Addis Ababa University, College of Health Sciences,

School of Public Health

Ethiopian Field Epidemiology Training Program (EFETP) Compiled Body of Works in Field Epidemiology

By:

Ashenafi G/Mariam

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

October, 2024

Addis Ababa, Ethiopia

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Approval by Examining Board

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Examiner ____

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LIST OF ABBREVIATIONS AND ACRONYMS

AAR	After Action Review
AAU- SPH	Addis Ababa university school of public health
ABPC	Ampicillin
ADNIS	Animal Disease Notification and Investigation System
AHI	Animal health institute
AMR	Antimicrobial resistance
AMU	Antimicrobial use
ANC	Antenatal care
AOR	Adjusted odd ratio
APHI	Amhara Public Health Institute
AU	African Union
AU-IBAR	African union-Inter-African Bureau for Animal Resources
AURTI	Acute upper respiratory tract infection
AWD	Acute watery diarrhea
BCG	Bacilli Calmette Guerin
BCG	Bacilli Calmate Gurine
BG	Brilliant Green Agar
BI	Braeteu index
BPW	Buffered Peptone Water
CAHWs	Community Animal health workers
CBS	Community-Based Surveillance
CCC	Case containment center
CDC	Centers for Disease Control and Prevention
CER	Central Ethiopia Region
CEZ	Cefazolin
CFR	Case fetality rate
CI	confidence interval
CI	Container index
CL	Colistin
CLSI	standard of the clinical and laboratory Standard institute
COR	crude odd ratio
CP	Chloramphenicol
CPFX	Ciprofloxacin
CTC	Cholera treatment center
CTU	Cholera treatment unit
CTX	Cefotaxime
DEN	Dengue

DF	Dengue Fever
DHF	Dengue hemorrhagic fever
DHIS 2	District Health Information System-2
DNA	Deoxyribonucleic acid
DOVAR	Disease Outbreak and Vaccination Activities Report
EDEP	Ethiopian Dracunculiasis Eradication Program
EOC	Emergency operation center
EPA	Environmental protection Authority
EPHI	Ethiopian Public Health Institute
EWCA	Ethiopian Wildlife Conservation Agency
FAO	Food and Agriculture organization
FBD	food borne disease
FERG	Disease epidimiology reference group
GAP	Global action plan
GC	Gentamycin
GIS	Geographic Information System
GWD	Guinea Worm Disease
GWEP	Guinea Worm Eradication Program
GWO	Guinea worm officer
H_2S	Hydrogen sulfide
HC	Health Center
HCW	Health Care Workers
HEW	Health Extension Workers
HH	house hold
HI	House (premise) index
HIV	human immunodeficiency viruses
HMIS	Health management information system
ICT	International Certification Team
IDPs	Internally displaced persons
IDS	Integrated disease surveillance
IEC	Information, Education, and Communication
IMS	Incident management system
IPA	indole propionic acid
IPC	infection prevention and control
IRS	indoor residual spraying
JEE	Joint External Evaluation
KAP	Knowledge, attitude, and practices
KM	Kanamycin
LAFP	Long-acting family planning
LLNI	Long Lasting Insecticide Treated Nets
MAM	Moderate acute malnutrition

MCCDA	Modified Charcoal Cefoperazone Deoycholate Agar
MCV	Measles conjugated vaccines
MDR	multi-drug resistance
MH	Mueller-Hinton
MIC	Minimum Inhibitory Concentration
MKTT	Müller-Kauffmann Tetrathionate
MLST	Multilocus sequence typing
MOA	Ministry of Agriculture
MOH	Ministry of Health
NA	Nalidixic acid
NADSS	National Animal Disease Surveillance Systems
NAHDIC	national Animal health and diagnostic institute
NCC	National Certification Committee
NGO	Nongovernmental organization
NTDs	Neglected Tropical Diseases
OCV	oral cholera vaccines
OH	One heath
OH-SMART	One Health Systems Mapping and Analysis Resource Toolkit
OIE	Office International des Epizooties
OR	odd ratio
ORS	Oral rehydration solution
PCR	polymerase chain reaction
PHEM	Public Health Emergency and Management
PHEOC	Public Health Emergency Operation Center
PNC	Postnatal care
PoE	Point of Entry
PVP	Positive predictive value
QGIS	Quantum Geographic Information System
RCCE	Risk communication and community engagement
RDT	Rapid diagnostic test
RDTs	Rapid Diagnostic Tests
RGWC	Regional Guinea Worm Coordinator
RHB	Regional Health Bureau
RRT	Rapid response team
RVS	RAPPAPORT-VASSILIADIS-Soya
SAFPl	Short-acting family planning
SAM	Severe acute malnutrition
SBA	skill birth attendance
SBCC	Social and Behavioral Change Communication
SIM	Sulfide Indole Motility

SM	Streptomycin
SNNPR	Southern Nations Nationalities and People's Region
SOS	Morse code distress signal
SPSS	Statistical Package for the Social Sciences
TC	Tetracycline
TCCE	The Carter Center Ethiopia
TMP	Trimethoprim
TSFP	Target supplementary feeding program
TSI	Triple Sugar Iron Agar
TWG	Technical Working Group
UNICEF	United nations international children's emergency fund
USIAD	United States Agency for International Development
VAS	Village under Active Surveillance
VBV	Village Based Volunteer
WASH	water, sanitation, and hygiene
WDAs	Women development army
WHO	World Health Organization
WoHO	Woreda Health Office

EXECUTIVE SUMMARY

The Ethiopia Field Epidemiology Training Program offers a two-year master's degree designed to build public health capacity in Ethiopia. It is based on the CDC's Epidemic Intelligence Service (EIS) and involves 25% classroom learning and 75% fieldwork. The program is a collaboration between several institutions, including Addis Ababa University and the Ethiopian Ministry of Health. The primary objective is to provide health workers with hands-on training in public health emergencies and other health-related concerns. The program's outputs, which are arranged into nine chapters, include Outbreak investigation, Surveillance data analyses, System evaluations, Health profile descriptions, Scientific manuscripts, abstracts, disaster narratives, thesis, and other relevant output.

Chapter One: The Outbreak investigation section includes three investigations: two case-control studies on cholera and dengue fever in the Jijiga and Gode regions in 2023 and 2024, respectively. The third was a descriptive dengue outbreak investigation in the Afar region in 2023. All investigation reports contain abstract, introduction, methods, discussions, conclusion, recommendations, acknowledgment, and references separately.

Chapter Two: In this study the retrospective data is collected from 1993 up to 2021 it is analyzed by tables, graphs, maps, and figures. The data contain the disease distribution in humans from 1993 up to 2021; the disease distribution in animals from 2013 onwards both domestic and wild animals; and the rumor trend of the last 5 years; it also describes the data based on surveillance categories.

Chapter Three: Based on the CDC's system evaluation attributes simplicity, flexibility, stability, acceptability, representativeness, timeliness, data quality, sensitivity, and positive predictive value of the malaria Surveillance system in Akaki Sub City was evaluated. The study aimed to describe and evaluate the malaria surveillance system, focusing on its performance, core functions, and supportive functions.

Chapter Four: This chapter contains an assessment of the health profile data for Shebelle Zone, Gode town, Somali Region. It provides the Woreda population's health and related data, which is essential for setting health priorities, carrying out suitable public health initiatives, and acting as a

basis for practical public health research. This chapter will be a useful resource for stakeholders in the health and allied fields seeking evidence-based information.

Chapter Five: The author's guidelines were followed in the preparation of scientific manuscripts for peer-reviewed journals. The manuscript was a dengue fever outbreak investigation, malaria surveillance system evaluation, and Epidemiological study on Salmonella and Campylobacter raw Animal source food in Japan.

Chapter Six: Three abstracts were prepared on Guinea worm disease surveillance data analysis and Epidemiological study on Salmonella and Campylobacter raw Animal source food in Japan. The abstract was presented in Obihiro Japan and the Ministry of Agriculture in Ethiopia and the third abstract was prepared on the thesis work and planned to be sent international conference.

Chapter Seven: Summary narrative report to assess health and health-related problems among internally displaced persons residing in South Wollo Zone, Amhara region, Ethiopia. This chapter included the cross-sectional study results on IDP five sites of south Wollo zones.

Chapter Eight: this chapter covered cross-sectional research results that combine both quantitative and qualitative approaches. All the research protocols and results were addressed.

Chapter Nine: the additional outputs are the three-month field deployment on cholera outbreak investigation in South Wollo, Oromia special zone, Dessie and Kombolcha cities, and the research on Epidemiological study on Salmonella and Campylobacter raw Animal source food in Japan. The research combines a detailed investigation of food-borne pathogens at serotype, genome identification, and antimicrobial susceptibility tests based on MIC and CLSI standard

CHAPTER -I OUTBREAK INVESTIGATION

1.1 Dengue fever outbreak investigation in Gode Town, Shabelle zone, Somali Region, 2024

Abstract

Introduction: Any one of the four closely related viral serotypes can cause dengue. Mosquito species is a vector for dengue for human transmission. The disease is most common in tropical and subtropical areas, where year-round transmission is made possible by mosquito vectors sustained by favorable environmental circumstances. The first-ever DF outbreak in the Somali region occurred in Godey Town, Ethiopia in 2014; a comparable outbreak was documented in Dire Dawa, Ethiopia, in 2013. The purpose of this study is to look into the outbreak, identify the etiology, and identify risk factors related to it.

Methods: A total of 117 individuals were carefully chosen to participate in a community-based case-control study, consisting of 39 cases and 78 controls in a 1:2 ratio. The distribution of the disease by person, place, and time was assessed through a descriptive study based on the total number of cases during the outbreak. Following this, an unmatched case-control investigation was conducted to confirm the outbreak and identify its risk factors. Data were collected using structured questionnaires. Using Epi Info, the data was entered, and SPSS version 26 was used for analysis. To determine the relationship between the independent variable and the outcome variable, binary and multivariable logistic regression models were used. A p-value of 0.05 or less indicated that a variable was significant.

Results: A total of 105 cases were found, and their attack rate and case fatality rate were 1.64 per 1000 and 0, respectively. 52 (49.5%) of these were female and 53 (50.5%) were male. Of 15 kebeles 14 kebeles from Gode town own are affected. The age group of 21 to 30 years old had the greatest age-specific attack rate and 15 kebeles 02 had the highest attack rate of 20.51/1000 population. An unmatched case-control study was conducted with 39 cases and 78 controls. having LLINs (AOR 0.038, 95% CI 0.003-0.543) and applying mosquito repellent on the skin (AOR 0.092, 95% CI 0.023-0.372) were found to be protective factors. On the other hand, not using LLINs (AOR 13.208, 95% CI 2.898-60.207) and the presence of larvae in the household (AOR

5.723, 95% CI 1.592-20.573) were identified as significant risk factors associated with dengue fever.

Conclusion: having latrines and the use of mosquito repellent on your skin have a proactive factor so it needs to be aware the community and mosquito repellent supply should be encouraged. No usage of LLINs and the presence of Larvae in the household have a significant association with the disease pattern of the area so needs to conduct vector control activities at the household level and enhance risk communication and community engagement activities

Keywords: dengue fever, case-control, outbreak, Gode town

Introduction

Dengue is caused by four different but related viruses, labeled as DEN-1, DEN-2, DEN-3, and DEN-4. These viruses are spread to humans through the bites of mosquitoes, specifically *Aedes aegypti*, *Ae. albopictus,* and *Ae. polynesiensis*. Once infected, people develop Dengue fever, which can sometimes escalate into a more severe condition known as Dengue hemorrhagic fever(1). Dengue hemorrhagic fever (DHF) results from reinfection by a different Dengue serotype. Apart from a transient shield, dengue infection does not shield against infection with different serotypes. However, it does provide immunity against infection with the same dengue serotype. Infants, young children, and adults are susceptible to dengue, it manifests as a fever, headache, rash, pain behind the eyes, soreness in the muscles and joints, nausea, and vomiting(2, 3).

There are mild to severe variations of dengue, including dengue hemorrhagic fever (DHF) and dengue shock syndrome. Those who contract the more severe types of dengue fever typically require hospitalization(4)

Dengue is transmitted by *Aedes aegypti* and *Aedes albopictus* mosquitoes, which are found in many regions across the globe. The illness usually manifests as symptoms 3–10 days after the mosquito bite and starts 4–7 days later. For transmission to occur, the mosquito needs to feed on a human during the day when the virus is present in high concentrations in the blood.

The annual number of cases of dengue fever infections has increased thirty times over the last fifty years to 390 million, with 96 million cases displaying symptoms and about 3.9 billion individuals in 129 countries at risk(4). The disease is most common in tropical and subtropical areas, where year-round transmission is made possible by mosquito vectors sustained by favorable environmental circumstances. Dengue fever has recently spread due to several factors, including urbanization, population increase, and international trade and travel(5).

The earliest dengue outbreaks in Africa to be officially recognized were in Zanzibar in 1823 and 1870. Dengue fever outbreaks were documented in Egypt, Burkina Faso, Senegal, and South Africa around the beginning of the 20th century. As of 2020, 46 African nations had recorded occasional instances or outbreaks(6)

The city of Dire Dawa in Ethiopia reported the country's first dengue infections in 2013. Later, suspected cases were documented in several districts in the Somali Region between January 2014 and June 2017 and in the Afar Region in 2014. Dengue fever epidemics often affected the Dire Dawa city administration between 2013 and 2017. Dengue incidences occurred occasionally across the nation between 2013 and 2020, and this is seen as a serious public health issue(7).

General objective

- To investigate the outbreak and to determine the etiology and its associated risk factors

specific objectives

- To describe the Outbreak
- To confirm the etiology
- To determine the related risk variables

Material and Methods

Study area

Gode, Ethiopia's district, experiences hot summers with daytime highs reaching 40°C. The two rainy seasons are April to June and October to December. Variations in rainfall due to regional weather patterns and climate change can affect livelihoods. Latitude: 5.9484979Longitude: 43.5655004. The district is situated 604 kilometers from Jijiga, the largest town in the Shebelle zone, and 1225 kilometers from Addis Ababa, the capital city of Ethiopia. The district is 7,700 km^2 in total size. 21.8 people per square km.

Gode Woreda, a district with a complex administrative structure, is well-equipped to address its community's healthcare needs. There are four health posts, two health centers, a referral hospital, and fifteen urban kebeles. The district also has 150 private drug shops and is involved in international NGOs like SOS and WHO.

According to the data found the total population of the woreda is 65,060 from this 32,368 (49.75.%) males and 32,693(50.25%) females. The area covers 7,700 km square 21.8/km square population density. The area covers 7,700 km square 21.8/km square population density. The average elevation in this woreda is 358 meters above sea level. With 99.9% of the people belonging to Somalia, it was the largest ethnic group; the remaining tribes made up 0.08% of the total.

Study design

The study design included unpaired case-control research after a descriptive analysis to evaluate the disease's spread by person, place, and time.

Operational definition

The case definition is based on the national PHEM guideline 2rd Edition 2021 G.C

Suspected case

"Any person with acute febrile illness of 2-7 days duration with two or more of the following: headache, retro-orbital pain, myalgia, arthralgia, rash, hemorrhagic manifestation, leucopenia."

Confirmed case

A suspected case with laboratory confirmation (positive IgM antibody fourfold, greater increase in IgG antibody titers in paired (acute and convalescent) serum specimens, positive PCR, or isolation of the dengue virus using cell culture).

An Epidemiologically linked case- is a suspected case that has been in touch with one or more epidemiologically or laboratory-verified cases.

Target Population- Every person residing in Gode City at the time of the study was the target population.

Source Population- The entire population residing in the study area served as the study's source population.

Study Population- The study included 117 participants, comprising 39 cases and 78 controls, selected from the source population.

Criteria for Inclusion and Exclusion

The study's inclusion criteria include those who have been proven to have dengue or an epidemiological connection to confirmed cases during the outbreak period and randomly selected controls who live in the same community as the patients.

People who do not live in Gode City but who receive treatment at a case management clinic and who have their dengue fever cases recorded by their districts before January 2024 are excluded.

Sample Size Calculation

With a power of 80%, an odds ratio of 3.589, a 50% exposed control percentage, and a 1:2 case-to-control ratio, we used Epi-info statistical computing software to determine the sample size. There were 78 controls and 39 cases in the 117-person sample.

Data analysis

After being collected, the data was coded for every question and processed using Epi info version 7. The information was moved to SPSS version 26. Tables, frequencies, and graphs were used to summarize the descriptive statistics that were obtained for each variable. A logistic regression's underlying assumption was examined. Each independent variable's relationship to the outcome variable was examined using binary logistic regression, and variables with p-values less than 0.25 were included in the multivariable logistic regression analysis. Following that, a multi-variable logistic regression p-value of less than 0.05 was significant.

Study Variables- cases and controls

Independent Variables-Sex, Age, Educational status, Occupation, Having LLINs, LLINs usage, the household of the responders have used IRS spray during the last six months, and there are larvae present. Usually, they dress fully or in trousers, and mosquito repellent Sleep inside a screened window or door, Specimen collection and laboratory confirmation, know about Dengue fever, Know the Etiology of DF, DF Contagious, Know the mode of Dengue fever transmission, Know the symptoms of DF, Time of mosquito bites and Water required for breeding.

Data source

A structured questionnaire was used to gather information, and cases and controls from the chosen health facilities, documents, and a line list were also examined to determine the true number of cases. We chose one primary hospital and one health center based on its caseload and representativeness for the cases due to its high number of reported cases and referrals to the three health centers.

Selection of Cases and Controls

We selected the cases using a line list that we acquired from Gode Hospital and SOS Health Centre. Every case that fits the case specification was recruited as a case after a community-wide active case search. Within the same community, controls were chosen from the cases' immediate neighborhood. Following the day-long interview process with the cases, two controls were selected from the same residence as the cases for each case

Data Collection Techniques

Descriptive study: First, we conducted interviews with the relevant parties at every location we visited, including the district, city, and regional health management teams, to gather data. We looked at case records, including patient admission cards, queue lists, and HMIS registration books. Information on any recent modifications to the population size, reporting scenarios, and case definitions was cleared. Health extension workers and medical specialists from medical facilities actively assisted in case detection in the community using the community case definition. Case definitions utilized in the course of the outbreak's surveillance and investigation. The descriptive research includes those who met the criteria for dengue fever cases.

Analytic study: The investigator conducted in-person interviews with the respondents to gather data (community). Sociodemographic data were gathered via semi-structured questionnaires. Possession of LLINs, LLIN use, Larvae presence in the home, IRS spraying of the respondents' homes within the previous six months, and typical clothing types worn trousers or body full dresses, mosquito repellent Sleeping inside a screened window or door, Specimen collection and laboratory confirmation, known about the Dengue fever, Known Etiology of DF, DF Contagious, Know the mode of Dengue fever transmission, Knew the symptoms of DF, Time of mosquito bites and Water required for breeding

RESULT

Descriptive Epidemiology

105 cases overall, based on the IDS-line list for reporting from medical facilities, including SOS Health Centre and Gode Hospital. From this 53(50.5%) were male and 52(49.5%) females. Of 15 kebeles 14 kebeles from Gode town own are affected.21 and 84 cases were reported from SOS Health Center and Gode Hospital respectively. 10 cases were confirmed by laboratory tests. Attack rates were 1.64 per 1000 and 0 for case fatalities, respectively. The index case was not known and it is a vector-borne disease. The possible first case was seen on 15/01/ 24

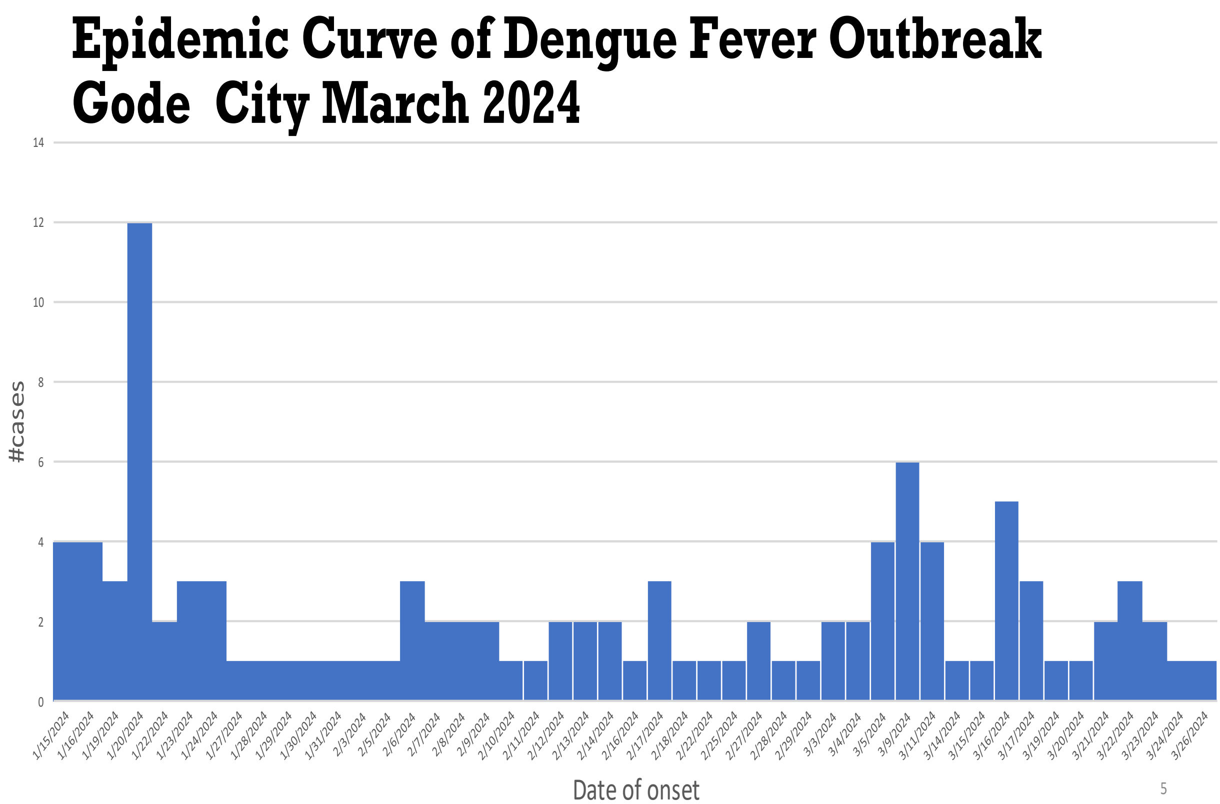

Figure 1 Epidemic Curve of Dengue Fever Outbreak Gode Town March 2024

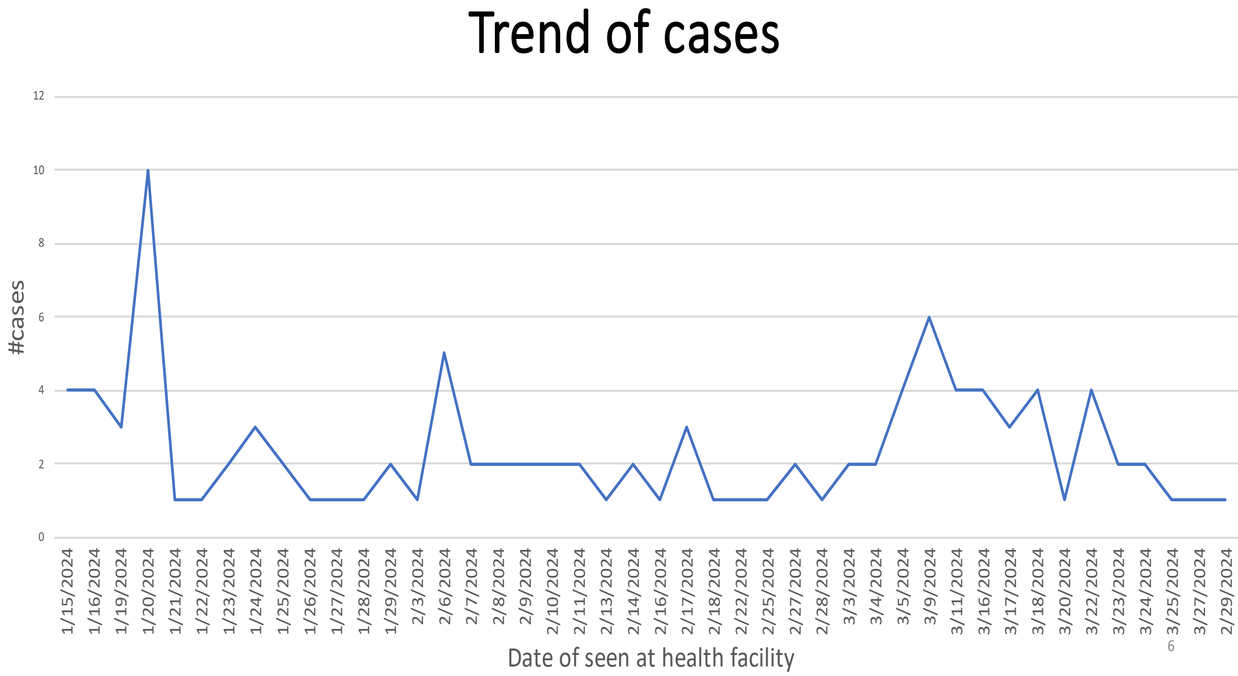

Figure 2 Trend of cases

AGE SEX DISTRIBUTION

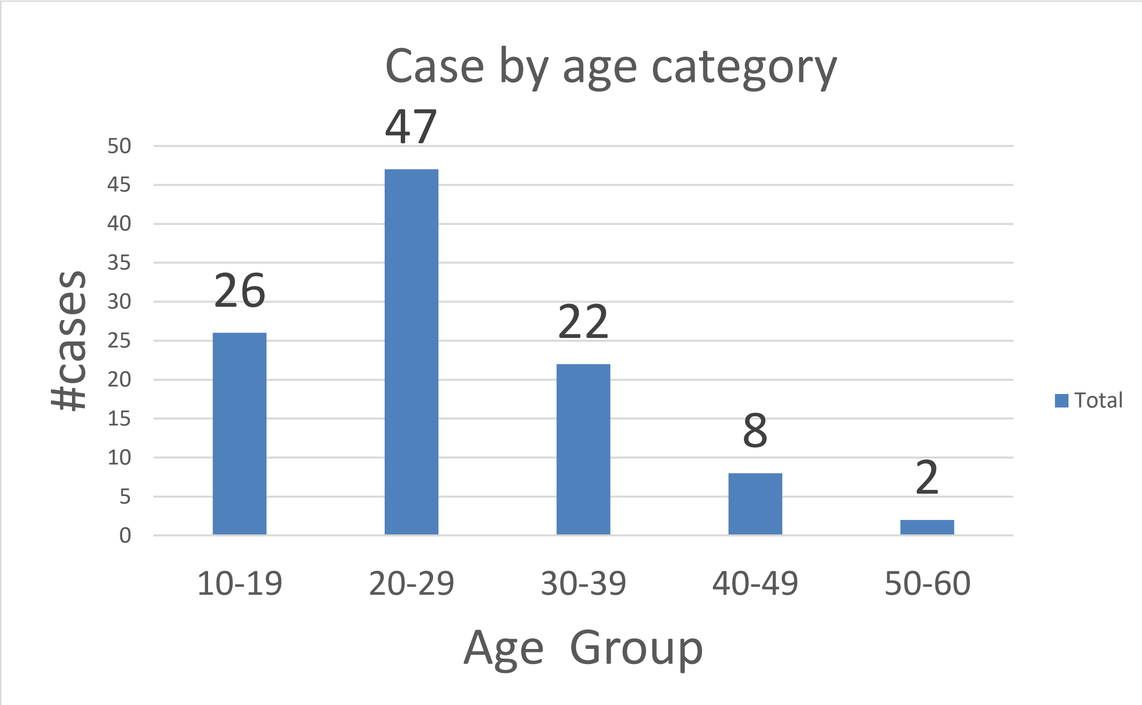

Figure 3 case by age category

With a mean age of 25.87 years and a range of 10 to 60 years, the cases' median age was 24 years. Of the cases, patients between the ages of 21 and 30 accounted for 40 (42.6%). Males experienced a sex-specific attack rate of 53/31341, females had a sex-specific attack rate of 52/32693, and the age group between 21 and 30 years old had the greatest age-specific attack rate.

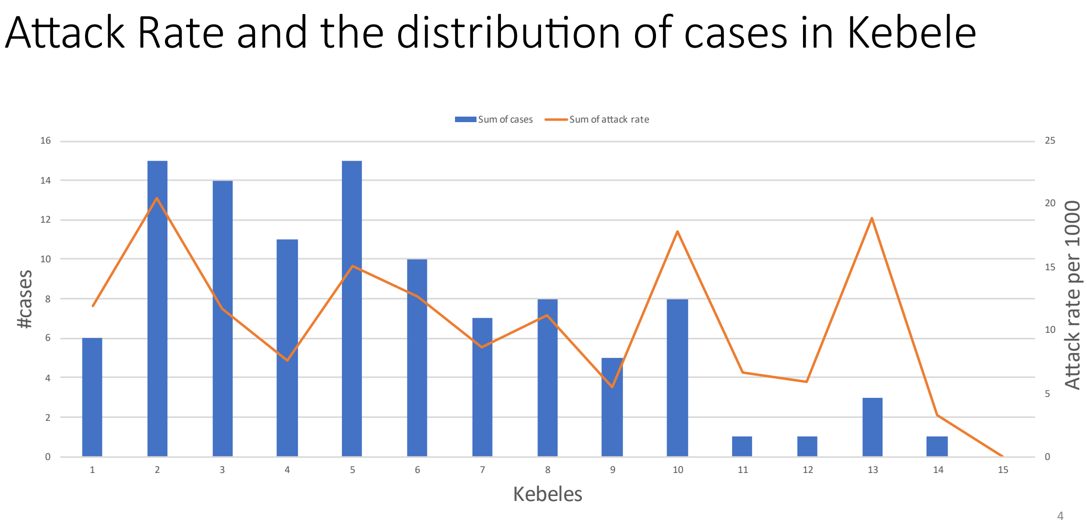

Figure 4 Attack Rate and the distribution of cases in Kebele

The crude attack rate varied slightly among the many impacted kebeles, but it was 1.64 per 1000 persons. Peak instance from Kebele 02 and 05 There are open and closed water containers at Kebele 01, 02, and 05 that are useful for vector multiplication, and there is a lavage (car wash) facility there as well. Kebele 15 has no cases, Kebeles 014 has the lowest incidence rate of 3.3/1000 people, while 02 has the highest attack rate of 20.51/1000 population.

Respondents' sociodemographic details

39 cases and 78 controls out of the 117 participants who were enrolled and answered during the case-control study. Out of the total respondents who were included, 49 (40.8%) were female and 71 (59.2%) were male. Males made up the largest percentage of case participants 57.5% (23/40) of the total and female individuals 42.5% (17) of the control group. In contrast, male participants made up 48 (60%) and female participants made up 32 (40%) of the control group. For the cases and controls, the mean age was 35.04 and 33 years old, respectively.

Table 1: Socio-demographic Characteristics of Participants in a Community-Based Dengue Fever Outbreak Investigation (N=117; 39 Cases, 78 Controls)

Variable	Case= 39	Control= 78	Total= 117
Sex			

Female Male	17(43.6) 22(66.4)	35(45) 44(55)	
Age <5 yrs 5-35 yrs 35-65yrs >65 yrs	 1(0) 25() 13() 0()	 0(0) 35() 32() 12()	
Educational status No formal Education Had formal Education	 25(64.0) 13(36.0)	 49(63) 29(43)	
Occupation Jobless Private business Government employee	 6 25 8	 21 46 12	

Table 1 Table 2: Potential factors for Dengue fever outbreak spread and control Gode Town, 2024. (n=117, case=39, control =78)

Variables	Case	Control	COR (95%CI)
Is the water container open? Yes No	 14(36) 29(64)	 32(41) 36(59)	
Having LLINs Yes No	 32(82) 7(18)	 76(97) 2(9)	
LLINs usage No Yes	 20(51) 19(49)	 4(5) 74(95)	
Educational level No formal Education	 27(70)	 2328)	

Had formal education	12(30)	56(72)	
The existence of stagnant water around their residency Yes No	 7(18) 32(82)	 5(6) 73(94)	
Larvae are present in the home Yes No	 24(62) 15(38)	 28(36) 50(64)	
IRS spraying of respondents' homes throughout the previous six months No Yes	 39 (39) 0 (0)	 15 (19) 64(81)	
types of clothing that are typically worn: body-covering dresses and trousers	 16 (41) 33(59)	 50 (64) 28 (36)	
Do you apply skin repellent to keep mosquitoes away? Yes No	 4 (10) 35 (90)	 47(60) 32 (40)	
Sleeping inside a screened window or door Yes No	 20 (51) 19 (49)	 47 (60) 28(36)	

Table 2 Knowledge status of participants about Dengue Fever

Variables		Case N = 39	Control N = 78	Total= 117
Known about the Dengue fever	Yes No	21(55%) 18(45%)	70(90) 8(10)	

Known Etiology of DF	Yes No	22(57%) 17(23%)	52(67) 27(23)	
Is DF Contagious	Yes No	12(31%) 27(89%	30(38) 48(62)	
Know the mode of Dengue fever transmission	Yes No	10(26%) 29(64%)	53(70) 25(30)	
Knew the symptoms of DF	Yes No	19(49%) 20(51)	45(58) 23(42)	
Time of mosquito bites	Yes No	22(56%) 18(46%)	57(73) 22(27)	
Water required for breeding	Yes No	11(28%) 28(72%)	50(64) 28(36)	

Table 3Bivariable analysis of potential exposures

Potential exposure	OR	95%CI		P-value
		Lower limit	Upper limit	
Having LLINs	0.115	.023	0.584	0.009
LLINs usage	14.80	0.084	0.499	0.000
The existence of stagnant water around their residency	0.323	0.121	0.862	0.25
Larvae are present in the home	3.929	1.739	0.377	0.001
IRS spraying of respondents' homes throughout the previous six months	383675213 3.667	0		0.997
Kinds of clothes usually wear Trousers/body full dress	0.358	0.161	0.795	0.012
Do you apply skin repellent to keep mosquitoes away?	0.072	0.023	0.223	0.000
Sleeping inside a screened window or door	0.694	0.317	1.520	0.362

Known about the Dengue fever	0.155	0.058	0.410	0.000
Known Etiology of DF	0.714	0.323	1.58	0.406
Is DF Contagious	0.631	0.274	1.452	0.279
Knew the symptoms of DF	0.185	0.079	0.438	0.000
Time of mosquito bites	0.646	0.296	1.409	0.272
Water required for breeding	0.334	0.149	0.749	0.008

The results of the bivariate analysis showed that the presence of larvae in the home and the use of LLINs are risk factors.

Depending on bivariant analysis protective factors are Having LLINs, Kinds of clothes usually wearing Trousers/body dress, using mosquito repellent, knowing about Dengue fever, DF Contagious, Knowing the symptoms of DF and Water required for breeding

The presence of standing water surrounding their residence, the IRS spray used by the respondents' household within the previous six months, and sleeping through screened windows or doors The known cause of dengue illness, the contagious nature of dengue, The duration of mosquito bites did not appear to be a risk factor or protective factor for dengue fever. To determine if the independent variable was connected to dengue fever, multivariable logistic regression was performed after the bivariate analysis resulted in $p<0.2$.

Table 4 multivariant analysis

Potential exposure	AOR	95%CI		P-value
		Lower limit	Upper limit	
having LLINs	.038	.003	.543	.016**
LLINs usage	13.208	2.898	60.207	.001**
Presence of Larvae in the household	5.723	1.592	20.573	.008**
Kinds of clothes usually wear Trousers/body full dress	.506	.155	1.656	.260
use mosquito repellent on your skin	.092	.023	.372	.001**
Known about the Dengue fever	.286	.076	1.079	.065
Knew the symptoms of DF	1.010	.541	1.885	.975
Water required for breeding	.371	.109	1.259	.112

Based on the multivariate analysis of the Kinds of clothes usually worn Trousers/body dress, Known as Dengue fever Water required for breeding in the dengue outbreak area has not a significant association with the disease dengue fever. having LLINs and the use of mosquito repellent on your skin have an association with its association is protective. LLIN usage and the presence of Larvae in the household are a risk factor that has a significant association with dengue fever.

Entomological survey

Within the home, both artificial and natural vector breeding grounds Artificial breeding sites that are Birkas Larval-positive are the type of breeding3. Natural breeding habitats that are larval-positive 1. The ratio of bed nets to family members 4 Making use of bed netting both during the day and at night

Aedes aegypgi is prevalent in all of the town's kebelles, although at different levels, according to the larval survey. Tires, jerry cans, buckets, drums, and cement tanks (Birka) were among the containers used for the larval survey. Kebelle has the greatest HI, CI, and BI values.

Table 5 List of kebeles and number of Birkas in Gode town, 2024

List of Kebeles	Number of Birkas	Number of households	Number of containers with a household ratio
01	44	503	0.087475
02	45	731	0.06156
03	78	1189	0.065601
04	36	1449	0.024845
05	137	994	0.137827
06	40	790	0.050633
07	72	810	0.088889
08	81	712	0.113764
09	74	909	0.081408
10	21	448	0.046875
11	7	151	0.046358
12	34	170	0.2
13	60	159	0.377358
14	14	301	0.046512
15	7	305	0.022951
Total	750	9621	0.077954

Figure 5 Identification of breeding site, larvae and applying spraying chemical Gode ciy, march , 2024

Discussion

In 2013, there was a dengue virus pandemic in Dire Dawa. Somali region Godey town dengue fever outbreak occurred in 2014. Before it, there had been no reports of dengue transmission in Ethiopia since 2013.

Clinical signs and test results confirmed that dengue fever was the outbreak's causative agent. Beginning on January 15 and peaking in the third week of January 2024, the outbreak had a crude attack rate of 1.46/1000 and a case fatality rate of 0. The cases' mean age was 25.87 years, with a median age of 23.5 years, spanning from 10 to 60 years. Of the cases, patients between the ages of 21 and 30 accounted for 40 (42.6%). Males had a sex-specific attack rate of 49/31341 and females had a sex-specific attack rate of 45/32693, with the age group between 21 and 30 having the highest attack rate.

The inquiry into this outbreak identified various contributing variables. According to the study, not using an LLIN increased the risk of dengue fever by 13.208 times when compared to using one. This result is consistent with a prior study carried out in the Somali region (7).

Another independent risk factor for an outbreak of dengue fever is the presence of larvae in household water containers. This result is in line with the research done at Gode City (8).

The associated risk factors and study variables that were conducted in this study have protective factors concerning disease development. Those who have protective associations have LLINs and use mosquito repellent(3, 9)

The findings of this study indicate a strong correlation between LLIN possession and dengue fever outbreaks. There has been evidence of a strong correlation between illness and owning LLINs, which is consistent with these findings.

Limitations of the study

- The population was restricted to Gode town, and thus might not be representative of the entire Somali region.
- • Case ascertainment bias arises because the controls were unable to obtain a laboratory result confirming their lack of illness.
- Only 10 cases were confirmed with a rapid test, and controls were not tested for dengue fever.
- Household income and other socioeconomic variables were not inquired about

Conclusion

The results of the epidemiological, entomological, and serological examinations demonstrated that dengue fever virus infection was the cause of the probable fever epidemics. having LLINs and the use of mosquito repellent on your skin have an association with its association is protective. LLIN usage and the presence of Larvae in the household are a risk factor that has a significant association with dengue fever. An intervention should be applied in the area, especially vector control activities, coordination and collaboration with different stakeholders, case management activities risk communication, and community engagement.

Recommendation

- It needs multisectoral engagement especially dry waste management of the city, municipal, and Agriculture
- Strength of the linkage between private health facilities and the PHEM system
- Provide training on surveillance, case management, vector control at health and risk communication& community engagement at the facility level and for urban health extension
- Assign a surveillance officer at the health center

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1.2 Cholera outbreak investigation in Jijiga City, Somali region, October 2023

Abstract

Introduction: Cholera is a severe diarrheal illness caused by an infection in the intestines with the Gram-negative bacterium *Vibrio cholerae*. One of the most important measures of social progress, it nevertheless presents a problem for nations where it is impossible to ensure that everyone will have access to clean water and proper sanitation. On October 3, a cholera epidemic was reported in Jijiga City's Somali region. Since cholera can spread quickly throughout a community, cases must be identified and reported as soon as possible. This study aims to investigate the outbreak and determine the etiology and its associated risk factors.

Methods: A total of 120 individuals were methodically selected to participate in a community-based unmatched case-control study, consisting of 40 cases and 80 controls, maintaining a 1:2 ratio. A descriptive study methodology was used to assess how the disease was distributed among individuals, locations, and times: Subsequently, an extra unmatched case-control study was conducted to verify the identity of the outbreak and identify its contributing components. Data was collected through structured questionnaires and analyzed using SPSS version 26, with binary and multivariable logistic regression analyses, identifying significant variables with a p-value of 0.05 or lower.

Results: In total, 120 participants were enrolled in this study, including 33.3% cases and 66.7% controls. Individuals aged between 5 and 35 years made up 45% of the cases. The findings showed that independent factors related to cholera prevention were using a private latrine, treating water before drinking it, and washing hands both before and after meals. Significant risk variables impacting the disease pattern in the study area, these behaviors also had a preventive effect. Using a private latrine (AOR 0.149, 95% CI 0.066-0.940), purifying water before drinking (AOR 0.144, 95% CI 0.34-0.603), and washing hands before and after eating (AOR 0.186, 95% CI 0.51-0.677) all significantly reduced the risk of contracting cholera.

Conclusion: The use of private latrines, purifying water before drinking, and washing hands before and after eating have all been found to be significant risk factors for contracting cholera. Enhancing awareness of cholera prevention and control methods, including water treatment, personal hygiene, and environmental sanitation, is essential for combating cholera outbreaks.

Besides this multisectoral collaboration and coordination are necessary to implement effective interventions to mitigate the cholera burden of the study area.

Keywords: cholera, outbreak, case-control, Jijiga, case and control

Introduction

Acute watery diarrheal illness known as cholera is brought on by an intestinal infection with the gram-negative Vibrio cholerae type O1 or O139 bacteria. It can infect both adults and children. One of the most important measures of social progress, it nevertheless presents a problem for nations where it is impossible to ensure that citizens will have access to clean water to drink and proper sanitation(1).

Among more than 100 Vibrio species, only Vibrio cholerae causes cholera outbreaks. This species is categorized into two serogroups: Vibrio cholerae O1 (which includes the Classical and El Tor biotypes) and Vibrio cholerae O139, first detected in India in 1992 and later found in other Asian countries between 1993 and 1998. Cholera spreads mainly through the fecal-oral route, with contaminated water or food being the primary transmission sources. A high dose, typically over a million organisms, is required to cause infection, and transmission through direct contact, such as touching infected individuals, is uncommon.

The primary host of Vibrio cholerae is humans. Vibrio is present in large amounts in the faeces and vomit of asymptomatic carriers and patients. One milliliter of cholera liquid vomits or excrement contains up to 100,000,000 germs. A few more possible reservoirs are fish, water, certain molluscs, and aquatic plants. Although the infectious dose varies depending on an individual's susceptibility, an infection is often caused by a dose of 1,000,000.

Cholera is on the rise, as most recent study articles have shown, with an estimated 1.4 billion people at risk in endemic areas, 3 to 5 million cases, and 100,000–120,000 deaths annually worldwide. Additionally, it has been endemic for centuries in a few Asian nations, developed epidemics over time in a growing number of African nations, and most recently made a comeback to the Americas with ongoing transmission in Haiti and the Dominican Republic. Vibrio cholera strains that are increasingly virulent and resistant to medication are constantly emerging, and the frequency of extensive outbreaks with high case-fatality ratios has increased.

For those without access to WASH practices safe and clean water, sanitation, and hygiene—the disease continues to be a serious public health concern and a surrogate measure of a nation's underdeveloped socioeconomic system. In cholera-endemic nations, there were an estimated 2.86

million cases and 95,000 fatalities in 2015. Except for India, Bangladesh, Haiti, and Sudan, all of the nations where cholera causes more than 1,000 deaths each year are in Africa(2, 3).

Throughout the late 19th and early 20th centuries, there were at least five breakouts, cholera has been a serious epidemic illness in Ethiopia for millennia. There have been documented incidences of cholera in Ethiopia since 1970. A single enlarged branch that has been introduced at least 11 times since 1970 is responsible for prior epidemics in Africa. With the advent of serotype Ogawa in outbreaks in Ethiopia in 1970, the two El Tor strains were brought to Africa. In 1993, cholera made a comeback in Ethiopia, endangering both rural and urban areas. The 1970 isolates of V. cholerae from Ethiopia and the subsequent announcements by the Ethiopian government of a cholera pandemic in 2019, 2020, and 2021, both refer to serotype Inaba in East Africa, specifically in Ethiopia(4).

Ethiopia has seen numerous cholera outbreaks in various regions during the previous five years. In the Oromia, Sidama, SNNP, and Somali Regions, the first epidemic of this era began in late 2015 and spread across the entire nation in 2016. All areas reported 30,718 suspected cases in total in 2016, except Gambella. There were over 26,000 cases and 217 deaths reported in 2015, compared to over 48,000 cases and 878 deaths in 2017. With 75% of cases and 87% of deaths, the most impacted region was Somalia. There were cholera outbreaks in the southeast in 2022, resulting in 674 cases and 7 fatalities. Living in woredas, over 15.9 million Ethiopians are highly vulnerable to epidemics in the future(5).

Objectives

General objective

- To investigate the outbreak and to determine the etiology and its associated risk factors

Specific objectives

- To describe the outbreak
- To verify the etiology
- To identify the associated risk factors

Material and Methods

Study area

The study was conducted in Jijiga City Somali National Regional State from October 3 to October 16, 2023. Jijiga is Situated in the Fafan zone, the city is 1,634 meters above sea level and lies 70 km (37 mi) west of the Somalian border. Its coordinates are Latitude: 9° 20' 59.99" N and Longitude: 42° 47' 59.99" E. Based on Ethiopian statical service, the estimated population of Jigjiga town is 428,759. In December and April, respectively, Jigjiga town experiences mean monthly temperatures ranging from 15.2°C to 27.73°C. May is the hottest month while December is the coolest. The town's yearly average temperature is 20.4°C. 523.48 mm of rain falls on Jigjiga town every year on average. The average monthly rainfall in December and April, respectively, ranges from 7.13 mm to 103.11 mm (6, 7).

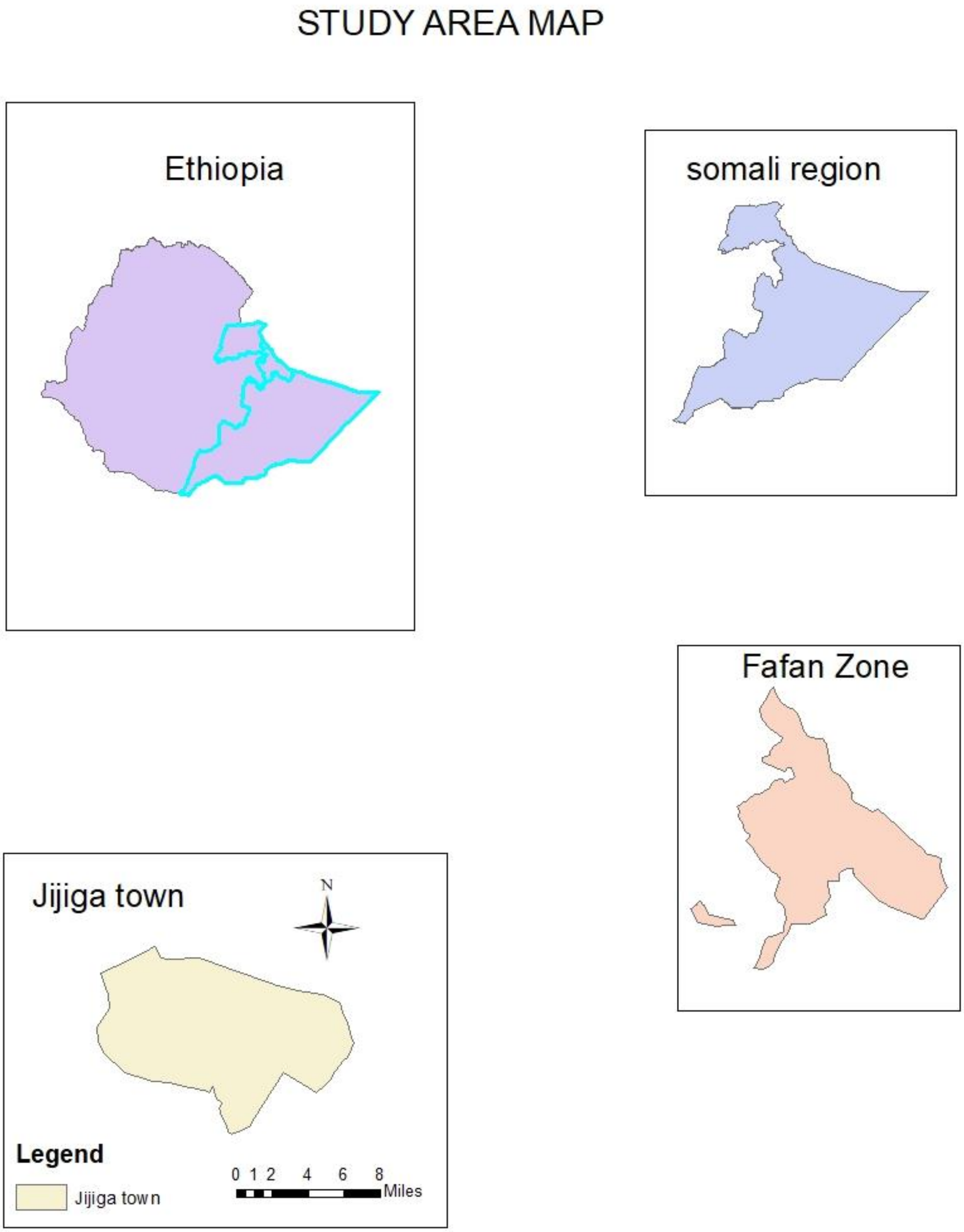

Figure 6 Study area of the cholera outbreak investigation

Study design

A descriptive study design was used to evaluate the disease's distribution by person, location, and time. The identity of the outbreak was later confirmed by a second unmatched case-control study. The purpose of this follow-up investigation was to pinpoint particular risk variables connected to the outbreak. The descriptive investigation shed light on the disease's extent and dissemination. The nature of the outbreak was further clarified by the case-control investigation.

Operational definition

The case definition is based on the national PHEM guideline 2022 and the National Guideline

for Cholera Surveillance and Outbreak Response 3rd Edition 2022 G.C(1)

Community case definition

Suspected cholera case -If any person of 2 years age or more with profuse acute watery diarrhea and vomiting

Standard case definition

Suspected cholera case - Outbreak not declared: any person aged 2 years or more presenting with acute watery diarrhea and severe dehydration or dying from acute watery diarrhea. Outbreak declared: any person aged 2 years or more presenting with or dying from acute watery diarrhea.

Confirmed case – A suspected case in which Vibrio cholera O1 or O139 has been isolated from their stool

An Epidemiologically linked case is a suspected case, which has contact with a laboratory-confirmed case or another epidemiologically confirmed case.

Target Population: The target population was all people living in Jijiga City throughout the time spent studying.

Source Population: The whole population of the study area, including Kebeles's cholera victims, served as the study's source population.

Study Population: The study involved 120 participants selected from the source population, consisting of 40 cases and 80 controls.

Case and Control Selection

Any individual having a confirmed cholera result or a case that satisfies the cholera case definition is considered a case. Individuals under the age of two who were admitted to the cholera treatment center (CTC) in the affected woreda during the outbreak period were not given laboratory confirmation. Jijiga PHEM officials retrospectively recognized cases from previously generated IDS line lists for cholera cases. After receiving confirmation of their address from the impacted kebeles of the chosen woreda, the cases were chosen one after the other until the necessary sample of forty cases was achieved.

Any individual who is two years of age or older, had not contracted cholera during the outbreak, and was chosen at random from the community where the confirmed cases had resided is considered a control. Cases are identified first to choose the control group. After the cases were identified, the research team proceeded to the residential area using the location that the case patient had provided. They then randomly chose the control houses and began interviewing the control, gaining the control's informed verbal agreement if the subject met the requirements. All participant subjects underwent the identical process until the necessary number of controls was reached.

Criteria for Inclusion and Exclusion

The study's inclusion criteria are that participants must be either Jijiga City residents with confirmed cases of cholera or have an epidemiological connection to confirmed cases during the outbreak period, as well as randomly selected controls who live in the same neighbourhood as the cases.

Exclusion Criteria: Individuals who are not residents of Jijiga City but are treated at Jijiga City Cholera cases reported by their districts and CTC before October 2023.

Sample Size Calculation:

Epi Info version 7.2.6 software was used to calculate the sample size, based on the Kelsey et al. double population proportion formula. The sample size was estimated using the following assumptions: a significance level (alpha) of 0.05, a two-sided 95% confidence level, 80% power, and an assumed 60% prevalence of exposure among controls, to detect an odds ratio of at least 4.1. The final estimated sample size was 120 participants, consisting of 40 cases and 80 controls.

Data analysis

Data was collected, coded, and processed using Epi info version 7, and transferred to SPSS version 26. Descriptive statistics were calculated, and data distribution was established. A logistic regression model was examined, with variables with p-values less than 0.25 included in multi-variable analysis. Statistical significance was determined using odds ratio, 95% confidence interval, and $P \leq 0.05$.

Variables

Dependent variables: cases and controls

Independent variables: Contains characteristics such as age, sex, marital status, level of education, occupation, residential area, date of onset, date of admission or hospitalization, and risk factors such as water and food sources for drinking and domestic use, toilet use, and washing habits.

Specimen collection and laboratory confirmation

A stool or rectal swab was collected and laboratory diagnosis was by RDT and culturing followed by confirmation by PCR test.

Data Collection Techniques

Descriptive study: First, we conducted interviews with the relevant parties at every location we visited, including the district, city, and regional health management teams, to gather data. We looked at case records, including patient admission cards, queue lists, and HMIS registration books. Information on any recent modifications to the population size, reporting scenarios, and case definitions was cleared. Using the community case definition, case detection was actively carried out in the community with the assistance of health extension workers and medical experts from medical facilities. Case definitions utilized in the course of the outbreak's surveillance and investigation. The descriptive research includes those who met the criteria for cholera cases.

Analytical study: The investigator collected data through face-to-face interviews with community respondents. Semi-structured questionnaires were employed to gather information on sociodemographic factors, clinical and contact history, water sources, feeding and hygiene practices, latrine usage, and the knowledge level of both cases and controls (or their parents/caregivers if the cases or controls were children). The Ethiopian Public Health Institute adapted the questionnaire for national use. The administered questions covered topics such as age, sex, marital status, water sources for drinking and household use, commonly consumed foods, types of toilets used, handwashing practices, and participants' knowledge.

Data Management and Analysis

To gather data, the questionnaire was translated into Affi Somali. For uniformity, it was then translated back into English. Data collectors received training on collecting tools and procedures. Daily reviews and corrections were made, and Excel statistical software and Epi-info version 7 were used to analyze the data. Secondary data was manually compiled and transcribed electronically.

Descriptive Epidemiology

Based IDS-line list for reporting from health facilities especially CTC centers and hospitals to Jijiga city a total of 40 cases. From this 23 (57.5%) were male and 17(42.5%) females. 15 kebeles from Jijiga own are affected. Of the total number of cases, 38 had been hospitalized and treated within the district's newly formed CTC and CTU. It is also known that 02 of those cases died after being admitted to the CTC. The RDT test verified 12 examples. The assault rate per 10,000 people was 0.94, and the case fatality rate was 0.04, respectively.

The patient in the index case, an 18-year-old girl, was exposed to pond water. The patient was admitted to Karamara Hospital on October 3, 2023, when the sickness first manifested. She is experiencing vomiting and watery diarrhea. Following treatment with intravenous infusions, ORS, and medications containing doxycycline, she recovered from the infection. She had a stool sample collected on the reporting date, and it proved positive.

Outbreak of cholera Jijiga city

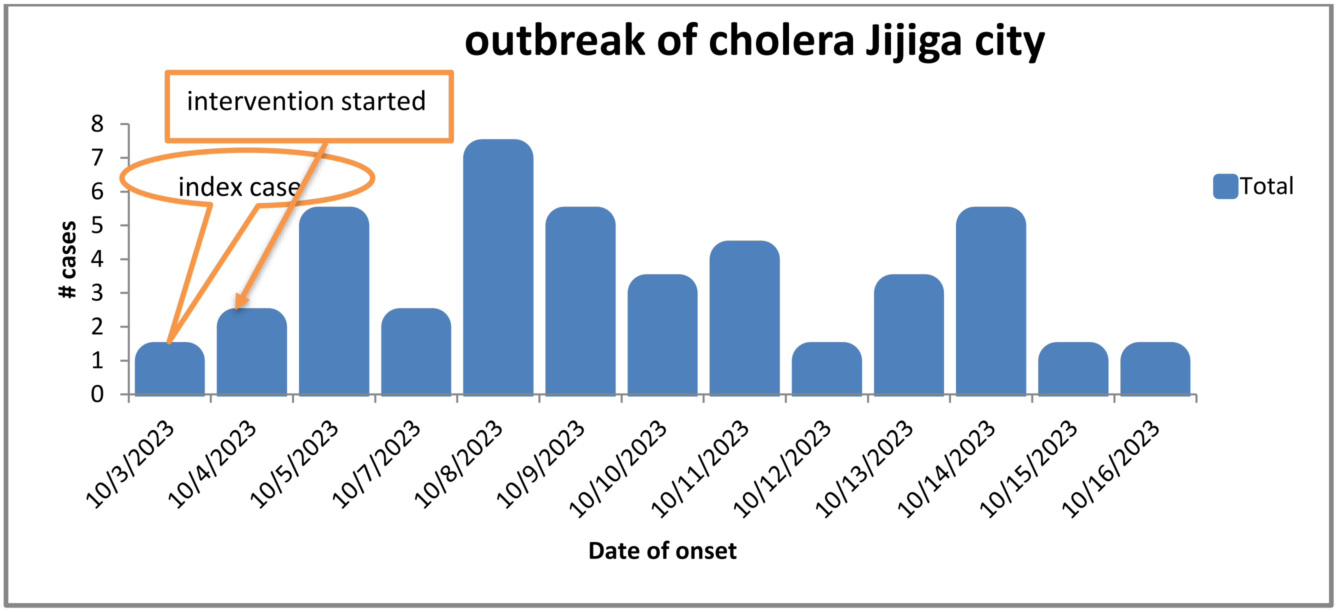

Figure 7 outbreak of Jijiga city based on date of onset

When we see the distribution of the disease males are more affected than female

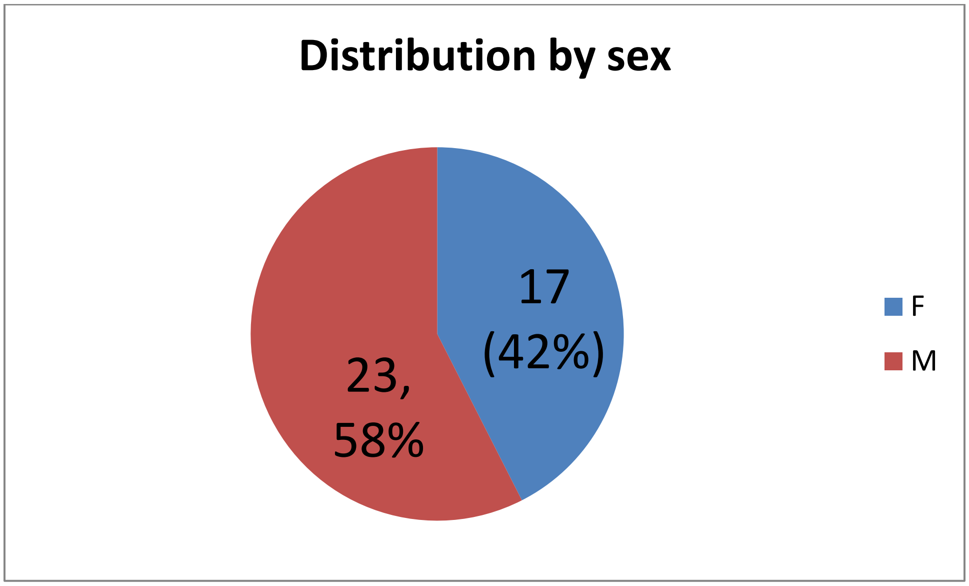

Figure 8 Distribution case by Sex

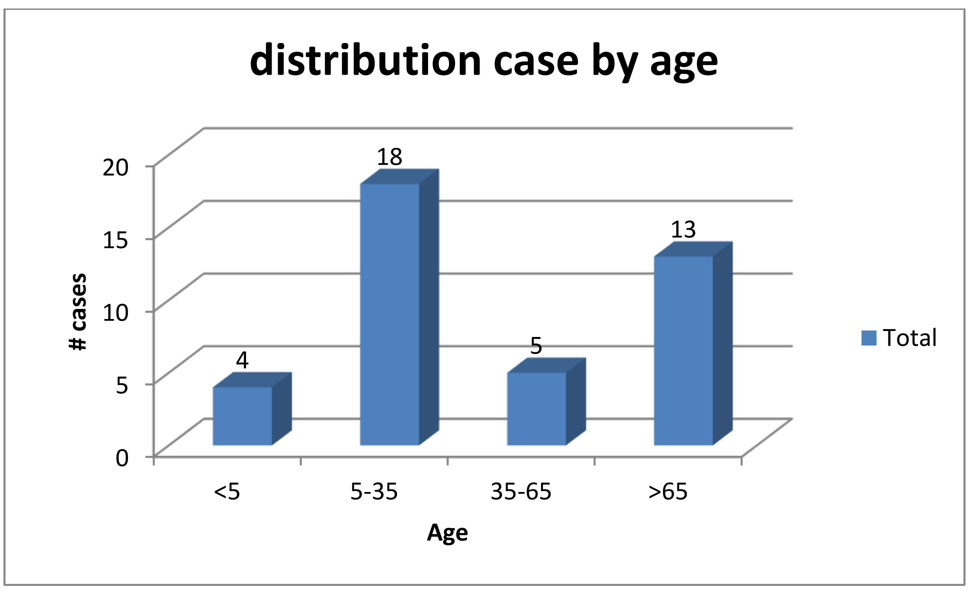

Figure 9 Distribution of cases by age

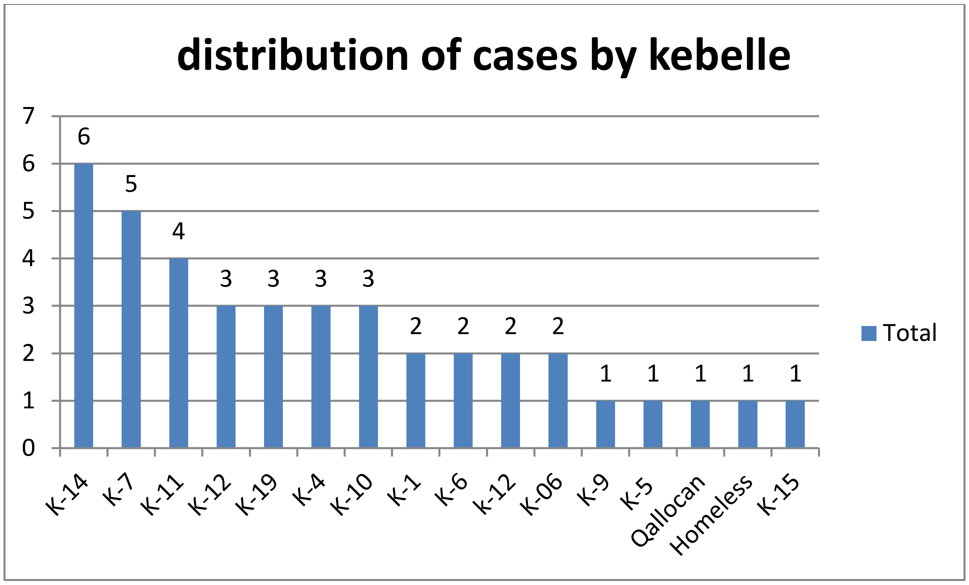

Figure 10 Distribution of cases by kebele

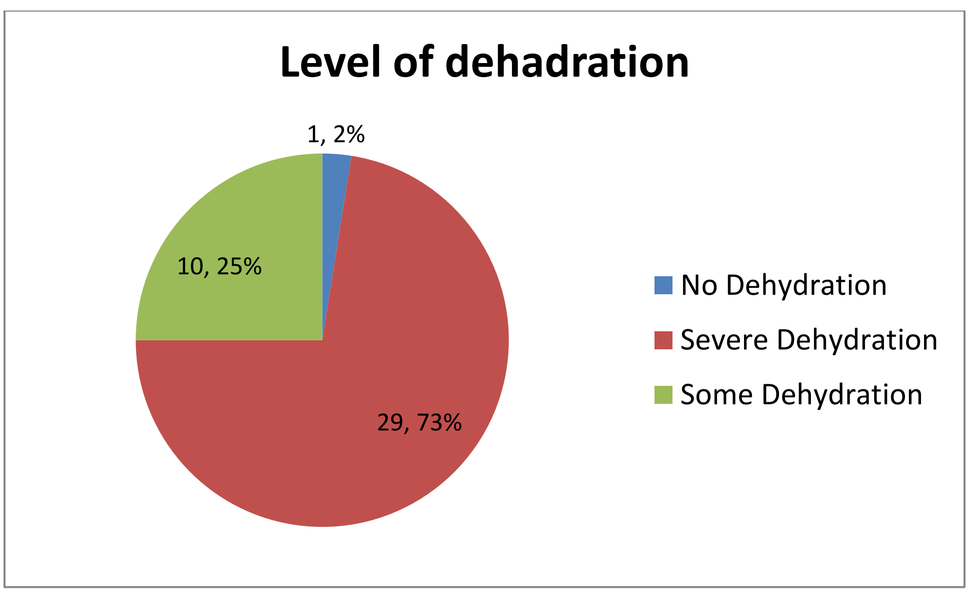

Figure 11 level of dehydration

Analytical study

The sociodemographic attributes of the participants

In all, 120 participants 40 cases, and 80 controls were enrolled and responded to the case-control study. Of the total included respondents, 49 (40.8%) were female and 71 (59.2%) were male. Males made up the largest percentage of case participants 57.5% (23/40) of the total and female individuals 42.5% (17) of the control group. In contrast, male participants comprised 48 (60%) and female participants comprised 32 (40%) of the control group. For the cases and controls, the mean age was 35.04 and 33 years old, respectively.

