



**Addis Ababa University, Collage of Health Science, School of Public Health,  
Department of Epidemiology and Biostatistics**

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

By  
Tessema Bayu Mazengia (BSc)

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

January 2026  
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2. Dr. Abigiya Wondimagegnehu (Mph, PHD)

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## ACRONYMS

|             |                                                        |
|-------------|--------------------------------------------------------|
| AAU-----    | Addis Ababa University                                 |
| AIDS-----   | Acquired Immune Deficiency Syndrome                    |
| ART-----    | Antiretroviral Therapy                                 |
| BSS-----    | Behavioral Surveillance Survey                         |
| CBS-----    | Case Based Surveillance                                |
| CBN-----    | Community Base Nutrition                               |
| CFR-----    | Case Fatality Rate                                     |
| CHP-----    | Community Health Profile                               |
| CHW-----    | Community Health Workers                               |
| CTC-----    | Cholera Treatment Center                               |
| DHIS-----   | Demographic Health Information System                  |
| EPHI-----   | Ethiopian Public Health Institute                      |
| EPI-----    | Expanded Program on Immunization                       |
| HIT-----    | Health Information Technology                          |
| HIV-----    | Human Immunodeficiency Virus                           |
| IIT-----    | Interruption In Treatment                              |
| LTFU-----   | Loss to Follow-up                                      |
| MCH -----   | Maternal and child health                              |
| UNICEF----- | United Nations International Children's Emergency Fund |
| OPF -----   | Open Defecation Free                                   |
| PITC -----  | Provider Initiated Test and counseling                 |
| PLHIV-----  | People Living With Human Immunodeficiency Virus        |
| PMTCT-----  | Preventing Mather to Child Transmission                |
| PNC -----   | Post Natal Care                                        |
| RDT-----    | Rapid Diagnostics Test                                 |
| DTG-----    | Dolutegravir                                           |

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## Executive Summary

This document fulfills the requirements for the master's degree in Epidemiology in Public Health. It compiles a comprehensive portfolio encompassing research theses, outbreak investigations, and system evaluations, data analyses from public health surveillance, health profile descriptions, scientific writing, and public health emergency management. The report consists of nine chapters summarizing two years of academic and fieldwork experience.

**Chapter 1** presents a research thesis titled *Magnitude and Factors Associated with Treatment Interruption among HIV-Positive Adolescents in Selected Public Hospitals, Addis Ababa, Ethiopia (January 2021–December 2023)*. The study found that 17.5% of participants (95% CI: 9.56–33.38) interrupted their antiretroviral therapy, highlighting a significant challenge in treatment adherence among adolescents. **Chapter 2** details an outbreak investigation of a **cholera epidemic** in the Garda Marta area of the Gamo Zone, South Ethiopia. The investigation identified 420 cases, with an attack rate (AR) of 78 per 10,000 populations and a case fatality rate (CFR) of 0.02%. **Chapter 3** covers a **five-year (2017–2021)** HIV data analysis in the North Shewa Zone, Amhara Region. The findings revealed 4,093 new HIV-positive diagnoses during the period, indicating a sustained burden of HIV in the area. **Chapter 4** evaluates the **HIV case-based surveillance system** in Adama City, Oromia Region. The assessment revealed that 63.9% of reports lacked REDCap reporting standards, and 75% of technical staff and facilities demonstrated weak coordination, underlining system and communication gaps. **Chapter 5** provides the **health profile of Basona Worana District**, North Shewa Zone, amhara Region, where 21 rural health posts, 3 health centers, and 2 private clinics deliver healthcare services. **Chapter 6** presents the **public health emergency disaster report** on the 2023 flooding situation in the Gedeo Zone, summarizing preparedness and response activities up to September 30, 2023. **Chapter 7** includes a **scientific manuscript** prepared in Vancouver style, based on the HIV treatment interruption study. **Chapter 8** compiles abstracts for scientific presentation, including a study on the Magnitude and factors associated with treatment interruption among HIV-positive adolescents in selected public hospitals, Addis Ababa, Ethiopia 2025. **Chapter 9** concludes with documentation of multiple **public health emergency situational reports** and the eight-month **cholera response operations** by national and zonal teams in the Gedeo Zone.

**Conclusion**, the study on HIV treatment interruption highlighted the necessity of more effective interventions targeted at adolescents. Important lessons about managing epidemics were learned from cholera outbreak investigation and response efforts. HIV system evaluation in Adama City and data analysis in North Shewa revealed ongoing issues with coordination and surveillance. Practical experience in multisectoral response coordination, emergency planning, and health system assessment was further demonstrated by the emergency response and health profile reports.

Considering the findings above, suggestions for Reduce adolescent ART interruptions by implementing peer-support programs, youth-friendly adherence counseling, and rigorous follow-up procedures. Enhance early warning systems, regularly increase the capabilities of local health teams, and make sure resources are allocated in a timely manner to contain outbreaks quickly. Standardize reporting instruments (REDCap, for example) and improve technical staff-healthcare facility cooperation. Boost logistics, human resources, and infrastructure in areas like Basona Worana to enhance service delivery.

## **Chapter 1: - Thesis**

# Magnitude and factors associated with treatment interruption among HIV-positive adolescents in selected public hospitals, Addis Ababa, Ethiopia

## Abstract

**Background:** According to United Nations Programme on HIV/AIDS report an estimate of 1.6 million adolescents aged 10 to 19 were living with human immune virus worldwide in 2018. Even though antiretroviral therapy programs have expanded rapidly and are now freely available, treatment interruption remains major public health problem in the country.

**Objective:** To assess the magnitude and factors associated with treatment interruption among adolescents living with human immune virus in four public hospitals of Addis Ababa, Ethiopia.

**Method:** A cross-sectional study using retrospective record review of patient charts and computerized medical records was conducted for a period of September 2020 to December 2022. Data was collected from 297 samples which are proportionately allocated in those four hospitals based on patient flow. Extraction form was used to collect data and data collectors were assigned from among the medical staff employed by the antiretroviral therapy clinics of selected hospitals. After being examined, cleaned, and downloaded into an Excel file, the gathered data was exported to SPSS Version 26.0 for additional analysis. Descriptive statistics were employed and Bivariate and multivariate logistic regression model were used to identify associated factors for interruption of antiretroviral therapy.

**Results:** In this study 17.5% of participants (95% CI: 9.56–33.38) interrupted their antiretroviral therapy one or more times from their appointments. Oral thrush (AOR=3.34, 95% CI: (1.47, 7.59), not taking Cotrimoxazole prophylaxis (AOR=3.42, 95% CI: (1.42, 8.24), one year on antiretroviral therapy (AOR=3.75, 95% CI: (1.47, 9.55)), not taking Dolutegravir related medication (AOR=3.85, 95% CI: (1.60, 9.27), and world health organization stages 1 and 2 (AOR=3.50, 95% CI: (1.25, 9.78) and (AOR=3.52, 95% CI: (1.02, 12.12) respectively were found to be significantly associated with this variables.

**Conclusion:** nearly one in five adolescents living with human immune virus interrupted their antiretroviral therapy. To increase ART retention and meet the 2030 HIV/AIDS eradication strategy, we suggest several key recommendations for ministry of Health and other responsible program implementers

**Key words:** Interruption in treatment; Determinants; Antiretroviral therapy; HIV/AIDS

## **Background**

Adolescence is the developmental transition to adulthood that includes rapid changes in the brain and body, often at different rates and is a time for healthy exploration of identity and learning independence (1).

According to the UNAIDS epidemiological estimates, there were 37.6 million HIV-positive individuals globally at the end of 2021, with 1.75 million of them being adolescents between the ages of 10 and 19. Sub-Saharan Africa accounted for a disproportionate amount of HIV infections, accounting for over 70% of the global burden of infection (2).

With an estimated 9.0% of individuals in the region living with HIV, the prevalence of HIV in sub-Saharan Africa is much higher than the global rate (2). South Africa, Nigeria, Mozambique, Uganda, Tanzania, Zimbabwe, Kenya, Malawi, and Ethiopia are among these nations (3).

The HIV epidemic in sub-Saharan Africa affects key populations, such as men who have sex with men (MSM), people who inject drug (PWID), sex workers, transgender, women (TGW), and people in prisons and others closed settings (2).

Key populations affected by the HIV epidemic in sub-Saharan Africa include transgender women (TGW), injecting drug users (PWID), sex workers, men who have sex with men (MSM), and inmates and other confined environments (2). 51% of the region's new infections in 2021 were in these critical demographics (2, 3).

In Ethiopia, the prevalence of HIV/AIDS has been a major public health issue. HIV/AIDS-related prevalence, incidence, mortality, and Disability-adjusted Life Years (DALYs) have been evaluated from 1990 to 2016, per a study that used data from the Global Burden of Diseases (GBD) 2016 (4).

According to data from the Ethiopian Population-based HIV Impact Assessment (EPHIA) survey, the prevalence of HIV in urban Ethiopia is approximately 0.5%, which is significantly less than the 3% benchmark set by the Joint United Nations Programme on HIV/AIDS (5).

The search results indicate that ART interruption has a substantial worldwide burden, with two-thirds of the burden occurring in Africa (6).

Interruptions in ART can lead to adverse clinical events and reduce the effectiveness of ART strategies (1).

However, patients who were initiated on ART within one year were more likely to be significantly protective toward interruption in treatment compared to patients who were on ART for more than one year (1). One in five people on ART (22.3%) had interrupted from the treatment in the study (7). While there is no specific information on the burden of ART interruption among adolescents in Ethiopia in 2021, the available data suggest that HIV remains a significant health concern among this population.

Antiretroviral therapy (ART) is a treatment that helps manage HIV by reducing the amount of the virus in the blood, lowering the risk of transmission to others, and improving the patient's quality of life (8). However, ART interruption can lead to serious consequences, such as decreased survival, lower CD4 count and increased drug resistance (8).

Several factors have been associated with treatment interruption, including Age, gender, advanced HIV disease, long-term ART use, lower socioeconomic status, and the absence of frequent therapeutic drug monitoring (9). Behavioral factors: substance use disorders, adherence to treatment, and sexual risk behavior (10). Clinical factors: HIV symptoms, viral load, and CD4 count (9).

Interruption of ART can lead to a decrease in survival rates due to increased HIV-related complication (9). Interruption of ART can result in a lower CD4 count, which is an indicator of immune system weakness (8).

## **Statement of the problem**

According to the 2012 (EFY) Health and Health Related Indicators published by MoH, Addis Ababa has 12 Hospitals, 98 Health Centers. The city has more than 25 and 759 private (for-profit) hospitals and clinics, respectively providing health services including HIV/AIDS care. Despite this high coverage of HIV/AIDS care Nearly 100 adolescents in Addis Ababa become newly infected every day. In addition to 286,000 HIV-infected adults, about 12,000 children are believed to be HIV positive.

Since the beginning of the epidemic, more than 50,000 people may have already developed AIDS, although not all cases have been officially recorded. The study aims to identify the factors contributing to treatment interruption among HIV-positive adolescents in Ethiopia. The search results provide insights into the risk factors associated with treatment interruption among HIV-infected individuals in various settings, including Ethiopia.

The interruption of antiretroviral therapy (ART) is a significant challenge in HIV care, with various known and unknown factors influencing this decision. Some known factors associated with ART interruption include individual-level barriers such as complex regimens, low health literacy, and virology failure, as well as system and structural-level barriers such as living in a rural area, being illiterate, and having a mental illness. But I still know many unknowns' factors in this area. Further research is needed to better understand the complex interplay of individual, system, and structural factors that influence the decision to interrupt ART, to develop more effective strategies for improving retention in HIV care in Addis Ababa.

## **Justification of the study**

This study on the factors for treatment interruptions among HIV-infected adolescents in Ethiopia is critically important for several compelling reasons. Firstly, treatment interruptions represent a significant challenge in resource-limited settings like Ethiopia. Such interruptions can lead to treatment failure, requiring patients to transition to more costly and potentially toxic second-line or third-line antiretroviral therapies (ART). Moreover, interruptions increase the likelihood of developing drug-resistant viral strains, which poses a public health threat by limiting treatment options.

Additionally, existing data highlights alarming variability in ART treatment failure rates across the country, with figures ranging from 3.1% in southern Ethiopia to a concerning 22.6% in Addis Ababa (11). These statistics underscore the urgency of understanding the underlying causes of treatment interruptions, particularly among vulnerable groups like adolescents, who may face unique barriers to adherence.

By identifying these factors can provide valuable insights that healthcare providers and policymakers can use to design evidence-based interventions. These interventions could improve adherence rates, reduce treatment failures, and ultimately enhance the health outcomes of HIV-infected adolescents. Furthermore, the findings could serve as a model for addressing similar challenges in other resource-constrained settings, amplifying the study's impact beyond Ethiopia.

### **Significance of the study**

Previously shared evidence, in Ethiopia, addresses adherence to ART and only a few studies were conducted to assess predictors of lost to follow-up. The study about risk factors for interruption in treatment among HIV-infected adolescents attending health care and treatment centers in Ethiopia is significant due to its potential impact on clinical outcomes, drug resistance and public health. Interruption in treatment (IIT) among HIV-infected adolescents can lead to poor clinical outcomes, increased drug resistance and higher risk of death, posing challenges to HIV care and treatment programs in sub-Saharan Africa (1). Therefore, understanding the risk factors for interruption in treatment is crucial for improving the effectiveness of HIV care and treatment programs in Ethiopia and addressing the specific challenges faced by HIV-infected adolescents.



## **LITERATURE REVIEW**

### **The magnitude of interruption in treatment among HIV- infected adolescents**

Interruption in treatment (IIT) is a challenge in HIV care and treatment programs in sub-Saharan Africa, and high IIT among HIV-positive adolescents has both individual and potential public health consequences, including discontinuation of treatment, increased HIV transmission and risk of death (1).

To measure the magnitude of the Anti-Retroviral Therapy (ART) interruption in the numerator and denominator, you can use the Medication Event Monitoring System (MEMS) (12). MEMS are a tool used to assess adherence to ART in patients.

The adherence is calculated by dividing the number of events of medication (e.g., drug dispensing or pick-up) by the number of days the patient was eligible to receive the medication. In the context of measuring ART interruption, the numerator represents the number of patients who experienced an interruption in their ART, while the denominator represents the total number of patients on ART.

### **Factors associated with antiretroviral therapy (ART) interruptions**

Literature review on the magnitude of risk factors for interruption in treatment among HIV-infected adolescences attending health care and treatment centers in Ethiopia yielded limited result. However, some studies conducted in Tanzania and Ethiopia have shown a high incidence of interruption in antiretroviral treatment among adolescents living with HIV (11) (13).

Risk factors for IIT among HIV-positive adolescents in Tanzania include aged between 15 and 19 years, male sex, residing in mheza district, advanced HIV disease, being on ART for a long time, and being placed on non DTG based drugs (1). However, the existing discrepancy and have not yet been investigated (14).

Socio-demographic factors such as male sex, age below 5 years, and HIV-positive children with age 3 years were found to be contributing factors for the occurrence of HIV treatment failure (14). Factors associated with antiretroviral therapy (ART) interruptions in HIV-positive individuals include advanced HIV disease, long-term

ART use, non-adherence to ART, lower socioeconomic status, and the absence of frequent therapeutic drug monitoring.

In Ethiopia, a study revealed that children, who interrupt and restart their HIV treatment, as well as those with age below 3 years, were at a higher risk of treatment failure (15). Poor ART adherence is also a significant factor that can lead to incomplete viral suppression and cause HIV treatment failure (15).

Global recommendations to prevent ART interruptions include on-time pill pick-up, electronic or paper-based appointment scheduling, SMS or telephone call reminders, peer counseling, cognitive behavioral therapy, and reduction of the HIV-associated stigma that prevent missing of ART drugs (15).

### **Socio-demographic Factors**

Socio-demographic factors for interruption in treatment among HIV- infected adolescence attending health care and treatment centers in Ethiopia” did not yield direct result; the available studies shed light on the border topic of socio- demographic factors associated with HIV treatment and care. One study conducted in Tanzania focused on the socio- demographic factors associated with medication adherence among people living with (PLHIV) a slightly greater proportion of males (26.79%) than females (26.27%) were IIT.

Also, the age group of 15-24 years (33.64%) accounted for the highest proportion of IIT, followed by the age group of 25-34 years (32.16), respectively, compared to other age groups. Furthermore, pregnant women (37.14%) accounted for a significant proportion of IIT compared to non-pregnant.

Another study in Ethiopia aimed identifies socio-demographic, economic, and clinical factors associated with ART adherence competence in HIV- positive adults at Felege Hiwot Teaching and Specialized hospital. The study focused on identifying socio-demographic, economic, and clinical predictors for ART adherence competence in HIV-positive adults (16).

While these studies do not directly address the interruption in treatment among HIV-infected adolescents in Ethiopia, they provide valuable insights into the socio-demographic factors associated with HIV treatment and care in similar settings. It is important to note that the specific socio-demographic factors contributing to treatment interruption among HIV- infected adolescents in Ethiopia may require further targeted research.

### **Economic factors**

Level of income can be defined in terms of individual income or household income. Previous research indicates that economically poor individuals tend to be exposed to greater dangers during their every life than the relatively wealth (17).

The adherence levels of patients are highly affected by level of income such that patients with a high level of income had good competence level of adherence (17). Thus, it is said that a person is ART adherence competent when he/she uses those resources to do what is expected, as would be the case in consuming medication as prescribed (17). Hence, patients with high income may use different alternatives to get pills and he/she also uses proper food adherence schedules for the treatment to be effective, and this encourages the patient to attend all visits to the health institution (17).

### **Clinical characteristics and their association with interruption in treatment**

Clusters of differentiation 4 (CD4) cell counts of patients at each follow-up visit indicate that patients with rapid progression of HIV had small CD4 cell counts (17).

Clinical characteristics and its association with IIT A slightly greater proportion (26.94%) of participants on the second-line regimen (drug type) were IIT compared to those on first-line treatment (25.75%) (13).

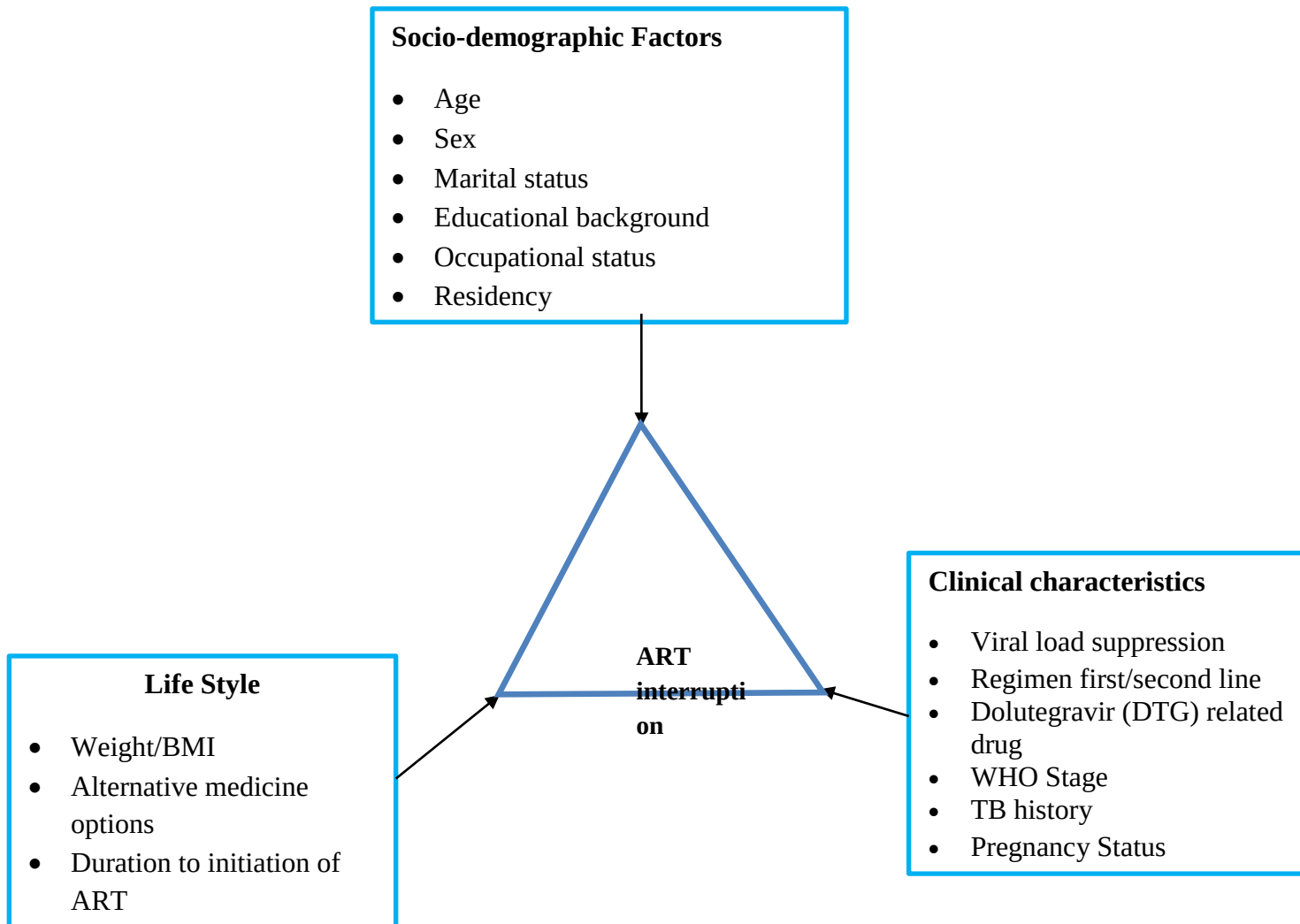
Results showed that PLHIV on ART for more than 1 year were more likely (21.58%) to be IIT than those on treatment for less than one year (1). Of the 2,924 (19.35%) participants who did the viral load test, 14.90% who were virally suppressed were IIT, compared to 31.78% who were virally non-suppressed. A greater proportion of participants (69.18%), and 69.15%, with BMI (kg/m<sup>2</sup>) < 18 and 25–< 30, respectively,

were IIT than those with a BMI between 18.5 – < 25 and 30 +. In addition, more participants in WHO stage I (30.72%) were IIT than WHO stage II, III, and IV.

