmed measles case definition: A suspected measles cases with laboratory confirmation (positive IgM antibody) or epidemiological link to confirmed cases in an epidemic (1).

Community case definition at health post level

Measles: Any person with fever and vesicular, maculopapular or pustular rashes on any part of the body.

3.4.8 Operational definitions

Health institution: Includes, Zonal health office, district health office, Health centers and health posts.

Health facility: Includes, health center and health posts.

Case detection: is the process of identifying cases and rumor investigation to know the outbreaks (1).

Outbreak confirmation: the process of these identifying laboratory and epidemiological linked confirmation (1)

Reporting: Refers to the process by which surveillance data moves through the surveillance system from the point of generation (1).

Epidemic preparedness: Refers to the existing level of preparedness for potential epidemics (1)

Stakeholders: The organizations or individuals that generate or use surveillance data for promotion of health, prevention and control of diseases (2).

Usefulness: A public health surveillance system is useful if it contributes to the prevention and control of adverse health-related events (2).

Simplicity: Simplicity denotes the structure and ease of operation of the surveillance system (2).

Flexibility: A flexible public health surveillance system can adapt to changing information needs or operating conditions with little additional time, personnel, or allocated funds (2).

Acceptability: Acceptability reflects the willingness of persons and organizations to participate in the surveillance system (2)

Sensitivity: Sensitivity refers to the ability of the system to detect cases or outbreaks through trends in the surveillance data (2).

Positive predictive value: Predictive value positive (PVP) is the proportion of reported cases that actually have the health-related event under surveillance (2)

Representativeness: A public health surveillance system that is representative accurately describes the occurrence of a health-related event over time and its distribution in the population by place and person (2).

Stability: Stability was assessed by questioning the surveillance officers on the consistency of the system (2)

3.4.9 Data analysis

Data analysis was carried out by using Microsoft office excel window ten.

3.4.10 Ethical clearance

Latter of permission was written from Oromia regional health bureau public health emergency management and human health research directorate to West Arsi zone, then from the zone to district by zonal health office.

3.4.11 Dissemination of study result

The study result was submitted to Addis Ababa University School of Public Health, Department of Ethiopia Field Epidemiology Training Program (EFETP), Oromia regional health bureau public health emergency management directorate and West Arsi zone Offices in hard copy and soft copy.

3.5 Results

We evaluated West Arsi zone, Oromia region surveillance system. In this assessment a total of 31 sites were participated that means six district health office, 12 health centers and 12 health posts these leis under West Arsi zonal administration boarders. The main focuses of the evaluation was the core activities, supportive functions and system attribute components of the surveillance system. We focused on presence of different updated guidelines, availability of standard and community case definitions, different clinical registrations, capacity of laboratory service they have, availability of outbreak, presence of emergency preparedness and response plan activities, different integrated and supportive supervision conducted and any feedback given, availability of resources for surveillance activities.

3.5.1 Description of measles disease which selected for surveillance system evaluation

Starting from 17 WHO week measles cases were reported in case based and line list form West Arsi zone the peak reaches in 42 WHO weeks and the list cases were recorded in 22 WHO weeks.

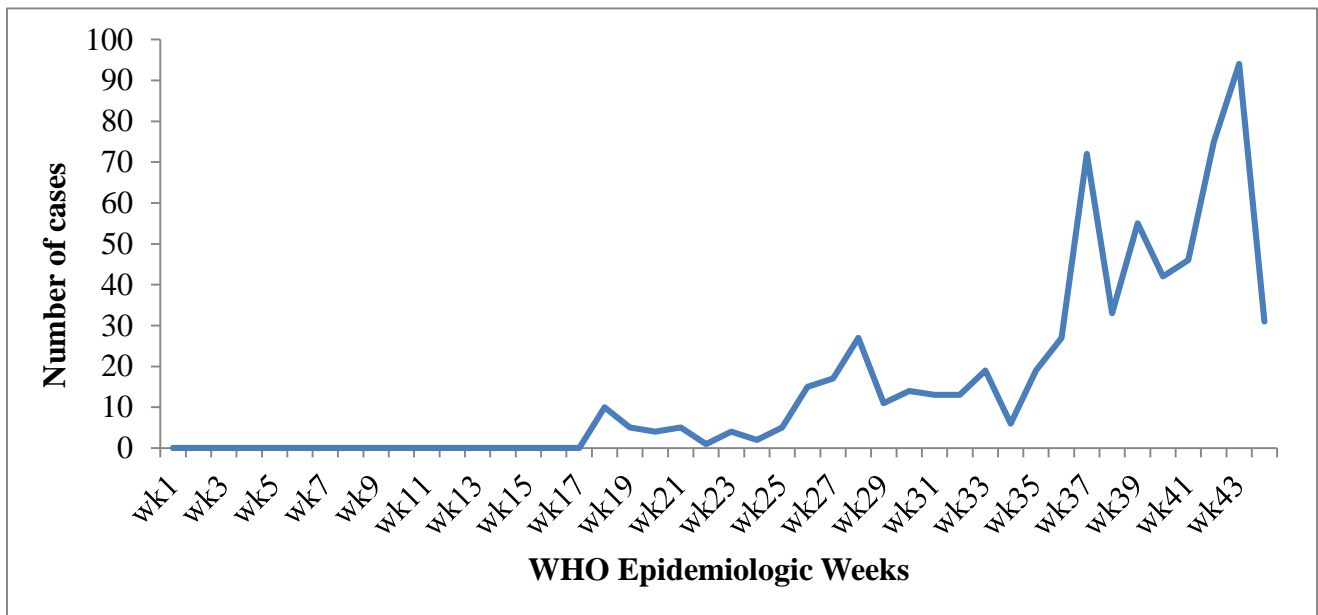


Figure 16: WHO weekly trends of Measles Cases in West Arsi zone Oromia region, Ethiopia, 2019.

In West Arsi zone there were 665 measles cases reported in 2019. Of these cases Dodola district was reported the highest cases and Arsi Negale town was report the lowest measles cases.

Table 20: Distribution of measles cases by district of West Arsi zone Oromia region, Ethiopia, 2019

| Name of District | Number of cases | % |
|--------------------|-----------------|--------------|
| Adaba | 42 | 6.3 |
| Arsi Negelle | 30 | 4.5 |
| Arsi Negelle Town | 1 | 0.2 |
| Dodola | 217 | 32.6 |
| Dodola Town | 36 | 5.4 |
| Gadab-Hasasa | 100 | 15.0 |
| Heban Arsi | 5 | 0.8 |
| Kofale | 13 | 2.0 |
| Kokosa | 3 | 0.5 |
| Kore | 52 | 7.8 |
| Nansabo | 74 | 11.1 |
| Shalla | 42 | 6.3 |
| Shashamane | 36 | 5.4 |
| Siraro | 8 | 1.2 |
| Wando | 5 | 0.8 |
| Grand Total | 665 | 100.0 |

Of these 665 measles cases reported and assessed there vaccination status 48% was unvaccinated, 30 % unknown and 22% was vaccinated respectively.

Table 21: Vaccination status of measles cases by district in West Arsi zone Oromia region, Ethiopia, 2019

| Districts | Vaccination status of cases | | |
|-------------------|-----------------------------|--------------|------------|
| | Unknown | Unvaccinated | Vaccinated |
| Adaba | 16 (38%) | 25 (60%) | 1 (2%) |
| Arsi Negelle | 10 (33%) | 11 (37%) | 9 (30%) |
| Arsi Negelle Town | 0 (0%) | 0 (0%) | 1 (100%) |
| Dodola | 78 (36%) | 112 (52%) | 27 (12%) |
| Dodola Town | 4 (11%) | 25 (69%) | 7 (20%) |
| Gadab-Hasasa | 20 (20%) | 67 (67%) | 13 (13%) |
| Heban Arsi | 1(20%) | 1 (20%) | 3 (60%) |
| Kofale | 3 (23%) | 8 (62%) | 2 (15%) |
| Kokosa | 0 (0%) | 3 (100%) | 0 (0%) |

| | | | |
|------------------------------|------------------|------------------|------------------|
| Kore | 23 (44%) | 13 (25%) | 16 (31%) |
| Shalla | 23 (55%) | 6 (14%) | 13 (31%) |
| Shashamane | 10 (28%) | 21 (58%) | 5 (14%) |
| Siraro | 3 (38%) | 0 (0%) | 5 (63%) |
| Wando | 5(100%) | 0 (0%) | 0 (0%) |
| West Arsi Zonal level | 200 (30%) | 320 (48%) | 145 (22%) |

3.5.2 Targeted diseases under surveillance

To do surveillance for all diseases and conditions are impossible due to resource scarce in terms of money, time and human resource. Due to this prioritization was important, accordingly, in previous at Federal ministry of health, public health emergency management core process which became Ethiopian public health emergency management institute given prioritization to those diseases that are interest at national and international levels and public health concern mandated by IHR. Firstly, during the formation PHEM processes owners at Federal ministry of health in 2007 identified 20 priority diseases to be included into the routine surveillance system. Of these, 8 diseases (malaria, meningitis, dysentery, typhoid fever, epidemic typhus, relapsing fever and sever acute malnutrition) are reported on weekly base and the rest 12 diseases (yellow fever, rabies, small pox, polio, NNT, measles, guinea worm, viral hemorrhagic fever, cholera, anthrax, avian human influenza and pandemic influenza) are reported on immediately base. Know due to emerging and re-emerging diseases and conditions, as well as, public health concerns, Ethiopian public health emergency management institute add two immediate and one weekly reportable disease. Those added and previously selected disease are listed in (Table: 22). Of these targeted diseases under surveillance reportable diseases these we select for surveillance system evaluation are measles which categorized as immediately reportable disease (Table: 22).

Table 22: List of immediately and weekly notifiable diseases/conditions, Ethiopia, 2019

| Sr. No | Immediate reportable disease | Weekly reportable diseases/condition |
|--------|--------------------------------------|--------------------------------------|
| 1 | Acute Flaccid Paralysis (AFP) /Polio | 1. Dysentery |
| 2 | Anthrax | 2. Epidemic typhus |
| 3 | Avian Human influenza | 3. Malaria |
| 4 | Cholera | 4. Meningococcal Meningitis |
| 5 | Guinea worm/ Dracunculiasis | 5. Scabies |

| | | |
|----|---|-----------------------------|
| 6 | Measles | 6. Sever Acute Malnutrition |
| 7 | Maternal death | 7. Relapsing fever |
| 8 | NNT | 8. Typhoid fever |
| 9 | Pandemic influenza (H1N1) | |
| 10 | Perinatal death | |
| 11 | Rabies | |
| 12 | Small pox | |
| 13 | Sever acute respiratory syndrome (SARS) | |
| 14 | Viral hemorrhagic fever (VHF) | |
| 15 | Yellow Fever | |

3.5.3 Epidemic preparedness and response plan

In all visited health institution they had said not experienced shortage of emergency stocks of drugs at the last one year, even though there were no separately allocated budgets for contingency drugs for in case of emergency and for epidemic preparedness plan and response activities. Due to this All visited district health office and zonal health department encountered shortage of budget.

Regarding existence and activities of Task Force Committee (TFC) and Rapid Response Team (RRT), there were established task force committees and rapid response team at zonal and visited districts and in 4/12 (33%) of visited health centers rapid response teams were not established. In others ways, the established TFC and RRT were identified that lack of continuous functionality in all health facilities and they had no regular meeting. All of visited health institution not used outbreak investigation check list except zonal health office.

Table 23: Availability of epidemic preparedness plan and response resource in visited health institutions of West Arsi zone, Oromia region, Ethiopia, in 2019

| Activities | Zonal level (n=1) | Distric t level (n=6) | Health center level (n=12) | Total (n=19) |
|---|----------------------|--------------------------|-------------------------------|-----------------|
| Availability of Epidemic response and preparedness plan | 1 | 6 | 8 | 15 |
| Availability of Emergency stock of drugs and supplies | 1 | 6 | 12 | 19 |
| Availability Outbreak investigation check list | 1 | 0 | 0 | 1 |

| | | | | |
|---|---|---|---|----|
| Availability of Rapid Response Team (RRT) | 1 | 6 | 8 | 15 |
| Availability of task force committee | 1 | 6 | 0 | 7 |
| Availability of budget for epidemics/emergency response | 0 | 0 | 0 | 0 |

3.5.4 Availability of national surveillance guide line, case definition and different forms

According to the assessment of visited health institution in west Arsi zone, the assessment did on availability of National Measles Guideline 21/31 (68%) of them have measles guide lines.

During this assessment 27/31 (87%) of them had standard case definitions for prioritized diseases from those assessed health institution. Those priority diseases with their case definition posted at visible area like outpatient department (OPD) were Neonatal Tetanus (NNT), Measles, Acute Flaccid Paralysis (AFP), Maternal Death, Cholera and Malaria in few facilities. In two districts health office and one health center there are standard case definition for measles not to be posted. These from assessed health facility and district health offices PHEM focal persons and health extension workers who interviewed for measles standard and community case definitions working in those assessed health institution 24/31 (77%) responded for selected disease as per guideline standard and community case definition. Among the assessed health centers and health posts 11/12(92%) and 10/12(83%) have standard and community case definition for measles respectively.

3.5.5 Availability of surveillance formats

During the assessment in visited health facility for availability of IDSR weekly and case based reporting in 33% of health facilities complains shortage of format in the last 6 months, they said, due to this reason they develop similar format on their computer and used at weekly bases by printing from their computers in office.

3.5.6 Surveillance data analysis and reporting mechanisms

In evaluated zone and at district health offices level there were assigned public health emergency management officers focal person, those assigned PHEM officers has responsible for surveillance of disease, reporting and data analysis. However, except using malaria monitoring chart, data analysis was not practiced at health facility and health post level, but to calculate prevalence and incidence the visited sites had appropriate denominator. Zonal health office does data analysis as usual routine activity and 2/6 (33%) of districts were analyzing the collected surveillance data by

time and place intermittently. Except zonal health office and one-third of districts, all of the visited health institution not easily know and respond decided threshold for notifiable disease. zonal health office, two districts and health centers which use Emails as mechanism of reporting surveillance data the rest all districts and health facility used phone call, message and paper form or hard copy to report surveillance data.

3.5.7 Weekly surveillance data reporting completeness and timelines rate

All visited health institutions not have any mechanism to trace timeliness of surveillance data, but according to zonal PHEM response average zonal timeliness of last three months were 76% and two districts and health centers 100% timely get their surveillances data report in the last three months. It is difficult for other health institution to calculate timeliness of surveillance data report. Regarding to completeness of reports, at zonal level there are 1,371 health institution expected to report weekly report for the last three months including private health facilities, but the zone received 1,200 reports as a result at zonal level completeness rate of surveillance data report was 1200/1371(88%). At district level completeness report of surveillance data were 100% completed in Wando and Shalla districts in the rest of districts the completeness report of surveillance data were 87% in Shashamane, 94% in Arsi Negelle, 89% in Dodola and 91% in Heben Arsi districts.

3.5.8 Outbreak investigation

There were an expectation of outbreak investigation and using the result of investigation for action at zonal and district level. But, in all districts and health facilities assessed, respondents said that, none of them hadn't investigated outbreak even though there was an outbreak of measles cases and cholera in almost all assessed districts, unless the zonal health office responded that, they had investigated cholera outbreaks.

3.5.9 Availability of Material and Logistics, Training, Supportive Supervision and Feedback

At zonal level budget allocation for PHEM activities was made, but at visited health institutions during this assessment they were responded as they had no budget for surveillance activities. Also at zonal level budget allocated from regional health bureau was not enough for all surveillance activities and most of the time they faced shortage of budget especially to conduct specific supportive supervision. Even though all visited district and health centers had no separate computers for PHEM activities, they used institutional computers together with other departments.

All assessed districts and health centers have electric power and two health centers have motorcycle. All districts have office telephone and other than one health centers not had office tell phone, even though, they use their personal mobile for surveillance data reporting, there were no facilitation of refunding or compensation mechanisms for their costs.

Table 24: Availability of resources for PHEM activities related to data management and communication in visited sites of West Arsi Zone, Oromia Region, in 2019.

| Material | Zonal level n=1 | District level n=6 | Health center Level n=12 | Health post level n=12 |
|-------------------|------------------------|---------------------------|---------------------------------|-------------------------------|
| Electricity | 100% | 100% | 100% | 8% |
| Motorcycle | 0% | 100% | 17% | 0% |
| Vehicle | 100% | 83% | 0% | 0% |
| Computer | 100% | 100% | 100% | 0% |
| Printer | 100% | 100% | 75% | 0% |
| Fax | 0% | 0% | 0% | 0% |
| Internet service | 100% | 16% | 16% | 0% |
| Megaphone | 100% | 67% | 67% | 0% |
| Office tell phone | 100% | 100% | 8% | 0% |

3.5.10 Training

At zonal level there were trained health professionals on selected priority diseases by regional PHEM officers, these working in PHEM department. In all districts and eight health facilities, PHEM officer/ focal person were trained on priority disease surveillance. According to report of zonal PHEM officer, all assessed health extension workers were not trained on surveillance system, active cases searching of outbreaks and selected priority disease, but they took orientation on cholera outbreak at primary health care unit.

3.5.11 Supervision

In all visited health institutions regular specific supportive supervision related to surveillance activities were not conducted for the lower levels. Other than West Arsi zone at all level an integrated supportive supervisions were conducted in quarterly bases which includes some surveillance system and priority disease within the checklists.

3.5.12 Feed back

To facilitate progress changes on surveillance system and notification of priority disease feedback plays a major role. In assessed health institutions, the result shown that, regular written feedback was not given for all visited health institution, however some health institution PHEM officers said that, they give feedback orally at a time when they support them and during review meeting by presenting their strength and observed gaps during supervision or supervision findings.

3.5.13 Case confirmation and laboratory capacity

All visited districts had standard operation procedures (SOP) of laboratory performance, as well as, for specimen collection and handling. Therefore, they had capacity to test the sample of some cases which is present at their laboratory facilities for those they have mandates, reagents and materials. In another way they had a capacity to transport specimens to higher levels for confirmatory test and also confirm for some cases like malaria tests by golden standard microscope. Laboratory of all visited health centers had ability to collect and diagnose sputum, stool and blood specimen.

3.5.14 Description of attributes of the surveillance system

3.5.14.1 Usefulness

All visited districts health office; health facilities and zonal health office agree that a surveillance system is useful if it contributes to the prevention and control of adverse health events. In all visited health institutions respondents had a common understanding of early detection of epidemic of disease under surveillance as the major use of surveillance system. That means they believe that the surveillance system helps to detect an outbreak of measles cases on time, estimate the magnitude of morbidity and mortality and used to detect factors related to the disease, as well as, permit the assessment of the effect of prevention and control program of measles. The system also helps them to secure budget and drugs for surveillance activities and outbreak anticipated diseases (2).

3.5.14.2 Simplicity

The simplicity of a public health surveillance system refers to both its structure and ease to operate. In this assessment, all focal persons agreed that the case definitions of these diseases for identification of suspected cases are easy to understand and could be applied by all levels of health professionals, as well as, community case definitions at community and health extensions. In all health facilities and district health offices, all respondents were familiar with case definition of

selected diseases. All respondents said it took less than fifteen minutes to report the weekly report by phone call or messages. However, the flow of information was easy, that means the follow of data from the community to health facility follow to district health office follow to zonal health office follow to regional health bureau, this was a simple pathway, unlike the confirmatory laboratory result and particular feedback was not simple as it should be.

3.5.14.3 Flexibility

The surveillance systems need to be flexible, because there are emerging and reemerging diseases, which may need to be included in the system. According to our assessment all visited health institution responded as the public health emergency management system made the reporting format flexible to report other new events under immediately and weekly reportable case based condition with namely as other specify to fill on without any difficulty because of this, it was flexible to add any emerged diseases. At a time we add scabies disease without changing the weekly reporting format by using the blank space provided for adding newly emerging diseases and conditions.

3.5.14.4 Data quality

Data quality reflects the completeness and validity of the data recorded in public surveillance system. It is examining by calculating the percentage of “unknown” or “blank” responses to items on surveillance forms, also quality of data is influenced by the performance of the screening and diagnostic tests (2).

Depending on the above definition in visited health institution out of assessed health institution, at zonal health office level, there was no unknown and blank space on the copy of surveillance reporting formats, due to at zonal health office the data quality is 100% and at district health office and health facilities on two districts and three health facility the copy of surveillance reporting formats were have lack of some variables. Accordingly, on those assessments at four districts there were 100% data quality and in two districts missing of some variables and not writing on the space provided for reports were present because of this it is less than 100% as well as at health facility level there were averagely 83% of data quality assured.

3.5.14.5 Acceptability

Acceptability reflects the willingness of persons and organizations to participate in the surveillance system (2). Participation of all health workers, stakeholders, partners and private health institutions in reporting system of surveillance activities in regular pattern is a major attribute for acceptability

of the system. It is acceptable at all level if, the public health surveillance system encompasses to provide accurately, consistent, complete, and timely reported data. According to our assessment these trained and not trained assigned health workers staff and some privet health institutions participated in the surveillance system. But, there was a gap to participate all privet health institution. It may be due to lack of training, follow up, as well as, not given attention for priority reportable diseases.

3.5.14.6 Representativeness

Representativeness can be evaluated in terms access to health services, health service coverage and health seeking behaviors of the population. In our evaluation we focused on measles diseases prevention and control service availability and health service coverage of the zone and districts. Our result was the health service for measles given in all health facility of the zone and the health coverage of the zones were 87 %. In another way the report of measles line list have sex, age and place of residence because of that it was representative due to have a chance of identifying the affected risk group by calculating their sex category, place of residence and age groups. Unlike the measles line list the weekly surveillance reporting format lucks personal characteristics like age and sex and other possible risk factors to identify the affected age group and propose for futures prospective readiness and prevention of outbreaks.

3.5.14.7 Timeliness

The timeliness of a public health surveillance system should be evaluated in terms of availability of information for control of a health-related event, including immediate control efforts, prevention of continued exposure, or program planning. During recent measles outbreak time identification of cases were good at health facilities, but delaines of giving feedback to initiate control and prevention, as well as, getting laboratory result from Ethiopian public health institutes are not as required time period.

3.5.14.8 Sensitivity

The sensitivity of a surveillance system can be considered on two levels, First, at the level of case reporting, sensitivity refers to the proportion of cases of a disease (or other health-related event) detected by the surveillance system. Second, sensitivity can refer to the ability to detect outbreaks, including the ability to monitor changes in the number of cases over time(2)

In this particular system evaluation, the sensitivity was measured by the extent of the system to identify all measles cases in the target population by the proportion of the total number of cases in

the population under surveillance being detected, when we observe generally in all districts there were a confirmed measles cases this results a true outbreak, but sensitivity needs false negative results these later tested by golden standard tests to become positive, in our cases there were no laboratory tests in local level and to became confirmed at national level, so it should be difficult to calculate sensitivity in this system evaluation.

3.5.14.9 Predictive value positive (PVP)

Predictive value positive (PVP) is the proportions of reported cases that actually have the health-related event under surveillance. Refers to “to what extent are reported cases really cases” from all reported positive cases by checking standard measurement (2). In this evaluation, measles positive predictive value was measured by standard case definition and positive test. Hence, positive predictive value calculated from all suspected measles cases that fulfilled standard measles case definition and positive at central laboratory.

PVP= True positive test for measles/Total suspect measles cases these their blood samples sent to Ethiopia public health institute multiplied by hundred. This was calculated as (Table: 25)

Table 25: positive value predictive of measles case based surveillance with blood samples collected from six visited district for confirmation in West Arsi zone Oromia Region, Ethiopia, 2019 236,520

| District | Total population | Expected Measles cases/100,000 population | # of blood sample sent to lab. | IgM Posi tive | PVP (%) |
|-----------------------|------------------|---|--------------------------------|---------------|-----------|
| Arsi Negele | 206,700 | 4 | 6 | 4 | 67 |
| Dodola | 236,520 | 5 | 21 | 13 | 62 |
| Heban Arsi | 78,040 | 2 | 1 | 0 | 0 |
| Shalla | 214,008 | 4 | 14 | 6 | 43 |
| Shashamane | 281,247 | 6 | 7 | 2 | 29 |
| Wando | 122,197 | 2 | 1 | 1 | 100 |
| West Arsi Zone | 2,755,726 | 55 | 58 | 44 | 76 |

3.6 Discussion

Zonal health office, all districts and two-third of health center had emergency preparedness and response plan. From the visited health institution zonal health office, all districts and two-third of health facilities established task force committee and rapid response team. Greater than three-fourth of the visited health institutions had PHEM, malaria and measles guide line as well as, standard and community case definition. Except at zonal health office there were no surveillance data analysis at districts and health facilities and shortages of priority diseases reporting pad. Greater than two- third of visited health institution used phone call and messages for reporting of surveillance data. Specific supportive supervision and written feedback was not performed for all visited health institution. Lack of basic integrated surveillance training and turnover of trained PHEM officer was encountered in visited health institution. In all visited health institution level there were no budget and logistic support for emergency preparedness and response plan. According to zonal PHEM officer report 76% and 88% of timeliness and completeness reports were identified in the last three months of performance respectively.

Even though there were an emergency preparedness and response plan at zonal health office, all districts and two-third of health centers was not supported by budget and logistics unless the outbreak was occurred. But at district administrative council level there is a contingency budget which only mobilized after an outbreak has occurred. This was bringing delays of rapid response for the existed events due to delay of decision on contingency budgets by district administrative council. However, all districts and zonal health office were had that established task force committee and rapid response team; they were not working regularly and not formulated with all necessary health professionals.

According to national PHEM guide line there were thresholds for all priority diseases, but except zonal health office and one-third of districts, all of the visited health institution not easily know and respond the decided threshold for the priority disease. This shown that utilization of surveillance manuals and guidelines is not effective at districts and health facilities level.

In all visited health institution; however surveillance officer was responsible for data collection and analysis except, at zonal health office level which weekly bulletin was prepared and at facility level performing of malaria monitoring chart, there were not data analysis in terms of place, person and time.

There was a shortage of reporting pad in some districts and health facilities, that were one-third of the visit health institution lacks reporting format pad and as well as available weekly reporting formats lacks some important variables like sex, age and possible risk factors which is helps for epidemiological analysis to take appropriate action for targeted groups. Due to this reasons these lacks reporting formats health institution used by copying the previous forms, manually preparing the formats and modifying it, these resulting using different types of reporting formats and collecting important indicators other than reporting format for action. Except zonal health office and two districts and two health centers which use Emails as mechanism of reporting surveillance data, all districts and health facilities used personal mobile call, messaging and hard copy for reporting of surveillance data and there expenses would not be replaced by office, this was resulting demotivating the PHEM officers to use personal mobile call and messaging for surveillance data reporting.

The common reasons given, for these why not they conduct specific supportive supervision for their lower level health institutions were shortage of manpower, work overload, lack of logistics and resources. Also there were no feedback systems, weekly and monthly monitoring of notifiable disease trends. Feedback was given for health facilities during the review meeting as a finding of supportive supervision. This finding showed as supervision activities and written feedback was not regularly done for all districts and health facilities.

There were no gap- filling training in visited health institution; this was resulted in that the visited health facility PHEM officer complained, they not have knowledge on newly emerging infectious diseases and way of filling the report as well as tracing mechanism of timeliness of surveillance data reports.

The timeliness report of West Arsi zone was 76% which was less than national target of 80% (1) and for other health institutions we not calculate timeliness for reporting surveillance data because of absences of tracing mechanisms for timeliness in these health institutions. In the last three months (from July to September), on average zonal health institution facilities, including private health facility reporting completeness rate was 88% which was greater than national 80% targets (1).