Table 6 Socio-demographic variables respondents of cholera outbreak investigation at Jijiga city, October 2023. (n=120, cases=40, controls =80)

Variable	Case No (%)	Control No (%)
Sex		
Female	17(42.5%)	32(40%)
Male	23(57.5%)	48(60%)
Age		
<5 yrs	4(10%)	0(0%)
5-35 yrs	18(45%)	45(56.25%)
35-65yrs	5(12.5%	19(23.75%)
>65 yrs	13(32.5%)	16(20%)
Marital status		
Married	22(55%)	45(56.25%)
Single	18(45%)	35(43.75%)
Educational status		
No formal Education	26(65%)	50(62,5%)
Had formal Education	14(35%)	30(37.5%)

Occupation		
Daily laborer	3	
Farmer/pastoralist	9	
Government employed	5	
Housewife	7	
Merchant	9	
Student	6	

Table 7 Potential risk factor cholera outbreak Jijiga city, October 2023. (n=120, cases=40, controls =80)

Potential exposure	Category	Cases	Controls	OR	95%CI		P-value
					Lower limit	Upper limit	
treating water before drinking	yes No	17.5% 82.5%	71.125% 34%	0.216	0.094	0.495	0.000
Consuming animal product	Yes No	20% 80%	53.75% 47.25%	0.205	0.084	0.499	0.000
Common Latrine	Yes No	55% 45%	56.25% 43.75%	0.951	0.443	2.040	0.897
Private latrine	Yes No	17.5% 82.5%	60% 40%	0.149	0.059	0.377	0.000
Contact history	Yes No	70% 30%	40% 60%	3.955	1.732	9.030	0.001
Using street food vendor	Yes No	95% 5%	62.5% 48.5%	12.020	2.705	53.0408	0.001
Travel to cholera-declared area	Yes No	12.5% 87.5%	4% 96%	3.667	0.830	16.206	0.087
Eating fruits and vegetables	Yes No	55% 45%	22.5% 87.5%	4.210	1.864	9.506	0.001

Using Pond water	Yes No	42.5% 57.5%	15% 85 %	4.188	1.742	10.070	0.001
Using Well	Yes No	72.5% 27.5%	35% 65%	4.896	2.130	11.254	0.000
hand washing before and after eating	Yes No	25% 75%	75% 25%	0.111	0.046	0.267	0.000

The results of the bivariate analysis showed that risk factors include the use of pond and well water sources, eating fruits and vegetables, using street food, contact history, consuming animal product

Depending on bivariant analysis protective factors are treating water before drinking, hand washing before and after eating, and using private.

Using a common latrine was not associated with cholera because its p-value was 0. 897 to be associated with the disease as a risk factor or protective factor the bivariate analysis result should be p<0.2 further analysis to determine if the independent variable was connected to cholera, multivariable logistic regression was used.

Table 8 Multivariable analysis

Risk factor	Sig.	AOR	95% C.I. for EXP	
			Lower	Upper
treating water before drinking	.008	.144	.034	.603
consuming animal product	.015	.203	.056	.737
private latrine	.040	.249	.066	.940
using street food vendor	.035	10.399	1.173	92.168
eating fruits and vegetable	.099	2.977	.816	10.859
using pond water	.063	4.407	.921	21.086

using well	.015	5.924	1.416	24.790
washing hands before and after eating	.011	.186	.051	.677

Based on the multivariate analysis of the respondent's contact history travel to the cholera outbreak area has not a significant association with the disease cholera. Washing hands before, after eating, and treating water before drinking, and using a private latrine have an association with cholera its association is protective. Consuming animal products, using street food vendors, and using well water has a significant association with cholera

Figure 12 Regional EOC meeting and Jijiga city CTC, October 2023

Discussion

This result indicated that the attack rate of the disease in Jijiga city was (0.94 per 10000 and the fatality rate was 0.04 per 10000 this is similar to the Attack rate compared with WHO guidelines in other studies. Based on the findings, we can conclude that the outbreak was observed as the epidemic curve showed first on 3rd October 2023, reached at pick level immediately 6 days.

According to this study, there is a significant association between the onset of diseases with washing hands both before and after eating. This finding is similar to the previous study conducted in Somalia, Oromia, and afar regions (8, 9, 10). The likelihood of cholera spreading is increased by reversibly incorrect and infrequent handwashing after using the lavatory. Handwashing correctly lowers the risk of cholera spreading from person to person and, in turn, lessens the severity of the outbreak (11, 12).

The findings of this investigation indicate that there was a significant association between treating water before drinking and cholera outbreaks. According to this analysis, there is a strong association between disease and treating water before drinking has been reported(10)

The result also showed that there was a significant association between the risk factor of using private latrines and cholera. this is similar to the previous study conducted Oromia region(13)

The associated risk factors and study variables that were conducted in this study have protective factors concerning disease development. Those who have protective associations are washing their hands before and after eating, using private latrines, and treating water before drinking this is similar to the study conducted in Somalia, afar, and Oromia regions(8, 9, 10, 13).

The results of this investigation showed that there was no statistically meaningful relationship found between the risk factors of eating animal products, buying food from street vendors, and utilizing well water and the eventual likelihood of cholera outbreaks.

Study Limitations

- The population was restricted to Jijiga, and thus might not be representative of the entire Somali region.
- There may have been recollection bias in some of the instances because interviews were conducted more than two weeks following treatment.
- As a result of the controls' inability to obtain a laboratory test that verified their health, case ascertainment bias developed.
- Since cases were disqualified if a household member had taken ORS for diarrhea at any point in 2023, we were unable to determine the risks of transmission inside the home.
- Only 12 cases were confirmed with a rapid test, and controls were not tested for cholera.
- Household income and other socioeconomic variables were not inquired about.

Conclusions

The outbreak occurs in 20 kebele of the city. Independent factors such as Washing hands before, after eating, and treating water before drinking, and using a private latrine have an association with cholera its association is protective. Thus, increasing public awareness of cholera prevention and control measures, water treatment, environmental sanitation, and personal hygiene are essential interventions to stop cholera outbreaks Besides this multisectoral collaboration and coordination are necessary to implement effective intervention to mitigate the cholera burden of the study area.

Recommendations

- Preventing additional spread and managing a protracted outbreak require early investigation and quick reaction measures. Therefore, district PHEM personnel will do a weekly, trained analysis of cholera cases to detect and contain the outbreak early.
- Enrolling all demographic information about the individual at the time of case registration and reporting can enhance the tracing systems.
- The enhancement of water supply quality and quantity necessitates coordination across many sectors and efforts from regional management.
- Awareness creation on the prevention and control
- Governmental and non-governmental organizations are expected to work on safe water supply and proper excreta disposal to lower the risk of disease.
- Contact history, which should be minimized as it is one of the exposing variables.
- Early detection and case management should be applied.
- The surveillance system should be strengthened to detect, verify, and contain the case

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1.3 Dengue fever outbreak report Chifira Wereda, Afar region, 2023

Abstract

Introduction: The Dengue Virus is an RNA virus that is encapsulated and spread by mosquito bites. It attaches to dendritic cells and uses autophagy to evade immune surveillance. Dengue is a top 10 health threat globally, with a mortality rate of 13% in untreated patients. Risk factors include prolonged rainfall, high humidity, temperature, uncovered water containers, and lack of door and window screens. This study aims to investigate the outbreak and determine the etiology and its associated risk factors.

Methods: In this study, one primary hospital was selected due to its high caseload and its role as a referral center for three health centers, making it representative of the area's cases. Data collection involved structured questionnaires, interviews with cases at the selected facilities, and a review of documents and line lists to determine the actual number of cases. The distribution of the disease by person, place, and time was assessed using a descriptive study approach, taking into account the total number of patients throughout the outbreak. Epi Info was used to enter the data, and SPSS version 26 was used for analysis.

Results: During the dengue fever outbreak, a total of 276 cases were reported, with 181 (65.6%) females and 95 (34.4%) males affected. The attack rate of the disease in Chifira werda was 2.3/10000 and the Age group 16-45 years were highly affected by the disease The cases were distributed across various age groups. While the index case could not be determined, the outbreak was confirmed by testing 15 samples, of which 3 (20%) were positive for dengue fever via RT-PCR at the Ethiopian Public Health Institute. Environmental investigations revealed used tires as common mosquito breeding sites, leading to larvicidal treatments and source-reduction efforts in 760 locations. Community education and engagement efforts helped reduce outbreaks and refer cases to health facilities. Additionally, onsite orientation on vector control measures was conducted for local health and community leaders.

Conclusion: the dengue fever outbreak, primarily affecting females, was confirmed through targeted serological testing, revealing a 20% positivity rate. Environmental factors, especially neglected water containers like used tires, played a significant role in mosquito breeding. The

effective response included vector control measures and community education, highlighting the need for ongoing surveillance and proactive prevention strategies to mitigate future outbreaks.

Keywords: dengue fever, descriptive, outbreak, Chifira wereda

INTRODUCTION

The Dengue virus is a member of the Flaviviridae family of enveloped RNA viruses with a positive-stranded genome. Its virion has a smooth, spherical surface, measuring about 50 nm in diameter. This structure is made up of an inner nucleocapsid core, a lipid bilayer, and an ordered outer protein layer. Dengue fever is mainly transmitted through mosquito bites of the species *Aedes aegypti* or *Aedes albopictus* (1). After successfully entering the host, DENV attaches to dendritic cells by interacting with specific cell surface molecules like Fc receptors and lectin-like receptors. DENV has developed mechanisms to evade immune surveillance. The virus takes advantage of autophagy for its replication process and employs non-structural proteins to impede the host's innate immune responses. DENV evades the immune system by mimicking host mRNA through viral protein modifications and disrupting specific immune interactions. These immune evasion strategies employed by DENV can significantly influence disease outcomes and impact the adaptive immune response. There are currently no specific treatments or antivirals to eliminate the virus while it is infecting the body. Current treatments are only to lessen the symptoms of DENV. However, there is a vaccine that is 80% effective (2).

Dengue fever is ranked among the world's top 10 health risks. The mortality rate can be as high as 13% in untreated patients with a secondary infection. With a 30-fold increase in global occurrence in the last 50 years alone, DENV is spreading quickly. The number of cases increased from 505,430 in 2000 to 5.2 million in 2019, according to the World Health Organization(3, 4). The number of cases is underreported because a vast majority of cases are asymptomatic, self-managed, or mislabeled. Over 50% of people worldwide are susceptible to contracting DENV infection. Up to 36,000 people worldwide may die from DENV infections, which are thought to cause 390 million illnesses annually. Serotypes DENV-1 to DENV-4 have all been found circulating in the Americas(4).

Risk factors for dengue virus infection include things like high humidity, prolonged rainfall, and high temperatures that encourage mosquito breeding sites (5, 6). Ae. aegypti can breed and spread more easily in urban environments where there are indoor and outdoor water containers, particularly uncovered ones such as buckets, drums, tires, pots, and jerry cans containing stagnant water (7). It has also been demonstrated that using repellents and not having door or window screens can lead to illness (5). This is especially crucial because Ethiopia's Somali region's weather makes it customary to sleep in the early morning and during the day.

The first case of dengue fever was documented in Ethiopia in 2013 following an outbreak linked to the disease in the city administration of Dire Dawa. Since then, there have been more dengue outbreaks and cases, which has had a serious impact on public health (5, 8). Since 2013, virtually yearly outbreaks have devastated Ethiopia's already disjointed economy and health system. According to reports, not using bed nets, having standing water near settlements, and the population's reduced nutritional state as a result of a protracted drought are some of the contributing reasons for dengue fever in Ethiopia. A few of the difficulties in controlling the current outbreak are the inadequate surveillance in the impacted areas, as well as the scant efforts in vector control and environmental management.

An outbreak of dengue fever has been occurring in two districts (Logia and Mille) in the Afar region of northeastern Ethiopia since April 4, 2023.

OBJECTIVES

General objective

- To investigate the outbreak and to determine the etiology and its associated risk factors

specific objectives

- To describe the outbreak
- To verify the etiology
- To identify the associated risk factors

MATERIAL AND METHODS

3.1Study area

Ethiopia's Chifra is a wereda distant region. Chifra, which is near the base of the eastern escarpment of the Ethiopian highlands, is part of administrative zone 1. It is bordered to the south by Mille, to the west by the Amhara region, to the north by Administrative Zone 4, and the east by dubti. A portion of the border with Zone 4 is defined by the Logiya River. There is one primary hospital, three health centers, and nineteen health posts in the Wereda, which has 119,331 residents overall.

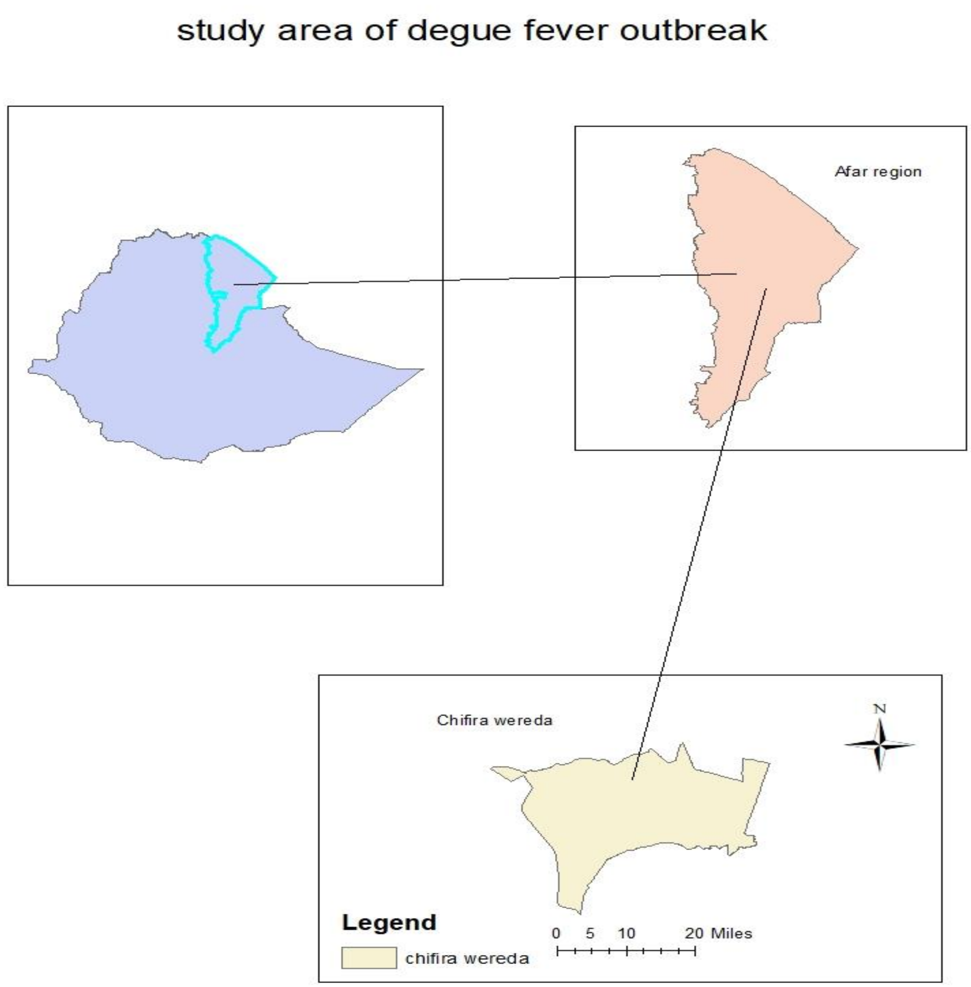


Figure 13 study area of dengue fever outbreak investigation

3.2 Study design

The study design was descriptive and described the disease pattern in person, place, and time.

3.3 Case Definitions

The case definition of the World Health Organization (WHO) was used. Suspected DF; is any person who has developed a sudden fever of more than 38°C for 2 to 10 days with at least two of the following signs and symptoms: headache, retro-orbital pain, myalgia, arthralgia, rash, hemorrhagic manifestations, or leukopenia. Confirmed DF; a suspected case with laboratory confirmation.

3.4 selection of cases

Chifira Primary Hospital provided us with a line list of all cases, which we used to choose our cases. All instances that satisfied the case definition were recruited as cases after a community-wide active case search was conducted.

3.5 Data source

Due to its high number of reported cases and representativeness for the cases, we chose one primary hospital for a referral to the three health centers. Data was gathered using a structured questionnaire, interviews with cases found at the chosen health facilities, documents, and line lists that were also reviewed to determine the true number of cases.

3.6 Descriptive study

We evaluated daily line lists, logbooks from the OPD, patient medical records, and daily epidemic summary reports gathered from all medical facilities. All the obtained data were assembled and descriptive analyses were done by time, place, and person by utilizing Microsoft Excel.

3.8 Laboratory Investigation

To confirm the occurrence of dengue fever a total of 15 blood samples were taken from malaria-negative patients and brought to the national reference laboratory at EPHI and three were confirmed results by RT-PCR testing.

3.9 Environmental investigation

The study team looked closely at water collection techniques, household cleanliness habits, and possible breeding grounds such as broken glass, old tires, and water containers both inside and outside the house. They conducted a thorough risk assessment of these locations for *Aedes aegypti* mosquito breeding. The crew also looked for larvae and assessed drainage systems that might aid in mosquito growth. We also carefully looked at the personal protection equipment that locals used to ward off mosquitoes. The purpose of this extensive observation was to pinpoint environmental elements that increase the likelihood of disease transmission and mosquito breeding.

3.10 Statistical Analysis

The gathered data was input into Epi Info version 7, and descriptive statistics were calculated for all variables. The results were then presented using tables, frequencies, and graphs for better visualization.

3.11 operational definitions

Dengue fever suspected case: any person with AFI illness of 2-7 days duration with 2 or

More of the following: headache, retro-orbital pain, myalgia, arthralgia, rash, hemorrhagic

Manifestations, leukopenia.

A laboratory-confirmed case is a suspected case that has laboratory results indicating

Infection (IgM positive, rise Ig antibody, positive PCR or viral isolation for dengue virus)

An epidemiologically linked case is a suspected case, that has contacts (possibly got the

virus) with a laboratory-confirmed case or another epidemiologically confirmed case

RESULT

Descriptive epidemiology

During the outbreak period, 276 cases of dengue fever were reported without any fatalities; 181 of them (65.6%) were female and 95 of them (34.4%) were male. Since the exact time of the disease's beginning is unknown, we treated the potential index case as the first patient at the hospital and did not identify the index case.

For confirmation of the existence of the outbreak, 15 Samples were collected for serologic tests and sent to the EPHI lab. 3 of them were positive for dengue fever with a positivity rate of 20%, confirmed by RT PCR at EPHI laboratory. A single suspected or confirmed case of dengue fever is considered an outbreak.

Number of cases VS date seen at health facility

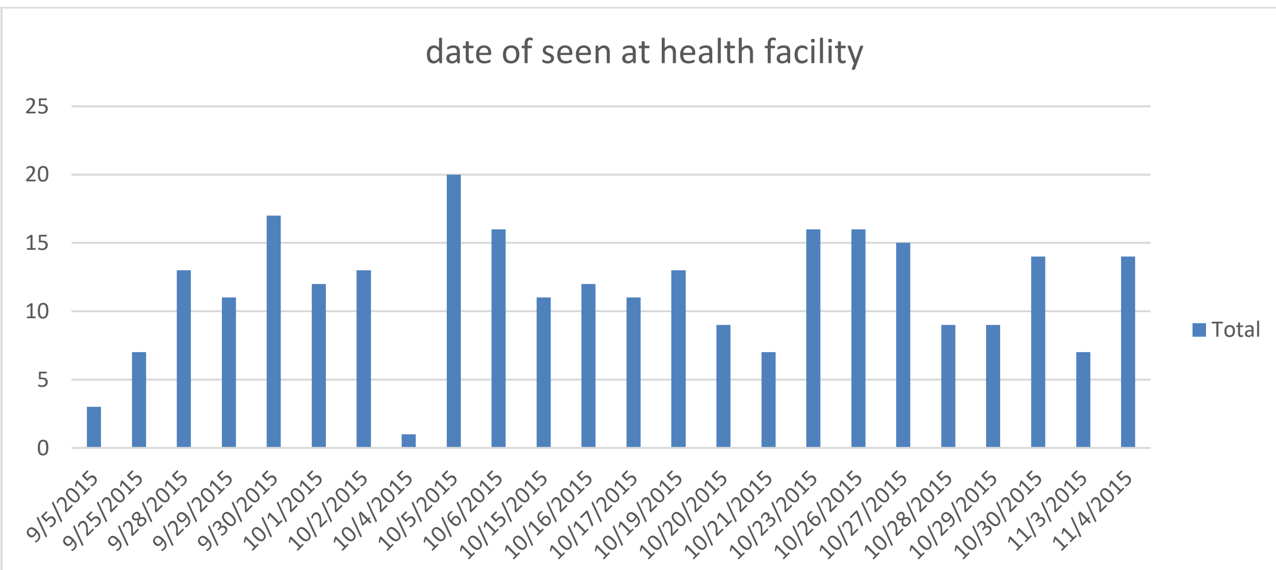


Figure 14 Number of cases VS date seen at health facility

Epi curve-based date onset

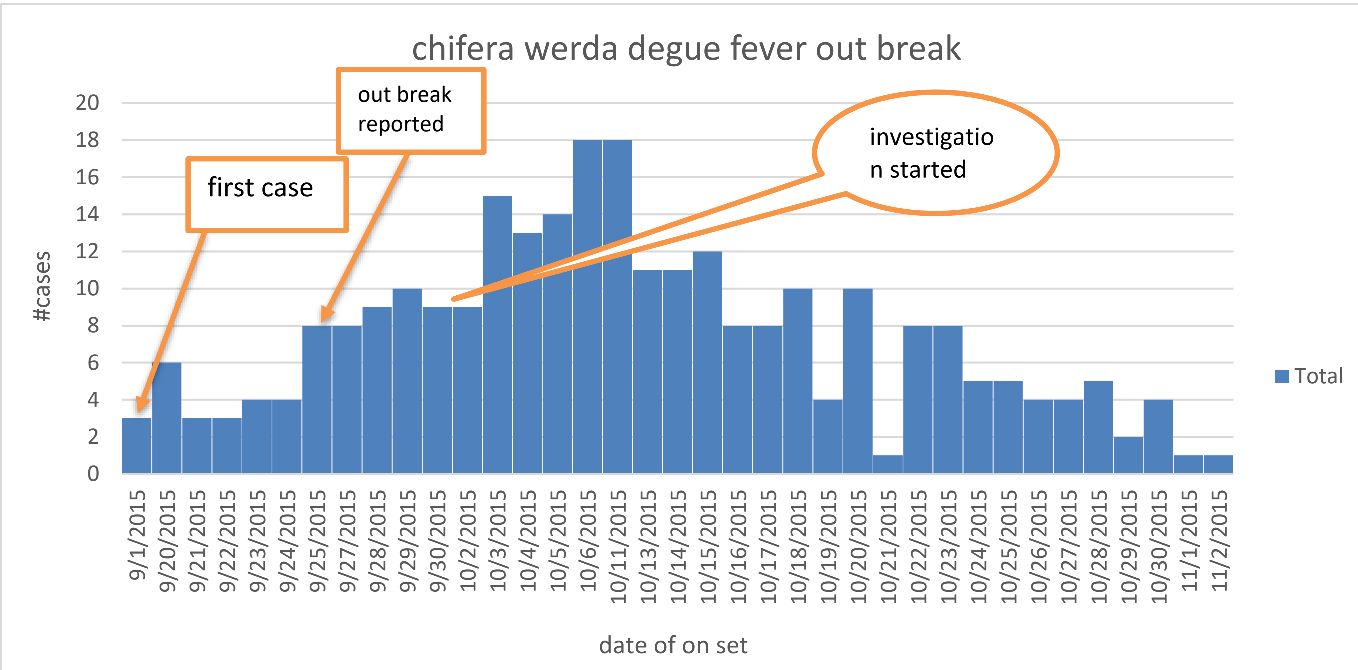
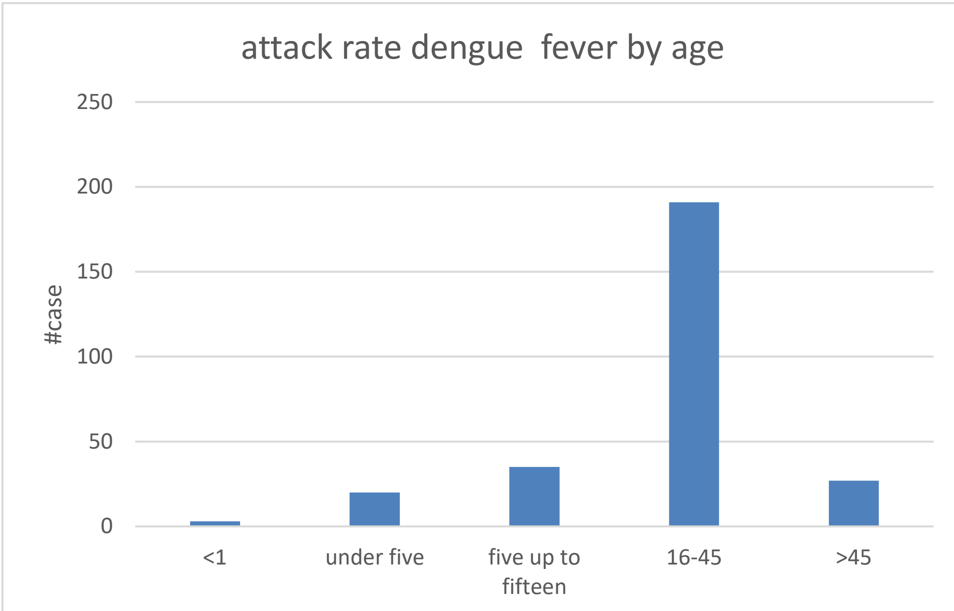


Figure 15 Epi curve-based date onset chifera wereda dengue fever outbreak



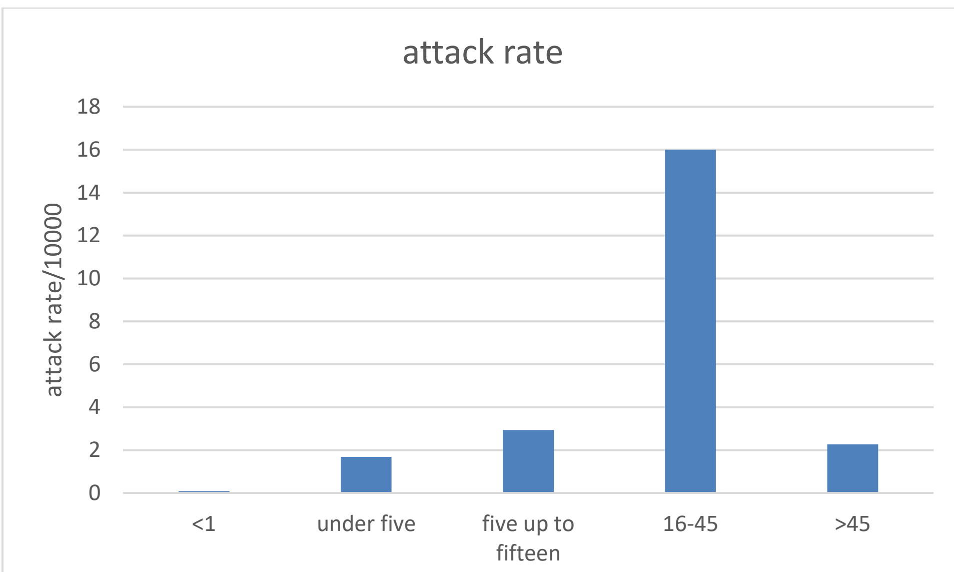


Figure 16 Dengue fever Attack rate by age

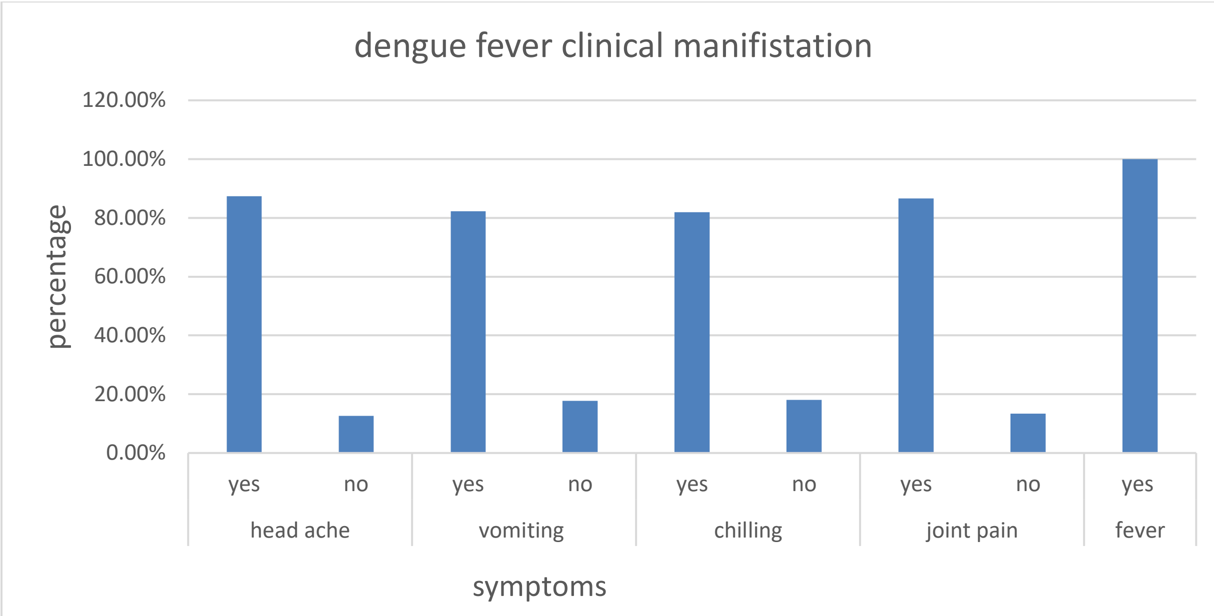


Figure 17 Dengue fever clinical manifestation

Laboratory Finding

Fifteen serum blood samples from the 276 affected patients were taken from sick individuals in accordance with the case definition at a medical facility by trained laboratory personnel. Since laboratory testing was not accessible at the outbreak site, the Ethiopian Public Health Institute received the collected sample and used RT-PCR testing to confirm it. Three (20%) of the fifteen probable cases tested positive for the dengue virus.

Environmental Investigation

To identify dengue fever mosquito vectors, suspected mosquito breeding locations were evaluated. A torch was used to examine water containers that had been neglected, both inside homes and outdoors in the courtyard (roto, abandoned tires, jerrican, etc. surface water area), and found the sample household's major vector, density, and possible breeding habitat. Used tires are the most prevalent nesting ground. Larvicidal and source-reduction larval source management (LSM) was applied to 760 environments (sprayed on 491 and source-reduced on 269).

No breeding habitat identified	No breeding habitat identified sprayed	No breeding habitat source reduction	Health education provided	Household visited	Fibril cases referred to health facilities
690	491	269	707	362	4

Teachers, kebele leaders, district health office employees, and staff from health facilities received onsite orientation regarding vector behavior and control strategies in addition to being given household tours.

Figure 18 Vector control activities Chifira and Awash Afar Region, June and July, 2023

DISCUSSION

Dengue fever was confirmed to be the causative agent of the outbreak based on laboratory results and clinical signs. Because Ethiopia is located in this region, it is susceptible to dengue fever and other vector-borne viral diseases. Dengue fever affects the majority of tropical and subtropical countries. Early May marked the beginning of the pandemic, which peaked in mid-June 2023.

Every DF patient in Chifira Wereda had a 100% fever, according to the results of the current inquiry. This aligns with the findings of the investigation carried out by the city administration of Dire Dawa and the Somali region(8, 9).

Serum samples were taken from 15 participants for confirmation, of those 3 were IGM positive for DENV (positivity rate of 20%). The remaining instances were connected epidemiologically by time, place, and person.

In this study females were more affected by 181(65.6%) this varies with the previous study conducted in Somalia(9). The possible reason females were affected was that most habitat sites of the vector were in and around the house females spent more time in the house than males and wearing clothing was different in door and pot dour stations.

The result indicated that the crude attack rate was 2.3/1000 which exceeds the research done in Werder Town, Somali Region, Ethiopia(9). This difference might be due to study setting, surveillance, prevention, and control strategies in the study area.

The age group 16-45 yrs. was highly affected by the disease, this shows that they are active age groups and they spent most of the time outside of the house which exposed them to day-bite mosquitoes this is similar to the previous study conducted(10). The case fatality rate is 0 and 95.65% (264) were outpatients

CONCLUSION

the result of this study is based on cases that meet the requirements of the standard case description and the vector found in the evaluated households, epidemiological, entomological, and laboratory findings so the cause of the outbreak was Dengue virus. No deaths have been reported.

The attack rate of the disease in Chifira werda was 2.3/10000 These females were more affected 181(65.6%) and the Age group 16-45 yrs were highly affected by the disease. The epidemic curve indicated that intervention measurement was done after the case declined.

CHALLENGES /GAPS

- ❖ Shortage of laboratory supplies (Geimsa solution, Glycerol, slide, sample collection materials, etc…) for affected and at-risk districts
- ❖ The integrated vector management intervention is not regularly conducted
- ❖ There is a critical shortage of input supply (RL PCM and Vit K)
- ❖ There is a transportation problem
- ❖ Community sensitization still needs to be aggressively conducted in all affected districts.
- ❖ Insufficient operational budget
- ❖ Weak partner involvement in the response efforts
- ❖ Needs of training
- ❖ Lack of formats for report

RECOMMENDATION

- ❖ Avail laboratory reagents and supplies for malaria testing (Geimsa solution, Glycerol, slide, sample collection materials, etc.)
- ❖ Strengthen surveillance, case management, RCCE, vector control activities, and environmental management activities with community participation
- ❖ Continue the identification of the breeding site and apply control measures
- ❖ monitoring and evaluation of an outbreak situation at all levels
- ❖ Coordinate in availing DF case management supplies

STUDY LIMITATION

this outbreak investigation is focused on descriptive epidemiology it only describes the case based on time, place, and person whereas the analytical epidemiology the disease the associated risk factor is not seen in this study.

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CHAPTER II SURVEILLANCE AND DATA ANALYSIS

2. Guinea worm disease surveillance and data analysis

EXECUTIVE SUMMARY

The nematode parasite *Dracunculus medinensi*s is the cause of Dracunculiasis, often known as Guinea worm disease, one of the Neglected Tropical Diseases. It is a poverty-related illness that cripples people living in isolated and marginalized communities with no access to clean water. The purpose of this study is to assess the disease burden: to describe the disease based on different parameters such as time place and in-person based on retrospective data and to evaluate the interventions that are implemented for the eradication program.

Guinea worm disease surveillance system is implemented with the involvement and integration of different sectors and partners. The most common surveillance is mainly, active, passive, and sentinel surveillance. The surveillance system consists of systematic collection, organization, analysis, interpretation, and dissemination of GWD data for action.

In this study the retrospective data is collected from 1993 up to 2021 it is analyzed by tables, graphs, maps, and figures. The data contain the disease distribution in humans from 1993 up to 2021; the disease distribution in animals starting from 2013 onwards both domestic and wild animals; and rumor trend of the last 5 years; it also describes the data based on surveillance categories.

The disease has varied over time The first nationwide case search was conducted in 1993 at that time only human cases but starting in 2013 animals were affected the dynamics changed and spread to wild animals and the baboons were affected.

The most common intervention that is implemented in the guinea worm eradication program is surveillance of both animals and humans. In the case of domestic animal surveillance tethering of dog and cat; in the case of wild animal surveillance baboon trapping is the most common intervention. The other interventions are Vector Control, Social and Behavioral Change Communication (SBCC), and Safe Water Provision.

The human case trend is decreasing but the animal infection is continuous it needs multisectoral collaboration and coordination to eradicate 2030.

Keywords: surveillance, Guinea worm, data analysis

INTRODUCTION

Neglected Tropical Diseases are the biggest public health issues throughout the world that cause high morbidity and mortality. NTDs aggravate the reduction of economic productivity across various countries, particularly in developing countries have public health and economic impacts.

The nematode parasite Dracunculus medinensis is the cause of dracunculiasis, often known as guinea worm disease. Humans contract the disease by consuming tainted water that contains copepods, or water fleas, which carry the parasite's infectious stage larvae. It is an agonizing, severe poverty-related illness that cripples those living in isolated and marginalized areas. It has a detrimental impact on people's general quality of life, school attendance, agricultural output, and health in the communities where it is common.

In 1986, the World Health Assembly passed a resolution WHA 39.21, to endorse the elimination of dracunculiasis disease in endemic member states. In 1991, WHA resolution 44.5 declared the Assembly's commitment to the goal of eradicating dracunculiasis. The WHA called upon all ministries of health to establish surveillance and prevention activities. There has been a notable decrease in the number of cases from 3.5 million in the 1980s to only 15 cases in 2021 since the eradication program for Guinea worms was started in the 1980s. Currently, the disease remains in five African countries, Chad, Ethiopia, Mali, South Sudan, and Angola.

In 1992, the EDEP was established with the support of The Carter Center (TCC) and WHO. The first nationwide case search was conducted in 1993 and identified 113 endemic villages and 1,129 dracunculiasis cases in the South Omo Zone of SNNPR and Gambella regions. In 1994, village-based surveillance in Gambella and South Omo zone of SNNP regions identified 1,252 cases of dracunculiasis in 99 endemic villages. The program eliminated dracunculiasis in 2001 from the South Omo zone and left Gambella as the sole GW-endemic region.

EDEP has been operating the program under three surveillance Levels (I, II, and III) and five major interventions; Surveillance, Vector control, safe water supply, Social and Behavioral Change Communication, and Proactive tethering of dogs and cats. For over two decades in Ethiopia, dracunculiasis was considered only a disease of humans; however, after 2013 the transmission dynamics changed and animal infections became a major program challenge Cognizant of the multi-sectoral involvement and partnership especially the Ministry of Water and Irrigation, EWCA, MOA, and Ministry of Education. The implementation of cross-cutting issues such as WaSH, veterinary public health, and research is outlined along with the key interventions.

Objective

- To analysis based on the retrospective date
- To assess the prevalence and the burden of the diseases
- To describe the disease on different epidemiological variables
- To assess the surveillance system
- To assess the guinea worm disease intervention and to set recommendation

1. GUINEA WORM DISEASE (GWD) SURVEILLANCE

Surveillance is a key element of disease control programs; it is also the most crucial element in the final stage of diseases under eradication. GWD surveillance is an ongoing, systematic collection, organization, analysis, interpretation, and dissemination of GWD data for an action. In the Guinea worm eradication program, different types of surveillance are implemented. Mainly, active, passive, and sentinel surveillance.

Passive surveillance, using the PHEM system, weekly surveillance reports are collected routinely from functional reporting health facilities on identified diseases including guinea worm. Active surveillance for Guinea worm diseases is implemented to search for cases/infections daily in GWD-endemic woredas. During active case search, every rumor detected is registered in the rumor registration book to be followed for further investigation and reported to the next higher reporting unit according to the guideline recommendations. A pre-selected sample of reporting sources in a sentinel monitoring system agrees to report all incidences of specific illnesses, which may point to trends in the target population as a whole. In the context of GWD, sentinel surveillance is established targeting wild animals. Staff members with the necessary expertise are needed to diagnose, gather samples, treat, and document cases of the condition that is being watched over.

In Gog and Abobo wereda, the Gambella region is currently experiencing guinea worm illness. Situated 766 kilometers southwest of Addis Ababa, the capital of Ethiopia, Gambella is one of the eleven regional states that make up Ethiopia. Its borders are shared by the Oromia regional state to the north and east, the southwest region to the south, and the nation of South Sudan to the west. It is located between 7-8o North longitude and 33-35o East latitude. The region has an average annual temperature of 30.7°C, an average annual rainfall of 800–2,100 mm, and an altitude of 300–2,300 meters above sea level.

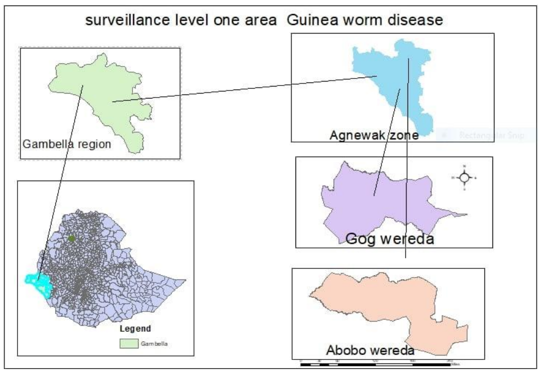

Figure 19 Current hotspot area of GWD

1.1 Rumor Detection and Reporting

Recognizing and detecting a suspected GW case is one of the most important tasks that the community, village leaders, VBVs, GWOs, HWs, AHWs, CAHWs, and teachers should know as part of the regular national program activities. It starts gathering any rumors from the community, media, or through regular active case/infection searches (house-to-house active case) depending on the level of surveillance.

GW identifying pictures and case search form will be used the current GW identifying pictures should be posted here When a community member identifies any GW rumors of humans or animals, they should immediately notify the nearby health facility health office, village leaders, VBV, GWO, CAHWs or call hotline 8335. After registration of rumors, the PHEM personnel who received the rumor at each level (national, regional, and zonal) should communicate to each other based on the reporting channel timely and to the woreda health office (PHEM officer) or GW field office (For Level I area) where the rumor is identified. Similarly, when the woreda health office (PHEM officer) or GW field office (For Level I area) gets the rumor, they should immediately report to the next level (zone, region, and national levels) within 30 minutes. Any immediately reported GWD case should also be included in a weekly-based report including zero reports for no case observation.

1.1.1Detection of Reported Rumor

Classification of rumor

GW Suspected Case: A person presenting a skin lesion with itching or blister living in an endemic area or risk areas for Guinea worm, with the emergence of a worm.

Discarded Rumor: If the investigators ensure that (suspected cases clinically diagnosed to other disease/health conditions) it does not fulfill the GWD case.

Suspect to be Followed Up: if the patient fulfills the definition of the suspect and the investigator is unable to decide the outcome during the first appearance of the investigation, he or she categorizes it as a suspect to follow up.

All reported GW rumors are investigated within 24 hours and recorded on standard recording formats: (including all the formats)

- ❖ Rumor Register/log book
- ❖ Rumor/suspect investigation form
- ❖ Village Surveillance Book (VSB) or Rumor Register/log book

All GW rumors are investigated within 24 hours using the standard national rumor/suspect investigation form and If the suspected case fulfills the admission criteria of CCC, the suspected person should be sent to CCC for further investigation and follow-up

1.1.2 Reporting of Rumor

Once the rumor data is recorded in the standard data recording formats (Rumor investigation form, Rumor/suspect register, and VSB), it is submitted to all levels of the PHEM reporting system every week. A responsible Woreda M & E Officer or PHEM officer compiles and archives the data into the provisional GW database (prepared in Excel format). Similarly, the copy of the data should also be distributed to the following bodies:

Original (white): EDEP secretariat office

2nd Copy: Catchment Health Facility

3rd Copy: Woreda Health Office

4th Copy: Zonal Health Department

5th Copy: Regional Health Bureau

6th Copy: Federal Ministry of Health and

7th Copy (Animal rumor/suspect data): To woreda livestock and fisheries office

Note: If the rumor becomes a suspected case/infection (morphologically confirmed worm emergence) follow the steps stated in section 5. GWD suspected case investigation.

1.2 Detection and Reporting of Guinea Worm Cases

1.2.1 Case detection of GWD

GWD case is detected based on case definition and surveillance tools with the involvement of community and public health officers and other responsible bodies.

Case definition of GWD

Confirmed GW Case: A case of guinea-worm disease is a person exhibiting a skin lesion with the emergence of one or more guinea worms in which the worm is confirmed in laboratory tests to be D. medinensis. The person is counted as a case only once during a calendar year.

Suspected Case: A person presenting a skin lesion with itching or blister living in an endemic area or risk areas for Guinea worm, with the emergence of a worm.

GW Suspect: A person living in /having a travel history to the endemic area/risk area exhibiting compatible GWD signs and symptoms; like localized skin lesions with itching, blister, or the emergence of worm

Community Case definition for GWD: Any person presenting a skin wound with a worm coming out.

GWD Surveillance tools distribution

The most common methods that can use GWD surveillance tools at health facilities.

- Case definition posters
- Log books
- PHEM weekly reporting forms
- Rumor investigation form
- Guinea worm case investigation form
- Rumor register form
- line listing format

Community Engagement in Guinea worm disease Surveillance

Active participation of community members in Guinea worm surveillance is crucial. A community-based Surveillance focal person in the community can serve as a GWD surveillance focal and community member with no CEBS focal person should be selected any representative (community or village health agents, similar health care providers, village chiefs, school teachers, veterinarians, HEWs, HDA and traditional healers are effective focal points) from the community.

1.2.2 Reporting system of GWD

Guinea worm disease is one of the immediately reportable diseases under the PHEM system. It is notified within 30 minutes of detection from health facilities to the next higher level of the health system. The PHEM weekly reporting form is used to report GWD every week. Rumors are investigated within 24 hours of notification and documented using the rumor investigation and rumor register form, respectively. If there is a Guinea worm suspect/case, the case investigation form is filled in and reported. As an endemic country, EPHI/EDEP also reports GWD surveillance data every month to the World Health Organization. This includes Surveillance indicators, a line list of villages under active surveillance, a line list of cases, and a line list of rumors/suspected cases. This monthly aggregated report provides data for planning and allocation of resources.

PHEM reporting systems of GWD are both paper/electronic-based, preferably PHEM, to improve data quality, and enhance virtual, near real-time disease monitoring capability so that it reduces system costs and easily generates automated alerts.

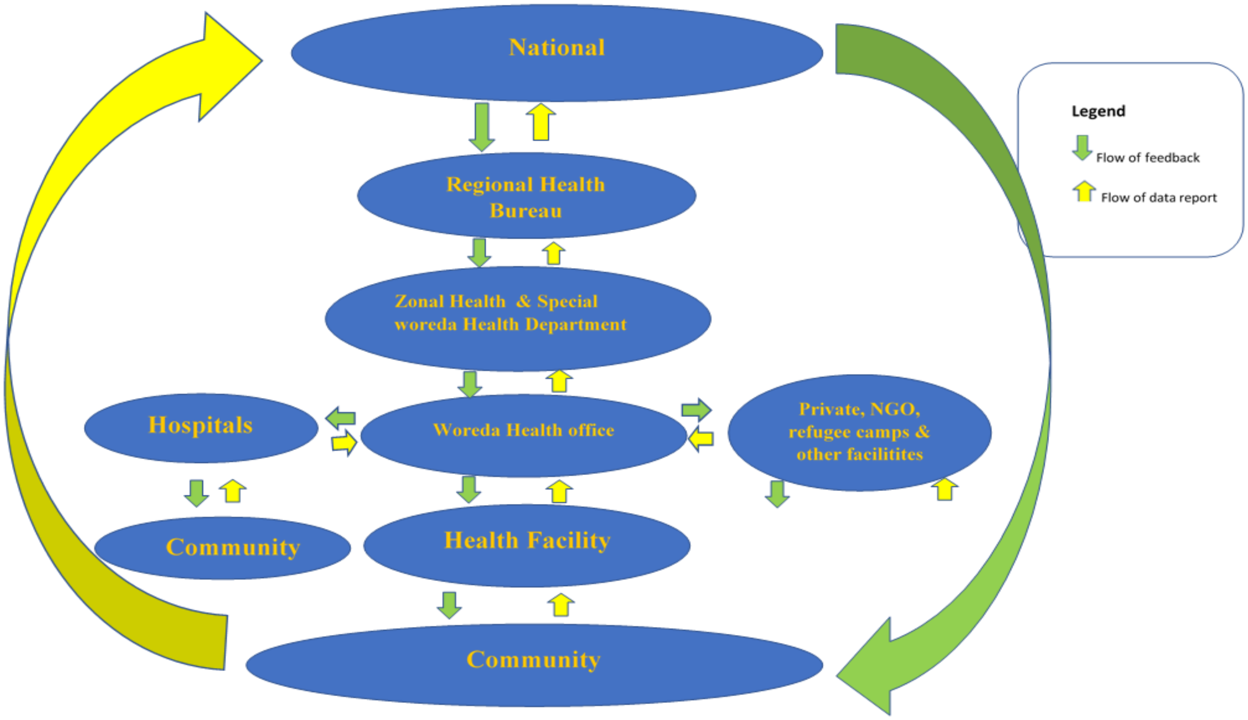

Figure 20.*Surveillance data and feedback flow in Ethiopia*

The imported GWD case needs to be notified to the country of origin as a potential Public Health Emergency of international concern according to the context of IHR. The national program coordinator fills in the appropriate form by copying the three levels of WHO to notify the counterpart in the country of origin according to the standard operating procedure.

2. GUINEA WORM DISEASE SURVEILLANCE DATA ANALYSIS

Collecting and reporting numerical information about Guinea worm diseases to the next level is not the end goal of guinea worm disease surveillance. The data collected is analyzed at various levels of the health system. This analysis generates information that guides relevant, timely, and appropriate actions.

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2.1 Analyze data by time

The data collected is analyzed at various levels of the health system. This analysis generates information that guides relevant, timely, and appropriate actions. Guinea worm disease data analysis by time is usually shown using graphs and tables.

2.1.1 Rumor Data Analysis

Table 9 *Guinea worm disease rumor trend from 2017-2021*

Year	human	animal	total no.	containment of dog and cat%
2021	12022	4981	17003	66.7
2020	7588	5228	12816	100
2019	6347	4340	10687	100
2018	7542	1540	9082	60
2017	6140	252	6392	50

The highest rumor reported in human case is 2021 year and total number 12022 suspected case is reported and 2017 the lowest number rumor reported and total number of 252. The highest number of reported both human case and infection in 2021 and the lowest number reported both human and animal is 2017.

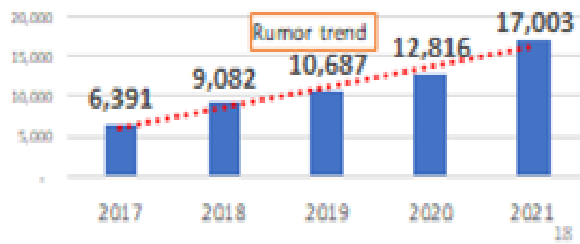


Figure 21 *Rumor trend*

The highest number of rumors of animal infection was reported in the 2020 year and the total number of rumors was 5228 the lowest number was reported in the 2017 year and the total number of 252. From the total animal rumors reported 100% of dogs and cats were contained in 2020 but the lowest containment of dogs and cats took place in the year of 2017.

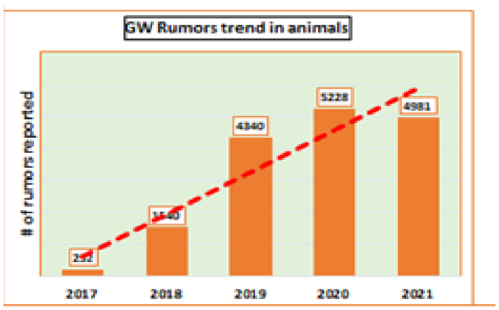


Figure 22 *Rumor in animal trend*

The highest number of rumors was reported month in 2021 in December and August in human cases and animal infections respectively the lowest number was recorded in April both in human and animal cases and infections. A total of 12,022 human cases, 4483 dogs, 462 cats, 15 baboons and 18 0ther rumors are reported in 2021

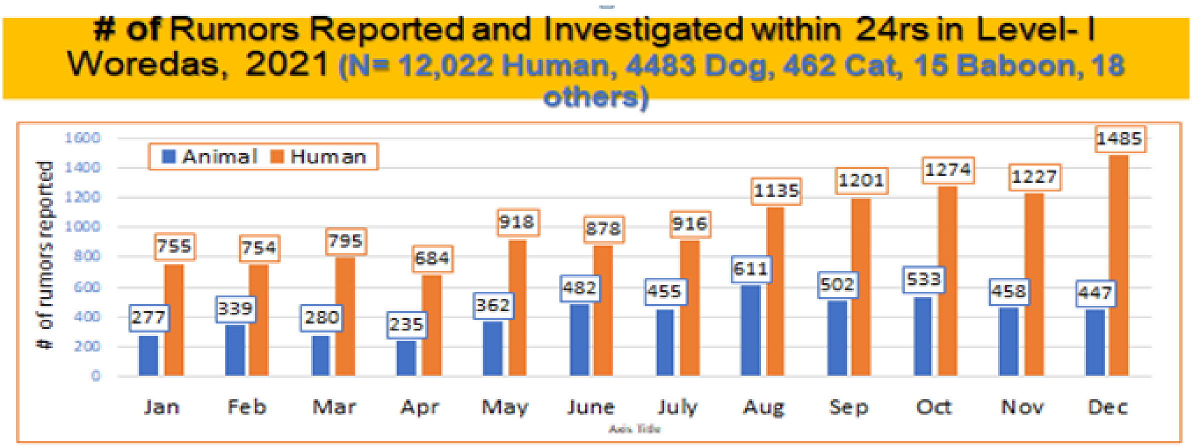


Figure 23 *Rumor trend in animal and human*

2.1.2 Case Data Analysis

Due to the results of the interventions, cases of dracunculiasis have decreased by over 99% from 1,129 human cases in 1993 to only 1 in 2021. A total of 4696 is reported stated from 1993 Up to 2021. 1993 saw the greatest number of instances recorded, whereas 2018 and 2019 saw no cases reported.

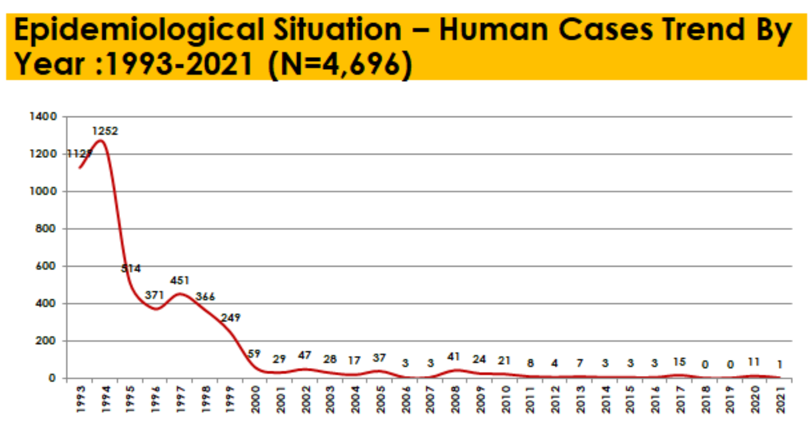


Figure 24 *Trends of dracunculiasis cases in Ethiopia from 1993-2021*

Case/infection trend in humans and animals,

The distribution of the disease in humans has been less than in animals since 2013 and it indicates the intervention has brought a change in the case of animal infection it started in 2013 and continues up to now. Three animal species are affected by this disease dog, cat, and baboon.

Table 10 *case/infection trend human and animal from 2013-2021*

year	human	Animal
2021	1	3
2020	11	15
2019	0	8
2018	0	17
2017	15	15
2016	3	16
2015	3	14
2014	3	3
2013	7	4

When comparing the human case and animal infections from 2013 up to 2013. The number of human cases declined and in 2018 and 2019 there were no human cases reported in 2021 the transmission continued in humans but in animal infection continued from 2013 up to 2021 the highest case was reported in 2018 and a total case of 17. The lowest case of animal infection was reported in 2014 and 2021 and the total number of infections recorded in both years is 3. The total percentage of affected animals are dogs 65.2%, baboons 20% and cats 14.7%. The disease transmission dynamic is not well defined it attacks wild animals, domestic animals, humans

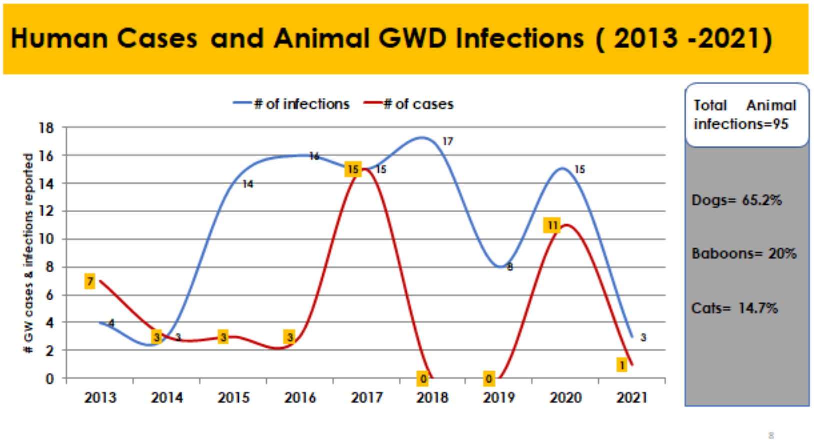
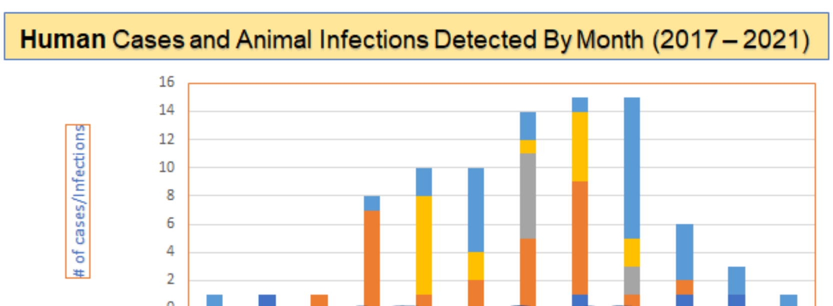


Figure 25 *case / infection trend human and animal from 2013-2021*

Case/infection trend in the month

Guinea worm distribution is increased in rainy or wet seasons especially July up to September the summer season is suitable for intermediate host reproduction



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017 Case/ Infections	1	0	0	1	2	6	2	1	10	4	2	1
2018 Infections	0	0	0	0	7	2	1	5	2	0	0	0
2019 Infections	0	0	0	0	0	0	6	0	2	0	0	0
2020 Cases/infections	0	0	1	7	1	2	5	8	1	1	0	0
2021 Cases/Infections	0	1	0	0	0	0	0	1	0	1	1	

Figure 26 *Human and infection detected by month*

2.2 Analyze data by place

Understanding the location of a disease can be gained by analyzing Guinea worm cases by location. The data described by spot maps give clues about where, how, and why the disease is spreading in specific geographical locations. The total number of cases per specified geographic area can be found using the dot density. Reporting residence on the guinea worm case-based reporting forms or line lists assists in charting and defining Guinea worm disease:

clusters of incidents that happen in a specific location.

Travel habits that are connected to the disease's mode of transmission.

Typical sources of infection for the individuals.

Regular Guinea worm disease data analysis options include Health Mapper, Quantum Geographic System (QGIS), and Geographic Information Software (GIS), which are open-source GIS programs that can be used to display the data. Marking roads, water supplies, the locations of particular villages, and other elements linked to the risk of Guinea worm disease transmission on a map of the region where cases occurred is crucial.

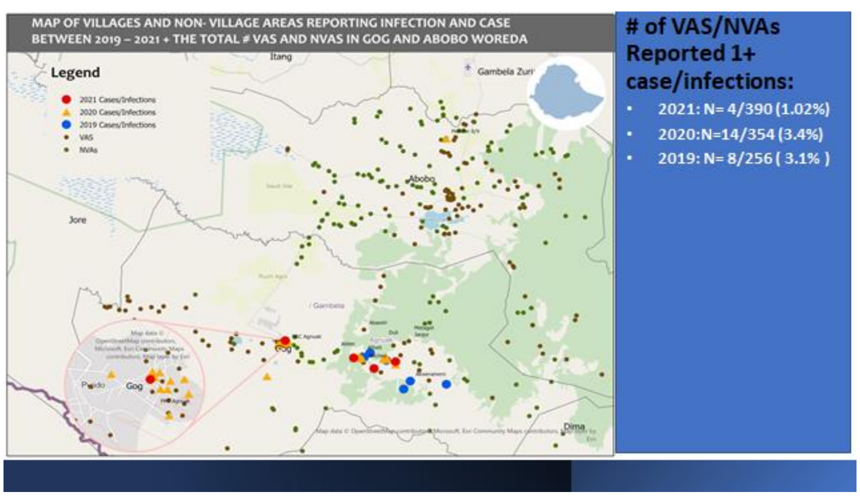


Figure 27 *Location of Dracunculiasis cases and infection between 2019 and 2021*

2.3 DATA ANALYSIS BASED ON SURVEILLANCE CATEGORIES

The nature of surveillance for cases/infections of Guinea worm disease varies with the status of disease transmission in the community. It is categorized based on the status of endemicity in the community where transmission of the disease is ongoing (Level I), active village-based searches for cases/infection should be carried out every week. However, surveillance for cases in formerly endemic or never-endemic villages (Level II & III) may be less frequent and more passive. The Ethiopian Dracunculiasis Eradication Program is currently implementing surveillance activities at three different levels.

Category	# of Woredas
Level I (endemic)	2
Level II (formerly endemic)	14
Level III (Never endemic)	964

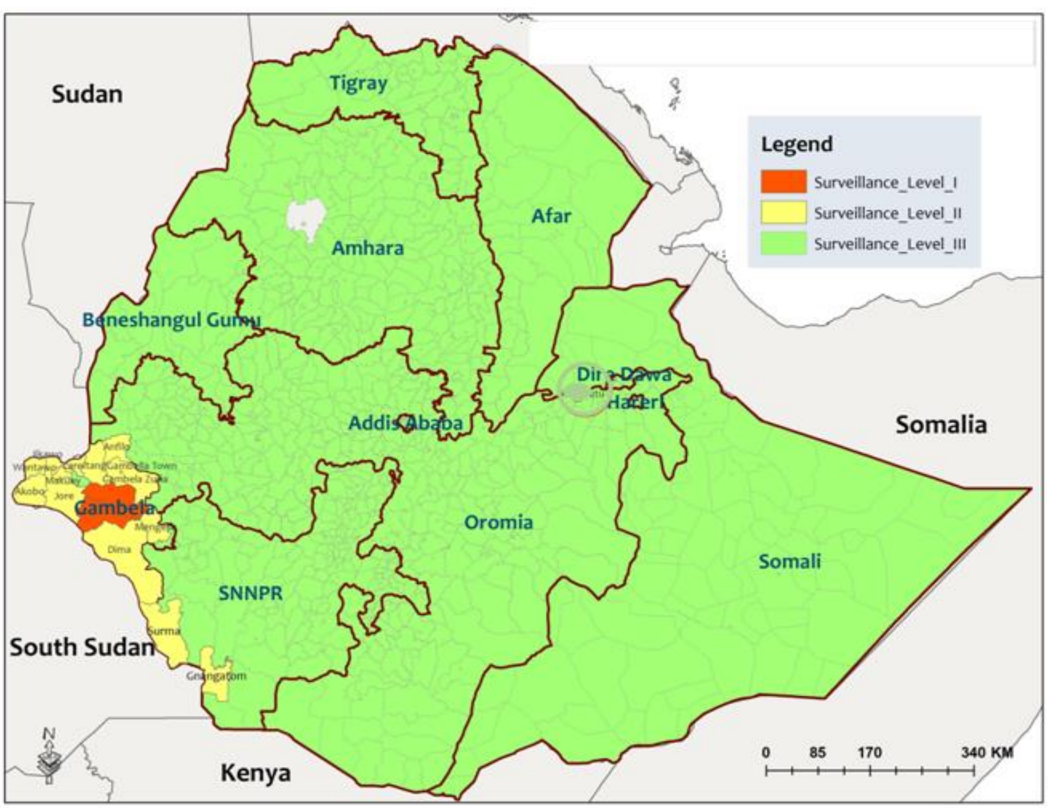


Figure 28 *Surveillance level for dracunculiasis in Ethiopia*

2.3.1 Level I (Endemic)

In Woredas, where there is endemic transmission, surveillance is in place. Every week, GWEP staff members or volunteer villager teams search every inhabited place (camps, hamlets, villages) for cases. The goal is to find cases as soon as possible after the worm emerges from the skin and to take immediate action to stop the patient from infecting others. All inhabitants are regularly informed about the financial award through word-of-mouth and other channels that are accessible. Every month, awareness levels are checked. Every rumor is looked into within 24 hours, the results of those investigations are published and recorded, and the frequency of rumor reports is tracked monthly.