### **Individual factor**

People living with HIV (PLHIV) on adult second line drug type were more likely to be IIT than those in adult first-line drug type (13). Participants with poor drug adherence had a 1.5 times higher risk of IIT than those with good drug adherence, PLHIV with unsuppressed viral load has about twice the risk of being IIT compared to their suppressed counterparts. PLHIV who were not on DTG-related drugs have about seven times increased risk of being to IIT than those on DTG-related drugs, Additionally, PLHIV with WHO stage III and IV had a higher risk of IIT than their counterparts (13).

## CONCEPTUAL FRAME WORK



**Figure 1 Conceptual Framework on ART interruption and associated factors the framework was developed after reviewing different literature (17).**

## **Objective**

### **General objective**

To assess the magnitude of interruption of ART and associated factors among adolescents living with HIV who were consecutively enrolled on ART between February 2020 and December 2022 in selected public hospitals of Addis Ababa, Ethiopia 2024

### **Specific objectives**

To determine the magnitude of interruption in treatment of ART and associated factors among adolescents living with HIV in selected public hospitals of Addis Ababa, Ethiopia

To identified factors for interruption of ART among adolescents living with HIV in selected public hospitals of Addis Ababa, Ethiopia

## **Methods and materials**

### **Study area**

The study was conducted in Addis Ababa. Addis Ababa is the capital city of Ethiopia. Addis Ababa covers an area of 527 square kilometers and has 11 sub cities. According to population projection value for 2019, the city has an estimated population of 4.59 million.

The city has a total of 12 public hospitals, with 7 managed by the Addis Ababa Health Bureau and 5 under the Ministry of Health. A study was conducted in four randomly selected hospitals: Menelik II Referral Hospital, Y12HMC, Ras Desta Damtew Hospital, and Zewditu Memorial Hospital. Menelik II Referral Hospital has 2,992 ART followers, Zewditu Memorial Hospital has 2784 ART followers, Y12HMC serves 2234 and Ras Desta Damtew Hospital accommodates 2543 ART followers.

### **Study design and period**

We were applied cross sectional study design using secondary data among HIV positive adolescent enrolled within three years from January 2021 to December 2023 among serologically confirmed HIV-positive adolescent patients within four selected

governmental hospitals in Addis Ababa Ethiopia. Data was collected from March 1 to May 30/2024.

## **Population**

### **Source of population**

All Adolescents Patients living with HIV/AIDS using ART drugs at selected hospitals during the time of data collection.

### **Study Population**

Adolescents between the age of 10-19 years HIV-AIDS patients who started ART and who attending follow up at least one year after ART initiation in selected hospitals

## **Inclusion and exclusion criteria**

### **Inclusion criteria**

Patients that were on ART follow up at selected hospitals whose Ages are 10–19 years

### **Exclusion criteria**

Known mental disorder patients were excluded from the study. Patients who had been on ART less than one year, as they have different patterns of treatment interruption, missing data participants with incomplete data excluded from the analysis.

## **Sample Size Determination**

### **Sampling procedure**

According to participant selection criteria, total adolescent HIV positive Population with a follow up at selected hospitals, during data collection time that fulfilled the involvement criteria. Study subjects selected from the rest of HIV patients by using systematic sampling selection technique.

$$n = \text{Sample Size}$$

p

= Estimated prevalence for ART interruption, taking 26.2% from previous research conducted (1).

$$Z\left(\frac{\alpha}{2}\right) = \text{standard distribution value at 95\% confidence level of } = 1.96,$$

$d$  = Margin of error between the sample and population = 5% = 0.05

$N$  = total population

To calculate sample Size (n) by using single population proportion formula

$$n = \frac{(Z^{\alpha/2})^2 p(1-p)}{d^2}, n = \frac{(1.96)^2 0.262(1-0.262)}{(0.05)^2}, n = \frac{3.8416 \times 0.2}{0.0025} \approx 297.1$$

$$= 297$$

**Table 1 Sample size calculation for determining the magnitude of ART treatment interruption among HIV positive adolescents who have follow-up in selected government hospitals, Addis Ababa, 2024**

| Factor          | Reference | Outcome in non-exposure | AOR  | sample size |
|-----------------|-----------|-------------------------|------|-------------|
| ART Drug access | 2         | 96.1%                   | 0.01 | 124         |
| Gender          | 25        | 62                      | 0.38 | 164         |
| CD4 Count       | 25        | 60                      | 0.42 | 197         |

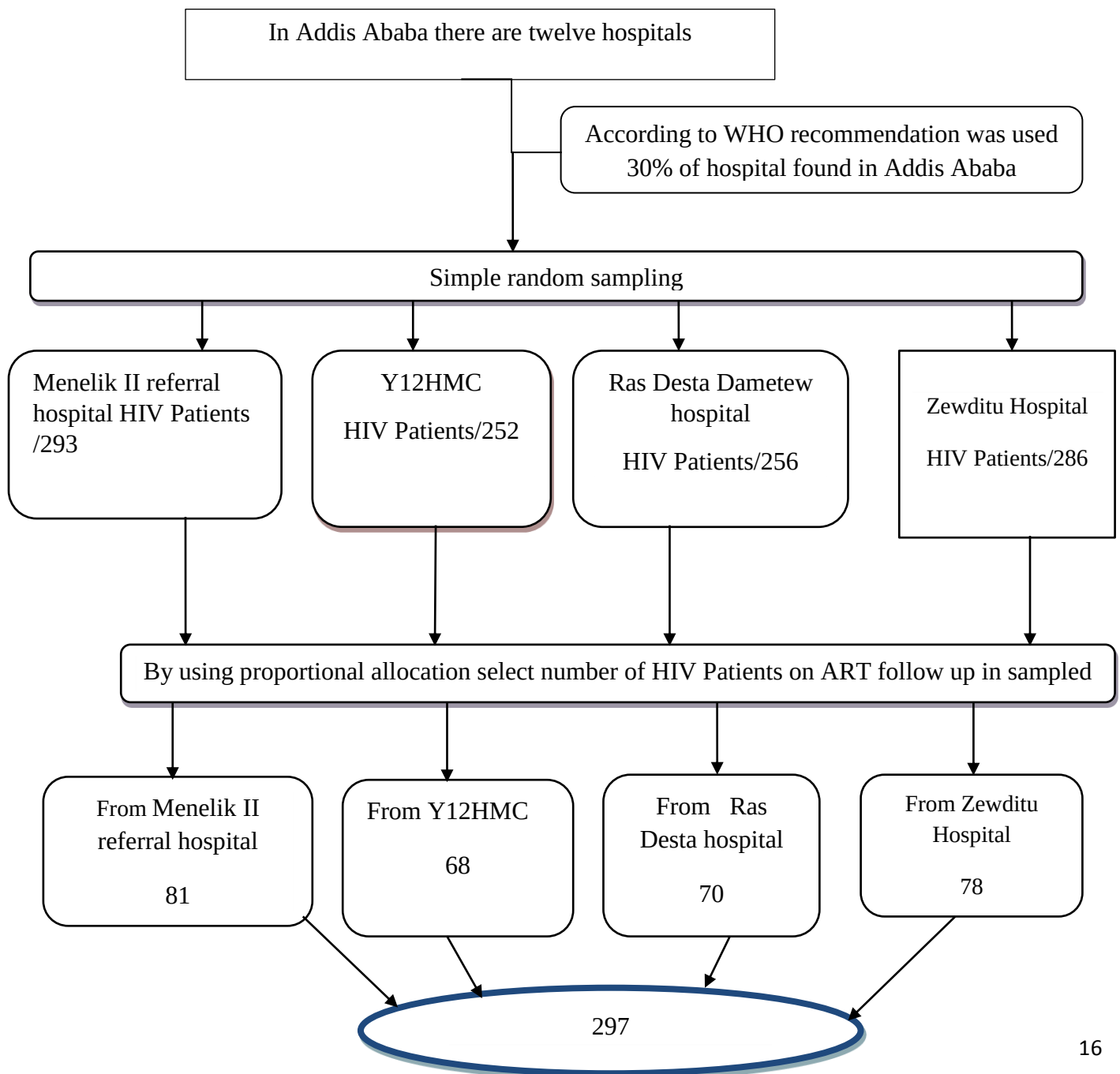
#### **Sampling methodology**

In the first stage, simple random sampling was applied to select four public hospitals from twelve hospitals found in Addis Ababa. The last quarter, preceding the study period, was reviewed and showed that there were 1087 ART follow-up were estimated. The final 297 sample size was then obtained by allocating ART follow-up proportionately in chosen hospitals. Depending on how many adolescents have HIV Each institution used a systematic sampling technique to choose research participants. The K value was found to be 4. The first study participant was chosen by lottery from the patient registration or client treatment and care form and then sampled at every 4<sup>th</sup> participant. Consequently, study participants were chosen every four intervals until the necessary sample size was reached.



The target population and their chart should be well defined to assure participant selection and adherence to ethical standards. In this case, the participants consist of adolescents with HIV who were on ART, and we contact them by phone and appointment by calling their healthcare providers.

By Using the right statistical techniques, select a proportionate number of participants from each hospital, taking into participant to the study's precision requirements and the frequency of ART interruption among adolescents with HIV.



**Figure 2 Schematic presentation of sampling procedures (all the study population had equal chance of being randomly selected)**

### **Data Collection material and Procedure**

#### **Data Collection Instrument**

Quantitative data was extracted from patient charts, registers, and electronic medicals records using organized chart abstraction tool which is designed based on the available standard national patient information systems. Both the data abstraction tool was developed in English and then the tool was verified, checked for its clarity and understand ability with completeness, in case some unclear questions that need revision was correct before the beginning of data collection by data collectors. Data collectors were trained in research objectives, methodology, and data collection procedures.

#### **Data collection procedures**

An extraction form was used to collect data; it was customized to fit the local environment and adapted from other studies. It was initially written in English and then professionally translated into Amharic. To make sure everything was accurate and consistent, it was then translated back into English by a different person. Questionnaire has four sections: socio-demographic, clinical, lifestyle, and predisposing factors for stopping antiretroviral therapy. Four data collectors, three data clerk officers and one public health officer serving as a supervisor were assigned from among the medical staff employed by the ART clinics of selected hospitals.

### **Study variable**

### **Outcome variable**

Interruption of ART

### **Independent variable**

Age of patient, Sex, occupation, educational status, TB history, regimen first/second line, Dolutegravir (DTG) related drug, WHO clinical stage and viral load suppression.

### **Operational Definition**

**Interruption in treatment** is defined as the discontinuation of antiretroviral therapy (ART) for a specified period, often defined as at least 30 consecutive days without taking ART (26).

**Antiretroviral therapy (ART):** is the treatment for HIV that involves taking a combination of HIV medicines every day (2).

**Baseline body mass index (BMI):** is a measure of a person's weight in relation to their height.

**Baseline antiretroviral therapy (ART) regimen:** to the initial combination of antiretroviral drugs prescribed to a patient at the start of treatment (27).

**Antiretroviral therapy Adherence:** Adherence is defined as good if it is  $\geq 95\%$  ( $< 2$  doses of 30 doses or  $< 30$  dos of 60 doses is missed) as documented by ART healthcare provider (28).

**Viral load suppression** refers to the reduction of the virus in the body to a very low level (16).

### **Data Quality Management**

A pre-test was done on 5% of the total sample size on other hospital (Tirunesh bejing hospital) for its clarity, simplicity and understandability, and one day training was given for data collector on data collection tool and sampling techniques and objective of the study. In addition, supervision was held regularly during data collection period by supervisor and principal investigator. The collected data was checked daily for completeness, and consistency was checked on questions before data entry.

## **Data Management and Analysis**

The data was thorough and double entered before an analysis was done to check quality and reliability. The data entry was done using SPSS version 26.0 and Perform data cleaning by using statical software to remove inconsistencies, errors, or missing data. This may involve checking duplicate entries, verifying the accuracy of information, and ensuring that the data was complete and consistent.

Organize and manage the data using appropriate software tools, Excel and then imported to SPSS version 26.0. Conduct statistical analyses to identify patterns, trends, and associations between variables. This may include descriptive statistics, such as frequency distributions, proportions, percentages and data are also having presented with tables, graph hand texts and measures of central tendency (mean, median, mode), and

Bivariate logistic regression was conducted primarily to identify variables having association with the dependent variables individually. Variables a P-Value less than 0.25 were entered into multivariable logistic regression analysis for controlling the possible effect of confounders and finally the variables which have significant association were identified because of adjusted odds ratio (AOR) with 95% confidence interval (CI) and P-Value less than 0.05 which is used to report statically significance.

## **Data Processing**

We used descriptive statistics, which include metrics like mean and frequency, to summarize the data. The results were presented by using tables or figures.

To ascertain the adequacy of the logistic regression model, model fitness tests were performed, including the Hosmer-Lemeshow goodness-of-fit test. This test evaluates whether the observed outcomes match expected outcomes based on the model, thus assessing the fitness of the logistic regression model to the data.

Multicollinearity among predictor variables was assessed using variance inflation factor (VIF) analysis. Multicollinearity occurs when predictor variables are highly correlated, potentially leading to unstable estimates of the regression coefficients. By calculating VIF values for each predictor variable, Multicollinearity can be identified, and steps can be taken to address it if necessary.

Both Bivariable and multivariable logistic regression analyses were conducted to identify factors associated with interruption in treatment among HIV positive adolescents. In the Bivariable analysis, variables with a p-value less than 0.25 were considered for inclusion in the multivariable logistic regression model. This threshold was chosen to ensure that potentially relevant variables were not excluded prematurely.

Subsequently, multivariable logistic regression analysis was performed to identify the final set of associated factors. This step allowed for the adjustment of confounding variables and the identification of independent predictors of interruption in treatment. Variables with a p-value less than 0.05 in the multivariable analysis were deemed statistically significant, indicating a strong and significant association between the dependent and independent variables. These associations were further described with their corresponding Adjusted Odds Ratios (AORs) and 95% confidence intervals (CIs).

To determine the last group of associated factors, multivariable logistic regression analysis was performed. Confounding variable adjustments and the identification of independent predictors of treatment interruption were made possible by this step. In the multivariable analysis, variables with a p-value of less than 0.05 were considered statistically significant, indicating a strong and significant association between the dependent and independent variables. The associated 95% confidence intervals (CIs) and Adjusted Odds Ratios (AORs) were used to better describe these connections.

### **Ethical consideration**

Submit my research plan to Addis Ababa university school of public health ethical review board (IRB) and Addis Ababa Health Bureau ethical review board for approval, ensuring that the proposed participant population, recruitment methods, sensitivity of information collected, and data collection methods are adequate for maintaining confidentiality and protecting participants' privacy. And then Ethical clearance was obtained from Addis Ababa university health science Campus ethical review committee and further letter was obtained from Addis Ababa Health Bureau ethical review board. Since, we were going to collect secondary data from the participant's medical and electronics medical charts; informed consent waiver was requested and if they have phone numbers and call by their health care giver who were working in ART room and then approach them to investigate about their reasons for interruption.

### **Dissemination of results**

The result of the study will be presented to Addis Ababa University Department result of the study will be presented to Addis Ababa University of preventive medicine as partial fulfillment of Master of Public Health degree in Field Epidemiology, Scientific conference and workshops. Finally further effort will be made to publish the findings of this study on Finally further efforts will be made to publish the finding of this study on international journal.

## Result

### Participants' Sociodemographic characteristics in the study

A total of 297 HIV positive adolescent patients participated with a 100% response rate. Most respondents 283(95.3%) were in the 15–19 age range. 126 (42.4%) of the participants had completed their secondary education. 243 (81.8%) of the respondents were single. Most respondents, 85 (28.6%) were students. (**Table 2**)

**Table 2** shows the frequency distribution among adolescents who are HIV positives adolescents based on Sociodemographic characteristics of participants (n=297).

| Sociodemographic Variables | Category            | Frequency | Percent |
|----------------------------|---------------------|-----------|---------|
| Sex                        | Female              | 178       | 59.9    |
|                            | Male                | 119       | 40.1    |
| Age                        | 10-14               | 14        | 4.7     |
|                            | 15-19               | 283       | 95.3    |
| Marital status             | single              | 243       | 81.8    |
|                            | Married             | 35        | 11.8    |
|                            | Divorced            | 17        | 5.7     |
|                            | Widowed             | 2         | .7      |
| Occupational status        | Student             | 85        | 28.6    |
|                            | No work             | 73        | 24.6    |
|                            | Daily laborer       | 61        | 20.5    |
|                            | Female sex worker   | 31        | 10.4    |
|                            | Housewife           | 25        | 8.4     |
|                            | merchant            | 14        | 4.7     |
|                            | private employee    | 8         | 2.7     |
|                            |                     |           |         |
| Educational status         | No formal education | 53        | 17.8    |
|                            | Primary             | 118       | 39.7    |
|                            | secondary           | 126       | 42.4    |

## Clinical characteristics

Over 65.3% of the participants were in WHO stage I at the time of the study, and Participants with a BMI (kg/m<sup>2</sup>) **18.5-24.99** and **<18.5** were interruption in treatment (55.6%) and 35.0%, respectively, then those with a BMI between 25 and 30+. At the time of recruitment, sixty-seven (22.6%) study participants had been receiving antiretroviral therapy (ART) longer than one year, compared to patients who had been receiving treatment for less than a year. Merely 36.7% of the participants were placed in a medication combination based on DTG at the time of the investigation. Of the adolescents, 24 (8.1%) had a history of tuberculosis infection during their lifetime. Of the adolescents, 11.8% were married and 4.0% were pregnant at the time of the study.

Comparing patient's treatment regimen, more participants, 72% of the individuals were on a first-line regimen, and 29.3% of participants had viral load suppression. Furthermore, 26.3% of participants were poorly adhered to antiretroviral therapy (ART). Of those 52 participants had interruptions in treatment and merely 36.0% of the individuals were receiving Cotrimoxazole Prophylaxis, while 21.2% of the participants had failed their first line of ART. (Table 3)

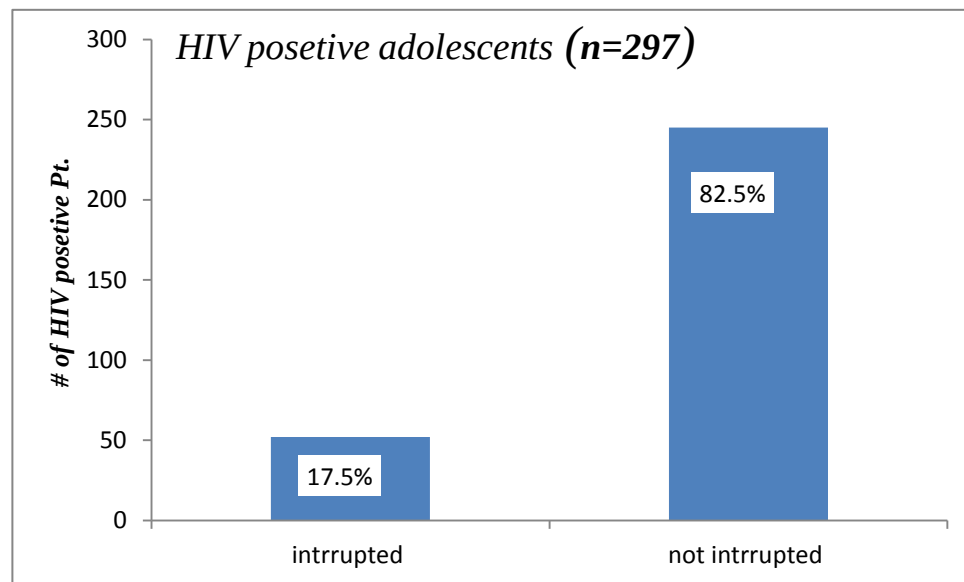


**Table 3 frequency distribution according to clinical related characteristics of respondents among HIV positive adolescents (n-297)**

| Clinical related characteristics | Category                      | Frequency | Percent |
|----------------------------------|-------------------------------|-----------|---------|
| BMI                              | < <b>18.5</b> /Undernourished | 104       | 35.0    |
|                                  | <b>Normal 18.5-24.99</b>      | 165       | 55.6    |
|                                  | 25-30/Overweight              | 28        | 9.4     |
| Oral Thrush                      | absent                        | 231       | 77.8    |
|                                  | present                       | 66        | 22.2    |
| WHO Stage                        | I                             | 194       | 65.3    |
|                                  | II                            | 36        | 12.1    |
|                                  | III                           | 39        | 13.1    |
|                                  | IV                            | 28        | 9.4     |
| Drug type/Regimen Line           | 1                             | 214       | 72.1    |
|                                  | 2                             | 83        | 27.9    |
| The Reason For Interruption      | Loss to follow up             | 28        | 53.8    |
|                                  | OT/transfer to out            | 24        | 46.2    |
| Failed for First Line ART        | Yes                           | 63        | 21.2    |
|                                  | No                            | 234       | 78.8    |
| Cotrimoxazole Prophylaxis        | Yes                           | 107       | 36.0    |
| Taking History                   | No                            | 190       | 64.0    |
| Duration on ART                  | Greater Than One Year         | 187       | 63.0    |
|                                  | One Year                      | 110       | 37.0    |
| VLR suppression                  | not suppressed                | 210       | 70.7    |
|                                  | suppressed                    | 87        | 29.3    |
| TB_ Screening Status             | TB_ Negatives                 | 273       | 91.9    |
|                                  | TB_ Positives                 | 24        | 8.1     |
| On anti-TB medications           | Yes                           | 15        | 62.5    |
|                                  | No                            | 9         | 37.5    |
| DTG related drug                 | Yes                           | 109       | 36.7    |
|                                  | No                            | 188       | 63.3    |
| Pregnancy status                 | Yes                           | 12        | 4.0     |
|                                  | No                            | 166       | 55.9    |

### Magnitude of ART interruption

Of those 17.5% of participants with (95% CI: 9.51–33.38%) interrupted from ART follow up. (Fig 3)



**Figure 3 magnitude of ART interruption among HIV positive adolescents (n=297)**

#### 7.1. Factors associated with treatment interruption among HIV positive adolescents in selected public hospitals, Addis Ababa 2024 (n=297)

More than fourteen variables were included in the binary logistic regression analysis to examine relationships between independent and dependent variables in people with HIV undergoing antiretroviral therapy (ART). The multivariate logistic regression was then conducted using ten variables that had a P value of less than 0.25. The variables ultimately demonstrated statistical significance (p-value less than 0.05) at a 95% confidence interval in relation to adolescents' interruptions in treatment in the multivariate logistic regression model (**Table 3**).