Laboratory of health facility had a capacity to collect specimen and handling. They also test the sample of some cases which is present at their laboratory facility and under their mandates and transport specimens to higher levels for these needs confirmatory test and confirm for some

epidemic and endemic cases. All visited health centers had ability to collect and diagnose sputum, stool and blood specimen.

All stakeholders agreed that the system is simple, easy to understand, representative and can accommodate modifications. This was shown by the weekly reporting formats having a place of space where to input additional new events if occurred to accommodate for reporting. The system allowed them to secure budget and drugs for surveillance activities and outbreak anticipated diseases respectively. However, late result report from central laboratory on measles specimen sent for confirmatory test raised as challenge in early detection and management of outbreaks. The system also acceptable in private and governmental health institution, but due to lack of training and orientation some private health institutions were not participated in notification (reporting of daily and weekly) of priority diseases.

3.7 Conclusion

Emergency preparedness and response plan was not uniformly available at visited health institution, as well as, some health facilities not established rapid response team. All districts establish task force committee and rapid response team. Specific supportive supervision and written feedback was not performed for all visited health institution. At district and health facility level surveillance data was not used for action or for detecting outbreak or events through diseases trained analysis and by setting threshold for priority diseases that, except at zonal level all of them not analyzed data by place person and time. The main reporting mechanism of surveillance data was phone call, message and hardy copy. There were no budget and logistic support for emergency preparedness and response plan. There were 76% and 88% of timeliness and completeness reports were respectively identified in the last three months of performance at zonal level. At district and health facility level there were no tracing mechanisms for timeliness. All visited health centers had ability to collect and diagnose sputum; stool and blood specimen. The surveillance system was found to be simple, useful, flexible, acceptable, and representative. The surveillance system implementation status of zone was need improvements especially at district and health facility level due to lack of the expected objective of public health action like regular data analysis, interpretations, specific supportive supervisions and feedback dissemination to which it may be significant.

3.8 Recommendation

West Arsi zone health office needs to strengthen the well-functioning of surveillance system, core activities and supportive functioning of the systems at zonal, district and health facility level including private.

- Emergency preparedness and response plan should be supported by budget at all levels.
- It should need regular supportive supervision and giving of feedback for identified gaps related to surveillance of measles cases as well as, for priority disease.
- Availing of standard and community case definition and posting on the facility wall should be important for updating the health professionals to rehearsing them during the diagnosis and treatment.
- Availing or facilitating for all health institutions surveillance data reporting pad and reimbursing or compensating of costs that they fee for reporting the surveillance data for those use personal phone call and massaging.
- Epidemiological data analysis including important variables should be performed at all level.
- Established district task force committee and facility rapid response team needs continuous functionality. This will be supported by regular meeting and setting direction.
- Due to turn over of PHEM officer and emerging of new cases, updating the assigned PHEM officer as well as health professionals including private health facility through review meeting and gap filling- training program.
- Establishing how to trace timeliness report at district and facility level is important to take action or alerting the occurred events or outbreaks for the concerned body or institution too early.

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Chapter Four: Health Profile Description Report

4. Health Profile Description of Ada'a district, East Shewa zone Oromia region, Ethiopia, 2019

Abstract

Introduction: Health profile is a technique of collecting, analyzing and interpreting information from several and various sources in order to advance understanding of the health of a community. It is a vital to provide an over sight of the condition and trends of prioritizing health and health related problems of public health of the district to designing appropriate intervention. The assessment was used for Ada'a district health office resource allocation and priority setting.

Methods: A cross-sectional descriptive study was conducted that comprised discussion and interview using standard check-lists those used previously for this purpose by EFETP, to collect data from Ada'a district health office, health institutions and other sectors of the district. We use a Microsoft excel 2010 to analyze the data.

Results: The total population of Ada'a district is estimated to be 144,086 of which 72,243 were males and 71,843 were females in 2018 district health facility to population, ratio 1:28,816 for health centers and 1: 6550 for health posts. Average road coverage of the district was 28.8 % and 60.7% has supplied with potable water. The pit latrine coverage in the district was 83%. There are 97% contraceptive acceptance rate, 84% antenatal coverage and 85% under five year vaccination coverage's. The incidence of upper respiratory tract infection and pneumonia are a top leading cause of outpatient morbidity 19.3% and 15% cases respectively. There is no mortality data of vital statics registrations in the district. Out of allocated district budget health offices get (8.9%) Birr both capital and running cost.

Conclusion: Mortality rate registrations like neonatal, infant and child mortality rate should be registered. Appropriate strategies and design should be needed to improve safe and clean water supply of the district. Mix and qualification professional staffing are needed for health centers as per standard.

Key word: Health profile/ Ada'a East Shewa, 2019

4.1 Introduction

4.1.1 Background

Health profile description is a system of collecting, organizing and summarizing, Presenting and discussing of health data and important health related indicators in specific time and area (1). It is a process of gathering, analyzing and interpreting information from different, multiple and diverse sources in order to develop understanding of the health of a community. In addition, it is important to identify and prioritize the health problems at all levels of health system to prepare informed decision for action to prepare plan, as well as, to allocate resource depending on tangible reasons (1).

Health profile descriptions describes health and others health related conditions, demographic, socio-economic, political, cultural and others aspect of a particular geographic areas of interest (1).

Health profile descriptions is the process of perusing health systems, identification of problems, prioritization of identified problems using stated criteria, the known criteria was; public health importance, magnitude of the problem, severity or seriousness of the problem, community and political concern and feasibility of the interventions (1).

It is a vital to provide an over view of the situation and trends of prioritizing health and health related problems of the community for planning and appropriate intervention. It also includes both previously identified health concern and those newly identified and emerging issues (1).

Comprehensive health profile intends to serve, as a tool to monitor progress in the health of the population world health Organization collaboration with its Member States will strengthen the national and international health information systems, and enable the generation of timely and reliable evidence to assess the health condition and trends, and the health system response. Most important, it will deliver the information needed by health planers and decision-makers (2).

In in England, local Authority Health Profiles provide an overview of health profile for each local authority. Consequently, they pull existing information in one place. The profiles had proposed to help local government and health facilities make plans to improve the health of their local population and reduce health disparities (3).

In Alexandria health department health profile serves as initial for government, non-governmental, profit and non-profit agencies and other stakeholders seeking to monitor and improve health in the

City of Alexandria. It has compiled a summary list of key health indicators that focus on health behaviors, morbidity rates of illness or disease and mortality rates of death (4).

In Ethiopia, health profiles provide an overview of the state condition and trends of priority public health problems and the health system profile these are description of institutional backgrounds and challenges of nationwide responses. They help for evidence based health police building through a compressive and continues analysis of the changes of the health situation and health system in the country (2).

Health profile of the district was a compressive document that contains information about the historical back ground and location of the district, political and administrative structures, and demographic features of its population, health status and indictors of the district, about endemic and newly emerging disease of the district, availability of basic infrastructure and distribution through the district , education and socioeconomic status of the district, (2).

Generally, health profile is a comprehensive gathering of information about health and health related problem. However, in previous time in Ada'a district, health profile data was not prepared and documented as organized ways. Therefore, the main objective of this document is to understand the status of Ada'a district health office, health related indicators, and to understand the current health situation of the community and to describe the major health problems of the district.

4.1.2 Rationale of the study

Health profile makes data, which used at community level. Describing the health profile of Ada'a districts had important advantages to show current gaps in the area of community health and management of work force. Using this health profile as a bases line decision maker of the district focuses on addressing gaps and for farther identification of district health related risk factors thinks to examine the health problems. This description was important for priority setting and understanding of community social, economic and geographical aspects of health problems.

4.2 Objective

4.2.1 General objective

To describe health and health related data and priorities community health problems for Ada'a district of East Shewa zone, Oromia region, Ethiopia, in 2019

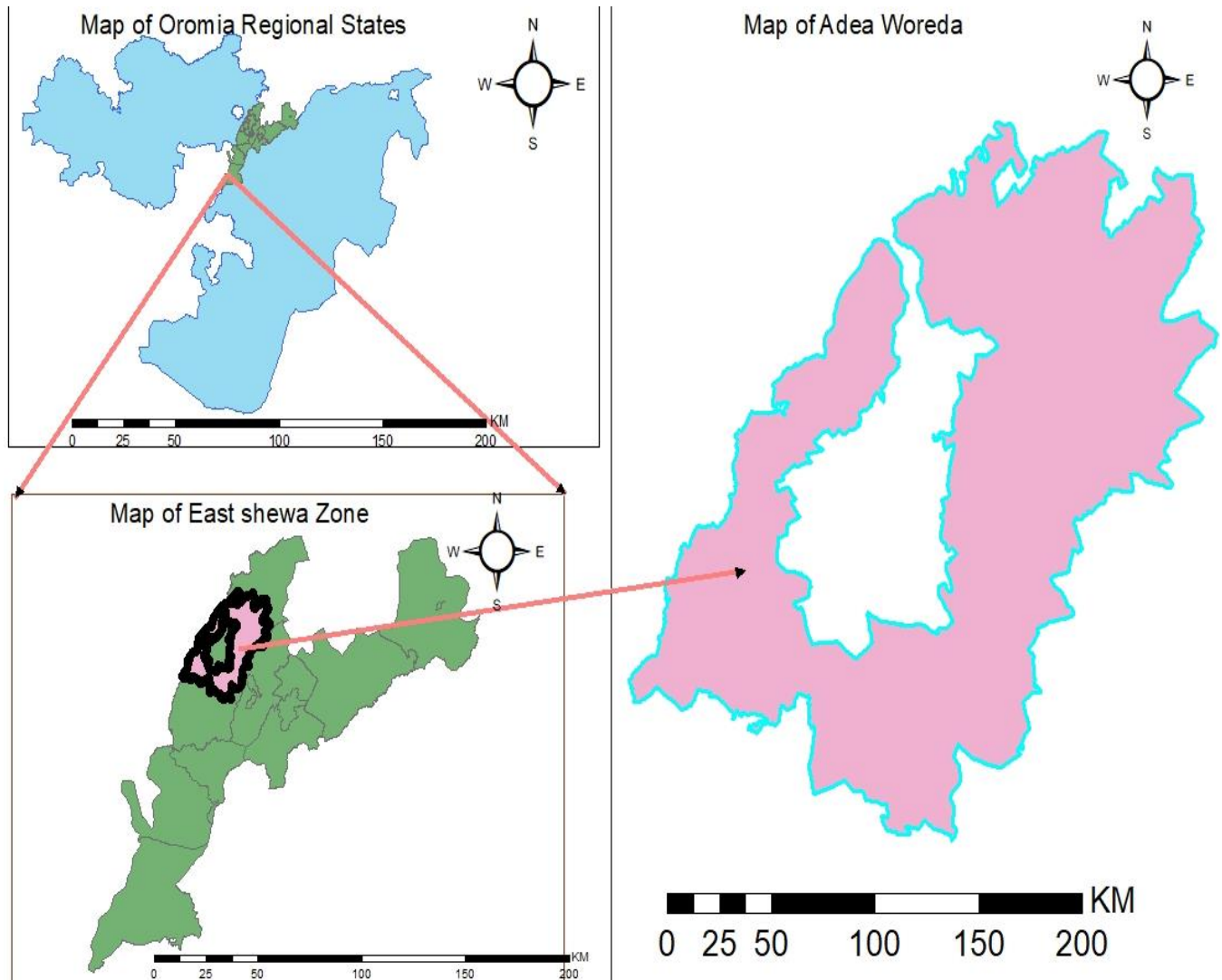
4.2.2 Specific objectives

- To describe health and health related problem of Ada'a district in East Shewa zone, Oromia region, Ethiopia, 2019.
- To describe level of health service coverage of Ada'a district in East Shewa zone, Oromia region, Ethiopia, 2019.
- To describe human resources of Ada'a district in East Shewa zone, Oromia region, Ethiopia, 2019.
- To priorities community health problems of Ada'a district in East Shewa zone, Oromia region, Ethiopia, 2019.

4.3 Methodology

4.3.1 Study Area

Health profile description conducted in Ada'a district, which found in East Shewa zone, Oromia Region. It was 47 kilometer far away from the capital city of country Addis Ababa to the south – East and 52 kilometers far away from Adama the capital town of East Shewa Zone. The altitude of Ada'a district ranges 1400m -1600m above sea level. It consists of two agro-climatic zones. These are Weynadega (94 %) and Kola (6 %). The average annual temperature of the district was been between 16°C - 24°C and Annual rainfall is 861mm³. It bordered on the north by Gimbechu, on East by Lume, on the South by Liben chukala and Akaki district and Dukam towns.



Map 4: Showing study area, Ada'a District, East Shewa Zone Oromia region, Ethiopia, 2019

4.3.2 Study period

All needed data of health indicators and vital statistics of the district in the past years was collected from February 20 to March 2, 2019

4.3.3 Study population

All population of Ada's districts and sectors under districts administration office

4.3.4 Study Design

Retrospective descriptive cross-sectional studies were conducted

4.3.5 Sample size and sampling technique

Purposive sampling technique used for health profile description of Ada's district and no need to sample size determination. The study conducted on already documented, available data that collected from different concerned district sectors.

4.3.6 Data collection methods and procedures

Before starting data, collection brief discussion with district health office and different sectors as contacted respectively on the purpose and benefit of the collected data. Standard questioners were used by adapting previously used by field epidemiologist for the purpose of health profile data collection and include some indicators by referring different field epidemiologist outputs. Data collection process includes different district sectors and within a sector different departments. These are district health office, Health center, Administrative office, Education office, Water and Energy office, Agriculture office, social affairs office and Culture and Tourism office.

4.3.7 Data analysis procedures

Collected data from different sectors were compiled, processed and analyzed by using window ten Microsoft excels.

4.3.8 Data quality assurance

Data quality checked by observing the filled questionnaires its completeness

4.3.9 Ethical consideration

Support letter written from Oromia regional health bureau to East Showa zonal health office and then to respective district health office in order to get permission from Ada's district.

4.3.10 Dissemination of results

The finding of this results both in hard copy and soft copy were communicated with Ada's district health office, East Shewa zone, Oromia regional health bureau, Addis Ababa University School of Public health Field Epidemiology department.

4.4 Results

4.4.1 Historical Back ground

Ada'a district is one of the district of East Shewa zones in Oromia Region. According to the cultural and tourism office of Ada'a district told us, Ada'a district previously combined with Liben Chukala district. Its former name known as Ada'a Chukala and go to its current name Ada'a district in 1998 E.C. Ada'a district is bordered on the north by Gimbechu district, on East by Lume district, on the South by Liben chukala district and by Akaki district and Dukam town on the West direction, which was found in Finfinne surrounding special zone. (Source cultural and tourism bureau)

4.4.2 Geography and climate

Bishoftu towns had used as a capital town of Ada'a district, but Bishoftu town has its independent own administrative organization. It was located at 47 kilometer away from the capital city of country Addis Ababa to the South-East and 52 kilometers far away from Adama the capital town of East Shewa zone.

The altitude of Ada'a district ranges 1400m-1600m above sea level. It consists of two agro-climatic zones. These are Weyna- dega (94 %) and Kola (6 %). The average annual temperature stated to be between 16^oc - 24^oc and Annual rainfall is 861mm³. (Taken from 2010 E.C report of Ada'a agricultural office)

4.4.3 Administrative and political structure

Administratively, the district had divided in to twenty- two (22) kebeles, which farther divided in to urban 4, and rural 18 kebeles and the kebeles farther divided in to gotis, which totally consists of sixty-six (66) gotis the smallest administrative bodies of the structures. and each kebele was found out of Bishoftu town, but the district administrative bodies offices were found in Bishoftu town.

4.4.4 Demographic information

According to 2007 Central Statistics Agency (CSA) (5), population estimation the total population of Ada'a district estimated to be 144,086 of which 72,243 were male and 71,843 were Female in 2010 E.C. Among these total population 31,702/144086 (22%) of them were residing in urban area while 112,384/144086(78%) of them were live in rural area. Total less than one, under five and under fifteen year constitutes 4,640, 23,673 and 31,886, respectively. Those age groups want more attention than the other age groups and also economic dependent on the productive age groups.

Child bearing (15-49) age groups of women accounts for 38,384 (22.13%) of a total population. Regarding ethnicity, religion and language there was no updated data without the 2007 national census which describe the dominant ethnic were Oromo followed by Amhara and the dominant religion orthodox Christianity, followed by protestant and the dominant spoken language, Afaan-Oromo followed by Amharic (6).

Table 26: Estimated population distribution by kebeles and Age category in Ada’a district, East Shewa Zone, Oromia Region, in 2018

| Name of Kebele | Total population | Total HH (4.8) | <1 years (3.22%) | <5 years (16.43) | < 15 years (47.61%) | Women reproductive age (15-49) (22.13%) |
|-----------------------|-------------------------|-----------------------|----------------------------|----------------------------|-------------------------------|--|
| Akako | 8484 | 1768 | 273 | 1394 | 4039 | 1878 |
| Ketaba | 8133 | 1694 | 262 | 1336 | 3872 | 1800 |
| Godino | 7924 | 1651 | 255 | 1302 | 3773 | 1754 |
| Koftu | 5364 | 1118 | 173 | 881 | 2554 | 1187 |
| Tulu | 5779 | 1204 | 186 | 949 | 2751 | 1279 |
| Kerfe | 8016 | 1670 | 258 | 1317 | 3816 | 1774 |
| Deko | 6224 | 1297 | 200 | 1023 | 2963 | 1377 |
| Hedi | 7508 | 1564 | 242 | 1234 | 3575 | 1662 |
| Ketila | 7541 | 1571 | 243 | 1239 | 3590 | 1669 |
| Denkeke | 8410 | 1752 | 271 | 1382 | 4004 | 1861 |
| Ude | 5525 | 1151 | 178 | 908 | 2630 | 1223 |
| Gobaseye | 5481 | 1142 | 176 | 901 | 2610 | 1213 |
| Giche | 5909 | 1231 | 190 | 971 | 2813 | 1308 |
| Golbo | 4383 | 913 | 141 | 720 | 2087 | 970 |
| Bekejo | 7671 | 1598 | 247 | 1260 | 3652 | 1698 |
| Gol-dertu | 6017 | 1254 | 194 | 989 | 2865 | 1332 |
| Chalebe | 5450 | 1135 | 175 | 895 | 2595 | 1206 |
| Dire shoki | 6496 | 1353 | 209 | 1067 | 3093 | 1438 |
| Dire | 7860 | 1638 | 253 | 1291 | 3742 | 1739 |
| Wejitu | 6482 | 1350 | 209 | 1065 | 3086 | 1434 |
| Tedecha | 5123 | 1067 | 165 | 842 | 2439 | 1134 |
| Y/Silase | 4306 | 897 | 139 | 707 | 2050 | 953 |
| Total | 144,086 | 30,018 | 4,640 | 23,673 | 68,599 | 31,886 |

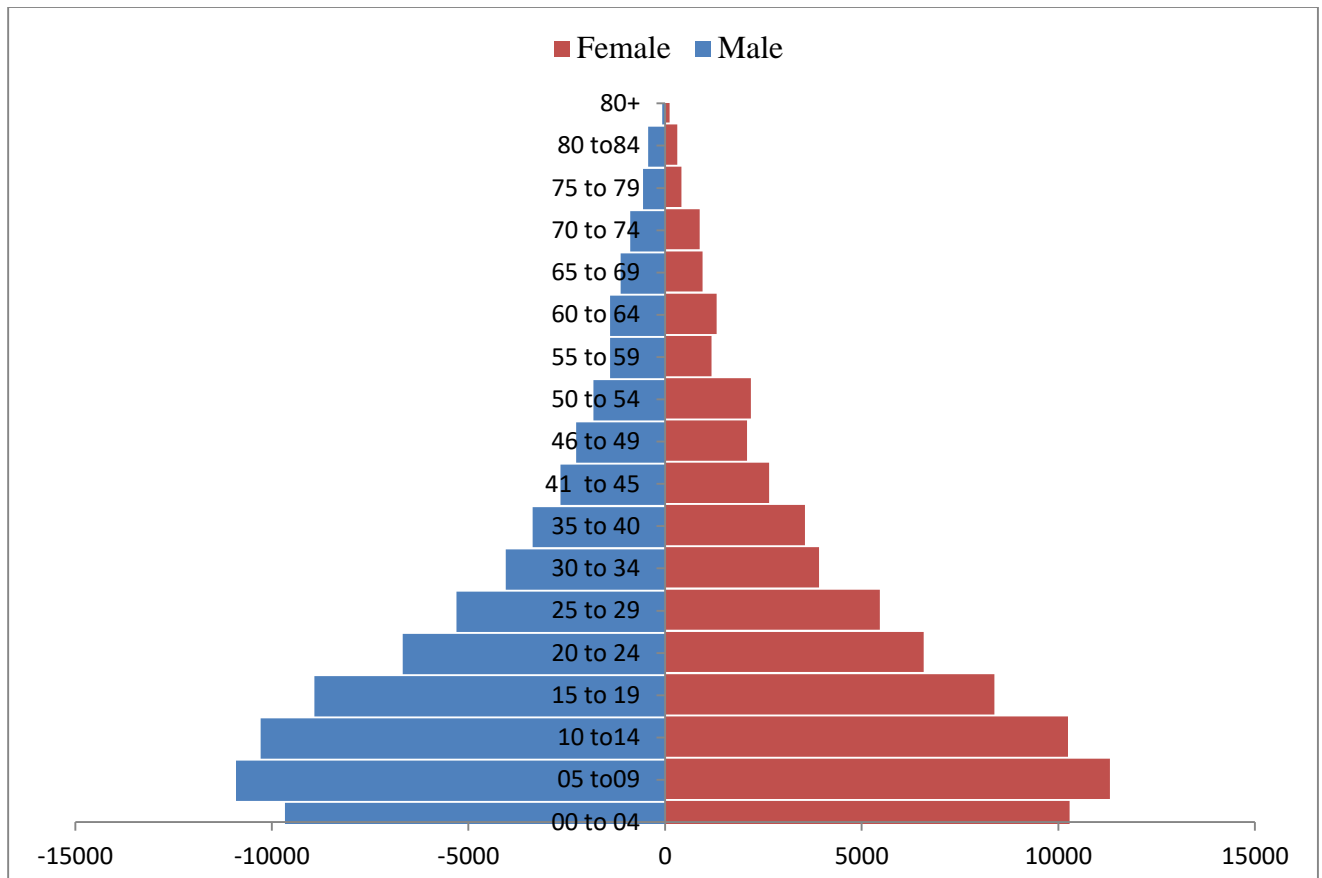


Figure 17: Population pyramid of Ada'a district East Shewa zone, Oromia region, Ethiopia, 2019

4.4.5 Education

According to several studies, people has observed to have differences in health status, exposure to health risks, access to health services and health seeking behavior because of their differences in educational status (7). In Ada'a district, there are 63 governmental and privet schools were present. Out of total, there were four high and fifty-nine primary schools in the district. There was no preparatory school in the district because of that the district student used by near Bishoftu town preparatory schools when they complete their high schools level class. The total numbers of target students to enroll in 2019 both at primary and secondary school were 22,439 which categorize as 11,777 Males and 10,662 Females. Out of the total target 28,032/22,439 (80 %) were enrolled. Female to male ratio indicates 1:1.1 and out of total enrolled students 70 had dropped from their education program that categorized in to 27 Males and 43 Females due to different reasons: like 12 students were due to low income of their family they were participate in daily laborers, 5

students caused by diseases, 6 students lack their family supports, 15 students for temporary profit, 10 students due to internal displacement and the reasons of 22 students were not mentioned.

Regarding to school infrastructures out of total schools in Ada'a district 18/63 (28.6%) have tap water and 1/63 (1.5%) have well water and 22/63 (35%) have latrine for male and female separately and 38/63 (60%) have only common latrine. About electric powers 13/63 (20.6%) have electricity power, 11/63 (17.5%) have solar power, and all schools are access to road transportation.

Concerning the primary and high school teachers out of total 196/476 (41%) was Female and the total teacher to student ratio in primary school was 1: 52 and in high school was 1: 21.

Table 27 : Distribution of schoolteachers and students in Ada'a district, East Shewa zone Oromia region, Ethiopia in 2019

| Category of school | Number of teachers | | | | | | | | | Number of students | | | | | |
|--------------------|--------------------|---|-------|---------|-----|-------|------------|----|-------|--------------------|-----|-------|-------|-------|-------|
| | TTI | | | Diploma | | | 1st Degree | | | Total | | | M | F | Total |
| | M | F | Total | M | F | Total | M | F | Total | M | F | Total | | | |
| 1-4 | 3 | 4 | 7 | 97 | 97 | 194 | 8 | 2 | 10 | 108 | 103 | 211 | 6850 | 6222 | 13072 |
| 5-8 | 1 | 1 | 2 | 81 | 61 | 142 | 41 | 13 | 54 | 123 | 75 | 194 | 4180 | 3845 | 8025 |
| 9-10 | 0 | 0 | 0 | 0 | 0 | 0 | 48 | 16 | 64 | 48 | 16 | 64 | 747 | 595 | 1342 |
| Total | 4 | 5 | 9 | 178 | 158 | 336 | 97 | 31 | 128 | 280 | 196 | 472 | 11777 | 10662 | 22439 |

Table 28 : School Ages enrolled and drop out of students in Ada'a District, East Shewa zone, and Oromia region in 2019

| Types of school and number of student | Total school Age planned Children to enroll | Total school Age children's enrolled | % | Drop out | | | % |
|---------------------------------------|---|--------------------------------------|------|----------|--------|-------|------|
| | | | | Male | Female | Total | |
| Number 1-4 | 16,089 | 13072 | 81 | 24 | 26 | 50 | 0.38 |
| Number 5-8 | 9,625 | 8025 | 83.3 | 3 | 17 | 20 | 0.25 |
| Number 9-10 | 2,318 | 1,342 | 58 | 0 | 0 | 0 | |
| Total | 28,032 | 22,439 | 80 | 27 | 43 | 70 | 0.31 |

4.4.6 Availability of infrastructure

Availabilities of different infrastructures assume the district to get more health status for their population. Accordingly, Ada'a district encounters by different infrastructures these bring improvement for health status of the population. The district had 256.52-kilometer of all-weather roads. Among these 67km is asphalts that pass through Modjo- Adama town and 189.25 are gravel road. Except one kebeles (Golba kebeles), all kebeles were access to road up to the center of the kebele office. However, average road coverage of the district was 28.8 %. Regards electric power out of total kebeles 16/22 (72.7%) has supplied with electricity power and the total coverage of the electric power was 60% and the district water supply, 36.4% (8/22) kebeles were access to tape water source and out district resident population 60.7% had supplied with potable water. Availability of sources of water supply in the district were 65 stand pipes, 2 protected and 1 unprotected springs, 2 protected and 72 un protected well water source in 2018. In the district, there was no functional land wire of telecommunication services. However, in all kebele and health facility, there were mobile phone networks and there were not bank and postal service in the district.

Table 29 : Types of water sources in Ada'a District, East Shewa zone, Oromia Region Ethiopia, in 2019

| Type of water | Number |
|---------------------|--------|
| Protected spring | 2 |
| Un protected spring | 1 |
| Protected well | 2 |
| Un protected well | 72 |
| Stand pipe | 65 |

4.4.7 Ada'a District health service delivery system

4.4.7.1 Organization of district health office (Oregano- gram)

In Ethiopia, the government mainly delivers the health services the health service organized into three levels. Level ones is a District health system comprised of primary hospital (to cover 60,000-100,000 population), health centers (1 to 15,000-25,000 population) and their satellite health Posts (1 to 3,000-5,000 population) connected to each other by a referral system. The primary hospital, five health center and twenty-five health posts form a Primary Health Care Unit (PHCU). However, Ada'a district health office is a level one of the administrative units of health system in

the district and leads health facilities and support health related given services in the district. It is responsible for planning, implementing, monitoring and evaluating of health programs and service deliveries in the district. To facilitate and accomplishing its missions to reaches intended goal, it organized in to five (5) process owner and five (5) case teams which the process owner is responsible for District health office head and the case team is responsible for vice of district head. These were, communicable disease control and primary health care support process owner, community based health insurance process owner, health service and quality control process owner, human resource development and management process owner, Ambulance service case team, disease privation and control case team, primary health care support case team, and family and child- health case team.