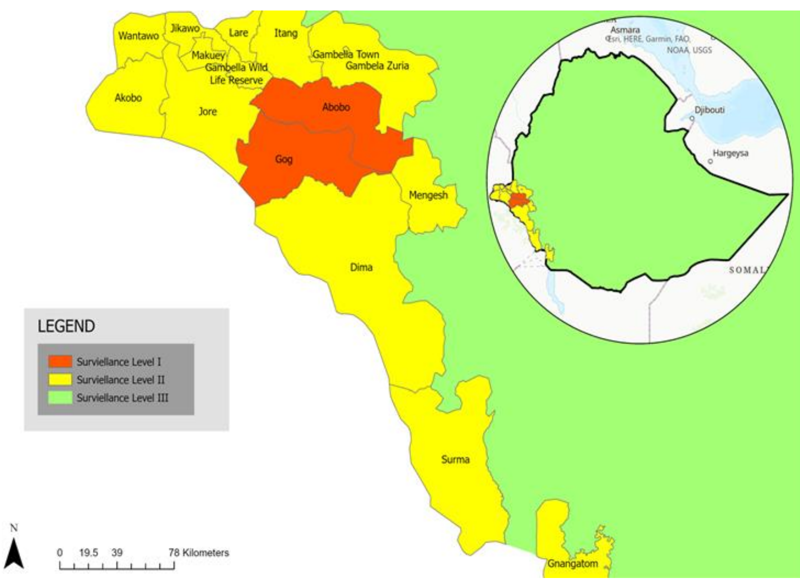


Figure 29 ***survelliance***

Table 11 *case Trend Gog and Abobo Woredas*

YEAR	Gog	Abobo
2023		
2022		
2021	1	
2020	11	
2019	0	
2018	0	
2017	1	1
2016	2	0
2015	2	1
2014	2	
2013	1	5
2012	2	
2011	6	
2010	20	
2009	22	1
2008	36	1
2007	0	
2006	0	
2005	24	8
2004	1	
2003	13	3
2002	34	
2001	18	2
2000	10	30

1999	18	8
1998	32	7
1997	13	4
1996	27	2
1995	37	3
1994	60	1
1993		

Case trend of level I surveillance from 1994-2021 a total of 472 cases is recorded in Gog wereda 392 and Abobo wereda 80. The highest cases reported in Gog and Abobo wereda were 60 and 30 in 1994 and 2000 respectively. No cases were reported in 2019 and 2018 in both weredas.

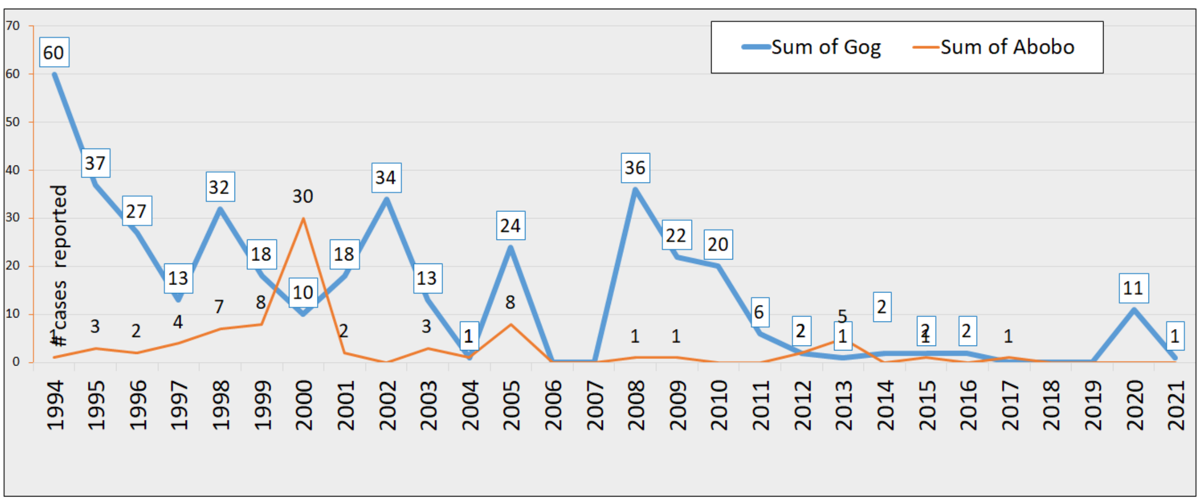


Figure 30 *Case Trend in Level - I Woredas*

When we see the animal infection trend in both Gog and Abobo weredas from 2013-2021 a total of 95 infections are recorded. The highest infection is reported in 2018(total number is 17) and the lowest infection was reported in 2014 and 2021(total number is 3). The first infection of baboons was detected in 2013. The first cat infection was detected in 2013. The total number of infections in species level of animals is dog 62, baboon 19, and cat 14.

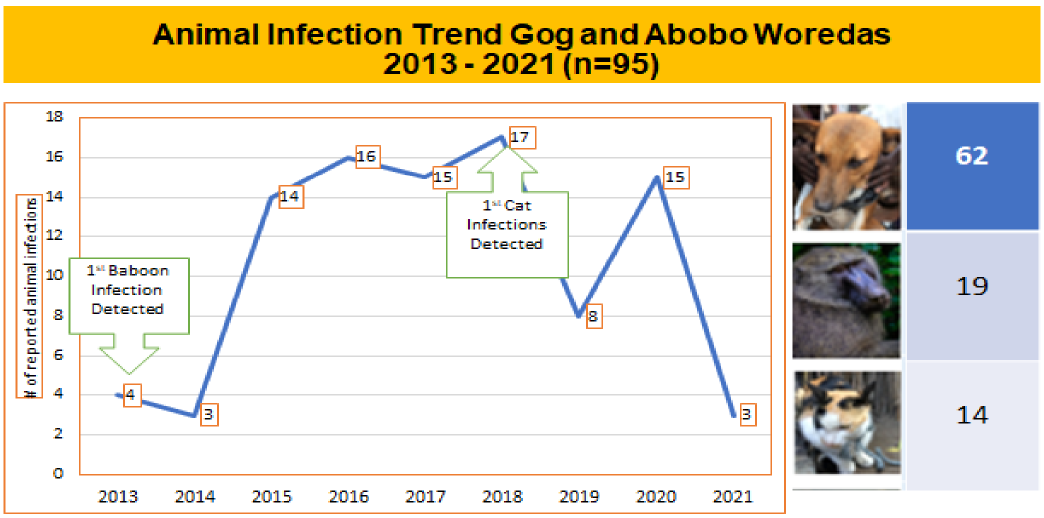
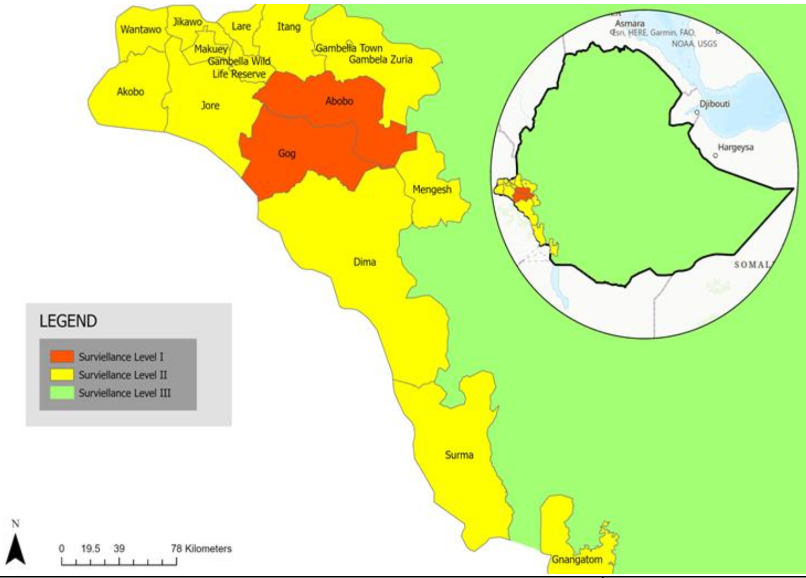


Figure 31 *animal infection trend Gog and Abobo woredas 2013-2021*

2.3.2 Level II (Formerly Endemic/adjacent to Level I)

In non-endemic woredas where there is a chance of case importation (near-endemic woredas or common water supplies, migratory routes, etc.), surveillance is put into place in the villages. A monthly assessment of the degree of reward awareness is carried out, along with extensive outreach and informational distribution to the local population regarding the monetary reward for reporting cases of GWD (by supervisors, village informants, health personnel, community leaders, radio, etc.). Within 24 hours of notification, all rumors are looked into; the results are reported and recorded; and the frequency of rumors being reported is tracked monthly.



Region	# of Woredas
Gambella	11
SNNPR	2
Oromia	1

Figure 32 *Surveillance level category by wereda*

The highest number of cases was recorded in Surveillance II in 1995 a total number of 1048. Since 2018 no case has been reported from this area and there is no ongoing transmission. Surveillance II areas are the Oromia region afilo wereda, the south region now is the south west region it including 2 weredas and 11weredas of the Gambella region.

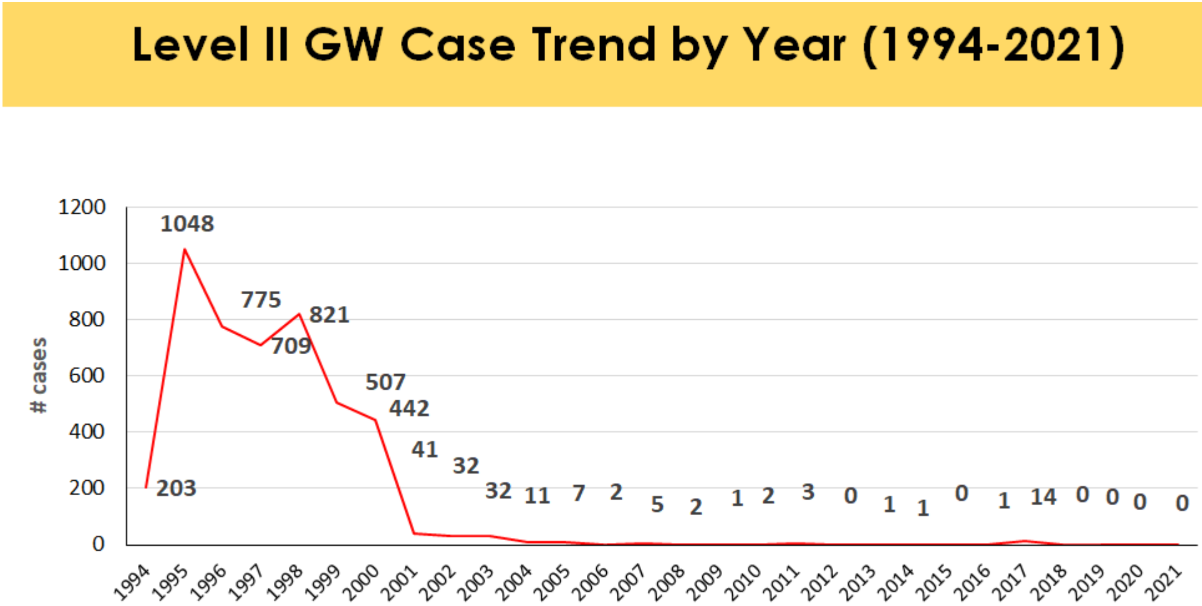


Figure 33 *case trend surveillance level II*

2.3.3 Level III (Never Endemic/adjacent to Level I)

Every other community in a non-endemic woreda that is not at a high risk of case importation uses surveillance. All available infrastructures are used to notify citizens about the financial prize, and awareness levels are monitored twice a year as part of this effort. Every rumor is looked into within 24 hours, the results of those investigations are published and recorded, and the frequency of rumor reports is tracked monthly.

2.4 Data analysis by person

Analysis of Guinea worm disease by person is very important. Most Guinea worm outbreaks are linked to personal variables like age, sex, occupation, residence & risky behavior of people. It is usually advised to analyze the impacted and at-risk populations by the individual. The number of cases of Guinea worm disease does not give all the details required to comprehend how a disease affects a community. Rates and percentages are helpful when comparing reported data.

3. ANIMAL GUINEA WORM DISEASE SURVEILLANCE DATA ANALYSIS

Standard Animal GWD definitions

***Animal Guinea worm infection*:** Animal exhibiting a skin lesion or lesions with or without the emergence of one or more Guinea worms ideally with laboratory confirmation. Animals counted as an infection once in a calendar year

***Animal GW suspect*:** An animal exhibiting localized itching, swelling, hair loss, blister, and or wound but no visible worm.

***Animal GWD Rumor*:** Any alleged information about animal GW infection from any source.

3.1 Animal GWD Surveillance structure and information flow

The animal guinea worm disease surveillance system shall be designed and established in a multisectoral or one-health approach. The structure or organogram of the Animal GWD surveillance started at the lower village level up to the national level where the Ministry of Agriculture (MOA) is at the heart of the structure taking over the ownership of the system.

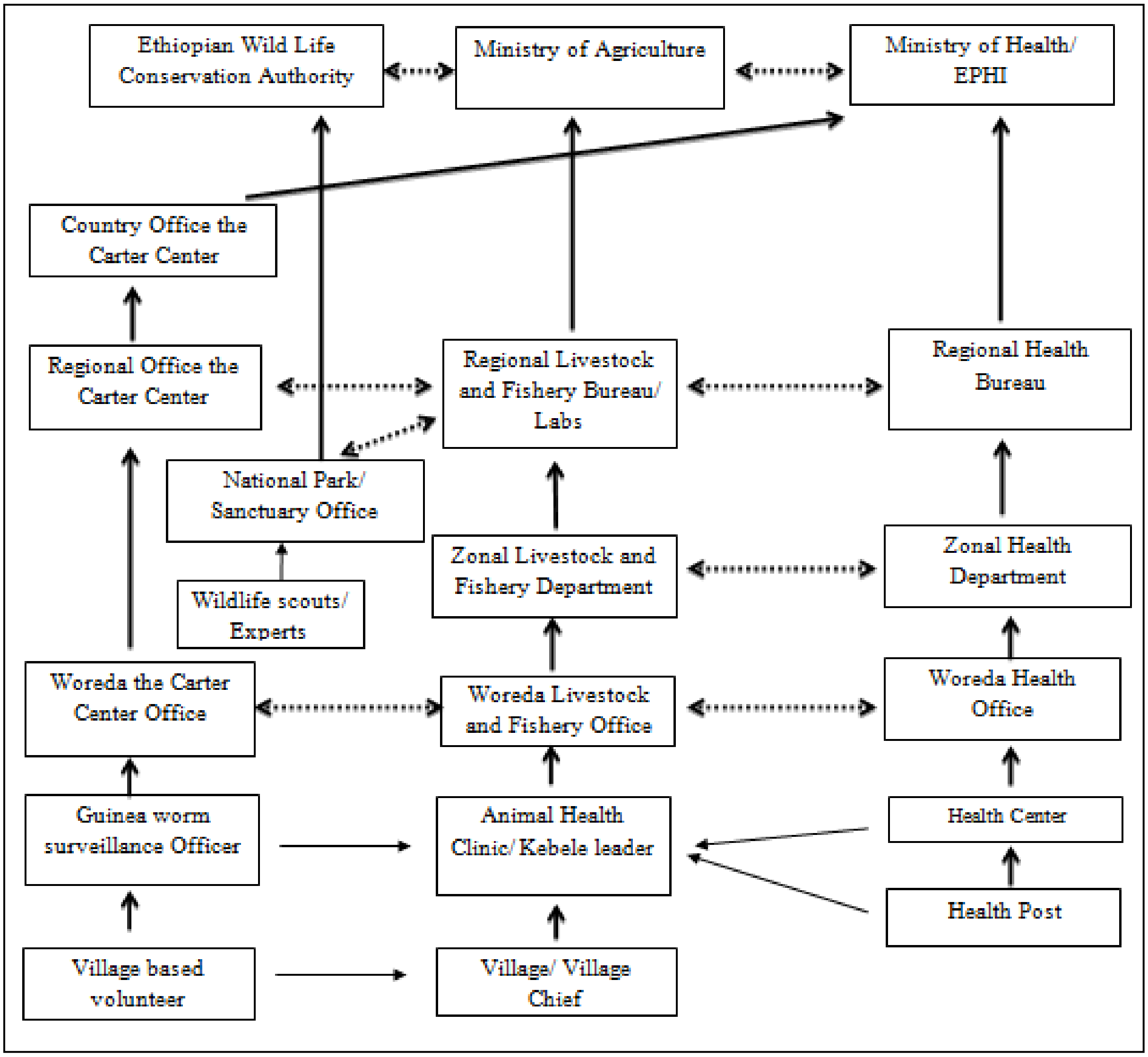


Figure 34 *Organogram of animal GWD surveillance reporting flow (system) in Ethiopia*

3.2 ANIMAL GWD SURVEILLANCE BASIC COMPONENTS AND TOOLS

3.2.1 Active surveillance

Active Animal GWD surveillance is implemented in Animals with the endemic transmission of GWD within the endemic districts (Level I areas). Multiple types of active disease searches for Animal infection are conducted each day for both domestic and wild animals, usually done by village-based volunteers, GWOs, Woreda Animal health workers, Regional veterinary laboratory staff, and other EDEP staff in all places (villages, forest) to detect infection within 24 hours.

3.2.1.1 Domestic Animal active GWD surveillance

- Daily monitoring and reporting (House to house active disease search)
- Participatory Disease surveillance (PDS) for Animal GWD
- Periodic Risk-based surveillance

3.2.1.2 Wildlife active GWD surveillance

Targeted wildlife surveillance focused on one or more disease-causing organisms in one or more wild animal species

Sentinel trapping

A sentinel surveillance system is employed when precise statistics regarding a specific illness are required. To diagnose, gather samples, treat, and record cases of the condition under observation, medical personnel with the necessary specializations are needed. A sentinel system is one in which data on wild animals' GWD is actively searched by putting traps in targeted areas to study its prevalence and follow up preventive measures in wild animals

3.2.2 Passive Surveillance

Ethiopia mainly relies on passive surveillance to know the disease status in the country and fulfill the international requirement by sharing the data with regional and international organizations (AU-IBAR and OIE). Currently, MoA is implementing a web-based monthly disease outbreak and vaccination activity reporting (DOVAR-2) and smartphone-based real-time animal disease notification and investigation system (ADNIS) under the national surveillance system.

Data analysis of animal guinea worm disease

The guinea worm infection rate among animals was retrieved from registered documents and the MOA surveillance system. Dogs, cats, and baboons are the three known species of animals that have been identified and confirmed infected by guinea worm. Ethiopia is the only country in the world reporting guinea worm infection among Olive baboons. Baboon infection was reported starting year 2013. From 2013 till 2021 around 95 animal infections were registered in the Gambella region. Almost all of the infection was reported in Gog Woreda and Abobo Woreda.

Out of the total infections, 62/95 (65%) were dogs; 19/95 (20%) were Olive baboons. And 14/95(15%) were cats.

Table 12 *Animal case based on the species*

year	animal	dog	Cat	baboon
2021	3	2	1	
2020	15	3	8	4
2019	8	2		6
2018	17	11	5	1
2017	15	11		4
2016	16	14		2
2015	14	13		1
2014	3	3		
2013	4	3		1
total	95	62	14	19

Based on from table 4 the animal infection from 2013-2021 on each species the highest infection reported in dog, cat and baboon 17, 8, 5 in the year 2018, 2020 and 2019 respectively. The lowest case is recorded in dog 2020; in baboon in 2014 no infection is reported, the first cat infection is reported in 2013.

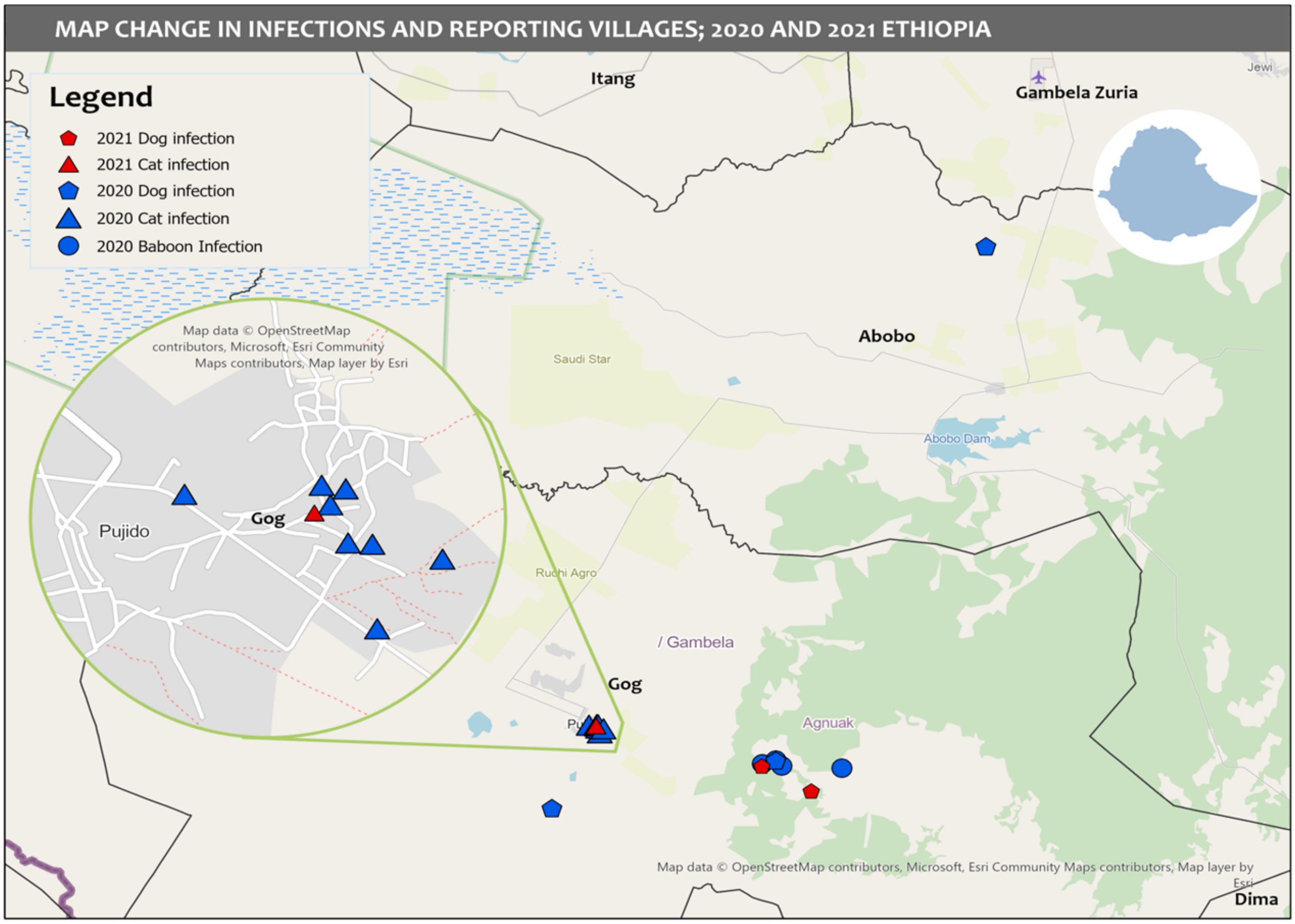


Figure 35 Distribution of animal infection

Distribution of animal infections in 2020 and 2021.2020 infections was indicated in blue and 2021 in red. We can see those areas where 2020 and 2021 infections were clustered. The majority of the 2020 and 2021 infections were clustered in Atheti and PRC Angua village of the Gog Wereda.

GUINEA WORM DISEASE INTERVENTIONS

4.1 Strengthen Surveillance and proactive tethering

The development of high-quality research, evidence, and innovations, the establishment of an evidence-based decision-making culture, and the creation and application of technology that improves the surveillance system's case and infection detection tools such as ADNIS and DOVAR in animals are the main objectives of this intervention. The program improves the digitization of dracunculiasis, and other data and the use of new technologies like satellite imaging, drones, and others for water source mapping. The program also aims at improving evidence generation using active and passive surveillance both in humans and animals and through conducting operational research. It also promotes the use of data from routine and non-routine data sources. It also focuses on continuously improving the availability and quality of data such as timelines and completeness of dracunculiasis surveillance data. It improves the documentation of dracunculiasis surveillance data and standardizes tools used for surveillance.

Proactive tethering

One of the most component interventions of animal surveillance is proactive tethering. Tethering is important to improve GWD surveillance and containment of infections in dogs and cats to reduce the risk of transmission through restrained movement and their interaction with the environment.

Proactive tethering is an intervention that is made to control the movement of dogs and cats and kept under the supervision of an owner until the guinea worm sign & symptom is shown or the worm is extracted and dogs are expected to be tethered for 1 year.

The tethered animal number is 1978 in the year of 2019 and it is 89% of the population of dog and cat tethered. In the year 2020, 93% is tethered, and the total number of 1933. In 2021 the total animal tethering is 98.9 % only 23 animals are untethered.

Proactive Tethering (# VAS & NVAs = 60)

Tethered animals – Dec 2019: N=1978 (89%)
Tethered animals – Dec 2020: N=1933 (96%)
Tethered animals – Dec2021: N= 2101 (98.9%)
Currently Untethered 23 (Aggressive N=18, Imported/released =5)

Indicator	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
# of eligible dogs/cats for tethering in VAS/NVA	2019	2107	2133	2175	2214	2261	2269	2182	2175	2152	2089	2124
# dogs/cats tethered in targeted VAS/NVA	1956	2050	2076	2124	2163	2210	2226	2139	2139	2101	2049	2101
% of dogs/cats tethered in targeted VAS/NVA	96.8%	97.3%	97.6%	97.5%	97.7%	97.7%	98.1%	98.0%	98.0	97.6%	98.8	98.9%

34

Figure 36 *proactive tethering*

The total number of animal infection is contained in the 2017, 2018, 2019, 2020 and 2021 is 50 %(11), 60(9), 100%(2), 100%(11) and 66.7%(3) respectively. The lowest containment animal infection of domestic animal is 2017 it only contained 50% of the total infected (figure 19)

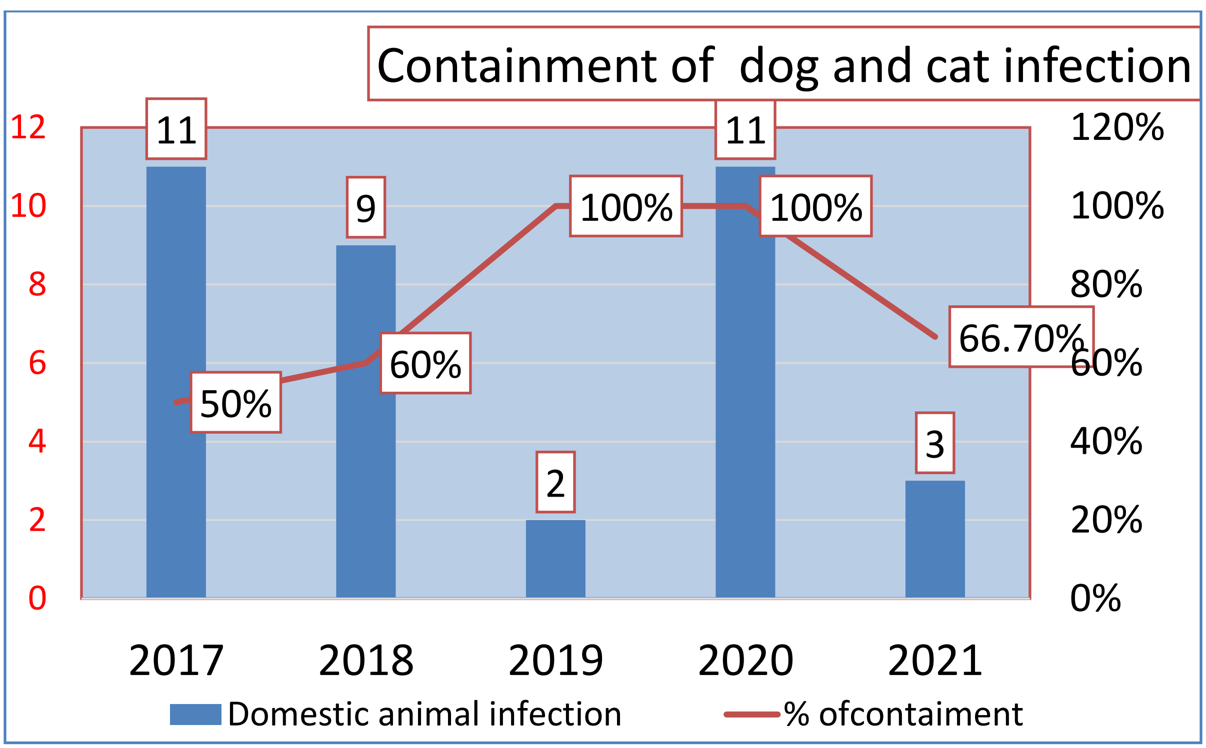


Figure 37 Containment of dog and cat infection

4.2 Improve access to safe drinking water

This intervention direction focuses on increasing the percentage of safe drinking water access in high-risk villages and investment farm areas to interrupt the transmission of dracunculiasis. Some villages lack safe drinking water and have reported human/animal infections in recent years. In addition, the majority of investment farms that host seasonal migrants and other workers do not have a safe drinking water system and this might expose them to yet another guinea worm outbreak. This focus area also includes interrupting the transmission of Dracunculiasis in level I endemic areas. It also focuses on strengthening institutional capacity, maintenance and rehabilitation of non-functional existing water schemes in endemic areas.

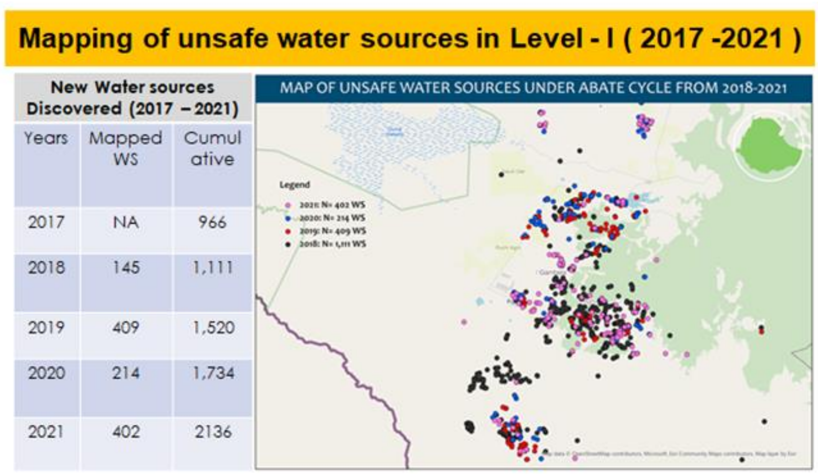


Figure 38 *water source*

4.3 Improve environmental management to interrupt the transmission

The interventions being implemented towards the eradication of the disease, particularly related to vector control activities in the form of applying Abate chemical to unsafe water ponds, which is regarded as a source of infection for both humans and animals, and maintaining the quality of vector control. This also includes environmental management of unsafe water sources.

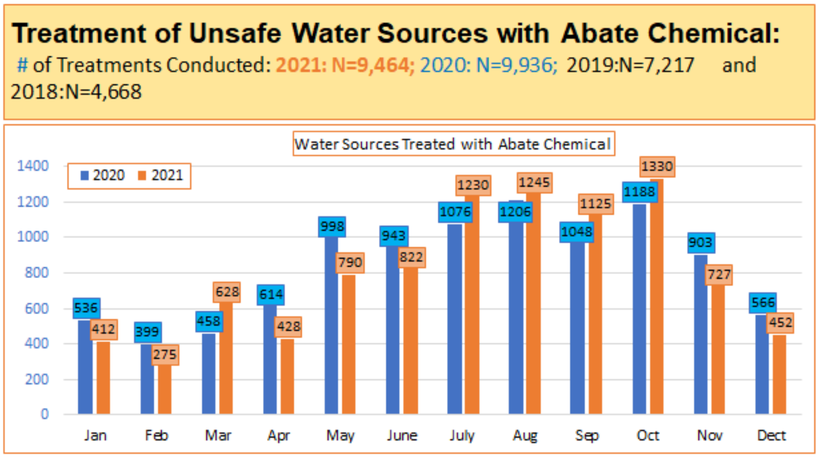


Figure 39 *Distribution of cloth and pipe pipetes*

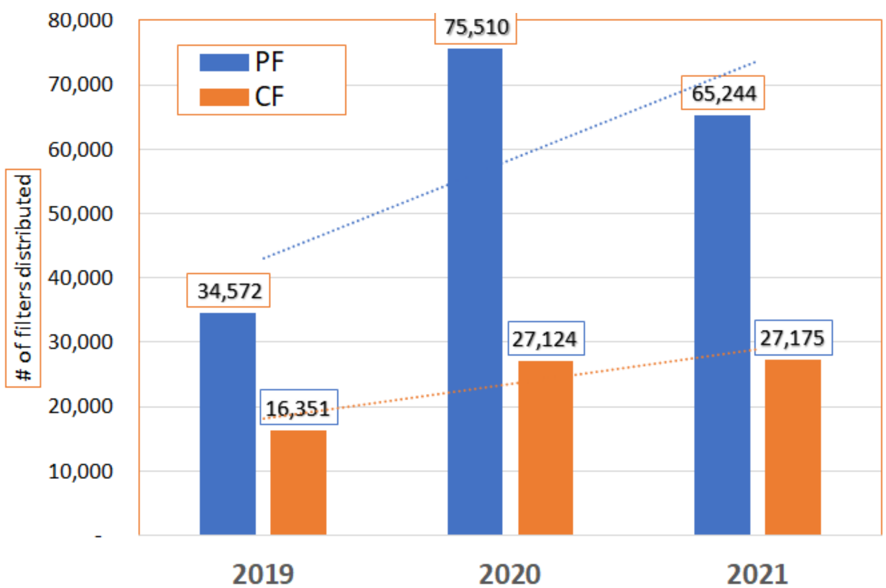


Figure 40 *Distribution of cloth and pipe pipettes*

4.4 Improve community engagement & ownership

This intervention focuses on ensuring active participation and engagement of the community in awareness creation on preventing measures and reporting rumors both in animal and human dracunculiasis cases. The goal is to give communities more decision-making and health literacy so they can take charge of their own lives. A significant turning point in this strategic phase to promote community ownership and engagement and quicken the path to the eradication of dracunculiasis will be the redesign, testing, and deployment of a set of alternative approaches customized to handle new difficulties to the current community engagement strategies.

CONCLUSION

The burden of the disease from 1993 up to 2001 in human cases is decreased but the transmission dynamic is not determined and affects both domestic and wild animals. The disease prevalence on animals started from 2013 up to now have variation from year to year and from species to species. According to the report dogs, cats, and baboons are affected by GWD. The coverage of the disease distribution is also limited. Abobo and Gog weredas are currently hotspot sites of the Gambaella region. That is active transmission is ongoing. the surveillance system is composed of both active and passive surveillance with multisectoral collaboration and coordination especially the Ministry of Health, the Ministry of Agriculture, and the Wildlife Commission working together by planning, joint supervision, monitoring, evaluation, and establishment of different committees from district level up to federal. The interventions for eradication of Guinea worm disease that have been applied to humans and animals are slightly different domestic animal tethering is the most common intervention and trapping in wildlife is the intervention the other interventions are abating, safe water provision, and Social and Behavioral Change Communication (SBCC)

RECOMMENDATION

- The disease eradication program should support equally the animal and human sector
- The disease surveillance system in the animal sector is not as well organized as human sector it needs to be strengthened in the animal sector such as reporting and detection of the disease
- Some of the interventions should be considered with the animal welfare and animal disease prevention protocols
- It needs operational research to determine the disease transmission and the role of paratenic and transport hosts should be well-defined
- Assessment of the interventions that are applied in wildlife is needed to evaluate the program
- Cultural and community settlement should be considered with disease prevalence

- Cross-border collaboration is needed to prevent disease transmission

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CHAPTER-III SURVEILLANCE SYSTEM EVALUATION

3. Malaria surveillance system evaluation Akaki kality sub city, Addis Ababa, 2023.

Abstract

Introduction: - Public health surveillance is the ongoing, systematic collection, analysis, interpretation, and dissemination of data regarding a health-related event for use in public health action to reduce morbidity and mortality and to improve health and malaria Surveillance system is composed of five functional components: case detection, recording, analysis, reporting and response.

Objective: - To evaluate the malaria surveillance system of Akaki kality sub city, Addis Ababa

Methodology: A descriptive cross-sectional study design was conducted on health facilities and the study participants are PHEM officers, family health team, HEWs, and those who were involved in a surveillance system. Data was collected by questionnaire, observation, and interviews for focal persons, review documents, and records. The malaria surveillance system was assessed based on CDC guidelines for public health surveillance system attributes and core functional components of the surveillance system.

Result: - a total of 4 government health centers, one medium private clinic, and a sub-city office were assessed in this study. All health facilities use surveillance tools such as case definition, guidelines, and reporting format. The information flow of the malaria surveillance is similar to the national PHEM guideline standard but there is no community report for the health facility PHEM and their report sources are inpatient, outpatient register, and private clinics. The report format is good it has more indicators compared to other weekly reportable diseases. All malaria reported by line list on KOBO and & weekly PHEM data entered by DHIS 2 done on time Each malaria case from Health centers and private health facilities was registered in an Excel sheet and stored electronically. One health center and private clinics did not analyze weekly base data. The evaluation result based on attributes was sub-city office report completeness and timeless was 100% but the health facility varies from 92%-100% but one health did not measure it. The positive predictive value of the sub-city office was 12.3%. Feedback and supervision the region gave 3 times a year to the sub-city, the sub-city gave quarterly for health facilities, health center gave weekly for private clinics during active case search.

Conclusions: - the malaria surveillance system in Akaki Kality sub-city had good achievements based on attributes and core functional components of surveillance but there was a gap in community-based surveillance, preparedness plan, and uniformity of all health facility RRT team engagement for surveillance it needs allocation of resources, trained human power, collaboration and coordination of different division all level. The sub-city should take malaria among the 5 listed priority diseases based on the burden of the disease of the sub-city

Keywords: Surveillance, malaria, evaluation, attributes

INTRODUCTION

The continuous, methodical gathering, evaluation, communication, and interpretation of information on a health-related incident for public health initiatives aimed at lowering morbidity and mortality and enhancing health is known as public health surveillance (1). A public health surveillance system's data can be utilized for developing research hypotheses, planning and evaluating programs, and taking prompt action in public health.

Despite a sharp decline over the past 20 years, malaria is still a significant public health and socioeconomic issue in Ethiopia. In addition to sickness and fatalities, it halted long-lasting socioeconomic effects, especially for the nation's rural communities, which comprise over 80% of the total. For instance, a significant loss of productivity results from the disease's propagation coinciding with important agricultural processes like harvesting. According to a survey, malaria has a large economic cost and causes 30% of all disability-adjusted life years (DALYs) to be lost. Malaria therefore ranks among the national health and overall socioeconomic development agenda's top priorities(2).

One of the African nations that has established official malaria institutions to combat the disease for more than 50 years is Ethiopia. Therefore, it is important to discuss the evolution of organizational structures that adhered to World Health Organisation (WHO) guidelines until the vertical malaria program was integrated with basic health services in 1993. There have been significant events since 1993 that have contributed to the national malaria program's increased capacity (2).

Ethiopia employs an integrated disease surveillance system, which combines different monitoring techniques into a single system that is part of the larger public health system. It also highlights that the same structures, procedures, and workforce should be used for all surveillance efforts. It was not possible to conduct surveillance for every illness or condition. As a result, diseases that are relevant on a national and worldwide scale should be prioritised. In order to facilitate speedy tracking, immediately reportable and weekly reportable individuals are chosen in Ethiopia and added to the routine surveillance. One ailment that needs to be reported each week is malaria(3).

In order to eradicate malaria, a strong system of monitoring, surveillance, and assessment is needed. Ethiopia is committed to creating a surveillance, monitoring, and evaluation system that would support efforts to eradicate malaria because the nation is eager to do so by 2030. The successful implementation of public health emergency management (PHEM) will serve as a foundation for the development of a surveillance system that can react quickly across the whole elimination path. Reorienting the surveillance system with new evidence and best practices(4)

The examination of system qualities, such as simplicity, flexibility, data quality, acceptability, sensitivity, predictive value positive, representativeness, timeliness, and stability, comprises the evaluation of malaria monitoring systems in this study. The assessment centers on the primary operational elements of the malaria surveillance system, including case identification, documentation, analysis, reporting, and response.

The evaluation focuses on the Akaka kality sub-city health facilities that are involved in the surveillance system of malaria at all levels of reporting unit and compare the national PHEM guideline, malaria surveillance Guideline, and CDC guidelines for Evaluating surveillance systems.

National Reporting flow of malaria based national Guide line

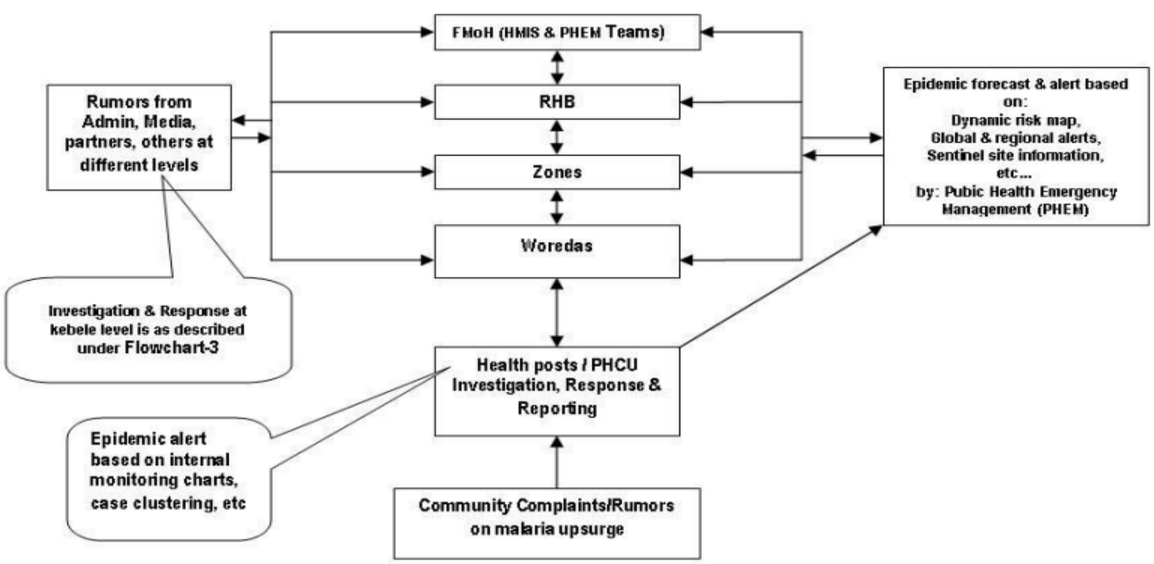


Figure 41 National reporting flow of malaria-based national guideline

OBJECTIVE

2.1 General objective

- To evaluate the malaria surveillance system of Akaki kality sub city, Addis Ababa

2.2 Specific objective

- To Describe the Surveillance System to be evaluated
- To evaluate the performance malaria surveillance system with attributes
- To identify core functions of surveillance about malaria
- To identify supportive functions of surveillance concerning malaria

METHODS AND MATERIALS

3.1 Study Area

Addis Abeba's industrial zone, Akaki Kality, is one of the eleven sub-cities that make up Addis Abeba. South of the city is where it is situated. From the city center, it is 20 km away (5). At an average altitude of 2,170 meters, Akaki Kality, Addis Ababa, Ethiopia, is located at 8.8958° N and 38.7892° E in latitude.

The topography of this sub-city is both gentle and sloppy. There is a river in this sub-city i.e., Akaki River. Its agroecology is middle altitude and among the two endemic subs city of Addis Ababa Akaki kality is the most prominent for malaria disease prevalence. The sub-city has 12 Woreda.

Table 13 Akakiki kality total population under surveillance and health facility

s/n	Description	Total number
1	Total number of population under surveillance	326,126
2	Hospital	1
3	Health center	7
4	NGO health centre	1
5	Health post	0
6	Private hospital	2

7	Private clinics	119

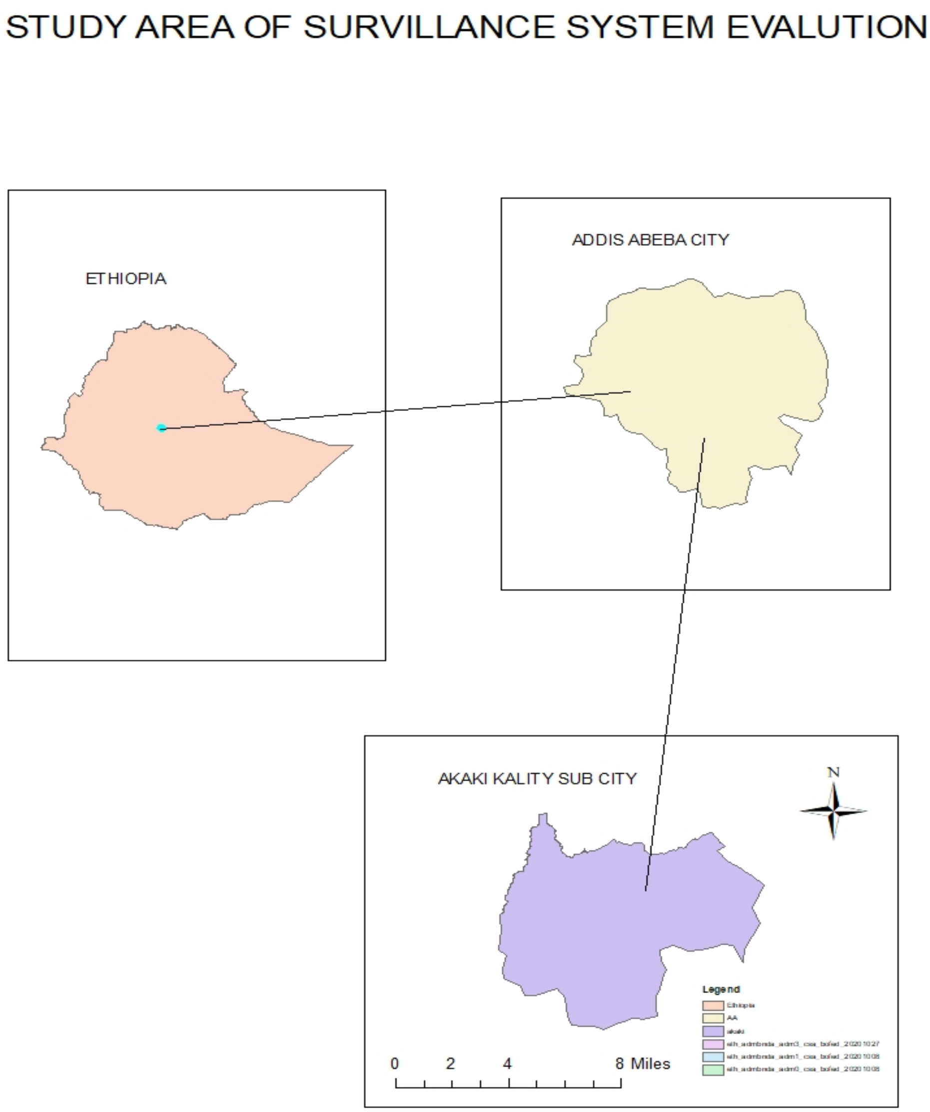


Figure 42 study area for malaria surveillance system evaluation

3.2 Study period

The period from the End of July /2023 to the beginning of September /2023

3.3 Study Subjects

The study subjects were sub-city health offices, Health Centres, health offices (Woreda Health Offices, sub-city health office, and the Regional Health Bureau), private clinics, and the population under surveillance.

3.4 Study design

A descriptive cross-sectional study design was used to evaluate Akaki Kality Sub city surveillance system.

3.5 Sample Size and Sampling

One medium private clinic, Sub city health office, 4 health centers from each health center from PHEM, and 3 from the family health team total of 10 respondents were addressed in the study. The selection was based on the discussion of region, sub-city, and health center offices randomly selected the study subject.

3.6 Data collection

Data was collected by questionnaire, observation, and interviews for focal persons, review documents, and records of some practical tools for surveillance and based on CDC guideline attributes.

3.7 Data Analysis

Microsoft Excel and Epi-info version

3.8 Ethical consideration

Before the start of this study official permission letter was obtained from the EPHI, City Administration, and sub-city administration to access the sub-city office, health centers, and private clinics (annex).

3.9 Dissemination of the Study

The finding of the study was submitted in both hard and soft copies to the AAU- SPH, Addis Ababa health bureau, Akaki Kality sub-city in addition to this I would send to Mentors and advisors in soft copies.

RESULT

The malaria surveillance system of the Akaki Kality sub-city was assessed. In this assessment sub-city and health center PHEM focal, health center family health team, private clinic, and officials were assessed. The evaluation was based on the functional component of the malaria surveillance system: case detection, recording, analysis, reporting, response, and attributes of the surveillance system were evaluated. The malaria evaluation surveillance system was assessed in 4 health centres, one private among and sub-city office.

4.1 General description of existing surveillance and information flow of sub-city

4.1.1 Description of priority disease and surveillance System

According to PHEM guideline 2022 Public health surveillance system should not carry out all diseases and events. Therefore, priority should be given to that disease that is interest in national and international level. In Ethiopia 32 diseases (17 are immediately, 10 are weekly, 4 are monthly and 1 are quarterly reportable) are selected on routine surveillance system).

The Addis Ababa City Administration Health Bureau, the AkakiKality sub-city health office PHEM core process, the Woreda health office PHEM officer, and the health facilities focal person are responsible for monitoring the 32 top priority diseases and health conditions in the AkakiKality sub-city. They do this by using various communication channels, such as paper-based reporting and the phone. These illnesses are designated for routine surveillance, which requires weekly reports, and obligatory notification, which requires reports right away.

Table 14 Priority reportable disease in Akaki kality sub city based on PHEM guideline 2022

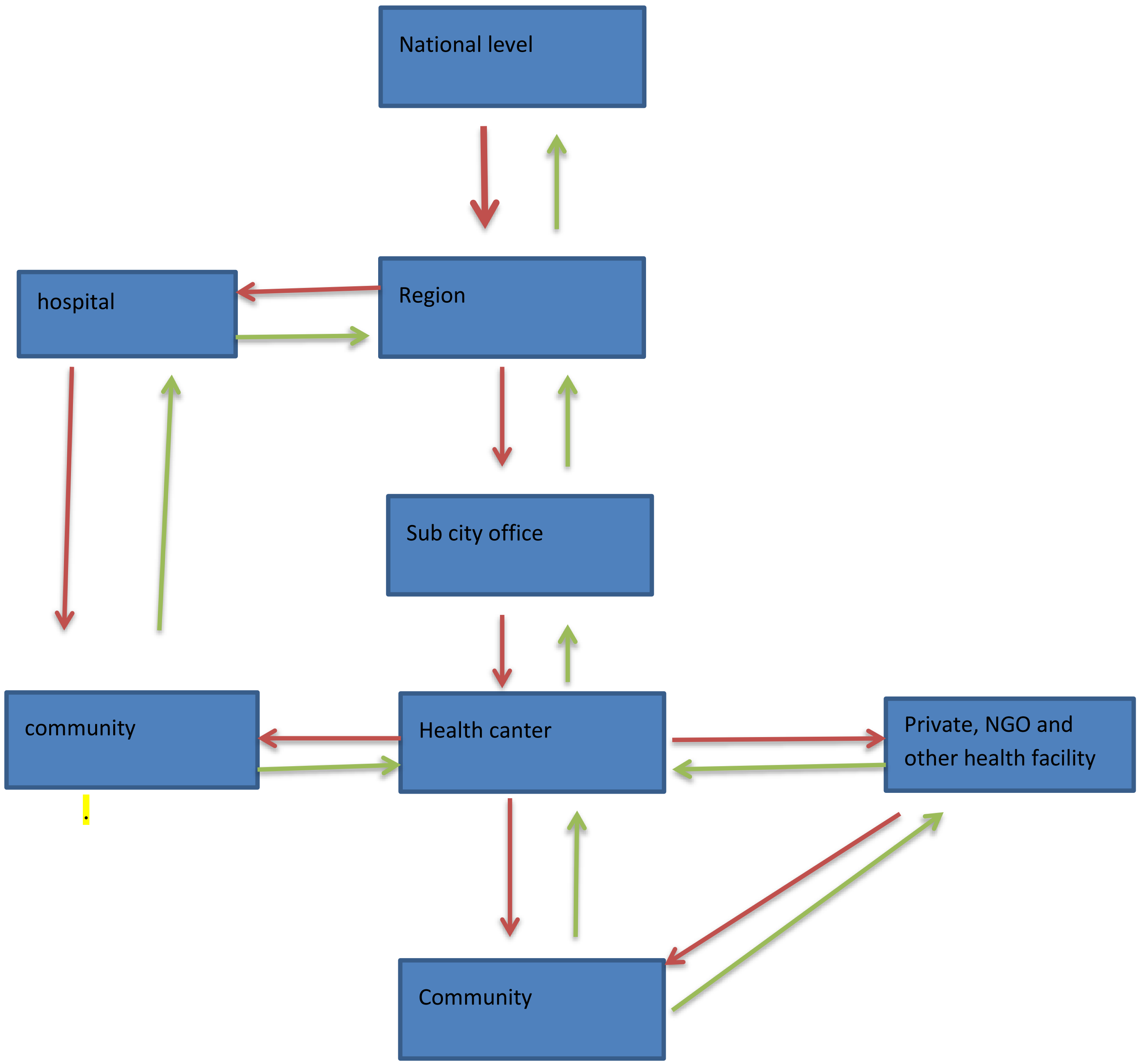
Immediately	Weekly	Monthly	Quarterly
Anthrax	16. Malaria	26. New HIV cases	32. Moderate Acute Malnutrition
2. Measles	17. Diarrhea with dehydration in children less than 5 years of age	27. Hypertension new cases	
3. Human influenza caused by new subtype	18. Acute jaundice syndrome within 14 days of illness	28. Diabetes new cases	
4. Adverse events following immunization	19. Severe pneumonia in children under 5 years age	29.Tuberculosis	
5. Neonatal s/ non neonatal tetanus	20. Viral Hemorrhagic Fever (VHF)	30. Maternal death	
6. Rabies	21. Dysentery	31. Perinatal death	
7. Smallpox	22. Relapsing Fever	All causes mortality indicator	
8. Severe Acute Respiratory Syndrome (SARS)	23. Meningitis		

9. Yellow fever	24. Severe Acute Malnutrition		
10. Poliomyelitis (acute flaccid paralysis)	25. Scabies		
11. Chikungunya			
12. Cholera			
13. Dracunculiasis (guinea worm)			
14. Dengue fever			
15. COVID-19			

4.1.2 Information flow of sub-city

Formal and informal flow of surveillance data information and feedback through the health system Addis Ababa city administration

Malaria is one of the priority diseases of weekly reportable based on the criteria of the public health importance, mortality, morbidity (Attack rate) as it is endemic to Ethiopia, the reporting flow from community to health center and then to sub-city and the sub-city sent to region and national level but in case feedback reverse is occurring. Hospitals are directly controlled by regions and it has feedback and report information sharing from regions and communities. The PHEM officers are responsible for report sharing and entering the data into MS Excel compiling the report and sent to National Public Health Emergency Management (PHEM). The surveillance data reporting system of the Malaria Akaki sub-city is electronic-based and paper-based form. The private clinic reports every Monday to the health center again health center reports on Tuesday for the city.



Legend

Upward transmission of report data and information

Feedback and information sharing

Figure 43 Formal and informal flow of surveillance data information and feedback through the health system sub-city

4.2 COMMUNITY-BASED SURVEILLANCE EVALUATION RESULT

It is an ongoing active community participation in the process of detecting, collecting, interpreting, notifying/reporting responding to, and monitoring public health emergencies, events public health-related risks in the community. The scope of community-based surveillance starts from systemic and ongoing detection of PH risks/ early warning signals, collection, notification, verification, response, and recovery(6).

Addis Abeba Akaki sub-city Family health team in the health center coordinates the health extension worker (HEWS). HEWs conduct active cases at the community level and report using a referral pad. There is no community report for PHEM officers in all 4 health centers including sub-city office.

HEWs in Addis Ababa Akaki Kalit sub-city are using WDAs, house block arrangements, and models at different institutes for community surveillance. From the visiting health centers saris, kality and Gelan health centers have HEWS malaria surveillance tools or guidelines but no one has a community case definition of malaria.

Some of the activities that are performed by HEWs and the family health team of the visited health centres are Establishing locality thresholds and monitoring epidemics, following vector control interventions, notifying malaria situation Participating in the investigation, and mapping malaria cases report daily/weekly.

4.3 Malaria trend in Akaki Kalit sub city the visited health centers case trend

4.3.1 Akaki Kality sub city health office

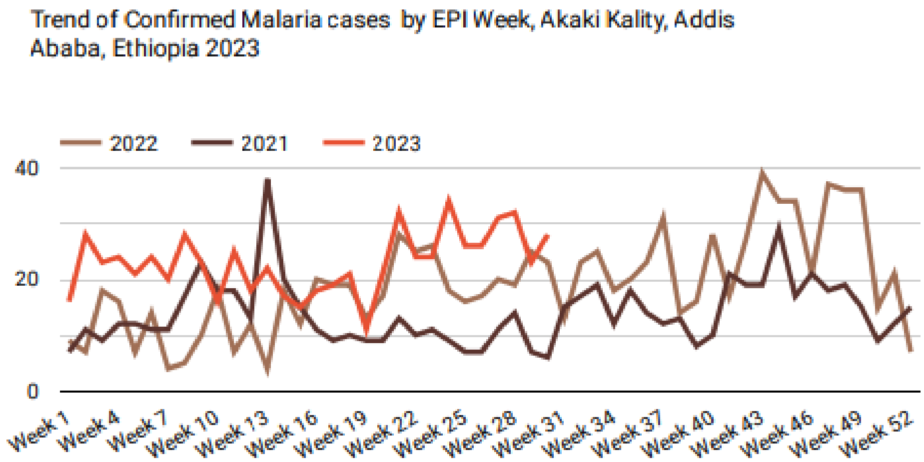


Figure 44 Trend of confirmed malaria cases by EPI week Akaki kality Addis Ababa, Ethiopia

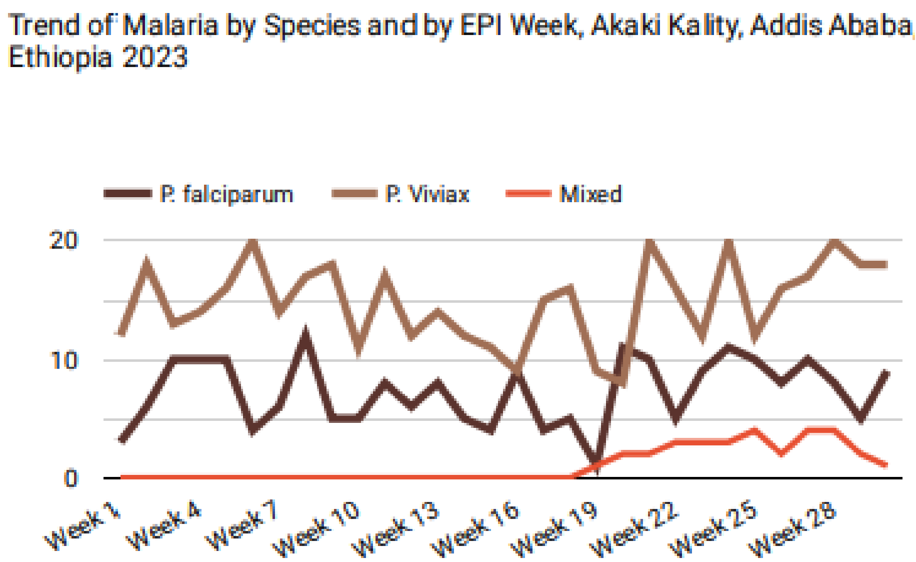


Figure 45 Trend of malaria by species cases by EPI week Akaki kality Addis Ababa, Ethiopia

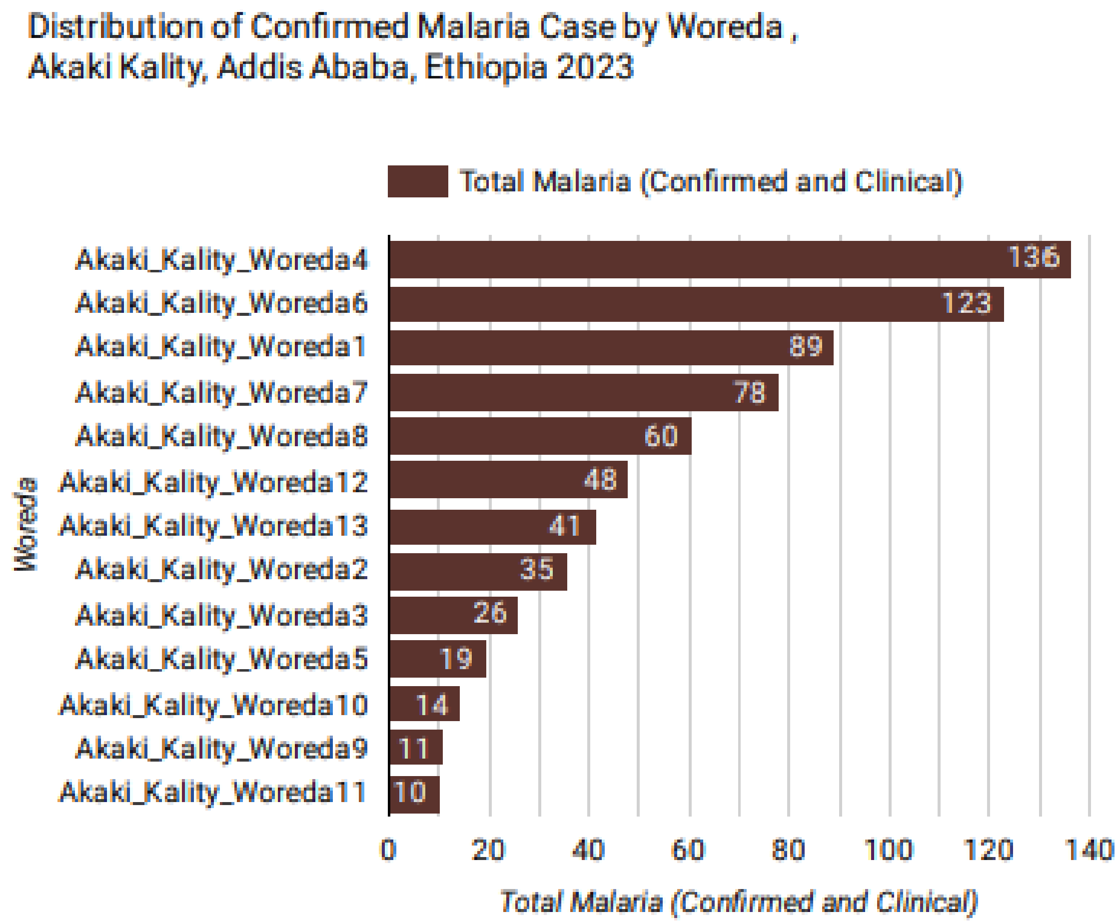


Figure 46 Distribution of confirmed malaria cases by wereda Akaki kality Addis Ababa, Ethiopia

4.3.2 Visited Health Centers

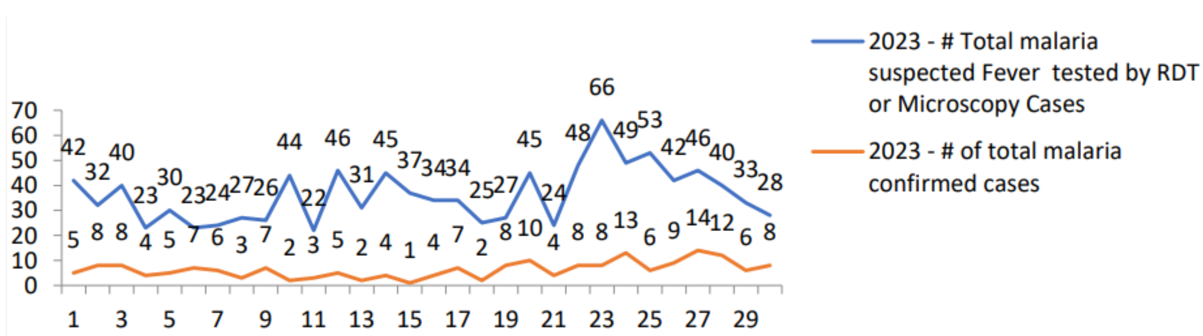


Figure 47 malaria Vs confirmed weekly trend analysis weekly 1-30/2023 w4& 12

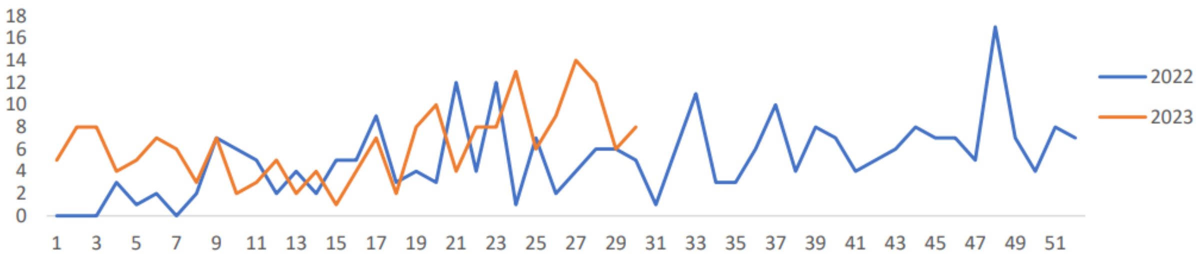


Figure 48 malaria Vs 2023 in werada 12 & 4

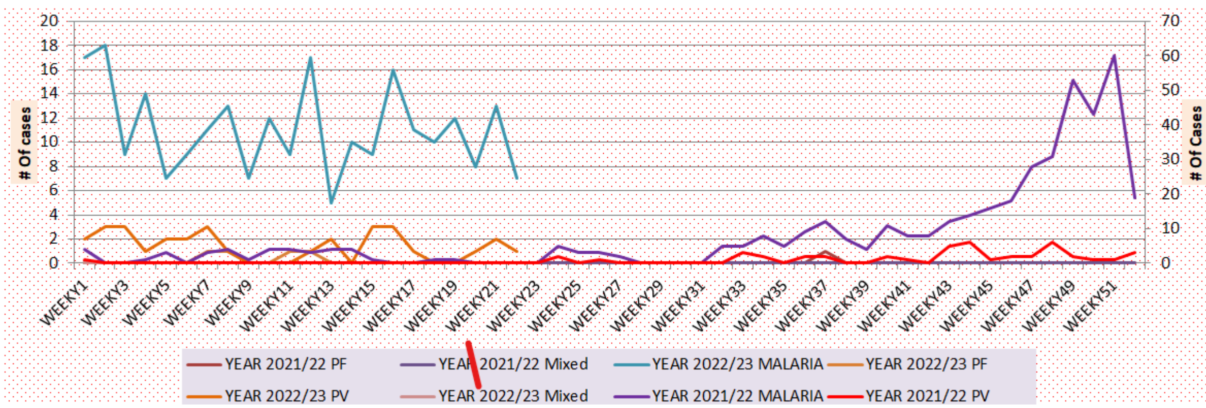


Figure 49 Distribution of malaria cases in Akaki Health Center

4.4 Evaluation core function of the Surveillance system

4.4.1 Availability of Surveillance System Tools:

The presence of case definitions to define specific diseases, reporting formats based on the priority diseases listed as either daily or weekly reportable diseases, surveillance guidelines outlining the priority diseases, and reporting systems are the primary tools for conducting surveillance.