In the multivariate logistic regression model, a  $p < 0.05$  was applied (**Table 3**). When comparing the likelihood of interruption, HIV-positive adolescents with a history of oral thrush were approximately three times more likely to experience an interruption

in treatment (IIT) than those without a history of oral thrush (AOR: 3.343, 95% CI: 1.47–7.57).

The probability of experiencing an interruption in treatment (IIT) is almost four times higher for adolescents living with HIV who were not taking DTG-related medications (AOR: 3.85, 95% CI: 1.59–9.27) than for adolescents who were taking DTG-related drugs. In addition, HIV positive adolescents with WHO stages III and IV had around three and four times the probability of an interruption in treatment (IIT) compared to WHO stage one HIV positive adolescents (AOR: 3.496, 95% CI: 1.25–9.72 and (AOR: 3.51, 95% CI: 1.02-12.12), respectively.

Adolescent Individuals who adhered to their medication regimen poorly (AOR: 0.154, 95%CI: 0.57-0.417)) were 0.8 times less likely a treatment interruption than those who adhered to their regimen good, it implies that poorly adherence was not increased the likelihood of IIT.

Additionally, participants in the research who had been receiving antiretroviral therapy (ART) for one year had approximately four times greater chance of experiencing treatment interruption than those study participants had been receiving antiretroviral therapy (ART) longer than one year (AOR: 3.75, 95% CI: (1.47, 9.55)). Antiretroviral therapy (ART) treatment interruption in adolescents living with HIV was significantly correlated with their use of Cotrimoxazole prophylaxis. Patients who did not take prophylaxis had a treatment interruption rate approximately three times higher than those who did (AOR=3.42, 95% CI :( 1.41-8.24)), suggesting that prophylactic users had a lower risk of infection-related treatment termination.

The factors that decreased the likelihood of treatment termination were female in sex (AOR: 0.31, 95% CI (0.14-0.68), body mass index (BMI) less than 18.5 to 24.99 kg/m<sup>2</sup> (AOR: 0.25, 95% CI (0.11-0.60), ART duration of less than 1 year (AOR: 0.72, 95% CI 0.65–0.81), and failed first line ART drug (AOR: 0.38, 95% CI: (0.16-0.92).

While the variable Viral load status was statistically significant in the binary logistic regression analysis, they were not the factors that were independently associated with treatment interruption they lost their statistical significance level in the multivariate logistic analysis: Not Suppressed AOR: 1.215, 95% CI: (0.526-2.808).

**Table 4: factors associated with treatment interruption among HIV positive adolescents who have a follow up in selected public hospitals, Addis Ababa 2024 (n=297)**

| Factors                                 | Treatment interrupted |           | COR (95% CI)                  | AOR (95% CI)                   | P-Value     |
|-----------------------------------------|-----------------------|-----------|-------------------------------|--------------------------------|-------------|
|                                         | Yes                   | No        |                               |                                |             |
| <b>Sex</b>                              |                       |           |                               |                                |             |
| Male                                    | 76                    | 25        | 1                             |                                |             |
| Female                                  | 169                   | 27        | <b>0.486(0.265,0.892) *</b>   | <b>0. 311 (0.141,0.685) **</b> | <b>.004</b> |
| <b>Oral thrush</b>                      |                       |           |                               |                                |             |
| Absent                                  | 191                   | 25        | 1                             |                                |             |
| Present                                 | 54                    | 27        | <b>3.820 (2.050, 7.117) *</b> | <b>3.343 (1.471, 7.597) **</b> | <b>.004</b> |
| <b>BMI/ nutritional indicator</b>       |                       |           |                               |                                |             |
| 25-30+ kg/m2 or Overweight              | <b>21</b>             | <b>14</b> | 1                             |                                |             |
| 18.5-24.99kg/m2 or Normal               | <b>147</b>            | <b>26</b> | <b>0.234 (0.094, 0.581) *</b> | <b>0. 259(0.111,0.604) **</b>  | <b>.002</b> |
| <18.5 kg/m2 or undernourished           | <b>77</b>             | <b>12</b> | 0.265 (0.120, 0.587)          | 0.266(0.100, 0.709)            |             |
| <b>Failed for first line ART drug</b>   |                       |           |                               |                                |             |
| Yes                                     | <b>47</b>             | <b>19</b> | <b>0.412 (0.216, 0.788) *</b> | <b>0. 388 (0.163,0.924) **</b> | <b>.033</b> |
| No                                      | <b>198</b>            | <b>33</b> | <b>1</b>                      |                                |             |
| <b>Cotrimoxazole Prophylaxis Taking</b> |                       |           |                               |                                |             |
| Yes                                     | 125                   | 13        | 1                             |                                |             |
| No                                      | 120                   | 39        | <b>3.125 (1.590, 6.143) *</b> | <b>3.417 (1.417, 8.240) **</b> | <b>.006</b> |
| <b>Duration on ART</b>                  |                       |           |                               |                                |             |
| Greater Than One Year                   | <b>136</b>            | <b>19</b> | 1                             |                                |             |
| one year                                | <b>67</b>             | <b>14</b> | <b>3.238 (1.570, 6.679) *</b> | <b>3.751 (1.473,9.553) **</b>  | <b>.006</b> |
| less than one year                      | <b>42</b>             | <b>19</b> | 1.496 (0.707, 3.166)          | 1.53(0.59,3.99)                |             |
| <b>DTG related drug</b>                 |                       |           |                               |                                |             |
| Yes                                     | 142                   | 10        | 1                             |                                |             |
| No                                      | 103                   | 42        | <b>5.790 (2.777,12.073) *</b> | <b>3.851 (1.599, 9.273) **</b> | <b>.003</b> |

|                          |     |    |                             |                                |             |
|--------------------------|-----|----|-----------------------------|--------------------------------|-------------|
| <b>WHO Stages</b>        |     |    |                             |                                |             |
| Stage 1                  | 169 | 25 | <b>1</b>                    |                                |             |
| Stage 2                  | 31  | 5  | 1.090(0.388,3.065)          | 1.22(0.357,4.19)               |             |
| Stage 3                  | 26  | 13 | <b>3.380(1.538,7.426) *</b> | <b>3.496(1.250,9.778) **</b>   | <b>.017</b> |
| Stage 4                  | 19  | 9  | <b>3.202(1.305,7.856) *</b> | <b>3.518(1.021, 12.124) **</b> | <b>.046</b> |
| <b>Viral load status</b> |     |    |                             |                                |             |
| Not suppressed           |     |    | <b>1.837(0.987,3.421) *</b> | 1.215(0.526,2.808)             |             |
| Suppressed               |     |    | <b>1</b>                    |                                |             |

## Discussion

The pandemic of the human immunodeficiency virus (HIV) remains a serious public health problem although efficient use of antiretroviral medication (ART) has considerably reduced HIV transmission, HIV-related morbidity and mortality, and improved quality of life, (13). In this retrospective study described the magnitude and associated variables to the interruption in treatment (IIT) of antiretroviral therapy among HIV- positive adolescents in Addis Ababa.

First, among HIV-positive adolescents using ART, the overall rate of interruption in treatment (IIT) was 17.5% with the three years. Secondly, the research found that the six characteristics that were independently linked to interruption in treatment (IIT) were not taking medicine related to DTG, having been on ART for one year duration, patients have oral thrush, prophylaxis taking status, ART drug adherence and WHO stage. Third, the study found that female sex, ART duration of less than 1 year, and body mass index (BMI) of less than 18.5 to 24.99 kg/m<sup>2</sup> were associated with a lower probability of interruption in treatment (IIT). Fourth, characteristics that were independently linked with interruption in treatment (IIT) did not include variable viral load status.

The magnitude of interruption in treatment (IIT) in adolescent HIV-positives in the current study was like the findings of studies conducted in Harar public hospitals,

Eastern Ethiopia 21% and in Jinan China: a retrospective cohort study was lined with this finding (21, 22). The study findings are contrast to the 26.2% interruption in treatment (IIT) in a retrospective study in Tanzania (1) and 32% of adolescents' interruption in treatment (IIT) in a retrospective study USAID-supported state in Nigeria (23).

The observed difference in IIT magnitude may be due to the result of various patient data tracking systems and the study population's sample size. Among the study population, advanced HIV disease, transportation, choosing to use herbal medicine, employment obligations, not disclosing HIV status, religious beliefs and financial difficulties are likely causes for stopping care and treatment (24).

The current study found that patients who were not on a DTG-based regimen increased risk of being IIT than those on a DTG based regimen. This finding is consistent with the study conducted in the Tanga Region, Tanzania.

Interruption of ART was significantly associated with WHO stages III and IV. The risk was three and four times higher, respectively, than the WHO clinical stages I and II with stage III and stage IV. The results align with research conducted in amhara region-Ethiopia, in Kampala, Uganda and rural Tanzania (24, 25, 26). The elevated risk of opportunistic infection in HIV-positive individuals with WHO clinical stage IV may be explained by the considerable incidence of immune impairment in these patients. They can therefore fail to complete their care and therapy assignments.

Drug adherence for antiretroviral therapy was a statistically significant predictor of IIT. The risk was around three times higher for adolescents living with HIV who had poor ART medication adherence compared to those who adhered to their treatment regimen well. This result is in line with research done in the Amhara region of Ethiopia as well as meta- and systematic analysis of low- and middle-income nations (1, 13, 25). Poor drug adherence may have been caused by factors such as conflicts with religious beliefs, the use of herbal medicine as a substitute medication, fear of discrimination, adverse drug reactions, and financial difficulties. Therefore, healthcare

professionals can determine the potential causes of patients' poor adherence and provide tactics to program implementers to enhance medication adherence.

In comparison to adolescents without a history of oral thrush, who reported a high incidence of interruption in treatment among patients on a ART, adolescents with an oral thrush history have a higher risk of treatment interruption than those patients who have no oral thrush history. The results, however, conflict with research carried out at the Jos University Teaching Hospital in Jos, Nigeria (26).

The variation in causality of oral thrush as a factor contributing to treatment interruption in HIV-positive patients on ART can be influenced by several factors including clinical severity, immune status, treatment complexity, psychosocial factors, access to healthcare, and patient education. These factors interact in complex ways, leading to differing experiences and outcomes among patients. Understanding these variations can help healthcare providers tailor interventions to improve adherence and overall health outcomes for HIV-positive patients.

According to this study, taking Cotrimoxazole for prophylaxis was statically associated with ART interruption. Those who did not take Cotrimoxazole for prophylaxis had an approximately three times higher risk of treatment interruption in treatments. Our results are consistent with research carried out at the Jos University Teaching Hospital in Jos, Nigeria which showed that among HIV-positive adolescents on ART follow-up, there was a significant risk of interruption in treatment.

The observed variation may be the result of Cotrimoxazole side effects, which can result in non-adherence. Skin rashes and gastrointestinal problems are common side effects that can deter patients from taking the drug as prescribed. Individuals may overlook taking Cotrimoxazole, particularly if they are handling several prescription drugs for co-infections and HIV treatment.

One year of ART follow-up was found to be statically correlated with treatment discontinuation was roughly three times more likely to result in a treatment interruption than ART follow-up lasting longer than one year. This result is consistent

with research from a study done in northern Uganda but did not agree with studies conducted in Tanzania's Tanga Region (13, 27). About the length of the treatment, Extended use of ART can cause treatment weariness in patients, which can show up as a psychological burden from having to take medication for the rest of their lives. This exhaustion may result in poorer adherence or a complete interruption of therapy, particularly if patients report no symptoms or stability.

### **Strength**

One of the study's main strengths is its comparatively large sample size, which gives us significant power to get precise and trustworthy estimates over a wide range of potential risk factors that have been considered.

### **Limitation**

Participants were selected from health institutions in Addis Ababa, which may not fully represent the entire population of adolescents in the area and affect generalizability. Adolescents who do not attend health institutions or have limited access to healthcare may be underrepresented in the study.

Additionally, important factors that could not have been considered include disclosing HIV status to family members, initial CD4 count, substance use history, and drug side effects may have been overlooked.

The current study, however, did not evaluate critical characteristics that are also shown to influence interruption in treatment (IIT), such as drug side effects, relationships with clinicians, and the presence of social support



## **Conclusion**

The risk of interruption in treatment was high among adolescents in HIV care and treatment facilities in Ethiopia. This might lead to poor clinical outcomes, and increased drug resistance among ART-initiated adolescents. In addition, we found that a high risk of ART treatment interruption is significantly attributed to both among Adolescents aged between 15 and 19 years, advanced HIV WHO clinical stages III and IV, oral thrush, non-use of prophylaxis, one year of ART follow-up, and non-use of DTG-based regimen.

## **Recommendation**

To increase ART retention and meet the 2030 HIV/AIDS eradication strategy, suggest several key recommendations for ministry of health and other responsible program implementers

The Ministry of Health should make it a priority to educate adolescents living with HIV about the importance of uninterrupted ART follow-up.

The Ministry of Education should focus on raising the educational attainment of adolescents to improve their knowledge of HIV prevention strategies, which would ultimately reduce the spread of HIV.

Each sub-city health facility's youth and adolescent service unit should include health education programs that highlight HIV prevention strategies to raise awareness.

Health care clinicians and health extension workers should empower adolescents with HIV to avoid other opportunistic illnesses and educate them about the significance of ART follow-up.

Strengthen psychosocial support within ART clinics.

Conduct prospective studies to explore additional behavioral and social factors influencing ART interruption

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|                                      |                                                                                                                                                         |  |  |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
|                                      | <b>Annex I : English version questionnaires</b>                                                                                                         |  |  |
|                                      | Basic characteristics of the study population                                                                                                           |  |  |
|                                      | 100. Socio demographic Status (1).                                                                                                                      |  |  |
| 101.Address of patient               | 1. Addis Ababa<br>2. out of Addis Ababa                                                                                                                 |  |  |
| 102.How old are you?                 | _____?                                                                                                                                                  |  |  |
| 103.Sex                              | 1. Male<br>2. Female                                                                                                                                    |  |  |
| 104.Marital status                   | 1. Single<br>2. Married<br>3. Widowed<br>4. Divorce                                                                                                     |  |  |
| 105.Educational background           | 1. No formal education<br>2. Primary (1-8)<br>3. Secondary (9-12)<br>4. College and above                                                               |  |  |
| 106.Occupational status              | 1. Housewife<br>2. Private employee<br>3. Government employee<br>4. Merchant<br>5. Student<br>6. Daily laborer<br>7. No work<br>8. Female sexual worker |  |  |
| 107.Recorded Baseline BMI chart      | 1. <18.50 /under weight<br>2. 18.5–24.99/normal<br>3. >/=25 /overweight                                                                                 |  |  |
| 108.Oral thrush                      | 1. Present<br>2. Absent                                                                                                                                 |  |  |
| 109.WHO Stage                        | 1. I<br>2. II<br>3. III<br>4. IV                                                                                                                        |  |  |
| 110.Pregnant Status                  | 1. No          2. Yes                                                                                                                                   |  |  |
| 111.Baseline ART regimen             | 1. AZT based<br>2. TDF based<br>3. Other                                                                                                                |  |  |
| 112.Failed first line ART            | 1. Yes    2. No                                                                                                                                         |  |  |
| 113.Taking Cotrimoxazole prophylaxis | 1. Yes    2. No                                                                                                                                         |  |  |

|                                                          |                                                          |  |
|----------------------------------------------------------|----------------------------------------------------------|--|
| 114.ART duration (yrs.)                                  | 1. <1year 2. 1 year 3. >1year                            |  |
| 115.VLR suppression status Recorded on chart             | 1. Suppressed 2. Not suppressed                          |  |
| 116.TB history                                           | 1. TB positive<br>2. TB negative                         |  |
| 117.Anti-TB medications                                  | 1. Yes 2. No                                             |  |
| 118.DTG related drug                                     | 1. Yes 2. No                                             |  |
| 119.Drug Type/Regimen line                               | 1. First line 2. Second line                             |  |
| 120.Interruption in treatment                            | 1. Yes 2. No                                             |  |
| 121.If Q 125 is yes, why or the reason for interruption? | 1. OT<br>2. Drop out<br>3. Death<br>4. Loss to follow up |  |

## **Chapter 2: - Outbreak Investigation**



## Chapter 2: - Outbreak Investigation of cholera in south Ethiopia region, Garda Marta woreda, a Case Control study.

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### Abstract

**Background:** Cholera remains a major public health problem in developing countries, including Ethiopia, particularly in areas with limited access to clean water and sanitation. In April 2023, a cholera outbreak occurred in Garda Marta District, Gamo Zone, South Ethiopia Region, which necessitated an investigation to identify risk factors and guide control measures.

**Methods:** A total of 77 confirmed cholera cases and 154 neighborhood controls were involved in this unmatched 1:2 case-control study between April 14 and May 18, 2023. Data collection was done by structured questionnaires, and analysis was done using SPSS version 26. Odds ratios (OR) with 95% confidence intervals (CI) were calculated for the determination of factors associated with infection with cholera; the significance level for the p-value was set at <0.05.

**Results:** A total of 420 cholera cases (**Attack Rate: 0.77% (78/10,000); CFR: 1.67%**) were documented. The outbreak was caused by *Vibrio cholerae* O1, serotype Ogawa. Multivariate analysis showed that the following are significantly associated with infection: use of spring water (AOR = 6.16; 95% CI: 1.03–36.89), drinking “reverse” water (AOR = 7.75; 95% CI: 1.31–45.88), eating out (AOR = 4.39; 95% CI: 1.04–5.24), contact with cholera patients (AOR = 3.13; 95% CI: 1.08–1.93), and travel to affected areas (AOR = 3.03; 95% CI: 1.00–8.58). Drinking treated or tap water from the communal tap was protective. Environmental assessment revealed wide open defecation, low sanitation coverage at 39%, and local water sources contaminated with fecal material.

**Conclusion:** The outbreak was driven using contaminated sources of water, poor sanitation, and unsafe food. Recommendations include strengthening WASH infrastructure, improving hygiene education at a community level, and putting in place rapid response systems to avert future outbreaks within the region.

**Keywords:** Cholera, Outbreak Investigation, Risk Factors, Case-Control Study, WASH, Ethiopia

## **1. Introduction**

Cholera is an acute diarrheal illness caused by infection of intestine with *Vibrio cholerae*, of usually serogroup O1. It is primarily waterborne illness, but it can also be transmitted via contaminated food and, rarely, between infected people. Cholera has an incubation period that can range from several hours to 5 days. Onset of illness may be sudden, with profuse, watery diarrhea, or there can be premonitory symptoms such as anorexia, abdominal discomfort, and simple diarrhea. Vomiting is often present, occurring a few hours after the onset of diarrhea (1).

Globally, there is still a high burden of cholera, especially in developing countries and it is estimated that approximately 1.4 billion people are at risk in endemic countries, with disease incidence greatest in children aged below five years (13). Most outbreaks have taken place in Africa, a region that has accounted for 46% of all cases reported between 1970 and 2011 and has recorded high case fatality rates in the past (13).

The World Health Organization recommends focusing on prevention, preparedness and response to combat the spread of cholera. They also stress the importance of an effective surveillance system for early detection of potential outbreaks (6). Cholera has continued to be a global threat to public health and a key indicator of lack of social development (8).

Though used to be a common phenomenon worldwide, it is now largely confined to developing and underdeveloped countries, mainly in the tropical and sub-tropical regions (9). Cholera is endemic in Africa, parts of Asia, the Middle East, South and Central America (6, 10). Factors that may lead to outbreaks in endemic areas include wars, civil unrest, flooding, earthquakes, landslide, poor sanitation, improper refuse dumping, open defecation and slumps (7, 11).