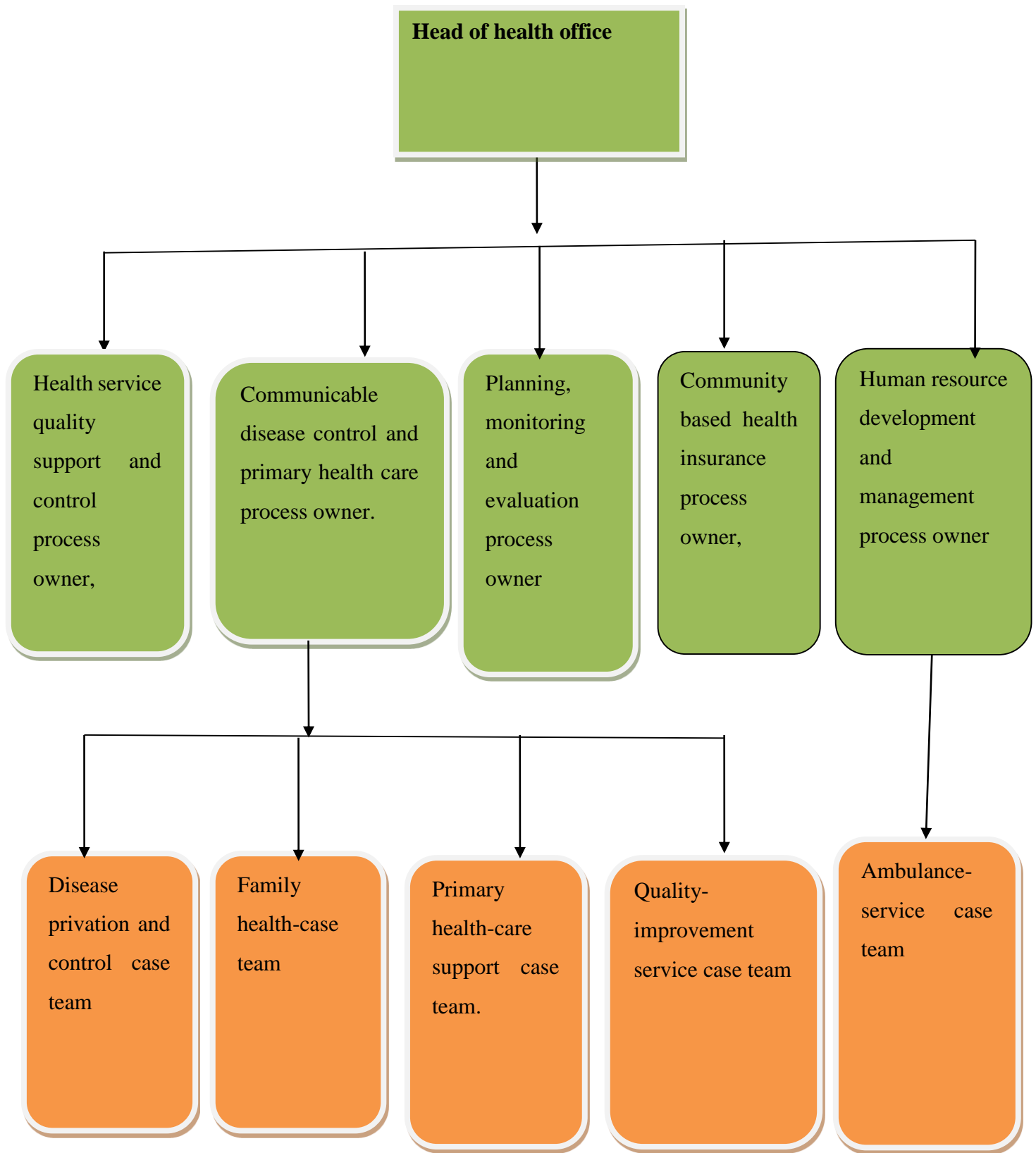


Figure 18 : Ada’s district health office organizational structure, East shewa Zone, Oromia Region, Ethiopia 2019

4.4.7.2 Health facilities and their services

Ada'a district aggregated in to primary health care unit as the national protocols, which had five (5) health- center and twenty- two (22) health posts , as well as, twelve (12) privet clinics these give primary health care at their facilities. The total health coverage of the district was 83.3% for health center and 100 % for health post. The health facilities to population ratio was (1:28,817) for health center and (1:6549) for health post. All health centers have at its catchment area five-satellite health posts, which had supported technically by health centers subject matter expertise and for office supplies and different logistics that help for their daily health extension service activities.

Table 30 : Accessibility of infrastructures for health facilities in Ada'a district, East Shewa zone, Oromia region, Ethiopia, in 2019

| Types of health facility | Total health facility | Water supply n(%) | Toilet n (%) | Electric power n (%) | Landline phone | Transportation accesses |
|--------------------------|-----------------------|-------------------|--------------|----------------------|----------------|-------------------------|
| Health center | 5 | 5 (100) | 5 (100) | 4 (80) | 3 (60) | 5 (100) |
| Health post | 22 | 7 (32%) | 21 (95%) | 3 (13) | 0 (0) | 21 (95) |
| Total | 27 | 12 (44) | 26 (96) | 12 (44) | 3 (11) | 26 (96) |

4.4.7.3 Health indicators and vital statics

Data on health indicators and vital statics are important to evaluate performances of health service activities, to take different initiatives for improvement and to set priority and develop strategies for delivering quality and accessible health services. In Ada'a district, there is no mortality data of vital statics such as maternal mortality rate, infant mortality rate, neonatal mortality rate, child mortality rate, total stillbirths; cured death rate and total live birth were not available.

| Indictors | Number | Population conversion factors |
|----------------------------|---------------|--------------------------------------|
| Total population | 144,086 | 50.1% |
| Female | 72,243 | 49.9% |
| Male | 71,843 | 3.47 % |
| Total live births | 5,000 | 3.22 % |
| Under one years old | 4,640 | 16.43 % |
| Under five years old | 23,673 | 22.13 % |
| Women 15-49 years old | 31,886 | 47.61 % |
| Under 15 years old | 68,599 | 3.47 % |
| Pregnant women | 5000 | 50.1% |
| Infant mortality rate/1000 | NA | |
| Neonatal mortality rate | NA | |
| Maternal mortality rate | NA | |
| Crude birth rate | NA | |
| Crude death rate | NA | |

4.4.7.4 Maternal and Child Health

4.4.7.4.1 Immunization coverage

The district has 5,000 children eligible for vaccination which are total live birth the district, however, vaccinated children were 4,289 (86%) for BCG, 4,698 (101%) for Penta3, 3,925(85%) for Measles and 3,925 (85%) for fully vaccination respectively and out of total 4,640 under-one children 4,837 (104%) of them were protected at birth that means their mothers take tetanus toxoid vaccine two times or greater than during their pregnancy or earlier.

Table 31 : Immunization coverage in Ada’a District, East Shewa zone Oromia region Ethiopia, in 2019

| Antigens | Target | Coverage | Percent |
|-----------------|---------------|-----------------|----------------|
| BCG | 5,000 | 4289 | 86 |
| Penta-1 | 4,640 | 4837 | 104 |

| | | | |
|----------------------------|-------|------|-----|
| Penta-3 | 4,640 | 4698 | 101 |
| PVC-1 | 4,640 | 4837 | 104 |
| PVC-3 | 4,640 | 4698 | 101 |
| Rota 2 | 4,640 | 4618 | 100 |
| Dropout rate P1 to P3 | <5% | | 3 |
| Dropout rate P1 to Measles | <10% | | 23 |
| Measles | 4,640 | 3925 | 85 |
| Fully | 4,640 | 3925 | 85 |
| PAB | 4,640 | 4837 | 104 |

4.4.7.4.2 Family planning and Antenatal care

Family planning services was one strategy to reduce maternal morbidity, mortality and to prevent unwanted pregnancy. However in Ada'a District through all kebele and health facility service's was offered out of total 26,843 non-pregnant (15-49) years target, those get services from the target showing by disaggregation method short acting 63.57% (17065/26843) long acting 33.5% (8,994/26843) which account total prevalence of contraceptive acceptance rate 97% (26,059/26843) as repeated and new accepters.

From the estimated 5,000 pregnant women who have received antenatal care at least one times were 82% (4,091/5000) and 65.6% (3,280/5000) four times during their pregnancy in the year 2018. From these 54% (2,200/4091) has been tested for syphilis, 100% (4091/4091) tested for PMTCT, and eight of them were HIV positive and initiate for B+.

More than half of pregnant women delivered at health centers or hospitals making skilled delivery attendant 68% (3421/5000). From the expected deliveries, 3421/5000(68%) had attended early postnatal care service within the first 7 days of delivery.

Table 32 : Health care component coverage in Ada'a district, East Shewa zone, Oromia region, Ethiopia, 2019

| List of health components | Target | Performance | % |
|---------------------------|--------|-------------|----|
| ANC-1 | 5,000 | 4091 | 82 |

| | | | |
|------------------|--------|-------|------|
| ANC-4 | 5,000 | 3280 | 66 |
| Skilled delivery | 5,000 | 3421 | 68 |
| Syphilis test | 4091 | 2,200 | 54 |
| PNC | 5,000 | 3421 | 68 |
| LAFP | 26,843 | 8994 | 33.5 |

4.4.7.5 Environmental Health Condition

Environmental health means efforts of disease and/or illness prevention from the environmental risk factors to realize the quality of health environment (6). Coverage of sanitation and clean water supply are the main determinants of environmental health. According to report of Ada’a district health office pit latrine were the dominant latrine coverage, which implies from 30,018 house hold 83% (25039/30018) of them had latrine and from these who utilize them were 72% (18,001/25039) and of the total kebele 59% (13/22) of them are open defecation free.

4.4.7.6 Top leading causes of outpatient visit (Morbidity)

Acute upper respiratory tract infection and pneumonia were a top leading cause of outpatient morbidity in adults that accounts 3,071(19.3%) and 2,394 (15%) cases respectively in 2018. There were no inpatient services in their health centers in the district; lacking of inpatient services were due to all health centers round to Bishoftu hospital by near because of that all of them refer the clients to Bishoftu hospital those need inpatient services.

Table 33: Top ten Causes of Morbidity in Ada’a District, East Shewa zone Oromia region, Ethiopia, in 2019

| Sr. No | Name of disease | No | % |
|--------|--|------|------|
| 1 | Acute upper respiratory tract infection (AURTI) | 3071 | 19.3 |
| 2 | Pneumonia | 2394 | 15 |
| 3 | Diarrhea(Non-blood) | 2057 | 12.9 |
| 4 | Infection of skin and sub -coetaneous tissue | 1842 | 11.5 |
| 5 | Acute febrile illness | 1433 | 8.9 |
| 6 | Dyspepsia | 1138 | 7.1 |
| 7 | Urinary tract infection | 1050 | 6.6 |

| | | | |
|--------------|-----------------------------------|---------------|------------|
| 8 | Other un specified disease of eye | 1049 | 6.6 |
| 9 | Trauma(Injury) | 1021 | 6.4 |
| 10 | Helmenathiasis | 880 | 5.5 |
| Total | | 15,935 | 100 |

The top leading Cause of less than five years old at outpatient department visit were non-bloody diarrhea followed by pneumonia.

Table 34: Under Five Top ten Causes of Morbidity in Ada’a District, East Shewa zone Oromia region, Ethiopia, in 2019

| Sr. No | Under five years | No | % |
|--------------|--|-------------|------------|
| | Name of disease | | |
| 1 | Diarrhea(Non-blood) | 1826 | 25.33 |
| 2 | Pneumonia | 1577 | 21.88 |
| 3 | Acute upper respiratory tract infection (AURTI) | 1386 | 19.23 |
| 4 | Infection of skin and sub -coetaneous tissue | 754 | 10.46 |
| 5 | Acute febrile illness | 487 | 6.76 |
| 6 | Other un specified disease of respiratory system | 280 | 3.88 |
| 7 | Diarrhea with dehydration | 246 | 3.41 |
| 8 | Helmenathiasis | 244 | 3.39 |
| 9 | Other un specified disease of eye | 213 | 2.96 |
| 10 | Otitis | 195 | 2.71 |
| Total | | 7208 | 100 |

4.4.7.7 Endemic Diseases

4.4.7.7.1 Malaria

Malaria is an infectious disease caused by the parasites of Female Plasmodium anopheles mosquito. Ada’a district had 90% (20/22) malarias kebeles with 129,423 at risk population. The district performs different prevention and control methods for malaria disease. They spray indoor residual spray for eight kebeles, which covered 24,575(97%) population and 6304 (84%) unit strictures. In addition, they gave health education promotion for utilization long lasting insect side bed nets and the utilization rate was 25,548/ 27745 (92%). The district also identifies malaria

suspect cases and treats them in all health centers and health posts. In this year they were identify 1617-suspecte case which diagnosed to become confirmed 104 cases, the species classification were 70 malaria case plasmodium falciparum and 34malaria cases plasmodium vivax, there was no death, as well as, malaria prevention, control and treatment supplies in the district.

Table 35 : Five years progress of malaria cases and slide positive rate in Ada’a district, East Shewa zone, Oromia region, in 2019

| Year | Slide examination | Positive for Pf+ PV | Slide positive rate |
|------|-------------------|---------------------|---------------------|
| 2014 | 9326 | 1942 | 20.8 |
| 2015 | 2268 | 425 | 18.7 |
| 2016 | 3298 | 488 | 14.7 |
| 2017 | 2302 | 292 | 12.7 |
| 2019 | 1617 | 104 | 6.4 |

4.4.7.7.2 Tuberculosis and leprosy

Tuberculosis is an infectious disease and global concern which caused by mycobacterium Tuberculosis. Out 254-target population of all forms of tuberculosis cases, 60% (142/254) detected in the district, of which 24% (34/142) pulmonary tuberculosis and 76% (108/142) were extra pulmonary tuberculosis with 100 % tuberculosis cure rate and treatment success rate. There were non-defaulters on tuberculosis treatment us well as non-multidrug resistance and one death reported in district for the year of 2018. Out 142 total cases, 89% (127/142) were tested and negative results for HIV infection. There was no case in the district regarding to Leprosy.

4.4.7.7.3 Hunan Immune virus /AIDS

Ada’a district performs different prevention and control mechanisms for HIV/ADIS, like counseling and testing, health education, and condom distribution. Accordingly from a total of 18,220 voluntarily tested for HIV/AIDS seven (7) of them were confirmed new infection and from the total 20,099 outpatient department visits 16,756 clients have taken PICT service of them 27 had HIV infection. Totally, 34 new HIV infection cases categorized as gender wise 22 Males and 12 Females.

4.4.7.8 Nutritional status of the district

Ada'a district have Five (5) OTP site and two stabilizing center at their health facilities levels. Out a total monthly screening for malnutrition at this district there were 14% (661/4664) have moderate malnutrition which put on OTP and one was admitted for SC in the in the year of 2018.

4.4.7.9 Outbreak and other disaster situations

In the past two years in this district, there were no any outbreak and disaster situations.

4.4.7.10 Human resources

Human resource and development is the crucial changing agent of public health problems. At any level of health organization work force classified as health professional personnel and health support worker forces. Health professionals also classified as into different category of professions. Accordingly depending on their professions in Ada'a district there were 18 health officers, 9 BSc Nurses, 30 clinical nurses , 1 pharmacist, 6 druggists , 7 medical laboratory , 2 environmental expertise, 11 mid wafers and 43 health extension workers and 60 supportive work force staffs. The total health human resources in Ada'a district were 127-health professionals and 60 supportive staff work forces, which divided in to five (5) health centers and district health offices.

Table 36: Human resource working in Ada'a District, East Shewa zone, Oromia region, Ethiopia in 2019

| Category of human resource | Health profession and supportive staff | Standard | Difference | Remark |
|----------------------------|--|----------|------------|-------------------|
| Health officers | 18 | 25 | 7 | Not meet standard |
| B Sc Nurse | 9 | 20 | 11 | Not meet standard |
| Medical Laboratory | 7 | 16 | 9 | Not meet standard |
| Pharmacist | 1 | 13 | 12 | Not meet standard |
| Environmental health | 2 | 7 | 5 | Not meet standard |
| clinical Nurse | 30 | 33 | 3 | Meet standard |
| Diploma mid wife | 11 | 15 | 4 | Not meet standard |
| Druggist | 6 | 10 | 4 | Not meet standard |
| HEWs Urban | 3 | 8 | 5 | Not meet standard |
| HEWs Rural | 40 | 40 | 0 | Meet standard |

| | | | | |
|------------------|------------|------------|------------|--------------------------|
| Supportive Staff | 60 | 138 | 78 | Not meet standard |
| Total | 187 | 321 | 142 | Not meet standard |

4.4.7.11 Community Health Insurance

According to reform of health service in Ethiopia, government declares community and social insurances. For the first time community health insurance was started in some districts as pilot test and now a days it expands to almost for all regions and districts including Town administrative. Ada'a district was started community health insurance as a pilot test in Oromia region at East Shewa zone. The district plan 27,000 households to join membership for community based health insurance out of total population; however, only 37% (10,034/27,000) them join the member ship. This is very low performance in the district. Those member ship of health insurance were get health services out of fee of in pocket many and at the end of every three months the total costs of health facilities added and reimbursed for the health facility from the health insurance agency. However, in this district out total 6,615,000 ETB reimbursements from district health insurance agency they get only 40% (2,652,330/6,615,000) of ETB. This may be a problem for health facilities to give quality service due to the budget of health facilities were not properly reimbursed on time from the Health Insurance Agency.

4.4.7.12 Budget allocation for district health office

In 2011 fiscal year of Ethiopia out of total 127,657,312 ETB budget allocated for Ada'a district health office including five health centers shared 8.9% (11,375,412/127,657,312) ETB, which categorized as salaries and running cost of the district health office 8,868,620 and 2,506,792 respectively and no allocation of budget for public health emergency management activities. In addition, the district utilizes 665,000 ETB which allocated from different donors and Oromia regional health bureau for different programs such as for family and child health. The total budget allocation for the district was not meet the WHO standards, which allow or recommends the health sectors budgets must be greater than or equal to 15% of a total district budget.

4.4.7.13 Limitation

There were not inpatient data to priorities and calculate mortality rate.

The district data had not well organized due to DHS2 software started recently and the district shift from HIMS system to DHS2 due to that their data was not well organized at one point of area other than in each department.

Identified problem and priority setting

- ✚ Low safe water coverage.....60.7%
- ✚ Low road coverage28%
- ✚ Low TB detection rate.....60%
- ✚ Low (MCH) ANC4, screening of syphilis test & Delivery coverage.....65.5%,
54% & 68%
- ✚ High dropout rate of measles vaccine.....23%

After discussing with district expertise including wise head us priorities the above problem depending on the magnitude severity, feasibility, community concern and governmental concern finally, we add the total score and put as the following table that finally the action plan would being developed and shared for the concerned body.

Table: 38 Problem prioritization Ada’a district East Shewa zone Oromia region, Ethiopia, 2019

| Sr. No | Problem | Magnitude | Severity | Feasibility | Community concern | Governmental concern | Total | Rank |
|--------|---|-----------|----------|-------------|-------------------|----------------------|-------|------|
| 1 | Low safe water coverage | 4 | 4 | 3 | 5 | 4 | 21 | 4 |
| 2 | Low road coverage | 4 | 4 | 3 | 5 | 4 | 20 | 5 |
| 3 | Low TB detection rate | 4 | 5 | 4 | 4 | 5 | 22 | 3 |
| 4 | Low ANC4,screening of syphilis test & Delivery coverage | 4 | 5 | 5 | 4 | 5 | 23 | 2 |
| 5 | High dropout rate of measles vaccine | 5 | 5 | 5 | 4 | 5 | 24 | 1 |

4.5 Discussion

Acute respiratory tract infection was the leading cause of morbidity in the district, accounting 19.3% in adult this was higher than national prevalence of OPD visit reported in 2016/2017 as 9.6%. In under- five children OPD visits diarrhea non-bloody was the leading cause followed by pneumonia 25.33% and 21.88% this was higher than the national prevalence of OPD visit reported in 2016/2017 as 22.3% and 18.6% respectively. This might be due to the poor environmental sanitation that exposed them to easily preventable communicable disease (8).

The safe drinking water coverage of the district was 60.5, which was greater than 57% EDHS 2016. The latrine coverage of this district 83% greater than the regional latrine 70% and less than 100% target.

Implementation of the maternal health care during pregnancy would assessed by looking at the coverage of first and fourth Visit antenatal care coverage. ANC 1st refers to the number of pregnant women who have obtained their first antenatal care by skilled health personnel compared with the number of target pregnant women in the working area in a one-year period. Coverage of ANC 4th refers to the number of pregnant women who have obtained their standard antenatal care, at least four times, in accordance with the recommended schedule for each trimester compared with the number of target pregnant women in the working area in a one-year period. The two-indicator scan shows the healthcare access for pregnant women and their level of compliance with antenatal check to health personnel. The coverage of district ANC1st and ANC4th 82% and 66% respectively this was less than region coverage 107% first visit and 66%, who had four visits. But it was greater performance when compare to EDHS 62% ANC1st and 32% ANC4th (9, 10).

Other efforts to reduce maternal mortality rate and infant mortality rate were to encourage all delivers to been assisted by skilled health profession and performed in healthcare facilities. The percentage of deliveries assisted by skilled health professional was 68% which was greater than EDHS, national and regional coverage 26%, 66%, 62% respectively (9,10).

Infant immunization program intends that each baby receive complete basic immunization. The achievement of the programs measured through complete basic immunization indicator. Full immunization coverage of Ada'a district was 85% this is above EDHS 39% and less than 90% national coverage (9, 10).

Estimated new all forms of TB case detection rate was 60%, which is lower than 85% national target and 62% Oromia regional health bureau performance (9). The coverage of tuberculosis had

not reached the expected target, this indicates that the diagnosis did not give enough priority to finding patients who were contagious in the district and needs improvement. Among TB cases in the district TB treatment completeness and TB cure rate were both 100 % and no TB treatment failure and defaulter in 2018 year.

Factor that contributed to quality improvement in the health service is the ability of the CBHI schemes to mobilize financial resources and hence investment in the facility. As all contracted health facilities are implementers of health care financing reform, the resultant increase in patient flow due to CBHI scheme has increased the amount of resources in the hands of health facilities, allowing them to acquire more drugs, diagnostic facilities, and medical equipment. However, the coverage of Ada'a district community health insurance was 40% in 2018, which needs improvement (9).

The ratio of health personnel to population is an indicator to measure the availability of health personnel to achieve specific targets of health development. The target ratio of health personnel to population in the district are: 1.2 Health officers per 10,000 populations, 2.7 all nurses per 10,000 population and 0.76 midwives per 10,000 populations. This was greater than Oromia region health officer 0.8 per 10,000 population and less than 4.2 all nurse per 10,000 population and 1.2 midwives per 10,000 populations respectively.

Health facility to population ratio of the district was lower than the standard of the ministry of health (1:25,000 for health center and 1:5000 for health post). In Ada'a district health facility to population, ration 1:28,816 for health center and 1: 6550 for health post (9).

4.6 Conclusion

The top leading causes of morbidity were upper respiratory tract infection and non-bloody diarrhea for adult OPD and for less than five-year age respectively. There were low coverage of safe drinking water, ANC4 and institutional delivery coverage. In addition, low detection rate of Tuberculosis and utilization of community-based health insurance including shortage of human resource. The health facility to population ratio was less than national standard

4.7 Recommendation

- ✚ District health office improves TB case notification and dictation as national and WHO target standard with community engagement.
- ✚ Maternal health of the district is upgraded and improved provision of services.
- ✚ Appropriate strategies and design needed to improve safe and clean water supply of the district.
- ✚ Mix and qualification professional staffing needed for health centers as per standard.
- ✚ District health office strengthens multi-sectorial coordination to achieve increasing CBHI coverage as per set standard (>80%)
- ✚ District administration and regional health bureau attain the district health facility and infrastructure as per standard of national.

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Chapter Five: Scientific Manuscripts for Peer reviewed Journals

5.1 “Measles outbreak investigation and response in Robe town, South-East Oromia region, Ethiopia, March, 2019”

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Abstracts

Background: - Measles is a highly contagious, vaccine-preventable, viral disease. In 2019, CDC reports 9,828,400 measles cases and 207,500 deaths global 48%, 71% in Africa region respectively. An epidemiology of measles estimated those more than 1.5 million cases of measles and 70,000 deaths with 4% CFR would occur in Ethiopia annually. In Oromia 26,908 suspected measles cases and 288 deaths were reported from January 1st, 2007 to December 31st, 2016. On March 2, 2019 Robe town reported a suspected measles outbreak. We conducted an outbreak investigation to describe the magnitude, identify risk factors and control measures.

Methods: - we conducted 1:2 unmatched case-control studies in Robe town from March 6 to 24 2019. The outbreak was confirmed by using serological laboratory test. We describe cases by using line list and collect data using structured questionnaire from all 45 cases & 90 controls by interviewing the case and control including their family. We use standard case definition to identify cases. We conducted bivariate and multivariable logistic regression by using SPSS24. Significance was stated at p- value < 0.05.

Results: - A total of 44 measles cases with case fatality rate 2.2% (1/45) were reported from Robe town. Among cases 29/45 (64%) were male and 33/45(73%) were unvaccinated, children<1 year and male were more affected with (AR=428/100,000) and (AR=78/100,000) Population respectively. Being unvaccinated with measles vaccine were risk factors 4(6.5 -11.46), limited knowledge about vaccine prevention of measles (AOR=2.9, 95% CI [1.11-7.56], contact with measles cases (AOR=3.96 , 95% CI [1.25-12.32], presence of measles cases in the some house (AOR = 5.2, 95% CI [1.18-22.99], being less than five years age group (AOR = 3.9 , 95% CI [1.4 – 10.79]) were associated with measles infection.

Conclusion: - Confirmed measles outbreak was caused due to low measles vaccine coverage, males and < 1 years were more affected. Being vaccinated was protective, limited knowledge on vaccine prevention of measles, having contact history and presence of measles cases in the house were identified risk. Strengthening routine and supplementary immunizations were required.

Keywords: Measles, Outbreak, Case-Control, Robe Town, Ethiopia, 2019

Introduction

Background

Measles is an acute, highly contagious vaccine-preventable, viral disease caused by measles virus (1,2). This virus is a member of genus Morbilli virus of paramyxoviridae family(1). Measles is a vaccine preventable disease, but remains a major killer of children around the world(3). The measles virus replicated in the nose and throat of infected individuals and transmitted by primarily respiratory droplets to mucous membranes in the upper respiratory tract or conjunctiva (1,4–6).

The incubation period of measles is 7-14 days from exposure to onset of symptoms; the rash usually appears 14 day after exposure and spreads from head to trunk to lower extremities(1,4). The patients are contagious from four day before the eruption of the rash to until four day after the eruption (1,4,5). Measles spreads by coughing and sneezing in direct contact or close contacts with infected nasal or throat secretions(1). The viruses remain active and contagious in the air for up to 2 hours(1). It can be transmitted by an infected person from the 4 days prior to the start of rash to 4 days after the rash erupts (1,4).