4.4.2 Availability of Surveillance Guideline

I have seen the national PHEM guideline and malaria surveillance and case management guidelines in all government health centers but I have not seen one private clinic.

4.4.3 Case definition

There is a standard case definition which is posted on the wall visible area where everybody can access and read on each health centre. The proportion of health facilities using standard case definitions for malaria is 100% but there is no community case definition. They visited a health facility 1 health center (saris) did not post the case definition in a visible place the remaining 3 health centers and one private clinic posted the standard case definition on the wall of OPD, emergency, PHEM offices, and public areas.

4.4.4 Reporting format

The report format is good it has more indicators when compared with other weekly reportable diseases. All malaria reported by line list on KOBO and & weekly PHEM data entered by DHIS 2 done on time Each malaria case from Health centers and private health facilities was registered in an Excel sheet and stored electronically.

The report format that is used in Akaki Kality sub-city health center , health extension workers, and private clinic are weekly reporting format, daily reporting format immediately, line list, case-based reporting format, and rumor log book for suspected epidemics.

The report from private sends most of the time through text and they do not keep the reporting format.

From the visited Health centre all reported by using paper-based and electronic copies. One health center does not use DHIS reports but the remaining 3 (75%) are using DHIS to send the report for the national level. the private clinics do not enter the data into DHIS and the health center takes the role of data entering on DHIS.

4.4.5 Data analysis

Data analysis was conducted in sub city office and Kality, Saris, Gelan health center by graph, especially by line Graph, and also the data is described by time, place, and person. The data was not analyzed in Sari Health Centre and Mekilit private clinic the reason the shortage of trained human resources and materials.

4.4.6 Threshold Level

The threshold level for malaria in sub city is familiar and measured. in the health center PHEM officers are using the PHEM guideline of 2022 but there are some limitations on the family health team (HEWS) from the total 10 respondents 7 are familiar with the threshold level but the others are not well explained for the threshold level.

4.4.7 Outbreak investigation

There is no malaria outbreak based on threshold level in sub-city

4.4.8 Epidemic Preparedness and Management

There is no budget for malaria surveillance it is not included in the top five disease sub-city but they have a plan to include it in top priority diseases. There is no training-specific malaria surveillance.

4.4.9 Feedback

The regional health office gave written and oral feedback to sub city 3 times per year. The sub-city office gave a feed to its respective health center and private clinics quarterly per year The health centers also gave private clinics written and oral feedback house to house weekly during active searching of cases and aligned other activities. Galen Health Center has a good example with its private clinics through the feedback system.

4.4.10 Supervision

Supervision was carried out by the health center for private clinics during an active search by the RRT team PHEM and family health team. Sub-city and regions were involved in supervision activities to support and feedback.

4.5 Surveillance evaluation attributes

The assessment of surveillance attributes was done through both qualitative and quantitative methodologies. The updated Weekly Report, updated guidelines for evaluating public health surveillance systems from the US Centres for Disease Control and Prevention (CDC), and the framework for evaluating public health surveillance systems for early outbreak detection are a few of the tools that were used to thoroughly assess surveillance systems (1).

4.5.1 Timeless

The single most important measure of timeliness is whether data are submitted in good time to begin investigations and implement control measures. The timeliness of reporting should be measured against predetermined standards. The standard In PHEM is the timeliness of immediate notification, i.e., within 24 hours; timeliness of weekly reporting; and timeliness of monthly reporting. Some of the findings are listed follow regarding the attribute of timelessness in Akaki Kality sub-city health center and private clinics.

Table 15 Timeless and completeness of health center and sub-city office

S/N	Name of health center	Timeless	Remark
1	Kality health center	92%	(one private clinic is not reported)
2	Akaki health center	100%	
3	Gelan health center	100%	
4	Saris health center	-	There is no evidence of this attribute
5	Sub city office	100%	

4.5.2 Completeness

During the evaluation, completeness was included Completeness of reporting sites submitting surveillance forms, Completeness of case reporting, and Completeness of surveillance data. all the reporting units within its catchments area have submitted the reports on time at sub city office, the completeness 100% at the sub-city office and 2 health centers .saris health center did not measure its completeness from its report etity health facility

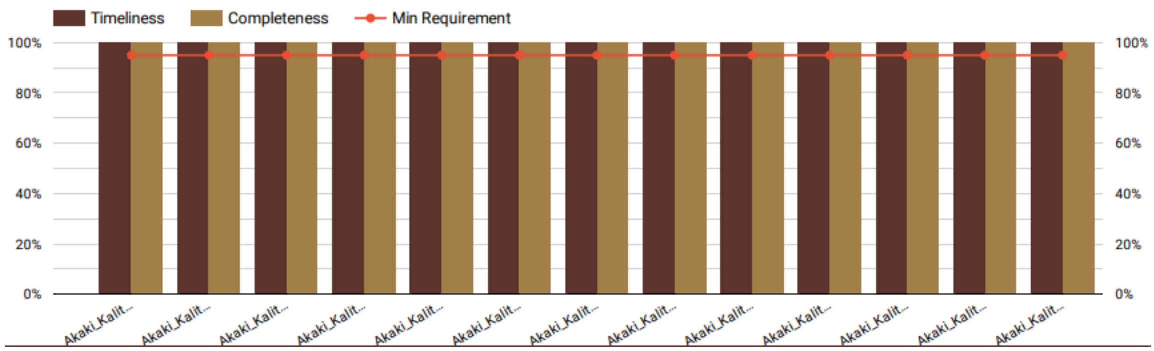


Figure 50 timeless and completeness of sub city

Timeliness & Completeness of health facilities of AK/KALITY Woreda 12 &4, Week 30 /2023

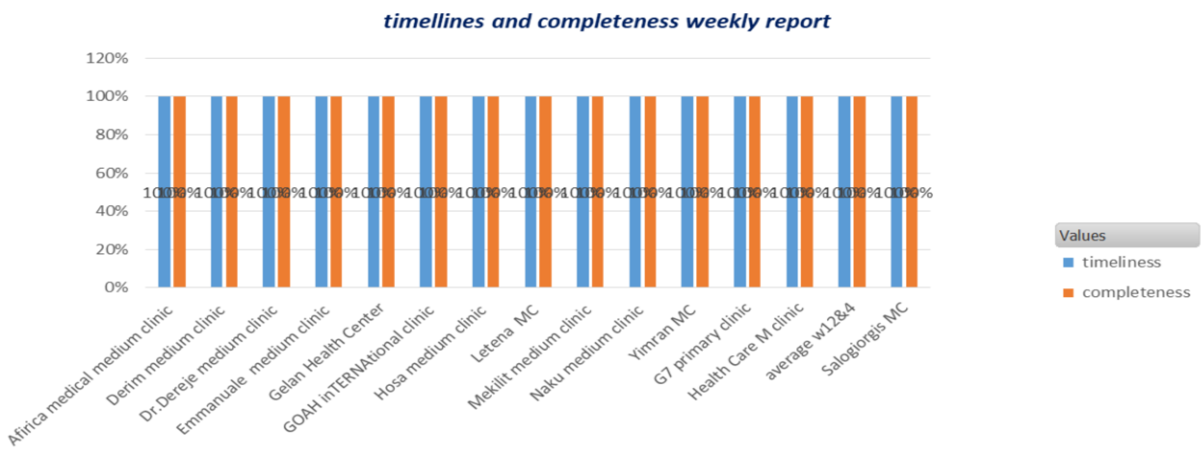


Figure 51 Timeless and completeness weekly report wereda 4 and 12 from private clinics

4.5.3 Usefulness

The surveillance system that applies to the sub-city is used for decision-making, prevention, and control of malaria, and to estimate the burden of the disease. The surveillance system was useful to take an action and early warning system. All the respondents agreed to agree with the mentioned useful activities of surveillance.

4.5.4 Simplicity

Health center PHEM officers, family health team members, and private clinic respondents agreed that reporting formats including immediate, daily, weekly, and monthly are easy to fill the format concerning malaria the logo book, line list, and weekly report format are also easy to applicable and it does take time to accomplish the format. Regarding case definition malaria all respondents agreed it is simple and easily understood.

4.5.5 Flexibility

As the current reporting format contains additional spaces at the end for both weekly and immediately reportable diseases namely; others, it can accommodate newly occurring health events/diseases (new disease emerged) to fill on without any difficulty. However, there is the limitation of the format in lacking some variables most required for analysis like age, sex, address, and clinical symptoms

4.5.6 Data Quality

The most common report source is a private clinic. When we observe the quality of the private clinics most of them report using text and it misses the most important variables. The private clinics do not report the suspected case of malaria they only report the RDT test result. There is no report linkage between PHEM and the community report of the family health team.

4.5.7 Acceptability

Acceptability of the system is the reflection of the willingness of the surveillance staff to implement the system and of the end users to accept and use data generated through the system

The participation rate of the surveillance site the health centers, wereda offices, and NGOs are 100% participation on the 2023 WHO week 30 based on the sub-city completeness of the report. There are some limitations on private clinics participating actively in reporting to health centers. During the vesting of Sararis Health Center, werda 6 and kality one private clinic did not report to the health center due to a lack of awareness, low resources, and human power for monitoring and evaluation activities.

4.5.8 Representativeness

Representative refers to the degree to which reported cases reflect the occurrence and distribution of all cases in the population under surveillance. In most cases health centres especially saris not from their catchment area the source of infection is other places where they have a travel history and are non-infected. Indigenous cases are minimal in number when compared to total cases but malaria is endemic in sub city.

4.5.9 Positive predictive value

The number who test positive with disease/ Number with a positive result. From the visited health centers and private clinics some of them measure the positive predictive value of the surveillance system. The positive predictive value of the sub-city office was 12.3% (690/5593)

4.5.10 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. those that test positive / all with the disease. Most of the cases were not Indigenous and the community surveillance system did not detect the case

4.5.11 Stability

The structural arrangement at the wereda level took place one year the PHEM focal is now only at the health center level. wereda level structure arrangement was dissolved and health centres are directly controlled by sub city office. The entire visited health center PHEM focal has 2 years of experience except for Kality health center so there is staff turnover.

DISCUSSION

This study used CDC's public health surveillance system evaluation guidelines and national malaria surveillance guideline to evaluate the performance of public health surveillance systems in Akaki kality sub city regarding their level of usefulness, simplicity, flexibility, acceptability, sensitivity, PVP, representativeness, data quality, stability, and timeliness. The study also focused on the core function components of surveillance which are case detection, recording, analysis, reporting, and response.

The core function of the surveillance system of this study showed that all the health facilities use standard case definitions and malaria surveillance guidelines for case detection but there no community case definition the proportion of the health facility that are used for case detection of case definition and guideline is 100% this similar to the previous study(7).

The study also showed that In Akaki Kality sub-city the structure of surveillance data reporting flows from the end user up to the top level. The community and health facilities (private clinics, NGOs, and government health center) are the main sources of information. Health center/wereda uses standard formats to compile aggregate and send the data to sub-city office/region, from which the central level receives. Feedback and information sharing also follow the same route this information flow is similar to the national PHEM guideline and malaria guide (6, 8). The result also indicated that the average reporting rate of the health facility to sub-city office is 100% but there was a lowering in some wereda from private clinics to health centers and also there is no community report in PHEM throughout the sub-city.

The result showed that the core function of the surveillance system of analyzing, recording, and response. The data were collected from health facilities from outpatients and in the patient register book and analyzed weekly at the health facility level and sub-city office. From the total of 4 visited government health centers and 1 private clinic. The data were analyzed weekly and showed its case trend in 3 government health centers and sub-city offices and they were used for action. Surveillance data were entered in electronic base data DHIS except for one health center and private clinics. The result also showed that there were no preparedness plans and allocating resources because they did not prioritize among top five diseases of the sub-city but they have planned to include on top five diseases according to national surveillance guidelines of Ethiopia's epidemic preparedness plan should include trained human resources, diagnostics, anti-malarial drugs, supplies and insecticides. Controlling the malaria pandemic should involve the allocation of vital antimalarial supplies and contingency operating money at the district or health center level. Since the location of the epidemic is never guaranteed, an extra 25% of the annual medicine demand should generally be held as a contingency at the previously mentioned levels(3).

This study showed that the quality of the surveillance system of the sub-city was measured both quantitatively and qualitatively based on attributes. Among attributes completeness and timelessness of the report of the sub-city were 100% which was greater than the national standard set of 80 % [4] but the health facility and wereda were not uniform and one government health center did not measure its completeness and timeless from its respective report entity.

The surveillance reports were used in the sub-city office of the health center for decision-making, prevention, and control purposes. The reports are immediately, weekly, and daily based and are registered, paper-based, and electronically stored. It is simply and easily accessible,

Regarding representativeness most of the cases in the sub-city were not indigenous it has travel history and previous infected carriers and Most of the cases in each health facility were not from its catchment area. Positive predictive value Most of the visited health centers and private clinics are not familiar with the positive predictive value but some of them measure the positive predictive value. The Akaki Kality sub-city's surveillance system's sensitivity There are two ways to evaluate a surveillance system's sensitivity. First, sensitivity in case reporting relates to the percentage of disease cases that the surveillance system finds. Second, sensitivity can be used to describe the capacity to identify epidemics, including the capacity to track variations in the overall number of cases over time(1). In Akaki kality sub city the cases to be reported under population surveillance were addressed but some of the cases were not population under surveillance. The system was able to detect if any case happened above the threshold level so the system has high sensitivity.

Simple surveillance system all respondents easily understand the case definition and manage the data. The quality of the data from different source reports varied 3 government health centers followed the report format and filled in all variables but the private clinics sent the report in text or telegram they did not follow the report format and they missed important variables and information.

Acceptability is a mostly subjective trait that covers the willingness of those on whom the public health monitoring system depends to deliver accurate, consistent, full, and timely data. the surveillance system in the sub-city all the report units are sent and the reporting rate is 100% but in private some health were addressed so this may vary acceptability between the level and health facilities for different reasons.

The stability of the surveillance system in the sub-city regarding staff turnover was not seen but concerning the availability of resources and budget, it has a great influence on the stability of the malaria surveillance system.

CONCLUSION

Akaki kality malaria system was evaluated based on the core functional component of malaria surveillance and CDC surveillance evaluation attributes. Based on the results and findings of the surveillance system community-based surveillance has a great gap and has no linkage with the PHEM system. The PHEM officer at health centers has taken a role as district office so their report entities are private clinics and inpatient and outpatient records and it needs to activate the RRT team, active case searching, and community-based report. Malaria surveillance of the sub-city has no epidemic preparedness plan and well-defined budget source and this may hinder epidemic /outbreak control and response influences surveillance

When we observe the key attribute performance of the sub-city and the observed health facilities most of the attributes are well applied such as simplicity, usefulness, timelessness, completeness, flexibility, acceptability, and stability. The positive predictive value and sensitivity of the surveillance system were not well understood by PHEM officers and were not measured in some health facilities.

RECOMMENDATION

Based on the findings I would like to recommend the following points

- Community surveillance should be a strength and should have a report linkage with PHEM system at health facility level.
- Well defined budget and epidemic preparedness plan is crucial for the surveillance system
- At the district level the PHEM system is dissolved and monitored by the health center so it needs to enhance human power by training, increasing the number, and using capacity-building options.
- Malaria surveillance tools such as case definitions, and guidelines should be available in all health facility
- Regular monitoring and evaluation of the surveillance system of malaria is needed at each level of the government structure
- RRT team and collaboration among different divisions of the health facility is needed to strengthen the surveillance system of malaria
- Training on disease surveillance and response at the woredas and health facility level should be conducted to build the capacity of health care providers of both governmental and non-governmental health facilities. This will increase case detection of diseases and regularly improve system performance, reporting, and data analysis.
- Some attributes of the surveillance evaluation especially sensitivity and positive predictive values need attention to capacitate the PHEM officer and actors who are involved in malaria surveillance

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CHAPTER-IV HEALTH PROFILE ASSESSMENT

4. Description of health profile for Somalia, region Shebelle Zone, Gode woreda 2023

Abstract

Introduction: -A health profile is used to gather and summarize events relating to health and other districts' socioeconomic, political, cultural, and demographic aspects. To organize, carry out, and assess public health initiatives, public health surveillance officials need access to this focused and condensed public health data.

Methods: -This health profile data was gathered by carefully examining health-related data from several sectors in Gode Woreda. Furthermore, the information gathered from examining local newspapers and literature posted which was not kept on file in the offices was also gathered. In March 2023, both structured and unstructured questionnaires were used as a strategy to collect data. and after that, Microsoft Excel processed, arranged, and analyzed the data.

Result: -According to the data found the total population of the woreda is 65,060 from this 32,368 (49.75.%) males and 32,693(50.25%) females. Male to female ratio is 0.99:1.01respectively. The area covers 7,700 km square 21.8/km square population density. Child immunization coverage shows high rates for most vaccines, with notable success in the initial doses. BCG coverage reached 86%, and both Penta1 and Rota1 vaccines had a strong coverage of 96%. However, there is a slight drop in coverage for subsequent doses, with Penta3 and Rota2 at 92%. The MCV1 vaccine achieved 87% coverage, but MCV2 saw a decrease to 77%. Overall, 87% of the target population was fully immunized. Maternal health coverage is generally strong, with high rates for antenatal care (ANC), skilled birth attendance, and postnatal care, all ranging between 82% and 89%. However, contraceptive acceptance is notably lower, at just 31%, In 2023, the most common public health issues among adults were acute febrile illness, malaria, typhoid fever, acute upper respiratory tract infection, and diarrhea Whereas pneumonia, functional intestinal, and AURI were the leading causes of morbidity for under-five children.

Conclusion and recommendation

The Woreda, with balanced population distribution, shows strong performance in child immunization and maternal health services, though slight declines in follow-up vaccine doses and low contraceptive acceptance rates highlight areas needing attention. The prevalence of infectious diseases, such as malaria and respiratory infections, particularly among adults and children under five, underscores the need for strengthened public health interventions. It is recommended that efforts be made to improve vaccine follow-up rates, enhance family planning services, and bolster disease prevention and treatment programs to address these ongoing health challenges effectively.

Keywords: Health profile description, Gode

1. INTRODUCTION

The Community Health Profile Assessment is a dynamic process that measures the health status of a community's population, enabling the establishment of health priorities and collaborative action planning to improve health and quality of life. It involves technical, social, and ethical aspects, evaluating the performance of various organizations contributing to community health improvement. Factors such as demographics, socio-economic status, education, productivity, health service system, environmental conditions, and genetic endowment affect community health, making it crucial to measure health indicators and prioritize health problems in the study area.

Health Profiles provide annual summaries of health data to support local authorities in improving public health and reducing inequalities. They offer a concise overview of key health indicators, comparing local areas to national averages, and serve as valuable tools for policy planning and performance management. These reports, published since 2006, highlight important public health issues and are regularly updated to remain relevant (1).

The health systems profile, which includes a description of institutional frameworks, trends in the national response, important concerns, and difficulties, is presented in the Ethiopian country health profiles along with an overview of the state and trends of priority health problems. Through a thorough and rigorous investigation of the dynamics of the nation's health condition and health system, they support evidence-based health policymaking (2).

A district's health profile is an extensive document that includes details about the district's location, history, accessibility, cultural significance, political and administrative structure, population demographics, general health status, health indicators, education, and socioeconomic standing (4).

The assessment's goal is to describe the district's health and health-related issues, as well as to communicate the local burden of morbidity and mortality, any disasters, and other information about the district's public health. It is a crucial document that should be used by all relevant parties, including public health professionals.

Rationale

There are few organized health and health-related indicators at the woreda level in the Somali Region, which makes it difficult to plan and use evidence-based information to guide decisions. The data from the health profile description project will assist other stakeholders with public health planning, resource allocation, interventions, and evaluation. A health profile has never been completed in Gode Town previously, and there is also no organized health and health-related information. Such data is necessary to maintain higher spending on global health. Enhancement of service quality could potentially be achieved through a methodical evaluation of health facility performance using established norms and standards.

2. Objective

General Objective: -

To describe health and health-related information of Gode town and to identify problems for priority setting

Specific objectives: -

- To outline the social, demographic, and geographical characteristics of the Gode town district
- To evaluate and detail health and related issues, such as health status and indicators
- To describe the current health challenges within the community
- To identify priority health concerns

3. METHODOLOGY

3.1 Study design

A study was conducted from 13 Feb. to 10 Mar. 2024 in Gode town using a cross-sectional descriptive analysis.

3.2 study area

The health profile assessment was conducted in Gode town which is found in Shebelle Zone Somali regional state.

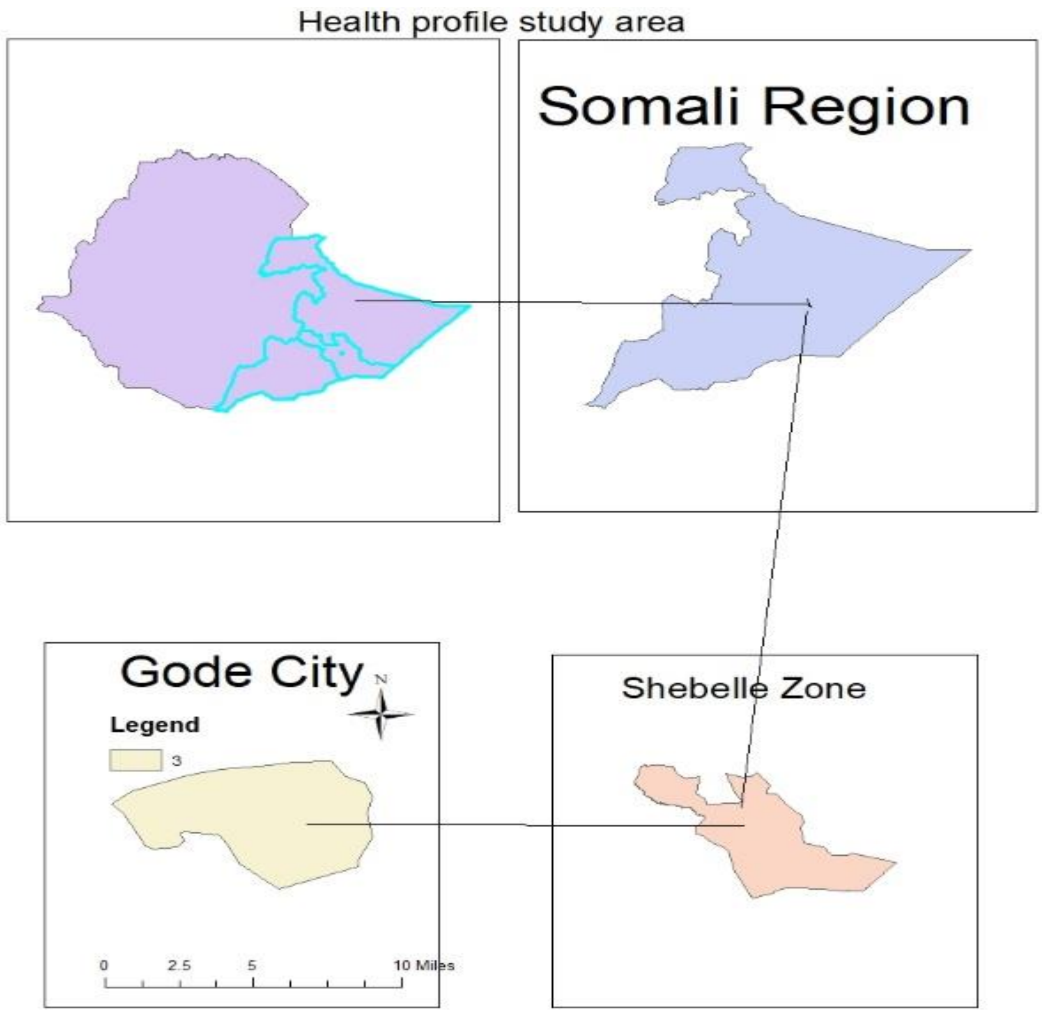

Figure 52 Study area of the health profile

3.3 Data collection and analysis

The data relevant to the study were collected from pertinent institutes including the Health, Finance, Education, Agriculture, and Tourism offices of the town. Gode Health Office provided the majority of the health-related data by extracting from DHIS (District Health Information System). Additional data were gathered via key informant interviews of responsible professionals and officials from relevant institutes and desktop reviews of publications, achieved records, reports, or bulletins. A checklist was developed and used for the data collection. In general, epidemiological approaches were implemented starting with a collection of health and related data followed by organizing, reviewing, and descriptive analysis with interpretation. The results were presented in tables, charts, graphs, and maps. Excel Pivot table was used for data collation, analysis, and presentation. Furthermore, GPS application and ArcGIS software were used for spatial data collection and for developing maps respectively.

3.4 Data analysis

The gathered data was compiled and examined using Micro-Soft Excel. Calculations of descriptive statistics, such as frequencies, percentages, and ratios, were made to characterize the information gathered on health profiles. The outcome is given narratively, with the use of a table and figure.

3.5 Ethical Consideration

Distribution of findings: The Addis Ababa University School of Public Health received the study's results. Dissemination of Results: The study findings were provided to the School of Public Health at Addis Ababa University. Key stakeholders were given copies for evaluation. The information will help guide public health policies and interventions.

3.6 Operational Definition

Maternal mortality rate: - Number of deaths assigned to pregnancy-related causes during a given time interval

Infant mortality Rate: - Number of deaths of children < 1 year of age reported during a given period among the Number of live births reported during the same period.

Skilled Birth Attendant Delivery: - delivery which is attended by health professionals in the Facility

Contraceptive acceptance Rate (CAR): - proportion of women of reproductive age (15-49 years)

who are not pregnant and who are accepting a modern contraceptive method (new and repeat acceptors).

Antenatal care 1 (ANC1): - Number of pregnant women who received antenatal care at least one time.

Antenatal care 4 (ANC 4): - Number of pregnant women who received ante natal care at least four times.

Post-Natal Care Coverage: - Proportion of women who seek care, at least once during postpartum

(within 42 days after delivery), from a skilled health attendant.

Still Birth rate: - the proportion of stillbirths from total births attended by skilled health attendants.

4. RESULTS

4.1 Geographical and Climate

Hot temperatures all year-round Summers are scorching, with daytime highs frequently reaching 40°C(104°F). The annual rainfall, (April to June) and the (October to December) are the two rainy seasons. However, a variety of factors, including regional weather patterns and climate change, can cause considerable variations in the amount of rainfall from year to year. In a very rainy year, Gode may receive as little as 200 millimeters of precipitation annually or as much as 600 millimeters. However, the area is vulnerable to droughts and irregular rainfall patterns, which can seriously affect local livelihoods, livestock, and crops. It is best to check with regional meteorological services or climate monitoring groups for the most accurate and current information. Latitude: 5.9484979Longitude: 43.5655004. The district is located 1225 km from Addis Ababa, the capital city of Ethiopia in the southeast direction, and 604 km from Jigjiga, the major town of the Shebelle zone. The total area of the district is 7,700 km square 21.8/km square population density. the

4.2 Administrative setup

The establishment period of Gode (Godey) woreda remains shrouded in mystery, with historical records providing little insight into its origins. Despite this ambiguity, the administrative structure of the district is well-defined, encompassing a comprehensive array of governmental sectors. With 15 urban kebeles, a Referral Hospital, two Health centers, and four health posts, Gode Woreda is equipped to address the healthcare needs of its populace. Additionally, the presence of 150 private drug shops underscores the importance of private enterprise in supplementing public health efforts. Moreover, the district benefits from the involvement of international NGOs such as SOS and WHO, further enhancing its capacity to deliver essential services and support to its residents. Despite the lack of clarity regarding its founding, Gode Woreda stands as a testament to the resilience and adaptability of its administrative framework in meeting the needs of its community.

4.3 Facilities

Gode Town boasts a reliable telecommunications network, ensuring seamless communication for its residents and businesses. With multiple banks and financial institutions, the town fosters economic growth and financial stability within the community. The presence of well-maintained concrete reservoirs ensures a consistent and ample water supply, contributing to the town's sustainability and resilience. Additionally, the accessibility of both asphalt and concrete roads facilitates smooth transportation, supporting the efficient movement of goods and people throughout the town. The electric power coverage of the town was found to be 9621 household-level

4.4. Demography

According to the data found the total population of the woreda is 65,060 from this 32,368 (49.75.%) males and 32,693(50.25%) females. Male to female ratio is 0.99:1.01respectively. The area covers 7,700 km square 21.8/km square population density. The area covers 7,700 km square 21.8/km square population density. This woreda has an average elevation of 358 meters above sea level.

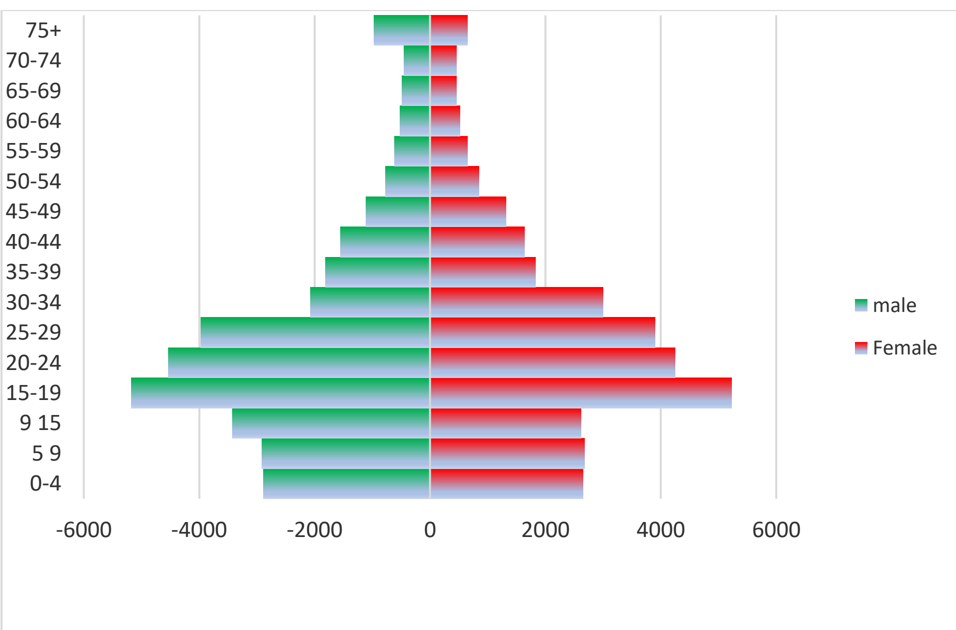

Figure 53 Population pyramid of Gode town

Table 16 Population of Gode town per kebele by sex 2014 FY

Population				Number of households
kebele	Male	Female	Total	Total
1	1693	3220	3320	503
2	2461	2364	4827	731
3	4002	3846	7848	1189
4	4863	4673	9536	1449
5	3345	3213	6558	994
6	2658	2554	5212	790
7	2726	2619	5345	810
8	2396	2302	4698	712
9	3059	2939	5998	909
10	1509	1449	2958	448
11	509	489	998	151
12	572	550	1122	170
13	535	514	1049	159
14	1013	974	1987	301
15	1027	987	2014	305
Total	31341	32693	64034	9621

The majority ethnic group in Somalia, which makes up about 99% of the population, speaks Somali as their first language and Amharic as a second. The remaining ethnic groups only make about 1% of the population.

4.5. Economy and income

In the Somalia region's Gode district, the economy reflects a diverse range of activities, mirroring the broader economic landscape of the area. Agriculture plays a pivotal role, with farming and livestock rearing serving as primary sources of income for many residents. The region's fertile lands support the cultivation of crops such as maize, sorghum, and beans, while pastoralism remains integral to the livelihoods of nomadic communities. Furthermore, services including travel and lodging contribute significantly to the local economy, especially given Gode's strategic location as a hub for transportation and commerce. Real estate development has also emerged as a prominent sector, fueled by urbanization and growing demand for residential and commercial properties.

Gode district's strategic location at the crossroads of major trade routes enhances its role as a pivotal commercial center within the Somalia region. Its proximity to key transit corridors facilitates the flow of goods and commodities between different regions, bolstering economic connectivity and trade networks. The district serves as a hub for the exchange of agricultural produce, livestock, and manufactured goods, attracting traders and merchants from neighboring areas.

Moreover, Gode's position as a trading hub fosters economic interactions beyond its immediate vicinity, fostering ties with distant markets and enhancing regional integration. This interconnectedness not only diversifies the range of products available within the district but also opens up opportunities for the export and import.

Table 17. Population of livestock in the district

Type of livestock	Cattel	Sheep	Goat	Camel and Horse
Population	35200	244350	135000	4500

4.6 Health professionals in the town

Adequate and qualified professionals should be in place for quality service delivery. In 2015 FY, the Health Sector workforce data was 207. Among the total health technical professionals, 108 are females while 99 are Males

Table 18 Health Professionals' 2015 FY

No	Qualification	Sex		Total
		Male	Female	
1	MD	01	0	01
2	MSc	0	0	0
	MPH in Field Epidemiology	0	0	0
	General MPH	03	0	03
	Integrated Emergency Surgeon (IES)	0	0	0
	Other	0	0	0
3	Degree			
	Environmental Health	01	0	01
	Health Informatics	02	0	02
	Health Promotion and Education	0	0	0
	Medical Laboratory Technology	0	0	0
	Midwifery	02	23	25
	Nurse	23	15	38
	Pharmacy	0	0	0

No	Qualification	Sex		Total
		Male	Female	
	Public Health (HO)	13	02	15
3	Level (Diploma)			
	Emergency Medical Technician (L-4)	0	0	0
	Health Extension (Level: I-IV)	21	19	40
	Medical Laboratory Technology (L-4)	04	0	04
	Midwifery (L-4)	2	23	25
	Nurse- Anesthetics (L-4)	0	0	0
	Nurse- L-4	23	15	38
	Pharmacy Technician (L-4)	04	01	05
	Sub total			193
4	Admin/Supportive staff			14
	Total			207

Vital Statistics and health indicators

Vital statistics like total deaths, total births, and under-one and under-five deaths are not recorded in the city.

Table 19 Vital Statistics and Health Indicators

No	Indicator	Number of cases	Target population	Rate (per 1000)
1	Infant Mortality Rate	0		
2	Child Mortality Rate	0		
3	Crude Birth Rate	0		
4	Crude Death Rate	0		
5	Maternal Mortality Rate	0		

Health professionals to population ration

The national standard ratio for physicians, HO, Environmental Health Officers, Nurses, and HEWs to the population is 1:100,000, 1:10,000, 1:25,000, 1:5,000, and 1: 2,500 respectively.

In 2015 there were no Physicians in the town except in the hospital. The hospital serves beyond the population of the town and zonal hospital it serves as shebelle zone

Table 20 Health professionals to population ratio

No	Qualification	Sex		Total	Professional to Pop. ratio	National Standards	Remark
		Male	Female				
1	Physicians	0	0	0		1:100,000	

2	MPH in Field Epidemiology	0	0	0			
3	Public Health Officer (HO)	13	02	15	1: 5005	1:10,000	
4	Integrated Emergency Surgeon (IES)	0	0	0			
5	Environmental Health	01	0	01		1:25,000	
6	Health Informatics	0	0	0			
7	Health Promotion and Education	0	0	0			
8	Medical Laboratory Technology	4	0	4			
9	Midwifery	02	23	25			
10	Nurses	23	15	38	1:1713	1:5,000	
11	Pharmacy Officer	04	01	05			
14	Health Extension	21	19	40	1:1623	1:2,500	

Health facilities

Health service coverage depends mainly on the availability of functional health facilities. Gode Town, a total of 162 health facilities, 1 hospital, 2 health, 4 health posts, 11 private clinics, and health facilities are providing health services for the community

Table 21 Types and Number of Health Facilities in 2015

No	Type of health facilities	Government	Private	NGO	Total	Remark
1	Hospitals	01	0	0	01	
2	Health Center	02	0	01	02	
3	MCH Center	0	0	0	0	
4	Medium Clinic	10	0	0	0	
5	First Clinic	0	0	0	0	
6	Medium Dental Clinic	01	0	0	0	
7	Medium Eye Clinic	01	0	0	0	
8	Pharmacy	150	0	0	0	
9	Drug Store	01	0	0	0	
10	Traditional Drug Store	0	0	0	0	
11	Health Post	04	0	0	0	
	Total	167	0	0	0	

Compared to the national average, Gode Town's health facility coverage in the 2015 fiscal year was deemed sufficient. The proportion of urban health centres and hospitals to the total population was reasonably excellent.

Table 22 Health facility coverage

Indicator	National Standard	Standard	Remark
Hospital -Population ratio	1:1.5 Mil		
Health center -Population ratio	1:25,000 1:40,000 1:20,000	1:25000	
Health post-Population ratio	1:5,000	1:5000	

Table 23 Top 10 diseases by morbidity per age and sex

Rank	Disease type/Any other list included	Children < 5 years of age			
		Female	Male	Total	Percentage
1	Acute upper respiratory infection	18	25	43	
2	Tonsillitis	45	19	64	
3	Functional intestinal	35	61	96	

	infection/Diarrhea/				
4	Pneumonia	78	44	122	
5	Urinary Tract Infection	15	10	25	
6	Other suspected diseases and conditions	04	12	16	
7	Typhoid and paratyphoid	21	13	34	
8	Dyspepsia	14	13	27	
9	Gastritis unspecified	03	02	05	
10	General medical condition	04	01	05	
	Total				

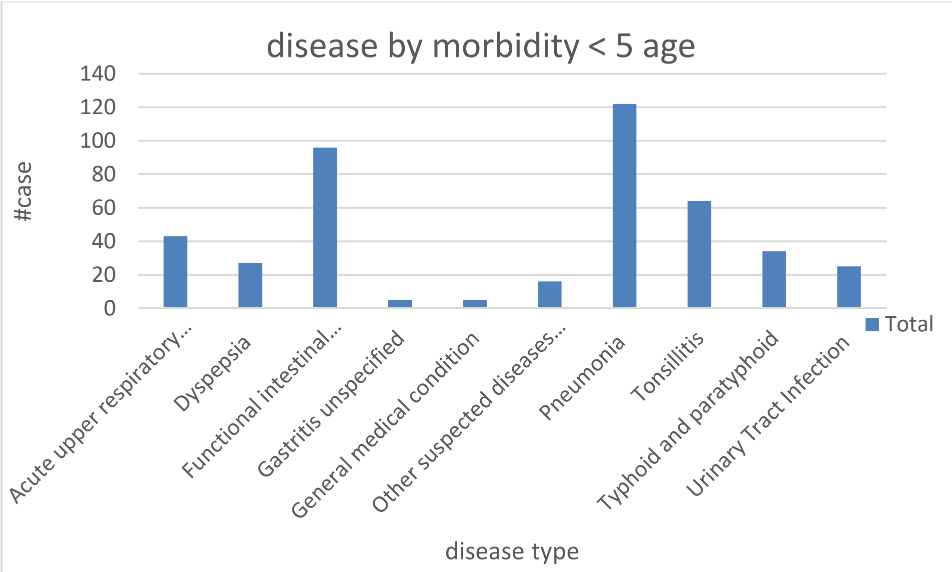

Figure 54 Disease by morbidity < 5 age

Table 24 Adult Top ten diseases/conditions leading cause of admissions in 2015

Rank	Disease/event	Remark
1	Diarrhea	
2	Malnutrition	
3	Acute febrile illness	
4	Pneumonia	
5	Dyspepsia	
6	Dysentery	
7	Malaria	
8	Otitis media	
9	Typhoid	

10	Skin disease	

Table 25 Ten top leading causes of disease of admission in Gode general Hospital

Disease type	Total number
Malaria	272
Pre-eclamsia	182
Pneumonia	144
Sepsis with outseptic shock	117
Ceasarean section	111
Visceral laeishmaniasis	104
Bacterial pneumonia	96
Pneumonitis unspecific	91
Gastroenteritis or colitis	87
Premature rupture membrane	86

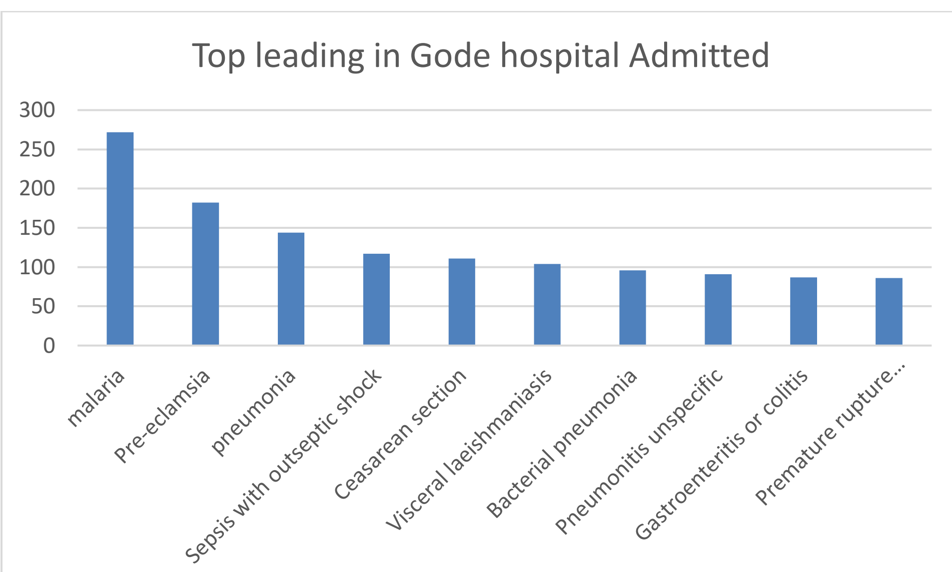

Figure 55 Top leading in God hospital Admitted

Table 26 Maternal Health Service Status in FY2015

No.	Indicator	Target population	Coverag e	Percentage
1	ANC 1st visit	1887	1667	89
2	ANC 4th visit	1881	1627	86
3	Skilled Birth Attendant (SBA)	1881	1610	85
4	Birth registration	1881	1541	82
5	PNC	1881	1610	85
6	Contraceptive acceptance rate	1761	545	31

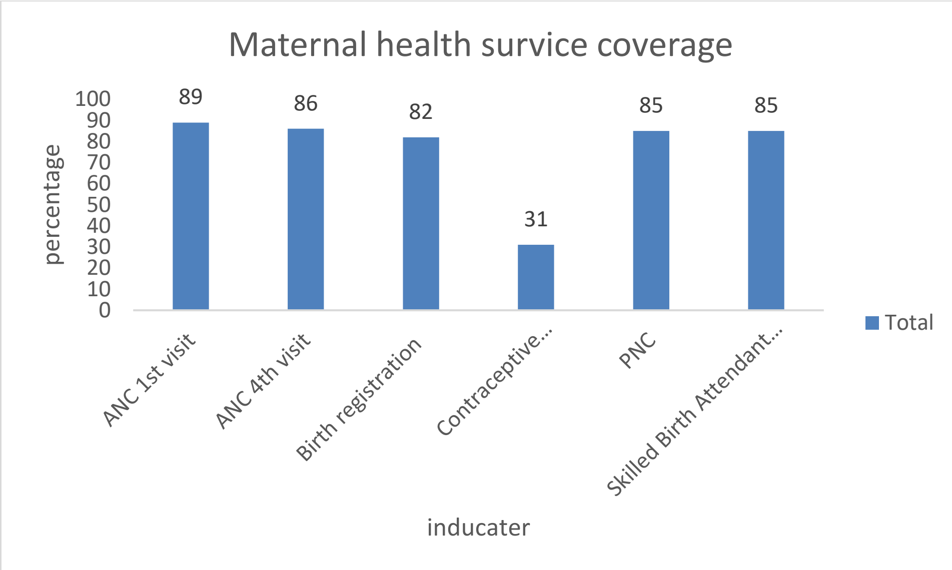

Figure 56 Maternal health service coverage

Table 27 Child immunization in 2015FY

No.	Vaccine	Target population	Coverage	Percentage	DOR
1	BCG	1881	1627	86	
2	Penta1	1747	1694	96	
3	Penta3	1747	1624	92	
4	Rota1	1747	1694	96	
5	Rota2	1747	1624	92	
6	MCV1	1787	1524	87	
7	MCV2	1747	1391	77	
8	Fully immunized	1747	1524	87	

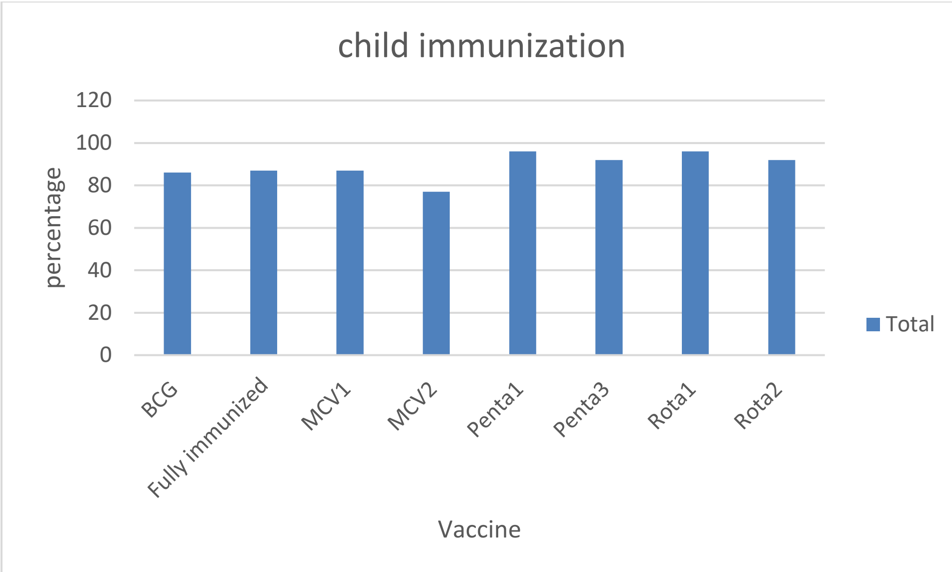

Figure 57 child immunization

Catchment area of population

Table 28 catchment area population

Health facility	Total population	Household
Gode health center	29120	4412
SOS health center	11131	1687
Health post 03	8002	1212
Health post 04	7430	1126
Health post 06	5313	805
Health post 10	5418	821

Table 29 Total budget allocation for the health sector per facility in three Fiscal years (2013 - 2015)

No.	Health facility	Fiscal Years		
		2013	2014	2015
71	Health center	1,500,000	1,500,00	4,800,000

Organizational structure of health

organogram

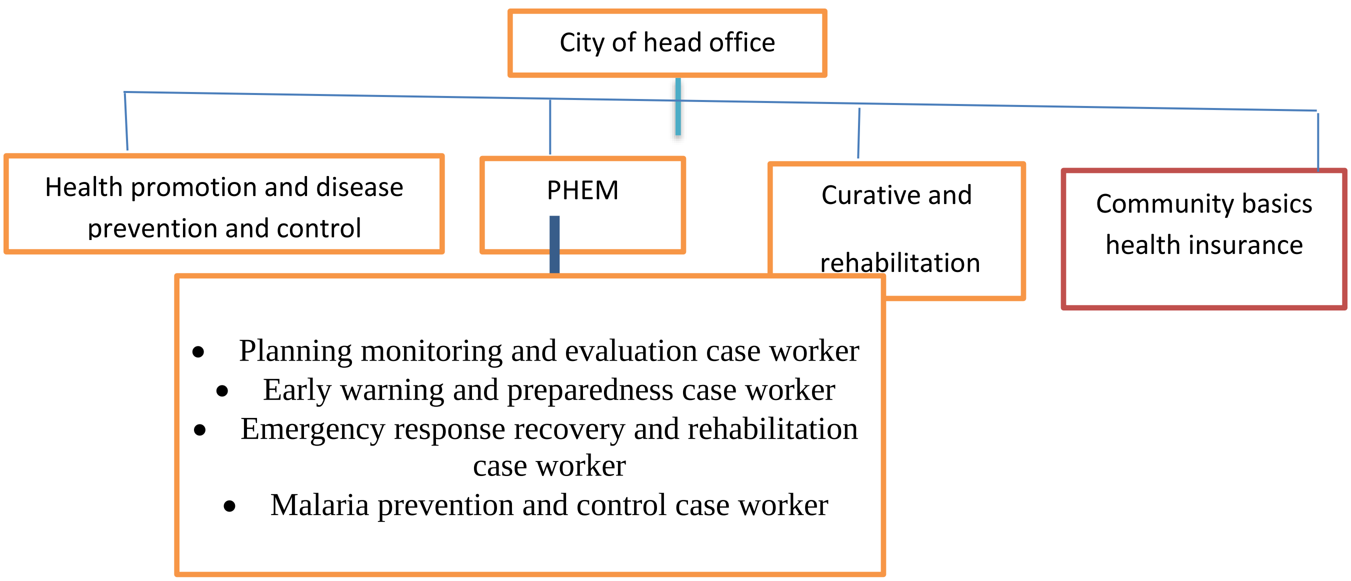

Figure 58 organogram Gode city health office

4.8 Education

Gode City has a total of 5 private and 9 government KG, 3 private and 8 government elementary schools, 1 high school, and 3 college

Education ensures the general health of the community as well as the well-being of the individual. All eligible age groups should be able to attend school, and educational facilities should be easily accessible. By enhancing coverage and quality, the Gode City Education Office is giving the industry the attention it deserves. 31,937 pupils were enrolled in various educational programs in the 2015 fiscal year, with 1,253 in kindergarten, 22,376 in primary school, and 8,358 in high school. with a gender distribution of 64.419% male and 35.58% female. When we broke down the percentage by gender, we found that, in KG, primary and secondary education.

The office is recruiting the required number of teachers and closely working with privates to improve the coverage and accessibility of schools. According to the data for the 2015 FY, Gode has a total of 1253 teachers (974 government and 279 private employed) and 14 KG, 11 primary and secondary schools. There are also 2 government and 1 private TVET colleges

Table 30 Number of schools and teachers per school level

No.	School level	No. of Students			No. of Teachers								
		Gov't	Private	Total	Gov't			Private			Total		
					M	F	Tot	M	F	Tot	M	F	Tot
1	KG	974	279	1253	254	720	974	113	279	279	367	886	1253
2	Primary (1-8)	13833	8543	22376	8443	4416	12859	4523	4020	8543	12966	8436	21402
3	High school (9-12)	3977	4381	8358	2775	1202	3977	2341	879	3220	5116	2081	7197
	Total	18784	13203	31987	11472	6338	17810	6977	5065	12042	18449	11403	29552

Discussion

Gode district in Ethiopia's Somali region endures harsh climatic conditions with scorching temperatures and erratic rainfall, leading to frequent droughts that impact agriculture and livelihoods. Despite these challenges, the district has a well-established administrative and healthcare system, supported by international NGOs. Its economy is driven by agriculture, livestock, and trade, with Gode serving as a key commercial hub. The population is predominantly Somali, with a balanced gender ratio, though vital health statistics are lacking. The district continues to build resilient infrastructure, including telecommunications, financial services, and transportation networks.

The 2015 data from Gode Town reveals significant disparities in the ratio of health professionals to the population when compared to national standards. Notably, there were no physicians available in the town outside of the hospital, which serves a broader population beyond Gode, including the entire Shebelle zone. The ratio of Public Health Officers (HO) was closer to the standard, with one officer for every 5,005 people, compared to the national standard of 1:10,000. However, the nurse-to-population ratio was 1:1,713, better than the national standard of 1:5,000, indicating a relatively higher presence of nurses. The most significant gap was in the Health Extension Workers (HEWs), with a ratio of 1:1,623, which is better than the national standard of 1:2,500 when compared to the nation was slight variation (5)

The morbidity data for Gode reveals significant health challenges, particularly among children under five and the adult population. For children, the leading causes of morbidity include pneumonia, which affects both sexes significantly, and functional intestinal infections like diarrhea, which had the highest overall cases. Respiratory infections, tonsillitis, and urinary tract infections also contribute to high morbidity rates, indicating the vulnerability of this age group to infectious diseases similar to the previous study(6)

In the adult population, diarrhea and malnutrition top the list of leading causes of hospital admissions, reflecting poor sanitation, water quality, and nutritional challenges in the region. Other common conditions include acute febrile illness, pneumonia, and malaria, highlighting the prevalence of both infectious and environmental health issues.

At Gode General Hospital, the most frequent causes of admission are malaria, pre-eclampsia, and pneumonia, with malaria being the most prevalent. The presence of serious conditions like sepsis, visceral leishmaniasis, and bacterial pneumonia underscores the critical need for enhanced healthcare services, particularly in managing severe infections and maternal health complications.

In 2015, maternal health services in Gode showed strong coverage, with high percentages of women accessing key services. The first and fourth antenatal care (ANC) visits had coverage rates of 89% and 86%, respectively. Skilled Birth Attendant (SBA) services were utilized by 85% of the target population, while birth registration and postnatal care (PNC) both had coverage rates of 82% and 85%. However, the contraceptive acceptance rate was notably lower at just 31% this agrees with the previous study conducted in Kebribayah District (7)

Child immunization rates were generally high, with BCG and Penta1 vaccines achieving coverage of 86% and 96%, respectively. Penta3 and Rota2 vaccinations had slightly lower but still strong coverage at 92%. Measles vaccinations (MCV1 and MCV2) had coverage rates of 87% and 77%, respectively. Overall, 87% of children were fully immunized. The data indicates good overall maternal and child healthcare service coverage, though there is room for improvement, particularly in contraceptive use and the second dose of the measles vaccine the survey result on demographic and health also showed similar findings(8)

In Gode, the catchment area population served by various health facilities is substantial, with the Gode Health Center covering the largest population of 29,120 people across 4,412 households. Other facilities, including the SOS Health Center and several health posts, serve smaller populations ranging from about 5,300 to 11,100 people.

Regarding budget allocation, there was a significant increase in funding for health centers over three fiscal years (2013-2015). The budget grew from 1.5 million in 2013 and 2014 to 4.8 million in 2015, indicating a substantial boost in financial resources dedicated to health services in the region.

Conclusion

Gode district in Ethiopia's Somali region faces significant health challenges exacerbated by harsh climatic conditions, limited access to healthcare professionals, and infrastructural gaps. The data from 2015 reveals notable disparities in health service availability, particularly the absence of physicians outside the hospital and the varying ratios of health professionals to the population. The district's population is particularly vulnerable to infectious diseases, with high morbidity rates among children and adults. Despite these challenges, maternal and child healthcare services demonstrate strong coverage, though there are areas needing improvement, such as contraceptive use and the second dose of the measles vaccine. The district has shown resilience in enhancing its healthcare infrastructure, evidenced by the increased budget allocation for health services and ongoing support from international NGOs.

Recommendations

Strengthen the Healthcare Workforce: Address the shortage of healthcare professionals, particularly physicians and Health Extension Workers (HEWs), by recruiting and retaining more qualified personnel to ensure adequate coverage and service delivery.

Improve Access to Maternal and Child Health Services: Enhance the accessibility and quality of maternal and child health services, focusing on improving contraceptive use and ensuring higher coverage of the second dose of the measles vaccine.

Enhance Disease Prevention and Management: Implement targeted interventions to reduce the prevalence of infectious diseases, including improved sanitation, access to clean water, and nutritional support programs. Strengthen the capacity of Gode General Hospital to manage severe infections and maternal health complications.

Expand Health Infrastructure and Resources: Continue to invest in healthcare infrastructure, particularly in rural and underserved areas, to reduce disparities in health service access. Ensure that the increased budget allocation is effectively utilized to improve healthcare delivery and outcomes.

Leverage International Support: Sustain and expand partnerships with international NGOs to bolster healthcare services, focusing on capacity building, resource mobilization, and technical assistance to address the district's pressing health challenges.

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CHAPTER -V SCIENTIFIC MANUSCRIPTS FOR PEER-REVIEWED JOURNALS

5. Dengue Fever Outbreak Investigation in Gode Town, Shabelle Zone, Somali Region, Ethiopia

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Abstract

Introduction: Any one of the four closely related viral serotypes can cause dengue. Mosquito species is a vector for dengue for human transmission. The disease is most common in tropical and subtropical areas, where year-round transmission is made possible by mosquito vectors sustained by favorable environmental circumstances. The first-ever DF outbreak in the Somali region occurred in Godey Town, Ethiopia in 2014; a comparable outbreak was documented in Dire Dawa, Ethiopia, in 2013. The purpose of this study is to look into the outbreak, identify the etiology, and identify risk factors related to it.

Methods: A total of 117 individuals were carefully chosen to participate in a community-based case-control study, consisting of 39 cases and 78 controls in a 1:2 ratio. The distribution of the disease by person, place, and time was assessed through a descriptive study based on the total number of cases during the outbreak. Following this, an unmatched case-control investigation was conducted to confirm the outbreak and identify its risk factors. Data were collected using structured questionnaires. Using Epi Info, the data was entered, and SPSS version 26 was used for analysis. To determine the relationship between the independent variable and the outcome variable, binary and multivariable logistic regression models were used. A p-value of 0.05 or less indicated that a variable was significant.

Results: A total of 105 cases were found, and their attack rate and case fatality rate were 1.64 per 1000 and 0, respectively. 52 (49.5%) of these were female and 53 (50.5%) were male. Of 15 kebeles 14 kebeles from Gode town own are affected. The age group of 21 to 30 years old had the greatest age-specific attack rate and 15 kebeles 02 had the highest attack rate of 20.51/1000 population. An unmatched case-control study was conducted with 39 cases and 78 controls. The use of LLINs (AOR 0.038, 95% CI 0.003-0.543) and applying mosquito repellent on the skin (AOR 0.092, 95% CI 0.023-0.372) were found to be protective factors. On the other hand, not using LLINs (AOR 13.208, 95% CI 2.898-60.207) and the presence of larvae in the household (AOR 5.723, 95% CI 1.592-20.573) were identified as significant risk factors associated with dengue fever.

Conclusion: having latrines and the use of mosquito repellent on your skin have a proactive factor so it needs to be aware the community and mosquito repellent supply should be encouraged. No usage of LLINs and the presence of Larvae in the household have a significant association with the disease pattern of the area so needs to conduct vector control activities at the household level and enhance risk communication and community engagement activities

Keywords: dengue fever, case-control, outbreak, Gode town

Introduction

Dengue is caused by four different but related viruses, labeled as DEN-1, DEN-2, DEN-3, and DEN-4. These viruses are spread to humans through the bites of mosquitoes, specifically *Aedes aegypti*, *Ae. albopictus,* and *Ae. polynesiensis*. Once infected, people develop Dengue fever, which can sometimes escalate into a more severe condition known as Dengue hemorrhagic fever(1). Dengue hemorrhagic fever (DHF) results from reinfection by a different Dengue serotype. Apart from a transient shield, dengue infection does not shield against infection with different serotypes. However, it does provide immunity against infection with the same dengue serotype. Infants, young children, and adults are susceptible to dengue, it manifests as a fever, headache, rash, pain behind the eyes, soreness in the muscles and joints, nausea, and vomiting(2, 3).

There are mild to severe variations of dengue, including dengue hemorrhagic fever (DHF) and dengue shock syndrome. Those who contract the more severe types of dengue fever typically require hospitalization(4)

Dengue is transmitted by *Aedes aegypti* and *Aedes albopictus* mosquitoes, which are found in many regions across the globe. The illness usually manifests as symptoms 3–10 days after the mosquito bite and starts 4–7 days later. For transmission to occur, the mosquito needs to feed on a human during the day when the virus is present in high concentrations in the blood.

The annual number of cases of dengue fever infections has increased thirty times over the last fifty years to 390 million, with 96 million cases displaying symptoms and about 3.9 billion individuals in 129 countries at risk(4). The disease is most common in tropical and subtropical areas, where year-round transmission is made possible by mosquito vectors sustained by favorable environmental circumstances. Dengue fever has recently spread due to several factors, including urbanization, population increase, and international trade and travel(5).

The earliest dengue outbreaks in Africa to be officially recognized were in Zanzibar in 1823 and 1870. Dengue fever outbreaks were documented in Egypt, Burkina Faso, Senegal, and South Africa around the beginning of the 20th century. As of 2020, 46 African nations had recorded occasional instances or outbreaks(6)

The city of Dire Dawa in Ethiopia reported the country's first dengue infections in 2013. Later suspected cases were documented in the Somali Region between January 2014 and June 2017 in several districts, as well as in the Afar Region in 2014. Dengue fever epidemics often affected the Dire Dawa city administration between 2013 and 2017. Dengue incidences occurred occasionally across the nation between 2013 and 2020, and this is seen as a serious public health issue(7).

General objective

- To investigate the epidemic, ascertain the cause and any risk factors that are connected to it

specific objectives

- To describe the Outbreak
- To confirm the etiology
- To determine the related risk variables

Material and Methods

Study area

Gode, Ethiopia's district, experiences hot summers with daytime highs reaching 40°C. The two rainy seasons are April to June and October to December. Variations in rainfall due to regional weather patterns and climate change can affect livelihoods. Latitude: 5.9484979Longitude: 43.5655004. The district is situated 604 kilometers from Jijiga, the largest town in the Shebelle zone, and 1225 kilometers from Addis Ababa, the capital city of Ethiopia. The district is 7,700 km^2 in total size. 21.8 people per square km.

Gode Woreda, a district with a complex administrative structure, is well-equipped to address its community's healthcare needs. There are four health posts, two health centers, a referral hospital, and fifteen urban kebeles. The district also has 150 private drug shops and is involved in international NGOs like SOS and WHO.

According to the data found the total population of the woreda is 65,060 from this 32,368 (49.75.%) males and 32,693(50.25%) females. The area covers 7,700 km square 21.8/km square population density. The area covers 7,700 km square 21.8/km square population density. The average elevation in this woreda is 358 meters above sea level. With 99.9% of the people belonging to Somalia, it was the largest ethnic group; the remaining tribes made up 0.08% of the total.

Study design

The study design included unpaired case-control research after a descriptive analysis to evaluate the disease's spread by person, place, and time.

Operational definition

The case definition is based on the national PHEM guideline 2^{rd} Edition 2021 G.C

Suspected case

"Any person with acute febrile illness of 2-7 days duration with two or more of the following: headache, retro-orbital pain, myalgia, arthralgia, rash, hemorrhagic manifestation, leucopenia."

Confirmed case

“A suspected case with laboratory confirmation (positive IgM antibody fourfold, greater increase in IgG antibody titers in paired (acute and convalescent) serum specimens, positive PCR, or isolation of the dengue virus using cell culture)”.