Worldwide, about 1.4-4.3 million cases and 28,000-142,000 deaths per year are due to cholera infection (6, 7). In 2013, 47 countries reported a total of 129,064 cases of cholera, including 2120 deaths, giving a Case-Fatality Rate (CFR) of 1.63% (7, 10). These represent a decrease of 47% in the number of cases reported compared to 2012.

Cases were reported from all regions of the world, including 22 countries in Africa, 14 in Asia, two in Europe, eight in America, and one from Oceania. Out of the 26 countries that reported deaths from cholera in the same year, 17 were in Africa accounting for 1366 deaths (CFR 2.43%) or 65% of global total (6, 7).

In West Africa, when compared to 2012, the number of cases reported in 2013 showed an important decrease of 80% (from 50,663 to 9765). Only Nigeria and Togo reported more cases than in 2012 (12, 13). In Nigeria, cholera infection is endemic, and outbreaks are common (14).

## **2. Statement of the problem and rationale**

The first index case was detected and reported from Garda Marta Bohe Kebele on April 10, 2023, from this kebele detect three cases for each, from Gogale 01 three cases and from Marta chilbo one case totally nine cases are detected on similar day on April 10, 2023, but the first alarming case was from Marta Bohe by health extension worker and refer to Gogale health center. After the first suspected cholera case was reported by Bohe Kebele of Garda Marta woreda, the cases were laboratory investigated from Gogale 01 kebele case for Vibrio cholera and RDT positive on April 10, 2023.

The outbreak was officially declared by the government on April 13, 2023. MOH and EPHI led the response with support from partners through case management, surveillance and WASH interventions at all levels. On April 15, 2023, the SER health bureau requested the Federal Ministry of Health and Ethiopian Public Health Institute investigation and response of the outbreak.

A team from EPHI, UNICEF, WHO and other partners which include health professionals and field epidemiology residents were deployed in the affected areas for investigation and strengthening prevention and control activities. Rapid assessment was conducted by the team deployed to the woreda and each kebeles with the aim of understanding the extent of the outbreak and identifying possible risk factors for the outbreak to support the preparedness towards implementing prevention and control activities.

The assessment was done by visiting treatment sites and interviewing cases in CTCs and interviewing health professionals working at the CTCs and respective health system structures by using questionnaire and checklist prepared by the team. Possible risk factors implicated from initial assessments include drinking water from unprotected sources; rivers and springs; Open defecation due to lack of latrines, poor solid waste collection and disposal and Poor food hygiene.

Different factors including, since the district has been affected by drought for the past three years, it is common to defecate in the field, so when it rains in 2023, the feces and other waste in the field will enter the flowing river through the flood and the water will be polluted. So, the onset of the rainy season could lead to further spread of the outbreak. Rapid identification of risk factors which were contributing to the outbreak was with paramount importance to support the prevention and control activities for the outbreak.

### **3. Objectives**

#### **3.1. General objective:**

To determine the factor(s) associated with increased risk of infection with cholera and to direct/guide/refine ongoing cholera outbreak prevention and control activities with a view to stopping transmission in Garda Marta District, Gamo zone, SER, Ethiopia, 2023

#### **3.2. Specific objectives:**

To verify cholera outbreak in Garda district

To assess the magnitude of the problem in the community

To identify risk factors associated with the outbreak.

### **4. Methods and materials**

#### **4.1. Study period and setting**

The investigation was conducted from April 14 to May 18, 2023, in Garda Marta district. It is one of the newly established 20 districts of the Gamo Zone. The administration town, Gogale, is located at 130 km from the Zonal capital (Arba Minch) and 635 km away to the south of Addis Ababa (the Capital of Ethiopia) and bordered by Kamba district in the north, Male district in the south, Gerese and Ale district in the east, and Male and abadebretsehay in the west.

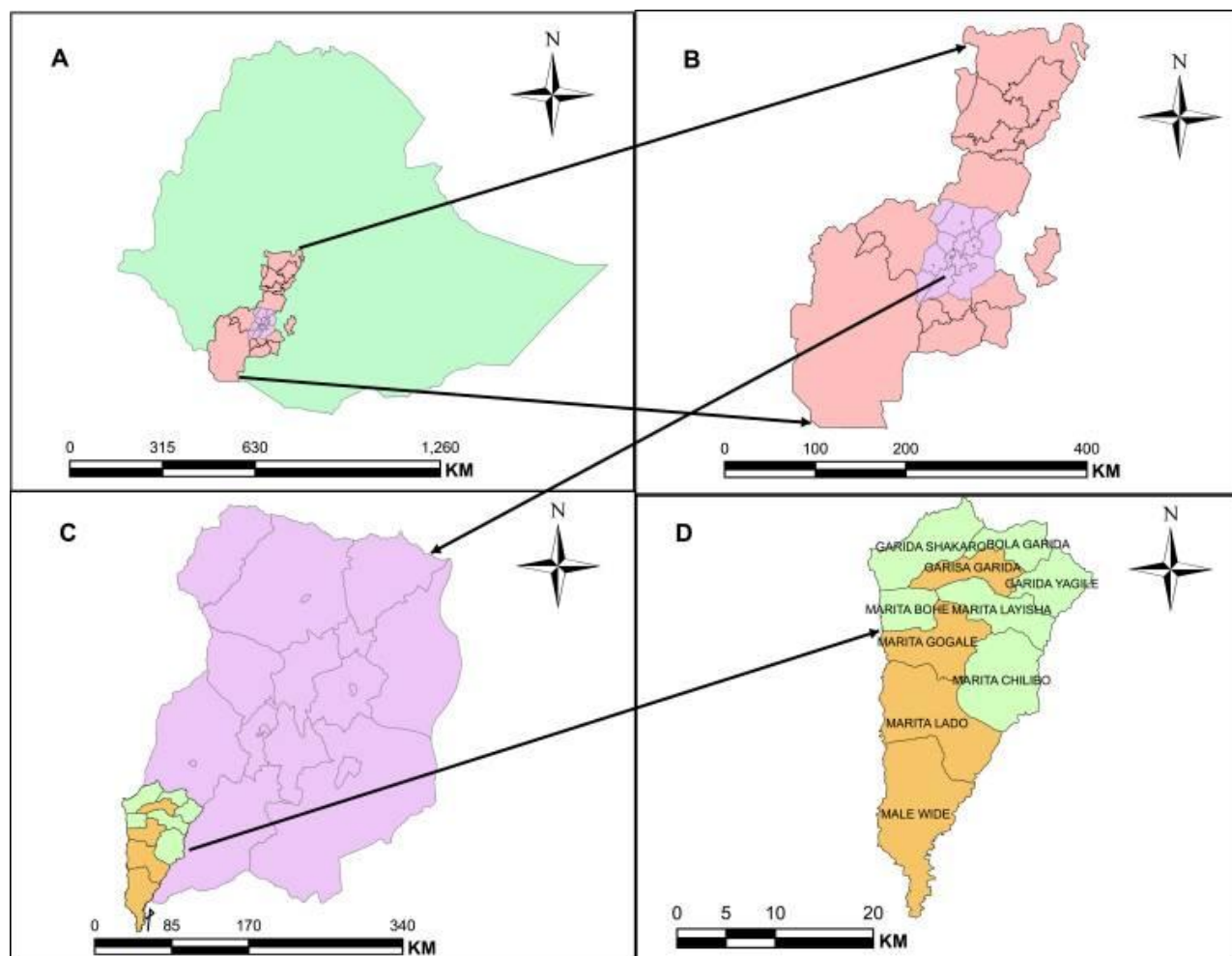
Based on the 2007 national census projection, the estimated total population of the district was 54104 (male 26,511 and female 27,593) of the total population, 15.61% (8303) were under five and 5.18% (2755) were under two-year children. The district is divided into 12 rural kebeles with a total of 2 health centers and 12 health posts.

All public health facilities (Health Centers and Health Posts) provide immunization services and nutritional screening as per the national immunization program. There were no private health facilities in the district. Agriculture is the main source of livelihoods for most of the population in the district followed by cattle rearing.

Garda Marta District is one of the drought-affected areas in the South Ethiopia region (SER) However, the clean water, hygiene and sanitation coverage in the area is very low due to occurrence of recurrent drought and lack of adequate portable clean water services and poor practice of hygiene in the woreda and its districts.

The total water coverage is only 3% but access to portable water is zero currently. There are epidemic diseases that occur repeatedly in woreda, like measles, cholera, malnutrition and drought. Currently there is cholera outbreak epidemic case in the woreda and around the total of 417 cholera cases were admitted to Garda CTC and 413 cases were discharged in different period, but the other four (4) cholera patients had died in facility, and three 3 community deaths were recorded up to date.

According to this overloaded burden of cases and different stakeholders like the woreda, zonal, nationals and other partners like EPHI, UNCEF and WASH are engaged to support the community.



**Figure 4:** Map of ethio region and garda marta woreda

#### **4.2. Study design:**

Un-matched case-control study design was conducted to assess the risk factors of cholera infection. Different laboratory tests like RDT and culture were also done from suspected possible risk factors identified to support the epidemiological findings.

#### **4.3. Study population:**

The study population includes case who meets the WHO standard case definition of the laboratory confirmed case as adopted by ministry of health Ethiopia and Controls were defined as controls from the same kebele of the case. Controls were randomly selected as described below and asked for their consent to participate in the study.

#### 4.4. Case definition

**Suspected case:** Was defined as any patient aged  $\geq 2$  years who had acute watery diarrhea, with or without vomiting and came from affected & nearby Kebele during data collection.

**Confirmed case:** a suspected case in which *Vibrio cholera* O1 has been isolated from his/her stool with laboratory (culture).

#### 4.5. Sample size calculation

Unmatched case control study was used. Least extreme odds ratio to be detected, hypothetical proportion of exposed controls 11.5%, hypothetical proportion of exposed cases 26.0%, confidence level =95%, Power =80%, number of cases was 77, number of controls was 154 and total sample size is 231 (Kelsey et al.) (3).

- Hypothetical proportion exposed in controls  $p_0=0.115$  (11.5%)
- Hypothetical proportion exposed in cases  $p_1=0.26$  (26.0%).
- Two-sided  $\alpha=0.05$  ( $Z_{\alpha/2} = 1.96$ ).
- Power = 80% ( $Z_{\beta} \approx 0.84$ )
- Case: control ratio  $m=2$  (two controls per case).

Method listed in your document: Kelsey et al. sample-size formula for unmatched case-control

Using the Kelsey unmatched case-control formula with the P values above yields:

Cases required = 77

Controls needed = 154 (1:2 ratio)

Total sample size = 231.



#### **4.5.1. Selection of cases**

The primary study subjects were newly confirmed cases of cholera admitted to the Cholera Treatment Centre (CTC) in the 9 Kebele during data collection timeline list in CTCs were used to identify newly admitted cases and systematically select cases for interview.

Systematic selections of cases (every two cases from the line list) were used to ensure the random allocation of cases during the selection process. This method was applied until the required sample size was obtained. Cases were selected from the Gogale CTC. Several cases and controls collected were proportionally allocated for each kebeles based on case load they managed.

#### **4.6. Data collection**

We collected data by interviewing all active cases came to CTC seeking treatment, and control subjects were interviewed at their home by using structured questionnaire in appendix I . We collected sanitation, latrine utilization and safe water supply coverage by reviewing reports and records from woreda health and water & mineral energy offices. We assessed socioeconomic and types of livelihood activity conducting in the district by discussing with woreda administrators.

We obtained line listed cases from CTC data were collected on some identifying information, demographic information, and date of onset and exposure to risk factors for infection including water and food sources, within three days prior to onset of disease. One day travel to data collection for each kebeles with woreda PHEM officer to help me as an Interpreter person for local language and others regional and zonal field epidemiology residents were participates on investigation and case detections.

#### **4.7. Data analysis**

We described the outbreak by person, place and time. We calculated odds ratio with 95% confidence interval using Epi Info version 7.2. We calculated attack rate, case fatality rate and percentages from line listed cases using excel. We used ArcGIS 10.1 to show cases on spot map.

## **5. Inclusion and exclusion criteria**

### **5.1. Inclusion**

To understand how rates of exposures to potential sources of infection differ between cases and uninfected persons, it was necessary to select controls from the same kebele of the case. Controls were randomly selected as described below and asked for their consent to participate in the study. To maximize the power to show differences in exposures, two controls were recruited for each case.

Prospective controls that have not had cholera illness were selected without conducting laboratory confirmation of the absence of cholera infection before selection. Controls were selected randomly. In the area where the case lives, two controls are selected directly through a random selection process on site. At the selected household, all eligible household members needed to be listed, and one randomly selected for the interview by using the lottery method. Only one member of a given household for control was selected. This was done repeatedly at different places until the number of controls required was obtained.

### **5.2. Exclusion criteria**

Children under-2 was not included in this study and Persons who had recently recovered from cholera were also excluded.

## **6. Ethical issues**

Some patients were not willing full to respond for interviews, so informed consent and permission was sought from patients who were admitted in CTC before the interviews.

### **Prevention of cholera transmission among investigation staff**

All investigation staff (RRT) were trained on infection control procedures including proper hand hygiene prior to implementation, to minimize their own risk of infection when in close contact with patients and during community visits. Data processing and analysis: using un-matched case-control design, the study examined the differences in

types of exposures between individuals with confirmed and Epi-linked cholera and healthy controls to determine the risk associated with that exposure. A standard questionnaire was used to collect information.

The purpose of this case-control study was to determine if a case was more likely to have been exposed to a risk factor in the three days before onset of illness than a similar uninfected person in the community.

The study was done prospectively, enrolling new cases in the Cholera Treatment Centers (CTC) as they were identified. The controls who were not sick with cholera were chosen at random from the same community of residence of the cases. Data entry and analysis was conducted using Epi-Info version 7.2. The associations between risk factors and infection among cases and controls were analyzed using chi-square statistics and expressed as odds ratios with 95% confidence intervals.

### **Environmental assessment**

We assessed water sources, sanitation and hygiene conditions of the visited households and general environmental health conditions of the community.

### **Laboratory test**

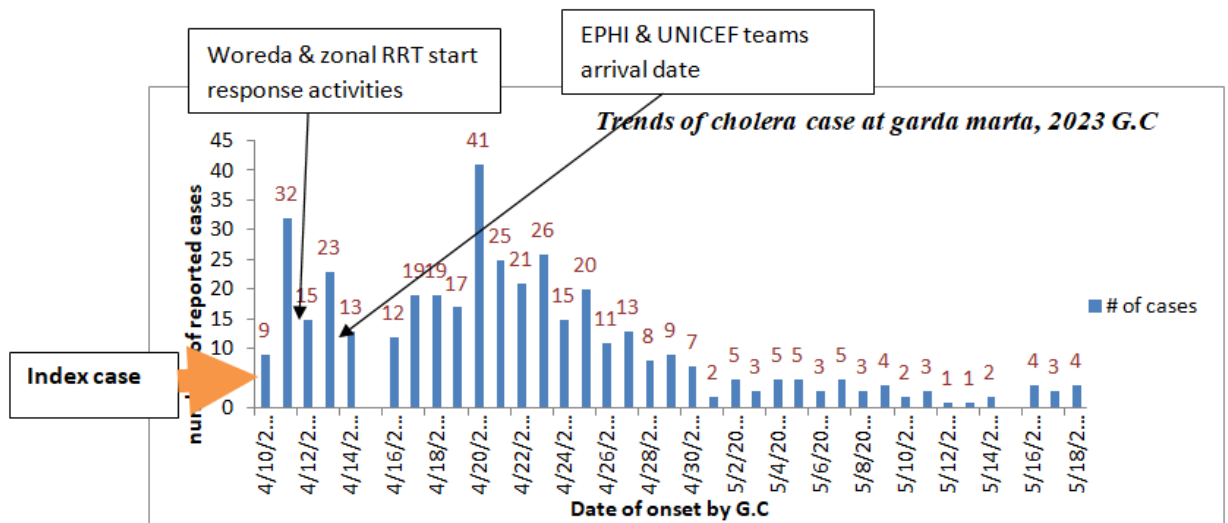
We collected stool specimens from a random sample of ten patients and water samples from four purposively selected water sources (River, unprotected spring and water source) and sent them to the regional laboratory.

## **7. Result**

### **7.1. Descriptive Epidemiology Distribution of cholera by time**

From April 10/2023 to July 23, 2023, a total of 420 cases with 3 community and 4 facility deaths, and the fatality rate (CFR) of 1.67%, were affected by cholera. The first case occurred in Marta Bohe Kebele on April 10/2023. The duration of outbreak was extended for more than two months, and an intermittent common source outbreak

was observed with multiple picks **Fig: 2** the first peak was observed on April 11th & 20<sup>th</sup>, 2023, and the other second peaks were between April 18th to 23rd. The sharp peak occurred on April 20/2023. There was a gradual decline in the number of cases with irregular manner, thereafter, by the end of May; the outbreak was nearly at its end.



**Figure 5:** trends of Cholera by date of onset in SER, Gamo Zone, Garda Marta woreda, 2023 Distribution by person.

The index case was a 12-year-old female, students; she developed diarrhea and vomiting on April 10/2023. She had no travel history from her community to other areas, but she had historical contact with suspected cholera patients, and she drank pond water at her school and sometimes she eats vendor food sold around her school. Within the same day by times difference 10 other cases were reported from different kebeles by health extension workers and refer to Garda molale treatment center.

By the next day alert letters were distributed to health facilities and community health workers to strength surveillance and case detection by mobilizing the community and team leaders. After two days the number of cumulative cases increased and expanded to 3 Kebele.

## 7.2. Descriptive Epidemiology Distribution of cholera by person

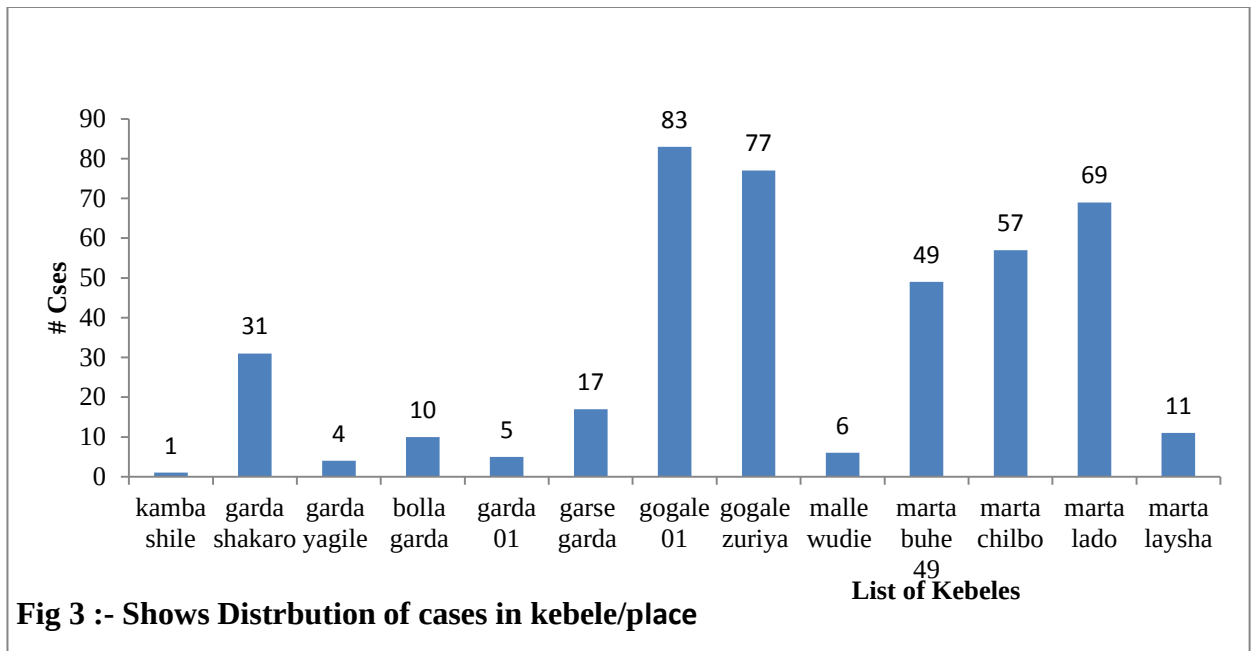
Males and females were affected by 247(58.81% to 173(41.20%) respectively by the disease. All age groups were affected by epidemic, but the most affected age ranges were from 5-14 years by 101(24.0%) and the second most affected age group was 25-34 years by 97(23.1%) years with a mean age of 28 years.