In 2019, CDC reports 9,828,400 measles cases 207,500 deaths global 48% and 71% in Africa region respectively (7). Based on the epidemiology of measles in Ethiopia and burden of disease modeling, it is estimated that more than 1.5 million cases of measles and 70,000 deaths (assuming 4% case fatality ratio would occur in Ethiopia annually (8). Despite the availability of a safe and effective vaccine, measles remains one of the leading cause of mortality among young children around the world (3). In developing countries , case fatality rates average 3-5%, but can be as high as 10-30% (1,8). Epidemics of the measles occur when the number of susceptible individuals in a population reaches threshold or three confirmed cases in one years (1,5). During 2019, measles out breaks were reported in several countries in Africa, Eastern Mediterranean, Europeans, Americas and South-Asia region (9).

Measles is usually mild or moderately severe illness associated with long-term health problems. The severity of measles illness varies widely, depending on a number of host and environmental factors (10,11). The severity or fatality increase for these aged less than five years, living in crowded conditions, malnourished and those with immunologically disorders, such as advanced HIV infection (10). The long term health problems these includes blindness, chronic lung disease, malnutrition and recurrent inflammations (10,11).

The World Health Organization created the expanded program of on immunization in 1974 as a means to continue the great success that had been achieved earlier with the eradication of small pox (8). At that time less than 5% of the world's children in the developing countries were receiving immunizations (8).

Since the introduction of effective measles vaccines, the epidemiology of measles has changed in both developed and developing countries (8). As vaccine coverage increased, there has been a marked reduction in measles incidence, and with decreased measles virus circulation, the average age at which infection occurs has increased (12).

A single dose of measles containing vaccine at nine months of age induces immunity in 85% of infants and later at one year's increase immunity in 95% of those vaccinated (1). A second dose of vaccination is recommended by WHO based on area measles transmission, age and coverage of measles containing vaccine, supplemental immunization activities and overall capacity and performance of the routine immunization and surveillance system (2).

World Health Organization of African Region has established objectives and strategies for its member state to achieve measles elimination by 2020 through increasing access service in all districts, improve vaccination coverage, reduce the incidence of measles less than one case per million population in all countries and improve the quality of measles surveillance, as well as, the epidemiological and biological investigation of measles out breaks in all countries (13).

Factors associate with measles virus infection are any non-immune person or who has not been vaccinated, infants who lose passive antibody before the age of routine immunization, children with vitamin "A" deficiency and immunodeficiency, corticosteroid therapy, regardless of immunization status and travel history to measles endemic area or having contact with those travel to endemic area, malnourished and young children are a high risk to develop measles complication and mortality from measles infection (1).

Since the introduction of effective measles vaccines, the epidemiology of measles has changed in both developed and developing countries (11). As vaccine coverage has increased, there has been a marked reduction in measles incidence, and decreased measles virus circulation, average age at which infection occurs has increased (12).

Different case control studies on measles outbreak investigation show that the possible factors for measles infection were less awareness, being unvaccinated, malnutrition, travel history to measles cases area, presence of measles case in neighbor or the house hold, poor cold chain management

and low measles vaccine coverage were potential cause for measles outbreak in Ethiopia (14–16). In Oromia region from 1st January 2007 to 31st December 2016A total of 26,908 suspected measles cases and 288 deaths were reported (17). According to 2019 mini- Ethiopian demographic health survey, measles containing vaccine first dose coverage was 59% (18).Accordingly Robe town identify measles suspect case at Robe general hospital and report to Oromia regional health bureau on March 2,2019. Beside the suspected measles case report from Robe Towns Oromia regional health bureau, organizes a team consisting of two a field epidemiology Training program residents, Regional surveillance officer and present graduate of field epidemiology residents were deployed to Robe Town and investigate the outbreak. In the last three years from this town there was no measles suspect case report prior to now. This investigation was intended to confirm the existence of measles outbreak, describe the morbidity and mortality of measles cases, and identify risk factors associated with the outbreak and take control measures.

Methods

Study Area and period

Investigation was conducted in Robe Town Oromia Region. Robe town located about 430km far from Addis Ababa the capital city of Ethiopia. In Robe town there were only two governmental health facility found one general hospital and one health centers. We conducted un- matched case-control study from March 6 to march 24, 2019. Ethiopian public health emergency management guide line used for cases definition. All confirmed, suspected to have measles and epidemiologically liked cases and deaths were used for descriptive study and selected unmatched community control were included to identify risk factors. We reviewed the outpatient medical logbook and medical record of cases at Robe General Hospital. We conducted interview the case and control using a structured and semi-structured questioner's to assess the vaccination status, nutritional status, family size, ventilation status of the house and distance from the health facilities. Screening of children for malnutrition was done with MUAC measurements for all study participants and observation of their immunization cards would be also done. Three field epidemiology resident (including principal investigators) were participated in data collection process. Those who refused to participate or unconscious were excluded. Before analysis, data was also cleaned for any missing and locally in consistent values. Data was analyzed using epinfo-7.2.6 and export to SPSS 24 bivariate and multivariate analysis was conducted. Letter of permission was written for Robe Town health informed verbal consent was obtained from all study

participants before interview privacy and confidentiality was insured. The study report was submitted to Addis Ababa University, School of Public Health, Oromia Regional Health Bureau and Robe Town Health Office.

Results

Descriptive epidemiology

Morbidity, Mortality, Symptom and Treatments Given

The first (Index) case of measles disease reported from Robe Town is 8 year old female which had a travel history to Dinsho districts adjust to Robe Town, but her permanent residence area is Robe Town 03 kebeles. There is an epidemic in Disho District of Bale zone. After she came back to the residence area on February 13, 2019 and two days later on 15, 2019 go to Robe general hospital when she develops sign of fever and rash. As her family knows she did not have any vaccination history before. She had a history of contact with other children in Disho district, which develops rash after she came back to her residence area.

Since from February 15, 2019 to March 22, 2019 for consecutive seven WHO weeks a total of 44 confirmed and epidemiologically linked to confirm cases and 1 death of measles were reported from Robe Town to Oromia Regional Health Bureau Public Health Emergency Management and Health Research Directorate. Of the three or 3/45 (6.7%) cases were confirmed by laboratory investigation (IgM positive) at central laboratory.

The clinical information reviewed from the line list and interviewed the cases and family of cases indicated that 44/45 (98%) of cases had fever, 45/45(100%) develops rash, 44/45(98%) of cases had cough and 41/45(93%) percent develops Pneumonia. All treated cases took antibiotics and among total 44 cases improved and one cases died with a case fatality rate 2 percent.

Description of cases by person, Place and time

Description by person

From February, 15 to March 22, 2019, which is considered as epidemic period, 43 measles cases and 1deaths were identified from the line list and 1 by active case search at Robe Town administrative boarders. The mean age of the cases is 6 years with standard deviation of 6.5 and 29/35 (64%) of the cases were male (Table 37).

Table 37: Measles cases by Age and sex category, Robe Town, Oromia Region, Ethiopia, 2019

| Age category | Sex | | Total number of cases (%) |
|--------------|----------------|----------------|---------------------------|
| | Male (%) | Female (%) | |
| < 1 Years | 6(13%) | 4(9%) | 10(22%) |
| 1-4 Years | 11(24%) | 6(13%) | 17(38%) |
| 5-14 Years | 6(13%) | 5(11%) | 11(24%) |
| 15-44 | 6(13%) | 1(2%) | 12(16%) |
| Total | 29(64%) | 16(36%) | 45(100%) |

The overall attack rate (AR) of the case was 62 cases per 100,000 Populations. The attack rate is high in Male (78 cases per 100,000 populations) than Female (45cases per 100,000 populations). Children less than one year were more affected than others (under one year AR 424 cases per 100,000population, 1-4 years 176 cases per 100,000 populations, 5-14 years 51cases per 100,000population greater 15 years 18 cases per 100,000 populations) (Table:38)

Table 38 : Measles Attack rate by Age group, in Robe Town, Oromia Region, Ethiopia, 2019

| Age category | Population | Number of cases | AR / 100,000 Population |
|------------------|------------|-----------------|-------------------------|
| <1 Year | 2356 | 10 | 424 |
| 1-4 Year | 9641 | 17 | 176 |
| 5-14 Years | 21653 | 11 | 51 |
| >15 Years | 39503 | 7 | 18 |
| Male | 37308 | 29 | 78 |
| Female | 35845 | 16 | 45 |
| All Age category | 73153 | 45 | 62 |

Description by place

The highest attack rate was registered in Robe -02 kebele 87cases per 100,000 populations and followed by Robe-03 kebeles75 case per 100,000 populations respectively.

Table 39 : Measles Attack rate (AR) and case fatality rate (CFR) by kebeles in Robe Town Oromia Region, Ethiopia, 2019

| Name of kebeles | Total population | Number of cases | Number of Deaths | Attack rate per 100,000 | Case fatality rate |
|-----------------|------------------|-----------------|------------------|-------------------------|--------------------|
| Robe-01 | 34117 | 14 | 0 | 41 | 0 |
| Robe-02 | 13825 | 12 | 0 | 87 | 0 |
| Robe-03 | 25211 | 18 | 1 | 75 | 5.3 |
| Total | 73153 | 44 | 1 | 62 | 2.2 |

Description by Time

The outbreak started on February 15 and ended on March 22, 2019. The outbreak last for five weeks. The outbreak reached peaks on 5 March of 2019 observed six cases and gradually decreased till the end of the outbreak on 22 March of 2019 as presented in (fig:19)

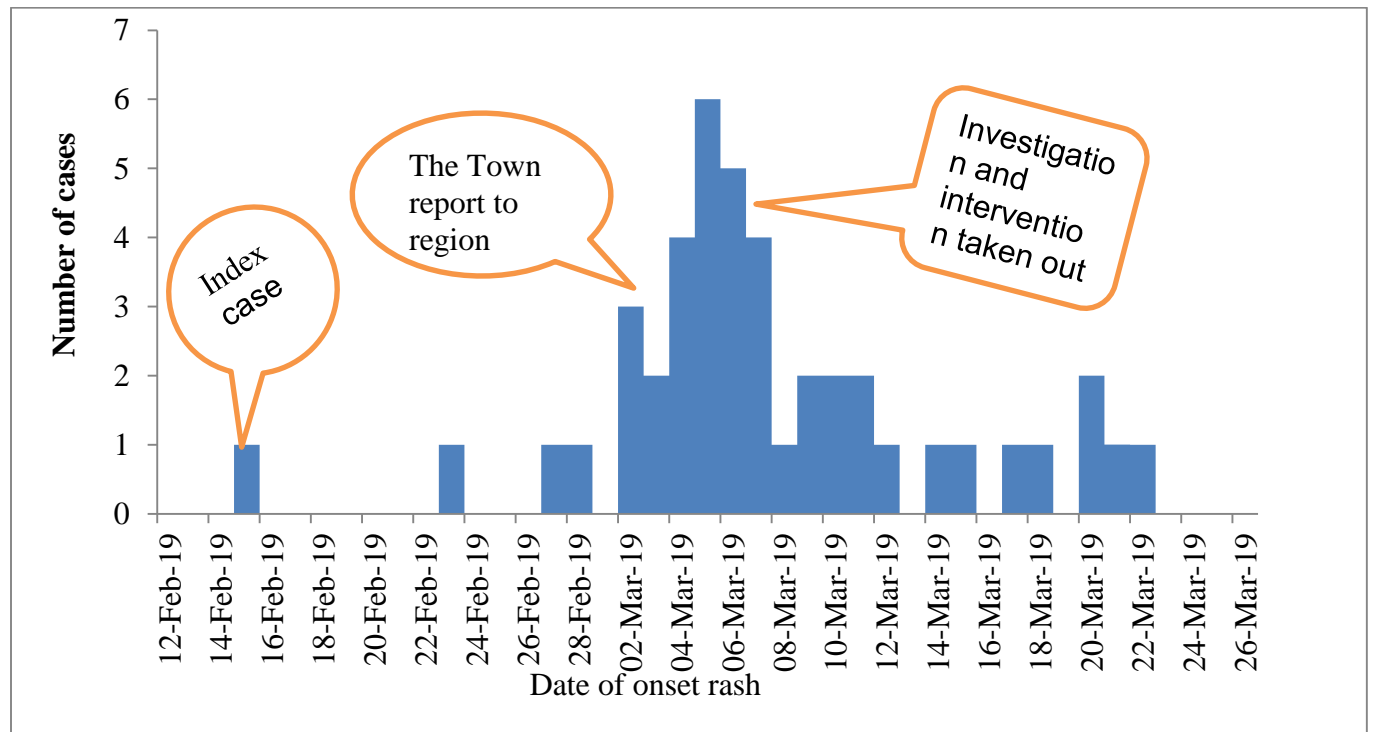


Figure 19: Epidemiologic curve of measles outbreak, Robe Town, Oromia region, Ethiopia 2020

The last three years of measles vaccine coverage of the town was reviewed and collected. The annual Administrative report of measles coverage of Robe Town during 2017, 2018 and 2019 were 108%, 69% and 49% respectively. No supplemental immunization activities conducted in the Town in the past three years. Accordingly, among the 135 participants included in the cases and control study, 71 (52.5%) individual had a history of measles previous vaccination, of which 13 had a vaccination card. From the assessment result of why not they vaccinate their children were 28/64 (44%) respondents had no awareness and schedule time for vaccination 16/64 (25%) were absence during the vaccination schedule, 10/64(16%) were scare vaccine to vaccinate their children and 9/64(14%) were thinks vaccination hurt their children if they vaccinate them.

Risk Factor Assessments

A total of forty-five cases and ninety neighborhood controls were participated in the case control investigation to identify the risk factors for measles infection in Robe Town. Significance of associated variables was assessed by bivariate and multivariate analysis. Age, sex, family size, educational status of family, case and control, ventilation status of house, Vaccination status of cases and controls, presence of ill person in the house, contact and travel history, knowledge on measles vaccine preventability and mode of transmission were analyzed and checked for association by bivariate analysis and finally, checked by multivariate analysis for these variables with P- value < 0.2. These are Age category, family size, vaccination status, having knowledge on transmission and vaccine preventability of measles, having contact and travel history and presence of sick persons with similar cases in the house.

For those variables candidate for multivariate, farther analysis were performed by multivariate to differentiate if the association is due to confounder or effect modification. Accordingly statistically significant variables on multi-variant analysis were Age category less than five years (AOR=3.9 (1.43 - 10.78), limited knowledge about vaccine prevention of measles (AOR=2.9, 95% CI [1.11-7.56]), Being unvaccinated with measles vaccine were risk factors (AOR= 4, 95% CI [6.56-11.56]), having contact history with those have measles cases AOR: 3.96 (1.27 -12.33) and presence of other measles cases in the house AOR: 5.2 (1.17- 22.98).

Table 39: Multivariate analysis of independent risk factors associated with contracting measles in Robe town, Oromia region, Ethiopia, in 2019

| Variables | Case n=45(%) | Control n=90(%) | COR (CI - 95%) | AOR (CI- 95%) | P-value |
|--|-------------------------|----------------------------|-----------------------|----------------------|----------------|
| Age | | | | | |
| <5 Years | 27 (60) | 29 (32) | 3.15 (1.6 - 6.6) | 3.9 (1.4 -10.8) | 0.008 |
| >=5 Years | 18 (40) | 61 (68) | 1 | 1 | |
| Family size | | | | | |
| Less than five | 17 (38) | 51 (57) | 1 | 1 | |
| Greater than or equal to five | 28 (62) | 39 (43) | 2.15 (1.03 - 4.48) | 1.8 (0.71 -4.78) | 0.2 |
| Vaccination status | | | | | |
| No | 33 (73) | 31 (34) | 1 | 1 | |
| Yes | 12 (27) | 59 (66) | 5(2.37-11.54) | 4(6.56-11.46) | 0.003 |
| Knowledge on measles transmission | | | | | |
| No | 30 (67) | 41 (46) | 1 | 1 | |
| Yes | 15 (33) | 49 (54) | 0.42 (0.19- 0.88) | 0.4 (0.15 -1.07) | 0.068 |
| knowledge about vaccine availability | | | | | |
| No | 27 (60) | 33 (37) | 2.6 (1.24 - 5.44) | 2.9 (1.1- 7.6) | 0.03 |
| Yes | 18 (40) | 57 (63) | | | |
| Travel history to active measles case | | | | | |
| No | 34 (76) | 81 (90) | 1 | 1 | |
| Yes | 11 (24) | 9 (10) | 2.9 (1.01 -7.66) | 0.6 (0.13 - 2.76) | 0.51 |
| Contact history with measles patient | | | | | |
| No | 24 (53) | 74 (82) | 1 | 1 | |
| Yes | 21 (47) | 16 (18) | 4 (1.82 -8.87) | 3.9 (1.27 -12.33) | 0.018 |
| Presence of sick person in the house | | | | | |
| No | 29 (64) | 83 (92) | 1 | 1 | |
| Yes | 16 (36) | 7 (8) | 6.5 (2.45 -17.49) | 5.2 (1.18 -22.98) | 0.029 |

Interventions under taken to contain the outbreak

The investigation teams describe the measles outbreak. Support the health workers on active case search; give orientations for private clinics and community leaders and showing how to fill the line list to complete. Cases were treated to prevent further spread; and reduce morbidity and mortality attributed to measles. Routine surveillance was strengthened and followed on daily bases. Health education and social mobilization was done by using car with van at public gathering (religion places, schools, market places) for the community members to prevent the transmission of the outbreak. Robe Town administration, health center and Hospital would be well communicated and coordinated to tackle the outbreak through mobilizing adjacent Bale zone and neighboring districts to prevent the outbreak from spreading to these areas and alarming the health extension workers and community leaders to strengthen adjoining surveillance systems. The administrative report of Measles vaccination coverage starting to the Establishment of Robe Town as Zonal administration separately from Bale zone was 108%, 69% and 49% for the consecutive last three years 2017, 2018 and 2019. In addition, to overcome the outbreak mass immunization campaigns were conducted for the targeted children from 6 months to 15 years.

Discussion

Since from February 15, to March 22, 2019, a total of 44 measles cases and 1 death of measles confirmed and epidemiologically linked to confirmed cases were reported from Robe town to Oromia regional health bureau.

All most all measles cases presented with clinically by complaining with rash and fever, since from the cases known to be suspect measles case depending to on the cases definition of measles cases, appropriate diagnosis and treatment were done in Robe general hospital by these taken orientations about measles case treatment, prevention and control .

These have immunodeficiency, malnutrition and faced to dalliance of medical managements exposed to high risk for measles disease, in this situations case fatality rate was high in infants less than one year age. The expected case fatality rate in Ethiopia was 3%-6% and for developing or Africa country 3-5%, our study calculates the case fatality rate 2.2% which, was less than the expected case fatality rate in Ethiopian and Sub-Saharan Africa (1–3). In other way it was similar with the case fatality rate of outbreak investigations conducted in Artuma Fursi district, Oromia zone, Amhara region, Ethiopia, which the cases fatality was 2.6% (17).

The mean ages of affected measles were 6 with 6.5 standard deviations and with over all attack rate of 65/100,000 population and males had high attack rate than females. The overall attack rate of this investigation shown that, lower attack rate than the attack rate of measles outbreak investigation conducted in Guji zone 81/100,000 and greater than the study conducted in in Kabridehar town of Ethiopia Somali regional state 4/100,000 (15,20). High attack rate would be seen in less than one year of age group (AR 147/100,000 population). The result was similar to measles investigation performed in Guji zone and dissimilar with the outbreak investigation conducted in kabrider district in which, highly affected age group were among 5-14 years (20). Measles outbreak occur in area were low immunization coverage of measles. In Robe town we observed that, three- fourth of the measles affected cases had not received measles vaccination. This finding was similar in the investigation done in Bale zone Ginir district (79%) and Guji zone(70%) affected children by measles outbreak were unvaccinated (14,15,20).

High vaccination coverage was known to be the main protection of measles outbreak. In the last three years, consecutively vaccination coverage of Robe town was less than 90% which was less than national and WHO targets (12,21). This shows that, low vaccination coverage of measles occur due to low community awareness, community health education about benefit of vaccine and poor community mobilization result attributed for the occurrence of measles outbreak (22).

Robe town administration has three kebeles and in this outbreak all kebeles were affected. Active case search and contact tracing were done in all kebeles special in robe-03 kebele addition team from health center and health office deployed for active cases search and contact tracing because more cases found in this kebele and it is also wide geographically other than the rest kebeles and also the index cases that returns from Disho district also found in this kebele due to her permanent residence where this area.

Our study showed that presence of ill person in the family of in house was contributed factors for the outbreak. Similarly, measles outbreak case-control study conducted by Field Epidemiology resident in Guji zone Liben district was revealed that, presence of measles case in the house or in neighbor indicate that, twenty eight times increases risk of contracting measles infection(21).

In this case-control study, the associated risk factor was being less than five years, which the odd of being less than five years were four fold higher than when compare to these greater than or equal to five years. This finding was similar to the case-control study conducted in Ginir district of Bale zone which less than nine months were more affected than others (15). Those individual

who had contact with measles case patient was four times more likely to have measles when compared to those who had no contact history. This finding was supported by the outbreak investigation finding of case control study conducted in Kabridehar town of Somali region of Ethiopia and Ginir district of Bale zone Oromia region (15,24). This is due to the nature of measles transmission which is by respiratory droplets or by direct or indirect contact with nasal and throat secretions of infected persons and the secondary attack rate of measles is above 90% in the presence of susceptible individuals (1,5,12).

Being vaccinated against measles vaccine is protective factor. This finding is in line with the finding of case control study conducted in Kabridehar town and Kabridehar district of Somali regional state, Ethiopia (19,24),and in addition the study conducted in Ginir district of Bale zone shown that, being unvaccinated against measles is significantly associated with measles infection (15). Child who hadn't vaccinated against measles vaccine had five-fold increased odd of having measles as compared to these vaccinated. Limited knowledge on vaccine preventability of measles infection was risk factors. These mothers not had knowledge on vaccine preventability of measles infection were three times increases to contracting measles infection when compared to theses have knowledge.

Limitation

Lack of immunization cards and exact date of vaccination and recall bias on date of onset of sign and symptoms

Conclusion

We confirmed the presence of measles outbreak in Robe Town of Oromia region. All cases treated at outpatient and inpatient services in Robe General Hospitals. Other than one death all cases were recovered from their illness. In this outbreak, males and age less than five years children had high attack rate. There were low immunization coverage and less identification of measles vaccine defaulters in the town. As a result this investigation suggested that low measles vaccination coverage was the main contributing factor for the occurrence of the outbreak. Being less than five years, having contact with case-patients and presence of measles case in the house or neighborhood were the associated risk factors, whereas being vaccinated for measles vaccine was protective.

Recommendation

The Town should strengthen measles routine immunization activities before their first date of birth to reaching the target of 90% and considers regular analysis of routine immunization coverage and

take action before the date of their vaccination schedule to sustained in the coverage of routine measles vaccination, increase the community awareness on measles vaccine, strengthens active surveillance. To overcome the present outbreak, mop-up mass vaccination campaign should be conducted.

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5.2 “Descriptive epidemiology of cholera outbreak in West Arsi Zone, Oromia Region, Ethiopia 2019 “

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Abstract

Introduction: Cholera is a diarrheal infection caused by gram -negative bacteria *Vibrio cholerae*, either type O1 or O139. Globally in 2019, there were 923,037 cases and 1911 deaths of cholera with case fatality rate of 0.2 and in Africa 55,087 of cases and 872 deaths with (CFR of 1.6). Cholera could affect both Males and Females and remains a challenge to countries where access to safe drinking water and adequate sanitation cannot be guaranteed. Cholera is usually transmitted through fecal contamination of water or food. We conducted cholera outbreak investigation, characterized cases by time, place, and persons to describe the morbidity and mortality due cholera outbreak in West Arsi Zone, Oromia region, Ethiopia.

Methods: Descriptive study was carried out among 167 cholera patients’ line list from September 29 to November 30, 2019. We defined cases, selected study participants and conducted descriptive analysis. We analyzed data using Microsoft excel 2010, calculated and described frequency, percentage, mean and median, attack rate (AR) and cases fatality (CFR).

Results: A total of 164 cases and 3 deaths with CFR 1.8% were identified from the line list. Female were 94 (56.3%) and the median age for case was 12 years with range of (1.0-85.0). Highest proportions of cases 58(34.7%) were within 5-14 age group and list affected 24(14.4%) >44 age groups. Age specific case fatality rate was highest in > 44 years. Highest cases were reported from Shashamane 112(67%) district. The outbreak started from 15th August and lasted over 18th December, 2019. Of the total cases 122(73%) were severely dehydrated.

Conclusion: Cholera outbreak with relatively increased overall attack and case fatality rate was conformed. Females affected more than males and the highest proportion of affected age group was above fifteen years of age. We recommend prevention of future outbreak and implementation of response measures to reduce morbidity and mortality and prospecting future strategies to prevent cholera outbreak in the zone.

Key word: Cholera outbreak, Descriptive epidemiology, West Arsi zone

Introduction

Cholera is a diarrheal bacterial infection caused by gram -negative *Vibrio cholerae*, by either type O1 or O139 (1). Globally in during the year 2019, a total of 55 countries reported 923,037 cases of cholera and 1911 deaths due to cholera with case fatality rate (CFR of 0.2) and in Africa from 16 countries affected by cholera, a total of 55,087 cholera cases and 872 deaths with (CFR of 1.6) was reported(2).

Cholera could affect both sex and remains a serious challenge to countries where there is limited access to safe drinking water and there is inadequate sanitation (1). Cholera is typically transmitted through fecal contamination of water sources or food items and poses risk of infection in many countries. The risk of cholera transmission is higher among communities with increased population, poor socio economic status, , insufficient water supply (quantity and quality); poor sanitation and hygiene practices; and refugee settings/ internally displaced persons (IDP) camps and urban slum populations are highly vulnerable; vulnerability risk have increases in pregnant women and children under five to acquire disease (1).

In Ethiopia previous studies conducted in Amhara region Raya kobo district, Oromia region (Guji, Bale and East Shewa East Wollega zones) identified that, cholera outbreak was occurred in area where the community use unsafe and open-source water for drinking, open defecation practices and low latrine coverage, In addition lack of knowledge on means of cholera transmission and contact of patient with diarrhea and vomiting in the house were significantly associated with risk for cholera outbreak(3,4).

In Ethiopia generally the main identified risk factor of cholera is contaminated water sources and low sanitation coverage that implies the national sanitation coverage in Ethiopia is 57% which translates to more than 45 million people without access to improved sanitation facilities (5).

The incubation period of cholera is very short 2 hours to 5 days and regarding symptom of patients about 20% of infected develop acute watery diarrhea with vomiting. If cholera patients are not timely and adequately treated, the loss of large amounts of fluid and salts (> 10-20 liters/day) can lead to severe dehydration and death within an hour's. The case-fatality rate of cholera in untreated may reach 30–50% and if treated appropriately with rehydration the case-fatality rate is below 1% (1).

The Global Task Force on cholera control has established a new global strategy for cholera control at the country level and provides a concrete path toward a world and set a goal to achieve

ending Cholera at 2030. By implementing the strategy between now and 2030, the global task force on cholera control (GTFCC) partners will support countries to reduce cholera death by 90 % (6).

Since the beginning of 2017 and as of 7 May, Ethiopia has reported 32,689 acute watery diarrhea cases and 776 deaths with CFR was 2.4%. The Ethiopian Somali Regional State is the region most affected, with 91% of the reported cases and 99% of the reported deaths (7). According to WHO Weekly Bulletin on Outbreaks and other Emergencies issued on 7 July 2019, from 25 April to 23 June 2019, 688 cholera cases of which 23 were laboratory confirmed and 15 deaths with case fatality rate of 2.3% were reported from five regions in Ethiopia, including Addis Ababa city administration.