An Epidemiologically linked case- is a suspected case that has been in touch with one or more epidemiologically or laboratory-verified cases.

Target Population- Every person residing in Gode City at the time of the study was the target population.

Source Population- The entire population residing in the study area served as the study's source population.

Study Population- The study included 117 participants, comprising 39 cases and 78 controls, selected from the source population.

Criteria for Inclusion and Exclusion

The study's inclusion criteria include those who have been proven to have dengue or an epidemiological connection to confirmed cases during the outbreak period and randomly selected controls who live in the same community as the patients.

People who do not live in Gode City but who receive treatment at a case management clinic and who have their dengue fever cases recorded by their districts before January 2024 are excluded.

Sample Size Calculation

With a power of 80%, an odds ratio of 3.589, a 50% exposed control percentage, and a 1:2 case-to-control ratio, we used Epi-info statistical computing software to determine the sample size. There were 78 controls and 39 cases in the 117-person sample.

Data analysis

After being collected, the data was coded for every question, and it was then processed using Epi info version 7. The information was moved to SPSS version 26. Tables, frequencies, and graphs were used to summarize the descriptive statistics that were obtained for each variable. A logistic regression's underlying assumption was examined. Each independent variable's relationship to the outcome variable was examined using binary logistic regression, and variables with p-values less than 0.25 were included in the multivariable logistic regression analysis. Following that, a multi-variable logistic regression p-value of less than 0.05 was significant

Study Variables- cases and controls

Independent Variables-Sex, Age, Educational status, Occupation, Having LLINs, LLINs usage, the household of the responders have used IRS spray during the last six months, and there are larvae present. Usually, they dress fully or in trousers, and mosquito repellent Sleep inside a screened window or door, Specimen collection and laboratory confirmation, know about Dengue fever, Know the Etiology of DF, DF Contagious, Know the mode of Dengue fever transmission, Know the symptoms of DF, Time of mosquito bites and Water required for breeding.

Data source

A structured questionnaire was used to gather information, and cases and controls from the chosen health facilities, documents, and a line list were also examined to determine the true number of cases. We chose one primary hospital and one health center based on its caseload and representativeness for the cases due to its high number of reported cases and referrals to the three health centers.

Selection of Cases and Controls

We selected the cases using a line list that we acquired from Gode Hospital and SOS Health Centre. Every case that fits the case specification was recruited as a case after a community-wide active case search. Within the same community, controls were chosen from the cases' immediate neighborhood. Following the day-long interview process with the cases, two controls were selected from the same residence as the cases for each case.

Data Collection Techniques

Descriptive study: First, we conducted interviews with the relevant parties at every location we visited, including the district, city, and regional health management teams, to gather data. We looked at case records, including patient admission cards, queue lists, and HMIS registration books. Information on any recent modifications to the population size, reporting scenarios, and case definitions was cleared. Health extension workers and medical specialists from medical facilities actively assisted in case detection in the community using the community case definition. Case definitions utilized in the course of the outbreak's surveillance and investigation. The descriptive research includes those who met the criteria for dengue fever cases.

Analytic study: The investigator conducted in-person interviews with the respondents to gather data (community). Sociodemographic data were gathered via semi-structured questionnaires. Possession of LLINs, LLIN use, Larvae presence in the home, IRS spraying of the respondents' homes within the previous six months, and typical clothing types worn trousers or body full dresses, mosquito repellent Sleeping inside a screened window or door, Specimen collection and laboratory confirmation, known about the Dengue fever, Known Etiology of DF, DF Contagious, Know the mode of Dengue fever transmission, Knew the symptoms of DF, Time of mosquito bites and Water required for breeding

RESULT

Descriptive Epidemiology

105 cases overall, based on the IDS-line list for reporting from medical facilities, including SOS Health Centre and Gode Hospital. From this 53(50.5%) were male and 52(49.5%) females. Of 15 kebeles 14 kebeles from Gode town own are affected.21 and 84 cases were reported from SOS Health Center and Gode Hospital respectively. 10 cases were confirmed by laboratory tests. Attack rates were 1.64 per 1000 and 0 for case fatalities, respectively. The index case was not known and it is a vector-borne disease. The possible first case was seen on 15/01/ 24.

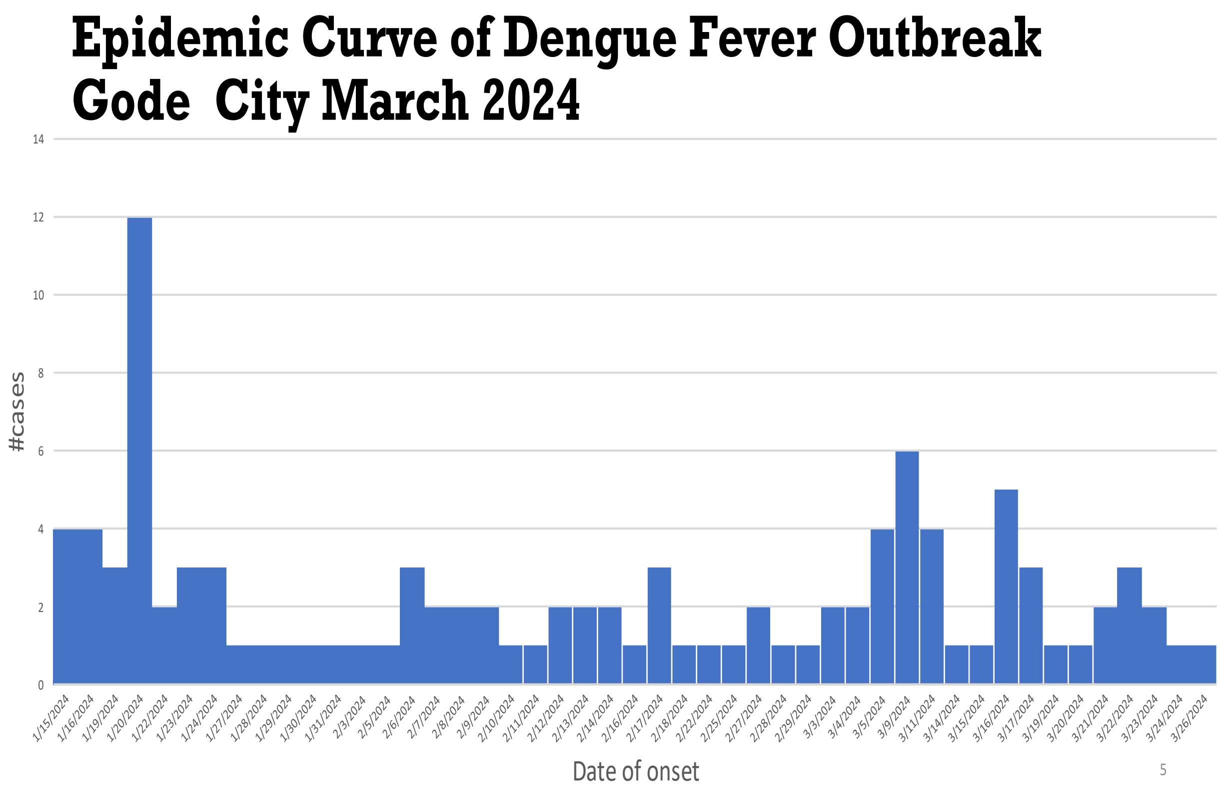

Figure 59 Epidemic curve of dengue fever Gode City March 2024

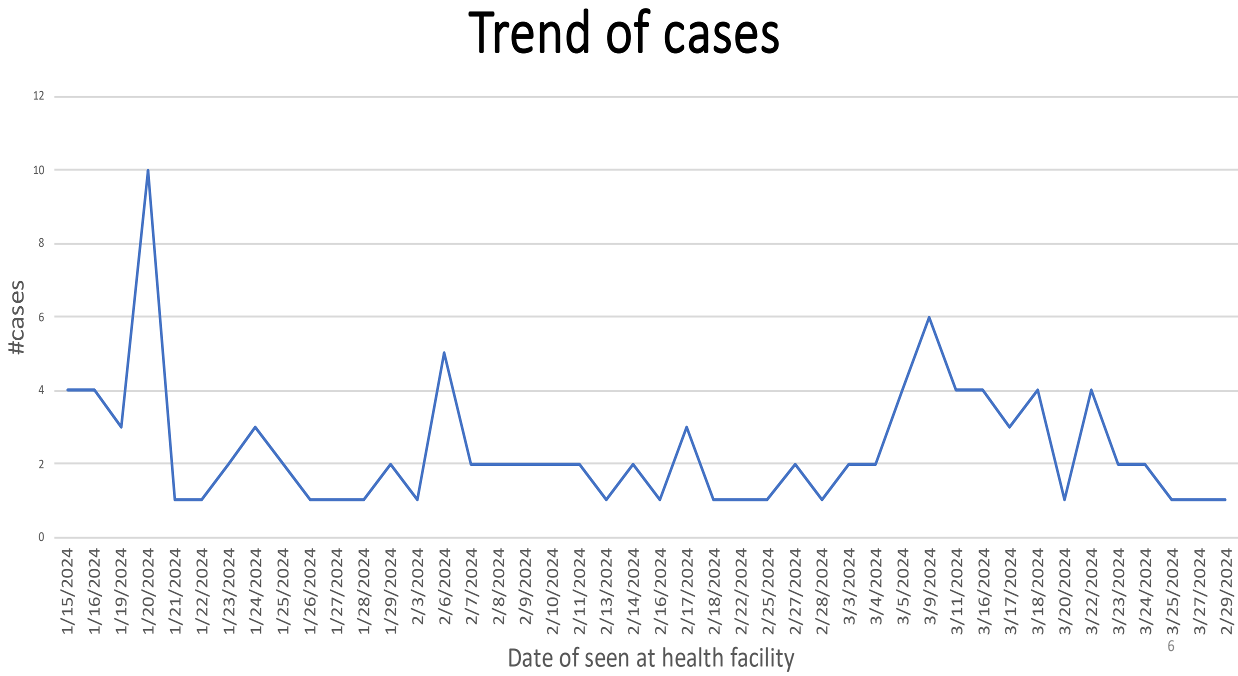

Figure 60 case trend

AGE SEX DISTRIBUTION

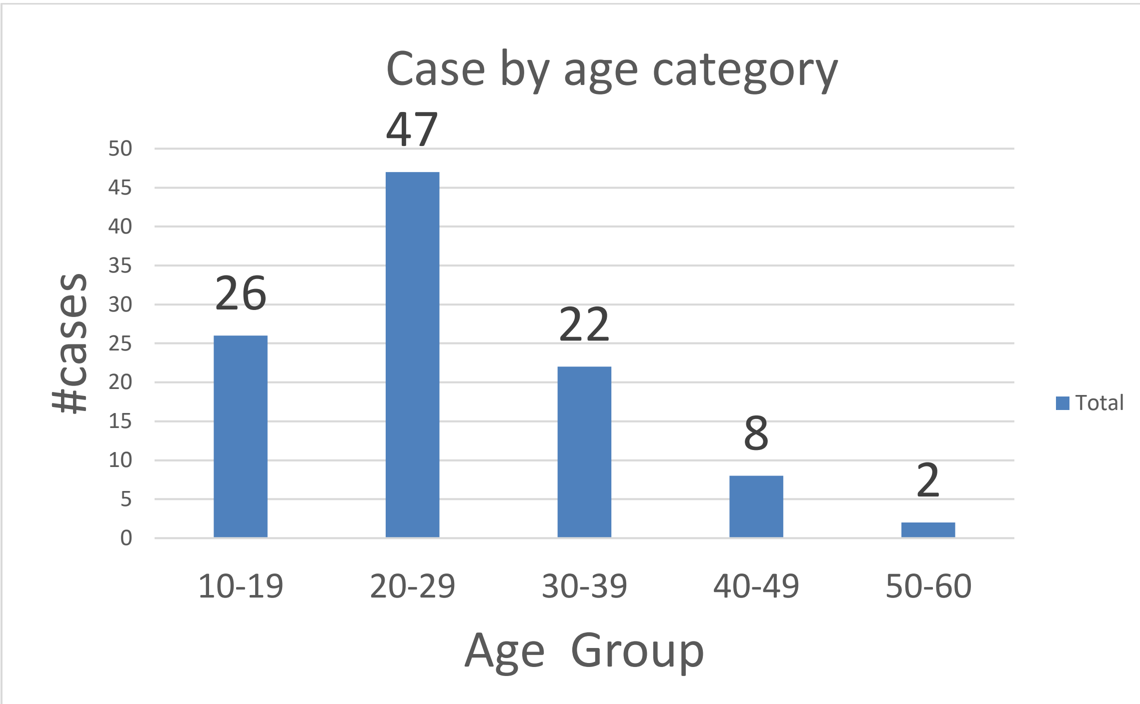

Figure 61 Distribution of cases by age category

With a mean age of 25.87 years and a range of 10 to 60 years, the cases' median age was 24 years. Of the cases, patients between the ages of 21 and 30 accounted for 40 (42.6%). Males experienced a sex-specific attack rate of 53/31341, females had a sex-specific attack rate of 52/32693, and the age group between 21 and 30 years old had the greatest age-specific attack rate.

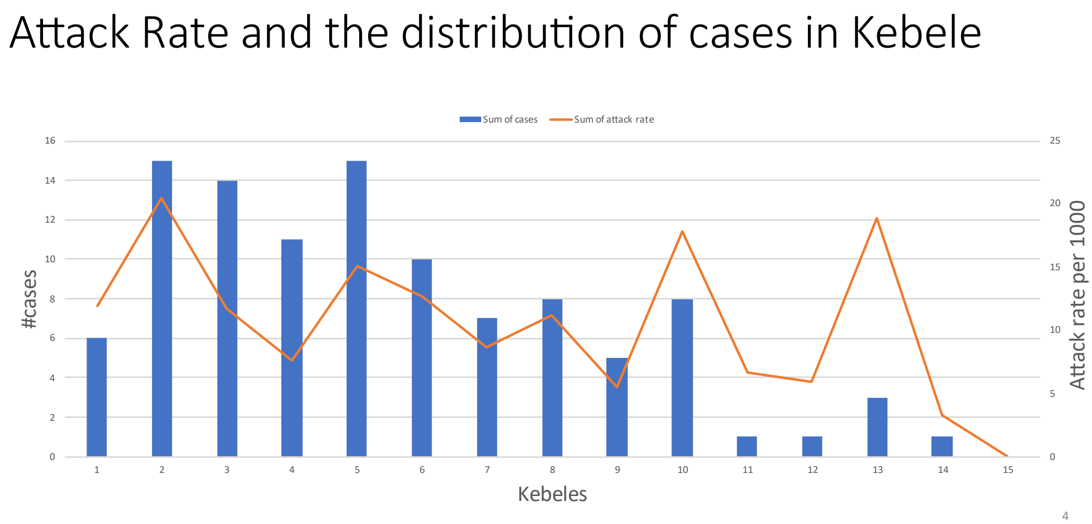

Figure 62 Attack Rate and the distribution of cases in Kebele

The crude attack rate varied slightly among the many impacted kebeles, but it was 1.64 per 1000 persons. Peak instance from Kebele 02 and 05 There are open and closed water containers at Kebele 01, 02, and 05 that are useful for vector multiplication, and there is a lavage (car wash) facility there as well. Kebele 15 has no cases, Kebeles 014 has the lowest incidence rate of 3.3/1000 people, while 02 has the highest attack rate of 20.51/1000 population.

Socio-demographic characteristics of respondents

39 cases and 78 controls out of the 117 participants who were enrolled and answered during the case-control study. Out of the total respondents who were included, 49 (40.8%) were female and 71 (59.2%) were male. Males made up the largest percentage of case participants 57.5% (23/40) of the total and female individuals 42.5% (17) of the control group. In contrast, male participants made up 48 (60%) and female participants made up 32 (40%) of the control group. For the cases and controls, the mean age was 35.04 and 33 years old, respectively.

Table 31 Socio-demographic characteristics of community-based survey Dengue Fever outbreak investigation at. (n=117, cases=39, controls =78)

Variable	Case= 39	Control= 78	Total= 117
Sex			

Female Male	17(43.6) 22(66.4)	35(45) 44(55)	
Age <5 yrs 5-35 yrs 35-65yrs >65 yrs	 1(0) 25() 13() 0()	 0(0) 35() 32() 12()	
Educational status No formal Education Had formal Education	 25(64.0) 13(36.0)	 49(63) 29(43)	
Occupation Jobless Private business Government employee	 6 25 8	 21 46 12	

Table 32 Potential factors for Dengue fever outbreak spread and control Gode Town, march, 2024 . (n=117, case=39, control =78)

Variables	Case	Control	COR (95%CI)
Is the water container open? Yes No	 14(36) 29(64)	 32(41) 36(59)	
Having LLINs Yes No	 32(82) 7(18)	 76(97) 2(9)	
LLINs usage No Yes	 20(51) 19(49)	 4(5) 74(95)	
Educational status			

No formal Education Had formal Education	27(70) 12(30)	2328) 56(72)	
The existence of stagnant water around their residency Yes No	 7(18) 32(82)	 5(6) 73(94)	
Presence of Larvae in the household Yes No	24(62) 15(38)	28(36) 50(64)	
Respondents' household IRS spray in the last six months No Yes	 39 (39) 0 (0)	 15 (19) 64(81)	
Kinds of clothes usually wear Trousers/body full dress	 16 (41) 33(59)	 50 (64) 28 (36)	
Do you use mosquito repellent on your skin? Yes No	 4 (10) 35 (90)	 47(60) 32 (40)	
Sleeping inside a screened window or door Yes No	 20 (51) 19 (49)	 47 (60) 28(36)	

Table 33 Knowledge status of participants about Dengue Fever

Variables		Case N = 39	Control N = 78	Total= 117
Known about the Dengue fever	Yes No	21(55%) 18(45%)	70(90) 8(10)	
Known Etiology of DF	Yes No	22(57%) 17(23%)	52(67) 27(23)	
Is DF Contagious	Yes No	12(31%) 27(89%	30(38) 48(62)	
Know the mode of Dengue fever transmission	Yes No	10(26%) 29(64%)	53(70) 25(30)	
Knew the symptoms of DF	Yes No	19(49%) 20(51)	45(58) 23(42)	
Time of mosquito bites	Yes No	22(56%) 18(46%)	57(73) 22(27)	
Water required for breeding	Yes No	11(28%) 28(72%)	50(64) 28(36)	

Table 34 Bivariable analysis of potential exposures

Potential exposure	OR	95%CI		P-value
		Lower limit	Upper limit	
Having LLINs	0.115	.023	0.584	0.009
LLINs usage	14.80	0.084	0.499	0.000
The existence of stagnant water around their residency	0.323	0.121	0.862	0.25
Presence of Larvae in the household	3.929	1.739	0.377	0.001
Respondents' household IRS spray in the last six months	383675213 3.667	0		0.997
Kinds of clothes usually wear	0.358	0.161	0.795	0.012

Trousers/body full dress				
Do you use mosquito repellent on your skin?	0.072	0.023	0.223	0.000
Sleeping inside a screened window or door	0.694	0.317	1.520	0.362
Known about the Dengue fever	0.155	0.058	0.410	0.000
Known Etiology of DF	0.714	0.323	1.58	0.406
Is DF Contagious	0.631	0.274	1.452	0.279
Knew the symptoms of DF	0.185	0.079	0.438	0.000
Time of mosquito bites	0.646	0.296	1.409	0.272
Water required for breeding	0.334	0.149	0.749	0.008

The bivariate analysis result indicated that risk factors for LLIN usage and the Presence of Larvae in the household.

Depending on bivariant analysis protective factors are Having LLINs, Kinds of clothes usually wearing Trousers/body dress, using mosquito repellent, knowing about Dengue fever, DF Contagious, Knowing the symptoms of DF and Water required for breeding

The presence of standing water surrounding their residence, the IRS spray used by the respondents' household within the previous six months, and sleeping through screened windows or doors The known cause of dengue illness, the contagious nature of dengue, The duration of mosquito bites did not appear to be a risk factor or protective factor for dengue fever. To determine if the independent variable was connected to dengue fever, multivariable logistic regression was performed after the bivariate analysis resulted in $p<0.2$.

Table 35 Multivariant

Potential exposure	AOR	95%CI		P-value
		Lower limit	Upper limit	
having LLINs	.038	.003	.543	$.016^{**}$
LLINs usage	13.208	2.898	60.207	$.001^{**}$
Presence of Larvae in the household	5.723	1.592	20.573	$.008^{**}$
Kinds of clothes usually wear Trousers/body full dress	.506	.155	1.656	.260
use mosquito repellent on your skin	.092	.023	.372	$.001^{**}$
Known about the Dengue fever	.286	.076	1.079	.065
Knew the symptoms of DF	1.010	.541	1.885	.975
Water required for breeding	.371	.109	1.259	.112

Based on the multivariate analysis of the Kinds of clothes usually worn Trousers/body dress, Known as Dengue fever Water required for breeding in the dengue outbreak area has not a significant association with the disease dengue fever. having LLINs and the use of mosquito repellent on your skin have an association with its association is protective. LLIN usage and the presence of Larvae in the household are a risk factor that has a significant association with dengue fever.

Entomological survey

Within the home, both artificial and natural vector breeding grounds Artificial breeding sites that are Birkas Larval-positive are the type of breeding3. Natural breeding habitats that are larval-positive 1. The ratio of bed nets to family members 4 Making use of bed netting both during the day and at night

The larval survey found that Aedes aegypgi is present in all of the town's kebelles but in varying amounts. Tires, jerry cans, buckets, drums, and cement tanks (Birka) were among the containers used for the larval survey. Kebelle has the greatest HI, CI, and BI values.

Table 36 List of kebele and number of Birkas in Gode town, 2024

List of Kebeles	Number of Birkas	Number of households	Number of containers with a household ratio
01	44	503	0.087475
02	45	731	0.06156
03	78	1189	0.065601
04	36	1449	0.024845
05	137	994	0.137827
06	40	790	0.050633
07	72	810	0.088889
08	81	712	0.113764
09	74	909	0.081408
10	21	448	0.046875
11	7	151	0.046358
12	34	170	0.2
13	60	159	0.377358
14	14	301	0.046512
15	7	305	0.022951
Total	750	9621	0.077954

Discussion

In 2013, there was a dengue virus pandemic in Dire Dawa. Somali region Godey town dengue fever outbreak occurred in 2014. Before it, there had been no reports of dengue transmission in Ethiopia since 2013.

Clinical signs and test results confirmed that dengue fever was the outbreak's causative agent. Beginning on January 15 and peaking in the third week of January 2024, the outbreak had a crude attack rate of 1.46/1000 and a case fatality rate of 0. The cases' mean age was 25.87 years, with a median age of 23.5 years, spanning from 10 to 60 years. Of the cases, patients between the ages of 21 and 30 accounted for 40 (42.6%). Males had a sex-specific attack rate of 49/31341 and females had a sex-specific attack rate of 45/32693, with the age group between 21 and 30 having the highest attack rate.

The inquiry into this outbreak identified various contributing variables. According to the study, not using an LLIN increased the risk of dengue fever by 13.208 times when compared to using one. This result is consistent with a prior study carried out in the Somali region (7).

Another independent risk factor for an outbreak of dengue fever is the presence of larvae in household water containers. This result is in line with the research done at Gode City (8).

The associated risk factors and study variables that were conducted in this study have protective factors concerning disease development. Those who have protective associations have LLINs and use mosquito repellent(3, 9)

The findings of this study indicate a strong correlation between LLIN possession and dengue fever outbreaks. There has been evidence of a strong correlation between illness and owning LLINs, which is consistent with these findings.

Limitations of the study

- The population was restricted to Gode town, and thus might not be representative of the entire Somali region.
- • Case ascertainment bias arises because the controls were unable to obtain a laboratory result confirming their lack of illness.
- Only 10 cases were confirmed with a rapid test, and controls were not tested for dengue fever.
- Household income and other socioeconomic variables were not inquired about

Conclusion

The results of the epidemiological, entomological, and serological examinations demonstrated that dengue fever virus infection was the cause of the probable fever epidemics. having LLINs and the use of mosquito repellent on your skin have an association with its association is protective. LLIN usage and the presence of Larvae in the household are a risk factor that has a significant association with dengue fever. An intervention should be applied in the area, especially vector control activities, coordination and collaboration with different stakeholders, case management activities risk communication, and community engagement.

Recommendation

- It needs multisectoral engagement especially dry waste management of the city, municipal, and Agriculture
- Strength of the linkage between private health facilities and the PHEM system
- Provide training on surveillance, case management, vector control at health and risk communication& community engagement at the facility level and for urban health extension
- Assign a surveillance officer at the health center

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CHAPTER-VIABSTRACT FOR SCIENTIFIC PRESENTATION

6.1 Knowledge, attitude, and practices of professionals on the tackling of antimicrobial resistance, residue, and use in federal institutions in Ethiopia in a one health approach: mixed approach qualitative and quantitative

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ABSTRACT

Introduction: Antimicrobial resistance poses a global threat to human, animal, plant, food, and environmental health, necessitating multisectoral and multidiscipline professional involvement to tackle this challenge. The study aimed to assess the knowledge, attitude, and practices of professionals in Ethiopian federal institutions regarding antimicrobial resistance and its use in 2024. The study identifies KAP gaps and application challenges, providing evidence to help policymakers design effective AMR prevention and control strategies, enhance multi-sectoral collaboration, and support future research.

Methods: An institution-based cross-sectional study design was employed from January to June 2024 using quantitative and qualitative research approaches. The study used stratified samples based on existing institutional structures as strata, using random sampling to assess knowledge, attitudes, and practices in each sector, and purposely selecting participants for key-informant interviews. Data was collected using the Kobo toolbox, exported to Excel, and analyzed using SPSS version 26. Binary and multivariable logistic regression was used to examine the independent variable's association with the outcome variable. Important variables were identified through multivariable analysis with a p-value of 0.05 or lower.

Result: 422 of the professionals who were contacted completed the survey, yielding a 99.98% response rate. The majority of the sample, or 309 (73.2%), were men. Between 25 and 55 years old was the age range of the respondents, with a mean age of 36.28 years (SD=6.68 years). Nearly 64.9%, 56.6%, and 53.6% of respondents had good knowledge, a positive attitude, and good practice respectively. It was also found that there was a statistically significant ($p < 0.05$) disparity between the knowledge level of respondents with Age, Gender, AMR-related training, and professional qualifications. The respondents' attitude levels were also significantly associated ($p < 0.05$) with age, gender, AMR-related training, and professional qualifications. Respondent's practice levels were also significantly associated ($p < 0.05$) with age, gender, education level, training related to AMR, and professional qualifications are significant factors influencing the practice levels of professionals towards AMR and AMU in federal institutions in Ethiopia.

Conclusion: In the current study, about more than half of the respondents had good knowledge, a positive attitude, and good practices regarding AMR, AMU, and residue. The result showed a significant knowledge, attitude, and practice gap regarding AMR and AMU on professional sociodemographic characteristics. So, one health approach of multisectoral collaboration and coordination is crucial to enhance the KAP of professionals regarding AMR and AMU.

Keywords: knowledge, attitude, practice, AMR, AMU and one health

6. 2 Guinea worm disease surveillance and data analysis

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Abstract

Dracunculiasis (Guinea worm disease) is one of the Neglected Tropical Diseases (NTDs), caused by the nematode parasite *Dracunculus medinensis*. It is a disease of poverty - debilitating residents of remote and marginalized communities in areas where access to clean water is limited. The purpose of this study is to assess the disease burden: to describe the disease based on different parameters such as time place and in-person based on retrospective data and to evaluate the interventions implemented for the eradication program.

Guinea worm disease surveillance system is implemented with the involvement and integration of different sectors and partners. The most common surveillance is mainly, active, passive, and sentinel surveillance. The surveillance system consists of systematic collection, organization, analysis, interpretation, and dissemination of GWD data for action.

In this study the retrospective data is collected from 1993 up to 2021 it is analyzed by tables, graphs, maps, and figures. The data contain the disease distribution in humans from 1993 up to 2021; the disease distribution in animals starting from 2013 onwards both domestic and wild animals; rumor trend of the last 5 years; it also describes the data based on surveillance categories.

The disease has varied over time The first nationwide case search was conducted in 1993 at that time only human cases but starting in 2013 animals were affected the dynamics changed and spread to wild animals and baboons.

The most common intervention that is implemented in the guinea worm eradication program is surveillance both animal and human. In the case of domestic animal surveillance tethering of dog and cat; in the case of wild animal surveillance baboon trapping is the most common intervention.

The other interventions are Vector Control, Social and Behavioral Change Communication (SBCC), and Safe Water Provision.

The human case trend is decreasing but the animal infection is continuous it needs multisectoral collaboration and coordination to eradicate 2030.

Keywords; surveillance, Guinea worm, data analysis

6. 3 Epidemiological study on the prevalence of *Salmonella and campylobacter* in raw animal source food in Ethiopia and Japan

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Abstract

Introduction: The global food-borne disease burden estimated that food-borne diseases from a limited number of hazards caused about 600 million illnesses. Salmonella and Campylobacter cause food-borne enteritis mainly via the consumption of raw or undercooked contaminated animal products. It is one of the food poisonings in Japan and a High burden of foodborne pathogens was reported on the animal source food value chain of Ethiopia.

Objectives: to assess the prevalence of Salmonella and campylobacter in raw animal source food, to identify the associated risk factors, to implement effective intervention on salmonellosis and campylobacter

Methods: A cross-sectional study design was used. Salmonella and campylobacter were isolated by their colony character and biochemical test. Further genetic characterization was done by PCR and MLST test. Antimicrobial susceptibility test was carried out for different strains.

Results: Salmonella serovars schwarzegrud, infantia and manhattan were isolated 14, 2 and 3 colonies respectively from 9 of 11 sample of chicken skin. From 6 isolated Campylobacter colony 2 colony were positive the total prevalence of salmonella and campylobacter in this study were 81.8 %(9/11) and 33.3 %(2/6) respectively. The result indicated that high rate of antimicrobial susceptibility were observed in streptomycin 57.9%, tetracycline 52.6%, kenamacine 21% and Trimethoprim 5.3%. All were susceptible for Nalidixic acid, Ciprofloxaci, Ampicilin, Gentamycin; Chloramphenicol, Cefazolin, Cefotaxim, Colistin.

Conclusion: In this study also showed that antibiotic use in- Ovo vaccination and for parent stock had a great contribution in food safety and drug resistance development of the food borne pathogen.

Keywords: salmonella, campylobacter, serovar, antimicrobial resistance, prevalent

CHAPTER VII NARRATIVE SUMMARY OF THE DISASTER SITUATION

7. Disaster summary report on internally displaced person sites, South wollo zone, Amhara region, Ethiopia.

Abstract

Introduction: Internally displaced people become more vulnerable and are exposed to additional risks as a result of displacement. This leads to an increased chance of disease and demise. Conflicting parties often purposefully deny IDPs access to medical care and humanitarian aid. In addition, the entrance of IDPs may put a burden on regional healthcare systems, and the host community ultimately bears the brunt of the internally displaced population's suffering. The goal of the study is to assess the health and health-related issues of internally displaced people living in the South Wollo Zone, Amhara region, Ethiopia.

Methods: In the south Wollo zone of the Amhara region of Ethiopia in 2023, the districts of Argoba, Kallu, and Tehuledere are home to Internally Displaced Populations (IDPs). To evaluate their health and health-related issues, a descriptive cross-sectional survey approach was used. Out of eight districts, three districts were chosen using straightforward random lottery techniques. The districts that were chosen were Tehuledere, Kallu, and Argoba. The study covered IDP sites in Jari, Turkish, Mekane Eyesus, Degan, Harbu, and Medina districts that were chosen. Document review, minute discussions, and interviews were the methods used to get the data.

Result: Among the selected districts, there were 6 temporary collective sites, which were 3(50%) in Tehuledere, 2(33%) in Kallu, and 1(17%) in Argoba. In the study sites,12,585 displaced persons were living in the camps. Among those, 5845(47%) and 6586(53%) of them were male and female. All the camps have no health facility for giving health services to the internally displaced persons. Among adults respiratory tract infection is the leading cause of morbidity, while in under five years children diarrhea becomes predominant in the study sites. Immunization service is not given routinely at all IDP sites. Among 969 (53%) under five children screened for nutrition 161(16.6%) of children had nutritional problems.

Conclusion: The major causes of morbidity among displaced persons were respiratory tract infection and diarrheal diseases. Food and shelter are the main concern for all internally displaced persons. The coverage of latrines and safe water supply for displaced populations were below the sphere standard. All internally displaced persons are living in overcrowded conditions which leads to the occurrence of chickenpox and diarrheal disease outbreaks. There are poor hygiene and sanitation practices at collective sites.

Keywords: Disaster summary report, IDPs site, south Wollo zone, Amhara, Ethiopia

Introduction

Internally displaced people (IDPs) are those who have been forced to leave their homes due to armed conflict, violence, human rights violations, or natural disasters, as long as they haven't crossed an internationally recognized state border, as defined by the UN's Guiding Principles on Internal Displacement(1,2).

The UNHCR differentiates internally displaced people from refugees, as both groups often leave their homes for similar reasons. Refugees cross international borders for safety, while internally displaced people stay in their home states. Major causes of displacement are armed conflict(3,4).

Consequences have an interwoven effect on social life, the environment, housing and infrastructure, livelihoods, health, and education. The lives of those who are internally displaced, the communities in which they reside, and the people they leave behind are all impacted in different ways. The most urgent threats are those to their physical safety, well-being, and human rights. It might also have a significant and long-lasting effect on socioeconomic development. Because internal displacement harms people's physical and mental health as well as their environment, as well as their ability to make a living, and their access to security, education, housing, and basic infrastructure, it can have a substantial negative effect on the economy of an individual, a community, or even a nation(5).

Education is a fundamental human right and a vital protection tool, aiding in coping with displacement and facilitating reintegration. It is crucial to ensure equal access to education for all internally displaced persons (IDPs) during all stages of displacement. Conflicting parties often exclude IDPs from healthcare and humanitarian assistance, straining local health systems.

Refugees and IDPs require necessities like food, shelter, water, sanitation, education, health services, protection, and safety(6,7, 8, 9).

The management of the health effects of natural and man-made disasters, emergencies, crises, and conflicts presents a constant challenge to the public health system, as do repeated and unexpected illness outbreaks. The healthcare system is still plagued by these issues, and detecting and effectively addressing them is getting harder and harder(10).

People in Ethiopia continue to be displaced by natural disasters, conflict, intercommunal violence, and other effects of climate change. While some have been homeless for several years, others have just recently left their homes. However, the continuous conflict in some part areas, along with economic decline and climatic shocks, continue to worsen the living conditions of Ethiopia's civilian population and increase the need for humanitarian aid.

Statement of the problem

Internal displacement can have catastrophic effects on IDPs, local government agencies, and the communities that house them. The ability of internally displaced persons (IDPs) to claim and exercise a broad range of fundamental rights can be severely impacted by the loss of access to their homes, land, livelihoods, personal documents, family members, and social networks. This is in addition to the fact that the displacement itself often constitutes a violation of their human rights(11).

Serious psychological effects and mental problems are known to result from traumatic life events caused by war, natural catastrophes, torture, and acts of mass brutality. These traumatic occurrences include deprivation of food, drink, shelter, and medical attention; confinement; physical harm and combat; maltreatment and seclusion; torture; and the subject's or family member's murder or death. Additionally, dose-effect correlations between cumulative trauma and its psychological effects have been documented(12-14).

Globally, there were 59.1 million internally displaced people by the end of 2021, dispersed throughout 59 countries and territories, of which 5.9 million were displaced by natural disasters and 53.2 million by conflict and violence. Of them, 25.2 million were under the age of 18 and 2.7 million were over 65. Ethiopia is home to a growing population of internally displaced people

(IDPs), Burkina Faso, Yemen, Afghanistan, and Ethiopia (4.3, 4.2, 3.5, and 1.5 million, respectively). Moreover, the number of them remained alarmingly high in Colombia, Syria, and the Democratic Republic of the Congo combined, making up about a third of the total worldwide. The worldwide total includes individuals who were forcibly removed from their homes years or even decades ago in addition to those who were displaced last year.15).

Over 20 million people in Ethiopia including internally displaced people (IDPs), returning IDPs, communities affected by crises, returning migrants, and their home communities will require assistance and protection in 2023 as a result of the worsening humanitarian situation in the country in recent years. Ethiopia recognized around 3 million internally displaced people in 2022, and the likelihood of displacement in 2023 and beyond remained high. (16).

Millions worldwide are affected by internal displacements, particularly in low- and middle-income African countries like Ethiopia. These displacements pose a significant health risk due to compromised living conditions and healthcare services. Despite conflict-related displacements, attention is low and response coordination is inadequate. The investigation aims to address these issues.

Rationale of the study

For several factors, there is a major displacement in the South Wollo zone. To give the right kind of help, it is essential to determine the needs and health state of the displaced people. This data is essential for assessing reactions, determining health concerns, and setting priorities for humanitarian aid all of which improve the overall state of affairs.

Literature Review

Over 59 million people worldwide are internally displaced due to conflict, violence, and natural disasters. These individuals often live in crowded, filthy areas with limited employment opportunities. The pandemic has worsened these conditions, particularly in the East and Horn of Africa and the Great Lakes area. In Borno State, Nigeria, 80.3% of displaced people use boreholes for drinking water (4, 15,17).

The 2004 border referendum displaced 60,000 people along the Somali-Oromia regional boundary, including Oromo and Somali IDPs. The 2007 fighting between the ONLF and the military left

20,000 people displaced in Oromia, 60,000 in Gambella, and 62,000 in Tigray. Unofficial evidence suggests 25,000-30,000 internally displaced people in SNNPR.(18).

In a study conducted in Moyale, Ethiopia, handwashing with soap was uncommon in all study groups during critical periods. Twenty percent of the important occasions were observed with soapy hands in the group that got liquid soap (19).

While both men and women (along with children) suffer greatly from the devastating effects of war and armed conflict that result in displacement, men and women are probably more vulnerable in various ways. Men are more likely to be involved in direct combat and be in war situations, whereas women are more likely to experience abuse, rape, and to shoulder a greater family load (20, 21).

As a result of trauma, women are generally more than twice as likely as men to acquire post-traumatic disorder. The coping mechanisms used by the two genders and their perceptions of the level of social support are probably going to vary(22-24).

Recognizing that such socioeconomic inequities can be reinforced in humanitarian crises, the 2007 Humanitarian Appeal for Ethiopia includes the protection of women and girls as well as children in general as a cross-cutting problem(25).

Social support is considered protective even though the underlying physiological mechanisms are still being investigated. This is because social support provides emotional and material nourishment, acts as a buffer against the negative effects of stress and trauma, and helps remove potentially stressful factors from the environment(26-28).

An estimated 4.51 million persons were internally displaced in the nation as of June 30, 2022. The conflict which includes the spread of the Tigray conflict into Afar and Amhara as well as more localized conflicts like intercommunal violence—is mostly to blame for the internal displacement; these conflicts have occasionally been instrumentalized and connected to the Northern crisis, most notably in the Benishangul Gumuz, Oromia, and Somali regions(4).

In the Amhara region, as of March 23, 2023, there were 950,618 registered internally displaced people living in host communities and communal IDP sites. 64,436 IDPs were living at 50 different communal locations (29).

In the south Wollo zone, there were 44,912 internally displaced people living in host communities and collective sites. In eight districts and fourteen collective sites were 16,755 and 28,155 in the host community and collective sites, respectively(30).

Objectives

General objective

To assess the health and health-related issues of internally displaced people living in South Wollo Zone, Amhara region, Ethiopia.

Specific objectives

- To evaluate the current conditions of displaced individuals living in the South Wollo Zone, Amhara region, Ethiopia.
- To identify the needs and gaps affecting those residing in the South Wollo Zone, Amhara region, Ethiopia.
- To assess the needs of internally displaced persons in the South Wollo Zone, Amhara region, Ethiopia, and examine the impact of the disaster on their health, nutrition, and WASH (Water, Sanitation, and Hygiene) conditions.

Methods and Materials

Study Setting

South Wollo zone, 401 kilometers northeast of Ethiopia's capital, has a population of 2,993,729 and covers 18,406.9 square kilometers. It has 20 Woreda, 3 Town administrative, 517 rural and 41 urban Kebele, and 707 health facilities. However, 44,912 individuals have been displaced and residing in camps and host communities in 8 districts (tehuledere, Kallu, argoba, delanta, kutaber, tenta, mekane Selam, saint, and Albeko) and 14 collective sites. List of collective sites Senkele/Medina, Mekane Selam, Degan, wegel tena, Kutaber, Masha, DebreZeit, Koreb, Jari, Mekane Eyesus, Turkesh Camp, Tenta Youth Center, and Bistima.

Study period

The disaster assessment was conducted from May to June 2024

Study Design

A descriptive cross-sectional study design was conducted to assess health and health-related problems among internally displaced persons residing at Jari, Turkish, Mekane Eyesus, Degan, Harbu, and Medina internally displaced persons sites, South Wollo Zone, Amhara region, Ethiopia.

Study population

During the assessment, the study population were all internally displaced persons residing at Jari, Turkish, Mekane Eyesus, Degan, Harbu, and Medina internally displaced persons sites, South Wollo Zone, Amhara region, Ethiopia.

Sample size and sampling process

Three districts, out of the eight districts with IDP sites, were chosen using a basic random lottery process. Tehuledere, Kallu, and Argoba were the districts that were chosen. The study covered all six (Jari, Turkish, Mekane Eyesus, Degan, Harbu, and Medina) IDP sites in the districts that were chosen.

Data collection tools and procedure

A standard checklist that was adopted from the CDC/UNICEF was used to gather comprehensive data on health and health-related response data over three months, from May to June, at the temporary sites of those internally displaced people (Jari, Turkish, Mekane Eyesus, Medina, Harbu, and Degan), as well as daily and weekly reports from health workers. Additionally, information was gathered by watching the locations' various activities and the surrounding area.

Data analysis and procedures

Microsoft Word and Excel were used to verify, input, and compile the gathered data to organize and analyze it. The analysis's key conclusions were conveyed through pivot table-based text, tables, graphs, charts, and figures.

Ethical consideration

Ethical considerations were thoroughly addressed within the framework of the government structure of the study area.

Dissemination of the result

The disaster summary report was distributed to the study area district health office and presented to the Addis Ababa School of Public Health.

Result

Demographic Information

In total, 9655 Households with 44,912 internally displaced people were living in the South Wollo Zone in host communities and camps across 8 districts (Tehuledere, Kallu, Kutaber, Borena, Mekdella, Worebabo, Tenta, and Argoba special district) with 14 total sites, according to the South Wollo Zone situational report. Of those, 16,755 (37.3%) were living in collective sites and 28,155 (62.7%) in the host community. Six temporary communal sites were identified within the chosen district: three (50%) were located in Tehuledere, two (33%) in Kallu, and one (17%) in Argoba. 12,585 displaced people were residing in camps at the research sites. Of them, 6586 (53%) and 5845 (47%) were female and male.

Table 37 Demographic information of internally displaced persons at Tehuledere, Kallu and Argoba special districts, South Wollo Zone, Amhara region, Ethiopia, 2023.

District Name	Name of collective site	Households	Total Population	Male	Female	Under-1 year	Under-5 Years	6 months -15 years	Reproductive age groups (15-49)
Tehuledere	Jari	460	1495	726	769	54	98	504	291
	Mekane Eyesus	416	1356	671	685	36	233	498	326
	Turkish Camp	513	1952	899	1053	105	252	787	780
Kallu	Degan	465	1760	852	908	100	297	785	463
	Harbu	952	3331	1445	1886	96	460	543	455
Argoba Special	Medina	691	2691	1252	1439	119	521	1225	569
Total		3497	12585	5845	5845	510	1861	3340	2884

Health Care Services at IDPs Camps

There isn't a health facility accessible in the collective IDP sites. Displaced people do, however, receive medical care from the surrounding medical institutions' districts. Providers of mental health and psychosocial support are mobile psychiatric practitioners stationed at the temporary IDP sites. When all IDP camps were assessed, 12,066 individuals from the outpatient departments of the surrounding health centers received treatment. One stroke-related mortality occurred at the Jari IDPs site, out of 49 (0.4%) admission cases from all sites.

Argoba Special District Temporary IDPs collective site (Medina)

Every household in the Medina temporary communal site has a kupon (Ticket), which allows all household members to freely utilize the medical services offered by the Medina Health Centre. At the Medina Health Centre, 1,464 displaced people from the Medina IDPs settlement received medical attention. Of them, 339 (23%) were younger than five years old, and 1,125 (77%) were adults. The primary cause of illness among adults at the Medina IDP site is respiratory tract infection, which accounts for 12.2%, 7.9%, and 7.4% of all cases, respectively. Dyspepsia and helminthiasis follow in order of prevalence.

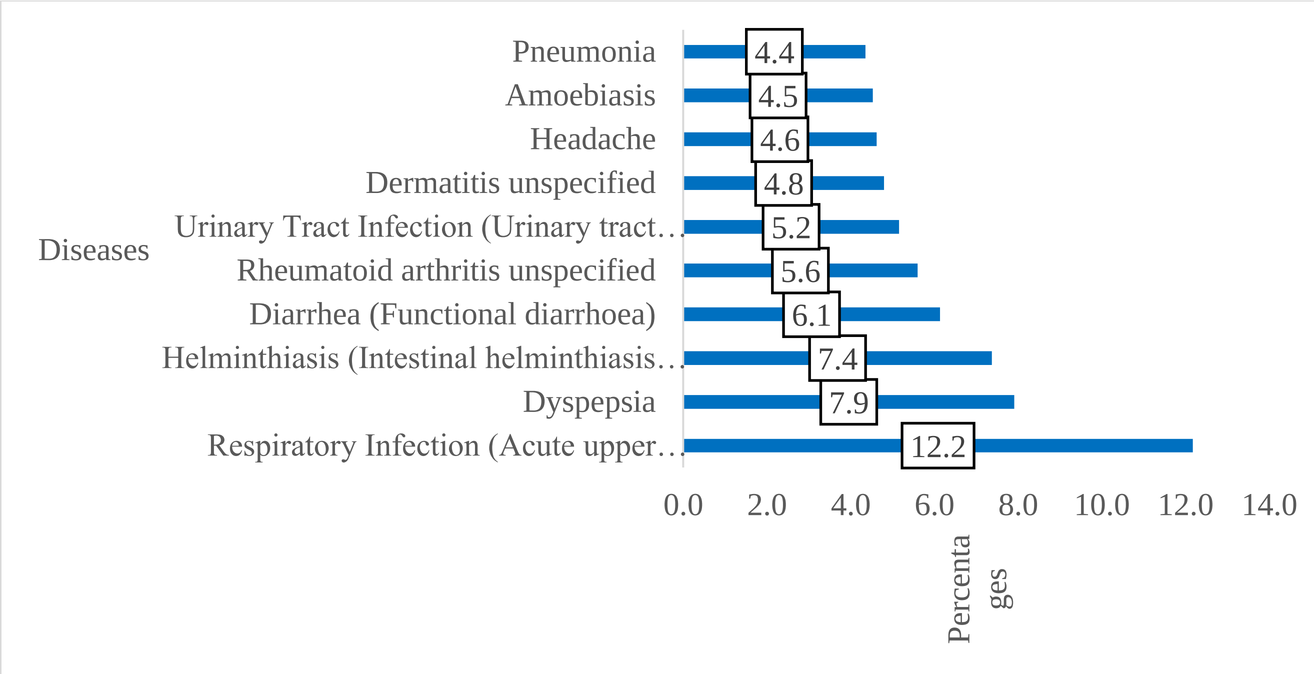

Figure 63 Top ten diseases causing morbidity among Adults in Argoba district, Medina IDPs sites, South Wollo zone, Amhara region, Ethiopia, 2024.

Respiratory tract infection following functional diarrhoea and conjunctivitis were the leading causes of morbidity among under-five children in Medina camp

Table 38 Top ten diseases causing morbidity among under five years children in Argoba district, Medina IDPs sites, South Wollo zone, Amhara region, Ethiopia, 2023.

Rank	**Diseases**	**Cases**	**From all cases (%)**
1	Acute upper respiratory infection	59	17.4
2	Diarrhea (Functional diarrhoea)	49	14.5
3	Conjunctivitis	38	11.2
4	Pneumonia	34	10.0
5	Helminthiasis	34	10.0
6	Amoebiasis	18	5.3
7	Dermatitis unspecified	15	4.4
8	Diarrhea (Shigellosis due to Shigella dysenteriae)	14	4.1
9	Allergy (Allergy unspecified)	11	3.2

10	Urinary Tract Infection	10	2.9
Sum of top 10 cases		282	83.2
Sum of all cases		339	100

Tehuledere District Temporary IDPs collective sites (Mekaneyesus, Turkish camp and Jari)

At the Haik health centre, 4441 displaced people from the three IDP settlements received medical attention. Thirteen hundred and ninety-nine (31%), of them were children under five, and thirty-four (69%) were adults. The most common causes of adult morbidity at the Turkish, Mekane Eyesus, and Jari IDP camps, respectively, were acute upper respiratory tract infections (13.8%), pneumonia (15%), and shigellosis caused by Shigella dysenteriae (19%).

Table 39 Top ten diseases causing morbidity among adults in Tehuledere IDP sites, South Wollo zone, Amhara region, Ethiopia, 2024

Turkish IDPs Camp				**Mekane Eyesus IDPs Camp**			**Jari IDPs Camp**		
Rank	Diseases	Cases	From all cases (%)	Diseases	Cases	From all cases (%)	Diseases	Cases	From all cases (%)
1	AURTI	60	13.8	Pneumonia	65	15.0	Shigellosis	134	19.0
2	Amoebiasis	58	13.4	AURTI	63	14.6	AURTI*	121	17.1
3	Dyspepsia	51	11.8	Dyspepsia	48	11.1	Dyspepsia	109	15.4
4	Helminthiasis	50	11.5	Helminthiasis	47	10.9	Helminthiasis	69	9.8
5	Typhoid Fever	48	11.1	Typhoid Fever	45	10.4	Typhoid Fever	45	6.4
6	Pneumonia	41	9.4	Diarrhoea	38	8.8	Pneumonia	56	7.9
7	Shigellosis	38	8.8	UTI	35	8.1	Amoebiasis	53	7.5
8	UTI	35	8.1	Typhus fever	34	7.9	UTI**	36	5.1
9	Conjunctivitis	28	6.5	Anaemia	30	6.9	Scabies	45	6.4
10	Scabies	25	5.8	Conjunctivitis	27	6.3	Conjunctivitis	39	5.5
Sum of top 10 cases		434	100	432		100	707		100
Sum of all cases		870	49.9	834		51.8	1350		52.4

In all, 1397 patients from the three IDP camps at Haik Health Centre were seen in the under-5 outpatient section. The main cause of illness for children under five in the Tehuledere IDP camps is functional diarrhea.

Table 40 Top ten diseases causing morbidity among under-5 years children in Tehuledere IDPs sites, South Wollo zone, Amhara region, Ethiopia, 2023.

Turkish IDPs Camp				**Mekane Eyesus IDPs Camp**			**Jari IDPs Camp**		
Rank	Diseases	Cases	From all cases (%)	Diseases	Cases	From all cases (%)	Diseases	Cases	From all cases (%)
1	Diarrhea	35	8.1	Diarrhea	30	6.9	Diarrhea	50	7.1
2	AURTI	30	6.9	Tonsillitis	28	6.5	AURTI	45	6.4
3	Pneumonia	28	6.5	AURTI	27	6.3	Tonsillitis	48	6.8
4	Tonsillitis	25	5.8	Pneumonia	25	5.8	Pneumonia	36	5.1
5	Otitis media	21	4.8	Otitis media	20	4.6	Fever	29	4.1
6	Helminthiasis	19	4.4	Helminthiasis	17	3.9	Anaemia	25	3.5
7	Shigellosis	18	4.1	Amoebiasis	16	3.7	Amoebiasis	20	2.8
8	Fever***	15	3.5	common cold	14	3.2	Otitis media	17	2.4
9	Scabies	12	2.8	Scabies	13	3.0	common cold	14	2.0
10	Allergy	10	2.3	Fever	9	2.1	Scabies	11	1.6
Sum of top 10 cases		213	100		199	100		295	100
Sum of all cases		434	49.1		403	49.4		560	52.7

Kallu District Temporary IDPs collective site (Degan and Harbu)

At the Harbu and Degan health centers, 6151 displaced people from the two IDP settlements received medical attention. Of these, 1653 (27%) were children under five, and 4498 (73%) were adults. The most common cause of morbidity in adult IDP camps in Kallu district is dyspepsia.

Table 41 Top ten diseases causing morbidity among adults in Kallu district IDPs sites, South Wollo zone, Amhara region, Ethiopia, 2023.

Degan IDPs Camp				*Harbu IDPs Camp*		
Rank	Diseases	Cases	From all cases (%)	Diseases	Cases	From all cases (%)
1	Dyspepsia	178	41.0	Dyspepsia	326	75.5
2	Pain (Pain in joint)	176	40.6	Headache	303	70.1
3	Headache	129	29.7	Pain (Pain in joint)	285	66.0
4	Typhoid Fever	111	25.6	AURTI	199	46.1
5	AURTI	108	24.9	Diarrhea	198	45.8
6	UTI	105	24.2	Helminthiasis	173	40.0
7	Diarrhea	98	22.6	UTI	152	35.2
8	Allergy	89	20.5	Typhoid Fever	151	35.0
9	common	62	14.3	Dermatitis	149	34.5
10	Low Back Pain	59	13.6	Hypertension	94	21.8
The sum of top 10 cases		1115	100	2030		100
The sum of all cases		1563	71.3	2935		69.2

Table 42 Top ten diseases causing morbidity among under-5 years children in Kallu district IDPs sites, South Wollo zone, Amhara region, Ethiopia, 2023.

Degan IDPs Camp				**Harbu IDPs Camp**		
Rank	Diseases	Cases	From all cases (%)	Diseases	Cases	From all cases (%)
1	Diarrhea	94	21.7	Diarrhea	218	50.5
2	AURTI	72	16.6	AURTI	138	31.9
3	Conjunctivitis	52	12.0	Conjunctivitis	96	22.2
4	Shigellosis	46	10.6	Tonsillitis	88	20.4
5	Helminthiasis	45	10.4	Helminthiasis	86	19.9
6	common cold	45	10.4	Pneumonia	61	14.1
7	Allergy	37	8.5	Shigellosis	61	14.1
8	Pneumonia	36	8.3	common cold	57	13.2
9	Tonsillitis	31	7.1	Dermatitis	44	10.2
10	Dermatitis	24	5.5	Fever (unspecified)	41	9.5
Sum of top 10 cases		482	100	890		100
Sum of all cases		572	84.3	1081		82.3

Morbidity by Person From the total out-patients treated in those IDPs sites, 6443(53.4%) of them were females, and 8677(71.9) were adult

Table 43 Morbidity by sex and age in Argoba, Kallu and Tehuleder district IDP sites, south Wollo zone, Amhara region, Ethiopia, 2023.

District Name	Name of collective sites	Male (%)	Female (%)	Total	Under-5 Years children (%)	Adult (%)	Total
Tehuledere	Jari	930(48.7)	980(51.3)	1910	560(29.3)	1350(70.7)	1910
	Mekane Eyesus	563(45.5)	674(54.5)	1237	403(32.6)	834(67.4)	1237
	Turkish Camp	606(46.5)	698(53.5)	1304	434(33.3)	870(66.7)	1304

Kallu	Degan	1015(47.5)	1120(52.5)	2135	572(26.8)	1563(73.4)	2135
	Harbu	1879(46.8)	2137(53.2)	4016	1081(26.9)	2935(73.1)	4016
Argoba	Medina	630(43.0)	834(57)	1464	339(23.2)	1125(76.8)	1464
Total		5623(46.6)	6443(53.4)	12066	3389(28.1)	8677(71.9)	12066

Essential Health Services at IDPs Camps

Maternal Health Service

In all of the IDP's temporary group sites, there are 133 expectant mothers. In the nearby health centres, 33 women receive prenatal care, and 19 mothers receive expert delivery and aftercare.

Table 44 Maternal health services given to women residing in Argoba, Kallu, and Tehuledere IDP sites, south Wollo zone, Amhara region, Ethiopia, 2023.

Name of District	Name of IDP site	Total Pregnant Mothers	ANC 1st service	ANC 4th service	Delivery	PNC	SAFP	LAFP
Argoba	Medina	30	25	10	2	1	23	2
Tehuledere	Mekane Eyesus	12	10	5	1	0	16	1
	Jari	16	14	8	1	1	23	18
	Turkish Camp	40	30	13	3	1	15	4
Kallu	Degan	23	17	14	2	1	24	3
	Harbu	12	10	7	1	1	19	5
Total		133	106	62	10	5	120	32

Child Health Services

At all districts of IDPs camps, Vitamin A, growth monitoring, and deworming services were not given to eligible children. Immunization service is not given at the sites and it is not programmable.

Table 45 Immunization services given to under-one-year-old children residing in Argoba, Kallu, and Tehuledere IDP sites, south Wollo zone, Amhara region, Ethiopia, 2023.

District Name	Name of collective site	Under-1 year	BCG	Penta1	Penta 3	MCV1	MCV2
Tehuledere	Jari	54	1	31	2	13	21
	Mekane Eyesus	36	1	20	3	1	1
	Turkish Camp	105	2	71	23	3	1
Kallu	Degan	100	1	95	8	4	1
	Harbu	96	2	50	32	23	13
Argoba Special	Medina	119	3	19	6	5	3
Total		510	10	286	74	49	40

Nutritional Screening

All IDP locations conducted nutritional screenings for children under five years old, pregnant women, and nursing mothers. 969 (53%) of the 1831 under-five children had their nutritional status evaluated. 161 (16.6%) of those kids reported dietary issues.

Table 46 Under five nutritional screening done at Argoba, Kallu, and Tehuledere District IDPs sites, south Wollo zone, Amhara region, Ethiopia, 2023.

District Name	Name of collective site	# of under-5 years	# of under-5 years screened (%)	# of SAM cases (<11.5 cm	# of MAM cases	#of SAM linked to OTP/ SC (%)	#of MAM linked to TSF (%)

				or edema) (%)	(11.5-12 cm) (%)		
Tehuledere	Jari	98	54	3	5	1	2
	Mekane Eyesus	233	123	5	12	2	7
	Turkish Camp	252	159	7	23	3	10
Kallu	Degan	297	120	9	8	4	5
	Harbu	460	213	8	32	7	13
Argoba Special	Medina	521	300	9	40	5	19
Total		1861	969	41	120	22	56

Nutritional screening was also done for Pregnant and Lactating women across all IDPs sites. Among 1339 Pregnant and Lactating women,750(56.4%) of them were screened for nutrition. Of all screened,10(1.3%) developed severe acute malnutrition 48(6.4%) of Pregnant and Lactating women were moderately acute malnutrition and all 58(100%) of them were linked to TSFP.

Chronic Illness

Communicable Diseases

There were 14 HIV and 18 TB patients in each of the IDP camps, and they received medical care from the surrounding health centers in each district.

Table 47 Communicable diseases at Argoba, Kallu and Tehuledere District IDPs sites, south Wollo zone, Amhara region, Ethiopia, 2023.

District Name	Name of IDPs site	HIV Patients (%)	TB Patients (%)
Argoba	Medina	1(6.7)	2(11.0)
Tehuledere	Mekaneyesus	1(6.7)	1(5.6)
	Jari	1(6.7)	12(66.6)

	Turkish Camp	1(6.7)	1(5.6)
Kallu	Degan	9(60)	1(5.6)
	Harbu	2(13.2)	1(5.6)
Total		15(100)	18(100)

Non-communicable Diseases

Nineteen-four patients had non-communicable diseases among the displaced people. Out of all the patients, 86 (44.3%) had hypertension, and 8 (4.0%) had cardiovascular illnesses. Of these, 4 (50%) were from the Turkish and Degan IDP camps. Seventy (87.5%) of those with mental health disorders were female.

Table 48 Non-chronic Communicable diseases at Tehuledere, Kallu, and Argoba District IDP sites, south Wollo zone, Amhara region, Ethiopia, 2023.

District Name	Name of collective site	DM *(%)	Mental Health Disorder (%)	Hypertension (%)
Tehuledere	Jari	3(15)	35(43.8)	8(9.3)
	Mekaneyesus	2(10)	3(3.8)	7(8.1)
	Turkish Camp	2(10)	33(38.4)	21(24.4)
Kallu	Degan	5(25)	8(10)	10(11.6)
	Harbu	5(25)	0(0.0)	36(41.9)
Argoba	Medina	3(15)	1(1.3)	4(4.7)
Total		20(100)	80(100)	86(100)

Water Supply, and Sanitation and Hygiene (WASH)

Water

Sanitation and water supply continued to be major issues in the IDP settlements during the assessment. During the assessment period, the IDPs from Degan and Mekaneyesus were not provided with access to clean drinking water or sanitary services. Protected sources, including tape and tanker water for bathing and dishwashing, were the main sources of drinking water for the displaced people. Nevertheless, the water supply from these sources is not steady; in particular, the water used at the Mekaneyesus location only flowed for a week, providing 4.4 liters per person per day for cooking, hygiene, and survival needs. This water did not flow every 24 hours. The water supply is located outside of their compound and is roughly thirty to forty minutes away from the site; they did not receive enough

Hygiene and sanitation

The accessibility or availability of latrines for shared sites differed amongst sites. Every IDP site has communal latrines built. At the Mekane Eyesus IDPs site, the latrine seat-to-population ratio is 1:31; at the Harbu IDPs site, it is 1:151. One latrine seat for every 69 individuals was the overall seat-to-population ratio from the study sites. The restrooms for men and women were not classified at any of the IDP camps. There is never a hand washing station open during prime study hours at any of the study sites. Open spaces for defecation are seen at all sites. The majority of the latrines are poorly built. It was difficult to find places for collective campers to dispose of both liquid and solid garbage. The only places where bathing facilities are built are Jari and Turkish

Table 49 Latrine availability at Tehuledere, Kallu, and Argoba District IDP sites, south Wollo zone, Amhara region, Ethiopia, 2023.

District Name	Name of collective site	Total Population	Number of Latrine Seats	Latrine seat-to-population ratio	Standard
Tehuledere	Jari	1495	28	1:53	1:50
	Mekane Eyesus	1356	44	1:31	1:50

	Turkish Camp	1952	20	1:98	1:50
Kallu	Degan	1760	46	1:38	1:50
	Harbu	3331	22	1:151	1:50
Argoba	Medina	2691	22	1:123	1:50
Total		12585	182	1:69	1:50

Food, Shelter, and non-food items

Food distribution for internally displaced persons in districts is not regular and lasts 3-4 months. 12585 IDPs live in crowded temporary shelters without separation, with no electricity access in Medina and Degan. Most, especially children and mothers, lack adequate clothing and poor sanitation. ITN distribution is not done due to malaria-endemic areas. Food and shelter issues are the main concerns in all visited sites.

Social mobilization and health education

Since health education and social mobilization constituted the cornerstones of the IDP response, no data about social mobilization has been recorded. Health education on communicable diseases such as COVID-19, TB, HIV, STDs, and others is provided to 2150 internally displaced people.

Availability of logistics and Supply

The local health institutions are struggling to provide treatment for internally displaced people due to a lack of medical supplies and logistics. In particular, there is a dearth of drugs for long-term conditions like mental illness, hypertension, and diabetes mellitus. Additionally, there's a lack of painkillers. Based on our checklist, we were able to detect that health facilities housing internally displaced people were lacking in several important drugs at the woreda level. The list of missing medications for IDPs at the woreda and health institution levels is displayed below.

Table 50 List of logistics at Argoba, Kallu and Tehuledere District IDP sites, south Wollo zone, Amhara region, Ethiopia, 2023.

		Availability		Remark
Sr. no	Name of logistics	Yes	No	
1	Ringer lactate	Yes		But not Enough
2	ORS		No	
3	Water treatment chemicals		No	
4	Amoxicillin	Yes		
5	Ceftriaxone		No	
6	Ampicillin injection		No	
7	Formula milk		No	
8	RUTF/ Plumpy nut		No	
9	Metronidazole capsule	Yes		
10	Adrenaline injection	Yes		
11	Dextrose 40%		No	
12	Examination gloves	Yes		
13	Artemether- Lumefantrine	Yes		
14	Malaria RDT		No	
15	RDT for cholera		No	
16	Insulin (all type)		No	
17	Anti-Hypertensive drugs		No	
18	Psychotic drugs		No	

There was no provision for malnourished pregnant women and children. Apart from the previously mentioned supplies and logistics, there was also a scarcity of blankets, pillows, and beds. Not all of the IDP sites had menstruating women's hygiene and sanitation protection items, such as napkins.

Human resource

As stated above, there are only two psycho-social professions were deployed to give a humanitarian response to the victims.

Surveillance

A hard copy of the rumor logbook for each disease linked to surveillance is available at the IDP sites, but it is also available independently at the surrounding medical facilities. Diseases like chickenpox, diarrhea, and malaria cases were recorded both instantly and every week in the assessment sites. Of them, an outbreak of diarrhea and chickenpox happened at the Jari and Degan communal sites, respectively. There were reports of 30 diarrhoeal illnesses and 56 cases of chicken pox, but no fatalities at any location. Additionally, a total of 17 malaria cases—10 male and 7 female—were reported at all IDP locations. Every case of malaria has been observed in adults. All instances that were reported were handled appropriately, but after three days, both outbreaks were discovered and confirmed.