**Table 5: Distribution of Cholera cases by sex & age groups, Garda Marta district, Sidama, 2016**

| Age group | Male      | Female    | Total      |
|-----------|-----------|-----------|------------|
|           | Cases (%) | Cases (%) | Cases (%)  |
| <5        | 25(6.0%)  | 15(3.6%)  | 40(9.6%)   |
| 5-14      | 63(15.0%) | 38(9.0)   | 101(24.0%) |
| 15-24     | 43(10.2%) | 29(7.0%)  | 72(17.2%)  |
| 25-34     | 56(13.3%) | 41(9.8%)  | 94(23.1%)  |
| 35-44     | 24(5.7%)  | 20(4.8%)  | 44(10.5%)  |
| 45-54     | 7(1.7%)   | 10(2.4%)  | 17(4.1%)   |
| 55-64     | 13(3.1%)  | 13(3.1%)  | 26(6.2%)   |
| >65       | 15(3.6%)  | 8(2.0%)   | 23(5.6%)   |

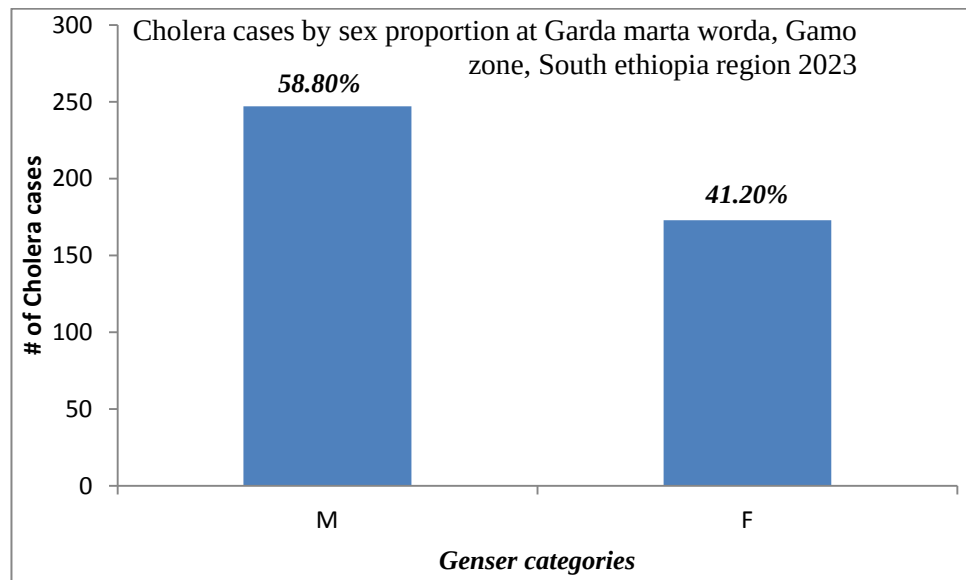
## 7.3. Distribution by place

The first case had occurred in Marta Bohe and then addressed a total of 9 Kebeles and 4 rural cities (100% of the woreda) were affected by the outbreak. Gogale 01 was the most affected with 83(19.5%) of cases followed by Gogale Zuria 77(18.3%) cases. The attack rate was also higher in Gogale 01 (2.05%). The overall attack rate for affected Kebeles was 0.78%.



**Figure 6: shows distribution of cholera cases in kebele/place**

The outbreak affected nine kebeles and four rural cities and most of the cases mapped from Gogale 01 kebele. Most of the residents of this kebele were pastoralists and some were farmers and most of their time passed outside of their home. Due to these reasons, they have the chance to expose themselves to drinking unprotected water and eat vendor's food.



**Figure 7: cholera cases by sex proportion at garda Marta worda, Gamo zone, SER, 2023**

#### 7.4. Developed symptoms and dehydration condition for cases

420(100%) cased patients developed at least two signs and symptoms like diarrhea and vomiting due to these reasons dehydration had occurred.

Dehydration status of the cases 217(51.70%) were moderate or some dehydrated and most of them had managed as outpatients on plan “A” others 203(48.22%) were severely dehydrated and managed or treated by admission on plan “B” & plan “C” phases (Table 6).

Table 6 developed symptoms and dehydration

| Clinical presentation of cholera cases, May 2023, Garda Marta Woreda, Gamo Zone, SER, Ethiopia |          |             |
|------------------------------------------------------------------------------------------------|----------|-------------|
| Watery diarrhea                                                                                |          | 420(100%)   |
| Vomiting                                                                                       |          | 420(100%)   |
| Dehydration                                                                                    | Sever    | 203(48.22%) |
|                                                                                                | Moderate | 217(51.70%) |

#### 7.5. Case- control study

According to the inquiry, the control group tested negative for cholera, but the affected person was proved to be cholera positive with culture and RDT. We recruited 231 participants of which 77 were cases and 154 were controls giving a case to control ratio of 1:2. Analytic analysis has been conducted for selected risk factors for cases and controls. Eating outside of the home, travel history to affected areas 5 days ago, using river water for drinking purposes and knowledge on cholera transmission were having associated with the infection. Knowledge of cholera transmission was protective of the infection.

**Table 7: Bivariate and multivariate analysis for selected risk factors for Cholera Outbreak, Garda Marta, 2023**

| Risk factor                                                 |     |  | Ca=<br>77 | Cont<br>rol=<br>154 | COR (95%CI)               | AOR<br>(95%CI)                          | P-val       |
|-------------------------------------------------------------|-----|--|-----------|---------------------|---------------------------|-----------------------------------------|-------------|
| Unclean latrines                                            | Yes |  | 38        | 102                 | 0.496<br>(0.280,0.814)    | 0.132(0.029,<br>1.936)                  | .178        |
|                                                             | No  |  | 39        | 52                  |                           |                                         |             |
| Travel History to<br>Affected area                          | Yes |  | 35        | 49                  | 1.785(1.106,11.55<br>4) * | <b>3.034</b><br><b>(1.002,8.583) **</b> | <b>.020</b> |
|                                                             | No  |  | 42        | 105                 |                           |                                         |             |
| Using River<br>Water for<br>Drinking<br>Purposes            | Yes |  | 49        | 120                 | 0.495(0.134,0.617<br>) *  | <b>6.681(1.948,22.<br/>911) **</b>      | <b>.003</b> |
|                                                             | No  |  | 28        | 34                  |                           |                                         |             |
| Eating Food<br>Outside the<br>home in the past<br>five days | Yes |  | 52        | 58                  | 3.442(1.047,5.36<br>3) *  | <b>4.386(1.040,<br/>5.244) **</b>       | <b>.001</b> |
|                                                             | No  |  | 25        | 96                  |                           |                                         |             |
| Contact With<br>Other cholera<br>patient                    | Yes |  | 64        | 62                  | 7.305 (4.760,<br>9.313) * | <b>1.127(1.081,1.9<br/>28) **</b>       | <b>.046</b> |
|                                                             | No  |  | 13        | 92                  |                           |                                         |             |

Among the total 17(22.08%) of cases and 46 (41.6 %) of controls had knowledge for cholera transmission. Thirty-eight (49.4 %) cases and one hundred two (66.23%) of controls were using unclean latrine. From participants those have a travel history to cholera affected areas most likely affected by 1.79 times. From the case control study subjects, 52 (67.5 %) cases and 58 (37.7%) control ate food outside their home in the past five days. And forty-nine (63.6%) of the cases and one hundred twenty (77.9%) controls using river water for drinking purposes. from cases sixty-four (83.1%) of cases and sixty (40.3%) of controls had a history of contact with other cholera patients. Twelve (15.6 %) of cases and twenty-nine (18.8%) of controls were participating in funeral ceremony from cholera death. in Bivariate and multivariate Analysis Travel History to Affected Area Associated with AOR of 3.034; 95% CI (1.002, 8.583), Using River Water for Drinking associated cholera by AOR= (7.746, 95% CI(1.308,45.876)), In the last



five days, eating food outside the house was statistically linked to a higher risk of cholera (AOR = 4.386; 95% CI (1.040, 5.244)) Table 8.

**Table 8:** Bivariate and multivariate analysis for water related for Cholera Outbreak, Garda Marta, 2023

| Variable                    | Cases<br>=77 | Controls<br>= 154 | COR (95%CI)             | AOR (95%CI)                        | P-<br>value |
|-----------------------------|--------------|-------------------|-------------------------|------------------------------------|-------------|
| Drinking donkey cart water  | Yes 59       | 120               | 0.928(0.138,1.190)<br>* | <b>1.950 (1.331, 11.494)</b><br>** | <b>.003</b> |
|                             | No 18        | 34                |                         |                                    |             |
| Drinking communal tap water | Yes 13       | 8                 |                         |                                    |             |
|                             | No 64        | 146               | 3.488(1.594,3.592)<br>* |                                    |             |
| Drinking spring water       | Yes 12       | 59                | 0.297(0.384,3.470)<br>* | <b>6.157(1.031,36.895)</b><br>**   | <b>.046</b> |
|                             | No 65        | 95                |                         |                                    |             |
| Drinking revers water       | Yes 49       | 120               | 0.495(0.254,1.128)<br>* | <b>7.746(1.308,45.876)</b><br>**   | <b>.024</b> |
|                             | No 28        | 34                |                         |                                    |             |

### 7.6. Risk factors for acquiring cholera

Due to frequent droughts, a shortage of portable water, and inadequate hygiene and service practices, the area has extremely poor water hygiene and sanitation. There is now no portable water available, and the woreda has a 5% overall water coverage rate. In the study groups, drinking donkey cart water (AOR = 1.950; 95% CI (1.331, 11.494)) was statistically associated with an increased risk of contracting cholera, and drinking spring water (AOR = 6.157; 95% CI (1.031, 36.895)) was statistically associated with an increased risk of contracting cholera and patients drinking reverse water statistically associated with an increased risk of contracting cholera (AOR =7.746, 95% CI (1.308, 45.876)).

**Table 9: Distribution of cases and controls by hygiene and sanitation related exposure, Garda Marta Woreda, Gamo Zone, SER, and Ethiopia 2023**

| Hygiene/sanitation            |     | Cases =77 | Controls = 154 | COR<br>(95%CI)     | AOR<br>(95%CI)         | P-value |
|-------------------------------|-----|-----------|----------------|--------------------|------------------------|---------|
| Have Latrine                  | Yes | 67        | 137            |                    |                        |         |
|                               | No  | 10        | 17             | 0.831(0.630,0.981) | 5.988(0.254,8.598)     | .520    |
| Defecation in river area      | Yes | 3         | 6              | 1.150(1.015,4.844) | 3.702(1.467,9.346) **  | .006    |
|                               | No  | 64        | 148            |                    |                        |         |
| Dispose waste in open pit     | Yes | 8         | 100            | 0.062(0.015,0.163) | 3.817(1.180,12.348) ** | .025    |
|                               | No  | 69        | 54             |                    |                        |         |
| Dispose waste by open dumping | Yes | 24        | 34             | 1.598(1.132,1.843) | 1.744(0.798,3.815)     | .164    |
|                               | No  | 53        | 120            |                    |                        |         |

Defecation in river area was associated with acquiring cholera, AOR =3.702, 95% CI (1.467, 9.346); Dispose waste in open pit was associated with AOR = 3.817, 95% CI (1.180, 12.348) (**Table 9**).

A Bivariate and multivariate logistic regression analysis showed contact with other cholera patients, travel history to the affected area, and food from vendors to be statistically significantly associated with the outbreak. According to the bivariate analysis, the use of street and river water for drinking was not associated with acquiring cholera.

### **7.7. Environmental and community investigation**

Many of the questions require observation of the environmental status and sanitation & hygiene practice of the community. Though the sanitation coverage of the woreda was 39%, from visited households' latrine 14% was not clean. There were observed human feces dumped on open fields and at the bank of rivers.

Similarly, safe water supply coverage of the woreda was also very low (5%), and nonfunctional water scheme was 19 %. Most people obtain their water from unprotected sources and/or buy from donkey carts they have taken from unknown sources. Peoples living in three kebeles named Garsagard, Gogalezuria and bohe

kebeles were used to drinking other's domestic purpose from river unprotected water sources.

### **7.8. Laboratory results**

Stool samples were collected from and tested by culture from ten suspected cholera patients the results for all 8 suspected were positive to *Vibrio cholera* with sero-group o1, serotype ogawa. Water samples from four different water sources were collected and tested for coil: three unprotected rivers and one protected spring. The result for all was positive fecal coli forms with a very high level of contamination.

### **7.9. Action taken**

Treatment centers CTC were established at the woreda, and all affected people had been treated with appropriate treatments plan based on national guidelines. Pillar-based activities were implemented like Infection prevention and control, and cases management activities like disinfecting vehicles in which the patient was transported, patient's house spray, and treatment and discharge protocols were posted and implemented. 24,000 sachets of pure and 1500 bottles of aqua taps chemicals had been distributed for 14074 households (26.80% of total households of the woreda). Adequate staff from zonal health department, Ethiopian public health institute (EPHI), woreda health office, and health facilities were deployed to all Kebele in the woreda and they conducted intervention activities like active case surveillance, mobilizing communities, and conducted health education to the communities.

## 8. Discussion

Cholera is primarily a disease in underdeveloped and developing countries especially when there is a disruption in public sanitation services or normal balance of nature hence creating health problems as food and water supplies can become contaminated in such scenarios (16). They lack access to potable water and mostly use river water as their source of drinking water. Their lack of these basic needs leads to exposure to poor sanitary and environmental conditions and predisposes the group of children to infection through the feco-oral route (16).

The cholera outbreak in Garda Marta Woreda, Gamo Zone, South Ethiopia Region, occurred between April and July 2023, affecting 420 individuals with a case fatality rate (CFR) of 1.67% and an attack rate of 78 per 10,000 populations. Laboratory confirmation identified *Vibrio cholerae* O1, serotype Ogawa, as the causative agent. The outbreak primarily affected communities relying on unprotected water sources and those with poor sanitation practices.

The epidemic curve demonstrated an intermittent common-source pattern, indicating repeated exposure to contaminated water sources rather than a single point exposure. The highest incidence occurred in Gogale 01 and Gogale Zuria kebeles, suggesting that these areas were central to transmission due to their shared water sources and low access to potable water. Males were slightly more affected (58.8%) than females (41.2%), and the most affected age group was 5–14 years (24%), consistent with findings from previous outbreaks in Ethiopia, Nigeria, and India, where school-age children were more exposed to unsafe water and food sold near schools.

Multivariate analysis identified several significant risk factors: drinking river water (AOR = .7.746, 95% CI (1.308, 45.876)), drinking spring water (AOR = 6.157, 95% CI (1.301, 36.895)), eating food outside the home within the previous five days (AOR = 4.386, 95% CI (1.040, 5.244)), contact with cholera patients (AOR = 1.127, 95% CI (1.081, 1.928)), travel to affected areas (AOR = 3.034, 95% CI (1.002, 8.583)), using river water for house hold consumption (AOR = 6.681, 95% CI (1.948, 22.911)), similarly using donkey cart water (AOR =1.950 95% CI (1.331, 11.494)), defect in

reverse side (AOR =3.702, 95% CI (1.467, 9.346)) and Dispose waste in open pit (AOR =3.817, 95% CI (1.180,12.348)). Conversely, drinking treated or community tap water was protective. These findings are consistent with studies from Addis Ababa (Dinede et al., 2020) and North-East Nigeria (Fagbamila et al., 2023), which showed that consumption of unprotected water and close contact with patients significantly increased cholera risk.

The environmental assessment carried out also found widespread open defecation, very low sanitation coverage (39%), and contamination of river water with fecal coli forms. These conditions provided ideal circumstances for the fecal-oral transmission of *V. cholerae*. The drought preceding this outbreak exacerbated water scarcity that necessitated that resident's resort to utilizing unsafe water sources, like the pattern seen in outbreaks that follow droughts and flooding in East Africa

According to World health organization high CFR that were reported in this investigation are similarly comparable to those revealed in other recent outbreaks in Ethiopia (19) and Uganda (9). The relatively low CFR reflects timely establishment of cholera treatment centers (CTCs), effective case management, and coordination between the Ethiopian Public Health Institute, EPHI, and the local health authorities. However, the persistence of new cases over two months suggests that environmental contamination and inadequate WASH interventions limited the control of the outbreak.

The results of the study reported that unsafe water and poor sanitation are still among the most important risk factors for cholera transmission in rural Ethiopia. Lack of potable water, open waste disposal, and poor hygiene education contribute to the vicious cycle of outbreaks. The identified cholera infection associated with eating food prepared outside the home suggests a greater need for regulating the dispose of waste in open pit. The strong association of travel to affected areas with infection illustrates the importance of inter-district surveillance and rapid information sharing during outbreaks.

## **9. Limitations**

This study had several limitations: recall bias regarding exposures in the days before illness onset; laboratory confirmation was done on a limited number of samples and therefore may have underestimated strain variation; and controls were selected from households in proximity, which may not accurately reflect the background exposure levels of the general population.

## **10. Conclusion and recommendation**

### **10.1. Conclusion**

In summary, this outbreak was multifactorial in origin, driven primarily by using contaminated water sources, poor sanitation, and high-risk behaviors of eating food from vendors or having contact with infected people. Strengthening integrated WASH programs, increasing safe water coverage, enforcement of food safety regulations, and ensuring a strong cholera surveillance system in place-all are cornerstones to prevent future outbreaks of this same nature.

## 10.2. Recommendations

Based on the findings of this outbreak investigation, recommendations to prevent similar outbreaks and strengthen public health preparedness and response include

**Improve access to safe water:** Construction and rehabilitation of protected water sources, such as boreholes and communal taps, to replace the current dependence on unprotected rivers and springs.

**Enhance Cholera Surveillance and Early Warning Systems:** Strengthening Community-Based Surveillance and early detection of Acute Watery Diarrhea cases by health extension workers.

**Community Engagement and Risk Communication:** Engage local leaders, schools, religious institutions, and women's development groups in the mobilization of communities towards behavioral change.

**Food Safety and Environmental Health Regulation:** Enhance inspection and regulation of street food vendors and local eateries to ensure food hygiene standards.

**Health System Strengthening:** Enhance the capacity of health workers in cholera case management, infection prevention and control, and WASH-related health promotion.

**Multi-sectoral Coordination and Partnership:** Improve collaboration among EPHI, Ministry of Health, WHO, UNICEF, NGOs, and local government sectors to enhance outbreak preparedness and response mechanisms.

**Long-term Preventive Measures:** Periodically conduct water quality testing and assessments of environmental sanitation in high-risk kebeles

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## Annex II :- English version quaternaries

### For Acute Watery Diarrhea Outbreak Investigation

| No.                                    | Question                                            | Coding Classification                                                                                                                                                           |
|----------------------------------------|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                        | Demographic status question                         |                                                                                                                                                                                 |
|                                        | Case Status                                         | 1 Case 2. Control                                                                                                                                                               |
|                                        | Responder                                           | _____                                                                                                                                                                           |
|                                        | Address                                             | Region_____ Zone_____<br>Woreda_____<br>Kebele _____ Got _____ House<br>No_____                                                                                                 |
|                                        | Age                                                 | _____ Year (s)<br>_____ Month(s)                                                                                                                                                |
|                                        | Sex                                                 | 1.Male 2. Female                                                                                                                                                                |
|                                        | Occupation                                          | 1. Farmer 2. Merchant 3. Student<br>4. Housewife 5. Unemployed 6. Pastoralist<br>7. Gov't Employee 8. Private Employee 9. Daily<br>Laborer<br>10. Not applicable 11. Other_____ |
|                                        | What is your marital status?                        | 1. Single 2. Married 3. Widowed 4. Divorced<br>5.NA                                                                                                                             |
| 100.                                   | Level of Education                                  | 1.Illiterate 2. Read and writing only<br>3.Elementary school (1-8) 4. Secondary School<br>(9-12)<br>5. Tertiary School(college+)                                                |
| 200.Risk factor related questionnaires |                                                     |                                                                                                                                                                                 |
| 201.                                   | Do you know about Cholera<br><br>Transmission       | 1. Yes 2. No                                                                                                                                                                    |
| 202.                                   | Unclean latrines                                    | 1. Yes 2. No                                                                                                                                                                    |
| 203.                                   | Have you Travel History to<br>Affected area         | 1. Yes 2. No                                                                                                                                                                    |
| 204.                                   | Have you Using River Water for<br>Drinking Purposes | 1. Yes 2. No                                                                                                                                                                    |

|                              |                                                                  |                 |
|------------------------------|------------------------------------------------------------------|-----------------|
| 205.                         | Have you Eating Food Outside<br>your home                        | 1. Yes    2. No |
| 206.                         | Are you Contact with Other<br>cholera patient                    | 1. Yes    2. No |
| 207.                         | Have Participating In funeral<br><br>Ceremony from cholera death | 1. Yes    2. No |
| 300. Risk factor to exposure |                                                                  |                 |
| 301.                         | Drinking street water                                            | 1. Yes    2. No |
| 302.                         | Do drink pon water                                               | 1. Yes    2. No |
| 303.                         | Do drink tan water                                               | 1. Yes    2. No |
| 304.                         | Do drinking HH tap water                                         | 1. Yes    2. No |
| 305.                         | Drinking communal tap water                                      | 1. Yes    2. No |
| 306.                         | Do drink highland water                                          | 1. Yes    2. No |
| 307.                         | Do drink spring water                                            | 1. Yes    2. No |
| 308.                         | Do drink treated water                                           | 1. Yes    2. No |
| 309.                         | Do drink revers water                                            | 1. Yes    2. No |
| 400.Risk factor to exposure  |                                                                  |                 |
| 401.                         | Raw meat                                                         | 1. Yes    2. No |
| 402.                         | Roasted<br>meat                                                  | 1. Yes    2. No |
| 403.                         | Vegetable                                                        | 1. Yes    2. No |

|                        |                          |                                   |
|------------------------|--------------------------|-----------------------------------|
|                        |                          |                                   |
| 404.                   | Forest Fruit             | 1. Yes                      2. No |
| 405.                   | Fish                     | 1. Yes                      2. No |
| 406.                   | Un    boiled<br>milk     | 1. Yes                      2. No |
| 407.                   | Beso                     | 1. Yes                      2. No |
| 408.                   | Kurkufo                  | 1. Yes                      2. No |
| 500.                   | Risk factor to exposure  |                                   |
| 501.                   | Street/vendor<br>food    | 1. Yes                      2. No |
| 502.                   | Restaurant food          | 1. Yes                      2. No |
| 503.                   | School                   | 1. Yes                      2. No |
| 504.                   | Meeting site             | 1. Yes                      2. No |
| 600.Hygiene/sanitation |                          |                                   |
| 601.                   | Latrine                  | 1. Yes                      2. No |
| 601.                   | Defecation in river area | 1. Yes                      2. No |

|      |                                               |                 |
|------|-----------------------------------------------|-----------------|
| 602. | Open defecation                               | 1. Yes    2. No |
| 603. | Hand washing before and after eating with sop | 1. Yes    2. No |
| 604. | Dispose waste in revers                       | 1. Yes    2. No |
| 605. | Dispose waste in open pit                     | 1. Yes    2. No |
| 606. | Dispose waste by burning                      | 1. Yes    2. No |
| 607. | Dispose waste by open dumping                 | 1. Yes    2. No |
| 608. | Dispose waste every where                     | 1. Yes    2. No |

## **Chapter 3: - Surveillance Data Analysis**

# Surveillance Data Analysis on HIV/AIDS in North Shewa Zone, Amhara Regional State, North Ethiopia (2016-2021)

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## ABSTRACT

### Abstract

**Background:** HIV/AIDS remains a major public health concern in Ethiopia, contributing significantly to morbidity, mortality, and socioeconomic challenges. Understanding local epidemiological patterns through surveillance data is critical for guiding prevention and control strategies.