In 2016, 5,232 cases of acute watery diarrhea (AWD) and 59 deaths with 1.13 CFR reported from 13 Zone and 10 Administrative Towns of Oromia regional states to Oromia Regional Health Bureau. Then in 2017, 3,433 cases of AWD and 21 deaths with 0.61 CFR reported namely, by Bale, East Hararghe, West Hararghe, North Shewa and West Arsi Zones of Oromia Region (8). As well as, in West Arsi Zone of Oromia regional states there were a continues attack with cholera outbreak in 2016 and 2017 which is 255 cases and 4 death with CFR 1.6 and 79 cases and 1 deaths with CFR 1.27 respectively, at Shalla, Wando, Dodola, Arsi Negelle, Adaba, Siraro and Shashamane districts (8).

There were increase in report of acute watery diarrhea and culture confirmed cholera cases in 2019, from different zones of Oromia regional states namely, East Hararghe, West Hararghe, Oromia special zone surrounding Finfinne, Guji, Shashamane Town and West Arsi zone (8) . Among 17 districts of West Arsi zone, Shashamane rural, Arsi Negelle, Heben Arsi, Wando and Shalla districts were affected by cholera outbreak during 2019 (9). Following the request from West Arsi Zone public health emergency management (PHEM) process owners to support cholera outbreak response. A malty disciplinary team composed of epidemiologist, clinicians, laboratory and environmental health personnel's deployed to the affected areas on September 29, 2019. This study was intended to describe the distribution of morbidity, mortality and symptom of cholera outbreak and to implement its control measures.

Methods

Study design, Period and Area

Descriptive study design was conducted from September 29 to November 30, 2019 in West Arsi zones of Oromia regional state which is located in the Southern part of Oromia, Ethiopia. Shashamane town is the capital town of the zone which is found 250km away from Addis Ababa the capital city of Ethiopia. Administratively, the zone has 15 rural districts and 2 administrative town districts. Of 15 districts, the five districts affected by outbreak were: Shashamane rural, Heban Arsi, Shalla, Wando and Negelle Arsi districts. In the zone 4 hospitals and 84 public health centers are providing service for the community in addition to private clinic.

Study participant's selection procedures

A total of 176 study participant's cases which consisted to 173 diseased cases and 3 deaths in the registered in the line list were included in the study. All cases with incomplete information and those travelled from other district and not part of the zonal administrative were excluded from the analysis.

Data collection tools

Secondary surveillance data were reviewed and line list was used to collect and describe cases and deaths. The line list includes socio demographic variables such as, age, sex, and address of patients, admission status, date of onset and date seen at health facilities. In addition, clinical and laboratory information, such as symptoms, medications used, specimen collection, outcome status and a travel history of cases was included.

Case definition

A suspected case: a cholera case was defined a patient aged 5 years or more develops severe dehydration or dies from acute watery diarrhoea in West Arsi zone residents from 15 August 2019 November 2019(1).

Probable case: A clinically compatible case that is epidemiologically linked to a confirmed case.(1)

A confirmed case: A suspected case in which *Vibrio cholerae* O1 or O139 has been isolated from their stool(1)

Laboratory Results

Cholera Rapid Diagnostic Test (RDT) was performed for the five initial cases recorded at the Bulchana cholera treatment center (CTC and all of them were positive for *Vibrio cholerae* O1 antigen). Then, stool sample were taken from two RDT confirmed cases and sent to Hawassa Regional Laboratory for culture confirmation. On August 18th, 2019 the laboratory results were reported as confirmed Cholera for *vibrio cholerae* sero type O1 for both cases. Sample of water in all five district from nine public stand pipe and storage container were tested six of them bacteriologically positive for *E. coli*.

Data quality control and analysis

Specific checks were made categorization of variables; these include harmonizing date formats or change it into Gregorian calendar. Incomplete data on the line list were identified and excluded from the analysis. Using a line list, we calculated frequencies, proportions, attack rates and age specific attack rates and analyzed data in time, place and person by using Microsoft Excel 2010. The study was approved by Ethiopian Public health institute, public health emergency management unit.

Results

Mortality, Morbidity and Symptoms

The cholera outbreaks were reported from Shashamane district in West Arsi Zone. The causative agent for this outbreak was conformed to be cholera serotype O1. The first case was a six years old child who developed sudden onset of acute watery diarrhoea and vomiting two days after her mother had travel history to cholera affected district. The case was registered on the 15th of August, 2019 with onset of diarrhoea on 13th August, 2019 and diagnosed at Togo health centre in Shashamane district. Another male child of 10 years old from the first case household presented with similar sign and symptoms and admitted to cholera treatment centre (CTC) on the 16th August, 2019. A total of 164 cases with overall 1.9 attack rate per 10, 000 populations and 3 deaths case fatality rates (CFR 1.8%) were recorded in respective order during the 2019 cholera outbreak in West Arsi zone Oromia regional states, Ethiopia.

The clinical information reviewed on the line list indicated that 45 (27%) of cases had sign of some dehydration (eye sunken, dry mouth and tongue, restless, pulse rapid and weak, drinks eagerly, skin pinch goes back slowly) and 122(73%) had sign of severe dehydration (in addition to signs and symptoms of some dehydration, there were sunken eye, dry mouth and tongue). sever dehydrated cases were treated with ORS, IV ringer- lactate fluid and antibiotics according to their indication and some dehydrated cases were treated with only ORS.

Description of Cases by Person, Place and Time

With regard to sex ratio there were 94(56.3%) females and 73 (43.7%) males were affected, where Females were being disproportionately affected. The median age for cases was 12 years, with an age [range: 1.0-85.0 years old]. The highest proportions 58(34.7%) of cases were within 5-14 years' age group, followed by 15-44 years' age group 50(29.9%) which was different in pattern by sexes (Fig.1). The highest proportions of cases 32 (34%) were among 5-14 year of age, followed by 15-44-year age groups which was 30(31.9%). Whereas the least proportion affected age groups were 24(14.4%) theses greater than 44 years old. The age and sex Specific Case Fatality Rate (ASCFR) of under five years were (2.9 %). five – fourteen years of age group (1.7 %) and greater than forty-four age group (9.1%). Sex Specific Case Fatality Rate was (2.1%) in Female and (1.4) in Male. Cholera outbreak being notified by five districts namely, Shashamane, Shalla, Heben Arsi, Wondo and Arsi Negelle district. Of these district the highest cases were reported from

Shashamane that contribute 112(67%) followed by Shalla district which accounts 51(30.5%) (Table:40).

Table 40 : Cholera Attack rates and Case-fatality rates stratified by District of West Arsi Zone, Oromia Region, Ethiopia 2019

| District | Case | Death | Projected population in 2019 | Attack rate/10,000 population | Case fatality rate (%) |
|--------------------|-------------|--------------|-------------------------------------|--------------------------------------|-------------------------------|
| Shashemenne | | | | | |
| rural | 112 | 2 | 272342 | 4.1 | 1.8 |
| Shalla | 51 | 1 | 207228 | 2.5 | 2.0 |
| Heben Arsi | 2 | 0 | 75601 | 0.3 | 0.0 |
| Arsi Negelle | 1 | 0 | 210335 | 0.0 | 0.0 |
| Wando | 1 | 0 | 118314 | 0.1 | 0.0 |
| Sub-total | 167 | 3 | 883820 | 1.9 | 1.8 |

The epidemic pattern shows continues common source and person to person transmission outbreak, with the epidemic curve showing two distinct peaks. The first peak was in September 18th day 7 cases. The Second peak was in November 8th day 11 cases (Fig.18).

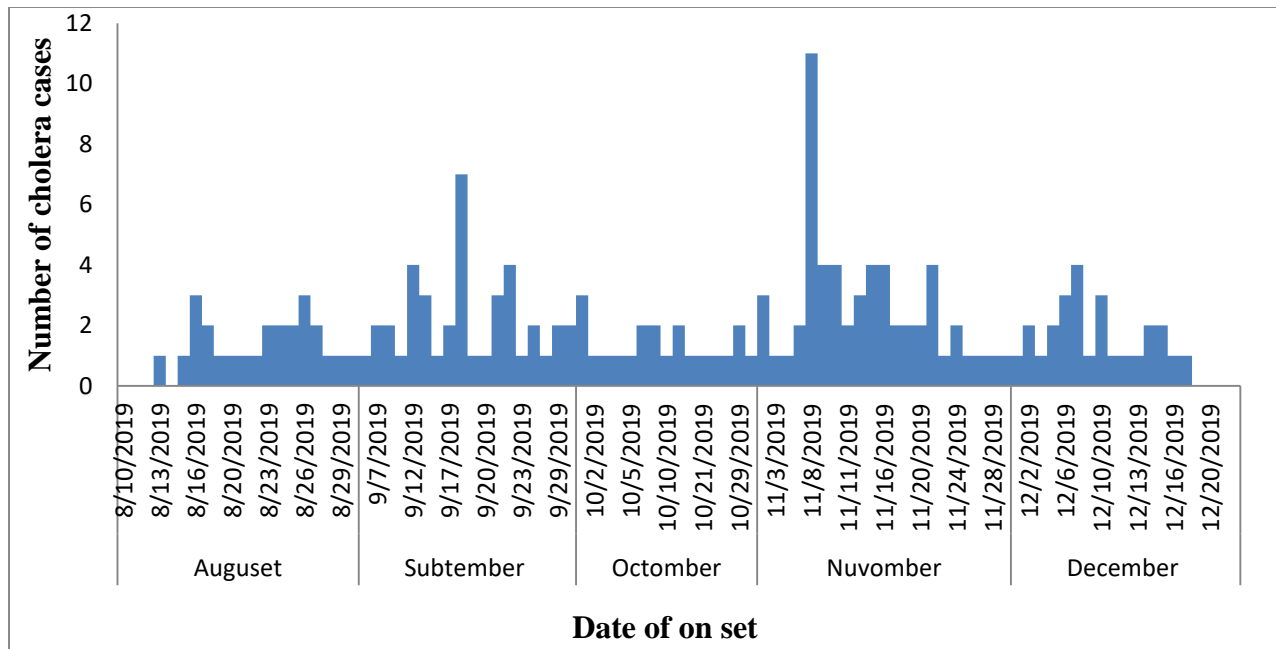


Figure 20 : Epidemic curve of the cholera cases and deaths of West Arsi Zone, Oromia Region, Ethiopia 2019

Outbreak Response Measures and Challenges

Outbreak Response Measures

We activated district outbreak rapid response team and established coordination team composed of case management, water sanitation and hygiene (WASH), social mobilization, surveillance, logistics and monitoring and evaluation (M&E) as per the cholera outbreak response guide. We conducted active case search at health facility and community, followed and disinfected infectious sources. We implemented personal hygiene and sanitation measures, such as, construction of latrine, awareness creation on latrine utilization, water sources inspection and disinfection, chemicals distribution for households and treatment centers. We used car with van at public gathering (religion places, schools, market places), distributed learning materials (cholera leaflets and posters) and used local FM media to disseminate key cholera prevention and control messages.

Challenges Encountered

The Zonal and district epidemic preparedness plan was not updated with the involvement of sectors and stockholders. There was not sufficient evidence with regard to latrine coverage, latrine utilization and drinking water source and coverage; there was shortage of water treatment chemicals.

Discussion

The overall attack rate of current cholera outbreak was 1.9/10,000 population. Our finding is greater than the attack rate of cholera outbreak 1.6/10,000 in 2017 of this zone and the study done in Oromia Regional State, 2010 of 3 Zone of Bale, Guji, East Shewa (4,8). The difference may be at the time the cholera cases not reported freely us now, because of that all cases may be not reported since the country not declared cholera outbreak, on the other side the current cholera outbreak attack rate was smaller than the attack rate of cholera outbreak determined by Gerald Pande, Alex Rioplexus Ario and Joseph K. B. Matovu, in 2018 at Western Uganda with attack rate (2.6%). This difference may be due to the cholera outbreaks were occurring simultaneously in Democratic Republic of Congo on both sides of the border and un well coordination of prevention mechanisms (13). The case fatality rate of cholera outbreak in current study was 1.8%. This is higher than what WHO recommends. World Health Organization recommended that CFR due to cholera should not be more than 1% (1). The CFR was more than WHO acceptable rate this may be due to quality of case management. Also our finding was greater than the finding of outbreak investigation conducted in Yemen, 2016 that revealed the CFR of (0.07%) (14). This difference might be due to under report in Yemen due to the emergence of the armed conflict in March 2015 in Yemen. Similarly the case fatality rate is less than the cases fatality rate recorded in Brong Ahafo Region, Ghana, 2017 that reported as CFR due to cholera outbreak was 2.4% (10).

The current cholera outbreak showed that, more females were affected than male this finding was consistence with the finding of outbreak investigation conducted in Kaduna state, Northwest Nigeria, 2014 which revealed that, female were predominantly affected by the outbreak(15). But, our finding is contradicting with the outbreak investigation conducted in Raya Kobo district, Amhara region, Ethiopia, 2017 which indicated that, majority 6 (60%) of cholera cases where male (3). This difference might be due to that, the difference in sample size, in a way that, the total sample under this study was 10 whereas the sample size of our study was 167 their sample size was very small when compare to our sample size. However, our finding is inconsistence with the finding of the study conducted in Brong Ahafo Region, Ghana, 2017 that reported as male were affected more (53.4%) by cholera outbreak(10). This deviation might be due to, the difference of life style between Ethiopian and Ghana in male, in such way that, male stay out of home and more likely to eat food sold at vendors, market place, restaurant and other public place where food hygiene was not guaranteed more in Ghana as compared to ours.

The current cholera outbreak investigation provided that, 44.3% out of total cases were recorded in age group of ≥ 15 years old. This finding is line with the study conducted in Republic of Congo that showed age ≥ 15 account the highest number of cases (11). Also our finding is agreed with the study finding conducted in Raya Kobbo District, Amhara Region that the greater affected age group was 21-25 years old(3). This age group is more vulnerable to be exposed to food and drinks sold at market place, vendors and other public place where a level of food hygiene cannot be well handled.

In the last three years there were reaped cholera outbreaks in West Arsi zone, this may be due to low latrine coverage and utilization and shortage of clean water coverage's. in this year cholera outbreak attacks five districts, of these the highest attacked district was Shashamane followed by shalla district.

Cholera outbreak was occurred in the mid of August 2019, in West Arsi Zone. The causative agent for this outbreak was cholera serotype O1. This finding is line with finding of outbreak investigation conducted in Ghana by Charles Lwanga Noora in 2014, that was with cholera outbreak was occurred summer season (30th July, 2014) by cholera sero type O1(10). Again our finding is similar with the finding of the study conducted in Kasa'i Oriental province at Diulu HZ (Mbuji-Mayi City) in Democratic Republic of Congo, Cholera outbreak was occurred during month of February to December and caused by cholera sero type of O1(11). Similarly Cholera outbreak investigation conducted in Raya Kobbo, Amhara Region, Ethiopia shows that, cholera outbreak was occurred during (16th - 22nd August 2016) with cholera causative agent of Sero type O1(3). American Microbiologist in 1995 James B. Kaper and etal clearly stated that, V. cholerae sero type O1 can produces Cholera toxin that has long been associated with epidemic following rainy season(12). This finding implies that, cholera endemic and epidemic area was susceptible to suffer with the outbreak during rainy season. So strengthening of surveillance activities and follow up of preparedness is mandatory to prevent the outbreak in every rainy season with consideration of cholera sero type O1.

Conclusion and recommendation

We conform cholera outbreak overall high attack and case fatality rate, females affected more than males and the highest proportion of affected age group was above fifteen years of age, as well as, insubstantial evidence with regard to latrine and drinking water coverage.

Recommendation

Control the outbreak and implementation of response measures to reduce morbidity and mortality. Conduct follow up studies to understand the risk factors, and identifying latrine and water coverage and utilization and prospecting future strategies to prevent cholera outbreak in the zone.

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Chapter Six: Abstracts for Scientific Presentation

6.1. “Measles outbreak investigation and response in Robe town, South-East Oromia region, Ethiopia, March, 2019”

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Abstracts

Background: - Measles is a highly contagious, vaccine-preventable, viral disease. In 2019, CDC reports 9,828,400 measles cases and 207,500 deaths global 48%, 71% in Africa region respectively. An epidemiology of measles estimated those more than 1.5 million cases of measles and 70,000 deaths with 4% CFR would occur in Ethiopia annually. In Oromia 26,908 suspected measles cases and 288 deaths were reported from January 1st, 2007 to December 31st, 2016. On March 2, 2019 Robe town reported a suspected measles outbreak. We conducted an outbreak investigation to describe the magnitude, identify risk factors and control measures.

Methods: - we conducted 1:2 unmatched case-control studies in Robe town from March 6 to 24 2019. The outbreak was confirmed by using serological laboratory test. We describe cases by using line list and collect data using structured questionnaire from all 45 cases & 90 controls by interviewing the case and control including their family. We use standard case definition to identify cases. We conducted bivariate and multivariable logistic regression by using SPSS24. Significance was stated at p- value < 0.05.

Results: - A total of 44 measles cases with case fatality rate 2.2% (1/45) were reported from Robe town. Among cases 29/45 (64%) were male and 33/45(73%) were unvaccinated, children<1 year and male were more affected with (AR=428/100,000) and (AR=78/100,000) Population respectively. Being unvaccinated with measles vaccines were risk factors (AOR= 4, 95% CI [6.56-11.46]), limited knowledge about vaccine prevention of measles (AOR=2.9, 95% CI [1.11-7.56], contact with measles cases (AOR=3.96 , 95% CI [1.25-12.32], presence of measles cases in the some house (AOR = 5.2, 95% CI [1.18-22.99], being less than five years age group (AOR = 3.9 , 95% CI [1.4 – 10.79]) were associated with measles infection.

Conclusion: - Confirmed measles outbreak was caused due to low measles vaccine coverage, males and < 1 years were more affected. Being vaccinated was protective, limited knowledge on vaccine prevention of measles, having contact history and presence of measles cases in the house were identified risk. Strengthening routine and supplementary immunizations were required.

Keywords: Measles, Outbreak, Case-Control, Robe Town, Ethiopia, 2019

6.2.Descriptive epidemiology of cholera outbreak in West Arsi Zone, Oromia Region, Ethiopia 2019

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Abstract

Introduction: Cholera is a diarrheal infection caused by gram -negative bacteria *Vibrio cholerae*, either type O1 or O139. Globally in 2019, there were 923,037 cases and 1911 deaths of cholera with case fatality rate of 0.2 and in Africa 55,087 of cases and 872 deaths with (CFR of 1.6). Cholera could affect both Males and Females and remains a challenge to countries where access to safe drinking water and adequate sanitation cannot be guaranteed. Cholera is usually transmitted through fecal contamination of water or food. We conducted cholera outbreak investigation, characterized cases by time, place, persons and described the morbidity and mortality due cholera outbreak in West Arsi Zone, Oromia region, Ethiopia, 2019.

Methods: Descriptive study was carried out among 167 cholera patients' line list from September 29 to November 30, 2019. We defined cases, selected study participants and conducted descriptive analysis. We analyzed data using Microsoft excel 2010, calculated and described frequency, percentage, mean and median, attack rate (AR) and cases fatality (CFR).

Results: A total of 164 cases and 3 deaths with CFR 1.8% were identified from the line list. Female were 94 (56.3%) and the median age for case was 12 years with range of (1.0-85.0). Highest proportions of cases 58(34.7%) were within 5-14 age group and list affected 24(14.4%) >44 age groups. Age specific case fatality rate was highest in > 44 years. Highest cases were reported from Shashamane 112(67%) district. The outbreak started from 15th August and lasted over 18th December, 2019. Of the total cases 122(73%) were severely dehydrated.

Conclusion: Cholera outbreak with relatively increased overall attack and case fatality rate was conformed. Females affected more than males and the highest proportion of affected age group was above fifteen years of age. We recommend prevention of future outbreak and implementation of response measures to reduce morbidity and mortality and prospecting future strategies to prevent cholera outbreak in the zone.

Key word: Cholera outbreak, Descriptive epidemiology, West Arsi zone

Chapter Seven: Narrative Summary of Disaster situation

7.1. Narrative Report of Flood Disaster Situation in Ilu district of South west Shewa zone, Oromia region, Ethiopia August, 2020

Abstract

Background: Disasters is a serious disruption of the functioning of a community causing widespread human, material, economic or environmental losses which exceed the ability of the affected society to cope using its own resources. Floods and droughts have been a prominent hazard over Africa in general and Ethiopia in particular. For instance, in sub-Saharan Africa, the cumulative effect of floods and droughts together were responsible for around 80% of deaths related disasters and 70% of economic losses. To execute disasters situational analysis and addressing anticipated risks as to develop response plan.

Methods: The assessment was conducted from August 15-28, 2020 using semi-structured questioners interview methods was used to collect information from the district health office and to identifies the risk anticipated and review of document and reports obtained and discussion with district preparedness and response task force had been made.

Results: Due heavy rain, starting from June to August over fellow Awash River caused flash floods in different kebeles of Ilu district since August 13, 2020. Due to this disasters there were 8,626 displaced individuals comprising of 1,290 households in four displacement kebeles were identified. Population at risk 4744 (54.8 %) were Female. Seventy two households submerged, no death occur other than loss of public and privet property.

Conclusion: Flooding affected kebeles displaced from their residence place and loss their properties including daily consumption. Accordingly, there were shortages of food, water and COVID-19 protective materials which affect the displaced community. Ilu district and Oromia regional health bureau should facilitate to overcome displaced community from the flooding risk.

Keywords: Disasters. Flooding, Ilu South west, Oromia, Ethiopia, 2020

7.1.1 Introduction

7.1.1.1 Back ground

Disasters is a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources and hazard is a potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation (2). Floods are the most devastating natural hazards in the world, claiming more lives and causing more property damage than any other natural phenomena (3). Every year, floods affect over 85 million people globally. Between 2012 and 2014, floods accounted for 42% of the nearly 40,000 natural disaster deaths, making floods the lethal type of natural disaster during this period (4).

Floods and droughts have been a prominent hazard over Africa in general and Ethiopia in particular. For instance, in sub-Saharan Africa, the cumulative effect of floods and droughts together were responsible for around 80% of deaths related disasters and 70% of economic losses (5).

In 2020, According to the National Disaster Risk Management Commission of Ethiopia (NDRMCE) reports indicate that, close to 1,017,854 people have been affected and 292,863 people are displaced by floods across the country since the beginning of 2013 E.C end of 2012 E.C summers season. The floods have killed livestock destroyed crops, damaged homes and public infrastructures to an extent not seen in decades (6).

Flash floods usually result from intense rainfall over a relatively short period of time. Much of the flood disasters in Oromia are related to rivers that overflow and burst their banks following heavy rains and inundated lowlands (7).

Heavy rainfall has been reported across Ethiopia during the seasonal June to September rains in 2020. This has caused flooding in six of the ten regions. Oromia region has been the worst hit with over 447,565 people affected by the floods (6)

Death and physical injuries are direct health effects of floods, as well as, infectious diseases, malnutrition, and exacerbation of non-communicable diseases were include under the indirect health effects (4). These assessments identify the health and health related risk occurs in Ilu district of South West Shewa zone Oromia regional state due to over fellow of Awash river flooding.

7.1.2 Objective

7.1.2.1 General objective

To execute disasters situational analysis and addressing anticipated risks as to develop response plan in Ilu district South West Shewa, Oromia region, Ethiopia, 2020

7.1.2.2 Specific objectives

- ✚ To assess the immediate extent and likely hood of different risks in the Ilu district in relation to health delivery system
- ✚ To take action or intervention for displaced population based on risk classification
- ✚ To develop coping of flooding response plan depending on the assessment findings

7.1.3 Method, Area and period

Ilu district was found in Oromia regional states. It was located 59km from zonal town Waliso and 35km far from Addis Ababa capital city of Ethiopia. Ilu district was bounded by North with West Shewa, by South west Bacho district of South west Shewa zone, by North Sebata town and by East Sebata district of Finfinne surrounding special zone of Oromia.

The total area of the district was about 37,294 hectares of land and had topographical feature that ranges from 2060 to 2100 meter above sea level. The climate was characterized midland agro-climate condition as “Kola and Woina-dega”, the mean minimum and maximum annual temperature of the district is 15 °C and 25°C, respectively and the mean annual rainfall reaches of 700-800 mm.

It had a total of 16 rural kebeles and 2 urban kebeles. The district population mainly produces different cereals like Teff, beans, maize and also the people of the district livestock uses as cash and food production. Based on Central Statistical Agency of Ethiopia (1) the district has an estimated projected total population of 89,548, Male 43,847 Females 45,669 out of the total population less than one year children 2,990, < 5 years 15,044 and pregnant women 2990.

The assessment was conducted from August 15-28, 2020 using semi-structured questioners interview methods was used to collect information from the district health office and to identifies the risk anticipated, in addition to that, review of document and reports obtained and discussion with district preparedness and response task force was made at district level.

7.1.4 Results

7.1.4.1 Ilu district current flood disaster situation

In Ilu district the flood occurred due to heavy rain since from June to August, final in August 13, as a result of over fellow of Awash river caused flash floods in many area which affects four kebeles highly and displaced from their permanent residence area.

In 2020 in addition to flooding, there is a high risk of spreading of pandemic COVID-19 virus, cholera outbreak and other water-borne diseases following flood incidents due to deteriorated sanitary conditions, as well as, the use of contaminated water sources. In other cases, flooding is also likely made favorable conditions to mosquito breeding. Accordingly, risk assessment or screening of COVID-19 conducted and 11 suspect cases identified and referred to Ilu district isolation centers and tested for COVID-19 viruses. Also, in case of COVID-19 viruses to reduce the risk of complication for theses displaced population comorbidity screening was done like hypertension and diabetes mellitus screening.

7.1.4.2 Displacement and risk occurred

At Ilu district southwest Shewa of Oromia region, there were 8,626 displaced individuals comprising of 1,290 households in four displacement kebeles were identified. The total populations displaced were 4744 (54.8 %) were Female and the rest were Males. Due to this disaster there were 72 households which was submerged and no deaths occur in the district except displacement and severe loss of property from Asgor health center and individuals households. According to rapid assessment made by district and deployed from regional health bureau 1,745 peoples were placed in school and the rest with host communities that not affected by flooding in the district.

Table 41: Flood Affected population and Kebeles Ilu district south West Shewa zone, Oromia region, Ethiopia, 2020

| Affected kebele | Kebele total population | Number of House hold | Affected HH | Affected population |
|------------------------|--------------------------------|-----------------------------|--------------------|----------------------------|
| Muloseyaye | 6824 | 1422 | 427 | 4237 |
| Midejigdu | 4237 | 883 | 265 | 1419 |
| Tulumogoro | 4729 | 985 | 296 | 1271 |
| Warersokelina | 4833 | 1007 | 302 | 1699 |

| | | | | |
|--------------|--------------|-------------|-------------|-------------|
| Total | 20623 | 4297 | 1290 | 8626 |
|--------------|--------------|-------------|-------------|-------------|

7.1.4.3 The immediate public health risk assessed

7.1.4.3.1 Access to health services for displaced community

One of the problem in this flooding is that Asgori health centers was affected by this flooding, due to this interrupt the delivery of basic and essential health services, which needs to ensure the continuity of these basic health services with temporary mobile clinics .

7.1.4.3.2 Diseases related to over crowding

The populations in the affected areas have been displaced into schools and with host community. These was high risk for different communicable diseases like measles; meningitis and developing of TB and in addition further exacerbate the infection rate and effect of COVID-19 due to shared minimal enclosed spaces that brings overcrowding.