Surveillance data were collected from each IDP site and report committees and by assigned IDPs surveillance focal persons together with the rapid response team to collect the situation of IDPs daily. Then the delegated person reports it to the Woreda, the Woreda collects and analyzes the data and shares it with the zonal Health department and the zone sends it to Amhara Public Health Institute.

Figure 64 Kitchen, water, and latrine facilities of IDPs of South Wollo, Amhara region, June 2024

Discussion

IDPs in camps lack adequate facilities and rely on neighboring health centers for medical care. Common communicable diseases, particularly respiratory tract infections, and diarrhea, are prevalent. Overcrowding, inadequate ventilation, and sanitary conditions exacerbate exposure. District health authorities are concerned about vaccine-preventable infections due to poor response and integration.

It is crucial to do nutritional screenings in emergencies for children under five, nursing mothers, and pregnant women. Nutritional screening is conducted for nursing women and children under five at all sites. Since there is insufficient food and other support for health services in the sites, the target population will grow, necessitating the completion of this action to screen them.

There are poor hygiene and sanitation practices like open defecation, the absence of liquid and solid waste disposal, lack of hand washing facilities, at collective sites are below the standard(9). This could be due to a lack of WASH resources, such as water supplies, or to inadequate awareness and application of sanitation and hygiene.

Safe water is one of the priorities needs of the displaced population. The water availability differs between sites and some sites are facing a difficult situation. The recommended standard for water queuing time and quantity are less than 30 minutes and 7.5 liters/person/day at IDPs in Ethiopia, but except at the Harbu IDPs site, all IDPs sites have water supply with below the standard for the time for queuing and quantity, which ranges from 30- 40 minutes of queuing and 4.4 to 6.5 liters/person/day respectively(31). Provision of water supply and sanitation are still critical challenges mainly at Medina and Mekaneyesus temporary IDP collective sites. Overall, these IDPs reported that they did not have access to a shower except for Jari and Turkish sites.

The ratio of latrines to the population in the displaced persons was one seat to 69 individuals, which was less than the SPHERE standards of one sit of a latrine for 50 individuals(31). This might be due to a weak preparedness plan and limited resources for the response of internally displaced persons.

At every stage of a disaster, having a place to live is essential. Beyond only allowing oneself to survive, shelter is essential for security and safety, climate protection, and improved disease resistance. Additionally, it is critical for maintaining human dignity and, to the greatest extent feasible, family and community life under trying conditions (9). The temporary settlement/collective sites have not been chosen anticipatorily, this will result in overcrowding and poor sanitation conditions. IDPs residing in critical shelters most frequently mentioned problems with general shelter conditions and overcrowding: Open windows, too tiny, a lack of privacy inadequate bedding. Overcrowding was one of the observed problems at the sites this overcrowding and protracted displacement will also increase the risk of a further spreading of disease.

All the residents were settling in the malaria-endemic area, but there was no ITN distributed for them. Providing and ensuring ITN for all residents was recommended in this settlement(9). Shortage of ITN and a high presence of vectors will raise the risk of vector-borne diseases transmission of disease especially for malaria.

There is a shortage of medical supplies and logistics which are giving services for internally displaced persons in the nearby health facilities. Specifically, there is a lack of medication for chronic diseases like diabetes mellitus, Hypertension, and Mental health disorders. This might be due to the high number of utilized population (194) and the shifting of the supporters to other sites in the county.

Outbreaks happened at the Degan and Jari IDP sites throughout the research period, although all cases were reported and confirmed three days later. which, by the WHO norm, is late because it has to be confirmed and reported within 24 hours(9, 32). This could be the result of inadequate communication, a shoddy surveillance system, and the absence of a healthcare provider at the camp.

Conclusion

Internally Displaced Persons (IDPs) in the assessed regions face severe challenges in accessing adequate medical care, with heavy reliance on neighboring health centers due to insufficient facilities within the camps. The prevalence of communicable diseases, particularly among children under five, is exacerbated by overcrowding, poor ventilation, and inadequate sanitation. The lack of vaccination programs, combined with poor coordination among medical facilities, raises concerns about the spread of vaccine-preventable diseases. Despite ongoing nutritional screenings, the growing population and insufficient food and support services necessitate expanded efforts. Substandard hygiene and sanitation, critical water shortages, inadequate shelter conditions, and a lack of medical supplies further compromise the well-being of IDPs

Recommendations

To address these challenges, the following actions are recommended:

Enhance Healthcare Infrastructure: Improve the capacity of camps by establishing adequate medical facilities and ensuring a consistent supply of essential medications, particularly for chronic diseases.

Implement Vaccination Programs: Develop and execute vaccination initiatives to protect displaced children and other vulnerable populations from preventable diseases.

Improve WASH Services: Increase the availability of clean water, proper sanitation facilities, and hygiene education to reduce the spread of infections.

Expand Nutritional Support: Scale up nutritional screening and support programs to meet the growing needs of the IDP population, ensuring that vulnerable groups receive necessary assistance.

Strengthen Surveillance and Response Systems: Enhance disease surveillance, communication protocols, and timely outbreak reporting to meet WHO standards and effectively manage public health threats.

Provide Adequate Shelter: Ensure that temporary settlements are appropriately planned to prevent overcrowding and maintain sanitary living conditions, including the distribution of ITNs to mitigate the risk of malaria and other vector-borne diseases.

Foster Coordination Among Health Facilities: Improve integration and coordination among neighboring health centers and camp-based services to provide a unified and efficient response to the healthcare needs of IDPs.

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CHAPTER-VIII THESIS

8. Knowledge, attitude, and practices of professionals on the tackling of antimicrobial resistance, residue, and use in federal institutions in Ethiopia in a one health approach: mixed approach qualitative and quantitative, 2024.

ABSTRACT

Introduction: Antimicrobial resistance poses a global threat to human, animal, plant, food, and environmental health, necessitating multisectoral and multidiscipline professional involvement to tackle this challenge. The study aimed to assess the knowledge, attitude, and practices of professionals in Ethiopian federal institutions regarding antimicrobial resistance and its use in 2024. The study identifies KAP gaps and application challenges, providing evidence to help policymakers design effective AMR prevention and control strategies, enhance multi-sectoral collaboration, and support future research.

Methods: Using quantitative and qualitative research approaches, an institution-based cross-sectional study design was employed from January to June 2024. The study used stratified samples based on existing institutional structures as strata, using random sampling to assess knowledge, attitudes, and practices in each sector, and purposely selecting participants for key-informant interviews. Data was collected using the Kobo toolbox, exported to Excel, and analyzed using SPSS version 26. Binary and multivariable logistic regression was used to examine the independent variable's association with the outcome variable. Important variables were identified through multivariable analysis with a p-value of 0.05 or lower.

Result: 422 of the professionals who were contacted completed the survey, yielding a 99.98% response rate. The majority of the sample, or 309 (73.2%), were men. Between 25 and 55 years old was the age range of the respondents, with a mean age of 36.28 years (SD=6.68 years). Nearly 64.9%, 56.6%, and 53.6% of respondents had good knowledge, a positive attitude, and good practice respectively. It was also found that there was a statistically significant ($p < 0.05$) disparity between the knowledge level of respondents with Age, Gender, AMR-related training, and professional qualifications. The respondents' attitude levels were also significantly associated ($p < 0.05$) with age, gender, AMR-related training, and professional qualifications. Respondent's practice levels were also significantly associated ($p < 0.05$) with age, gender, education level, training related to AMR, and professional qualifications are significant factors influencing the practice levels of professionals towards AMR and AMU in federal institutions in Ethiopia.

Conclusion: In the current study, about more than half of the respondents had good knowledge, a positive attitude, and good practices regarding AMR, AMU, and residue. The result showed a significant knowledge, attitude, and practice gap regarding AMR and AMU on professional sociodemographic characteristics. So, one health approach of multisectoral collaboration and coordination is crucial to enhance the KAP of professionals regarding AMR and AMU.

Keywords: knowledge, attitude, practice, AMR, AMU and one health

1. INTRODUCTION

1.1 Background of the Proposed Research Plan

Antimicrobial discovery labeled them as miracle drugs, which are vital medicines in the prevention & treatment of infections, but their effectiveness is under threat by the development and spread of drug-resistant organisms or Antimicrobial Resistance (AMR). Antimicrobial resistance (AMR) refers to a microorganism's capacity to survive and multiply despite the presence of higher concentrations of an antimicrobial agent compared to its susceptible counterpart within the same species(1, 2). The improper use and overuse of antimicrobials in human and animal health, as well as in food production, combined with insufficient infection control measures, are speeding up the development of resistance. Once these resistance traits emerge, they can quickly spread between humans, animals, and the environment(3, 4).

Drug-resistant illnesses are thought to be the cause of at least 700,000 deaths annually. Every year, AMR makes life-saving medical treatments considerably risky and an increasing number of common diseases incurable. If antimicrobial resistance is not addressed, it may result in up to $100 trillion in costs and 10 million annual deaths by 2050. The biggest impact likely will be in Asia and Africa, which likely would cause for an estimated 4.7 million and 4.2 million deaths, respectively AMR might put up to 24 million people into extreme poverty (2, 5, 6). According to a recent estimate, bacterial antimicrobial resistance (AMR) caused 1.27 million fatalities worldwide in 2019 (7).

The most important factors for the existence of Antimicrobial are irrational drug-related problems, Poor husbandry, hygiene, and agriculture waste management, Lack of regulation and oversight, Poor therapy adherence, non-therapeutic use, and Poor quality antibiotics(2, 8)

AMR is influenced by gender and other pertinent socioeconomic strata, such as occupation, income, age, location, and educational attainment. Due to biological differences and gender-constructed roles, behaviors, and activities like childbirth, abortion, and pregnancy, women are more likely to be exposed to antimicrobial resistance (AMR). This risk is exacerbated when these events occur in hospital settings that lack adequate safety or hygienic conditions. This includes, among other things, inadequate access to water and sanitary facilities, a lack of cost-effective antimicrobials for treatment and diagnosis, and healthcare personnel who are ignorant of the overuse or abuse of medications. Gender conventions, roles, and relationships, as well as socioeconomic variables like education level and place of employment, have a significant impact on where people work and what they do there(9, 10).

Serious and growing threat to global public health, animal and environmental health, and the burden of AMR varies widely across countries. For example, a recent systematic review published in the Lancet showed the global distribution of AMR and highlighted the endless distribution of this problem. For example, methicillin-resistant Staphylococcus aureus is higher (more than 70%) in South America (Peru and Chile) and Asia (Saudi Arabia, Bangladesh, Iraq, and Mongolia). In Ethiopia, the prevalence of methicillin-resistant Staphylococcus aureus is estimated to be 40-50%. Carbapenem resistance K Pneumonia infection rates are high in India (50-60%) and low in the UK. In Ethiopia, it is estimated that it is 10-20%. The burden of carbapenem-resistant A. baumannii is estimated to be very high (>80%) in Europe and China and (30-40%) in Ethiopia. Third-generation cephalosporin-resistant K. Pneumonia is common (>80%) in Africa, including Ethiopia (7).

Drug-resistant illnesses contributed significantly to mortality in 2019; over 5 million individuals died as a result of these diseases. Almost 1.3 million of these fatalities had an immediate link to antimicrobial resistance. AMR's effects extend beyond human health. In 2017, it was predicted that unmanaged AMR may cause 28 million people to live in poverty and erase 3.8% of the world's gross domestic product annually by the year 2050. The most vulnerable individuals on the planet are those who reside in low- and middle-income nations(11).

Major consequences of AMR are Increased morbidity and mortality, Treatment failure leading to chronic problems, Long a more complicated stays in hospital, Lack of availability of clinically effective antibiotics, Adverse effects of alternative treatments (potentially less effective, possibly more toxic), Treatment with expensive drugs Excess health care costs, Negates technological advances in medical sector, Patient acts as reservoir of resistant organisms which are passed to community and health-care workers Increased burden on health system Huge economic impact (both direct & indirect Decreased societal productivity)

The cattle industry in Ethiopia is expanding quickly and provides the economy of the nation with food, cash, and foreign exchange. Antibiotics are generally used in livestock production for three main purposes: to treat individual animals that have bacterial illnesses, to prevent disease in herds or flocks, and to enhance animal growth. The frequent use of antibiotics in modern animal production methods is linked to selection pressure on microorganisms to develop resistance(8).

Ethiopia has a significant AMR burden, and specimens from humans, animals, food, and the environment all include resistant bacteria. The government has taken several measures to reduce AMR. The nation has completed baseline studies, created a national strategy plan, and is one of the 109 nations that have reported to and enrolled in GLASS. A One Health strategy is the most effective way to handle the issue of AMR resistance levels, which calls for strong policy and intervention strategies (4, 12)

Any intervention must alter the target group's knowledge, attitudes, and practices (KAP) for the changes to be sustained and for it to be effective. this study undertaken by one health-involved federal institution focuses on multisectoral engagement and KAP survey of different professionals towards antimicrobial resistance and use this will enhance national AMR prevention containment effort of the country.

1.2 Statement of the Problem

To stop and manage antibiotic resistance, the government has launched several programs. However, initiatives related to the environment, human health, and animal health do not fully address the prevention and control of antimicrobial resistance. Various studies have shown that antimicrobial resistance in Ethiopia is occurring at alarming rates, impacting the economy and public health. According to the study, in 2019, there were 21,200 AMR deaths and 85,300 AMR-related deaths in Ethiopia. Ethiopia is the country with the 35th highest age-standardized death rate per 100,000 population related to AMR compared to 204 countries. AMR causes more deaths in Ethiopia than maternal and child diseases, cardiovascular diseases, respiratory infections and tuberculosis, intestinal infections, and neoplasms (13).

Although Ethiopia has started AMR prevention and containment implementation early and has done a lot, the government feels that the country lags behind the AMR threats and risks which are still high due to an inadequate multi-sectoral approach, insufficient and low-quality AMR/AMU data, lack of sustainable financing, sub-optimal practices, inadequately trained professionals and the problem of insufficient laboratory and supplies, knowledge attitude and practices gap of implementers at different level (14).To overcome these challenges further study is essential on different aspects.

The study undertaken on knowledge, attitudes, and practices about antimicrobial use (AMU), and antimicrobial resistance (AMR) showed that there was a gap in knowledge, attitude, and practice at different levels among different target groups (15)

The knowledge of patients, communities, livestock producers, health professionals, and students was presented in 20 published pieces. 90.00% of these studies mentioned that study participants had knowledge gaps. Of the 17 papers that evaluated attitudes, 88.23% stated that a disparity existed. Out of the 17 papers that assessed practices, 94.12% mentioned wrongdoing(4)

Antimicrobial resistance knowledge, attitudes, and practices were the subject of a systematic review and meta-analysis (16), which revealed a sizable knowledge and practice gap on AMR among patients, the general public, and animal producers. To address this issue, Ethiopia has adopted a National Action Plan for 2021-2025. The primary implementers and actors of this strategic plan are experts from federal agencies working under one health-involved sector (14)

Therefore, multidisciplinary KAP research is needed to curb AMR from one health perspective. This helps to design effective interventions, assess awareness levels, understand factors, and identify gaps and challenges. This research will be conducted based on scientific evidence, the objectives of the National Strategic Plan, and the experience of the principal investigator.

1.3. Significance of the study

The research Evaluates the efficacy of current policies, guidelines, and interventions to support prudent AMU and combat AMR. Identify gaps and challenges in the knowledge and application of appropriate AMU and AMR prevention methods. The study findings will encourage giving evidence to decision-makers which will help to design effective interventions for AMR prevention and containment efforts in the country.

This study will also aid in improving multi-sectoral collaboration to tackle antimicrobial resistance in one health approach, increase professional understanding in the field, and serve as data for policymakers. Besides this, the findings of this study could serve as the starting point for future research

2. LITERATURE REVIEW

2.1 multi-sectorial effort and Gaps in one health perspective to tackle AMR

Globally, the danger of emergent health hazards is rising due to dynamic changes and destabilization at the interfaces of animal, human, and environmental health (17, 18). To maintain the best possible health and well-being in the face of these risks, coordination and collaboration throughout several sectors are crucial. To increase efficiency and effectiveness in controlling health concerns, the One Health approach which is described as the integrative effort of several sectors striving to obtain optimal health for humans, animals, and the environment involves various cooperation approaches both within and across countries (19, 20).

Microorganisms resistant to antibiotics can proliferate and spread from animals that provide food to humans through direct contact, the food chain, and environmental factors. Thus, AMR is a multisectoral issue that affects how people, animals, and the environment interact. Given that food and feed production systems, agroecological habitats, and human and veterinary health are all involved in and impacted by antimicrobial resistance (AMR), a multisectoral, multidimensional "One Health" strategy is required to prevent it. Antimicrobials prescribed for humans may be identical to or comparable to those used to treat a variety of infectious disorders in animals (21). Resistant germs can spread between humans, animals, and the environment, as well as between nations. AMR does not take into account human-animal or geography (22)

The World Health Assembly has approved the GAP on AMR, which was created in 2015 by WHO in coordination with FAO and OIE. The GAP draws attention to the One Health approach, a transdisciplinary, cooperative, and multi-sectoral strategy that has been accepted as the worldwide framework for facilitating cooperation between various sectors to prevent and contain AMR(21)

As evidenced by the National One Health platform, which entails the active participation of numerous stakeholders, and multiple policy documents that suggest multi-stakeholder and multi-disciplinary approaches to better address complex public health issues, Ethiopia is fully committed to the collaborative, multi-sectoral, and Tran's disciplinary approach. The government supported the implementation of the one-health strategy by endorsing the National One Health Strategic Plan and the Public Health Policy of Ethiopia (1993).

Although Ethiopia has made significant progress and started AMR prevention and containment implementation early, the government believes that the nation lags behind the threats and risks associated with AMR, which are still high due to a lack of a sustainable financing source, subpar practices, inadequate trained professionals, a lack of adequate multi-sectoral approach, and a problem with inadequate laboratory and supplies (14). In this study, I will assess the multi-sectoral gaps among professionals, sectors in both horizontal and vertical direction

2.2 AMR Knowledge, attitude, and practice

Surveys measuring knowledge, attitude, and practice (KAP) are a good way to find out what people know, think, and do about a certain issue. They are typical of a particular group. In studies on health-seeking behavior, they are the most widely utilized research instrument (14). Professionals' knowledge is evaluated to determine how closely it aligns with biological ideas. Attitude has been defined as "a taught tendency to think, feel, and act in a particular way towards a given item or class of objects (23). As a result, attitudes are the result of intricate relationships between values, feelings, and beliefs. Antimicrobial usage is typically a question asked in KAP surveys. Planning successful AMR prevention programs involves learning what the public believes, knows, and does regarding the use of antibiotics.

According to the study, there are significant disparities in university students' understanding and usage of AMU and AMR in Ethiopia (24). This review's pooled random effect meta-analysis showed that patients, the general public, and livestock producers all had a sizable knowledge and practice gap when it came to AMR. Therefore, it is necessary to implement focused educational interventions to increase people's awareness of AMR and create efficient AMR countermeasures (16).

This study will contribute to highlighting an in-depth KAP among different professionals in one health-involved sector. Hence, this study intends to identify KAPs toward antimicrobial usage and antimicrobial resistance among different professionals involved in the prevention and containment of AMR and AMU in one health strategy.

2.3 Antimicrobial use

Drugs like antibiotics, anthelmintics, antiprotozoals, antihistamines, hormones, etc. are used in humans and animals either rationally or irrationally as therapeutic, prophylactic, and growth promoters (22, 25, 26). The goal of rational drug usage is to provide patients with the least expensive medications for both themselves and their community, while still meeting their clinical needs in doses that last for a sufficient amount of time (27). Antimicrobial use must be rational to prevent the emergence of resistance and enhance patient outcomes. A collection of initiatives known as "antimicrobial stewardship" (AMS) is meant to encourage the prudent use of antibiotics (29)

Irrational use of drugs involves overuse, underuse, or misuse of medicines, leading to resource wastage and health hazards. Examples include poly-pharmacy, inappropriate antimicrobial use, injection overuse improper self-medication, disregard for physician recommendations, and noncompliance with dosage schedules(22).

To use medications rationally, patients must receive the appropriate medications at reasonable costs, at the appropriate doses, and for the appropriate length of time. However, the issue in veterinary medicine is so serious that 50% of human medications are prescribed, administered, or marketed improperly, and 50% of patients do not take them as directed(25, 28)

A systematic evaluation of antibiotic usage and resistance in Ethiopia revealed high levels of multi-drug resistance and a pooled estimate of approximately 50% inappropriate antibiotic use (29). Antibiotic over-the-counter sales were also reported to be at high rates(30)

Studies showed that the Irrational Use of Drugs has economic and public health impact that includes the Emergence of drug-resistant organisms, Increased risk of unwanted effects such as adverse drug reactions, False sense of security (owners), Masking or confusing or delaying correct diagnosis, Wastage of resource, Increase cost of treatment, Loss of faith or confidence on the profession, Public health hazard(26)

Ethiopia has endorsed the third strategic plan Optimizing the use of antimicrobials in human and animal health is among the five strategic objectives of the strategic plan to be effective. and address the problem further study is needed to enhance national AMR prevention and control efforts in the country (14).

2.4 AMR Containment Efforts and Gap in Ethiopia

Ethiopia's AMR prevalence, trends, and potential risk factors were revealed by the first national AMR prevention and containment baseline evaluation, which was carried out in 2009 (31). AMR-associated bloodstream infection mortality in a hospital environment in Addis Ababa, Ethiopia was documented in a different investigation. The pooled percentage of gram-negative bacteria that produced extended-spectrum beta-lactamases was 50%, per the 2020 systematic review and meta-analysis (32). Furthermore, the estimate of pooled vancomycin-resistant Enterococci explained 14.8% (33). Approximately 2% of the 238 gram-negative bacilli isolates were resistant to carbapenem (34)

The national antimicrobial resistance surveillance results for the priority pathogens in 2019 supplement the data from earlier publications for the various studies (34). The results presented here alert the public to the dangers that antibiotic resistance poses to public health, even though the data were heterogeneous, hospital-based, and had limited regional representation.

Ethiopia has a high prevalence of antibiotic prescriptions against World Health Organization (WHO) guidelines. Antibiotics are seen in 57.6% of prescriptions on average. Prescriptions for antibiotics are primarily based on empirical judgments (35). Most surgical operations, including clean surgical procedures, utilize antimicrobial prophylaxis. It is discovered at levels over advised thresholds, with incorrect dosages, durations, and indications (36)

The dysfunction of the Drug and Therapeutic Committee, and Drug Information Services, and limited availability and adherence to conventional treatment guidelines are the main causes of the illogical overuse of antibiotics. One of the main issues is the patients' self-medication and adherence to the recommended antimicrobials (37).

To prevent and contain antimicrobial resistance, it is still urgently necessary to increase evidence-based knowledge, which calls for surveillance of responsible antimicrobial use, trends in resistance in food and feed production, and environmental factors(6).

The primary accomplishments of AMR control in Ethiopia include diverse interventions across the five strategic objectives of the OH AMR strategy, as well as baseline assessments in both human and animal health, which served as the foundation for gap identification and the creation of the OH AMR strategy.

2.5 socio-demographic factors associated with KAP of antimicrobial resistance and use

A study conducted in Ethiopia showed that there was an association between the knowledge level of AMR containment practices and socio-demographic characteristics such as professional qualification, field of study, age, professional experience, and training experience among respondents (24, 38)

Demographics of Survey results inducted that there was a variation in gender, age, and educational status in knowledge, attitude, and practices towards antimicrobial resistance among the target population(15)

2.6 Conceptual Framework

The conceptual framework shows the relation between the independent variable socio-demographic factors and the outcome variable

Independent variable dependent variable

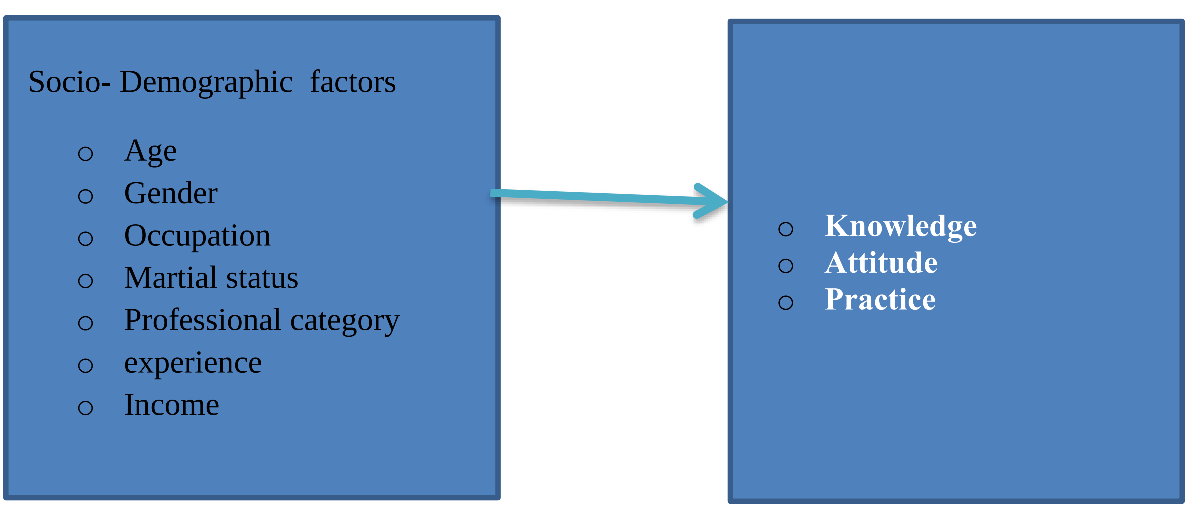

Figure 65 Conceptual framework socio-demographic factors towards knowledge, attitude, and practice of AMR and AMU

3. RESEARCH QUESTION AND OBJECTIVE

3.1 Research Question

Is there any association between the socio-demographic profiles of the professionals against their knowledge, attitude, and practices toward antimicrobial resistance and antimicrobial usage?

3.2 Research Hypothesis

Null hypothesis

There is no association between Socio-demographic profiles of the professionals and their knowledge, attitude, and practices toward antimicrobial resistance and antimicrobial usage

Alternative hypothesis

Socio-demographic profiles of the professionals have an association with knowledge, attitude, and practices toward antimicrobial resistance and antimicrobial usage

3.3 General Objective

The General Objective of the study is to identify the gap in Knowledge, attitude, and practices of professionals on the tackling of antimicrobial resistance, use, and residue in one health approach.

3.3.1 Specific Objectives

- To identify the gap in multi-sectorial and inter-sectorial collaboration
- (To assess Horizontal collaboration across sectors as well as vertical collaboration across levels among professional and sectors interims of joint planning, resource and information sharing, supervision, and implementation arrangement to contain and prevent AMR one health approach)
- To assess the KAP on professionals working in the Human Health, Agriculture, and Environmental sectors.

- To determine the association between the socio-demographic profiles of the professional against their knowledge, attitude, and practices toward antimicrobial resistance and antimicrobial usage.

4. METHODOLOGY

4.1 Study Setting

The study was conducted in Addis Ababa in the Federal Ministry of Health, Agriculture, and Environment sectors. The study covered the sectors that were involved under the umbrella of AMR containment and prevention in one health approach this includes directorates, institutions, agencies, authorities, and different divisions of work within the three sectors.

Ministry of Health

The research encompassed a range of sectors dedicated to addressing antimicrobial resistance (AMR), comprising the Clinical Service Directorate, Quality Directorate, Environmental Health Directorate, Disease Prevention and Control Directorate, Public Relations Directorate, and other directorates within the ministry. Moreover, pivotal contributions were made by institutions, authorities, and agencies under the Ministry of Health.

Ministry of Agriculture

The study was conducted within the administrative framework of the Ministry of Agriculture in Ethiopia, which oversees diverse aspects of agricultural management and institutional organization. This framework includes different directorates such as The Animal Health and Veterinary Public Health Directorate, the Public Relations Directorate, and the Plant Health Directorate. the study also covered institutions, authorities, and agencies. In this study, the Ethiopian Agriculture and Animal Health Institute was included Environment Protection Authority and its respective institution and directorate

The study also examined international organizations and development partners involved in One Health approaches to combat antimicrobial resistance (AMR) and support sector activities. These included the World Health Organization (WHO), the Food and Agriculture Organization of the

United Nations (FAO), the United States Agency for International Development (USAID), the Africa Centers for Disease Control and Prevention (Africa CDC), and USAID itself. These entities contribute expertise, guidance, financial support, and technical assistance to address AMR comprehensively across human, animal, and environmental health domains.

4.2 Study Population

Healthcare professionals, veterinarians, and environmentalists are members of the three sectors and have exposure to AMR and AMU. The professionals are engaged in different levels of government structure

4.3 Study Design

An institutional-based Cross-sectional study was conducted in the study area. The study was conducted using a mixed-method approach, which was apply to both quantitative and qualitative methods.

Quantitative data was collected by using structured self-administered Questionnaires to assess the knowledge, attitude, and practice (KAP) of professionals towards AMR and AMU.

The qualitative data collection methods used key Informant interviews (focal persons) and an observation using a checklist.

4.4 Sample Size and Sampling

4.4.1 Sampling Technique

Using institutional structure as a basis, samples were stratified. We used simple random sampling to evaluate the KAP for professionals in each of the three industries. The straightforward random sample technique was used to recruit the respondents. Participants in the key informant interview will be purposefully chosen to ensure a thorough comprehension of the issue.

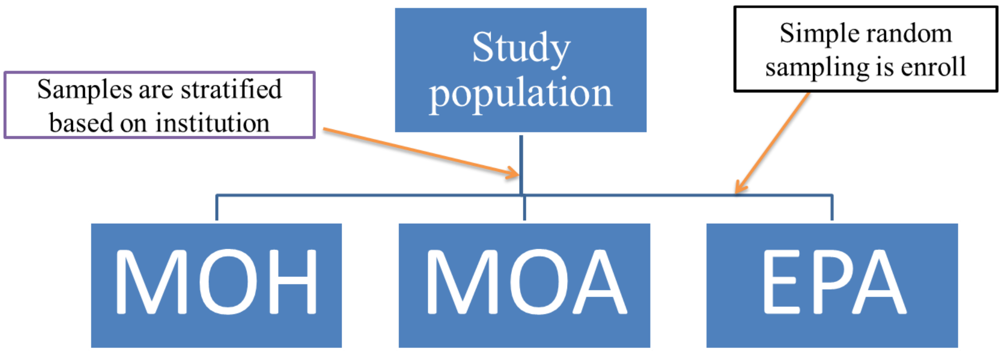

Figure 66: Diagrammatic presentation of the sampling technique

4.4.2 Sample Size Determination

The sample population was determined using the standard formula of Cochran or the single population proportion formula. In this study, the principal investigator considers the sample size determination by taking a p-value of 50% because there has been no previous study conducted on the Knowledge, attitude, and practices of professionals on the tackling of antimicrobial resistance and use in federal institutions in Ethiopia, a 95% confidence level, and a 5% margin of error. Finally, the sample size was calculated by following the following formula:

$$n= \frac{(Z\alpha/2)2 \times P(1- P)}{d^2}$$

n= minimum sample size

P= Expected proportion of good knowledge (50%) because there is no previous study

$Z\alpha/2$= Critical value for a given confidence interval (with 95% CI)

d= margin of error (5%)

$$n= \frac{(1.96) \times (0.5)\,(0.5)}{(0.05)^2} = 384$$

To compensate for possible non-response, 10 % of the corrected sample size (39) was added and made up the final sample size of 423.

Allocating samples proportionally to each stratum's total population according to the following formula: ni = n/N * Ni Where n is the total sample size that will be chosen

N = total population

Ni = total population of each stratum

ni = sample size from each stratum

A total of 188(44.5%) from the Ministry of Health, 170(40.3%) from Ministry of Agriculture, and 64 (15.2%) from the Environmental Protection Authority based on the sample proportion formula.

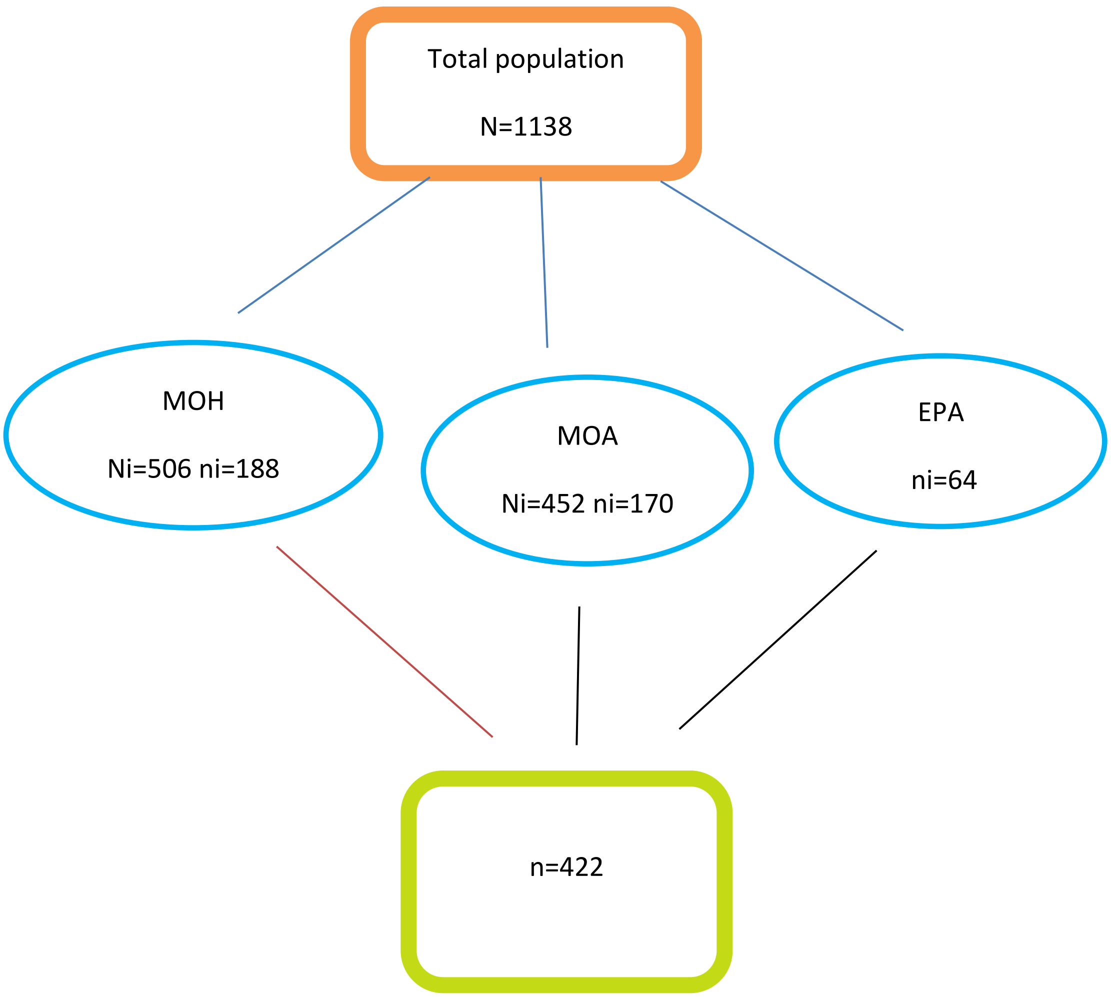

Figure 67 Flow chart of study participants for the KAP survey towards AMR and AMU one health approach in the federal institution of Ethiopia, 2024

Sample size determination for qualitative study

Sampling was continued until it reached informational redundancy or saturation. As a result, there are no hard-and-fast rules to estimate sample size based on the approach of the study or the data collection method used. Based on the Rules of Thumb Based on the Approach for Interviewing Key Informants or Focal Persons Interview approximately five people.

4.5 Data Collection

4.5.1 Data collection tool

The questionnaires were arranged depending on the involvement of the institution and qualification of respondents and it is focused on knowledge, attitude, and practice. We developed a pretested semi-structured, self-administered questionnaire from the previously published studies (20, 24, 38).

For qualitative data collection tools for key informative interviews or focal persons, I will use previous studies and the One Health Systems Mapping and Analysis Resource Toolkit (OH-SMART) to assess multi-sectoral and intersectoral collaboration.

4.5.2 Method of data collection

The researchers prepared a systematic questionnaire that was given by interviewers after reading the literature. The demographic data given in the first section of the questionnaire comprised age, sex, education level, job experience, professional qualification, and training in AMR and AMU. In the second part, the dependent variable Participants' knowledge, attitude, and practices towards AMR and AMU were assessed by 18, 13, and 10-item questions respectively. the third part of the question consists of opened ended prepared for key information.

Subject-matter specialists looked over and assessed the questionnaire's design, substance, readability, comprehension, and relevance. Under the primary investigator's supervision, the data collectors pretested the devices as part of their training. Based on the feedback received during the pre-testing, necessary amendments were made to ensure clarity and accuracy.

Data was gathered via the Kobo toolbox and the questions were deployed for participants through email and social media like telegram also a face-to-face interview was conducted by taking a profile list from its institution and by following informed consent ethical protocol.

The institution's focus points were located and deliberately chosen for recruitment as important informants. They were advised to give accurate and timely information, and they were asked if they would be interested in participating in the study. To ensure that no information was overlooked, permission to record was requested during the data-gathering process.

4.6 Data Analysis

Using the Kobo toolkit collected and coded the data. The data was imported into SPSS version 26 after being converted to Excel. For every variable, descriptive statistics will be calculated and presented in the form of tables, frequencies, and graphs.

Knowledge, attitude, and practice levels were the dependent factors, and sociodemographic data (age, sex, marital status, education level, work experience, profession qualification, occupation, and AMR training experience) were the independent variables. A score was assigned to each respondent based on how they answered questions about their knowledge, attitude, and practices. For all knowledge, attitude, and practice questions, participants earned a score of "0" for each question with a "No" response and a score of "1" for each question with a "Yes" response. The respondents who scored those with scores equal to or above the mean (14.8246), (11.3910), and (6.9905) were categorized as having "good" knowledge, a "positive" attitude, and "good" practice, respectively, after adding together all of the scores (24, 39, 40).

Response variables in this study have two possible outcomes, hence binary logistic regression will be used. To determine the elements linked to good attitudes, good knowledge, and good practices regarding the use of antibiotics and antibiotic resistance The independent variables of the sociodemographic profiles were combined with binary and multivariable logistic regression models. First Binary logistic regression was conducted to see the association of each independent variable with the outcome variable and those variables having a p-value less than 0.25 were incorporated into the multi-variable logistic regression analysis. In multi-variable logistic regression models, a p-value of less than 0.05 will be deemed statistically significant. $P \leq 0.05$ was regarded as statistically significant, and the odds ratio and 95% confidence interval will be computed. Ultimately, the outcome was.

Both qualitative and quantitative research models were employed by me. Qualitative research employed approaches, particularly intersectoral collaboration, that were not explored in the quantitative research approach. The purpose of the analysis of the qualitative data was to comprehend the multi-sectoral collaboration in AMR. The study selected themes and carried out a thematic analysis, concentrating on the points of similarity and divergence of view among the participants. The information acquired from this qualitative instrument was analyzed to capture the various viewpoints of all participants, and themes that were similar were examined collectively. The observation checklist provided the data that was utilized in the qualitative data analysis.

4.7. Inclusion and exclusion criteria

Inclusion

The participant who has experience with AMR and AMU in their workplace and has professional (Health care providers, veterinarians, and environmentalists) background

Professionals with a minimum of six months' work experience and current job during the data collection period

Focal person for their sector

Exclusion criteria

Professionals with less than 6 months of work experience and not included in the professionals list on human health, animal health, and environment

4.8 Variables

Dependent variable

Knowledge: - It is the awareness of the professional about AMR and AMU. The measure of knowledge is determined by taking the mean score of the 18 questions and classifying the participants as having good knowledge (if they scored more than and equal to the mean score of the questions properly answered) or poor knowledge (if they scored less than the mean score of the questions correctly answered).

Attitude: - The way a professional think and behaves toward AMR and AMU. It is assessed using 13 questions. The responses to all attitude-related questions were combined to generate total scores. The mean score was then calculated to classify participants as having either a positive attitude (if their score was equal to or above the mean) or a negative attitude (if their score was below the mean).

Practice: - The habitual professional involvement to prevent AMR and AMU. Ten questions are used for assessment. The total mean score was determined by adding the answers to all practice-related questions. Following that, participants were categorized as having either poor practice (if their score was below the mean) or good practice (if their score was equal to or above the mean).

Independent variable

Age

Gender

Educational status

work experience

Professional qualification

occupation

Access to healthcare services and Training experience on AMR

4.9 Data Quality Assurance

Before data collection, the instrument tool was pretested, and a pilot study and also provide training for data collectors to ensure understanding of the instrument. during data collection, regular supervision is conducted to check the data collectors adhere to the data collection plan and to identify any problems to adjust.

Following data collection, the raw data was adjusted, and to find any missing variables, a preliminary frequency run was conducted. Email, detachable flash drives, and multiple computer folders will all be used to store and backup data. Before gathering the required data, the lead investigator will pre-code questions and fix templates in preparation for data entry.

4.10 Operational Definitions

Operational definitions are set by the principal investigator based on previous studies, and national and international consensus.

“**Good” knowledge**, a ‘positive’ attitude, and ‘Good’ practice: - in this study “good” knowledge, a ‘positive’ attitude, and ‘good’ practice on AMR and AMU refer to scores that were obtained equal to and above the mean value.

“Poor” knowledge, a ‘Negative’ attitude, and ‘Poor’ practice: - in this study “poor” knowledge, a ‘negative’ attitude, and ‘poor’ practice on AMR and AMU refer to scores that were obtained less than the mean value.

One Health approach: - a "whole of society" approach that acknowledges the connections between human health, animal health, and environmental health. To achieve the optimal health results for people and animals, the One Health idea aims to promote multidisciplinary collaboration efforts across several sectors, including health, agriculture, and the environment.

Antimicrobial resistance: - is a phenomenon that occurs when microbes are resistant to one or more antimicrobial agents, used to treat infection or as an antiseptic

Health professionals: In this study, health professionals refer to physicians, nurses, and pharmacy and laboratory professionals

Animal health professionals: include veterinary professionals and Paraprofessionals

Environmental professionals: a person who has formal training in the diagnosis or recognition of Environmental issues and or pests of livestock

5. RESULT

5.1 Knowledge, attitude, and practice survey results

5.1.1. Respondents' Socio-Demographic characteristics

422 of the professionals who were contacted completed the survey, yielding a 99.98% response rate. Table 1 presents an overview of the survey respondents' demographic characteristics. The majority of the sample, or 309 (73.2%), were men. Between 25 and 55 years old was the age range of the respondents, with a mean age of 36.28 years (SD=6.68 years). Professionals in Human health comprised 188 (44.5%), Environmentalists 64 (4.6%), and Veterinarians 170(40.3%) among the responders. The mean year of experience for the respondents was 12.19 (SD= 5.2), with the least and maximum years of professional experience being 5 and 25 years, respectively.

Respondents' training experience on AMR, AMU, and residue of the respondents, 176 (41.7%) stated that they had completed AMR and AMR-related training in the previous six months.

Table 51 Socio-Demographic characteristics of survey respondents

Variables	Frequency (N=422)	Percentage (%)
Genders		
Male	309	73.2
Female	113	26.8
Age in years		
≤30	90	21.3
31-35	115	27.3
36-40	117	27.7
41-45	58	13.7
>45	42	10
Years of Professional Service		
≤5	48	11.4
6-10	126	29.9
11-15	158	37.4
>15	90	21.3
Professional qualification		
Veterinarian	170	40.3
Human health	188	44.5
Environmentalist	64	15.2
Education level		
≤ first degree	208	49.3
MSc	187	44.3
Ph.D.	27	6.4

5.1.2 Knowledge

5.1.2.1 Knowledge of Terms and concepts related to AMR, AMU, and one health approach

knowledge of professionals was assessed by asking them the terms and concepts related to AMR, AMU, and one health approach for containment and prevention. respondents were most familiar and heard with the terms “antibiotics,” (n=414, of 422 respondents, 98.1%) and “antibiotic resistance,” (n=406, 96.2%) respectively. majority 281(66.6%) of respondents had adequate knowledge regarding the terms and concept of “antimicrobial stewardship”. As many as 332(78.7%) of the respondents had adequate knowledge and were familiar with World Antimicrobial Awareness Week. The majority of responders (364, or 86.3%) were aware of bacteria that can become resistant in humans by consuming food that originated in animals and that animals have developed resistance to. Among the respondents, 365 (86.5%) and 272 (64.5%) were aware of organisms that can be spread from humans to animals and the environment, as well as the National One Health approach to containing and preventing antibiotic resistance, respectively.

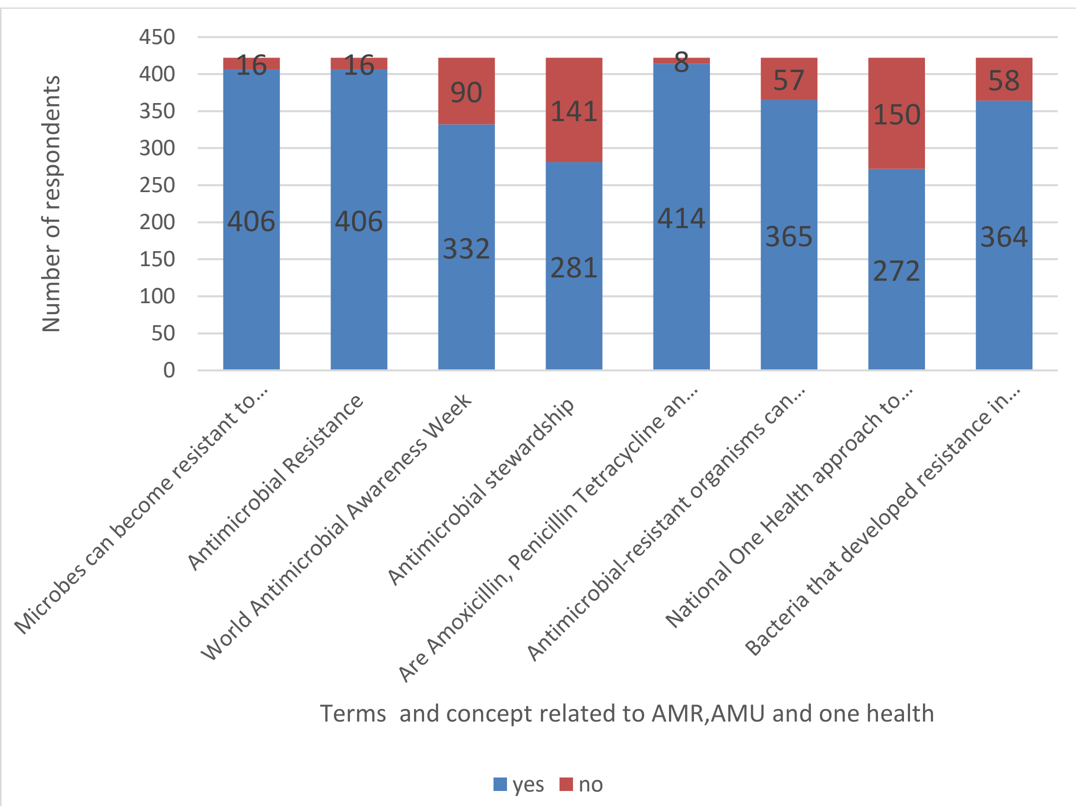

Figure 68 Knowledge of Terms and concepts related to AMR, AMU, and one health approach

5.1.2.2 Knowledge of AMR, AMU cause and impact, and also prevention and containment

The respondents were asked to determine if a series of statements regarding antimicrobial use (AMU) and the causes, impacts, prevention, and containment of antimicrobial resistance (AMR) were yes or no. Over 80% of participants correctly identified the following statements as yes: "Good sanitation and hygiene, vaccination, and good animal husbandry could reduce or slow AMR," "Antibiotics should be purchased from drug stores or pharmacies based on prescription," "It is good to implement an antimicrobial stewardship program at the facility level,". about 77 % of the respondents said "Frequent use of antimicrobials will lead to a decrease in the number of treatment options" and 75 % of respondents said "Antimicrobials used to treat animals can remain within their tissues". Lower 70% of respondents said; "Antibiotics are used to treat infections caused by viruses," "It is good to use antimicrobials as additives with animal feeds" and "Newer and the price is higher antibiotics are better efficacy"

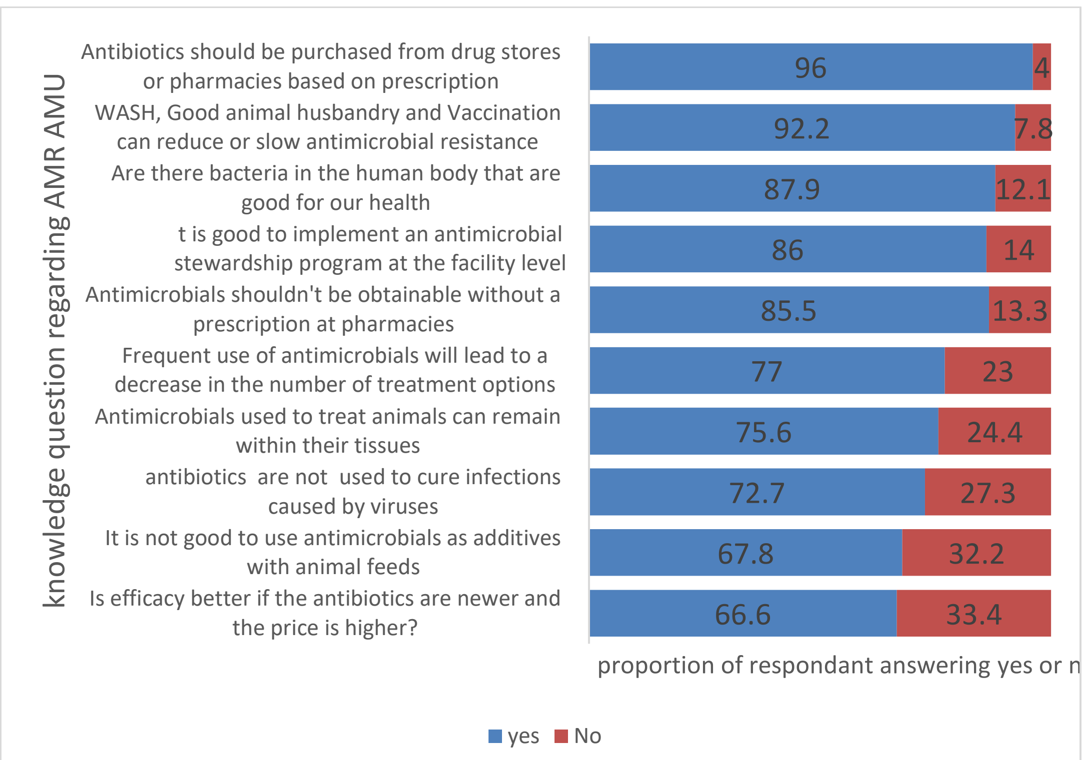

Figure 69 Knowledge of AMR, AMU cause and impact, and also prevention and containment

5.1.2.3 Respondents' knowledge level of AMR and AMU among different professional categories

The total knowledge score of the participants was determined by summing up their understanding of these eighteen variables. The total assessed knowledge score was then used to determine the respondents' level of knowledge. The knowledge level was divided into two categories based on the mean value of the knowledge score (14.8246), which was used as a cutoff point: poor knowledge (if the knowledge score is below the mean value) and good knowledge (if the knowledge score is equal to or higher than the mean value). Consequently, 274 (64.9%) of the total respondents had good knowledge of AMR, AMU, and residual, while 148 (35.1%) had poor knowledge.

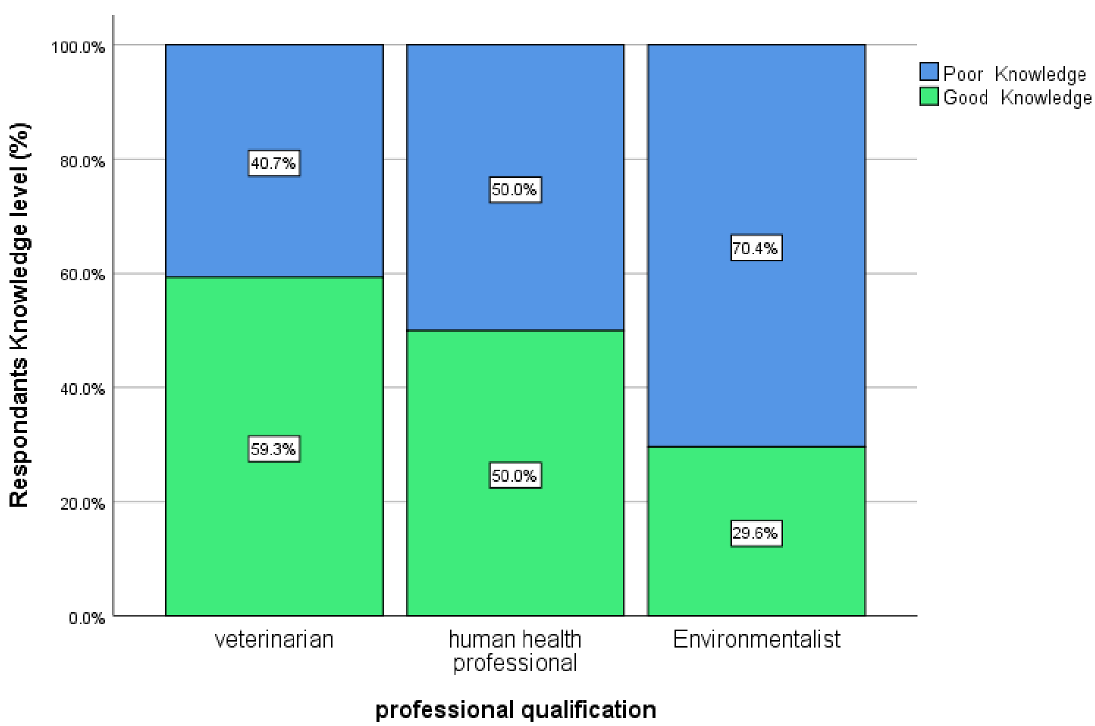

Figure 70 Respondents' knowledge level on AMR and AMU among different professional categories

5.1.3 Attitude

5.1.3.1 Attitude of Respondent's Survey Result

Across all survey respondents, over 80% said: AMR is a serious public health challenge in the country, it affects families' health and also has an influence on animal production. Most of the respondents answered the causes of AMR are Poor IPC by healthcare professionals and inappropriate use of antimicrobials. About 65% of respondents agreed with the statement I feel informed about antibiotic resistance. fifty-five percent of respondents said, "I have sufficient knowledge of environmental protection and waste disposal."

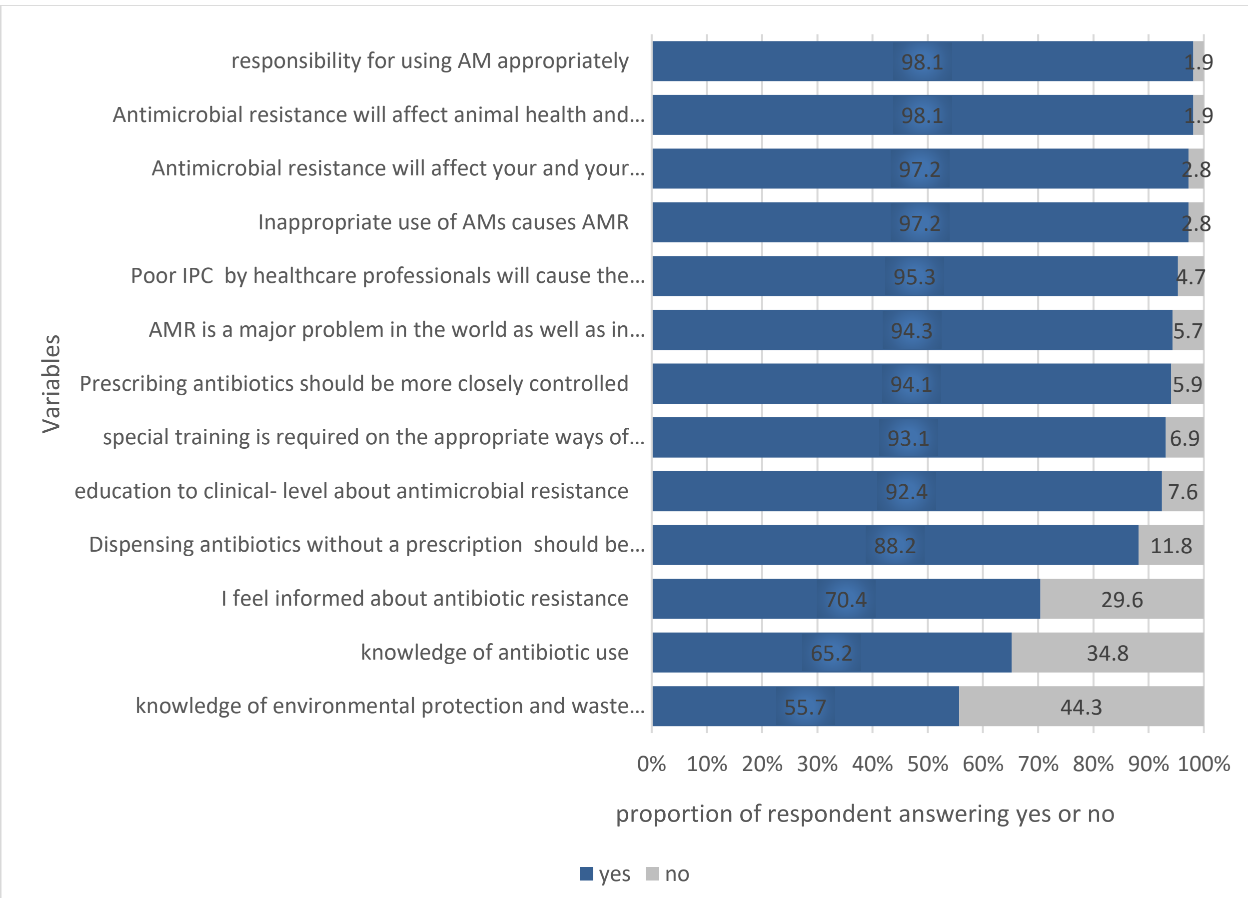

Figure 71 Attitude of Respondent's Survey Result

5.1.3.2 Respondents' Attitude level of AMR and AMU among different professional categories

The Attitude of respondents on these 13 variables was summed up and made up a total Attitude score. The total measured knowledge score was then used to determine the Attitude level of respondents. The mean value of the Attitude score (11.3910) was used as a cutoff point to categorize the Attitude level into two; Negative Attitude (if the attitude score is below the mean value) and positive Attitude (if the Attitude score is equal and higher than the mean value). Accordingly, as many as 183(43.4%) of the total respondents had Negative Attitudes and 239(56.9%) had good knowledge of AMR, AMU, and residue. The median value was 12 and the IQR (10,13)

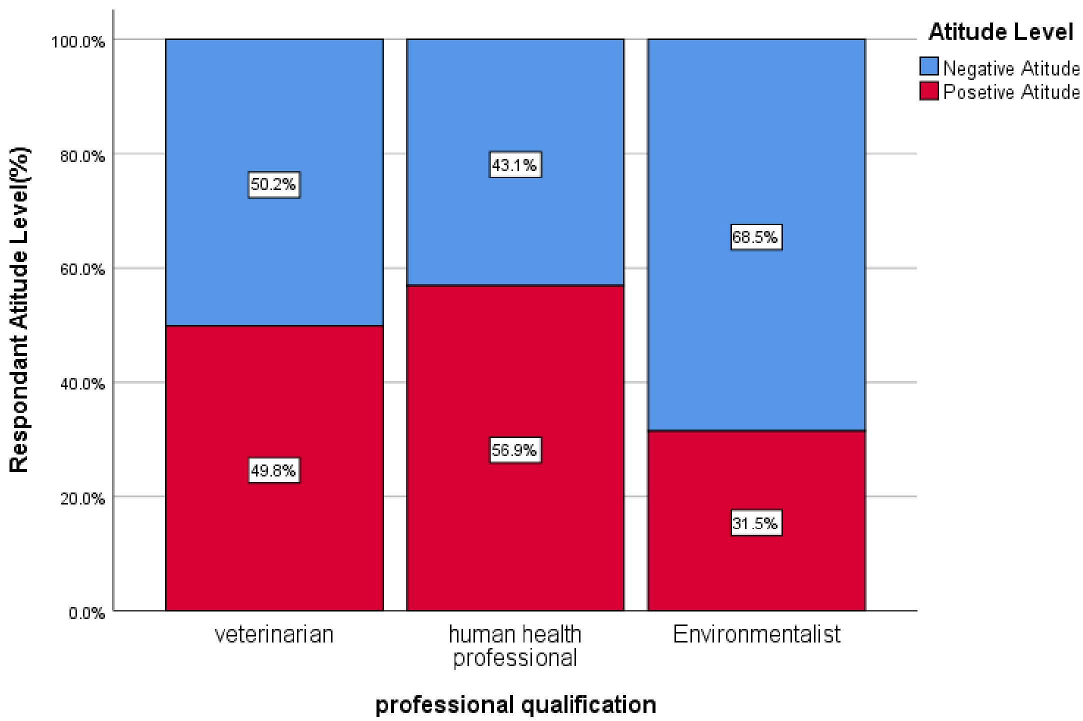

Figure 72 Respondents' level of Attitude AMR and AMU among different professional categories

5.1.4 Practice

5.1.4.1 Practice of Respondent's Survey Result

Among practice, indicator questions regarding AMU and AMR the participant responded yes as an incorrect answer. 354 said "I stop antibiotics as soon as complaints lessen," 354 said "I use antibiotics prescribed by doctors," 356 "I follow the prescription after choosing an antibiotic" 276 "I use food with keeping the drug residual period," 267 "I do not ask the doctor to prescribe antibiotics for the common cold," 298 "I do not use antibiotics for the co5mmon cold," 278 "I use antibiotics for acute bronchitis," 245 "I use antibiotics when coughing up yellow/ green phlegm," 264 "I use antibiotics for a sore throat caused by any microbe," and 222 "I use food with keeping the drug residual period"

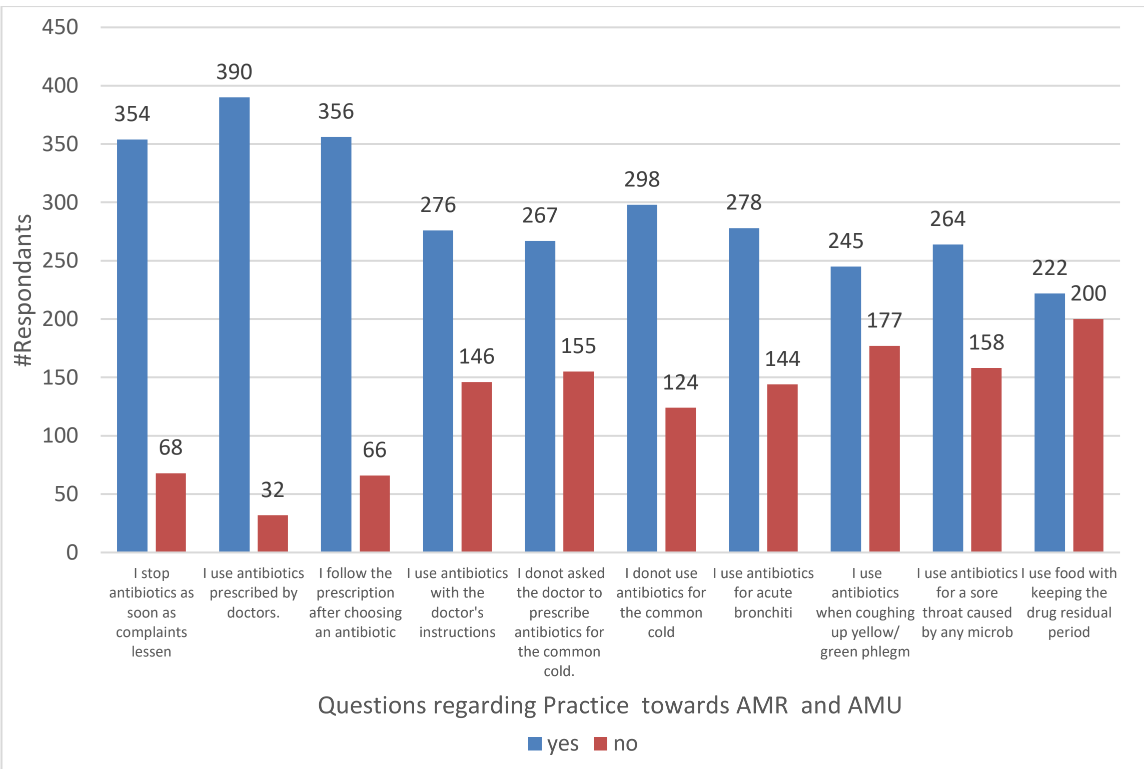

Figure 73 Practice of Respondent's Survey Result

5.1.4.2 Respondents' Practice level of AMR and AMU among different professional categories

The total practice score was calculated by adding together the respondents' practice on these ten criteria. The respondents' practical level was then ascertained by adding up all of their measured practice scores. The mean value of the practice score (6.9905) was used as a cutoff point to categorize the practice level into two; practice (if the practice score is below the mean value) and good practice (if the practice score is equal and higher than the mean value). Accordingly, 196 respondents (46.5%) had good practices related to AMR, AMU, and residue, while 226 respondents (53.5%) had poor practices. The median value was 7, with an IQR (5,9).