**Objective:** To analyze five years of HIV surveillance data and describe the distribution, trends, and ART coverage of HIV in North Shewa Zone, Amhara Regional State, Ethiopia, from October 2016 to September 2021.

**Methods:** A retrospective descriptive analysis was conducted using data extracted from the Health Management Information System (HMIS) of North Shewa Zone. All confirmed HIV-positive cases reported between 2016 and 2021 were included. Data was cleaned and analyzed using Microsoft Excel and SPSS version 26 to describe trends by person, place, and time. Results were summarized using descriptive statistics, tables, and figures.

**Results:** A total of 4,093 HIV-positive cases were reported during the five-year period, with an overall prevalence of **0.17%** and a case fatality rate of **0.58%**. Females accounted for **61.6%** of cases, with the most affected age group being **25–29 years (9.43%)**. The number of new cases showed a declining trend from **0.74% in 2016** to **0.6% in 2021**. Geographically, the highest burden was observed in **Debre Berhan Town** and **Shewarobit Woreda**. Of all cases, **83.5%** were on ART, **5.6%** had interrupted treatment, and **6.4%** were not yet linked to care.

**Conclusion:** Despite a gradual decline in HIV prevalence, the infection remains a significant public health issue in North Shewa Zone, particularly among women and young adults. Strengthening surveillance systems, enhancing community awareness, and improving ART adherence are essential to sustain progress and achieve national HIV elimination goals.

**Keywords:** HIV/AIDS, prevalence, ART coverage, surveillance, North Shewa Zone, Ethiopia



## **1. INTRODUCTION**

### **1.1. Background**

The virus known as human immunodeficiency virus (HIV) targets cells that aid the body in increasing a person's susceptibility to various illnesses and infections. It is transmitted via sharing injection equipment or coming into touch with specific bodily fluids of an infected individual, most frequently during unprotected sex (sex without a condom or HIV medication to prevent or treat HIV (1).

At the end of 2023, an estimated 39.9 million people worldwide were living with HIV, with a global adult prevalence of about 0.6% among those aged 15–49 years (2). Since the start of the epidemic, approximately 88.4 million people have been infected with HIV, and around 42.3 million have died from AIDS-related illnesses (2) in 2023, there were 1.3 million new HIV infections and 630,000 AIDS-related deaths globally (2).

Sub-Saharan Africa remains the most heavily affected region, accounting for more than two-thirds of all people living with HIV, with a prevalence of 3.4% among adults (3). There has been significant progress in reducing both new infections and AIDS-related deaths: New HIV infections declined by 21.9% between 2010 and 2021, from 2.11 million to 1.65 million annually (4). AIDS-related deaths have dropped by 69% since their peak in 2004 and by 51% since 2010 (3)

In 2023, 30.7 million people were accessing antiretroviral therapy (ART), a major factor in reducing mortality and improving quality of life for those living with HIV (3). Despite these gains, the rate of decline is not sufficient to meet the global targets for 2025 and 2030; with forecasts suggesting more than 40 million people will continue to require lifelong ART for decades (4).

Women and girls represent 53% of all people living with HIV (4). Key populations face much higher prevalence rates, including gay men and other men who have sex with men (7.7%), sex workers (3%), people who inject drugs (5%), transgender people (9.2%), and people in prisons (1.3%) (3).

Sub-Saharan Africa carries the highest burden, but other regions such as central and Eastern Europe, central Asia, and the Middle East and North Africa have seen rising incidence and mortality rates in recent years (4). In countries like Ethiopia, HIV/AIDS remains a significant public health challenge,

with the disease contributing to high rates of disability and mortality, especially in certain regions such as Gambela (5).

HIV surveillance is the cornerstone of our understanding of the HIV epidemic. The diversity of the HIV epidemic across geographic regions, populations and time has necessitated robust and comprehensive surveillance efforts that have continued to evolve as the HIV epidemic has progressed.

Human immunovirus HIV infection is monitored through the National HIV Surveillance System (NHSS) to help improve the health of people with HIV and reduce transmission. NHSS data are routinely used at federal, state, and local levels to monitor the distribution and transmission of HIV, plan and evaluate prevention and care programs, allocate resources, inform policy development, and identify and respond to rapid transmission in the United States (6).

Centers of disease control (CDC) maximized the effects of federal funding by integrating funding for HIV prevention and surveillance into a single program; the integration of program funding has expanded the use of HIV surveillance data and strengthened surveillance, resulting in enhanced cluster response capacity and intensified data-to-care activities to ensure sustained viral suppression.

## **1.2. HIV surveillance in Ethiopia**

Ethiopia being a resource-constrained country, the production and utilization of quality data did not receive much attention in the initial response to the epidemic. Instead, the focus was on determining the degree of involvement of well-recognized core risk groups for other STIs, namely female commercial sex workers and truck drivers. However, initial surveys were unlinked and anonymous and provided no detailed information about risk factors.

Between 1990 and 1996 there were barely any systematic surveillance activities at either regional or national levels. The first systematic national report on HIV, produced in 1996, 2 noted the progressive rise of HIV prevalence from 1% in 1989 to 3.2% (urban 12% and rural 1.5%) to an estimated 5.2%, which indicated a generalized epidemic. The rural epidemic remained little understood until the 2005 DHS.

Ethiopia's HIV surveillance systems have been in continuous development, but the development has been piecemeal, and the overall usefulness of the systems has been controversial, with arguments

arising over inconsistencies in the methodologies, claims and counterclaims that they are not representative, all apart from the basic problems inherent in the various surveillance methodologies. This came to a head in the past two years with the controversy over the differing results of the 2005 DHS and ANC surveillance reports.

### **1.3. Rationale of HIV/ADIS surveillance data analysis**

An effective HIV surveillance data analysis is essential for identifying which areas are most affected, for describing the magnitude and for monitoring its trends, and evaluating the effectiveness of HIV control programs and policies. Data generated from public health surveillance system is used for guiding immediate public health action program planning evaluation and monitors trends in the burden of disease and formulating research hypothesis. Such surveillance analysis also alerts for local health office and ministries of health to develop intervention to improve HIV prevention program. Finally, surveillance data analysis gives key information for any further studies in the area.

## **2. Objectives**

### **2.1. General Objective**

To analyze five years HIV surveillance data and describe the overall burden and trends of the disease between 2016 to 2021 in North Shewa Zone, Amhara.

### **2.2. Specific Objectives**

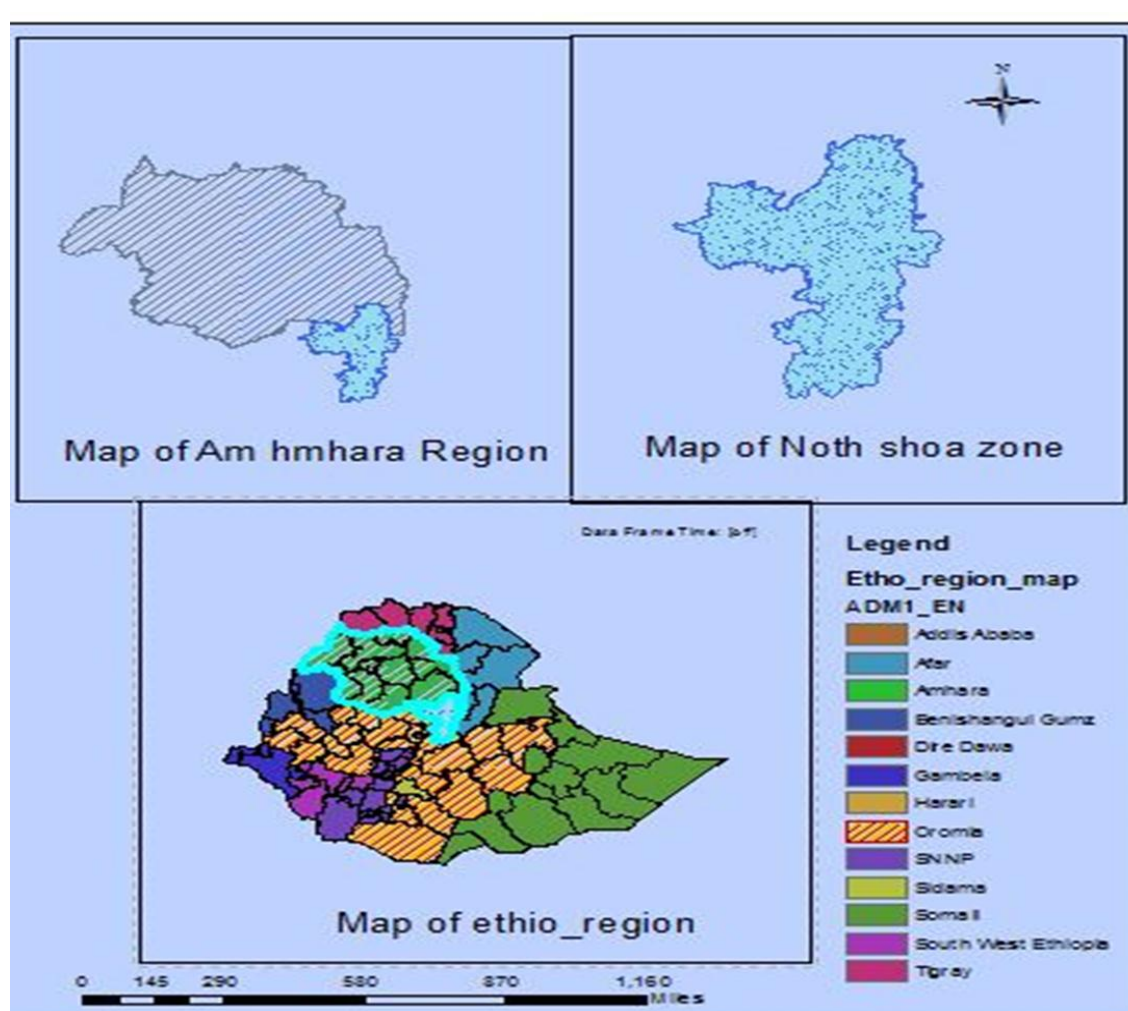
- To describe the magnitude of HIV by time, place and person
- To detect the changes of HIV in different periods of time
- Identification of Key and Priority Populations
- Assessing Behavioral and Contextual Risk Factors
- Informing Program Planning and Policy Development

## **3. Methods and materials**

### **3.1. Study Area and period**

Analysis of HIV data was conducted in North Shewa zone. North Shewa is one of 10 Zones in the Ethiopian Amhara Region. North Shewa takes its name from the kingdom or former province of Shewa. The Zone is bordered on the south and the west by the Oromia Region, on the north by

Debul Wollo, on the northeast by the Oromia Zone, and on the east by the Afar Region (7). When we look at the health facilities that are offering HIV care services in the Northern Shewa Zone, we find that there are 45 urban and 372 rural kebeles in the city government and 22 circuits. These include There are 139 private clinics, 91 health posts, 309 health centers, two general hospitals, seven government hospitals, and one primary private hospital.



**Figure 8: map of North shewa Zone, 2023**

### 3.2. Source Population and study population

All HIV/ADIS-positive cases in the Zone from October 2016 to September 2021 were considered our source population. All HIV cases that were registered in the HMIS database, had surveillance reporting information for the designated time frame, and had HIV test results verified as positive at medical facilities made up our study. To determine the current prevalence of HIV, we included from

our analysis all newly diagnosed and previously treated prevalent patients because we used prevalence rather than incidence as a measure of HIV burden.

### **3.3. Study design and study period**

To examine the patterns of HIV cases in the study areas throughout a five-year period (October 2016–September 2021), a retrospective analysis was carried out. The data came from HMIS data obtained through district health offices and HIV test results that were confirmed to be positive at medical facilities and reported to the central surveillance of the zonal health office.

### **3.4. Sampling Procedures and Sample Size**

We used all aggregated HIV/ADIS Cases records of HMIS database of North Shewa Zone.

### **3.5. Data Collection**

The manager of Ethiopia's public health emergency operation center (PHEOC) writes formal requested permission letter for the North Shewa Zone health office to use HIV data from its HMIS database, Then HIV data for the five years (October 2016 to September 2021 G.C.) was provided to us in Microsoft Excel format by the HMIS database specialist.

### **3.6. Operational definitions**

**Health Management Information System (HMIS):** collects, stores, analyses, and evaluates health-related data from health facility to district, regional and national administrative levels. (4).

**A newly identified HIV case:** A person with a confirmed HIV infection diagnosis who was previously undiagnosed, utilizing a national testing algorithm (12).

**Recent HIV-1 infection:** According to Asante HIV recency test kits, this infection was most likely contracted during the 12 months prior to the recency test date. We concluded that the infection was most likely recent because routine viral load testing was not conducted. Adults aged  $\geq 15$  are the only demographic targeted by HIV recency testing surveillance (4).

**Long term infection:** HIV infection classified as "long term" is one that was most likely contracted prior to 12 months from the date of the most recent test.

**Invasive medical procedure:** Is a purposeful entry to the body, usually by incision or percutaneous puncturing or by inserting instruments into the body openings for medical reasons and that might pose an additional risk of HIV infection. Examples are blood transfusion and needle injections (4).

**HIV Index Case:** Is a person who initially is diagnosed with HIV infection and will serve as a contact person to identify and investigate his/her sexual/biological contacts and risk network.

### **3.7. Variables**

#### **3.7.1. Dependent variables**

The prevalence of HIV

#### **3.7.2. Independent variables**

Sociodemographic variables: age, sex.

### **3.8. Description of HIV surveillance Reporting system**

Case report forms include sufficient information for surveillance programmes to describe the HIV epidemic according to person, place and time. Information collected includes basic demographic data, facility information and information reported.

### **3.9. Data analysis**

Descriptive trends overall and by age group, sex, ART status and key population are presented. Retrospective data extracted and organized from a database of North Shewa zonal health office central surveillance was analyzed. Microsoft Excel 2010 was used for cleaning (editing missing values) and organizing the data (calculating number of cases for each woreda, year). The source of data for the database was respective district level surveillance report of HIV tests results of confirmed HIV cases from each health facility. We presented results using tables and figures.

### **3.10. Dissemination of the finding**

The final document will be disseminated to Addis Ababa University College of Medicine and School of Public health and Amhara Regional public health institute (ARPHI) Amhara Regional Health Bureau, and North Shewa Zone health Department, both in hard and soft copy.

### **3.11. Ethical considerations**

The data were accessed after approval of the ethical clearance protocol of this study from Ethiopian Public Health Institute official letter reference number EPHI/5-44/630 and consent of Amhara Regional State public health institute.

## 4. Result

### 4.1. HIV case distribution by person age and sex

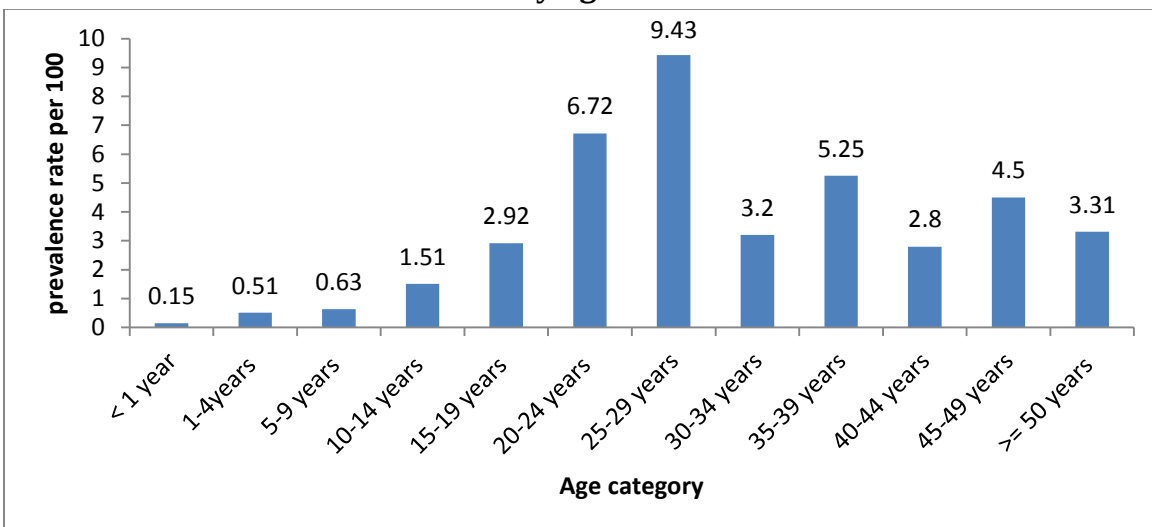
From October 2016 to September 2021, there were 4,093 HIV cases reported in North Shewa Zone, with an overall prevalence rate of **0.17%**, and a case fatality rate of 0.58%. The total population of the zone during this period was 2 405 537.

Of the total cases reported, 61.6% were females, with a corresponding ratio of approximately 2.5:1.6 females to males. The incidence among females was consistently higher than that of males across all years except for the last reporting year (Oct 2020–Sep 2021), when a slight decline among females was observed.

By age group, the 25–29-year-olds accounted for 9.3% of the total number of reported cases with HIV, the most affected age group during the period of study. On the contrary, the least number of cases was recorded among children younger than one year old. Look at fig. 2 and 3

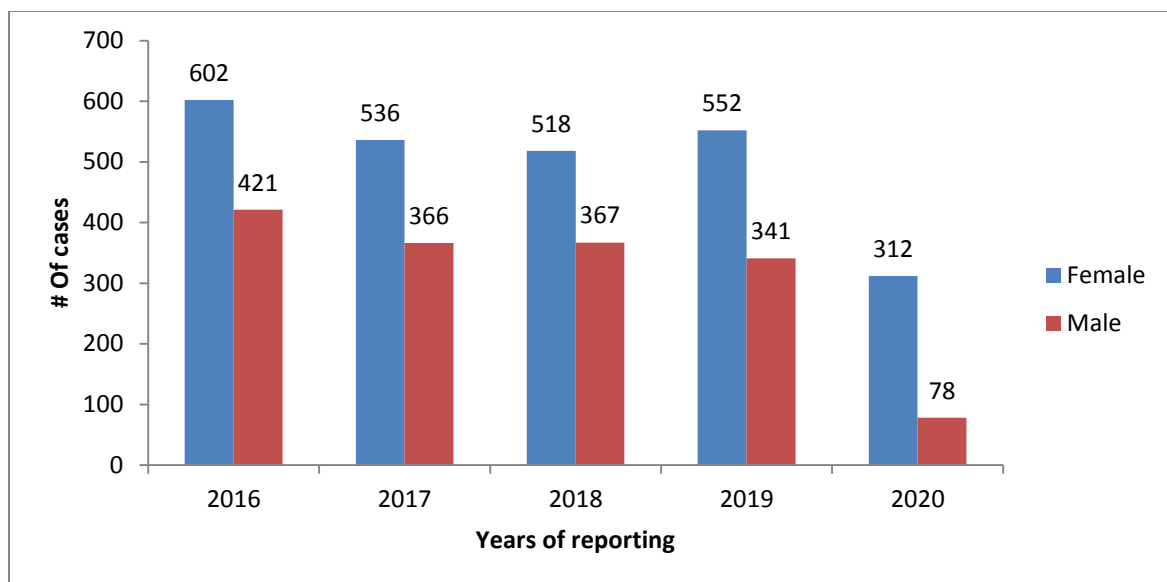
Overall, data show that the young adult population, especially females, is still the most affected in the North Shewa Zone, and thus targeted prevention and awareness interventions are called for, focusing on sexually active women and youth.