7.1.4.3.3 Water and food borne diseases

During flooding clean water scarcity is one of the major problems due to interruption of clean and safe water. This may be as a result of existing water schemes either is broken down or contaminated with flood. In addition, there were lowly access to safe water, insufficient hygiene and toilet facilities, and contaminated environments for food preparation and handling practices leads to risk of health problems. In addition, water sources may become unsafe for drinking and utilization of other purposes like preparation of food due to the risk of fecal contamination by overflow of latrines and in proper management sanitation activities. Accordingly it may be increases the risk of water-borne diseases such as, for Cholera, typhoid and Shigellosis.

7.1.4.3.4 Vector borne diseases

Malaria is endemic in all flood-affected Kebeles of the district. Un proper management of Water supply and storage, unsafe practices of utilization may also should be put in place to increases vector breeding in this area. This was farther facilitating for exposing to malaria at high risk.

7.1.4.3.5 Malnutrition

In Ilu district monthly less than two years screening for malnutrition and performing of growth monitoring and promotion program were done at two health centers and sixteen health posts and two stabilizing centers at health center and sixteen outpatients therapeutic feeding program at health post level was available in the district, but due to flooding condition it was interrupted, this may be risk to malnutrition as a result to compromises natural immunity; this was leading to expose

different malnutrition diseases in children and pregnant mothers. We assess the previous three year screening of malnutrition performance in similar months (Table: 42).

Table 42: : Malnutrition cases by year and months in Ilu District, South West Shewa zone, Oromia region, Ethiopia, 2020

| Months | 2018 | | 2019 | | 2020 | |
|--------------|-----------|----------|----------|----------|-----------|----------|
| | # of OTP | SC | # of OTP | SC | # of OTP | SC |
| June | 10 | 0 | 1 | 0 | 8 | 0 |
| July | 0 | 0 | 1 | 0 | 14 | 0 |
| August | 1 | 0 | 3 | 0 | 6 | 0 |
| Total | 11 | 0 | 5 | 0 | 28 | 0 |

7.1.5 Interventions Taken by the District Task force committee.

7.1.5.1 Provision of health services for displaced community

- ✚ Establish mobile clinic at place of temporary residence area in school.
- ✚ Screening for COVID-19 pandemic viruses and malnutrition
- ✚ Ensure minimum initial service package for reproductive health and availability of basic and comprehensive emergency health services.
- ✚ Ensure availability of basic medicines for treatment.
- ✚ Identify and address critical health needs of vulnerable groups like elder and disabled.

7.1.5.2 Risk reduction related to overcrowding

Strengthen communicable disease surveillance and response system at school sheltered displaced community and host community where the displaced community placed and live together for temporary time. In line with the current COVID-19 pandemic, due to vulnerability of displaced community; therefore, ensuring the flood response intervention was integrated with the COVID-19 response strategy is crucial and access to water, compliance with sanitary/hygiene requirements to prevent further spread of COVID-19 and distribute adequate personal protective equipment (hand sanitizers and masks) including COVID-19 risk communication and community engagement (RCCE) and provision of hand washing facilities.

7.1.5.3 Water, Food and Vector borne diseases

Reducing the risk of water, food and vector borne diseases for these at school occupied and at the same hosting community through determining the appropriate method of household water

treatment for each community as availability of water purifying chemicals, in addition for all affected kebeles and distribute LLINs. Temporary latrine was prepared and promotion of key hygiene messages including provision of Information Education Communication (IEC) materials. In addition, orientation was given for displaced communities (on COVID-19 pandemic prevention and isolation methods, sign, symptoms and risk factors related to its transmission methods, on safe water storage and use of water treatment and LLINs utilizations).

Table 43 : Plan of action for flood response by key thematic areas of Intervention, in Ilu district south west Shewa zone, Oromia, Ethiopia August, 2020

| Key thematic areas of intervention | Activities to be done | Responsibly body | Indicators |
|--|---|--|---|
| Social mobilization and awareness creation | <ul style="list-style-type: none"> ✚ Mobilizing those school sheltered community through health education and risk communication especially on COVID-19 pandemic disease prevention and protection mechanisms ✚ Distribute leaflets and posters for the displaced community those shown COVID-19 and other epidemic disease transmission and prevention methods | <ul style="list-style-type: none"> ✚ Ilu district Health office, ✚ District communication office,, ✚ District Administration, ✚ Kebeles leaders, | <ul style="list-style-type: none"> ✚ Health education and awareness creation session conducted ✚ Distributed leaflets and posters |

| | | | |
|--------------------------------------|--|---|---|
| <p>Water, Hygiene and Sanitation</p> | <ul style="list-style-type: none"> ✚ provisions of water for flood affected kebeles in area where no source of clean waters ✚ Supply and distribute water treatment chemicals (Bishan gari, aqua tab, water guard and PUR ✚ Avail different materials used for storage of water like, jerry cans ✚ Provide laundry and hand washing soap, face masks and sanitizers for COVID-19 viruses prevention ✚ Test water quality ✚ Assess latrine availability and utilization at each temporary shelters and community hosting displaced population. ✚ Construct adequate latrine and shower points at temporary shelter ✚ Provide Laundering washing basin ✚ Monitor utilization of latrine ✚ Drainage of logged flood water ✚ Re-construct public latrines damaged by the flood ✚ Inspection of food and water at school shelters | <ul style="list-style-type: none"> ✚ Oromia Regional Health Bureau PHEM directorates in collaboration with Water and Energy Bureau ✚ Ilu district Health and Water office ✚ Kebeles leaders, Community representatives | <ul style="list-style-type: none"> ✚ No. of kebeles reassessed for risk identification/mapping ✚ Water treatment chemicals supplied, face masks and sanitizers distributed ✚ Number of water storage material availed or distributed ✚ Number of launder and hand soaps distributed ✚ Conducted Water quality test ✚ Number of appropriate pit latrine constructed and utilized ✚ Number of latrine and shower constructed at temporary shelters ✚ Logged flood water drained ✚ Conducted inspections to assure food and water |
|--------------------------------------|--|---|---|

| | | | |
|---|--|---|--|
| <ul style="list-style-type: none"> ✚ Surveillance, COVID-19, Malnutrition malaria, TB, Meningitis, Measles and other communicable disease prevention and control | <ul style="list-style-type: none"> ✚ Assign from the community those reports or informs new events or rumors in temporary shelters ✚ Ensure daily active case searching including rumor documentation and verification at host community and school shelter places ✚ Conduct appropriate investigation for any rumor received from the host community or temporary shelter areas ✚ Regular surveillance data collection, analysis & reporting from temporary sheltered Outbreak event notification to the respective higher levels ✚ Ensure availability and utilization of LLINs ✚ Environmental management by draining of logged water ✚ Routine Screening of malnutrition for under 5 children, pregnant women and lactating mother and link to OTP/TSF programs if identified | <ul style="list-style-type: none"> ✚ Oromia region PHEM directorates , Ilu District health office ✚ Kebeles leaders, HEWs, Community representatives ✚ Assigned rapid response teams | <ul style="list-style-type: none"> ✚ Disease rumor documented and verified ✚ Number of outbreaks investigated, confirmed and reported ✚ Number of Surveillance data collected, analyzed and reported ✚ Availability and utilization of LLINs ✚ Number of mosquito breeding site disregarded |
|---|--|---|--|

| | | | |
|---|--|---|--|
| <ul style="list-style-type: none"> ✚ Case management | <ul style="list-style-type: none"> ✚ Availing emergency drugs and medical supplies for school sheltered and host community ✚ Assign health professionals for diagnosis and appropriate treatment at temporary clinics. ✚ Avail case management guideline and case definitions ✚ Arrange referral system for complicated cases to nearby health center/Hospitals ✚ Ensure the availability of Infection prevention supplies and guidelines at temporary clinics ✚ Avail supplementary feeding program for under five children, pregnant and lactating mothers at nearby health facilities. ✚ Ensure that routine MCH service utilization | <ul style="list-style-type: none"> ✚ ORHB, ZHD, District health office, HC, Hospital | <ul style="list-style-type: none"> ✚ Availability of emergency drugs and medical supplies ✚ Availability of health professionals at assigned temporary clinic ✚ Utilization of prepared referral system for complicated cases ✚ Distributed infection prevention supplies ✚ Screened children for SAM & MAM ✚ Pregnant and lactating mother provided supplementary feeding |
| <ul style="list-style-type: none"> ✚ Coordination | <ul style="list-style-type: none"> ✚ Strengthen Task force committee ✚ In capacitate Task Force and technical team ✚ Conduct regular meetings with TF and technical teams ✚ Prepare and implement emergency response plan | <ul style="list-style-type: none"> ✚ Oromia regional PHEM directorates ✚ Ilu district Administration and Kebele leaders | <ul style="list-style-type: none"> ✚ Review meeting conducted which TFC prepared and disseminated EPRP f the district |

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Chapter Eight: Protocol/Proposal for Epidemiologic Research Project

Knowledge and Practice of Notifiable Disease Surveillance among Health-Care Workers in East Showa Zone, Oromia Region, Ethiopia

Summary:

Background: Public health surveillance is the ongoing systemic collection, analysis, and interpretation of outcome-specific data essential for planning, implementation and evaluation of public health practice, and the timely dissemination of data like, disease, injury, and disability, as well as risk factors, vector exposures, environmental hazards, or other exposures for those who need to know despite to prevent and control disease and injury. The study will be to identify the knowledge and practice of disease surveillance, as well as, the existing factors and desire solutions in the zone.

Methods: Facility based cross-sectional study will be conducted from May 30 to June 28, 2021. A total of 562 participants will be included in the study. an interviewer administered questionnaire will be used by data collectors after ethical clearance received and letter of support written by regional health bureau to zonal health office, district health office and health facility. Filled questionnaires will be checked for completeness and consistency daily by the principal investigators incomplete filled questionnaire re-assessed by data collectors. At the end descriptive analysis such as mean, proportion, and percentile, median and standard deviation will be calculated and in addition bivariate and multivariate logistic regression with p-value of 0.05 will be used to shown the association.

Work plan: Data collection will be started on June 4th and end June 28, 2021

Budget: The required cost for the study will be estimated to be **52,070** ETB.

8.1.1 Introduction

8.1.1.1 Background

Integrated diseases surveillance was an approach that aims at collecting health data for multiple diseases, using standardized tools which was the various surveillance activities become integrated into one system within the broader of national health system and emphasizes all functions of surveillance activities to be carried out using similar structures, processes and personnel (1,2). It was approach modified to strengthen national diseases surveillance system by coordinating and streamlining all surveillance activities and ensuring timely provision of surveillance data (3).

Public health surveillance is the ongoing systemic collection, analysis, and interpretation of outcome-specific data. Essentially used for planning, implementation and evaluation of public health practice, and the timely dissemination of data like, disease, injury, and disability, as well as risk factors, vector exposures, environmental hazards, or other exposures for those who need to know despite to prevent and control human disease and injury (1,4,5).

Public health events its name changed to Public Health Emergency Management (PHEM) since 2009 during wide reform initiative of Business Process Reengineering (BPR) implemented in the whole country (8). Public Health Emergency Management includes emergency preparedness, early detection, response and recovering from the public health effects of emergency threats (1,9). In addition the public health emergence management provides laboratory support to public health emergency for the identification of important public disease or conditions (8).

The flow of information in public health emergency management system in Ethiopia is from the community to health facility, then to facility focal person to district health office, to zonal health office then to regional public health emergency management and finally to national emergency reporting unit (1). Data analysis would be expected to perform at all level and action to be taken in similar way at each reporting facility, as well as, feedback given for each reporting unit (9).

In Ethiopia study done in Southern Nation Nationality of people's Region (SNNPR) on Integrated Disease Surveillance and Response Implementation shown that, one of the problems identified was (93%) of health facility had no form of data analysis available on the priority diseases and (45%) of them not have a reporting system to the district health offices (10). Other challenges facing for good performance of the IDSR program is the issue of incomplete and untimely. This problem is observable at health workers level in relation to their knowledge and practice of health-care workers towards the integrated disease surveillance response. In Ethiopia, as well as, Oromia

region the study is needed to assess priority disease surveillance system to explain the knowledge and practice of health-care workers towards Integrated Disease Surveillance and Response (IDSR).

8.1.2 Statement of the problem

Notifiable disease surveillance is important for early detection of changes in the temporal, geographic and age distribution of new and known diseases that indicate outbreak of infection, or changes in the sporadic diseases. It determines the exposure, prevalence, burden, mortality and long-term trends of infectious disease and also it enable appropriate and timely action to be taken in order to protect the public health (4,9). Despite of this importance different researchers shows challenges on knowledge and practice of disease surveillance, in Kenya 92.9% of health-care worker were not aware on priority Integrated Disease Surveillance and a cross sectional study conducted in Benin city among Doctors of resident in a tertiary health institution shown that, (89.7%) had had a poor practice of disease surveillance (11,12). Accordingly, the knowledge and practice of public health towards integrated disease surveillance and response are very important for the efficient reporting of notifiable diseases. Despite this, the roles and responsibilities of the public health care-workers in disease surveillance and response cannot be emphasized (13).

Both the quantitative and qualitative study conducted in Malawi on the implementation gaps and challenges of IDSR system showed that, 73.1% completeness and 40.2% timeliness rate respectively of total expected monthly reports nationwide and zero weekly reports identified. Accordingly, major implementation gaps were lack of weekly report and trainings, as well as, the challenges of IDSR implementation revealed through qualitative data included case identification, compiling reports and inadequate resources (14). Other study conducted in Nairobi city county, Kenya identified that, on the pattern of epidemics monitoring data reporting 47% of the health facilities made complete report 36% partial reporting and 17% had no report at all. Accordingly, the institutional factors identified supervision, presence of IDSR focal persons were significantly associated with poor data reporting at ($P < 0.001$) whereas, training and awareness of surveillance data reporting days were individual factors which were significantly associated with poor reporting practice at ($p < 0.001$) (15).

A cross sectional qualitative study conducted in Uganda in 2016, explains the importance of training on the completeness and timeliness of reporting, case detection and data analysis as better response to disease outbreaks after training has taken. The challenges are included an inadequate

number of trained staff, funding, irregular supervision, high turnover of trained health workers, and lack of key logistics (16).

Rapid response to diseases outbreaks is important for controlling of its spread to other area, However in East Shewa zone five years malaria surveillance data analysis shown that the average completeness rate of report shown that less than national and WHO 80% target. The zone is at risk of delayed response in case outbreak occurred due incompleteness report of notifiable reporting diseases in the zone. Accordingly, there is a need to streamline the system to realize, exceed and maintain the national (Ethiopian ministry of health) reporting target rate of 80% (1). However, the effective control of these notifiable diseases highlights the need to increase the disease notification practice. Yet, the knowledge and practice of disease surveillance among the health care-workers has not assessed in East Shewa zone of Oromia region. Hence, the assessment of the knowledge and practice of disease surveillance for health care-workers will be important. Hence, objective of this study is to assess the level of knowledge and practice of disease surveillance among health care-workers in East Showa zone, Oromia region, Ethiopia.

8.1.3 Significance of the study

The findings of the study is expect to provide information on the level of knowledge, Practice and factors affecting disease surveillance practices among health care-workers and integrated disease surveillance response. It helps to improve the public health emergency management and response strategy in the zone. The study will be identify the gabs of knowledge and integrated disease surveillance practice factors, desire solutions, and help in making informed suggestions towards the improvement of the integrated disease surveillance response strategy in the zone as well as used as a base line for other researches in the region.

8.1.4 Literature Review

8.1.4.1 Overview of Surveillance of Notifiable Diseases

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 (9).

Public health surveillance data forms the foundation of public health program and is required for a number of purposes, ranging from demonstrating the size and impact of the public health problem has addressed by the program. Those identifying the population groups to which additional prevention efforts should be directed, determining whether the problem is growing in size or reduced to providing feedback to data providers, and as a part of an overall program evaluation strategies (13).

It is a watchful, alert approach to information collecting that serves to improve or maintain the health of population (17). It was traditionally applied to acute communicable diseases beginning in 1950's in USA (17). Its scope has now expanded to include non-infectious diseases, health related events like environmental hazards, immunizations, distribution of biochemical, health care delivery, etc. Historically, William Farr in Registrar Generals office, in mid1850s was the first to start collecting organizing, analyzing and disseminating statics data (17). In 1878, the USA Congers authorized Public Health Services to report occurrence of quarantinable diseases namely cholera, plaque and yellow fever (17). In1893 effort began towards the standardization of format for data collection by producing relevant forms (17). In 1913, USA government directed the Public Health Services to send weekly telegraphic summaries (17). The national officer of vital statics was thus created in the public health services office (17). Until 1950, weekly report was published in public health reports but later became the Morbidity and Mortality Weekly Report (MMWR) and was then transferred to the centers for disease control (CDC) (17).

In Africa following the resolution of the 48th assembly, the Integrated Disease Surveillance and Response strategy was adopted by WHO/AFRO Member States in September 1998 as the approach for improving public health surveillance and response for priority diseases, conditions and events at community, health facility, district and national levels (2).

The Ethiopia Federal Democratic Republic Government, strengthening disease surveillance system by indorsing integration of surveillance activities has started in 1996. Whereas the public Health Emergency management (PHEM) has established as a core processes at Ethiopian federal

ministry of health since, 2009 after countrywide reform initiative aimed to bringing effectiveness and efficiency in execution of various works using the Business Process Reengineering (BPR) as a tool (1,8).

There are various activities done to improve disease surveillance globally (2,5). Those efforts made to an effective early warning and improving the detection and notification of the out breaks. Practical reasons why disease notification has established as public health practice, and why it has maintained were different new infectious disease have recognized by the world health organization. Since 1973 and at Ekpoma in Endo state (in 1990 and 1992) like outbreak of Lassa fever and in November 2003 there was an outbreak of the deadly but preventable disease, Severe Acute Respirator Syndrome (SARS) in at least 25 countries. As well as, in recent Ebola and pandemic of Coronavirus disease(COVID -19) are the main public issues which to be why diseases notification was important and public health practice (13).

The significant health impacts and economic costs of disease outbreaks highlights the critical importance of effective public health surveillance and rapid response. As well as, the cost of infection as an example the severe Acute Respiratory Syndrome (SARS) a global epidemic that occurred in 2003 affected 8,096 persons with almost 800 deaths resulted to huge financial cost of \$40-\$54 billion (13). In addition the high rate of illness can lead to lower worker productivity while premature mortality reduce the size of the labor force, both of which have economic trouble (12).

There is growing evidence that these economic and societal costs can be mitigated by surveillance systems that are stable and flexible, in the case of SARS, an effective surveillance system has the potential to decrease the size of the epidemic by one-third and the duration by four weeks, with significant cost savings (13,18).

Disease surveillance and notification is which comprises databases, personnel, and materials that are organized to collect data which are utilized for informed decision making (1).

Notifiable diseases which are prone for epidemic, had international concern and diseases on eradication, elimination and other disease of public health importance programs in Integrated Disease Surveillance and Response activities. Those diseases have selected based on diseases which have high epidemic potential, that have available effective control and prevention measures for addressing the public health problem they pose and required internationally under IHR 2005 (1, 11). As Ethiopian Public health institute categorization those diseases are 23 (15 are immediate

reportable whereas 8 are weekly reportable diseases. Those 23 disease and conditions are classified in to two reporting time period depending on their epidemic potential, these disease selected for eradication and elimination are decided to reported as immediate report for the next reporting level, as soon as, suspected or confirmed depending on the case definition suited in Ethiopian public health emergency management. According to the Ethiopian Federal Democratic Republic (PHEM) guide line fifteen diseases selected for immediate report which is a single suspected case is considered as a suspected outbreak. A suspected out break diseases should be notified within thirty minute difference from the identified level (unit) of report up to the national reporting unit, then national reporting unit report to WHO within twenty four hours of dictation. Of these, 8 diseases (malaria, meningitis, dysentery, typhoid fever, epidemic typhus, relapsing fever, SAM and scabies) are reported on weekly base and the rest 14 diseases (yellow fever, rabies, small pox, polio, NNT, measles, guinea worm, viral hemorrhagic fever, cholera, anthrax, avian human influenza, sever acute respiratory syndrome, pandemic influenza and Maternal death) are reported on immediately base (1)

These data are analyzed before transmission to the next level and to complete the cycle of flow of information for action, adequate feedback of surveillance information is needed by health workers and the community. The flow of information in surveillance system is two direction in this way the timely and easily understood analysis of information and feedback through the various levels of reporting system. This is used in updating control activities, thus, maintaining interest and motivation among the reporters. Feedback also serve as a control and increases community awareness and participation on the pattern of diseases (1,13).

8.1.4.2 Knowledge on Integrated Diseases Surveillance Response among Health Workers

The knowledge about notification of disease is important for the reporting of notifiable disease. Hence the knowledge of reporting requirements and responsibilities among health care workers must be examined adequately to find out the cause of under reporting. The study done on implementation of Integrated Disease Surveillance Response (IDSR) in Kingdom of Bahrain, in 2014, shown that, uncertainty of diagnosis (58.6%) and lack of knowledge how to notify were (20%) (19). In addition the study done in Nigeria, in 2016 on health workers knowledge and notification of integrated disease surveillance those heard about IDSR were 67.5 and those know the correct definition of IDSR were 57.5% (20).

Regarding to knowledge on IDSR reporting form, the study done in Nigeria identifies 24% of the health workers did not know or correctly use the reporting form (21).

Cross-sectional facility based descriptive study done in Zambia, identify that, factors affecting the implementation of the IDSR were low knowledge of health workers (22). Other assessment of health facilities in Meru County of Kenya health-care worker knowledge on Integrated Disease Surveillance and Response (92.9%) of them were not aware of notifiable diseases and (89.7%) had a poor practice of disease surveillance response. As well as, on the level of implementation of IDSR strategy from the total (40-60%) of health facilities were unsatisfactory level of implementation and (70.65%) of the health workers challenges to implement IDSR because, lack of “airtime” (Phone call fees) leading to non-reporting(18). Also other study in Kenya shown due to different reasons (56%) of health facilities were classified as poorly reporting practice (24,25). In other way lack of feedback from the concerned authorities is a well-recognized barrier to communicable disease notification in most of the Mediterranean region. There is usually no way of showing health workers the value of their vital contribution to the system and due to this they lose interest in surveillance activity (19).

A descriptive cross-sectional study conducted on health workers to examine the awareness and knowledge of health-care workers about integrated disease surveillance notification in Anambra State, Nigeria, Shown that, 89.8% of the health-care workers aware about Integrated Disease Notification system. In addition 33.3%, 31.1% and 33.7 % of them knew the specific uses of three reporting form those used for IDSR reporting form 001,002 and 003 respectively (26).

8.1.4.3 Integrated Disease Surveillance Notification Practice

One of the factors affecting IDSR implementation was poor practice of health workers towards integrated disease surveillance report (22). The comparative study done in Nigeria shown that, year of experience and knowledge on integrated disease surveillance had significant association. However, health workers with good knowledge of reporting compared to those with poor knowledge of reporting notifiable diseases had five fold of reporting notifiable diseases and those had 20 or more years of experience in practice were less likely to report disease using IDSR forms (13). Another Cross-sectional study conducted in Oyo State, Nigeria, shown that, about 70% of the health workers had good knowledge on IDSR data flow and 67.3% knew how to use IDSR form 003 but less than 10% knew how to use other IDSR forms (21).

A study on the practice of disease reporting among physicians requirement who attend a conference at Mount Sinai Medical Center reported that, the average score of 15.6 (out of 20) has obtained for physician's knowledge of disease in the list of 20 reportable communicable disease. Only 40 (24%) physicians knew the correct procedures for reporting, and 47% knew that reporting was required within 24 hours of diagnosis (13).

A systemic review that, shown poor reporting practice on integrated disease surveillance reporting were includes: non-sustainable financial resources, lack of co-ordination, inadequate training and turnover of peripheral staff, erratic feedback, inadequate supervision from the next level, weak laboratory capacities coupled with unavailability of job aids (case definitions/reporting formats), and poor availability of communication and transport systems (27).

8.1.4.4 Factors Associated to Integrated Disease Surveillance Response Practice

Qualitative study conducted on surveillance practice in Solomon Island identifies that, even though the interviewees were knowledgeable and willing to contribute to the surveillance system. Constraining factors included the perception that, surveillance was less than patient care and has reported later than during busy periods and wide variability in application of case definitions. Also motivating factors were frequent training, formal recognition for good performance, incentives and designation of focal point (28). Other cross sectional survey conducted on notifiable disease reporting among public sector physicians in Nigeria identifies that, the most common perceived obstacles to reporting were lack of infrastructure/logistics or reporting system, which was 31%. However, lack of knowledge among doctors about how to report or to whom to report was 26% and all most 99% of the physician were report by their on cell phone (29). In addition, a cross-sectional facility based descriptive study done at Zambia, shown that; factors that affected the implementation of the IDSR were low knowledge levels among health workers about IDSR and negative attitudes opinion that the IDSR system wasted much of their time and interfered with their clinical work. In addition, poor practices of health workers towards IDSR lacked of quick feedback and resources like reporting form, electricity and good network connectivity have identified as factors affecting IDSR implementation (22).

The assessment conducted on diseases notification in South Eastern State, of Nigeria reveled that, only two-thirds of the respondents were aware of disease reporting forms and of those aware, between 11 and 24% did not know or correctly identify the uses of one type of form or other. Majority of the opinion were that disease reporting was a unwieldy activity (67%), inadequate

supply of forms (52.4%) and 74% had not reported a disease before received training in disease reporting (30).

The assessment conducted in Malawi on the implementation gaps and challenges for timely report revealed that, major implementation gaps are lack of weekly report and trainings and the challenges are case identification, compiling reports and inadequate resource respectively (14). Additionally, a quasi-experimental study done on the challenges of integrated disease surveillance response reporting among healthcare personnel in Mangu, Plateau State, Nigeria in 2015, confirms that, the presence of the IDSR forms and the knowledge of health workers was statistically significant with a p-value <0.0001 after intervention (21).

Study conducted in Nairobi County, Kenya, in 2013 on factors associated to adequate weekly reporting for disease surveillance, three factors identified by multivariate analysis are weekly reporting form (AOR 19,95% CI:6-65), posters showing IDSR functions (AOR 8,95% CI: 2-12) and having a designated surveillance focal person (AOR 7, 95% CI:2-20) (31).

In Ethiopia, there is lack of assessment on knowledge, practice and disease surveillances. However, the assessment done in Southern Nation Nationality of Peoples Region in 2016, on Integrated Disease Surveillance and Response Implementation, (93%) of health facility had no form of data analysis available on the priority diseases and (45.7) of them not have a reporting system to the district health offices (10).

Conceptual framework

The surveillance of notifiable disease practiced and the cases are detect at the health facility the first level of contacts of the patient with the health systems, then registered, confirmed, analyzed, interpreted and used for action. To practice surveillance system it needs knowledge, resource and materials. Accordingly the WHO/AFRO develops conceptual frame works these are six core activities comprising public health surveillance (detection, registration, reporting, confirmation, analysis, feedback, and four support activities, which are communication, training, supervision and resource provision. Those and including the socio-demographic characteristics of health workers are factors affecting the knowledge and practice of notifiable diseases (32).