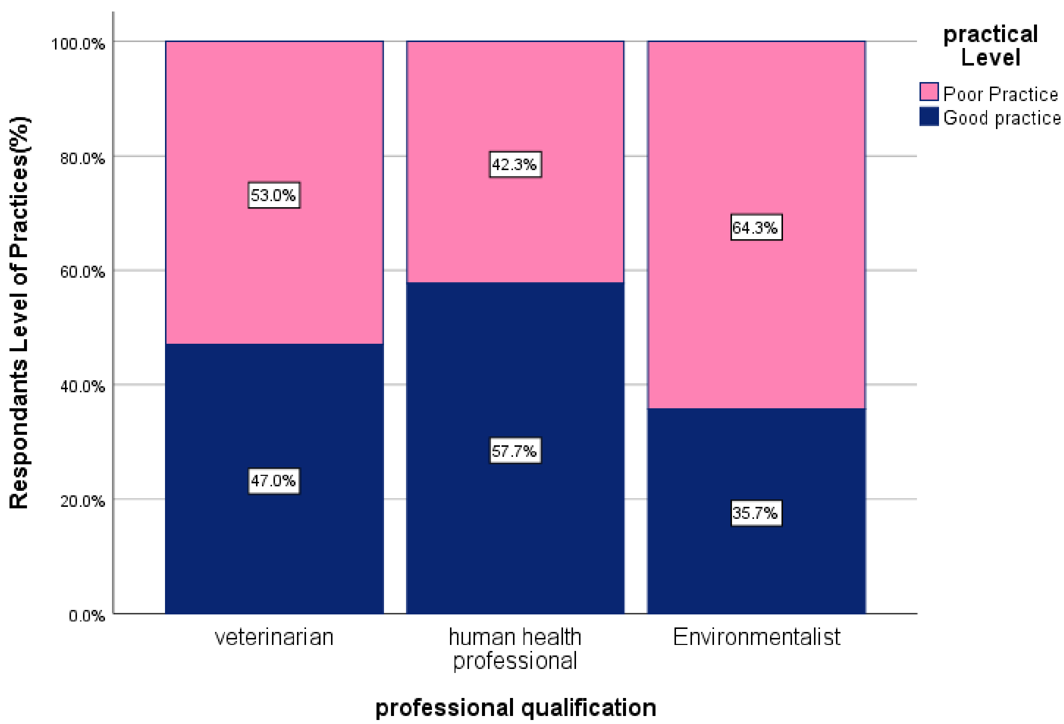

Figure 74 Respondents' practice level of AMR and AMU among different professional categories

5.1.5 Factors associated with participant's KAP level towards AMR and AMU

Participants were given self-administered questionnaires to complete to evaluate potential risk and protective factors related to professionals' KAP towards AMU and AMR. Analyzing those chosen exposure-independent variables through a statistically significant approach was necessary to ascertain whether they had any potential or strong connections. Consequently, binary and stepwise bivariate logistic regression analyses were carried out. Among factors incorporated in the bi-variate analysis participants' Age, gender, degree of education, Experience, professional category, and training experience revealed a significant correlation. Variables having a P-value of 0.25 were entered in the multivariable logistic.

Table 52 Bivariable and multivariable logistic regression of knowledge level of professionals in federal institution of Ethiopia towards AMR and AMU

Variable category	Knowledge level		Bivariate analysis			Multivariate analysis		
Age	Poor	Good	COR	95% CI	P-value	AOR	95% CI	P-value
≤30	60	30	(Ref)					
31-35	42	73	3.476	1.947-6.207	0.000	2.346	1.008-5.464	0.048
36-40	24	93	7.750	4.139-14.511	0.000	8.768	2.646-29.050	0.000
41-45	17	41	4.824	2.359-9.864	0.000	3.493	0.583-20.915	0.171
>45	5	37	14.800	5.275-41.522	0.000	25.742	3.323-20.915	0.002
Gender								
Male	79	230	4.566	(2.89-7.206)	0	2.544	1.351-4.789	0.004
Female	69	44	(Ref)					
Professional experience								
≤5	36	12	(Ref)					
6-10	53	73	4.132	1.966-8.686	0.000	2.432	0.922-6.415	0.072
11-15	33	125	11.364	5.327-24.241	0.000	0.694	0.189-2.546	0.582
>20	26	64	7.385	3.329-16.379	0.000	0.323	0.045-2.321	0.261

education level								
≤first degree	99	109	(Ref)					
MSc	44	143	2.952	1.913-4.555	0.000	1.743	0.899-3.378	0.100
P.h.d	5	22	3.996	1.458-10.955	0.007	2.287	0.527-9.920	0.269
training related to AMR								
Yes	13	163	15.249	15.249-28.296	0	15.734	7.579-32.661	0.000
No	135	111	(Ref)					
professional qualification								
Veterinarian	46	124	3.466	1.905-6.307	0.000	3.363	1.4-8.075	0.007
Human health	66	122	2.377	1.334-4.234	0.003	2.597	1.145-5.887	0.022
Environmentalist	36	28	(Ref)					

The results of the multivariable binary logistic regression indicated that the following variables are statistically significantly correlated with professionals' knowledge of AMR and AMU:

1. The odds of the Knowledge level of professionals towards AMR and AMU were 2.544 times higher having a good knowledge level among male professionals as compared to female professionals (AOR= 2.544; CI: 1.351-4.789, P = 0.004).

2. The odds of the attitude level of professionals towards AMR and AMU were 2.346 times higher having a good attitude level among professionals aged between 31-35 years as compared to those aged ≤30 years (AOR=2.346; CI: 1.008-5.464, P = 0.048).
3. The odds of the Knowledge level of professionals towards AMR and AMU were 8.768 times higher having a good knowledge level among professionals aged between 36-40 years of having a good knowledge level compared to those aged ≤30 years (AOR=8.768; CI: 2.646-29.050, P = 0.000).
4. The odds of the Knowledge level of professionals towards AMR and AMU were 25.742 times higher having a good knowledge level among professionals aged over 45 years of having a good knowledge level compared to those aged ≤30 years (AOR=25.742; CI: 3.323-20.915, P = 0.002).
5. The odds of the Knowledge level of professionals towards AMR and AMU were15.734 times higher having a good knowledge level among professionals who had training related to AMR as compared to those who have not had training (AOR=15.734; CI: 7.579-32.661, P = 0.000).
6. The odds of the Knowledge level of professionals towards AMR and AMU were 3.363 times higher having a good knowledge level among veterinarians as compared to environmentalists (AOR=3.363; CI1.4-8.075, P = 0.007).
7. The odds of the Knowledge level of professionals towards AMR and AMU were 2.597 times higher having a good knowledge level among human health professionals as compared to environmentalists (AOR2.597; CI: 1.145-5.887, P= 0.022).

Table 53 Bivariable and multivariable logistic regression Attitude level of professionals in federal institution of Ethiopia towards AMR and AMU

Variable category	Attitude level		Bivariate analysis			Multivariate analysis		
Age	Negative	Positive	COR	95% CI	P-value	AOR	95% CI	P-value
≤30	64	26	(Ref)					
31-35	46	69	3.692	2.049-6.654	0	3.191	1.456-6.994	0.004
36-40	60	57	2.338	1.306-4.187	0.004	1.778	0.688-4.598	0.235
41-45	12	46	9.436	4.317-20.624	0	9.47	2.081-43.100	0.004
>45	1	41	100.92	13.183-20.6	0	163.47	12.965-2061	0
Gender								
Male	111	198	3.132	2.001-4.905	0	2.416	1.315-4.438	0.004
Female	72	41						
Professional experience								
≤5	36	12	(Ref)					
6-10	68	58	2.559	1.219-5.370	0.013	1.395	0.566-3.442	0.469
11-15	62	96	4.645	2.245-9.612	0	1.753	0.547-5.619	0.345
>20	17	73	12.882	5.562-29.84	0	0.955	0.163-5.61	0.96
education level								

≤first degree	113	95	(Ref)					
MSc	65	122	2.2326	1.487-3.351	0	0.765	0.423-1.382	0.374
Ph.D.	5	22	5.2337	1.909-14.350	0.001	1.277	0.333-4.891	0.721
training related to AMR								
Yes	44	132	3.897	2.55-5.956	0	2.034	1.194-3.464	0.009
No	139	107	(Ref)					
professional qualification								
Veterinarian	74	96	2.162	1.199-3.900	0.01	1.199	0.561-2.562	0.64
Human health	69	119	2.874	1.599-5.168	0	3.87	1.862-8.043	0
Environmentalist	40	24	(Ref)					

The results of the multivariable binary logistic regression indicated that the following variables are statistically significantly correlated with professionals' attitudes regarding AMR and AMU.

1. The odds of having a positive attitude toward AMR among male professionals are 2.416 times higher compared to female professionals [AOR= 2.416; CI:1.315-4.438, P=0.004].
2. Professionals who have received training related to AMR have 2.034 times higher odds of having a positive of AMR compared to those who have not received such training [AOR=2.034; CI:1.194-3.464, P=0.009].
3. The odds of having a positive attitude towards AMR among human health professionals are 3.87 times higher compared to environmentalists in the federal institution in Ethiopia [AOR=3.87; CI:1.862-8.043, P=0]

4. The odds of the attitude level of professionals towards AMR and AMU were 3.191 times higher having a positive attitude level among professionals aged between 31-35years having a positive attitude level compared to those aged ≤30 years [AOR=3.191; CI:1.456-6.994, P=0.004].
5. The odds of the attitude level of professionals towards AMR and AMU were 9.47 times higher having a positive attitude level among professionals aged between 41-45years having a positive attitude level compared to those aged ≤30 years [AOR=1.778; CI:0.688-4.598, P=0.235]
6. The odds of the attitude level of professionals towards AMR and AMU were 163.47 times higher having a positive attitude level among professionals aged greater than 45 having a positive attitude level compared to those aged ≤30 years [AOR=163.47; CI:12.965-2061, P=0].

Table 54 Bivariable and multivariable logistic regression practice level of professionals in federal institution of Ethiopia towards AMR and AMU

Variable category	practice level		Bivariate analysis			Multivariate analysis		
Age	Poor	Good	COR	95% CI	P-value	AOR	95% CI	P-value
≤30	53	37	(Ref)					
31-35	48	67	1.999	1.142-3.501	0.015	2.833	1.291-6.218	0.009
36-40	50	67	1.919	1.099-3.351	0.022	3.545	1.37-9.172	0.009
41-45	20	38	2.722	1.372-5.400	0.004	2.965	0.816-10.772	0.099
>45	25	17	0.974	0.462-2.053	0.945	0.657	0.136-3.165	0.600

Gender								
Male	124	185	2.62	1.678-4.092	0	2.743	1.546-4.868	0.001
Female	72	41	(Ref)					
Professional experience								
≤5	28	20	(Ref)					
6-10	56	70	1.750	0.893-3.430	0.103	0.861	0.369-2.008	0.730
11-15	71	87	1.715	0.892-3.299	0.106	0.408	0.133-1.254	0.118
>20	41	49	1.673	0.824-3.397	0.154	0.720	0.15-3.457	0.682
education level								
≤first degree	103	105	(Ref)					
Msc	87	100	1.128	0.759-1.675	0.552	0.653	0.372-1.146	0.138
P.h.d	6	21	3.433	1.332-8.852	0.011	4.077	1.248-13.322	0.020
training related to AMR								
Yes	66	110	1.868	1.259-2.772	0.002	1.831	1.113-3.013	0.017
No	130	116	(Ref)					
professional qualification								
Veterinarian	84	86	1.597	0.89-2.868	0.117	1.330	0.647-2.735	0.438
Human health	73	115	2.458	1.374-4.396	0.002	3.238	1.624-6.456	0.001

Environmentalist	39	25	(Ref)

The multivariable binary logistic regression result showed that the following factors do have statistically significant linkage with the practice level of professionals towards AMR and AMU.

1. Male professionals have 2.743 times higher odds (AOR=2.743; CI: 1.546-4.868, P = 0.001) of having a good practice level compared to female professionals. Gender appears to be a significant factor in influencing knowledge levels.
2. Professionals aged between 31-35 years have 2.833 times higher odds (AOR=2.833; CI: 1.291-6.218 P = 0.009) of having a good practice level compared to those aged ≤30 years.
3. Professionals aged between 36-40 years have 3.545 times higher odds (AOR=3.545; CI: P1.37-9.172= 0.009) of having a good practice level compared to those aged ≤30 years.
4. Professionals' education level with a Ph.D. has 4.077 times higher odds (AOR=4.077; CI: 1.248-13.322, P = 0.020) of having a good practice level compared to those with ≤5 years of experience.
5. Professionals who have had training related to AMR have 1.831 times higher odds (AOR=1.831; CI: 1.831, P = 0.017) of having a good practice level compared to those who have not had training.
6. Human health professionals have 3.238 times higher odds (AOR=3.238 CI: 1.624-6.456 P = 0.001) of having a good practice level compared to environmentalists.

5.2 Qualitative Findings

The quantitative and qualitative findings on antimicrobial resistance (AMR) and AMU are closely intertwined, each enriching the understanding of the issue. Quantitative results show that factors such as age, gender, and AMR training significantly impact knowledge, attitudes, and practices related to AMR. Qualitative insights support these findings by highlighting that AMR training and cross-sectoral collaboration are crucial for effective AMR containment. However, qualitative data also reveals additional challenges, such as resource constraints and the need for better coordination, which are not fully captured by the quantitative analysis. By linking these qualitative insights with quantitative results, it becomes evident that targeted professional training and improved cross-sectoral coordination are vital for achieving better AMR knowledge and practices, reinforcing the need for both individualized and systemic interventions.

5.2.1 Findings from key informant interviews

There were five key informants during the key informant interview. 34 to 50 years of age. They were all men. They were specifically chosen from the focal persons of the institutions. The Environment Authority, the Ministry of Health, and the Ministry of Agriculture are a few of these. Purposively, all key informants were chosen based on their professional background and engagement in the prevention and containment of AMR, specifically about one health approach.

Table 55 The demographic characteristics of the study participants.

Informant	Age	Gender	Years of Experience	Highest Education	Professional Title
1	50	Male	23	Master's Degree	Human Health Professional
2	43	Male	18	Master's Degree	Veterinarian
3	48	Male	20	Master's Degree	Veterinarian
4	34	Male	12	Degree	Human Health Professional
5	37	Male	17	Degree	Environmentalist

Professionals from a range of fields, including public health, veterinary medicine, environmental health, and human health, are among the important informants. Their educational backgrounds are various, with master's degrees being the most common, and they have a large amount of professional experience, ranging from 12 to 23 years.

The informants talked about how familiar they are with the One Health idea to AMR during the interviews. They stress the importance of cross-sector collaboration in reducing the national burden of antimicrobial resistance (AMR) while acknowledging its significance to their institutes.

For AMR management to be effective, cross-disciplinary and cross-sectoral approaches are considered necessary. They frequently engage in interactions with external authorities and institutions to combat antimicrobial resistance (AMR) through containment and prevention measures. Attending regular meetings with representatives from many industries promotes cooperation and knowledge exchange.

Cross-disciplinary or cross-sectoral collaboration initiatives that have been successful include the creation of national action plans, cooperative assessment, research, innovation, public awareness campaigns, and heightened government participation. Nevertheless, there are issues like limited funds, insufficient resources, and a lack of knowledge. It will take careful planning, resource allocation, and ongoing involvement to overcome these obstacles.

Failed collaborative activities often stem from issues like resource sharing and unequal support among partners. Despite challenges, fostering cross-sectoral collaboration is deemed feasible and necessary for addressing the complex nature of AMR effectively.

AMR containment and prevention initiatives face obstacles from a lack of funding, poor stakeholder participation, and a lack of priority given to the problem. Budget allocation, integrating AMR efforts into development plans, enhancing teamwork, and institutionalizing AMR projects are some of the solutions.

5.2.2 Qualitative analysis results in themes and codes from the transcript

Table 56 themes and codes emerged from key informant interview

Theme	Codes	Excerpt from Transcript
Collaboration Mechanisms	Multisectoral collaboration, Intersectoral collaboration, Coordination mechanisms	"The country establishes different platforms like inter-ministerial committees, national and regional advisory committees, secretarial, and different technical committees. Under this committee, all One Health involved sectors are participating."
One Health Approach	One Health approach, Cross-disciplinary approaches	"Yes, One Health in the context of antimicrobial resistance (AMR) refers to a collaborative, multisectoral, and transdisciplinary approach to addressing the interconnected health of humans, animals, and the environment in the context of antimicrobial resistance."
Challenges and Constraints	Budget constraints, Awareness gaps, Institutional structures	"Challenges faced by Ethiopia include limited awareness about antimicrobial resistance (AMR), weak surveillance systems, inadequate regulation and enforcement, limited access to quality healthcare services in rural areas, and lack of coordination among stakeholders from human health, animal health, agriculture, and environmental sectors, which may hinder the implementation of a cohesive One Health approach."
Successful Activities	Joint evaluation, Policy integration, and Public awareness campaigns	"Several factors contributed to the success of One Health's approaches to addressing antimicrobial resistance, Interdisciplinary Collaboration, Shared Responsibility, Data Sharing and Surveillance, Policy Coordination, Community Engagement, Capacity Building, and national Collaboration."

Failed Collaborative Activities	Failed activities, Resource sharing	"Failed collaborative activities are often related to resource mobilization issues, such as inadequate budget allocation and lack of integrated approaches."
Stakeholder Engagement	Stakeholder engagement, Capacity building	"Participating experts in different committees like technical working groups, task forces, and advisor committees."
Priority Agenda	Mainstreaming activities, Priority Agenda	"From the absence of budget allocation and not mainstreaming the activities to the development plan"

DISCUSSION

According to the results of the current study, professionals' knowledge of antimicrobial resistance (AMR), antimicrobial use (AMU), and the One Health approach, respondents showed strong familiarity with basic terms like "antibiotics" and "antibiotic resistance," with 98.1% and 96.2% recognition rates, respectively. This is a higher proportion than the previous study conducted in Ethiopia on healthcare professionals and university students (24, 38, 41). Most demonstrated an adequate understanding of antimicrobial stewardship and World Antimicrobial Awareness Week and were aware of the risks associated with antibiotic resistance in bacteria that affect animals and humans. This discovery is consistent with Tikur Anbessa Specialized Hospital (41) research and the WHO WAAW report (2). Over 80% correctly identified statements about the benefits of sanitation, prescription-based antibiotic use, and antimicrobial stewardship programs. this agrees with the previous study conducted on healthcare professionals(38, 41).

Overall, 64.9% of respondents had good knowledge of AMR and AMU, while 35.1% had poor knowledge, based on a knowledge score cutoff. This result is similar to those obtained from the following studies: Paramedical staff, Deredewa, physicians and nurses in hospitals in Amhara, and graduate students at Wellega University (40, 41, 42). However, this study reported a different result on knowledge from other studies conducted in the country (24, 38, 43). Numerous factors, including sample size, methodology, literacy, in-service training, research setting, and sociocultural influences, could explain this variation.

The result indicated that the attitude of the study participants was 56.6% positive This finding is consistent with previous research findings(42). This result also showed a higher proportion of professionals with a positive attitude towards AMR and AMU than the general population, patients, and livestock keepers, as demonstrated by a pooled systematic review conducted in Ethiopia(16). In contrast, in this study, paramedical staff in Dire Dawa, Ethiopia, found that 80% of respondents had positive attitudes toward strategies to combat antimicrobial resistance(43)

This study revealed that 53.6% of the study participants had good practices similar results were shown in the previous study conducted the overall pooled prevalence of the good practice of antimicrobial resistance in Africa was almost approach this finding (44). Contrary to the findings in this study, the systematic review and meta-analysis by Beshada et al. reported that good practices related to AMR in Ethiopia were lower than average, with only 49% of participants demonstrating good practices, and an even lower estimate of 40% among patients(16) and low levels of good AMR practices were consistent study conducted in the Amhara region (45). The study showed that healthcare workers in the Debre Markos referral hospital had good practicals regarding AMR and AMU when compared to the present finding (46).

In this study, socio-demographic factors such as Gender, sex, Professional experience, educational level, Professional category, and training were determined with significantly associated with the knowledge level of AMR and AMU. Age, Gender, professional experience, and training experience had a significant association ($p<0.05$) with the knowledge level of the respondents. This agrees with reports of studies conducted on KAP Among Health Professionals at the University of Gondar Specialized Hospital, Tikur Anbessa Hospital, and university students (24, 38, 47). Professional experience and educational level had no association ($P>0.05$) with the respondents' knowledge of AMR and AMU. This is similar to the previous findings(24, 48).

This study showed significant associations ($P<0.05$) between age, sex, training experience, and professional qualification with the attitude level of the participants towards AMU and AMR. This agrees with the previous study (24, 48, 49). According to this study result, there were no associations ($P>0.05$) between education level and professional experience with the attitude level of the respondents towards AMR and AMU. This is similar to the previous finding (50, 51)

The study revealed that there was an association ($P<0.05$) between the age, sex, training experience, and professional qualification with the practical level of the participants toward AMR and AMU. This agrees with the previous study that was conducted mentioned that sex and education level had a positive correlation with the practical level of the respondents(52) and the other study also showed that the training experience and professional qualification of the respondents had an association with the practical level of the respondents towards AMR and AMU(24, 38).

The study indicated that there was no association ($P>0.05$) between professional experience, education level, and professional qualification with the practical level of the respondents. This agrees with a study conducted on healthcare professionals in Fitche Hospital(51). This contradicts the previous study that was conducted (24, 47) and the reason for the variation in a study is due to sample size, methodology, literacy, in-service training, research setting, and sociocultural influences, which could explain this variation.

According to the qualitative study result, Participants stressed the relevance of the One Health concept and advocated for cross-disciplinary efforts to combat AMR. Successful activities such as national action plans and public awareness campaigns demonstrate the effectiveness of collaborative approaches. However, challenges like budget constraints and unequal support hinder progress. Solutions proposed include resource allocation, integrating AMR activities into development plans, and strengthening collaboration among stakeholders. Despite obstacles, there is optimism that overcoming these challenges is possible through sustained engagement and institutional. This is similar to the previous study conducted(20, 53)

LIMITATION OF THE STUDY

The study was focused only on the professionals who are classified as professional category and did not include other professionals the study also did not cover the whole institution and focused on the head office and accessible for data collection. The study also had recall bias as it took place over an extended period. Social desirability bias might have been introduced. Questions from the same knowledge and attitude are given to responders with varying professional backgrounds. It's possible that respondents' workload prevented them from filling out the questionnaires. The cross-sectional study design may have an impact on the cause-and-effect relationship between the study participants' knowledge, attitude, and practice of the dependent binary variables and the predictor variables.

CONCLUSION

This study generated important information on the knowledge, attitude, and practice of professionals regarding antimicrobial resistance and use. It can be concluded that most respondents were knowledgeable about AMR and AMU, had a positive attitude, and had good practices regarding AMR, AMU, and residue. Across all categories, age, gender, and AMR-related training consistently emerged as strong predictors of better outcomes, while professional experience and education levels exhibited variable effects. The result showed a significant knowledge, attitude, and practice gap regarding AMR and AMU on professional sociodemographic characteristics. Therefore, to address the gap The One Health concept encourages multidisciplinary efforts to combat AMR, despite budget constraints and disparities, through resource allocation, integrated development plans, and enhanced stakeholder collaboration.

RECOMMENDATION

Awareness and Education: Launch campaigns and educational programs targeted at professionals to enhance their understanding of AMR and promote prudent antimicrobial use.

Infection Prevention: Implement robust infection prevention and control measures in healthcare facilities, agricultural settings, and the environment to minimize the spread of resistant organisms.

Stakeholder Collaboration: Facilitate collaboration among various stakeholders, including healthcare professionals, veterinarians, environmentalists, farmers, and policymakers, professional associations to foster a coordinated approach toward combating AMR.

Promote Continuing Education: Implement continuous training programs for professionals on antimicrobial resistance and use to fill knowledge gaps, update practices, and reinforce positive attitudes towards prudent antimicrobial use.

Address Sociodemographic Disparities: Tailor educational campaigns and interventions based on professional sociodemographic characteristics to effectively bridge the knowledge, attitude, and practice gap regarding AMR and AMU.

Enhance One Health Collaboration: Encourage multidisciplinary efforts among healthcare professionals, veterinarians, environmentalists, policy-makers, and researchers to combat AMR through coordinated action, data sharing, and joint planning.

Allocate Resources for AMR Mitigation: Advocate for resource allocation towards AMR mitigation strategies, including improved surveillance systems, research funding, and infrastructure development to bolster antimicrobial stewardship practices.

ETHICAL CONSIDERATIONS

The Addis Ababa University School of Public Health's Ethical Committee gave its clearance. SPH/296/2024 was the protocol number assigned to the ethical evaluation. Every participant was made aware of the aim of the study. To ensure that every person was willing to participate, written informed consent was obtained, and all identifiers from the questionnaire were removed to make it anonymous.

WORK PLAN

Work plan for thesis

Table 57 work plan

Activities	November	December	January	February	March	April	may	remark
Proposal submission								
Ethical approval								
Budget release								
Pretest								
Data collection								
Data analysis								
Writing and submission to advisors								

BUDGET

Table 58 budget with activities

S/N	Activities/need	Cost in ETB
1	Material cost	10000
2	Transport cost	10000
3	Recurrent personnel	30000
4.	Another cost	150000
Total cost		65,000

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CHAPTER-IX ADDITIONAL OUTPUT

9. 1 Epidemiological study on the prevalence of *salmonella and campylobacter* in raw animal source food in Ethiopia and Japan

Abstract

Introduction: The global food-borne disease burden estimated that food-borne diseases from a limited number of hazards caused about 600 million illnesses. Salmonella and Campylobacter cause food-borne enteritis mainly via the consumption of raw or undercooked contaminated animal products. It is one of the food poisonings in Japan and a High burden of foodborne pathogens was reported on the animal source food value chain of Ethiopia.

Objectives: to assess the prevalence of Salmonella and campylobacter in raw animal source food, to identify the associated risk factors, to implement effective intervention on salmonellosis and campylobacter

Methods: A cross-sectional study design was used. Salmonella and campylobacter were isolated by their colony character and biochemical test. Further genetic characterization was done by PCR and MLST test. An antimicrobial susceptibility test was carried out for different strains.

Results: Salmonella serovars schwarzegrud, infantia, and Manhattan were isolated in 14, 2, and 3 colonies respectively from 9 of 11 samples of chicken skin. From 6 isolated Campylobacter colonies, 2 colonies were positive the total prevalence of salmonella and campylobacter in this study were 81.8 %(9/11) and 33.3 %(2/6) respectively. The result indicated that a high rate of antimicrobial susceptibility was observed in streptomycin 57.9%, tetracycline 52.6%, kenamacine 21%, and Trimethoprim 5.3%. All were susceptible to Nalidixic acid, Ciprofloxaci, Ampicilin, Gentamycin; Chloramphenicol, Cefazolin, Cefotaxim, and Colistin.

Conclusion: This study also showed that antibiotic use in Ovo vaccination and for parent stock had a great contribution to food safety and drug resistance development of the food-borne pathogen.

Keywords: salmonella, campylobacter, serovar, antimicrobial resistance, prevalent

INTRODUCTION

Foodborne diseases are diseases that are caused by consuming contaminated food or drinks. The World Health Organization report on the global food-borne disease burden (2015 WHO), estimated that food-borne diseases from a limited number of hazards caused about 600 million illnesses globally every year, affecting about 1 in 10 people in the world. Diarrheal disease-causing agents are the leading cause of food-borne diseases. They are responsible for over 549 million of the 600 million food-borne illnesses annually. Children below 5 years bore almost a third (38%) of the global food-borne disease cases in 2010

The World Health Organization's (WHO) Foodborne Disease Epidemiology Reference Group (FERG) (3) has published the most thorough estimates of the health impact of FBDs in African nations, estimating that the burden of FBDs is similar to that of malaria, HIV/AIDS, or tuberculosis. According to Havelaar et al. (2015), low-income countries bear the majority of this burden (98%) and it is mostly caused by biological hazards (97%) with diarrhoeal disease agents accounting for the majority of the overall burden of FBD in African region E, which includes Ethiopia, followed by helminths and invasive bacteria (Havelaar et al., 2015).

According to reports, Ethiopia's animal source food value chain has a high prevalence of food-borne pathogens (Lina et al., 2023). The most frequent FB pathogens identified from Ethiopia were Shigella, Salmonella, Listeria monocytogenes, Escherichia coli (E. coli), Campylobacter spp., and Listeria, with food-producing animals serving as the main reservoirs (Belina et al., 2021). Ethiopian food poisoning epidemic reports are frequently connected to the intake of raw meat and milk (Kassahun and Wongiel, 2019). Nevertheless, incidents of foodborne diseases are underreported and infrequently subject to thorough investigation (Ayana et al., 2015).

Food animals are a major epidemiological risk factor for non-typhoid human salmonellosis because they harbor a wide variety of salmonella serotypes. The process of removing the gastrointestinal tract during food animal slaughter is thought to be one of the ways that carcasses and organs are contaminated with salmonellosis.

Salmonella enterica is one of the most commonly isolated foodborne pathogens and is regarded as a major global health threat. The genus Salmonella consists of two species, Salmonella enterica and Salmonella bongori, which are further divided into over 2,600 serovars. Among these, Salmonella enterica is responsible for the majority of infections in humans and animals. Many subtypes have evolved from the same serovars. Most Salmonella serotypes are polyphyletic or homologous in origin, with distinct pathogenic lineages. The vast number and genetic diversity of Salmonella serotypes have made serovar identification highly complex. Molecular biology-based methods have proven to be more efficient than traditional phenotypic subtyping techniques, as they are typically more discriminatory and less affected by environmental factors. Multilocus sequence typing (MLST) is increasingly used by reference and diagnostic laboratories for epidemiological investigations and outbreak studies.

Objective research

To solve the problems in Ethiopia, we need to

assess the prevalence of *Salmonella* and campylobacter in raw animal source food,

identify the associated risk factors,

implement effective intervention on salmonellosis and campylobacter

In this study, we conducted a small-scale survey on *Salmonella* contamination of raw meat in Japan

Methods and Materials

Study area: The study was conducted in Obihiro Japan in food suppliers and retailers from February 2023 up to April 2023. Obihioro City Japan is located at 42.91722 latitudes, 143.20444 longitudes, and an altitude of 43 meters above sea level.

Samples collection: Animal-source foods are sold in the city in different supermarkets. Some of the food sources is directly from the farm and the other are from processing companies. The total sample size is 11 the source of the sample is from 2 Producer for sample size 5 and the rest 6sample have no information about the producer. In this study, we take chicken skin, minced chicken meat, and minced pork meat from a total of 3 retailers. The origin of the animal source food is different geographical areas it is from AOEM and Hokkaido. In this study also we consider the shelf life of the food and the weight of the sample.

Study design: A cross-sectional study was performed in obihior city.

Study methodology

A cross-sectional was conducted in the food chain that involves animal source food suppliers in the market, especially chicken meat and pork.

Culturing of bacteria on media: Using a stomacher, various weights of minced pork, chicken, and meat samples were combined with pre-enriched medium and 25 milliliters of sterile BPW. The mixture was then incubated at 37°C for a full day. After being incubated for 24 hours at 41.5°C for RVS and 37°C for MKTT, 0.1 ml and 1 ml of the BPW culture were transferred into 10 ml of Rappaport Vasiliadis Medium with Soya (RVS) and HTT broth, respectively, as a selective enrichment. A loop containing the infected RVS and HTT broth was cultivated onto selective media, DHL, and BG agar, and incubated for 24 to 48 hours at 37°C. Salmonella black colonies were chosen and labeled on DHL plates to be subcultured and ready for additional testing.

Biochemical test: A loop of Salmonella Bacterial colony from DHL media was taken and inoculated with a different pattern for each, LYSIN, and SIM liquid broth media and incubated at 37°C for 24-48 hrs. Salmonella showed a different reaction on each media in the case of TSI black, gas at butt and motility; TSI media showed black, gas at butt, and red at slant surface; lysine remain purple with salmonella.

Agglutination test and serotyping: Salmonella strain was tested for somatic antigens by slide agglutination using O antisera (Denka Co., Tokyo, Japan, and SSI, Copenhagen, Denmark). Salmonelle strain further tested for flagella antigens by tube agglutination using H antisera (Daka). The serovars were determined based on the reaction between O and H group antigens according to Kauffmann-whitescheme. Pick up a loop of sample from TSI and mix with antiserum of o antigens on slide. Observe the agglutination for salmonella again subidentification of the type serovar of o multivariate by slideagglutination. Pick a loop of sample from TSI media in 3ml of SIM incubate at 37°C for 24-48 hrs.And add 3ml formalin.

*Antimicrobial susceptibility test:*The susceptibility of the salmonella isolates to 12 antimicrobial agent was determined by antimicrobial a twofold broth micro dilution method in 96 well-microliter plate (Dry plate Eiken chemical).as described the standard in the standard of the clinical and laboratory Standard institute (CLSI). The following antimicrobial agents were tested ampicillin (range of antimicrobial dilution 1 to 28)cifazoline(1 to 128), cefotaxime(0.5 to 64 mg/l), streptomycin(1 to 128 mg/l), gentamycin(0.5 to 64mg/l), kanamycin(1 to 128mg/l), tetracycline(0.5 to 128mg) nalidixic acid (1 to128 mg/l), ciprofloxacin(0.03 to 4mg/l, colistin(0.12 to 16mg/l) ,chloramphenicol(1 to128mg/l) and Trimethoprim (0.25 to 16mg/L). pick the loop with colony and dissolve in to water with macfrand 1 standard mix 25 microliter bacterial culture with 12ml MH broth add 100microliter in the plate. the plate were incubated 35 degree centigrade for 24 hours. The resistance break points were defined based on the CLSI standard and the report on Japan veterinary antimicrobial resistance monitoring system 2016-2017.

PCR test: Based on PCR result theisolated salmonella the typical Salmonella colonies were confirmed by PCR amplification of the gene and compare with prima. PCR assays designed using single sets to identification campylobacter and multiplex PCR assays simultaneous identification based on Takara protocol.

MLST test: After purification the DNA template the seven housekeeping gene is amplify by electrophoresis and MLST gene sequencing is carried out based on data base

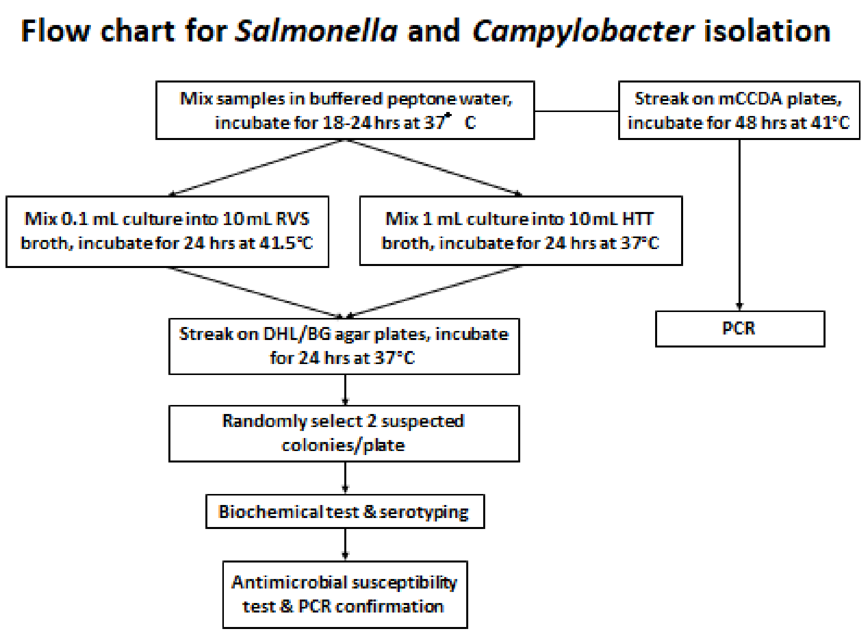

Figure 75 flow chart for salmonella and campylobacter isolation

RESULT

Colony characteristics

Table 59 Colony characteristics of salmonella and campylobacter in different media

Bacteria	**Selective media**	**Colour of colonies**	**Background colour**
Salmonella	DHL agar	Black	Original colour
	Brilliant Green agar	White	Red/purple
Campylobacter	modified (m) CCDA	Grey/white	Black

9 of 11 samples showed *Salmonella*-suspected colonies on DHL agar plates

6 samples showed *Campylobacter*-suspected colony on mCCDA agar plates *Biochemical tests for Salmonella*

A total of 30 *Salmonella*-suspected colonies were randomly selected.

Each colony was inoculated to SIM, TSI, and Lysine decarboxylase media

Table 60 Salmonella biochemical characteristics in SIM, TSI, and LYSIN media

Salmonella characteristics	**No. colony on SIM**	**No. colony onTSI**	**No. colony on LYSIN**
Motile	28/30		
H_2S production	28/30	28/30	
No IPA production	28/30		
Glucose use		28/30	
Gas production		20/18	
Lysine decarboxylase			19/30

Salmonella: motility (+), H2S (+), glucose use (+), gas (+), lysine (+)

19 colonies were finally confirmed as *Salmonella* and then serotyped

Antimicrobial susceptibility test result

Table 61 Broth microdilution method in MIC measurement

NA	1	2	4	8	16	32	64	128	0/19
CPFX	0.03	0.06	0.12	0.25	0.5	1	2	4	0/19
SM	1	2	4	8	16	32	64	128	11/19
KM	1	2	4	8	16	32	64	128	4/19
TC	0.5	1	2	4	8	16	32	64	10/19
ABPC	1	2	4	8	16	32	64	128	0/19
GM	0.5	1	2	4	8	16	32	64	0/19
CP	1	2	4	8	16	32	64	128	0/19
CEZ	1	2	4	8	16	32	64	128	0/19
CTX	0.5	1	2	4	8	16	32	64	0/19
CL	0.12	0.25	0.5	1	2	4	8	16	0/19
TMP	0.12	0.25	0.5	1	2	4	8	16	1/19

NA: Nalidixic acid; CPFX: Ciprofloxacin; SM: Streptomycin; KM: Kanamycin; TC: Tetracycline; ABPC: Ampicilin; GM: Gentamycin; CP: Chloramphenicol; CEZ: Cefazolin; CTX: Cefotaxime; CL: Colistin; TMP: Trimethoprim

Orange line: break point; Yellow cell: MIC of colonies found in this study

Serotyping of Salmonel

Table 62 Salmonella serotyping

Serovar	O antigens	H antigens		Number of colonies
		Phase 1	Phase 2	
Schwarzengrund	4	D	1,7	14
Infantis	7	R	1,5	2
Manhattan	8,6	D	1,5	3

19 colonies were classified into 3 serovars.The most prevalent serovar was Schwarzengrund. These 3 serovars were frequently isolated from broilers and humans in Japan

Table 63 Summary of salmonella

Sample no.	retailers	Blands	Producers	Production area	Co. no.	Serovars	Drug susceptibility test	Isolates no.
1	AEON	A	C	Hokkaido	R1-1	Schwarzengrund	All susceptible	2
					R1-2	Schwarzengrund	All susceptible	
2	AEON	B	D	Aomori	R2-1	Infantis	SM+TC	3
					R2-2	Schwarzengrund	SM+KM+TC	4
3	AEON	B	D	Aomori	R3-1	Schwarzengrund	SM+TC	5
					R3-2	Schwarzengrund	SM+TC	
					H3-2	Schwarzengrund	All susceptible	1
4	Daiichi	No	No	Hokkaido	R4-1	Manhattan	SM+TC	6
					R4-2	Manhattan	SM+TC	
5	Daiichi	No	No	Hokkaido	R5-1	Manhattan	SM+TC	7
					R5-2	Infantis	All susceptible	8
6	AEON	B	D	Aomori	R6-1	Schwarzengrund	SM+KM+TC	9
					R6-2	Schwarzengrund	SM+TC+TMP	10
7	AEON	B	D	Aomori	R7-1	Schwarzengrund	SM+KM+TC	11
					R7-2	Schwarzengrund	SM+KM+TC	
8	Fukuhara	No	No	Date, Hokkaido	R8-1	Schwarzengrund	All susceptible	12
					R8-2	Schwarzengrund	All susceptible	
9	Fukuhara	No	No	Date, Hokkaido	R9-1	Schwarzengrund	All susceptible	13
					R9-2	Schwarzengrund	All susceptible	

Colonies derived from the same sample, showing the same serovar and the same drug susceptibility profile, were considered as one isolate. As a result, a total of 13 different isolates were obtained in this study.

PCR and MLST result of salmonella and campylobacter

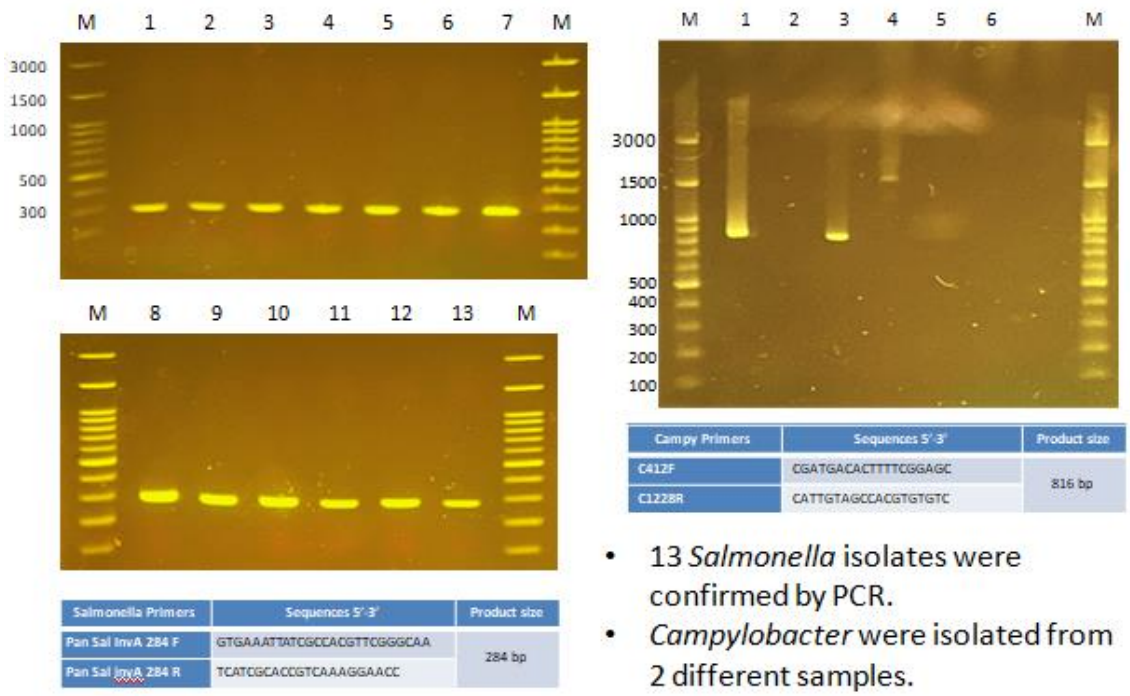

Figure 76 Salmonella and campylobacter PCR result

DISCUSSION

The result of the present study showed that 13 isolates of *Salmonella* were obtained from 9 of 11 different samples (81.8%, 9/11). All the positive samples were chicken skins. In this study, we have isolated 3 serovars of *Salmonella*: 9 strains of Schwarzengrund (69.2%, 9/13), 2 strains of Infantis (15.4%, 2/13), and Manhattan (15.4%, 2/13). These are the most common serovars in Japan (Sakakida et al., 2022), (Duc et al., 2020) and (mori et. al.,2018)

In Ethiopia, *Salmonella* serovars Braenderup, Saintpaul, Typhimurium, and Anatum are predominant in chicken meat (Getachew et al., 2015; Bayleyegn et al., 2003)

Antimicrobial resistance profile from 19 isolates, serovar schwarzengrundis resistant to 4 different drugs, infantis is resistant to 2, and Manhattan is resistant to 2. A similar study showed antimicrobial resistance in *Salmonella* isolated from food in Japan's veterinary antimicrobial resistance monitoring system (Sasaki et al., 2021) with a slight difference in susceptibility of Schwarzengrund, possibly due to the scale of surveillance: whole Japan vs Hokkaido and Aomori. This study showed the isolates with high resistance to SM and TC. The reason is that SM is used with in-ovo vaccination for prevention of bacterial contamination at injection and TC is used in parent stock against bacterial infection. In this study we have got 3 serovars of *Salmonella* and its prevalence was 81.8% (9/11) and *Campylobacter* with 18.2% (2/11). The antimicrobial resistance profile showed that multi-drug resistance (MDR) was developed in each strain and a high rate of resistance was recorded in streptomycin and tetracycline.

CONCLUSION

In this study we have got 3 serovars of *Salmonella* and its prevalence was 81.8% (9/11) and *Campylobacter* with 18.2% (2/11). The antimicrobial resistance profile showed that multi-drug resistance (MDR) was developed in each strain and a high rate of resistance was recorded in streptomycin and tetracycline. These quantitative results demonstrated the significant threat to food safety posed by the evolution of antibiotic resistance in chicken and poultry products as a result of antibiotic overuse in the poultry food chain.

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9.2 Three months of field deployment for cholera outbreak investigation and response in the Amhara region's South Wollo zone, Oromia special zone, Dessie, and Kombolcha cities, 2024.

Introduction

Ethiopia is currently experiencing a significant cholera outbreak affecting 90 woredas across eight regions. These regions include Oromia, Afar, Southern Nations, Nationalities, and People's Region (SNNPR), Central Ethiopia Region (CER), Dire Dawa, Harari, Somali, and Amhara. Among these, Oromia is the most affected with 29 woredas reporting cases, followed by Somali with 23 woredas impacted. The Amhara region, in particular, is facing its third round of the outbreak, signaling a recurrent and persistent issue. The widespread nature of the epidemic across multiple regions highlights the urgent need for coordinated public health interventions to contain and manage the spread of cholera.

Amhara region On July 15, 2023, suspected cholera cases were reported from the Bermil St. George Holy Water site in the Quara District of West Gondar Zone, located in the Amhara Region. By December 18, 2023, the outbreak had escalated, resulting in 4,983 reported cases and 90 deaths, reflecting a case fatality rate (CFR) of 1.8%. Of these cases, 148 were laboratory-confirmed, while 4,835 were epidemiologically linked. The outbreak affected 58 woredas, underscoring the severity and widespread nature of the cholera crisis in the region.

Objective:

- To “Stop Cholera” at all Epi-centers throughout the country within the 8-week Time frame.
- To reduce Case fatality rate <1% at all Epi centers

The overall situation of the Cholera Outbreak

There have been 20 cases recorded in the South Wollo zone, but no one has died from the infection. On the other hand, the Oromo Special Zone has logged a much larger number of cases 308 in total, five of which were fatal. It is noteworthy, therefore, that all 308 cases in the Oromo Special Zone have now recovered completely. A lesser outbreak with only 3 recorded cases, all non-fatal, occurred in Dessie City. Fortunately, there were no fatalities connected to the lone case that was documented in the Kombolcha military camp. According to these statistics, the situation has varied effects on different regions, with some suffering greater negative consequences than others. All in all, it emphasizes the significance

Oromia special zone

Bati town

On April 8, 2024, news of the first possible case of cholera was released from Bati Town, Oromo Special Zone, Amhara region. The Public Health Emergency Operation Centre (PHEOC) in Bati was activated once the outbreak was verified by positive RDT and Culture testing. A multisectoral coordinated response including stakeholders and health professionals was initiated. By June 4, 2024, 89 cholera cases including 2 fatalities had been reported, with a 97% recovery rate, despite efforts to contain the outbreak. However, the outbreak is still spreading because of things like a lack of access to clean water, squalor, and high levels of migration, particularly in places that border the Afar region.

Bati wereda

The cholera outbreak in Bati Woreda, located in the Oromo Special Zone of the Amhara region, began on April 6, 2024. Initial suspected cases were confirmed using RDT and Culture tests, leading to the activation of the Public Health Emergency Operation Center (PHEOC) and the implementation of a coordinated response involving health experts and various stakeholders. Despite significant efforts, by June 5, 2024, the district had recorded 211 cases and 3 deaths, with a recovery rate of 98%. However, the outbreak remains uncontained, with ongoing transmission driven by factors such as inadequate access to safe water, poor sanitation, dense urban populations, and high mobility, particularly in areas bordering the Afar region.

South wollo zone

In Delanta Woreda, there were 23 confirmed cases of cholera between October 20, 2016, and December 3, 2016. People with a history of visiting Alamata in North Wollo and recently discovered holy water sites were linked to the outbreak.

Since April 10, 2016, a cholera outbreak has been ongoing in the South Wollo Zone, with a total of 20 cases reported 19 from Argoba Woreda and 1 from Kalu Woreda. The source of this outbreak has been epidemiologically linked to Bati Woreda.

Dessie and kombolcha cities

In Dessie city, 3 cholera cases were reported with no deaths. Isolation centers were established in 4 private hospitals, more than 40 private clinics, 8 government health centers, and a referral hospital. In Kombolcha city, 4 CTC center sites were selected, with isolation centers set up in one hospital, 4 health centers, and 42 private clinics. In the Kombolcha military camp, 1 case was reported with no deaths.

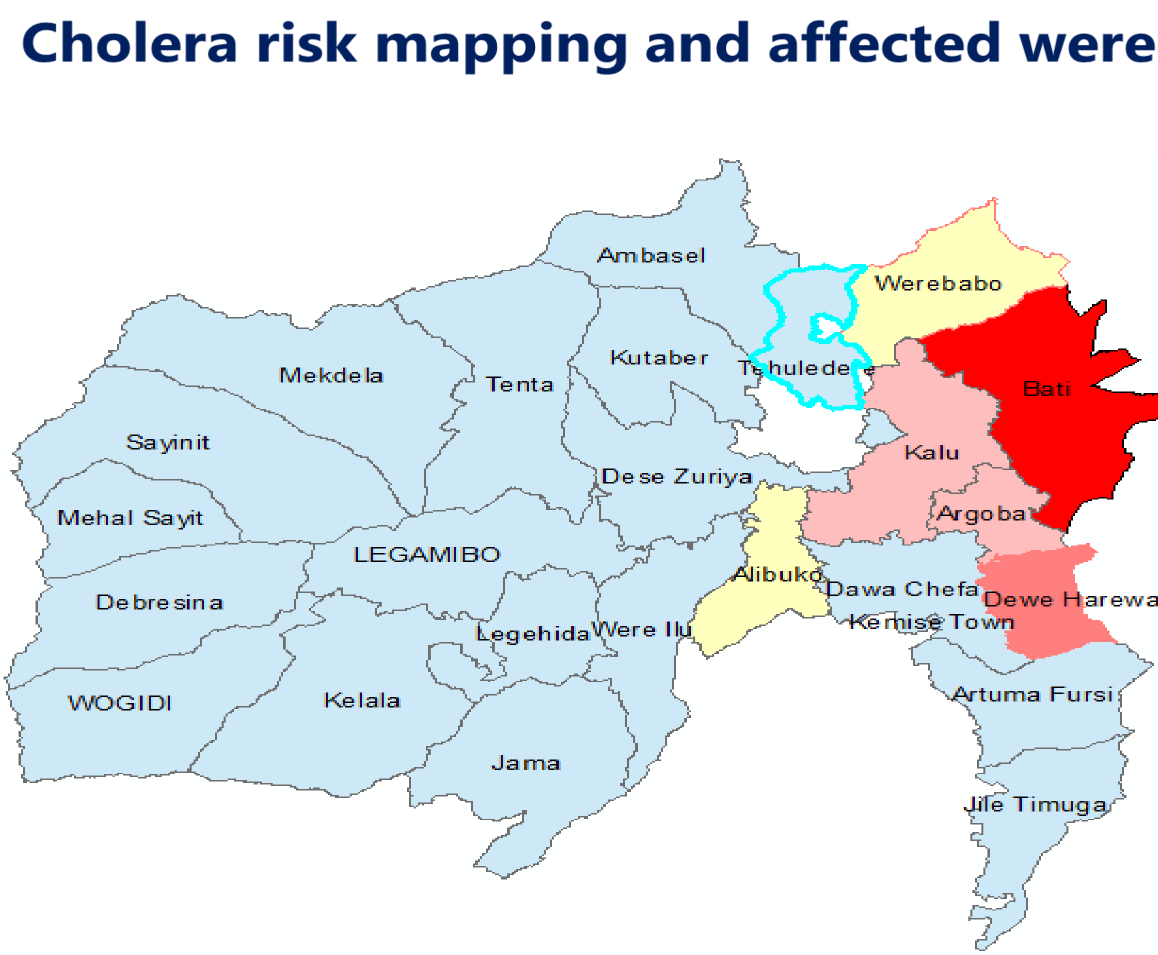


Figure 77 Cholera risk mapping and affected wereda

General information on current status

In the Amhara region, several woredas are currently dealing with active cholera cases. Bati Zuria Woreda, one of the affected areas, reported no new cases or deaths, with 207 patients discharged from the CTC. The facilities in this area include 2 Cholera Treatment Centers (CTC) and 10 Oral Rehydration Points (ORP). Bati Town, another affected area, also reported no new cases or deaths, with 87 patients discharged from the CTC. The total reported cases in Bati Town are 89, with 2 deaths. In Argoba Woreda, no new cases or deaths were reported, with 19 patients discharged from the CTC. Lastly, in Kallu Woreda, no new cases or deaths were reported, with 1 patient discharged.

	Region	Currently Active Woredas	Newly affected woreda	New Cases	New Death	Current Admission at CTC	Discharge	CTC /#	CTU /#	ORP /#	Remark
	Amhara	Bati zuria wereda	Bati zuria wereda	0	0	0	207	2	0	10	Total cases 211 Total death 3
		Bati town	Bati town	0	0	0	87	1	0	0	Total case 89 death 2
		Arigoba wereda	Argoba	0	0	0	19	1			
		Kallu		0	0	0	1	1			

The region’s total cholera cases stand at 211, with 3 total deaths.

Dehydration status and cases

Table 64 Dehydration status and cases

Case classification	Bati	Bati wereda	Argoba	Kallu
New Cases	0	0	0	0
Total Cases	89	211	19	1
New Death	0	0	0	0
Total Death	02	3	0	0
Current on treatment	0	0	0	0
Severe dehydration	0	56	14	1
Some/Moderate dehydration	0	109	3	
No dehydration	0	46	3	
Total Recovered	87	207	19	1

Case trend

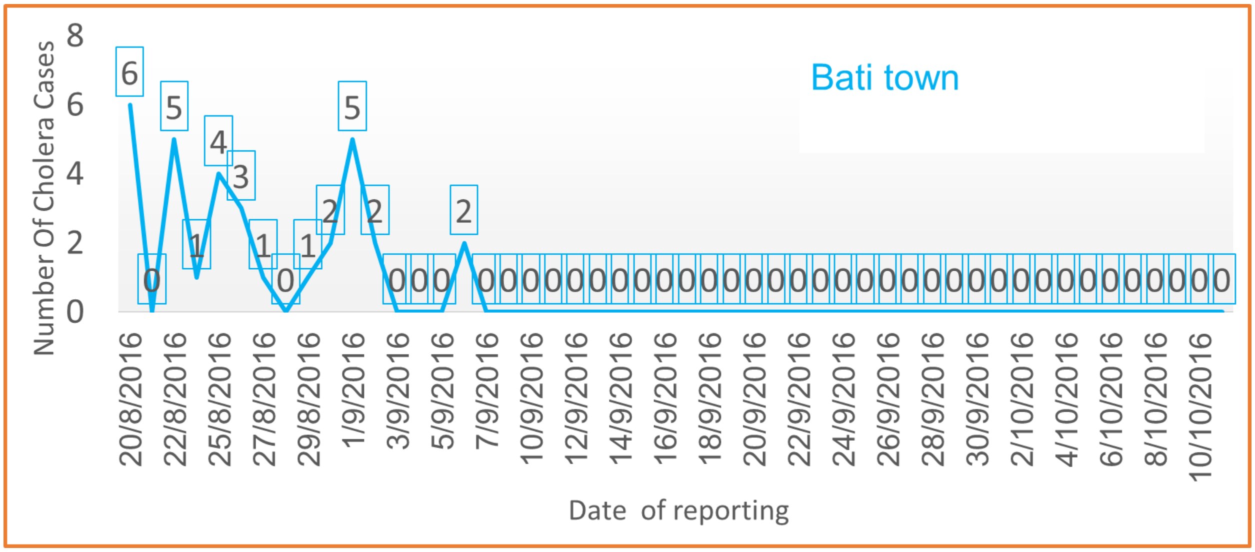


Figure 78 case trend of Bati town

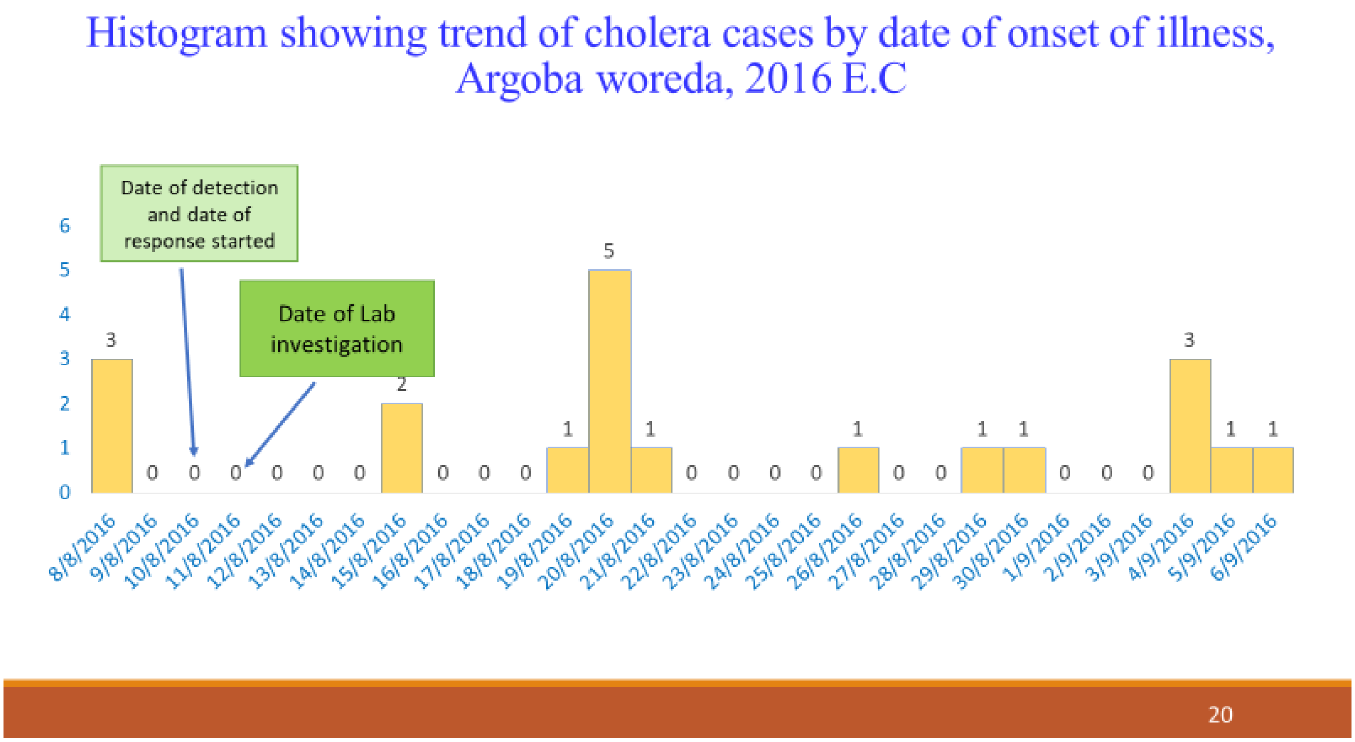


Figure 79 Histogram showing trend of cholera cases by date of onset of illness Argoba wereda

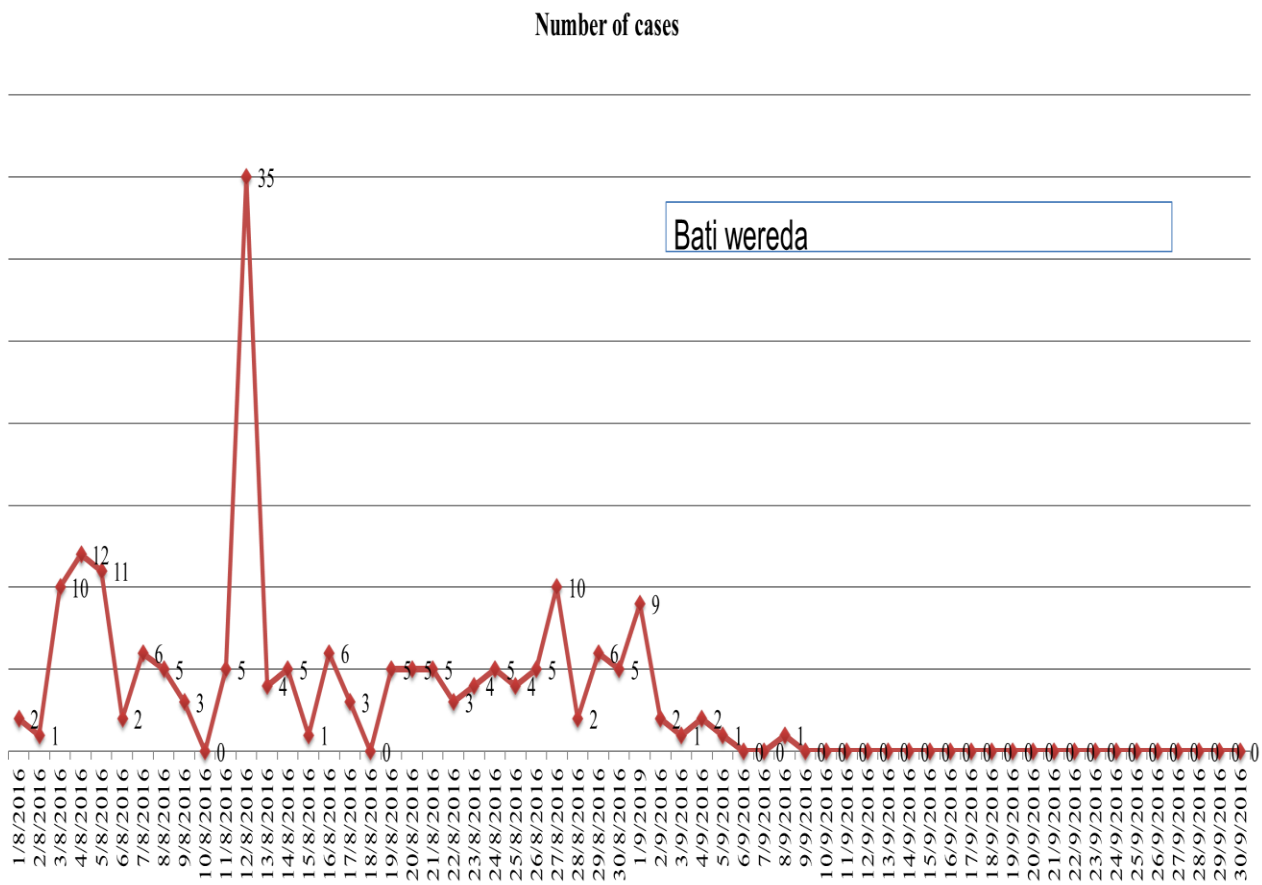


Figure 80 case trend of cholera bati wereda

I. Major Achievements on the pillars of response activities after deployment

1. Coordination

- ➢ Cross-border collaboration between regions meeting was held at Kombolcha
- ➢ IMS meetings, Partnership meetings, Taskforce meetings, and Supportive supervision were conducted
- ➢ Activate and engage stakeholders at all levels and health facilities
- ➢ Activate and engage the health center RRT team.
- ➢ Discuss response activities with Wereda officials at all levels, including health posts. Monitor and evaluate outbreak response at the Wereda EOC.
- ➢ Identify gaps and limitations in each health facility and share experiences.

- engaged and participating community and religious leaders as main actors in the cholera outbreak response, especially Herbu Fulweha
- Engaged and involved city administrations

Figure 81 Coordinationation at zonal, health facilities, community, and religious leaders

In Bati, 64 IMS meetings, 11 partnership meetings, 11 supportive supervision sessions, and 11 Rapid Response Team deployments were conducted during the outbreak

South Wollo Zone IMS meeting conducted weekly, partnership meeting conducted monthly, supportive supervision weekly.

2. Surveillance

surveillance activity was ongoing in both affected woredas and at-risk areas. A suspected case was verified and has since been declined. Daily reporting is being followed up with health facilities. Line list formats, guidelines, and case definitions were distributed, and orientations were given to health centers and private clinics. Case definitions and active case searches were conducted, including house-to-house searches and BCC (Behavior Change Communication) activities. Rumor reporting is continuing in Bati, and all reports are being investigated. Cross-border surveillance is also ongoing, particularly along the border of the Afar region (Telalak woreda), as well as in Bati and Argoba woredas.