#### 1.1. Distribution of HIV cases by age



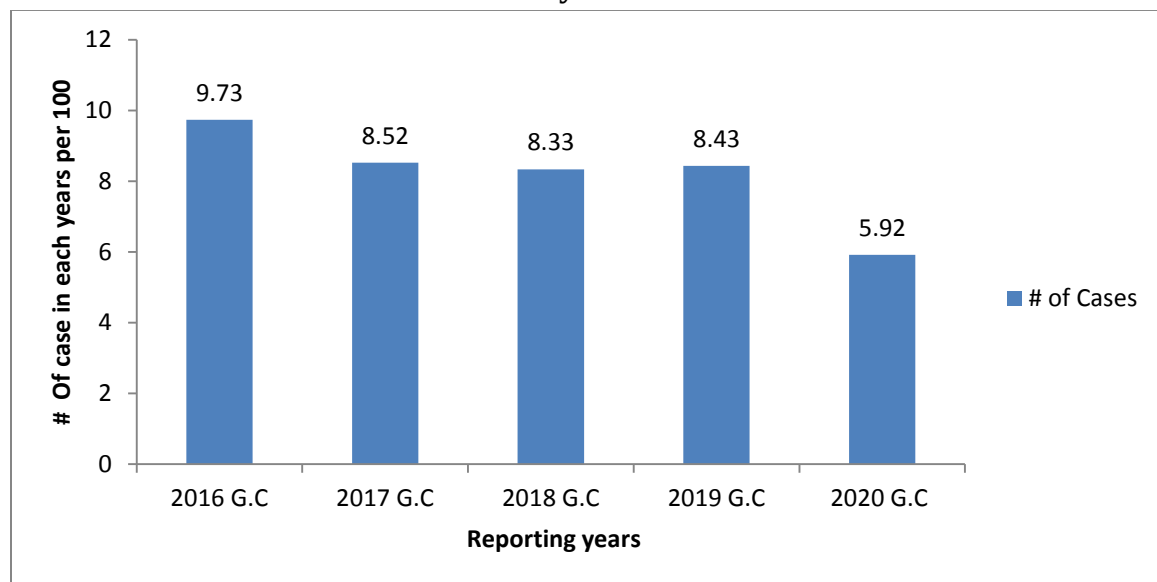
**Figure 9: Age- specific reported HIV cases by year of diagnosis, in North Shewa zone Oct 2016 to Sep 2021 G.C**

Of the total **4,093 individuals diagnosed with HIV**, **2,518 (61.5%)** were receiving **antiretroviral therapy (ART)**.



**Figure 10: HIV case by sex -specific rates of reported, in North Shewa Zone from 2016-2021 G.C.**

## 1.2. Distribution of HIV cases by time



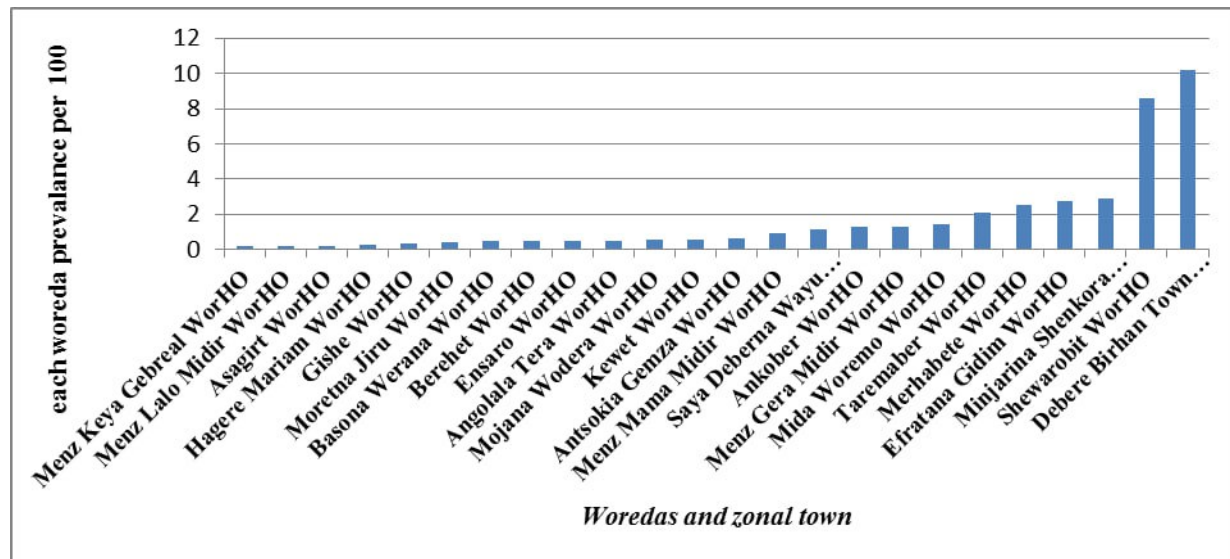
**Figure 11: reported HIV positive cases within each year in North Shewa Zone from 2016-2021 G.C.**

In the years for which the survey and analysis were done, 9.73% of the total HIV cases were reported in 2016, while the figure for 2017 was 8.52, showing a declining trend over the succeeding four years. In 2019, there were 843 cases reported, while in 2020, 592 cases were recorded a consistent decrease in the number of new case reports over these years.



### 1.3. Distributions of HIV case by place

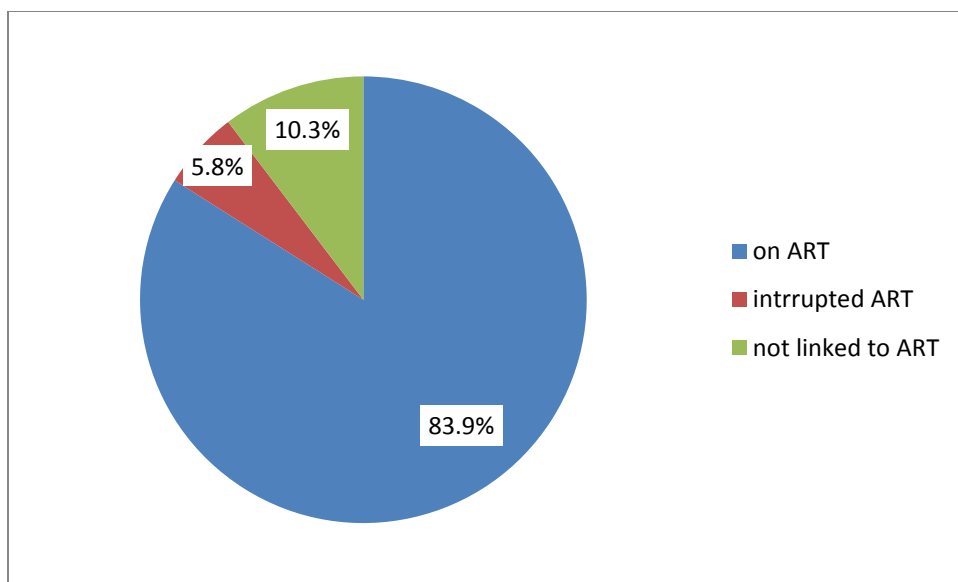
In total, HIV cases were reported in all 24 woredas and one zonal town. The highest numbers of cases were reported in Debre Berhan Zonal Town, with 1,018 cases, followed by Shewarobit Woreda, with 860 cases. Conversely, the lowest numbers of reported cases were found in Menz Keya Gebrel and Menz Lalo Midir woredas, each reporting 19 cases in the study period.



**Figure 12 prevalence of new HIV cases by woreda and zonal town of Amhara, North Shewa zone from 2016-2021 G.C**

### 1.4. ART status of HIV positive patents

In all, the zonal database had 54,335 HIV-positive people, of which 34,795 were women and 19,540 were men. Of these, 47,589 (87.58%) were on antiretroviral therapy (ART), 3,274 (6.03%) had discontinued ART follow-up, and 3,472 (6.39%) were not yet linked to treatment. Data for this analysis were obtained from the zonal HMIS, covering a period of five continuous years (October 2016 to September 2021), during which 4,093 cases were identified as HIV-positive. From these, 3,417 (83.48%) were under ART follow-up, and 231 (5.64%) had interrupted treatment for various reasons.



**Figure 13 illustrates the distribution of HIV-positive patients in Amhara, North Shewa woredas, and the zonal town from October 2016 to September 2021 G.C**

## 2. Discussion

### 5. Discussion

This retrospective analysis of HIV surveillance data in North Shewa Zone from 2016 to 2021 showed that despite a gradual decline in prevalence over the years, HIV remained a public health burden. A cumulative 4,093 new HIV-positive cases were reported during the review period, representing a zonal prevalence of 0.17% with a case fatality rate of 0.58%. The findings are supported by national evidence showing a steady but slow decline in the prevalence of HIV throughout Ethiopia over the last decade.

The results obtained showed that the 25–29-year age group had the highest proportion of HIV-positive patients, amounting to 9.43% of the total cases. This finding agrees with studies conducted in Jimma Zone and Northwest Ethiopia, which also reported that young adults, especially those aged between 20–34 years, were the most affected age group (9, 10). The high prevalence among this age group may be due to a high level of sexual activity, along with low perception of risk and inconsistent use of condoms. Additionally, the economic migration of young people and inadequate

availability of youth-friendly HIV prevention services might have increased vulnerability in this age group.

The gender disparities were also reflected, with 61.6% of the reported cases being females. This is consistent with the national and global trends of higher prevalence among females due to both biological vulnerability and socio-economic reasons (UNAIDS 2024). This may be partly explained by gender inequalities, transactional sex, and low negotiation power in sexual relationships. Other facility-based studies in Ethiopia also revealed such gender differentials and stressed that this necessitates targeted, gender-sensitive prevention strategies (11).

In the temporal trend, there was a declining pattern in new case reports of HIV infection between the years 2016 and 2021. The prevalence rate declined from 0.74% in 2016 to 0.58% in 2021, indicating gradual improvements in prevention and treatment coverage. This trend could be associated with expanded ART coverage, expanded community-based testing, and enhanced health information systems. Still, the rate of reduction was modest, indicating continued transmission within subgroups of the population. Similar declines were seen in the temporal trend of national DHS and programmatic data, although regional variations remain important (4).

Interestingly, there were slight increases in case detection seen in both 2018 and 2019, possibly reflecting intensified surveillance and building diagnostic capacity during these years. This could reflect surveillance artefacts rather than true epidemiological resurgence. Seasonal fluctuations, with peaks in February and August, may correspond to increased mobility and social gatherings, potentially increasing exposure risks during these months.

Geographically, there were HIV cases reported from all 24 woredas and one zonal town, but higher burdens were noted in Debre Berhan Town and Shewarobit Woreda. These urban centers are typified by higher population density, increased mobility, and higher concentration of key populations like sex workers and long-distance truck drivers. The findings are comparable to spatial analyses which showed higher HIV prevalence along urban and transit corridors across Amhara and Oromia regions (8).

Such spatial clustering highlights geographically targeted interventions, including hotspot-based testing and prevention campaigns.

The analysis also reflected encouraging ART uptake, with 83.5% diagnosed and on ART treatment, 5.6% with interrupted ART, and 6.4% not yet linked to care. Though the ART coverage rate indicated partial attainment of the UNAIDS 95–95–95 target, the gap in the continuity of treatment is still worrisome. Interruptions of ART can result in viral rebound, increasing risk for transmission. Identified mechanisms for strengthening follow-up, adherence counseling, and community-based support systems may improve treatment outcomes and contribute to epidemic control.

The declining trend in HIV prevalence witnessed in North Shewa is supported by both national and regional data that report a progressive decline since 2010 (11). However, the continued occurrence of new infections among young adults and females reflects that seen in numerous sub-Saharan African studies, underlining the structural and behavioral factors that perpetuate the epidemic. In contrast to high-burden regions like Gambela and Addis Ababa, the relatively lower prevalence in North Shewa may indicate effective rural outreach and prevention services, although urban pockets of infection persist.

### **3. Strength and Limitations of the findings**

#### **3.1. Strength**

Pay attention to the evaluation criteria that are dependent on the study methodology and how it affected the results. When talking about analysis strengths, one must address its validity, practical applications, and corroborating data. As a result, the procedures for gathering and analyzing study data were attempted to achieve by carefully examining and debating each variable. To determine the distribution of cases, assess the disease trend, evaluate control measures, monitor changes, facilitate planning and estimate the magnitude of specific problems.

#### **3.2. Limitations**

The weakness I had was not using data back-up and losing data and being forced to collect data again. Also, giving priority to other tasks, not completing our surveillance data analysis work on time and not sending it to the advisor and mentor can be taken as a gap.

### **4. Conclusion and recommendation**

#### **4.1. Conclusion**

While surveillance data indicate promising declining trends in HIV prevalence and improved ART coverage, the epidemic remains a public health concern in North Shewa Zone. Sustainability of downward trends in new infections necessitates an enhanced system for surveillance, addressing socio-behavioral determinants, and a strong ART program. Continuous emphasis must be placed on high-risk age groups, urban centers, and gender disparities to achieve regional and national goals of HIV elimination.

#### **4.2. Recommendation**

- My suggestion to the zone and district health offices in the zone and the districts, is that intensive surveillance work will do to help prevent the spread of the disease in these areas.
- Regional and zonal health office should be emphasis health education or community awareness for high-risk areas.
- I will give my opinion Women and people between the ages of 25 and 29 are the ones who are being attacked, so I would like to work on prevention by identifying the reasons that are the reason for people in this age group to be attacked more often.
- I suggest to ministry of health and others nongovernmental organization HIV/AIDS is considered as concentrative epidemic and map partners for engaged to that area.

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## **Chapter 4: - Surveillance System Evaluation**



# East Shewa Zone, Oromia Region, Ethiopia, HIV/AIDS Case-Based Surveillance System Evaluation, July/2023-June/2024, Addis Ababa, Ethiopia

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## Abstract

**Background:** HIV/AIDS is still one of the major public health concerns in Ethiopia. Case-based surveillance systems are crucial for monitoring new infections, trends over time, and programmatic responses. The performance evaluation of the HIV case-based surveillance system was done in the East Shewa Zone, Oromia Region, regarding its main attributes: data quality, timeliness, simplicity, acceptability, representativeness, flexibility, stability, and usefulness.

**Methods:** A cross-sectional assessment was done from April to May 2024 in 16 health facilities that implemented HIV CBS activities. Information was collected through structured questionnaires, facility observations, and review of 112 case reporting forms. Quantitative data were analyzed using Microsoft Excel and SPSS version 26; findings were interpreted according to CDC's surveillance system evaluation framework.

**Results:** Of the 36 interviewed healthcare professionals, 63.8% were public health officers and 61.1% were counselors in primary care; 75% of respondents were male. Overall completeness of CRFs stood at 87.3%, while data validity was 95%. Representatives improved from 41.4% in 2019 to 64.6% in 2023. Most respondents, 94.4%, found it easy to fill out the CBS forms, while 91.7% reported automatic real-time transmission of data to the national level. The system had high acceptability of 100% and flexibility of 97%, though poor coordination, limited feedback, network interruptions, and generator fuel guards hampered the performance. The most common uses for CBS data were drug supply management (81%), test kit logistics (89%), and mapping new hotspots of infection (80.6%).

**Conclusion:** The East Shewa Zone HIV CBS system is functional, acceptable, and flexible, with good data quality and timeliness. However, there were gaps in coordination, feedback, and infrastructure stability. Strengthening supervision, enhancing analytical capacity, improving the mechanisms for giving and obtaining feedback, and integrating the private health facilities into the CBS network are crucial in the improvement of quality in surveillance data and program effectiveness.

**Keywords:** HIV, Case-Based Surveillance, Data Quality, Evaluation, East Shewa Zone, Oromia Region, Ethiopia

## Introduction

Human immunodeficiency virus (HIV) infection is still a global public health problem. The number of HIV-positive individuals was estimated to be 38.0 million worldwide in 2020, with 2.78 million being children and adolescents aged 0 to 19 years. In the same year, 120,000 young people under 18 years died due to acquired immunodeficiency syndrome (AIDS)-related causes, while 310,000 young people under 18 years contracted HIV for the first time (1).

The target number of 370,000 new HIV infections for 2025 will triple to 1.2 million people if the current trends continue (1). The data indicate the need for countries to monitor HIV prevention, care, and treatment interventions effectively.

The Joint United Nations Programme on HIV/AIDS established the 95-95-95 targets, meaning 95% of all people living with HIV should know their HIV status, 95% of all people with diagnosed HIV infection should receive sustained antiretroviral therapy (ART) and 95% of all people receiving ART to have viral suppression by 2030 (1).

Sixteen nations, eight sub-Saharan African nations, are nearing the 95-95-95 targets, with Botswana, Eswatini, Rwanda, Tanzania, and Zimbabwe already achieving this (1).

In 2023, the burden of HIV in Ethiopia continued to be a significant public health concern. The prevalence of HIV among children in urban Ethiopia was reported to be 0.36% (2). Despite successes in reducing HIV prevalence and incidence rates in the country, challenges persist, particularly in terms of mortality rates and disparities in access to HIV testing, treatment, and care services between urban and rural populations (3).

Ethiopia has made significant investments in HIV/AIDS prevention and care since the 1990s, adopting global targets to end the AIDS and HIV epidemics by 2030 (2). The country has shown progress in reducing HIV incidence rates, but the persistently high mortality rates indicate suboptimal and delayed access to HIV testing, treatment, and care services, especially in rural areas where improvements are needed (2). Efforts to

address these challenges require resources, renewed government commitment, and interventions focused on high-HIV prevalence zones to achieve effective strategies in combating HIV/AIDS in Ethiopia (3).

The HIV Case-Based Surveillance (CBS) system is a critical public health tool designed to monitor and evaluate the incidence and management of HIV cases. This evaluation focuses on the implementation and effectiveness of the CBS system in Zimbabwe, particularly in the Mutare district, where it was launched in April 2017 (7).

The HIV Case-Based Surveillance (CBS) system in Ethiopia has undergone significant development and evaluation since its inception. This evaluation focuses on the implementation and impact of the CBS system, particularly following the introduction of a digital platform that enhances data collection and analysis (5).

Prior to 2019, Ethiopia faced challenges in collecting and analyzing HIV surveillance data due to inadequate digital infrastructure. The establishment of the CBS system was supported by the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) and implemented by ICAP in over 800 health facilities across the country.

The HIV CBS system in Ethiopia represents a significant advancement in public health surveillance capabilities. By leveraging digital tools and comprehensive training programs, it has enhanced the ability to monitor HIV trends effectively and implement targeted interventions. However, ongoing efforts are needed to address training gaps and resource limitations to ensure sustained success in combating HIV/AIDS within the country (5). The continuous evaluation of this system will be crucial for adapting strategies to meet emerging challenges in the HIV epidemic landscape.

### **Objectives of HIV Surveillance System evaluation**

To guide the spatial prioritization of HIV preventive activities, the analysis of HIV surveillance data aims to identify and characterize geographic locations associated with newly diagnosed cases, particularly recent infections (14). In addition, the system

attempts to track and characterize epidemiological patterns in recently diagnosed HIV patients according to behavior, demography, route of transmission, and recentness of HIV infection. The system also seeks to track and characterize clinical status trends at the time of diagnosis, including WHO Stage, initial CD4, and other opportunistic infections.

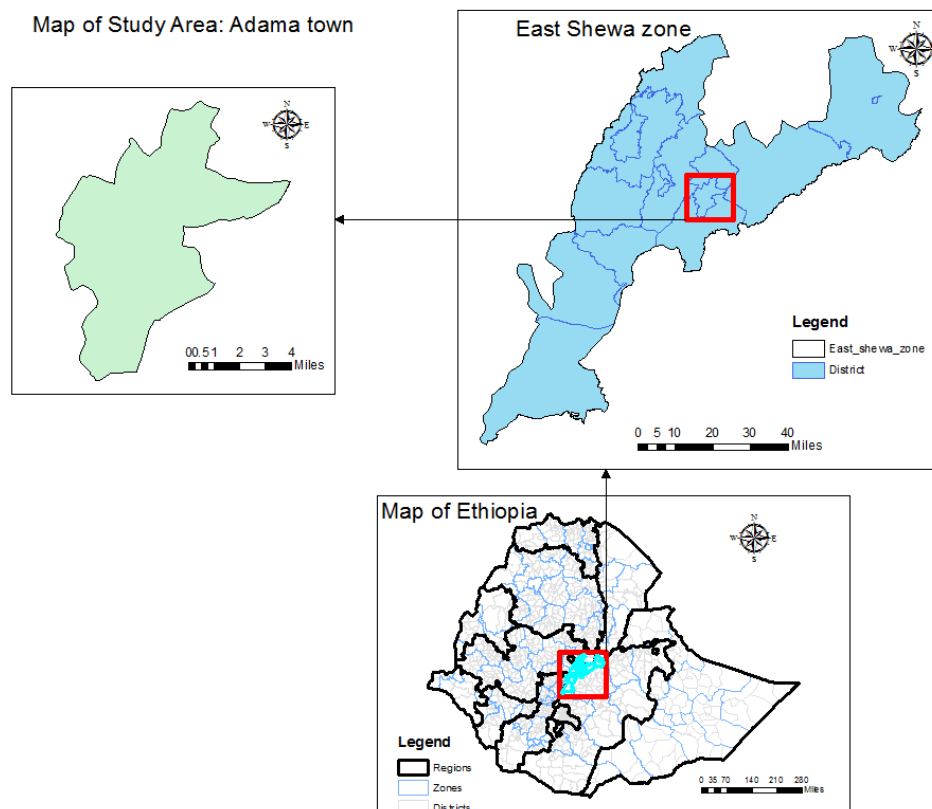
## **Methods**

### **Study area**

East Shewa is a zone in Ethiopia's Oromia Region (Oromo: Shewa Baha). East Shewa connects the eastern and western parts of Oromia. It is situated at its center. The West Arsi Zone borders this zone on the south; the Southern Nations, Nationalities and Peoples Region border it on the southwest; North Shewa borders it on the northwest; the Amhara Region borders it on the north; the Afar Region borders it on the northeast; and Arsi borders it on the southeast. The Bilate River defines the zone's westernmost extent. Dukam, Galan, Tullu Dimt, Basaqa and Aqaqi, Bishoftu, Metehara, Batu Dambal, and Adama are among the towns and cities in East Shewa.