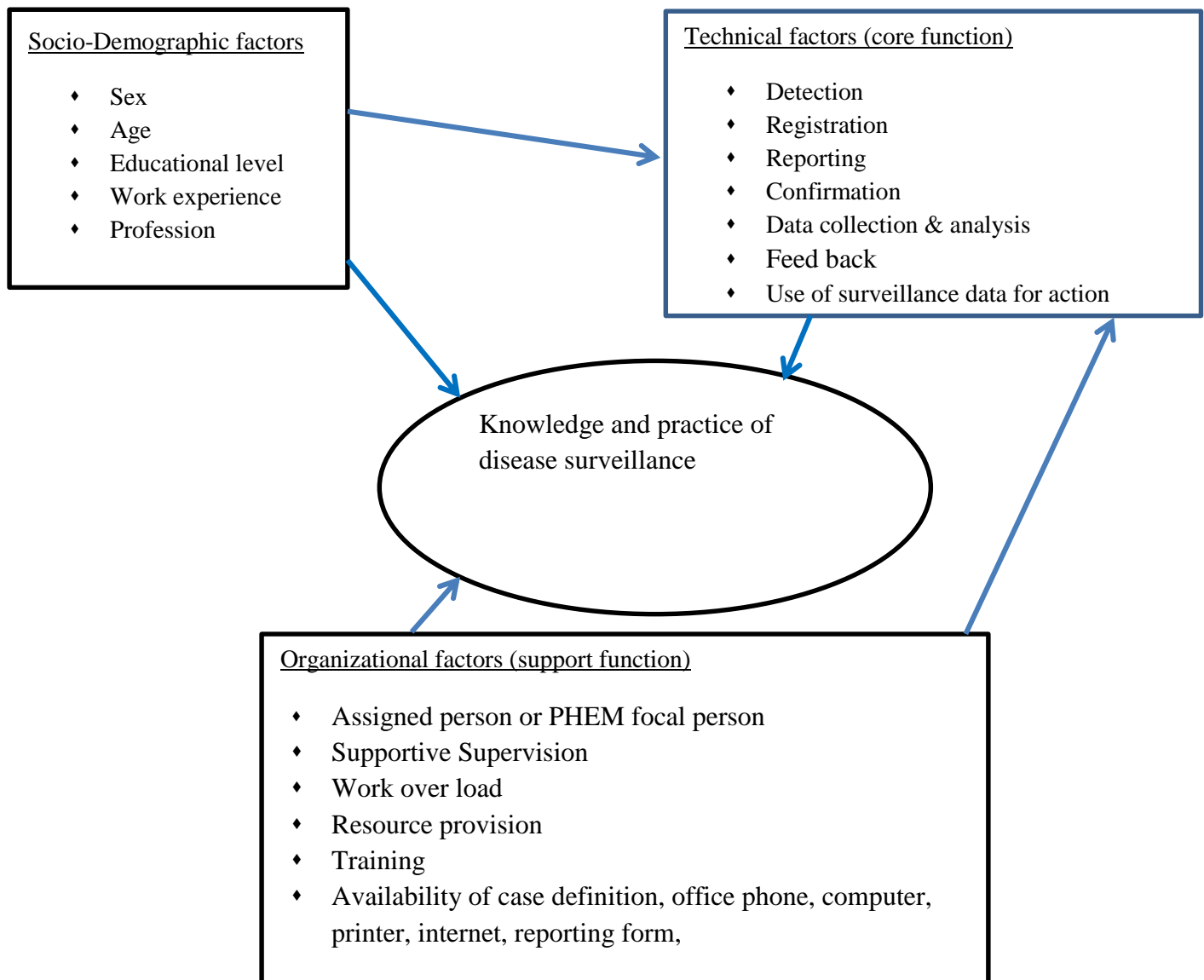


Figure 21 : The conceptual Framework adapted from WHO, for assessing notifiable disease surveillance practice and its associated factors in East Shewa, Oromia Region, Ethiopia, January 2021.

Research questions

1. Are there available PHEM reporting forms and other relevant tools for the PHEM system like different logistics in East shewa zone, health centers?
2. Do health care workers know how to make effective use of these PHEM forms in their health centers?

8.2 Objectives of the study

8.2.1 General objective

The main purpose of this study is to assess the knowledge and practice of notifiable disease surveillance among health-care workers in East Shewa Zone, Oromia Region, Ethiopia, from May 30 to July 28, 2021

8.2.2 Specific objective

1. To determine the level of knowledge of notifiable disease surveillance among health-care workers in East Shewa zone of Oromia region
2. To assess practice of notifiable disease surveillance among health-care workers in East Shewa zone of Oromia Region.
3. To identify factors associated with notifiable disease surveillance practices among public health-care Workers in East Shewa Zone of Oromia region.

8.2.3 Methods and Materials

8.2.3.1 Study area and period

The study will be conducted in East Shewa zone, which is 100 kilometers away from Addis Ababa to the East. The zone has low level topography with an altitude ranging from 120-2500 meters above sea levels. The zone has an estimated area of 10,232 square kilometers and has three geographical climatic zones, highland or “Dega” which area >2500 meters altitude accounts for 5%, Mid-land or “Weynadega” for area from 2000 to 2500 meters altitude constituting 25% and low land or “Kola” for areas below <2000 meters accounts for the remaining 70%. East Shewa zone is one of the twenty-one Zones in Oromia regional state situated in the Great Rift Valley between 90 N to 140 latitude and 400 E to 420 E longitudes. The zone has 11 administrative district and 59 governmental health facility and 102 Private clinics. Depending on the public health emergency management guideline and governmental structures all health facilities should expected to practice priority diseases surveillance. In East Shewa Zone, 2,852 health workers assigned and gave services in 59 governmental health facilities. East Shewa zone has bordered by the Amhara Region to the North, by the Afar Region to the Northeast, by South West Shewa Zone to the West, by Arsi zone to the South, Southeast, and Finfinne Surrounding Oromia Special Zone, by Arsi zone to South West and by the Southern Nations, Nationalities and People’s Region on Southwest. The study will be conducted from May 30 to June 28, 2021.

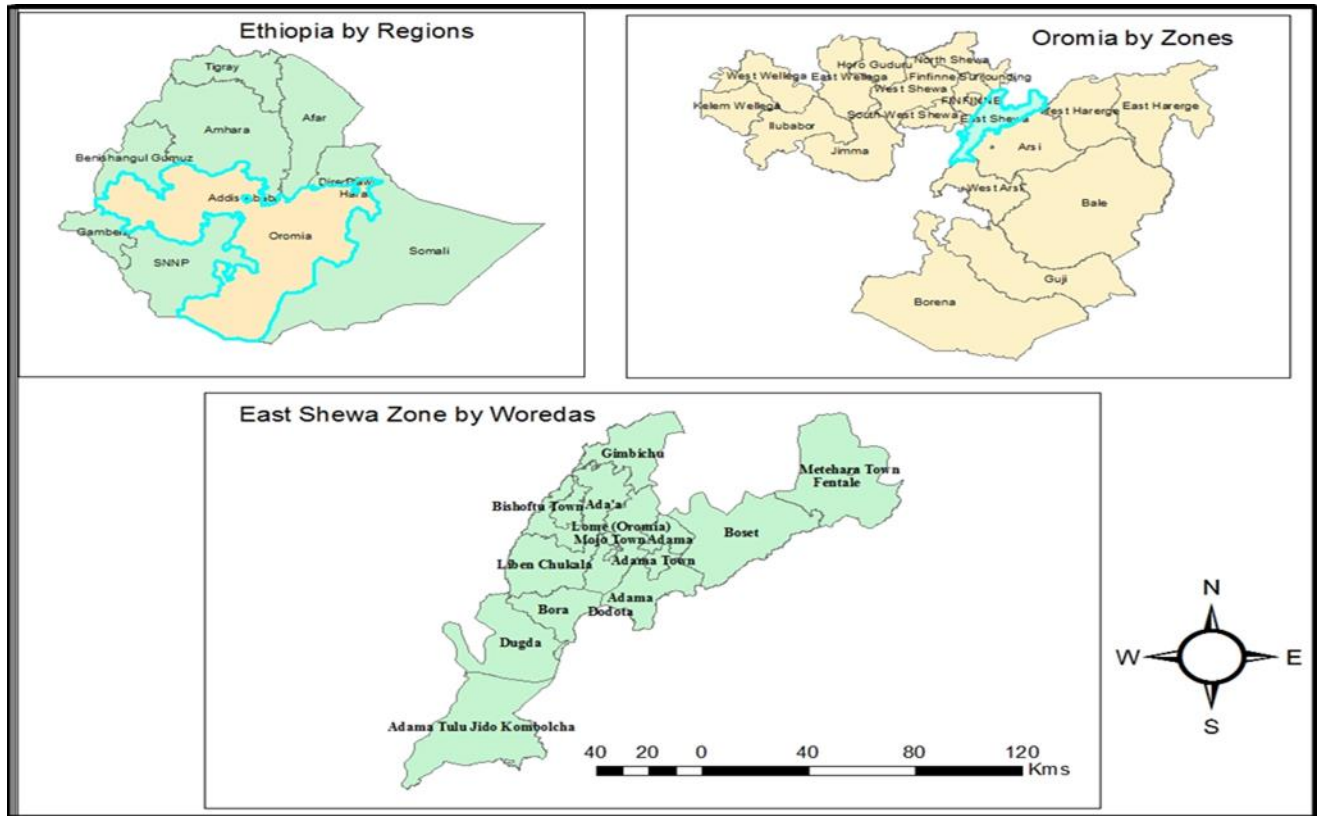


Figure 22: Map of the Study area of East Shewa Zone in Oromia Regional State of Ethiopia, 2021

8.2.3.2 Study Design

A health facility based cross-sectional study design will be conducted using both quantitative and qualitative data collection method to assess the knowledge, practice and its associated factors among health care workers on notifiable disease surveillance.

8.2.3.3 Population

8.2.3.3.1 Source population

All health workers who are working at health centers, which found in East Shewa zone of Oromia region, are the source population.

8.2.3.3.2 Study population

All selected health workers, at health centers are the study population.

8.2.3.3.3 Study subject

The study subjects are health care workers at different working unit, PHEM officer and department (unit) head at health centers

8.2.3.4 Eligibility criteria

8.2.3.4.1 Inclusion and exclusion criteria

All health workers those not excluded working in health centers are included.

Health center workers who were not involved in clinical care like administration unit and security personnel or staffs and health workers who were not permanent staff of the current health center workers like those on clinical attachments have excluded.

8.2.3.5 Sample size determination and sampling procedures

8.2.3.5.1 Sample size determination

For the quantitative part, the sample, size (n) required will be calculated using the following single population proportion formula based on the assumption of 50% proportion (p) that all the health workers have knowledge and practice surveillance disease report. Hence, 0.0025 (5%) marginal error (d) to maximize the size of the sample, a standard Z score of 1.96 corresponding to 95% confidence level. Correction for the loss of sampling efficiency resulting from the use of stratified sampling, 5% non-response rate, using design effect of 1.5 and the total population or health workers of East Shewa zone was 2,852 that was less than 10,000 we use population correction formula. Then the sample size was calculated as follows:

$$n = [(Z \alpha / 2)^2 (p \cdot q)] / d^2 = [(1.96)^2 * 0.5 * 0.5] / (0.05)^2 = 384$$

However, since the target/eligible health workers of population is <10,000 which is 2,852, it needs to adjust the sample size by population correction factor formula as follows:

$$n \text{ adjusted} = n = \frac{n}{1+n/N}, \quad n = \frac{384}{1+384/2852}, \quad n = \frac{384}{1+\frac{384}{2852}} \quad n = 338$$

Where: N- the population size (total health workers in the zone)

n- Number of sample size

Considering 5% non- response rate sample size was increased (n = 338+17) to = 355 and by considering 1.5 design effect; the final calculated sample size was = (355*1.5) =533

8.2.3.5.2 Sampling techniques and producers

For quantitative method;

First East Shewa zone is purposively selected from the 21 Zones of Oromia region. Then, from eleven districts of East Shewa zone, seven district health offices namely (Ada'a, Adama, Adami Tulu, Boset, Fentale, Dugda and Lume) which covers 62% of the total zonal districts has been

selected by using Simple Random Sampling (SRS) technique. Moreover, from the selected districts, we proportionally allocate health centers (HCs) depending on their total health centers they have and we draw health centers by using SRS v technique. Accordingly, (three out of five HCs of Ada'a, seven out of ten HCs of Adama, five out of seven HCs of Adami Tulu, four out of seven HCs of Boset and two out of four HCs of Fentale, five out of seven HCs of Dugda and three out of five HCs of Lume) districts will be selected respectively by using SRS. which a total of twenty nine health centers. Finally, respondents will be selected by using SRS technique proportionally allocating the sample to selected HCs up to we reach the calculated sample size.

Sample determination, technique and procedures for qualitative part

We will determine the sample size by following purposively selection from all selected health centers by selecting facility head. Accordingly, from twenty-nine health facilities twenty-nine (29) respondent included.

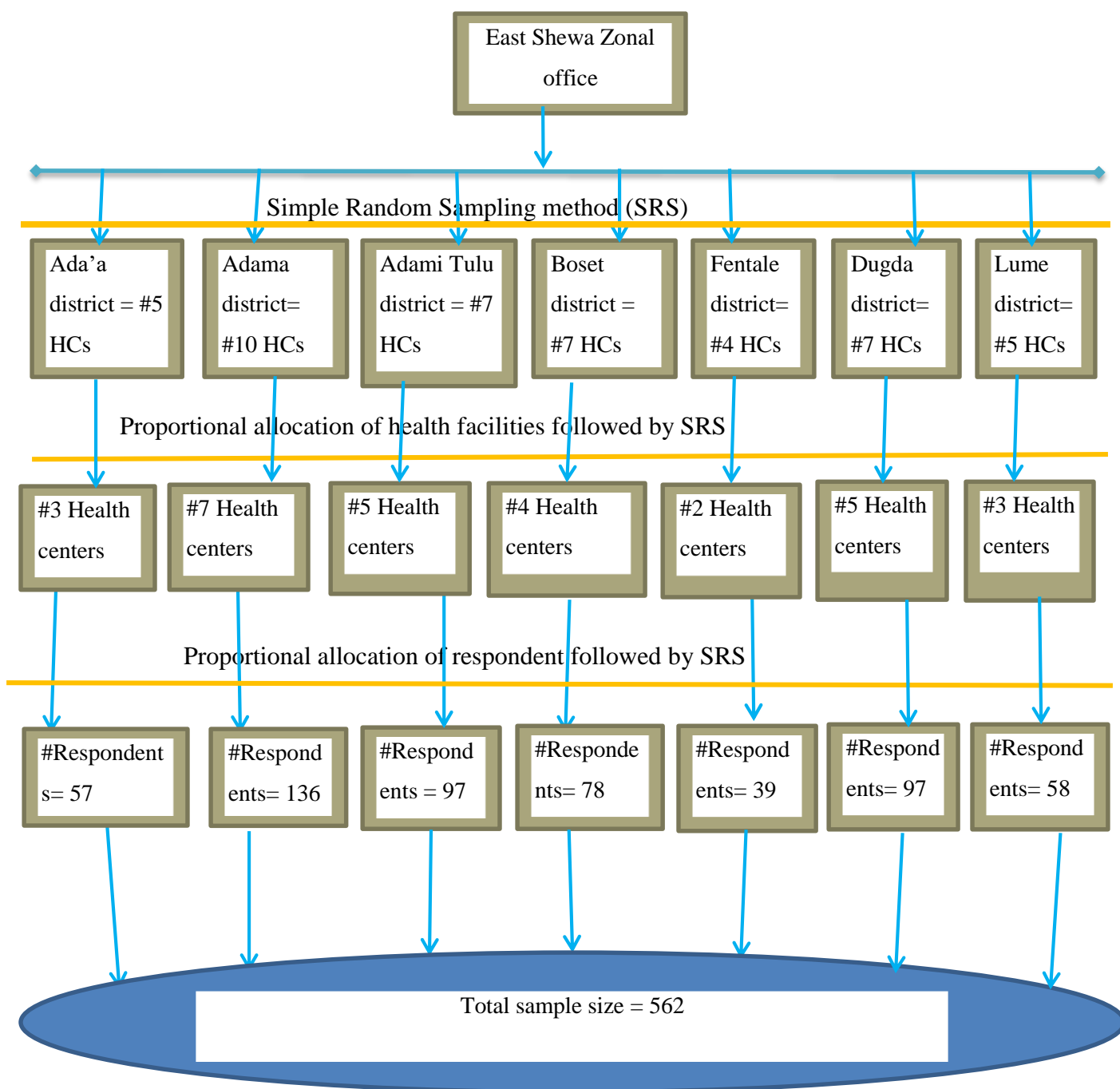


Figure 23: Schematic presentation of the sampling procedures indicating the selection of sample and respondents-from East Shewa zone of Oromia region, Ethiopia, February 2021.

8.2.4 Variable of the study

8.2.4.1 Dependent variables

Knowledge and practice of disease surveillance

8.2.4.2 Independent variable

- ❖ Socio demographic variables including;
 - ♦ Age, Sex,
 - ♦ Marital status
 - ♦ Educational status
 - ♦ Professions
 - ♦ Work experience
- ❖ Organizational support function of surveillance system
 - ♦ Assigned person or PHEM focal person
 - ♦ Supportive Supervision
 - ♦ Work over load
 - ♦ Resource provision
 - ♦ Training
 - ♦ Availability of case definition, office phone, computer, printer, internet, reporting form,
- ❖ Core function of surveillance system
 - ♦ Detection
 - ♦ Registration
 - ♦ Confirmation
 - ♦ Complexity of reporting form
 - ♦ Feed back
 - ♦ Data collection & analysis
 - ♦ Use of different software like computer
- ❖ **How to measure dependent variables**

Good knowledge: Respondents from a set of thirteen Knowledge questions, those who will answer greater than the mean score of knowledge questionnaires will be categorized as having good knowledge.

Poor knowledge: Respondents from a set of thirteen Knowledge questions, those who will answer less than mean score of knowledge questionnaires will be categorized as having poor knowledge.

Good practice: Respondents from a set of eighteen practice questionnaires, those who will answer greater than fifty percent of the practice question will be categorized as having good practice .

Poor practice: Respondents from a set of eighteen practice questionnaires, those who will answers less than fifty percent of the practice question will be categorized as having poor practice.

8.2.5 Operational definition

Health workers: all health workers those who work in health institutions.

Health institution: Zonal Health Office, District Health Office, Health center and Hospitals

Health facility: Health Centers and Hospitals

Case dictation: Case detection is the process of identifying cases and outbreak

Case registration: Case registration is the process of recording the cases identified

Case confirmation: Case confirmation refers to the epidemiological and laboratory capacity used for confirmation.

Reporting:- Reporting refers to the process by which surveillance data moves through the surveillance system from the point of generation.

8.2.6 Data collection methods, tools and procedures

For quantitative

Data will be collected by using a structured questionnaire and semi-structured observation checklist using face-to-face interview and observation (to collect availability of materials like guide line, reporting format, posted case definition and data).

The questionnaires has four parts; namely part one: questions socio demographic variable (ten questions); part two: knowledge questions (13); part three: practice questions (18) and part four: questions on associated factors of public health workers practice.

Six-degree holder health professionals who trained on IDSR will be recruited as data collectors interviewing and two-degree holder health professionals these have an experience on IDSR coordinating will be recruited for supervision. The principal investigator will be responsible to lead the overall process of the project activities while supervisor will-lead the whole data collection process. He/she will be dedicated to check the data collected for consistency, completeness and suspicious of irregularity. The data collectors will be responsible for interviewing and collecting data collection tools, clarifying unclarified and ambiguous things.

For quantitative part: we use key informant interview using KII question guides

8.2.7 Data quality control

The data quality will be controlled by pre-testing the data collection tools on 5% of sampled population in similar health institution other than the study area for checking understandability &

whether any amendments will be needed after the pre-tests will be checked for any ambiguity, sequencing of questions and clarity of wording. Based on the results of the pretest, any needed modification of the tools will be made. One day training will be given for both data collectors and supervisors on data collection procedures; briefing on the general objective of the study; a discussion on the methods to be used in relation to reach the intended goals one week prior to data collection period. All collected data will be checked for completeness and consistency by the supervisors and principal investigator. At the time of data collection, anything that is unclear and ambiguous will be corrected by the data collectors. On daily bases, all collected data have to be rechecked by the investigator to ensure proper implementation of the data collection process.

8.2.8 Data processing and analysis

For quantitative part

The coded data will be entered and cleaned by using (Epi-info) version 7.2.6 and exported to Statistical Package for Social Sciences (SPSS) computer software version 24 for further analysis. Data will be coded and analyzed using SPSS software version 24. Contingency tables will be drawn to show the distribution of data.

8.2.9 Data analysis

Data will collect manually, coded and analyzed using statistical package software SPSS version 24. Contingency tables will be drawn to show the distribution of data. Regression will used to test for associations between socio-demographics, materials and Knowledge, practice and factors affecting IDSR. Binary logistic regression will be done to determine predictors of IDSR at P value less or equal to 0.05.

8.2.10 Ethical clearance

The study will be carried out after getting permission from the Research and Ethics Review committee of Addis Ababa University, School of Public Health. Data is then collected after getting written consent from Oromia Regional Health Bureau, public health emergency management directorate. Informed verbal consent has to be obtained from all study participants. Each study subjects have to discussion about the objective of the study and privacy is maintained by anonymous.

8.2.11 Dissemination plan of results

The finding of this assessment will be communicated to Addis Ababa University Public Health Science, Field Epidemiology Department, Oromia Regional Health Bureau Public Health

Emergency Management Directorates, East Shewa zonal health office. In addition the result of this study will be published, presented on scientific conferences.

8.2.12 Work plan and Budget

Work plan

Table 44: Epi-Project Work plan East Shewa zone, Oromia region, Ethiopia 2021

| Planned Activities | April 2020 | May 2020 | Sup. 2021 | Feb. 2021 | March 2021 | May 2021 | May 2021 | June 2021 | Aug 2021 |
|--|---------------|-------------|--------------|--------------|---------------|-------------|-------------|--------------|-------------|
| Draft proposal submission | | | | | | | | | |
| Proposal submission | | | | | | | | | |
| If Fund get approval of project | | | | | | | | | |
| Select data collectors and research assistant | | | | | | | | | |
| Conduct training for data collectors | | | | | | | | | |
| Pre-test, Data collection and cleaning | | | | | | | | | |
| Prepare for field work | | | | | | | | | |
| Data collection | | | | | | | | | |
| Data entry and cleaning | | | | | | | | | |
| Data analysis and interpretation | | | | | | | | | |
| Submission of the final project and presentation | | | | | | | | | |

Table 45: Epi-project Budget plan in East Shewa zone, Oromia region, Ethiopia, 2021

| Budget Item | Responsible body | Qualificati on/unit | Quan tity | Rate/ Unit cost/E TB | Duration of Work in days | Total |
|--|-----------------------|---------------------|-----------|----------------------|--------------------------|---------------|
| I. Personnel Costs | | | | | | |
| Investigator | Master candidate | number | 1 | 400 | 15 | 6000 |
| Supervisors | Health Professional | number | 2 | 400 | 10 | 8000 |
| Data collectors | Health Profession | number | 6 | 400 | 10 | 24000 |
| Training Data collectors and supervisors | Tea/coffee | number | 6 | 10 | 2 | 120 |
| | soft drinks (2 times) | number | 6 | 30 | 2 | 360 |
| | Perdium | item | 6 | 450 | 2 | 5400 |
| Sub total | | | | | | 43880 |
| II. Transport | | | | | | |
| Tax cost (per trip) | | number | 2 | 200 | 10 | 4000 |
| Sub total | | | | | | 4000 |
| III. Equipment and supplies | | | | | | |
| Stationary | A4 Paper | rim | 3 | 300 | | 900 |
| | pen | pack | 1 | 300 | | 300 |
| | pencil | pieces | 10 | 3 | | 30 |
| | sharpener | pieces | 4 | 10 | | 40 |
| | stapler | pieces | 2 | 50 | | 100 |
| | Binders | pieces | 8 | 40 | | 320 |
| Sub total | | | | | | 1690 |
| Others | | | | | | |
| Printing | | number | 400 | 2 | | 800 |
| Copying | | number | 1000 | 1 | | 1000 |
| Binding | | number | 6 | 50 | | 300 |
| Mobile card | | number | 4 | 100 | | 400 |
| Sub total | | | | | | 2,500 |
| Total | | | | | | 52,070 |
| Grand total | | | | | | 52,070 |

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Chapter Nine: Additional Out puts

9.1 Zonal and district level COVID-19 contact tracing training for contact tracers and Rapid response teams Oromia region, June 5-10, 2020

9.1.1 Introduction

9.1.1.1 Back ground

Emerging and reemerging pathogens are global challenges for public health. Corona virus is one of a new emerging disease of international concern with high political and public concern due to its fast transmission and high fatality. It is a new strain that has not been previously identified in humans. The first COVID-19 case was found in China Hubei Province in Dec 31 2020. Coronavirus disease 2019 (COVID-19) is caused by the SARS-CoV-2 virus, and spreads from person-to-person through droplet and contact transmission. To control the spread of COVID-19, interventions need to break the chains of human-to-human transmission, ensuring that the number of new cases generated by each confirmed case is maintained below 1 (effective reproduction number < 1). After three months, the first COVID-19 index case (Japanese citizen) in Ethiopia reported from the region on 13th of March 2020. In response to WHO press release on COVID-19 declared as the global pandemic; Oromia Regional Health Bureau has organized incident management team structure to its Emergency Operation Center (EOC) which is operating 7 days and 24 hours. The region has implemented WHO recommendations to prevent the transmissions of the disease in all its zones, districts and city administrations. Some of the measures taken by the region was include; partial lockdown of the major city where confirmed cases have reported, health education through different media outlets and other means of communications on preventive measures such as staying at home, social distancing and hand hygiene. However, the new infections are spreading at an unprecedented rate and deaths have been recorded in different zones and town administrative of the region. Also a clear indication observed those have contacts with COVID-19 would become positive. So Contact tracing is one of the essential Epidemiological measures if implemented effectively will suppress transmissions of the COVID-19 in region. To these effects, Oromia Regional Health Bureau planned to give training for contact tracing.

9.1.2 Objectives

9.1.2.1 General objective

To train contact tracing workforces and supervisors with knowledge and skills required to strengthen early identification and response to contact of confirmed or probable COVID-19 case.

9.1.2.2 Specific objective

- ✚ To improve health Trainees Knowledge on epidemiology
- ✚ To build the knowledge on COVID-19 mode of transmission
- ✚ To capacitate on infection prevention and control
- ✚ To strengthen the zonal and district surveillance/contact tracing

9.1.3 Method of training

- ✚ Interactive communication
- ✚ Power point presentation
- ✚ Role play and discussion
- ✚ Demonstration

9.1.4 Result

Training was conducted for 21 zones and 19 town administrations in four clusters from each zone and town administrative five participants are present a total of 200 participants in four clusters (Adama, Sheshamane, Nekemte & Jimma clusters) by two session conducted.

9.2 Small grant project “Effect of Education Intervention on Healthy Lifestyle modification among Hypertensive Patient attending Outpatient Department at Bishoftu Hospital in Oromia region, Ethiopia, 2021”

Abstract

Introduction: Hypertension is the most common NCD and the leading cause of cardiovascular disease in the world. An unhealthier lifestyle and changing environments causing a rapid increase of the incidence of NCD among low and middle-income countries, Lifestyle modifications are capable of lowering hypertension, while most of hypertensive patients don't have enough knowledge about lifestyle modification.

Objective: To assess effective of education intervention on knowledge, clinical measurement and practice of healthy lifestyle change among hypertensive patients attending outpatient department at Bishoftu hospital.