In a recent round of Rapid Diagnostic Tests (RDT) across four woredas, a total of 19 tests were conducted in Bati Town, resulting in 11 positive and 8 negative outcomes. In Argoba, 5 tests were performed, all of which returned negative results. Bati Wereda saw 6 tests conducted, with 5 positives and 1 negative. Finally, in Kallu, 3 tests were administered, yielding 1 positive and 2 negative results. These findings highlight the varying prevalence of positive cases across the different woredas.

In Bati town, Argoba, Bati woreda, and Kallu, a series of public health activities were conducted to manage and control the spread of diseases. Through active case searching, 83 cases were identified in Bati town, 19 in Argoba, and 1 in Kallu. Contact tracing efforts led to the identification of 6 additional cases in Bati town, 14 bati wereda, 10 in Argoba, and 1 in Kallu. Household disinfection was carried out in 609 homes in Bati town, 19 in Argoba, and 1 in Kallu, ensuring that areas with identified cases were thoroughly sanitized.

The reporting of the line list documented 89 cases in Bati town, 19 in Argoba, 211 in Bati woreda, and 1 in Kallu. Additionally, rumors related to possible cases were investigated, with 203 reports in Bati town, 19 in Argoba, 592 in Bati woreda, and 1 in Kallu. These efforts highlight the comprehensive measures taken across these regions to identify, trace, and respond to public health threats.

3. Case management

Case management Was conducted at CTC and ORP centers of affected weredas, Isolation centers were prepared in all health facilities including private clinics during the epidemic period.

In a series of supervisory activities across Bati town, Argoba, Bati Wereda, and Kallu, the following results were observed:

- CTC (Cholera Treatment Center) supervision was conducted extensively, with 12 centers supervised in Bati town, 19 in Argoba, 12 in Bati Wereda, and 12 in Kallu.
- ORPs (Oral Rehydration Points) supervision was more focused in Bati Wereda, where 12 ORPs were supervised, while no ORPs were supervised in Bati town, Argoba, or Kallu.

- Regarding fulfilling minimum requirements at CTCs, 1 center in Bati town, 1 in Argoba, 2 in Bati Wereda, and 1 in Kallu met the necessary standards.
- For ORPs, only in Bati Wereda did 10 ORPs meet the minimum requirements,

4. WASH

Table 65 WASH activities in affected weredas

SN	Activity	Bati town	Bati wereda	Argoba	Kallu	Remark
1	Water source tested	52	583	6	53	
2	Chlorine residual test	52		0		
3	House hold water treatment chemicals distributed	10311 HH	32602	35747	597	
4	Treatment of water points/Mass chlorination	52	583	3	1067	
5	Enforcement of regulatory actions	3			24	
6	New Water point established	5		0	7	
7	Maintenance of water points	17	160	2	98	
8	Water tracking	1394000L		0	-	

9	New latrine constructed	53	1574	0		
10	Latrine Utilization Coverage	84		98	88	
11	Distributed hand washing facilities	20 facilities with 400 Soap		0	35	

Figure 82 RCCE and WASH activities in Bati Town

5. RCCE

Significant public health outreach activities were conducted in Bati town, Kallu Wereda, Bati Wereda, and Argoba. A total of 41,965 individuals in Bati town, 3,245 in Kallu Wereda, and 94,114 in Bati Wereda received health education, emphasizing the importance of community awareness. Social mobilization efforts included 9 sessions in Bati town, 2 sessions in Kallu Wereda, and activities that reached 126,900 people in Bati Wereda, alongside 8 sessions in Argoba. IEC (Information, Education, and Communication) materials were distributed, with 5,873 leaflets in Bati town and 29,078 in Bati Wereda.

6. Risk site mapping

in Bati town, 17 communal latrines, population gathering sites such as schools, markets, and religious sites, as well as public celebration areas, are identified as potential risk sites. Additionally, the town's river water source poses a risk. In Bati Wereda, two water sources have been identified, with six clusters recognized as high-risk areas. Kallu Wereda includes specific sites such as Harbu Fulweha and Geta Mewilid, particularly during religious celebrations, as areas of concern. Furthermore, this Wereda has a history of a cholera outbreak in 2000 E.C., specifically in Kebele 032, and is home to internally displaced persons (IDPs). Similarly, Argoba Wereda also presents risks due to population gathering sites and the presence of IDPs.

Table 66 Risk site mapping in affected wereda

Name affected wereda	Risk site
Bati town	17 communal latrines, population gathering site(school, market, religious site), public celebration
	Water source river

Bati wereda	Two water source
	6 cluster is identified as a risk area
Kallu wereda	Harbu fulweha, Geta mewilid(religious celebration)
	IDP, Back History cholera outbreak area 2000 E.C kebele 032
Argoba	IDP, population gathering
	Water source

7. **Key Gaps and Challenges**

- Week intersectoral coordination
- Little partner engagement
- Low coverage of safe water and Sanitation
- Drought
- Need of Training
- Shortage of IPC/WASH materials
- Risk intervention area(IDP, holy water, population gathering, etc..)
- Shortage of operational Coast for Cholera outbreak response
- The outbreak was not responded to by OCV Vaccine

8. **Changes After Deployment**

- The cholera outbreak is controlled for more than 2 months and zero cases maintained
- Mapping of risk area and follow-up is continued
- Zonal IMS strengthened, activated RRT, task force, and partnership meetings and deployed supervision team at zonal, wereda, and health facility level
- Needs and gaps of the affected wereda were identified

- A major achievement in the response Activities have been carried out in affected wereda and high-risk area
- strength surveillance
- Achievement on IPC/Wash activities, RCCE

9. Conclusion

The cholera outbreak that began in April 2024 has been successfully controlled in the affected regions, with no new cases reported for over three months. Bati town was particularly impacted, with 89 cases and a 3% case fatality rate (CFR), while Bati Wereda reported 211 cases and a 1.4% CFR. Additional cases were also reported in Argoba and Kalu Woredas, linked to the outbreak in Bati. The effective response measures have helped contain the outbreak, but the situation underscores the need for ongoing vigilance and improvements in public health systems.

10. **Recommendation**s

Ongoing Monitoring and Follow-up: Maintain close follow-up on the functionality of response committees and ongoing activities to ensure sustained control and prevention of future outbreaks.

Partnership Engagement: Actively engage partners in the four zones, particularly South Wollo and Oromia Special Zones, to provide necessary support for community health needs.

Strengthening Health Systems: Enhance the linkage between private health facilities and the Public Health Emergency Management (PHEM) system to improve coordination and response.

Training and Capacity Building: Provide comprehensive training in surveillance, case management, and risk communication & community engagement at the facility level to bolster preparedness and response capabilities.

High-Risk Area Prioritization: Focus on high-risk areas and enhance cross-border surveillance to prevent the spread of future outbreaks and ensure early detection and intervention.

II. After action review

After the outbreak was controlled, an after-action review (AAR) was conducted in the affected areas of South Wollo Zone, Oromia Special Zone, Dessie, and Kombolcha cities. The review focused primarily on Bati, which had the most cases in the area. The objective of the AAR was to assess the effectiveness of current public health systems in preventing, detecting, and responding to public health events, to identify lessons learned, and to share these insights with other professionals. The purpose of the review is to contribute to the development of a national health security action plan and to support other evaluations, such as the Joint External Evaluation (JEE) or simulation exercises.

Pillar 1. Coordination

lessons

- IMS was established including both the Bati Town and Bati Wereda
- IMS meeting was conducted daily and more than 60 IMS meetings were conducted
- In each IMS meeting action points were prepared
- A total of seven-section response team was established
- the coordination between the government health sector and the health cluster partners as well as the coordination between health centers, hospitals, and private clinics was good and had a good initiation
- the partner was engaged fully throughout the outbreak and few were only at the beginning of the outbreak
- lessons
- IMS was established including both the Bati Town and Bati Wereda
- IMS meeting was conducted daily and more than 60 IMS meetings were conducted
- In each IMS meeting action point was prepared
- A total of seven-section response team was established
- the coordination between the government health sector and the health cluster partners as well as the coordination between health centers, hospitals, and private clinics was good and had a good initiation

- the partner was engaged fully throughout the outbreak and few were only at the beginning of the outbreak

Gap

- Initially private clinic sent the suspect case after treatment
- The engagement of some sectors in the task force like communication limited
- Shortage budget and trained human power

Best Experience

- The PHEOC was active and had a strong platform, especially with the IMS meetings being conducted daily and action points being taken at each meeting

AAR supervision Bati

Figure 83 AAR supervision in Bati Town and Bati wereda

Pillar 2. Epidemiological Surveillance

lessons

- Case detection and verification were early
- The first Rumer was come by HDA (28/7/2016) and immediately verified
- the onset and the detection of the event had no gap
- the most contributing factor to early detection was the awareness and the occurrence of the disease before 14 years
- A rumor notification system was created by the surveillance team. It includes kebele leaders and health extension and receives a daily report
- A total of 203 and 592 Rumers received from Bati Town and bati wereda
- The chief of the surveillance team received the report and conducted data analysis daily
- The source of the outbreak was water
- An official letter was prepared at the end of the outbreak
- cross-border surveillance was conducted with Afar and adjacent weredas
- a total of 609 and 973 address household addresses by contact tracing only 6 cases and 14 cases were identified from Bati Town and Bati Wereda respectively
- An outbreak investigation was conducted and it was case-control
- there was daily report sharing for the respective part
- The sample was collected, confirmed, and notified timely
- a total of 17 and 11 RDT and culture tested positive respectively

Gap

In the beginning, few suspect cases hide themselves in resistance to restrictions

Best Experience

coordination of the surveillance team with other sections of the response team ambulance and sprayer were ready together with the surveillance team daily monitoring and evaluation were conducted

Pillar 3. Case management

Lessons

- CTC was established based on WHO guideline
- cases were managed based on their severity
- The referral system from community and health facility to CTC was well-organized
- case definition was posted
- facilities on the CTC were available like showers; latrines, foot baths, screening area; admission area; recovery area; fence

Gap

shortage of logistic supply for CTC

Best experience

Cases were managed early, resulting in a smaller number of severe cases (only 56 severe cases in total) and no readmissions. Additionally, the referral system from the community and health facilities was well organized.

Pillar 5. Risk Communication and Community Engagement (RCCE)

Lesson

- In Bati Wereda health education was addressed at 379032 and one person got a lesson more than 3 times average. The total population of the wereda is 101050 and HH is 23500
- 10459 Household addressed health education in Bati town
- they used previous cases for health education
- health education was given in markets, schools, religious institutions, and population-gathering sites like
- market, school, and “sedeka” were closed
- messages reached the target groups and risk communication was managed

Gap

shortage of montarbo (Mega-phone)

Best Experience

Population gathering sites such as markets, schools, transportation hubs, and other public events were closed. Health education was provided to the entire population through megaphones, IEC materials, leaflets, health facilities, religious institutions, meetings, house-to-house visits, and community engagements. In total, 379,032 individuals in Bati Wereda were reached and addressed.

Pillar 5. IPC/WASH

Lessons

- since the source of the outbreak was water efforts were made to safe water supply and water treatment
- 583 and 53 water sources were treated and 160 and 17 were maintained in both Bati town and Bati Wereda respectively
- Aqua tab was distributed in two rounds 130,000 and 40000 in Bati Wereda for 23500 household
- 10,459(100%) for HHS 32,713 first round and 1400 second round bati town
- Latrine 2290 and 1500 ongoing and 53 and 40 ongoing bati wereda and bati town respectively
- A total of 38600 hand washing practices in different population

Gap

Shortage of IPC/Wash logistics

Best Experience

An intervention was implemented that included water treatment, a safe water supply, and an increase in latrine coverage to control the outbreak.

Annex I Cholera Outbreak Response WHO Triggers Questions for AAR

For some of the pillars that are frequently taken into consideration during an AAR after a public health event, this appendix offers subsets of sample trigger questions. Facilitators and interviewers can use trigger questions to help to focus discussions.

Pillar 1. Coordination

1. Was there an activated PHEOC/ICP during the response? --
----

2. How was the coordination between the government health sector and the health cluster partners? ____

3. Were all partners equally engaged? ________________________________, Which partners were fully engaged? ____

4. How was cross-border coordination and collaboration with neighboring zones and woredas?
____¬-
____

5. What was the status of different coordination platforms during the response? (RRT, IMS, Taskforce
etc...)____
____

6. How was the coordination between health centers, hospitals and private clinics? (describe briefly)____
____
____

7.How do you describe the preparedness before the occurrence of the outbreak?(Describe in terms of logistic, human resource, EPRP plan and coordination
etc…)____
____
____
____
____
____

8. Was a coordinated, multisectoral, interagency response strategy created? In what ways did this improve the response?

____
____

9. What were strengths, weaknesses, best-experiences and challenges during the response?____

10. What were the enabling factors, limiting factors, and impact of the coordination during the response?

Pillar 2. Epidemiological Surveillance

1.How was the case detection system?

______________________________,Was it early or late?

______________________________,

2. How do you describe it? ------------------------------

3.What was the rumor notification system? Was it early or late? How do you describe it?----------

5.How do you describe the surveillance data management practice?------------------------------

6.How was the RRT status in active case searching?, ------------------------------

7. What was the source of the outbreak? ------------------------------

8.How did you investigate the source of the outbreak?------------------------------

9. How was the cross-border surveillance?(Describe briefly)------------------------------

----
----

10. How did you conduct contact tracing?---

____

11. How did you describe contact tracing status?---
----

12. Did you conduct an outbreak investigation?--
----

13. What was the study type for Q 16?--
----

14. How was the timeliness and completeness of daily surveillance data reporting?-----------------
----
----

15. How was the community engagement in active case searching?------------------------------------
----

----

16. What were the strengths, weaknesses, enabling factors, limiting factors, and impact of the surveillance during the response? --
----

Pillar 3. Laboratory

1. How was the sample collection, case confirmation, and result notification system?---------------
----
----

2. How do you describe its timeliness? --

----

3. Were plans and standard operating procedures for laboratory testing adequate to respond to the event?--
----
----

4. Were there trained lab professionals on cholera sample collection in the nearby health facilities? --
----
----

5. How do you describe the biosafety and biosecurity practice of cholera sample?-------------------
----
----

6. What were the enabling factors, limiting factors, and impact of the laboratory during the response? --
----

Pillar 4. Case management

1.How the situation was handled in terms of cases and fatalities?---------------------------------------
----

----

2. How patients were referred and moved between medical facilities?---------------------------------
----
----

3. How were the various sectors and partners involved in the coordination of case and fatality management?---
----
----

4. Were the tools, supplies, and resources required for personal safety and case management on hand? (Shortly describe)---
----

----

5. What part did the government and other parties play in case management?------------------------
----

----

6. In what manner was the case management funded? Were patients able to get it for free? --------
----
----

7. How was the CTC organized?(Describe based on the WHO standard)------------------------
----

----

8. Was there hand washing facilities; showers; latrines, foot baths, screening area; admission area; recovery area; morgue room; fence?--

9. Was the CTC staffed with a standardized number of response staff?--

10. How was the communication between the case management team with other teams?---

11. What were weakness identified during response?--

12. What were challenges faced during outbreak response?--

13. What were best practices? --

Pillar 5. Risk Communication and Community Engagement (RCCE)

1. How were risk communication activities and messages coordinated across different levels of the health system (local, regional, and national) and among partner organizations?

2. Did the messages reach their intended audiences, and were they understood?

3. Is there an established risk communication strategy?

4. How was public communication managed during the emergency?

5. Was a specific communication plan developed?

6. Were there any aspects of the strategy that proved ineffective or irrelevant?

7. Did risk assessment inform risk communication, and was there a reciprocal exchange?

8. Did the personnel responsible for risk communication and risk assessment collaborate effectively?

9. How was risk communication monitored during the emergency?

10. Has there been any noticeable change in public behavior or sentiment as a result of the communication efforts?

11. Did the population most in need of receiving communication actually get the messages?

12. If not, what were the reasons?

13. How do we verify this?

14. Were adequate resources, including budget, allocated for risk communication and community mobilization?

15. How were communication efforts and messages coordinated with other sectors and partners?

16. How were rumors and misinformation identified, and what actions were taken to address them?

17. How effective was public communication in building trust with the public and managing emerging concerns?

18. Were mechanisms in place for at-risk communities to engage or contact authorities with questions?

19. Was feedback from communities used to update risk communication messages and strategies?

Pillar 6. IPC/WASH

1. What infection prevention and control measures were put in place to protect healthcare workers, both inpatients and outpatients, as well as the wider community? Were these measures adequate?

2. Were the infection prevention and control strategies implemented during the emergency effective in preventing the spread of infection within healthcare settings and the community?

3. How was waste managed in healthcare facilities and within the community, particularly after funerals?

4. Were there sufficient resources, such as personal protective equipment, waste disposal, and decontamination supplies, to safeguard staff from infection?

5. How was coordination with other sectors, including the private sector, ensured for the implementation of infection prevention and control measures in healthcare facilities and communities, and for water, sanitation, and hygiene activities?

Annex II Checklist for field deployment for rapid assessment in outbreak areas.

S.no	checklist for Rapid assessment on cholera outbreak area			
	General Information			
I	Date ----/-----/-----(dd/mm/yyyy)			
II	Interviewers name & Position:			
III	Respondents name & Position:			

IV	Address: Cell Phone No:---------------------- E-Mail:			
V	Secio-demographic information			
VI	Zone __________________District name : ____________________			
VII	Name of Health Center or Hospital: ______________________			
VIII	How many health posts are available and how many of them are functional?______________ & __________			
IX	Catchment population ________________IDPs population _____________________			
	Tasks			
	1- Coordination	**Response (Yes/No)**		**Remark**
1.1	Is there **Public Health Emergency Management Committee (PHEMC)**			
1.2	If yes for Ques. 1.1, Do you have a Cholera Emergency Preparedness & Response Plan /EPRP (comprehensive in logistics, human resources, role, and responsibilities,) -If no, why			
1.3	If yes for Ques. 1.1, does the committee conduct regular meetings and review activities based on the vulnerable risk assessment for possible cholera in the wereda? (regular=daily-Quarterly)			
1.4	if yes for Ques.1.1, Does the Wereda Public Health Emergency Management Committee review the daily response of active outbreaks and give a direction by the chair			
1.5	Is the any integration between sectors (Health, Social affair, Water office, youth affair ,Education office, Agriculture and Municipality etc) to prevent and control cholera?			
1.6	Is there a functional WASH team who will coordinate emergency response?			
1.7	Are the partners working in the woreda partcipating in every activities collaboratively with woreda health office?			
1.8	Any chalenges regarding the coordination of the cholera outbreak response			
	2-Surveillance and laboratory			
2.1	Is there any assigned surveillance officer at wereda and focal person at health facility level in place where cholera outbreak reported?			
2.2	If yes for Ques. 2.1, Is the officer and focal person trained in basic PHEM and cholera surviellance and ooutbreak investigation?			
2.3	Is there any previously identified hot spot area in your subcity/ woreda?			
2.4	If yes for Ques.2.3 what are the name of hot spot areas? ____			

2.5	If yes for Ques.2.3. are you assessing cholera outbreak preparedness on the selected hotspots?			
2.7	If yes for Qes. 2.3. what is your observation in the hotspot area ?__________			
2.8	Do you have multidisciplinary Rapid Response Teams (RRTs) with clear terms of reference (TOR)?			
2.9	Do you follow the standard of receiving and sending PHEM weekly reports and outbreak daily report? (starrting from Health post?			
2.10	Do all health facilities send a timely weekly surveillance report to the next level? (Woreda)			
2.11	Do you regulary assess the timeliness and the completeness of the reports? If yes what is the timeliness and completeness of the report?			
2.12	Do you perform regular data analysis by time, place and person? For cholera outbreak daily?			
2.13	Do you conduct active case searching during this cholera outbreaks?			
2.15	If yes, Ques. 2.14. have you conducted proper cholera outbreak investigation and reponse? If yes what is the result of the investigation?			
2.16	Do you have guidelines, protocols, reporting and other monitoring tools for cholera surveillance?			
2.17	Do you have rumor logbook and rumor reporting formats at all levels?			
2.18	Did you experience internal displacement in this budget year? if yes List the IDP sites/ woredas:-			
2.19	Do you have standard and community case definition of Cholera?			
2.20	Do you collect sample for confimtion of cholera suspcted case ? If yes how many sample taken? The result of sample taken?			
2.21	Do the Public health facilites have the capacity to conduct culture laboratory testing and drug sensitivity testing? To where laboratory did you refer the sample?			
1.8	Any chalenges regarding the surviellance and laboratories of the cholera outbreak response			
	3-Case Management and Infection Prevention and Control			
3.1	Do you have Cholera treatment protocols and guidelines in all health facilities and CTC/ CTU?			
3.2	Do you have healthcare workers trained on cholera case management including IPC in CTC/ CTU?			
3.3	Do you have infection prevention and control guidelines and SOPs at all levels?			
3.4	Are there an identified appropriate health facility for ORT, CTU, and CTC to treat cases in case of cholera outbreak?			
3.5	Do you have a proper referral system in place (community to health facility; health facility to CTC)?			
3.6	Do you have protocol for safe and dignified burial of cholera-related deaths (including disinfection, transport and safe and dignified burial)?			

1.8	Any chalenges regarding the cases management and IPC of the cholera outbreak response			
	4-WASH			
4.1	Do you have WASH protocols (waste management, water treatment, cleaning and disinfection, handwashing with soap) in all facilities?			
4.2	Have you assessed the presence of proper hand washing facility and Sanitation system at all level?			
4.3	What is your water source the community in your atchement area?			
4.4	Is there adequate and safe water supply at all levels? If yes , put coverage in percentage			
4.5	Do you asses the safety of water from the source till consumption , collection , transport ,storage and use ?			
4.6	Are there accessible and safe sanitation facilities at all health facilities?			
4.7	Do you asses the availability and proper use of latrine at all levels in the community , institutions and service areas to avoid open defecation?			
4.8	Do you assess health facilities for proper IPC and WASH practices?			
4.9	Do you inspect the liquid and solid waste management systems of the community and institutions ?			
4.10	Do you create awareness to the community /public to treat water using locally available method/technology (Boiling , filtration , SODIS, chlorination) ?			
4.11	Do you assess the availability of water treatment chemicals, disinfectants and water storage facilities at the woreda/ community level?			
4.12	Have you conducted bacteriological test in the selected hotspot area ?			
4.13	How many of them were postive for total caliform and E.Coli?			
4.14	Have you conducted Free Rresidual Chlorine test in the selected hotspot area and water sources in the ?			
4.15	How many of them have chlorine residual with in 0.2 - 0.5 mg/l?			
4.16	How many of them were below the 0.2 mg/l_____ and above 0.5mg/l___			
1.8	Any challenges regarding WASH of the cholera outbreak response?			
	5-Risk communication and Community Engagement (RCCE)			
5.1	Do you have a plan on RCCE in your catchment on cholera prevention?			

5.2	Do you regularly conduct social mobilization (face-to-face health education) on cholera for the community? In WDA,churches, School , markets etc.			M--- --F-- --T-- --
5.3	Do you give health education on cholera prevention for people reached at health facilities?			M--- --F-- --T-- --
5.4	Do you engage WDA in community awareness & actions on cholera prevention?			
5.5	Do you use mobile van, leaflets , stickers, posters, bnners and other means to creat awarness on cholera prevention?			
5.6	Have you identified trusted community appointed people as entry points for response teams to work with at risk community?			
5.7	Do you have community health volunteers trained on community based surveillance and reporting?			
5.8	Do you have routine feedback mechanism and engagment system between the community and the cholera response team ?			
5.9	Do you have any means to manage rumors, misinformation, and fake news regarding cholera			
1.8	Any challenges regarding RCCE of the cholera outbreak response?			

6- Logistics

6.1	Type of item	Avalability	Available Qnty	Sno	Type of item	Av
6.2	ORS			6.14	Bleach solution	
6.3	R/L			6.15	Chelorine solution	
6.4	N/S			6.16	Erytheromycine 500mg	
6.5	DNS			6.17	NGT (Injetube)	
6.6	D/W			6.18	Syrng with needle 10 ml	
6.7	Ciprofiloxacecilline			6.19	Syrng with needle 5 ml	
6.8	Ciftraxone			6.20	Syring with needle 2 ml	
6.9	IV Canulla with distilled water			6.21	Cholera bed	
6.10	Glucose 40%			6.22	Examnation Gloove	
6.11	Cottone woll			6.23	Surgical gloove	
6.12	Water Treatment chemicals			6.24	Cholera investigation kit	
6.13	Goaze			6.25	Doxycyclline 100 mg PO	
				6.26	Zink sulphate 2omg	

Annex III Questionnaire for dengue fever outbreak

Informed Consent

Interviewer name________________________ signature____________________

Date of interview___________________________

Result of interview: 1. Completed 2. Completed partially 3. Refused

1. Demographic Information

Kebele: _________

House No.: _________

1.1 Respondent Identification Number: _____________________

1.2 Gender: __________________

1.3 Age (in years): _______

1.4 What is your marital status? __________________

1.5 What is your highest level of education? __________________

1.6 What is your occupation? __________________

1.7 How many family members live with you? __________

2. Clinical Information

2.1 What is your classification as a respondent? __________________

2.2 When did your symptoms first appear? (dd/mm/yyyy): ___________

2.3 What symptoms did you experience? __________________

2.4 When did you visit the health facility? (dd/mm/yyyy): ___________

2.5 What treatments have you received? __________________

3. Laboratory Specimens

3.1 Was a sample taken to test for Dengue Fever? __________________

3.2 When was the sample collected? (dd/mm/yyyy): _____/_____/______

4. Knowledge About Dengue Fever

4.1 Have you heard about Dengue Fever before? __________________

4.2 If yes, what do you believe causes Dengue Fever? __________________

4.3 Is Dengue Fever contagious? __________________

4.4 If yes, how do you think Dengue Fever is transmitted? ___________________

4.5 When do mosquitoes bite most often? ___________________

4.6 Do mosquitoes need water to breed? ___________________

4.7 Are you aware of the symptoms of Dengue Fever? ___________________

4.8 If yes, what symptoms do you know? ___________________

5. Exposure

5.1 Have you ever been infected with Dengue Fever? ___________________

5.2 If yes, in which year did this happen? _________

5.3 Do you own any Long-Lasting Insecticidal Nets (LLINs)? ___________________

5.4 If yes, do you use them while sleeping? ___________________

5.5 When did you last receive LLINs? _______

5.6 Who in your household uses the LLINs most often? ___________________

5.7 Are there any water containers around your house that might hold water? ___________________

5.8 If yes, what types of containers are they? ___________________

5.9 Have Aedes mosquito larvae been found in water containers in or around your home? ___________________

5.10 If yes, which containers had mosquito larvae inside? ___________________

5.11 Do you typically stay at home between 8-10 am? ___________________

5.12 Are you usually home between 4-6 pm? ___________________

5.13 Is there any standing water near your village? ___________________

5.14 If yes, how far is the standing water from your house? ___________________

5.15 Has your house been sprayed for mosquitoes? ___________________

5.16 When was your house last sprayed? ___________________

5.17 Is there a river close to your village? ___________________

5.18 If yes, what is the name of the river? ___________________

5.19 How far is the river from your house? ___________________

5.20 Has anyone in your family recently passed away? ___________________

5.21 If yes, how many family members have been sick? ____________

5.22 Have you been in close contact with anyone experiencing similar symptoms within the last 1-2 weeks? ___________________

5.23 Have you traveled anywhere in the last two weeks? ___________________

5.24 If yes, where did you travel? _______

5.25 Do you use air conditioning or screens on your windows and doors? __________________

5.26 Do you apply mosquito repellents on your skin? __________________

5.27 Do you use mosquito repellents inside your house? __________________

5.28 What kind of clothing do you typically wear? __________________

Thank you very much

Annex IV Questionnaire for Cholera Outbreak Jijiga City

Interviewer name_________________________ signature_____________________

Date of interview____________________________

Result of interview: 1. Completed 2. Completed partially 3. Refused

1. Demographic Information

Kebele: __________

House No.: __________

1.1 Respondent ID: _______________________

1.2 Sex:

a. Male

b. Female

1.3 Age: ________ Years

1.4 Marital Status:

a. Single

b. Married

c. Divorced

d. Widowed

e. Not Applicable (NA)

1.5 Educational Status:

a. Illiterate

b. Primary school

c. Secondary school

d. College or University

1.6 Occupation:

a. Student

b. Daily laborer

c. Housewife

d. Merchant

e. Farmer

f. Other (specify)

1.7 Number of family members: ___________

2. Clinical Information

2.1 Respondent Classification:

a. Cases

b. Controls

2.2 Date of Onset (dd/mm/yyyy): ____________

2.3 Sign and Symptoms:

a. Watery diarrhea

b. Vomiting

c. General body weakness

d. Loss of consciousness

e. Abdominal or muscle cramps

f. Other (specify)

2.4 Date Seen at Health Facility (dd/mm/yyyy): ____________

2.5 Treatment: (Specify)

3. Laboratory Specimens

3.1 Is a sample taken for cholera?

a. Yes

b. No

3.2 Date Sample Collected (dd/mm/yyyy): _____/______/______

4. Knowledge Towards Cholera

4.1 Have you heard about cholera?

a. Yes

b. No

4.2 If yes, what do you think is the cause?

a. Virus

b. Bacteria

c. Protozoa

d. Other (specify)

e. Don’t know

4.3 How do you think cholera is transmitted from person to person?

a. Contaminated food

b. Contaminated water

c. Contact with an infected person

d. Other (specify)

4.4 What do you do when you get cholera?

a. Go to a health facility

b. Seek help from a traditional healer

c. Use ORS

d. Use holy water

e. Other (specify)

4.5 Do you think cholera is a preventable and curable disease?

a. Yes

b. No

4.6 How do you prevent Acute Watery Diarrhea (AWD)?

a. Using a toilet

b. Eating cooked food

c. Using purified water

d. Handwashing

e. Other (specify)

5. Exposure

5.1 Did you travel anywhere in the past 10 days?

a. Yes

b. No

5.2 Did you have contact with anyone who traveled to a cholera epidemic area in the past 10 days?

a. Yes

b. No

5.3 Did you have any visitors from outside your province of residence in the 10 days before your diarrhea started?

a. Yes

b. No

5.4 Did you attend any gatherings or events (weddings, festivals, funerals, church gatherings, etc.) in the 10 days before your diarrhea started?

a. Yes

b. No

5.5 What is the source of water for your household consumption (drinking, cooking, cleaning, etc.)?

a. Pipe water

b. Spring

c. Well

d. Pond

e. Surface water

f. Other (specify)

5.6 What type of container do you use to fetch water from the source and for storage in your house?

a. Jerrycan

b. Bucket

c. Ensira (Gan)

d. Other (specify)

5.7 Do you clean your water containers regularly?

a. Yes

b. No

5.8 What methods of water purification do you use?

a. Boiling

b. Filtration

c. Sedimentation

d. Water chemicals (e.g., Wuha Agar, Bishan Gari)

e. Other (specify)

Annex V ANNEX REPORTING AND REGISTER FORMAT

Annex 4.1 Guinea Worm Disease (GWD) Integrated Case Search Form

Guinea Worm Disease (GWD) Integrated Case Search Form

Campaign ______________________________ **Month** ________________

Région __________________ **Zone** ____________________ **District** ____________________ **Kebele** __________________ **Village** ________________

Instructions:

QUESTION #1: Shows the ID card (photo with emerging guinea worm) and ask if they have seen a person with GWD (hanging worm) in the house, village, or neighboring villages.
If they say YES write (Y) or No write (N)

QUESTION #2: Shows the ID card (photo with a blister) and ask if they have seen a person with a blisters, swelling, wound recently in the house, village, or neighboring villages \

QUESTION #3: Record the Number of people interviewed during the household visit

- If the number of household is more than 60 use another form.
- If a HH answers yes to Q1 or Q2 then **RECORD** the information on the rumor/suspect registration form on the back of the form and **CONTACT** your supervisor immediately or call to ____________

HH No	Q1: Have seen a person with GWD (hanging worm)? (Y/N)	Q2: Have seen person with blister, swelling, itching, or wound? (Y/N)	No. of people interviewed	HH No	Q1: Have seen a person with GWD (hanging worm)? (Y/N)	Q2: Have seen person with blister, swelling, itching or wound? (Y/N)	No. of people interviewed	HH No	Q1: Have seen a person with GWD (hanging worm)? (Y/N)	Q2: Have seen person with blister, swelling, itching or wound? (Y/N)	No. of people interviewed
1				21				41			
2				22				42			
3				23				43			
4				24				44			
5				25				45			
6				26				46			
7				27				47			
8				28				48			
9				29				49			
10				30				50			
11				31				51			
12				32				52			
13				33				53			
14				34				54			
15				35				55			
16				36				56			
17				37				57			
18				38				58			
19				39				59			
20				40				60			

Date	Rumor /suspect Name	Village	Age	Sex	Responsible GWO

Name of the interviewer ________________________ **Name of person completing this form** __________________ **Date case search conducted**__________________

Annex 4.2: Dracunculiasis Rumor Registration

ETHIOPIA DRACUNCULIASIS ERADICATION PROGRAM

GUINEA WORM DISEASE RUMOR REGISTER

Region: ______________________ **Zone:** ____________________ **District:** _____________________ **Year:** ___________

Name and type of reporting health facility (ONLY for health facility rumor register): ______________________________

Cum. S.no	Place of reporting		Patient Name (Full name)	Age	Sex	Name of reporter	Name and title of health worker detecting rumor (eg. HW, HEWs etc..)	Indicate the setting if detected by health worker (*NID, MDA, or HF*)*	Date rumor reported (dd/mm)	Date rumor investigated (dd/mm)	Investigated by	Is patient a suspect? (Yes/ No)	Signs and Symptoms (√)					Did patient became a case? (Yes/ No)	Date of final outcome	Final diagnostic outcome of the patient	GPS coordinate (Latitude, Longitude)
	Kebele	Village											Swelling	Itching	Blister	Wound	Emerging worm				

NB: * Indicate the setting of rumor detection if detected by health workers: NID= National immunization days (campaigns), MDA= Mass drug adminstration, HF= health facility

NB: * GPS coordinates (Latitude, Longitude), applied in all region of Ethiopia except Gambella Region.

Annex 4.3: Guinea worm Disease reporting, registration, and Investigation Form

Rumor Reporting, Registration, and Investigation Information

Reporting Village: ___________ Kebele: ___________ District: ____________ Zone:

___________ Region: __________ Date rumor first reported (dd/mm/yyyy): ________ Name of reporter (if self-reporter indicates):

Date rumor investigated (dd/mm/yyyy): __________ Investigated by:

_______________________Position: __________

Date rumor registered in rumor register (dd/mm/yyyy): _____________

(If rumor detected by health worker: Name and title of health worker:

____

Indicate the setting: During Immunization campaign (NIDs) During mass drug administration (MDA) At Health facility Other (specify): _______________________

II. Rumor Information and Place of Residence

Name (Full name): _________________________ ______________________

____

(Name) (Father's name)

(Grandfather's name)

Age: ____ Sex: ____ Occupation: __________ Ethnicity: ___________ Name of Head of

HH: ____________________

Resident: Village: ___________ Kebele: ___________ District: __________ Zone:

___________Region: _____________

III. Residence or Travel history in the last 10-14 months

____

____

____

____

Has the patient traveled or lived in endemic areas in the last 10-14 months? Yes No

IV. Signs and Symptoms

Swelling Blister Itching Wound Emerging worm (currently)

Other signs and symptoms (specify): ___________________ Location of signs and symptoms: ____________________

If patient or family reported observing the emergence of worm but not seen during the investigation: Number of worms emerged: ____________ Date worm(s) emerged (dd/mm/yyyy): ________________________

What happened to the worm: Broken Retracted back Fully extracted Other (specify): ________

V. Clinical Diagnosis and Classification

Guinea worm disease Suspect to be followed up* Discarded

Date of final outcome (dd/mm/yyyy): ____________________ (* write pending if the rumor requires follow up visits)

VI. Actions Taken

Examination of signs and symptoms Controlled immersion Anti pain/ Paracetamol Bandaging

Health education given to patient and family Water containment plan (plan to keep out of water)

Sent to health center or containment center: Yes No Date sent (dd/mm/yyyy): ______________

VII. Recommendation/Follow-up Action Points/Remarks

____

____

____

NB: * If the rumor becomes a suspect, use the detachable form at the bottom for follow-up visits.

Rumor investigation forms should be submitted to the supervisor at the end of each month during report submission.

SUSPECT FOLLOW-UP FORM (to be filled ONLY for Suspects who need follow-up visits)

Patient Name: ________________ ___________________ _______________

Reporting village: ______________ Kebele: ______________ woreda: ______________ Date initial rumor investigation (dd/mm/yyyy): _________ (make sure the information here corresponds with the above)

Follow-up visits: (fill the dates of follow-up visits in the box below)

Dates

(dd/mm/yyyy)

Dates

(dd/mm/yyyy)

Lost to follow-up Reason for lost to follow-up:______________________________

Final Outcome: Guinea worm disease No more a suspect/healed Date of final outcome (dd/mm/yyyy): __________

NB: This follow-up form should be submitted to supervisor at the end of each month during report submission.

ETHIOPIAN GUINEA WORM ERADICATION PROGRAMME

CASE INVESTIGATION FORM FOR GUINEA WORM DISEASE (CIF) (to be prepared in 3 copies)

I. Reporting/Investigation Information

Reporting Village: __________Kebele:__________Woreda:___________ Zone:__________

Region: ______________ Epid No: ____________

Date Case Reported: (dd/mm/yyyy)___/___/______ Reported by:___________Position:_____________

Date Case Investigated: ____/___/______ Investigated by: _____________Position:________________

II. Patient Information and Place of Residence

Name: _____________Father name _____________Age: ___Sex:___Occupation: _____Ethnicity:___________

Resident Address: Village: _______Kebele:________ woreda: _________zone: ___________ Region:__________

Setting: Urban/Rural_________________________________ Land Marks: _____________

Place of residence is same as the reporting village: YES/NOif No, residence since when (in months):_________

(Please fill BOX "III. Place stayed in the last 10-14 months ...."If the number of months stayed in this box were less than 10.)

III. Place stayed in the last 10-14 months if not the same as above.

Village:________Kebele :_________woreda:___________Zone:_________Region:_________ Country:______

IV. Travel History of patient in the last 10-14 months

Date From:Date To:Village: Kebele Woreda: Region:

____

Possible water sources that the patient might have contaminated with location details and GPS:

NameLatitude Longitude Type SourceCheck box if treated with Abate and Date

____ _______________________ ☐

V. Sign and symptom

What was the first sign/symptom before the emergence of worm? Blister/Itching/Swelling/Others, Specify_

Emergence of guinea worm:YES/NO No. of Worms: _______

Is this the first guinea worm emerged this year? YES/NO

Date of the First guinea worm emerged: ___/___/_______ was the case detected before worm emerged?YES/NO

VI. Final Case Classification

Final Classification:_________________ (1-Indigenous Case2-Imported Case 3- Not a Guinea worm cases)

If <u>IMPORTED</u> case, type of importation: LOCAL/INTERNATIONAL.If imported case. Cross notification done: YES/NO

Please attach the imported case form if case was imported from other country.For internal importation, please send a copy of this form to district it was imported.

VII. Case Containment Measures and Guinea-worm registry

Received any health education:YES/NO, Patient entered any water source:YES/NO, Place Managed: CCC/Home/Health Centers/Hospital, Name of Health Facility/Health Center/Other Centers if patient washospitalized: ______________

Admission Date: ___/____/______ ` Discharged Date: ___/____/______

SN.NO. Location of worm: Date worm detected: Date worm emerged: date worm bandaged: Date confirmed by supervisor: date worm extracted

___:_________ :___/____/_____:___/____/______ :___/____/______ :___/____/______ :___/___/____

Regular bandaging done? Yes/No; was a specimen (worm) saved and preserved in alcohol? YES/NO

Person who completed this form:

____

NAME POSITIONSIGNATURECELL PHONE NO

Annex VI Data collection tool to evaluate Malaria surveillance system Akaki Kality Sub city Addis Ababa

Data collection tool to evaluate Malaria surveillance system Akaki Kality Sub city Addis Ababa

Questionnaire

Introduction:

I appreciate you taking the time to talk to me today. Mariam/Ashenafi G is my name. I worked as a field epidemiology resident and student at Addis Ababa University School of Public Health after serving as a practical-based resident at the Ethiopian Public Health Institute. I would like to talk to anyone who are involved in the malaria surveillance system as I am assessing it. The evaluation's goals are to ascertain the system's operation and whether the stated goals are being achieved. Lastly, suggestions for system improvement will be sent to all relevant parties.

Part-I General information

1. Interview Date ___________________________________

2. Name of Health Facility _____________________________ wereda__________

3. Name of respondent______________________________ position_________________

4. Phone number__________________________ Email__________________________

5. Date of start of work surveillance system_____________________

Part-II General description of the surveillance system

1. Number of populations under surveillance at each level of study area ____

2. Number of Health facilities

Name Facility	
Hospital	
Health center	

Health post	
Private hospital	
Private clinics	

3. The presence of guidelines for surveillance for malaria and priority disease

____

____

______

4. Is there a case definition? ____
   a) Community case definition
   b) Standard case definition
5. Which type of reporting format is applied in for the past one year
   a) HEW
   b) Health center/hospital
   c) District health office
   d) Sub city/region office
6. Is there any responsible body to provide surveillance form to health facility
7. Which one of the following is the source of report
   a. Public health facility
   b. Private health facility
   c. Partner
   d. other
8. percent district report for the past one year

   Timeless

   Completeness

Part III Core function of the surveillance system

A. **Identifying cases and public health events**

1. The percentage of medical facilities with standardized disease

2. Registrations proportion of health facilities using standard case definitions (SCD) to identify IDSR priority diseases of cases

B. **Report cases and event**

1. percentage of full surveillance reports that the district receives on time
2. percentage of illness cases that are the subject of case-based surveillance and that are recorded using case-based forms or line lists

C. **Analyse and interpret data**

3. 3. Descriptive report on availability

D. **Investigate and confirm suspected cases/outbreaks**

4. percentage of suspected epidemics of diseases that are prone to breakouts that are reported to the district level within 24 hours of the epidemic threshold being crossed percentage of outbreaks under investigation that had laboratory results.

Part IV. Evaluation of the performance and attributes of the surveillance system

A. How effective is the system in achieving its goal? (Usefulness)

B. How dependable is the available data? (Data Quality)

C. How complete and accurate is the data collected by the system?

D. How promptly are reports received? (Timeliness)

E. How easily can the system adapt to changes? (Flexibility)

G. How simple is the system to operate? (Simplicity)

H. How well does the surveillance system function? (Stability)

I. How frequently does it experience breakdowns?

J. How effectively does it capture the intended cases? (Sensitivity)

K. What percentage of reported cases match the case definition? (Positive Predictive Value)

L. How well does the system represent the population under surveillance?

M. How user-friendly is the system's operation? (Acceptability)

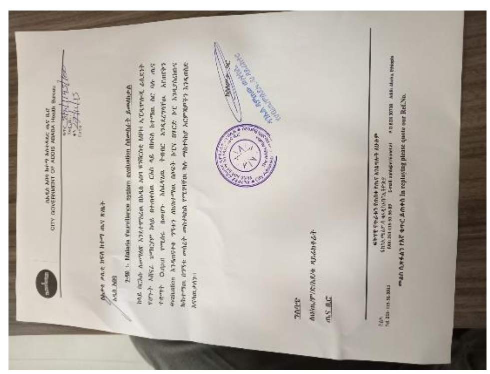
Part V. Preparedness and response

1. Is there plan for epidemic preparedness and response?
2. Is there a budget line for epidemic response?

3. Was there any report of the promptly reportable disorders in the past 1 month(yes/no)
4. If so, when is the report received after the disease or cases are discovered?
5. Means for reporting ____
6. is there a description of data analysed by (time, person, place)
7. Which graph is applicable for data analysis?
8. How often the data is analysed?
9. Do you have an action threshold defined of malaria?
10. Have appropriate denominators?
11. What is the feedback and supervision system?
12. How many feedback bulletin or reports has the regional level produced in the last year
13. How many supervisory visits have you made in the last 6 months compared to expect?

supporting letter for the regional health bureau





Annex VII Checklist health profile

1. Population-based on age and sex 2015

Population kebele

Age Category	Male	Female	Total	Percentage share
0-4				
5-9				
10-14				
15-19				
20-24				
25-29				
30-34				
35-39				
40-44				
45-49				
50-54				
55-59				
60-64				
65-69				
70-74				
75^+				
Total				

	Population			Number of households		
Kebele	Male	Female	total	Male	female	Total
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						

Table 4: Number of schools and teachers per school level

No.	School level	No. of schools			No. of Teachers								
		Gov't	Private	Total	Gov't			Private			Total		
					M	F	Tot	M	F	Tot	M	F	Tot

1	KG												
2	Primary (1-8)												
3	High school (9-12)												
	Total												

5: Health Professionals' 2015 FY

No	Qualification	Sex		Total
		Male	Female	
1	MD			
2	MSc			
	MPH in Field Epidemiology			
	General MPH			
	Integrated Emergency Surgeon (IES)			
	Other			
3	Degree			
	Environmental Health			
	Health Informatics			
	Health Promotion and Education			
	Medical Laboratory Technology			
	Midwifery			

No	Qualification	Sex		Total
		Male	Female	
	Nurse			
	Pharmacy			
	Public Health (HO)			
3	Level (Diploma)			
	Emergency Medical Technician (L-4)			
	Health Extension (Level: I-IV)			
	Medical Laboratory Technology (L-4)			
	Midwifery (L-4)			
	Nurse- Anesthetics (L-4)			
	Nurse- L-4			
	Pharmacy Technician (L-4)			
	Sub total			
4	Admin/Supportive staff			
	Total			

Table 6: Types and Number of health facilities in 2015FY

No	Type of health facilities		Government	Private	NGO	Total	Remark
1	Hospitals						
2	Health Center						
3	MCH Center						
4	Medium Clinic						
5	First Clinic						
6	Medium Dental Clinic						
7	Medium Eye Clinic						
8	Pharmacy						
9	Drug Store						
10	Traditional Drug Store						
11	Health Post						
	Total						

6. Health facility coverage

Indicator	National Standard	standard	Remark
Hospital -Population ratio	1:1.5 Mil		
Health center -Population ratio	1:25,000 1:40,000 1:20,000		
Health post-Population ratio	1:5,000		

7: Health indicators and vital statistics

No	Indicator	Number of case	Target population	Rate (per 1000)
1	Infant Mortality Rate			
2	Child Mortality Rate			
3	Crude Birth Rate			
4	Crude Death Rate			
5	Maternal Mortality Rate			

8. Health professionals to population ratio

No	Qualification	Sex		Total	Professional to Pop. ratio	National Standards	Remark
		Male	Female				
1	Physicians						
2	MPH in Field Epidemiology						
3	Public Health Officer (HO)						
4	Integrated Emergency Surgeon (IES)						
5	Environmental Health						
6	Health Informatics						
7	Health Promotion and Education						
8	Medical Laboratory Technology						
9	Midwifery						
10	Nurses						
11	Pharmacy Officer						
14	Health Extension						

9. Top 10 diseases by morbidity per age and sex

Rank	Disease type/Any other list included	Children < 5 years of age				People with ≥ 5 Years of age				
		Female	Male	Total	Percentage	Disease type	Female	Male	Total	Percentage
1	Acute upper respiratory infection									
2	Tonsillitis									
3	Functional intestinal infection/Diarrhea/									
4	Pneumonia									
5	Urinary Tract Infection									
6	Other suspected diseases and conditions									
7	Typhoid and paratyphoid									
8	Dyspepsia									
9	Gastritis unspecified									

10	General medical condition									
	Total									

10 : Top ten diseases/conditions leading cause of admissions in 2015

Rank	Disease/event	Female	Male	Total	Percentage
1	Grand Total				
2					
3					
4					
5					
6					
7					
8					
9					
10					

Table 11: Total budget allocation for Health sector per facility in three Fiscal years (2012 - 2014)

No.	Health facility	Fiscal Years		
		2013	2014	2015
1				
2				

Table 12: Maternal health service status in FY

No.	Indicator	Target population	Coverag e	Percentage
1	ANC 1st visit			
2	ANC 4th visit			
3	Skilled Birth Attendant (SBA)			
4	Birth registration			
5	PNC			
6	Contraceptive acceptance rate			

7	TT2+			
8	PMTCT			
9	Safe abortion service			

Table: 13 Child immunization in 2015FY

No.	Vaccine	Target population	Coverage	Percentage	DOR
1	BCG				
2	Penta1				
3	Penta3				
4	Rota1				
5	Rota2				
6	MCV1				
7	MCV2				
8	Fully immunized				

14. What are endemic disease and their distribution?

Annex VIII Internally Displaced Persons Response Checklists

Demographic profile

Region_________ Zone _________ Woreda _________ Name of temporary IDP site_______

Is there health facility at the camp? 1.yes 2 No

If your answer is no, where do you get health care/ service?

How far is it?

Total households_______ Male_______ Female_______

Total populations in the site ________ Male______ Female______

Total under one-year population_______ Male______ female__________

Total under five-year populations_________ Male_______ Female_______

Total 15-49 years women__________

Total 15-64 years populations_________ Male_______ Female_________

Total populations >65 yrs. ____________Male_______Female__________

Disabled population_________Male _________Female____________

Total PLHIV________Male_________Female____________

Total population with TB_______Male________Female__________

Total ANC in the IDP site_________________

Total lactating women in the IDP site_________

Total orphan children in the site____________Male________Female__________

Total populations with mental health problem_________Male______Female_______

WASH and Environmental health related checklists

improved latrines constructed_________# Trenched Latrine____________

Traditional latrines constructed________

of seepage pit excavated_________Was there an Open field Defecation_____________

Shower rooms constructed__________# Cloth washing compartment constructed________

of hand washing facilities constructed______# of soap and other sanitation material distributed___________# of soap and other sanitation material distributed____________

# of Steaming, shaving and delousing centers____________# of menstrual hygiene management rooms with sanitary pad___________# of sanitary campaign conducted__________________

# of IDP sites with Environmental Health Professional____________

# of protected water sources (hand dug well, spring, piped) _____________

# of unprotected sources (river, pond, lake) ____________

# of water treatment chemicals distributed_____________

# of water sources Bacteriological test performed __________

# of Chlorine residual test performed___________

Water Trucking available______________ # rottos distributed______________

Amount of water collected/day___________# Jeri cans distributed _____________

# of family heads with clean food utensils________# of Shelter with clean compound_________

# of Shelter with adequate housing/tents____________# of Shelter with adequate kitchens with smokeless stove___________# of HF with Water Supply_____________

# of HF with latrines___________# of HF with Incinerator______________

# of HF with shower______________# of HF with cloth washing______________

# of HF with Seepage pit/pond____________# of HF with infection prevention committee_______# of HF with disinfectant chemicals___________

Nutrition related checklists

Of children and PLW screened_____________ # SAM with MUAC <11____________

Children with MAM (MUAC >11-12) _________# of child with normal (MUAC >=12)______

of child at OTP______________# of child at SC______________

# of children Linked to TSFP___________   # of children linked to OTP__________

# of child linked to SC_________# of PLW screened______________

# of PLW with MAM (MUAC <23) ____________# of PLW with normal (MUAC >=23) _____

# of PLW linked to TSFP__________

Checklist related with MCH

Existing Pregnant Woman__________# Existing Lactating Women______________

Short acting FP acceptors__________ # long acting FP acceptors___________________

Emergency contraceptive used_____________# ANC 1____________ # ANC 2 – 3______

ANC 4___________# Delivery__________# PNC   PMTCT services availability_________

Safe Abortion Services___________ # Maternal Death_________# Neonatal Death______

of children <24 months__________# of Penta 1 vaccinated children_________

penta3 vaccinated children__________# of measles 1 vaccinated___________

of measles 2 vaccinated children___________# TT__________ # OPV1________

Human resource related checklist

List of health professional	**From federal**	**From region**	**From zone**	**From woreda**	**From NGOs**

List of available HP	List of available HC	List of available Hospital	List of available temporary clinic	# of mobile health team	# of functional HF

<u>Checklist on Logistics availability at each site</u>

Sr. no	Logistics	Yes/No(√/×)	Comment
1	Ringer lactate		
2	ORS		
3	Water treatment chemical		
4	NG tube		
5	Amoxicillin		
6	Permethrin		
7	Paracetamol		
8	Ceftriaxone		
9	Ampicillin injection		
10	Formula Milk		
11	RUTF/Plumpy nut		
12	Ibuprofen		
13	Metronidazole capsule		
14	Adrenaline injection		

15	Iron supplementation		
16	Examination gloves		
17	40% Dextrose		
18	Coartum (Artemether + Lumefantrine)		
19	Malaria RDT		
20	Primaquine		

<u>Surveillance activity related checklists</u>

Diseases/Conditions

Top ten cause of morbidity in under five children___________

Top ten cause of morbidity in adult______________

Top ten cause of mortality in under five and adult population_________

under five cases__________ #Adult cases____________# under five death__________

Adult Death Threshold Passed/Is it an outbreak? ____________

Type of Sample Collected ___________Number Collected____________Result________

Is there any Active Case Search________Identified risk factor (list) Gaps/Challenges_____?

Comment (Others disease) ________

Reporting system_____________

<u>Mental health and psycho-social support related checklists</u>

Post traumatic stress disorder (PTSD) (0 -14yrs) ___________

PTSD (Above 14yrs) ____________# Depression___________# Anxiety_____________

GBV______________# Substance use_______________

Others (define in Comment) _____________# Pharmaco-therapy______________

Psychosocial Support____________# Referral______________

Vector borne disease prevention and control checklists

Is the camp is in malaria endemic area?

How far is from large breeding site (_swamps or lakes) __________

Is LLINs distributed for displaced people?

Health Promotion

Health education for: -

Communicable like malaria, COVID -19, TB, HIV

Non-communicable disease (HTN, DM, etc.)

Hygiene and sanitation

Education

Is there a school nearby the camp?

Are the displaced people/students continue their education?

Annex IX Self-administered questionnaires for the KAP survey

Introduction

I appreciate you taking the time to talk to me today. Mariam/Ashenafi G is my name. I am a Field Epidemiology student at Addis Ababa University School of Public Health. I would like to talk with people who are involved in this title because I am conducting research on the knowledge, attitudes, and practices of professionals on the tackling of antimicrobial resistance, use, and residue in federal institutions in Ethiopia using a one health approach: mixed approach qualitative and quantitative.

This study aims to investigate Ethiopian knowledge, attitudes, and practices against the use of antibiotic resistance. Your involvement is necessary since the study's successful conclusion depends on your feedback. It is entirely voluntary for you to participate. You are free to end at any moment.

Informed Consent

The purpose of the study has been explained to me in a language I understand, and all my questions have been answered. I have been informed that I have the RIGHT TO DECLINE participation in this study without needing to provide a reason, and there will be NO NEGATIVE CONSEQUENCES if I choose not to participate. I have also been assured that everything I say during today's discussion will remain FULLY CONFIDENTIAL, and my name will not be mentioned in any materials produced from this study.

Sociodemographic characteristic of respondents *(mark your response)*

Age in years: ______

2. Gender □ Male □ Female

Professional experience ______ in years or _________ in months

What is the highest education level you completed? □MD/DVM □ MSc□ □BSc □Diploma others______________

Name of institution □MOH □MOA □EPA

Have you received training related to AMR, infection control, antibiotic prescribing, and use within the past six months? □ Yes □ No

University/college graduated from: ____________________________

Knowledge assessment section *(mark your response)*

No.	Knowledge questions	Response	
		Yes	No
1	Microbes can develop resistance to antimicrobials.		
2	Are there beneficial bacteria in the human body that support our health?		
3	Can antibiotics effectively treat infections caused by viruses?		
4	Antimicrobials should not be available without a prescription at pharmacies.		
5	Are you aware of antimicrobial resistance?		
6	The frequent use of antimicrobials can lead to a reduction in available treatment options.		
7	Is the effectiveness of antibiotics greater when they are newer and more expensive?		
8	Antimicrobial-resistant organisms can be transmitted among humans, animals, and the environment.		

9	Are Amoxicillin, Penicillin, and Tetracycline classified as antibiotics?		
10	Bacteria that become resistant in animals can also develop resistance in humans through the consumption of animal-derived food.		
11	A national One Health approach is necessary to address AMR prevention and containment efforts.		
12	Antibiotics should be obtained from drug stores or pharmacies only with a prescription.		
13	Using antimicrobials as additives in animal feed is beneficial.		
14	Antimicrobials used for treating animals can remain in their tissues.		
15	Implementing an antimicrobial stewardship program at the facility level is advisable.		
16	Are you familiar with World Antimicrobial Awareness Week?		
17	Are you aware of the concept of antimicrobial stewardship?		
18	WASH practices, good animal husbandry, and vaccination can help reduce or slow down antimicrobial resistance.		

attitude of professionals towards AMU and AMR in Ethiopia *(mark your response)*

N0.	Questions regarding attitude towards AMU and AMR	No	Yes
1	Antimicrobial resistance will impact the health of you and your family.		
2	Antimicrobial resistance will influence animal health and production.		
3	I possess adequate knowledge regarding antibiotic usage.		
4	I have a solid understanding of environmental protection and waste disposal.		
5	It is essential to provide more education at the clinical level about antimicrobial resistance.		
6	The improper use of antimicrobials contributes to the development of antimicrobial resistance.		
7	Inadequate infection control practices among healthcare professionals will facilitate the spread of antimicrobial resistance.		
8	Specialized training on the correct methods of prescribing antimicrobials is necessary.		
9	Currently, antimicrobial resistance is a significant issue both globally and in Ethiopia.		
10	There should be stricter controls on antibiotic prescriptions.		
11	The dispensing of antibiotics without a prescription or over-the-counter sales should be more tightly regulated.		
12	I feel knowledgeable about antibiotic resistance.		
13	Everyone should take responsibility for the appropriate use of antimicrobials.		

Questions regarding practice towards AMU and AMR *(mark your response)*

No.	practice questions	Yes	No
1	I discontinue antibiotics as soon as my symptoms improve.		
2	I take antibiotics that have been prescribed by my doctor.		
3	I adhere to the prescription after selecting an antibiotic.		
4	I take antibiotics without the guidance of a doctor.		
5	I requested that my doctor prescribe antibiotics for a common cold.		
6	I use antibiotics to treat a common cold.		
7	I take antibiotics for acute bronchitis.		
8	I use antibiotics when I have yellow or green phlegm.		
9	I use antibiotics for a sore throat caused by any type of microbe.		
10	I consume food without observing the drug's residual period.		

Closing

Thank the respondent/informant for the information and for their time.

You have an ethical duty to kindly make corrective interventions if you notice any glaring holes in the discussions and observations you have made, without waiting for comprehensive feedback and a report.

Assure them again that the responses will be anonymously consolidated in the report. This helps meet the objectives of the research, which again will contribute to improving one health approach to AMR prevention and containment

Annex X Semi-structured Interview Guides for Key Informant Interviews

Thank you for taking time to speak with me today. My Name is Ashenafi G/Mariam. I am a Field Epidemiology student at Addis Ababa University School of Public Health. I am conducting research on the Knowledge, attitudes, and practices of professionals on the tackling of antimicrobial resistance, use, and residue in federal institutions in Ethiopia in a one health approach: mixed approach qualitative and quantitative and I want to speak with people who are engaged in this title.

This study aims to investigate Ethiopian knowledge, attitudes, and practices against the use of antibiotic resistance. Your involvement is necessary since the study's successful conclusion depends on your feedback. It is entirely voluntary for you to participate. There won't be any repercussions if you decide to stop at any moment. During the conversation, anything you say will be kept private.

Informed Consent

I've been given an explanation of the study's goal in a language I can understand. My inquiries concerning the study have all been addressed.

I have been advised that I have the right to decline participation in this study, that declining does not require a reason, and that declining will have no negative effects on me.

I've been told that anything I say in today's talk will be kept completely confidential and that no material resulting from this study will use my identity.

A. Demographic information for all key informants

1. Age in years: ______

2. Gender □ Male □ Female

3. Total years of professional experience __________ in years

4. What is the highest education level you completed?

5. What is your professional title?

B. Interview for multisectoral collaboration adapted from the OH-SMART tool

1. Are you familiar with the term ‘One Health’ in AMR?

a. If so – what does it mean to you?

____
____
____
____

b. Do you think it has relevance to the work of your institute? How?

____
____
____
____

2. In your opinion do cross-disciplinary and/or cross-sectoral approaches contribute to how state institutions work in the state?

a. If yes, how?

b. If not – why?

3. What agencies/institutions outside of your own do you interact with regularly?

a. Why are you interacting with them?

b. Who do you contact?

c. What is his/her role?

d. How often does this interaction take place?

e. What are other agencies/institutions that you would like to have more regular interactions with?

4. Do you have an example of successful cross-disciplinary or cross-sectoral collaborative (OH) AMR activities?

a. What did it look like?

____

____

b. How did it work?

____

____

c. What made it successful?

____

____

d. Were there challenges to making it work?

____

____

e. Were they overcome? How?

____

____

5. Do you have an example of a failed collaborative AMR activity?

a. What did it look like?

____

____

b. Why did it not work?

____

____

6. Do you think fostering cross-sectoral collaboration is feasible and/or useful?

a. Why or why not?

____

____

7. What are the challenges and the solutions for AMR prevention and containment effort one health approach?

A.Challenge

____

____

____

____

B.Solution

____

____

____

____

Closing

Thank the respondent/informant for the information and for their time.

You have an ethical duty to kindly make corrective interventions if you notice any glaring holes in the discussions and observations you have made, without waiting for comprehensive feedback and a report.

Assure them again that the responses will be anonymously consolidated in the report. This helps meet the objectives of the research, which again will contribute to improving one health approach to AMR prevention and containment

Thank you for your time!

Annex XI Observation and document review checklist

No.	Questions			Remark
		present	Absent	
1	Availability of team in the institution			
2	the focal person or dedicated person			
3	The Availability budget for AMR			
4	Information sharing mechanisms horizontal and vertical			
5	Availability of policy, proclamation, directives, strategy, guidelines, school curriculum, and training program			
6	Functionality of different committees at different levels			

Annex XII: CURRICULUM VITAE

1. Personal information

Full Name: ASHENAFI G/MARIAM TEGEGNE

Sex: MALE

DoB: MAY 6 1983

Place of residence: ADDIS ABABA

Nationality: ETHIOPIA

Email address: ashenafigebremariam6@gmail.com

Phone number:0920333886

2. Education/Qualification

- Doctor of Veterinary Medicine (DVM) Mekelle University, 2001
- Diploma in zoonosis from Obihiro University of Agriculture and Veterinary Medicine with collaboration of JICA
- Introduction to food safety and risk assessment conducted by the Royal Veterinary College and International Livestock Research Institute from October 2021 to July 2022.
- Certification in an international short course on zoonotic disease, Michigan State University.
- Certificate on "Training of Trainers on Risk Analysis" by OIE March 4th to 15th, 2019
- Certificate in prevention and control of AMR, one health approach by the European Commission.
- Certificate on AMR prevention and containment and vaccine use by the World Animal Health Organization

3. Work Experience

- Ministry of Agriculture June 2016 up to now on zoonotic prevention and control expert participating in different national technical working groups of one health and participating national strategy of zoonotic disease prevention and control and AMR (antimicrobial resistance)
- Addis Abeba City administration from March 2014 up to May 2016 urban Agriculture and extension process coordinator
- Amhara region south wollo zone legehida wereda Agriculture and rural development office from December 2009 to February 2014 as Vice head of the office, animal health expert
- Experience strategy document preparation such as one health approach AMR prevention and containment, guinea worm disease elimination strategy
- Experience in Guideline and SOP document preparation such as zoonotic disease control and prevention guidelines, Guinea worm surveillance guidelines, animal source food guidelines, risk analysis Guidelines, animal surveillance Guidelines, and municipal abattoir SOP
- Experience in zoonotic diseases especially Rabies, anthrax, emerging pandemic threats, and guinea control and prevention activity
- Participating in national TWG, task force, and committee especially members of national TWG of Guinea worm and focal AMR in the ministry of agriculture lead technical committee ministry of agriculture regarding AMR
- Experience in disease investigation, outbreak control, and response
- Participating preparation of livestock packages and livestock road map
- Experience in all regions to support, supervision, capacity building, training, JEE, monitoring and evaluation of animal health activities, livestock activities, one health activities, and human health activities,

4. Publications

- Epidemiological Study on Bovine Dermatophilosis in and Around Adigrat and Mekelle Cities, Tigray Region Ethiopia http://dx.doi.org/10.5829/idosi.ajad.2018.21.28
- Assessment and evaluation of animal guinea worm infection intervention in Gambella https://ejphn.ephi.gov.et/ https://ejphn.ephi.gov.et/ejphn/article/view/84

5. References

- Dr. Tenaw Andualem Tadege, FAO Ethiopia, AMR Program lead, email: tenaw.tadege@fao.org Phone number 0911627059
- Dr. Enquebaher Kassaye, Associate Professor in Food Safety and Veterinary Microbiology Mekelle University email. enguebaher@gmail.com. Phone number 0914723692

Declaration

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

Name: Ashenafi G/mariam

Signature: ________________________

Place: Addis Ababa, Ethiopia

Date of Submission--------------------

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

Name of advisors_________________________

Signature: _________________________

Date______________________________