Design and Methods: interventional study design with convenience sample size of 60 hypertensive patients will be conducted at Bishoftu General Hospital in Bishoftu town from January to July 2021. Baseline data will be assessed on knowledge, clinical measurement and practice of healthy lifestyle change using interviewer administered and clinical measurement questionnaires. Then, selected patients will be attended an educational program every two weeks for 3 consecutive months, divided four groups into 15 subgroups. At the end of 3 months, the same questionnaire will be used to assess the intervention. Ethical and administrative issues will be followed in all stages of the evaluation. Data entry will be done using Epi info version 7 exported to SPSS version 24 for statistical analysis, X^2 , paired sample t-test to be employed to analyze changes in the mean scores of knowledge, clinical measurements and practice of lifestyle will be used at P value < 0.05 to be statistically significant.

Budget: A total of estimated budget 4500 USD is required to cover the related expenses.

9.1 Introduction

9.1.1 Background

Globalization and rapid urbanization have a huge impact on the lifestyles of the entire population. This reality has led to an unhealthier lifestyle and changing environments thus causing a rapid increase on the incidence of non-communicable diseases particularly among low and middle-income countries. Moreover, several studies demonstrate that low and middle-income countries are going through an epidemiological transition, where non-communicable diseases cases and communicable disease continue to increase simultaneously [1].

Hypertension is the most common non-communicable disease and the leading cause of cardiovascular disease in the world and many people with hypertension are unaware of their condition making treatment infrequent and inadequate [2]. In terms of economic burden, poorly controlled blood pressure is a considerable important public health concern among older adult in the world. It has been verified that lifestyle modifications are capable of lowering hypertension. Despite this fact, it has been recognized in several studies that most hypertensive patients don't have enough knowledge about lifestyle modification [3]. In Ethiopia, studies in a systematic review on the epidemiology of hypertension revealed, about 37–78% of hypertensive patients were not aware of their blood pressure condition. There were a high prevalence of hypertension in urban residents, and different factors were associated with hypertension, including being overweight, family history of hypertension, age, sex, diabetes mellitus, alcohol intake, physical inactivity, and obesity [4].

Non-communicable disease seems to be neglected for a long time due to substantial burden of communicable diseases, but since 2010 G.C strategic framework was developed at a national level and Ministry of health in 2013 has established non-communicable disease case team who follow it, as well started to implement action in 2014 [5].

Ethiopia Healthcare delivery system is organized into three tiers system. The first healthcare level: District health system, which consist one primary hospital, health center and five health posts, second level: General hospital and third level: Specialized hospital.

9.1.2 Significance

An education program is an integral role enables the patients to change their lifestyle, monitor their blood pressure, and follow their treatment regimens. Combined anti-hypertensive medication with educative lifestyle modification is made effective management of hypertension, self-care, and

prevent its relating complications. An assessment has not been done for the effect of educational interventions on knowledge and practice of lifestyle change among hypertensive patients attending a hospital in Ethiopia, doing such assessment on implementing the program is very important to generate evidence to revise prevention and control strategies/plan including the provision of the full package and continuous educational program for the patients as well used as a reference for other cardiovascular diseases.

9.2 Problem Identification and Definition

Hypertension is defined as a systolic blood pressure higher than 140 mmHg and diastolic blood pressure above 90 mmHg. One of the most important causes of hypertension is related to lifestyle choices [6]. An individual's level of knowledge and his or her understanding of the risk factors of the disease as well as the motivation to reduce them can improve health and prevent disease through lifestyle changes [7]. Lifestyle has always been a focus of health education and promotion. The World Health Organization considers lifestyle as the specific patterns of behavior events that result from the interactions between personal characteristics, social relations, environmental conditions, and socioeconomic circumstances [8, 9].

Ethiopia faced a triple burden of disease, with a mix of persistent infectious diseases, increasing non-communicable diseases and injuries. According to World health organization reports in 2018 from 700,000 deaths, 39% was attributed to non-communicable diseases, from these cardiovascular diseases accounted 16%, of all causes of death in Ethiopia [10].

In Ethiopia, different studies reported varied prevalence of hypertension because of the differences in participant's mean ages, source population, and study settings. In systematic review, hospital-based studies revealed the hypertension prevalence to be 13.2–18.8% (4), in meta-analysis studies showed that mean prevalence of hypertension was 19.6 % [4, 11].

An individual's lifestyle plays a significant role in the development of hypertension. Studies have demonstrated that nutrition monitoring, physical activity, stress, smoking, weight control, rest, and sleep are particularly important lifestyle factors. An emphasis on the significance of lifestyle modification in blood pressure control and treatment is crucial. Inadequate attention to health education by health workers and a lack of health education coverage in society as the most important barriers to prevention, control, and treatment of hypertension [12].

According to the study findings show that the best way to remediate this problem is through lifestyle modification, but the percentage of hypertensive patients with the right knowledge about

life-style modification is very low. Thus, this assessment aims to assess the effectiveness of an education intervention on knowledge, clinical measurement and practice of lifestyle modification among hypertensive patients attending outpatient department at hospital.

9.3 Justification

Global burden of diseases projected studies showed that Ethiopia is the first among the most populous nations in Africa expected to see dramatic increases in the burden of premature death and disability from non-communicable diseases by 2040 [13]. As a result one of the global targets for non-communicable diseases is to reduce the prevalence of hypertension by 25% by 2025 [14]. In 2011, the World Economic Forum estimated that the combined global economic impact of cardiovascular disease, chronic respiratory disease, cancer, diabetes, and mental health will be more than \$47 trillion dollars over the next 20 years, as well as, according to stud done in south West Shewa, Oromia region, in Ethiopia, in 2019, the mean monthly total cost of hypertension illness was USD 22.3[15-17].

To decrease its high burdens and socially, politically and economic impacts, the WHO developed the NCD Global Action plan 2013-2020 and the comprehensive global monitoring framework for the prevention and control of non-communicable diseases [13]. Also, in 2016, WHO and the United States Centers for Disease Control and Prevention launched the Global Hearts Initiative to support governments to prevent and treat cardiovascular diseases. Of the five technical packages that comprise the Global Hearts Initiative, the HEARTS technical package aims to improve the prevention and management of cardiovascular diseases, including hypertension detection and management. Ethiopian is one of the country that started to implements the global hearts initiative to respond to the risk factors that are associated with NCD [14].

Accordingly, Ethiopia is developing the national strategic plan for the prevention and control of NCDs with the overall goal future to reduce the burden of NCDs by promoting healthy lifestyles, reducing the prevalence of common risk factors, and providing integrated evidenced based treatment and care to those diagnosed with NCDs in the most cost-effective manner. However, no assessments conducted on the effect of an education intervention on lifestyle change in Ethiopia previously. As a result, this evaluation will be assessed the way of giving health education on a lifestyle change, as well as used as input to change or develop the NCD guide line, approach of educational intervention, as a cue for farther search.

9.4 Goals

The goal of this project is to improve the knowledge, attitude, and behavior of individuals for effective management of cardiovascular diseases and prevent its complications through healthy lifestyle modification and influencing policy and decision-makers to develop the strategy, guideline, and protocol through evidence-based information.

9.4.1 Specific objectives

- ✚ To assess the effect of education on patients' knowledge about hypertension among hypertensive patient attending the outpatient department at Bishoftu general hospital from January to July, 2021
- ✚ To assess the effect of education on the practice of healthy lifestyle modification among hypertensive patient attending the outpatient department at Bishoftu general hospital from January to July, 2021
- ✚ To assess effect of education on clinical measurement (Blood pressure, BMI & cholesterol level) among hypertensive patients attending outpatient department at Bishoftu general hospital from January to July, 2021

Evaluation Question: How is education intervention effective on level of knowledge, clinical measurement and practice of healthy lifestyle change?

9.5 Design and Methods

A hospital-based interventional study design with follow up assessment (pre and post-intervention) will be used. The evaluation is conducted among hypertensive patients attending the outpatient department at Bishoftu general hospital in Bishoftu town from January to July, 2021. The hospital is found in Bishoftu town in Oromia regional government state, which is located at 50km east of Addis Ababa the capital city of the country. It serves 1.5 million populations. The hospital is purposively selected considering the capacity to manage cardiovascular disease. In 2012 Ethiopian Fiscal Year, the hospital was diagnosing and treating a total of 5,340 hypertensive patients both primary and secondary hypertension (3,111 patient were primary hypertension).

9.5.1 Study population

The study populations are selected diagnosed hypertensive patients in outpatient department drawn from all the patients attending the hospital during 2012 Ethiopian Fiscal Year.

9.5.2 Inclusion and Exclusion Criteria

Inclusion criteria for evaluation are: hypertensive patients aged ≥ 18 years and < 65 years, diagnosed with hypertension less than one year, who had been on treatment for at least three consecutive months and willing to participating in the evaluation.

Excluding criteria consists of who are critically ill and psychiatric patients, pregnant women, having other chronic disease (Diabetes and CVD complication), physical disability.

9.5.3 Sample size

A convenience sample of 60 recently diagnosed hypertensive patients will be assessed.

9.5.4 Dependent variable

- ✚ Change in blood pressure, BMI and Cholesterol level
- ✚ Change in patients' knowledge and practice of lifestyle

9.5.5 Independent variable

Socio-economic: Age, sex, Ethnicity, religion, marital status, educational status, occupation, medical history

Clinical measurements- Body weight and height

9.5.6 Data collection method and tools

Quantitative data will be collected using a standardized interviewer-administered questionnaire and clinical parameters adapted from WHO STEP-wise survey questionnaire and modifying according to the objective of the evaluation[18]. The assessment will be conducted in three steps. STEP 1 and 2 (questionnaire, anthropometric and blood pressure measurements), and STEP 3- laboratory tests.

Step 1 involved the survey questionnaire consisting of core information (age, sex, marital status and education) and behavioral variables (fruit and vegetable intake, physical activity, alcohol and smoking). Medical history included questions on medication for raised blood pressure, and raised cholesterol.

Step 2 involved physical measurements including weight, height, and blood pressure.

Step 3 involved a laboratory test. Blood samples will be collected from participants to determine the total cholesterol. Additionally, educational materials will be adapted and validate the manual according to local context (WHO HEARTS package). Four clinicians, two laboratory technologists and two supervisors will conduct data collection.

9.5.7 Measurement

Knowledge mean - to assess knowledge of patients about the disease a set of questions about the nature of the disease (13 questions), hypertensive medications (9 questions) will be used. Each question had a group of answer points, each correct answer had one grade, while no answer or did not know to be scored zero. The scores obtained for each set of questions is summed up to get the total scores for patient's knowledge

Practice of healthy lifestyle- to measure respondents' healthy lifestyles through six subscales (8-9 items for each) that measure the dimensions of a health promoting lifestyle; it includes health responsibility, nutritional habits, physical activity, alcohol consumption and smoking. The total number of items is 52. The Health Promoting lifestyle is a summated behavior-rating scale. It uses a 4-point ordinal response format to measure frequency of self-reported health promotion behavior. Each item had four possible responses: 1 (never), 2 (sometimes), 3 (often), and 4 (routinely). A score for overall health promoting lifestyle behaviors will be obtained by calculating a mean of the individual's responses to all 52 items: Six subscale scores will be obtained similarly by calculating a mean of the responses to each subscale items and summed up the total scores of factors.

Clinical measurement:

Weight and height will be measured with participants standing wearing light clothing. Body weight (kilograms) is recorded to the nearest 0.1 kg. Height (meter) is recorded to the nearest 0.5 cm and measured with a manual height-measuring instrument (SECA stadiometer) with participants standing upright with the head in Frankfort plane. Body mass index (BMI) is calculated as weight in kilograms divided by the square of the height in meters (kg/m²).

Blood pressure will be measured twice on the seating position on their right arm with five-minute distance between two measurements and take the average of the two. The mean value of both systolic blood pressure (SBP) and diastolic blood pressure (DBP) are considered as a person's blood pressure measurements. Blood pressure, BMI and total blood cholesterol level is computed by summing each score of parameters and calculated their mean.

Evaluation Procedure: For conducting the assessment, three phases will be utilized:

Planning phase: Develop an education manual for health workers consulting with Cardiologist, selecting patient for intervention, recruit data collectors, supervisors and health professionals who are educating and follow up the intervention groups. Provide training for health professions who follow the intervention groups, data collectors and supervisors.

Implementation and Evaluation phase

At the beginning to collect the baseline data, each patient will be interviewed individually and face to face by the data collectors about the socio-demographic, clinical measurement, and lifestyle behavior data assessment will be taken. After baseline assessment, the intervention group will be divided into four subgroups of 15 participants based on the degree of their understanding and response. Then, the trained health professions will provide educational intervention every two weeks using a developed manual, before one day left communicate the patients through a phone call to avail them on the education program as time schedule, this intervention will be implemented in three consecutive months. Three months after the last educational session, all participants will be again assessed using the same assessment tools.

9.5.8 Data quality control

The questionnaires will be translated to the local language and translated back to English for consistency. Then, data will be collected by trained health professionals. The data quality will be controlled by pre-testing 5% of sampled population in a similar hospital, training will be given for six data collectors, two supervisors for the data collectors and six clinicians who will follow up the patients attending education program. Questionnaire modifications will be made after analyzing the pretest result before the actual data collection. To keep the validity of data collection tools, measurements will be taken with the same instruments during pretest.

This project is done with the collaboration of Oromia regional Health Bureau, Addis Ababa University School of Public Health Field Epidemiology department and Bishoftu hospital.

9.5.9 Interpretation and analysis plan

The completed questionnaires will be checked for completeness and enter into Epi Info version 7 and then exported to the SPSS version 24 for computing the frequencies, mean and standard deviation. Analytical statistics including Chi square (χ^2) and paired sample t-test will be used to analyze changes in the mean scores of knowledge, clinical assessment and practice will be used for data analysis at P value < 0.05 to be considered as statistically significant.

9.6 Limitation

Convenience sampling as well as limiting the study to the hospital is a problem for the generalizability of the findings to all patients with hypertension. The lack of the control group and the use of self-reported behavior tools are other limitations of the assessment.

The finding of this evaluation will provide an evidence for responsiveness to change in knowledge and practice of lifestyle change which improve effective hypertension management and prevent its complication.

9.7 Ethical consideration

Ethical clearance and letter of cooperation will be obtained from the Ethical Review Board of the Oromia Regional Health Bureau. The data collectors will be explained properly about the purpose of the evaluation and to the participants in simple and well understandable local language. Each patient has the right to withdraw from the evaluation at any time without giving any reason. Informed verbal and written consent will be taken from willing participants before interview. Confidentiality is maintained by making the data collection procedure anonymous.

9.8 Result Dissemination plan

The preliminary result will be presented to Addis Ababa University School of Public Health Field Epidemiology Department. The findings of the evaluation will be covered in the comprehensive report disseminated to Bishoftu general hospital, relevant government bodies such as Oromia regional Health Bureau, Ministry of Health and key stakeholders through print, poster and oral presentation on national and international Conference and meeting. Additionally, it will be accessed on internet for all through publication.

| <u>Title of Project: Effect of Education on Healthy lifestyle change among hypertive patients</u> | | | | | |
|--|------------------------|-----------------|-----------------------------|-------------------------|--|
| <u>Project Lead: Gemechu Shumi Bejiga</u> | | | | | |
| BUDGET ITEMS | Unit cost (USD) | Quantity | Duration (in months) | Total Cost (USD) | Justification |
| Budget (January, February, and March 2021) | | | | | |
| Fieldwork | | | | | |
| Conducting pretest questionnaires | 17/day | 2 | January | 102 | Two health professionals will conduct pretest for 3days[# of days*17USD*2health professionals(HP)] |
| Developing education manual & consulting cardiologist | 40/day | 2 | January, February | 800 | 40 USD Professional fee for 2 health professionals for ten days to complete manual (# of days developing manual*2HP*40 USD) |
| Providing training for data collectors & supervisors | 17/day | 6 | March | 204 | Training for 6 data collectors and 2 supervisors for 2 days(# of days*# of trainees*perduim rate/day) |
| Providing training for health professionals who providing & follow up education intervention | 17/day | 6 | March | 306 | training for 6 health professional who are providing education intervention for 3 days(# of days*# of trainees*perduim rate/day) |
| Trainers | 17/day | 2 | March | 170 | Two trainers will provide training for 3 days(# of |

| | | | | | |
|-------------------------------|-----------------|----|----------|-----|--|
| | | | | | training day*# of trainer*perduim rate/day) |
| Interviewers | 17/day | 4 | March | 204 | Perdum for 4 data collectors for base line data assesment (# of data collectors * perduim rate/day* #days) |
| Clinical data collectors | 17/day | 2 | March | 102 | Two data collectors for blood cholsterol sample collection for 3 days(# of lab*peruim rate/day*# of day) |
| Supplies and Equipment | | | | | |
| Office | 145/total items | 8 | January | 145 | For base line data colletion and educational material preparation, for Copy paper, pen, pencil sharpener, pencil(HB), clip boards, erasers, brief bags, handout(# of items*unit price) |
| Lab | 4/patient | 60 | March | 240 | Blood chlostrol testing for base line data (# of patient*unit price/patient* one round) |
| Travel | | | | | |
| Airfare | | | | | |
| Lodging | 15/day | 2 | March | 90 | Two trainers need accommodation for 3 days (#of training day * # of trainers * Maximum expense rate for accommodations /day) |
| Ground | 55/day | 1 | February | 110 | One rental car per day for pre-test questionnaire (# Car rented * # of day used * |

| | | | | | |
|---------------------------------|-----------|-----|-------------------|------|---|
| | | | | | Minimum expenses/day to renting car) |
| Fuel | 0.6/Litre | 1 | February | 26 | 43 liter fuel for one rental car (# Total liters * price of one liter) |
| Other/Miscellaneous Cost | | | | | |
| Printing and Copying | 0.05/copy | 100 | January, February | 5 | For pre-test Questionnaire, consent form & education manual(# of page*unit price) |
| Bank Charges | | | | | |
| Subtotal (Jan-Mar) | | | | 2504 | |

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List of Annexes

Annex 1: Questionnaires for case control of study on Measles outbreak investigation in Robe Town, Oromia region, March 2019

Back ground information of the town

Total population _____ Male _____ Female _____ kebele _____ Gotis _____

Questionnaire for Measles outbreak investigation in Robe town 2019 G.C.

Instructions: (Fill the questionnaires accordingly by *interview or observation*)

1) Data collector information:

Name: _____ Responsibility _____ Phone number: _____

2) Date of Data collection: _____

3) Region _____ town _____ Kebele _____ Got _____

4) Who is answering the questionnaire? Parent/ guardian of sick person Sick person other (please specify) _

5) Respondent category: case control Active case: Yes No

I. Socio-demographic information

1. Patient Name _____

2. How old are you? : _____ months _____ years

Sex: Male Female

3. What is your occupation?

Farmer Merchant Housewife Government employed Pastoralist Student

Not applicable other _____

4. What is your ethnicity? Oromo Tigre Amhara Gurage other (specify) _____

5. What is your religion?: Orthodox Protestant Muslim other _____

6. What is your marital status?: Single Married Widowed Divorced Not applicable

7. Have you ever attended school?: yes (go to question 8) No (go to question 9)

8. What is the highest level of education you have completed? (read answers): KG Read and write
 Primary Secondary Collage/University Not applicable

9. Father's occupation: Farmer Merchant Government employed Student Pastoralist Other

10. Mother's occupation : house wife or farmer Merchant Government employed Student Pastoralist Other _____

11. Parents' of case/control's education:

Mother: Illiterate Read and write Primary Secondary Collage/University

Father: Illiterate Read and write Read and write Primary Secondary Collage/University

12. Family size _____

13. What is the main material of the roof? RECORD OBSERVATION _____

14. Does your household have Electricity? Yes No A watch/clock? Yes No A radio? Yes No

A television? Yes No A mobile telephone? Yes No A non-mobile telephone? Yes No A refrigerator? Yes No A table? Yes No A chair? Yes No A bed with cotton/sponge/spring mattress? Yes No

II. Knowledge Questions

1. What is measles? _____

2. How do you think measles is transmitted? You can pick more than one response: Through the air Fecal/oral Food Close contact with an ill person other _____

3. How do you think measles can be prevented? Vaccination, there is no prevention local healing other _____

4. Who do you think can be affected by measles? Children less than 5 years old Children between 5-18 years People over 18 years old any age groups of both male and women don't know Other (specify): _____

5. Why do some people vaccinate their children with measles vaccine? To prevent measles To get help Other Specify _____

6. What is the routine age for a child to be vaccinated with measles vaccine?

3 month's 6 months 9 months don't know other _____

7. Do you think vaccination can prevent measles? Yes No Don't know

III. Risk factors

VACCINATION STATUS

1. Can I see your immunization card? Yes (go to question 3) No (go to question 2)

2. Were you vaccinated against measles?: Yes No (go to question 6)

Don't know (go to question 5)

3. What is the number of measles vaccine doses received? One Two More than two

Age of first dose _____ Age of second dose _____ Age of third dose _____

4. Were these vaccinations given during routine programming (at the health center during vaccination days) or during a campaign, or both? : Routine program
 Campaign Both Don't know
5. Date last measles vaccine dose received? ___/___/_____ (GO TO QUESTION #7)
6. What is the main reason were you not vaccinated against measles? Clinic was too far
 Absent during vaccination campaign You didn't know time for vaccination
 You think the vaccine will hurt the child Someone told you not to go
- You are scared of vaccines other, (specify) _____

Annex 2. Questionnaires for Epi-project proposal

The questioners have three parts: 1) Knowledge, 2) Practice/behavior and 3) Availability of materials and logistics for IDSR

| SECTION I: <u>Socio Demographic and Knowledge</u> | | | |
|--|---------------------------------------|--|----------------|
| S. No | Question | Answer | skip |
| 1. Socio-demographic characteristics | | | |
| | District/town | _____ | |
| | Interviewer ID | _____ | |
| | interviewed ID | _____ | |
| | Date of completion of the data | dd____mm____ year_____ | |
| | Consent has been read and obtained | 1. Yes 2. No | If, No, END |
| | Start time of interview (Local time) | Hours_____ Minute_____ | |
| S. No | Socio demographic information | | |
| | Question | Response | Skip |
| S01 | Sex | 1.Male 2. Female | |
| S02 | Your age? | Complete in Year_____ | |
| S03 | Your education status? | 1. Certificates 2. Diploma 3. Bachelor of Degree 4. Master’s Degree 5. PhD 6. Others----- | |
| S04 | Your Ethnic group? | 1. Amhara 2. Gurage 3. Oromo 4. Tigre 5. Others write_____ | |
| S05 | Your marital status? | 1. Never married 2. Currently married 3. Separated 4. Divorced | |

| | | | |
|----------------|---|---|----------------|
| | | 5. Widowed 6. Cohabiting 7. Others _____ | |
| S06 | what is your field of specialization | 1. Health Officer 2. Laboratory Technician 3. Environmental Health 4. Pharmacist 5. Nurse 6. Pharmacy Technician 7. General Practitioner 8. Midwifery 9. Health information technician 10. Other _____ | |
| S07 | Number of years in service (in years) | _____ | |
| S08 | Do you get training on Integrated disease surveillance | 1. Yes 2. No | If No go to Qs |
| S09 | For how many day you trained | _____ | |
| S10 | Do you rehearse topic of training | 1. Yes 2. No | If No go Qs |
| S11 | List topic of training | _____ | |
| Part II | Knowledge questionnaires | | |
| K01 | Do you know notifiable disease? | 1. Yes 2. No | If No Qk6 |
| K02 | What is your source of information | 1. Peers/friends, 2. Through mass media, 3. At work shop/ review meeting, 4. At training, 5. Coworkers, 6. During supervision from higher level 7. other specify _____ | |
| K03 | Do you know classification of notifiable disease depending on reporting system? | 1. Yes 2. No | If No go QK5 |
| K04 | List immediately reportable disease | _____ | |
| K05 | List weekly reportable disease | _____ | |

| | | | |
|-----------------|--|---|-----------------|
| K06 | Do you know reporting forms of notifiable disease | 1. Yes 2. No | If No go QK8 |
| K07 | How many type reporting forms present to report notifiable disease | 1. One 2. Two 3. Three 4. Four | |
| K08 | How frequent are immediate notifiable diseases reported? | 1. Immediately 2. Weekly 3. Monthly | |
| K09 | How frequent are routine notifiable diseases reported? | 1. Daily 2. Weekly 3. Monthly | |
| K10 | Have you ever read the PHEM or disease specific guide line | 1. Yes 2. No | |
| K11 | Case based form used for filling of the _____ disease | 1. Immediate /case- based notification 2. Weekly reportable disease 3. Monthly reportable disease 4. Outbreaks | |
| K12 | Line list used for reporting of | 1. Immediate /case- based notification 2. Weekly reportable disease 3. Monthly reportable disease 4. Outbreaks | |
| K13 | Reporting of disease surveillance used for _____ (Multiple response will be possible) | 1. To know trend of disease occurrence 2. For disease prevention and control 3. To dictate and notify disease outbreak 4. For research purpose 5. To determine the prevalence of disease 6. For planning and statics | |
| Part III | Practice | | |

| | | | |
|----------------|--|--|-------------------------|
| P01 | Have you ever diagnose the notifiable disease | 1. Yes 2. No | If No, go to QP03 |
| P02 | If you diagnose the notifiable disease list it | _____ | |
| P03 | Have you ever reported any disease using the PHEM reporting form? | 1. Yes 2. No | |
| P04 | If yes which disease was reported? | _____ | |
| P05 | Ability to correctly fill case based form | 1. Yes 2. No | |
| P06 | Is there a standard procedure for reporting notifiable disease in your facility? | 1. Yes 2. No | |
| P07 | Has submission of an urgent notification been ever delayed for more than 24 hours? | 1. Yes, 2. No 3. Unknown, 4. Not applicable | |
| P08 | Is there “zero reporting” (Do you submit a report even if there are no reportable cases)? | 1. Yes 2. No 3. Unknown 4. Not applicable | |
| P09 | Does the health facility use case investigation sheet for the recommended notifiable diseases? | 1. Yes 2. No 3. Unknown 4. Not applicable | |
| P10 | Do you have an action threshold for defined for any of the facilities priority diseases? | 2. Yes 2. No 3. Unknown 4. Not applicable | |
| P11 | Ability to correctly fill the weekly reportable form | 3. Yes 2. No 3. Unknown 4. Not applicable | |
| P12 | Ability to correctly fill inpatient register | 1. Yes 2. No | |
| P13 | Ability to correctly fill outpatient register | 1. Yes 2. No | |
| P14 | Ability to report using immediately reportable disease by case based form | 1. Yes 2. No | |
| P15 | Ability to summarize and present data in tables & figures | 1. Yes 2. No | |
| P16 | Ability to perform Trend Analysis | 1. Yes 2. No | |
| P17 | Ability to calculate incidence and prevalence of daises | 1. Yes 2. No | |
| P18 | Ability to give feedback on disease surveillance | | |
| Part IV | Availability of Material / tools and logistics for integrated disease surveillance | | |

| | | | |
|-----|---|-----------------|--|
| A01 | PHEM guide line | 1. Yes 2. No | |
| A02 | Case based reporting form | 1. Yes 2. No | |
| A03 | Weekly reporting form | 1. Yes 2. No | |
| A04 | Stationary | 1. Yes 2. No | |
| A05 | Calculators | 1. Yes 2. No | |
| A06 | Computers | 1. Yes 2. No | |
| A07 | Printers | 1. Yes 2. No | |
| A08 | Internets | 1. Yes 2. No | |
| A09 | Office Telephone | 1. Yes 2. No | |
| A10 | Power supply | 1. Yes 2. No | |
| A11 | Case definition posted on facility wall | 1. Yes 2. No | |

End of the Question

Thank You for Your Patience!!

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 compiled body of work have been duly acknowledged.

Name: _____

Signature: _____

Place: _____

Date of Submission: _____

The compiled body of work has been submitted for examination with my approval as a university advisor.

Name of advisor: _____

Signature: _____

Date: _____