With a total population of 1,356,342, including 696,350 men and 659,992 women, according to the Central Statistical Agency of Ethiopia (CSA) 2007 Census, East Shewa has a population density of 162.03 per square kilometer over an area of 8,370.90 square kilometers. There are 664, or 0.05%, who are pastoralists in addition to the 340,225, or 25.08%, who live in cities. There were 296,342 dwelling units and 309,726 households altogether in this Zone, with an average of 4.38 people per home. The Oromo (74.06%), Amhara (15.39%), and Gurage (3.82%) were the three largest ethnic groups listed; the remaining ethnic groups comprised 6.73% of the population. 69.15% of people spoke Oromo as their primary language, 24.29% spoke Amharic, and 2.64% of people spoke rage; the rest 3.92% spoke all other official primary languages. While 16.18% of the people identified as Muslims, 8.4% as Protestants, and 5.08% as practicing traditional beliefs, the bulk of the population claimed to be followers of Ethiopian Orthodox Christianity, with 69.33% of the population reporting that they did so (17).

According to the 1994 national census, there were 1,668,184 people living in this Zone in 343,656 homes, with 837,614 men and 830,670 women. At the time, 444,376 people, or 26.64% of the total population, were urban inhabitants. The Oromo (69.59%), Amhara (16.77%), Soddo Gurage (2.21%), Kambaata (2%), and Welayta (1.78%) were the five largest ethnic groups in East Shewa according to reports; the remaining ethnic groups made up 7.65% of the population. Sixty-nine percent spoke Oromo as their first language, followed by Amharic (26.58%), Soddo (1.43%), and Hadiya (1.28%). The remaining five percent spoke all other primary languages that were reported. Ethiopian Orthodox Christianity was the predominant religion practiced by most of the people, with 58.76% reporting to practice it and 35.01% saying they did not. 1.57% of them adhered to traditional religions, 3.47% were Protestant, and 3.77% were Muslims (18).



**Figure 14 Map of Ethio-region and East shewa zone**

**Study design**

We use of the most recent CDC recommendations for assessing public health monitoring systems; a descriptive cross-sectional analysis was carried out.

**Study Population**

To gather primary responses for the HIV monitoring system in testing and counseling services, I conducted interviews with healthcare professionals. A key informant that was interviewed includes the zone medical officer, community health nurses, matron, sister in charge, and the corresponding health information (HI) officer.

**Sample Size Calculations**

To assess the completeness of HIV CBS forms, we calculated a minimum sample size of 84 HIV CBS reporting forms using Dobson's formula for calculating sample size for a single proportion

Dobson formula (initial sample size

$$\frac{Z\alpha^2(p)(1 - p))}{d^2}$$

Where:

Z = Z statistic value i.e. 1.96 for a 95% confidence interval

p = proportion of HIV CBS reporting forms with 76% completeness (15).

d = 5% precision.

Assuming that completeness of HIV CBS reporting forms is 76% complete and given a 95% confidence interval, 5% level of precision and 10% non-response rate based on a study by Hall et al., 2006 15.

## **Sampling Techniques**

### **Sampling of Health Facilities**

By using purposively selected 16 health facilities that had implemented HIV CBS into the study. These were ACSMCH, Adama health center, Geda health center, St. Francis health center, Boku shenen health center, sister aklesia hospital, Adama model FGAE clinic, Medhanealem hospital, Rift Valley University Hospital, Adama 06 Kebele FGAE Clinic, Adama General Hospital, Wanji Hospital, Awash Health center, Biftu Health center, Hawas Health center and Merystopps.

### **Sampling of Primary Participants**

We enrolled ZHO and their staff and All (N= 36) health professionals who were on duty at the study participating in health facilities and who were involved in HIV testing, counseling, and data entry were recruited for the study.

### **Sampling of HIV Surveillance EHR Forms**

Seven forms from each of the 16 healthcare facilities that were part of the study using Microsoft Excel's "=RAND ()" random sample technique. We used the monthly sequential number that we were able to collect from the HIV testing services (HTS) registration to build a line-list of all identified reporting forms in an Excel file. 112 paper-based HIV CBS forms were sampled for the February 2023–January 2024 time frame.

### **Sampling of Key Informants**

Eight crucial informants who provided ART, HIV counseling, and testing to frontline workers were purposefully included in the study.

## **Evaluation of HIV surveillance System Attributes**

### **Representativeness**

When assessing HIV surveillance systems, representativeness is a crucial factor. It measures the degree of how well the system represents the overall distribution of HIV cases in the population and accurately records all cases (13, 14). To effectively

monitor trends in HIV infections and conduct public health interventions, a surveillance system with good representativeness must guarantee that it gives a realistic depiction of the distribution of HIV cases throughout the population as well as the incidence of cases over time.

Representativeness is a crucial factor in determining how well the HIV surveillance system captures the epidemiological features of HIV cases, which in turn enhances the efficacy of HIV preventive and control initiatives (1).

### **Timeliness**

Effective disease control and preventive initiatives depend heavily on the timeliness attribute when assessing an HIV surveillance system. Evaluating timeliness entails determining how quickly information for program planning, prevention of further exposure, and immediate control measures becomes accessible. The amount of time between the beginning of symptoms or exposure and the reporting of cases, trends, outbreaks, and the effectiveness of control efforts are among the factors that affect timeliness (15).

The period from the date of exposure or the onset of symptoms is considered for infectious or acute disorders, but the elapsed time from diagnosis is more significant for chronic illnesses (15). Assessing an HIV surveillance system's timeliness is crucial to guaranteeing quick reaction times, particularly when it comes to identifying epidemics, keeping an eye on patterns, and putting appropriate controls in place to manage the efficient transmission of HIV infections.

### **Data Quality**

Timeliness, correctness, and completeness are some of these qualities. To ensure sensitivity to correctly identify genuine cases, completeness is defined as including all examples without excluding any data variables. Ensuring accuracy entails making sure that the data entered accurately reflects the truth, including proper case definitions and coding, which are accessible through evaluation and training procedures.



**Simplicity**

When assessing an HIV monitoring system, the simplicity characteristic concentrates on the design and usability of the system. A monitoring system ought to be as uncomplicated as feasible while still accomplishing its goals (15). Analyzing simplicity entails determining how simple it is to enter data, apply case definitions, and operate the system (15). To ensure effective data collecting, processing, and reporting processes are all critical for disease monitoring and control efforts, a surveillance system must be simple. An HIV surveillance system's simplicity can be assessed in large part by focusing on three major areas: reducing complexity in data entry methods, guaranteeing clear case definitions, and streamlining the system design.

**Acceptability**

When assessing HIV monitoring systems, acceptability considers people's and organizations' willingness to engage with the system. Evaluating acceptability entails determining whether or whether healthcare professionals are willing to continue using the system, rely on data, and participate in HIV case-based monitoring. A few examples of the elements that affect acceptability are the time and effort needed to compile reports, the accuracy and timeliness of the data, and the availability of feedback reports and meeting minutes (13). For an HIV surveillance system to be efficient in tracking and managing HIV infections, active involvement, data integrity, and acceptability must all be understood and evaluated.

**Flexibility**

When assessing HIV surveillance systems, flexibility is a quality that allows them to adjust to shifting data requirements or operational circumstances with the least amount of extra money or staff. A system that is adaptable may efficiently handle novel illnesses, modifications to case definitions, changes in reporting sources, and developments in technology.

Assessing flexibility is seeing how a system reacts to fresh requests and modifications, including adjusting case definitions to satisfy changing specifications or adjusting for newly developing health events. For HIV surveillance systems to stay relevant and

effective in tracking and managing HIV infections over time, they must be able to adapt to new difficulties and integrate new data sources.

### **Sensitivity**

Evaluating the sensitivity qualities of an HIV surveillance system involves determining how well it can identify new HIV cases and track variations in the number of cases over time.

This entails assessing how many cases the surveillance system found, how well it identified outbreaks, and how quickly cases are reported and handled. Sensitivity can also refer to the dependability of data collection and management as well as the system's capacity to appropriately depict the incidence of HIV-related events. Determining the predictive value positive (PVP) of the system, that is, the percentage of reported cases with a health-related event under surveillance may also be a part of the sensitivity assessment. In general, the assessment of sensitivity in HIV monitoring systems concentrates on precision, timeliness, representativeness, and capacity to identify.

### **Stability**

Reliability and availability are stability factors that should be considered while assessing an HIV surveillance system. The ability of the system to gather, handle, and provide data consistently and without error, as well as to function, when necessary, is referred to as stability.

Stability is important for HIV monitoring systems because it guarantees proper system operation and availability for public health interventions when needed. A surveillance system's stability may be impacted by several factors, including a lack of trained personnel, a lack of specialized resources, and system disruptions. For this reason, it is critical to evaluate and preserve stability to guarantee the efficacy of the system.

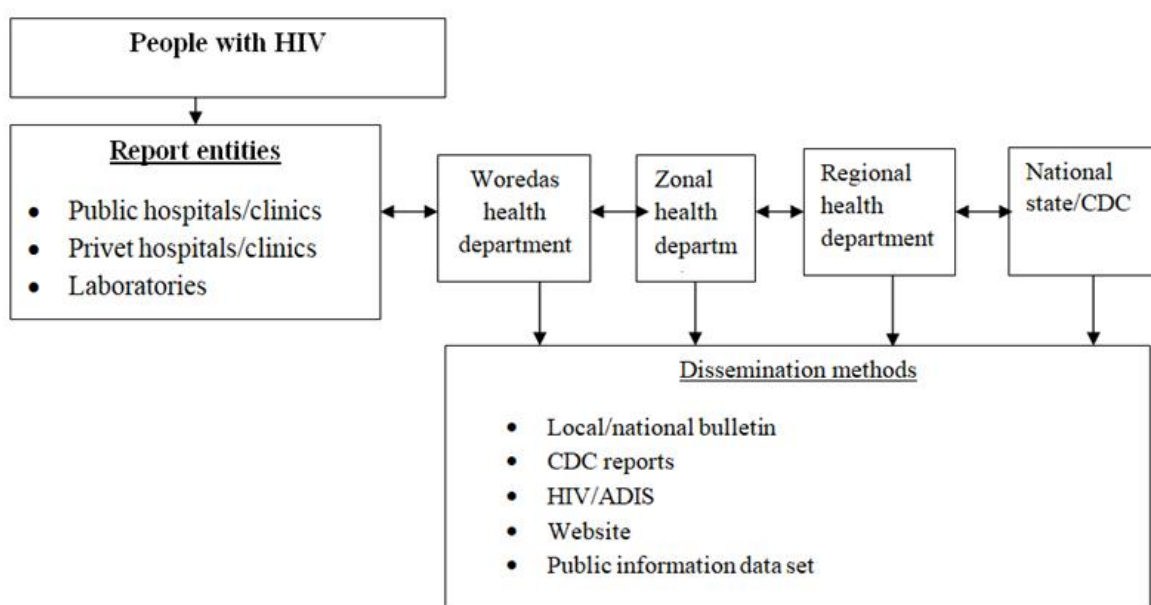
### **Usefulness**

The useful attributes for evaluating an HIV surveillance system include data analysis, data utilization, and public health actions based on the collected data. These attributes

focus on how effectively the system processes and interprets the data to inform decision-making and public health interventions. The system's ability to analyze collected data, generate reports, and identify trends is essential for assessing its usefulness in guiding preventive measures and healthcare services. Moreover, the utilization of data for public health actions, such as identifying new infection hotspots and implementing targeted interventions, demonstrates the practical impact and effectiveness of the surveillance system in addressing HIV-related challenges.

### Data Analysis

Epi Info TM version 7.2.4 was utilized for data entry and analysis. Quantitative data was analyzed using descriptive statistics, which were displayed as medians, interquartile ranges, frequencies, and proportions.



**Figure 15 How the CDC HIV/AIDS surveillance system works (16)**

### Ethical Considerations

I prepared concept note and submitted it to EPHI public health emergency directorate and Oromia regional health bureau to obtain permission to access the HMIS related data in the facilities conduct the study. I obtained written informed consent from all

respondents. I did not use participants' names or addresses during the study. Written informed consent was obtained from all respondents.

## **Results**

### **Demographic Characteristics of Health Workers Involved in HIV surveillance activities**

More than half of study participants were public health professionals, 23 out of 36 or (63.8%), and most were male, 27 out of 36 or (75%.) Participants' average age was 33 years. Out of the 36 healthcare workers involved in the study, 22 (61.1%) were primary care counselors. Table 1 shows that the 16 health facilities where HIV case-based surveillance activities were implemented fell under various authorities: government, 7; mission, 4; rural district councils, 3; city clinics, 2.

Poor co-ordination between CBS technical staff and health facilities 27/36 or (75%), lack of clear reporting guidelines 23/36 or (63.9%), insufficient feedback from higher levels on reporting performance (21/36, 58.3%), poor network connectivity 22/36 or (61.1%), frequent system outages 27/36 or (75%), and reliance on alternative systems were highlighted by the health professionals as the main reasons for the observed low reporting of newly confirmed HIV cases in the CBS system (Table 2).

### **Health Worker Knowledge about HIV Case-Based Surveillance System in Oromia Adama, 2024**

Among 36 health professionals 80.6% were tested for their knowledge and understanding of the HIV case-based surveillance system and defined an HIV-positive case correctly, while 75% of participants were correctly identified the objectives of the system. Additionally, 34(94%) out of 36 participants, were aware of the types of information being collected on HIV case reporting, while 33 (92%), could identify the reportable sentinel events correctly. Moreover, 31(91%), described the actions that needed to be taken after diagnosis as an HIV-positive case. Measured on a five-point Likert scale, the overall level of knowledge for the participants was generally high: 31(86%), had good knowledge; 3, (8.3%), had fair knowledge; and only 2(5.7%), had poor knowledge of the HIV CBS system (Table 10).

Table 10 shows the demographics of the medical staff members participating in HIV-related clinical services at Oromia region; East Shewa Zone HIV Case based activities implementation sites in 2024.

| Variable    | Categories                          | Frequency | Percentage  |
|-------------|-------------------------------------|-----------|-------------|
| Sex         | Male                                | 27        | 75          |
|             | Female                              | 9         | 25          |
| Age group   | <b>25-34</b>                        | <b>9</b>  | <b>25</b>   |
|             | <b>35 -44</b>                       | <b>17</b> | <b>47.2</b> |
|             | <b>45 -54</b>                       | 9         | <b>25</b>   |
|             | <b>55-64</b>                        | <b>1</b>  | <b>2.8</b>  |
| Designation | Primary care counselor              | <b>22</b> | <b>61.1</b> |
|             | Registration General nurse (RGN)    | <b>9</b>  | <b>25</b>   |
|             | Psychiatry and clinical nurse (PCN) | <b>5</b>  | <b>13.8</b> |

**Table 11: Causes for the underreporting of newly diagnosed HIV infections in Oromia region East Shewa Zone health institutions through HIV case-based activities, 2024.**

| Reason for under-reporting                      | Frequency | Percentage |
|-------------------------------------------------|-----------|------------|
| No reporting Guidelines                         | 23        | 63.9       |
| Limited coordination between units              | 27        | 75         |
| Inadequate CBS system competence                | 13        | 36.1       |
| No feedback from higher levels                  | 21        | 58.3       |
| Use of parallel systems for reporting cases     | 23        | 63.9       |
| Work overload/short staffed                     | 21        | 58.4       |
| Poorly designed interface                       | 9         | 25         |
| System downtime related challenges              | 27        | 75         |
| Too many data sources required to fill the form | 12        | 33.3       |
| Electricity power outages                       | 5         | 13.9       |
| High staff turn                                 | 11        | 30.6       |
| Poor network connectivity                       | 22        | 61.1       |

**Table 12 HIV case-based surveillance system awareness levels among health workers at CBS implementation facilities in Oromia region East Shewa 2024**

| Variable                                                     |                    | Freq n=36 | %   |
|--------------------------------------------------------------|--------------------|-----------|-----|
| Awareness and understanding of the HIV CBS system            |                    |           |     |
| Able to accurately define an HIV-positive case               |                    | 29        | 81  |
| Able to describe the objectives of HIV CBS system            |                    | 27        | 75  |
| Know which information was collected for HIV case reporting  |                    | 34        | 94  |
| Able to accurately state reportable sentinel events          |                    | 33        | 92  |
| Describe an action taken after an HIV-positive accurately    |                    | 31        | 91  |
| Overall health worker knowledge levels of the HIV CBS system | Good (4-5 correct) | 31        | 86  |
|                                                              | Faire (3 correct)  | 3         | 8.3 |
|                                                              | Poor (1-2 correct) | 2         | 1.7 |

**The HIV case-based surveillance System Attributes CBS to Implementing Facilities in Oromia region, East Shewa Zone, 2024.**

**Representativeness**

From July–August 2019, the REDCap system captured 82 out of 198, or 41.4%, compared to the DHIS-2 system, increasing to 254 out of 393, or 64.6%, by July–September 2023, for an overall representativeness of 67.2%. No private health facilities reported cases through the HIV CBS system. However, 29 of 36, or 80.6%, of the healthcare workers reported that several development partner organizations were actively engaged in outreach activities, community-based testing, and reporting of HIV cases to health facilities through the HIV CBS system.

## Data Quality

Overall, 112 CRFs were assessed for data completeness, and an overall completeness was 87.3%. Completeness for individual data elements ranged from 95% for client identifier information to 88% for facility information, with the lowest completeness, 86%, recorded for WHO clinical staging at diagnosis. Data validity was 95%, assessed by verifying patients' ages in 80 CRFs by comparing reported ages with calculated ages from dates of birth. Furthermore, 34 healthcare workers (94%) reported receiving supervisory visits from higher-level authorities, with a median of four visits reported (IQR = 4) (**Table 12**).

## Timeliness

Regarding the frequency of data entry, 23 out of 36 or (63.9%) healthcare workers responded that they did entry of paper-based HIV forms into the CBS system daily. Furthermore, 33 out of 36 or (91.7%) respondents reported that data transmission from health facilities to the national level happened automatically in real time once the information was entered into the system (Table 13).

**Table 13: Data quality of the Oromia region East Shewa Zone, 2024 HIV Case-based surveillance system at CBS implementation facilities**

| Variable                                                             | Freq (N=112) | %   | Completeness |
|----------------------------------------------------------------------|--------------|-----|--------------|
| Demographic information                                              | 112          | 100 | 95           |
| Diagnostic information                                               | 110          | 98  | 98           |
| Client aged 0-24 month                                               | 9            | 8   | 83           |
| Infant                                                               |              |     |              |
| Mother                                                               | 9            | 8   | 78           |
| Clients aged >=25 months (transmission risk)                         | 112          | 100 | 95           |
| Rapid test for HIV recent infection (client aged 15 years and above) | 98           | 88  | 88           |
| Assessment of WHO clinical staging at notification                   | 100          | 89  | 89           |
| ART initiation                                                       | 108          | 96  | 96           |
| Information on facility entering notification form into the CBS form | 80           | 71  | 71           |
| Validity                                                             | 112          | 100 | 95           |

**Simplicity**

Of the 36 health workers who were interviewed, 34(94.4%), reported that filling out HIV CBS forms was easy. The time taken to fill out a form in the case reporting system took a median of 10 minutes, IQR 6–12, compared to 18 minutes, IQR 7.5–28.5, for DHIS-2. Proficiency of data clerks in REDCap database: editing or updating electronic health records: 23 out of 36, or (63.8%), could do so, while all, 36/36, or 100%, could access the REDCap system (Table 13).

**Acceptability**

Of the 36 respondents, there were 34(94.4%) of professionals, who said they were part of a team for analyzing and using HIV CBS data. All respondents (100%) showed interest in continuing to use the system and confirmed previously reporting at least one case (Table 13).

**Flexibility**

Most health workers, 35/36(97%), reported that the introduction of new technologies like mobile phones and tablet devices were easily accommodated in the HIV CBS system. Then 32(88.9%), reported the system was capable of being linked with other health information systems. However, 4 healthcare workers reported that the introduction of recency testing, which relies on the use of electronic mobile devices, imposed additional demands on the HIV CBS system and took longer to operate than the traditional paper-based forms.

**Stability**

All 36 respondents were healthcare professionals and were actively involved in HIV CBS activities. Of the 16 facilities that were assessed, nine did not have a functional generator, while two had generators that required servicing, both factors that contributed to poor performance of the CBS system. Generator fuel shortage was the major operational challenge identified.



**Table 14, Timeliness, simplicity, flexibility, acceptability and usefulness of the HIV CBS system at CBS implementing facilities in Oromia region East Shewa Zone, 2024**

| Variable                                                                         |         | Frequency | Percentage  |
|----------------------------------------------------------------------------------|---------|-----------|-------------|
| Timeliness of the HIV CBS system                                                 |         |           |             |
| Time period taken for entry of paper-based HIV forms in to the CBS system n= 26) | Daily   | 23        | 63.9        |
|                                                                                  | weekly  | 3         | 8.3         |
|                                                                                  | Monthly | 0         | 0           |
| Timely transmission of CBS data from facility to national level                  | Yes     | 33        | 91.7        |
|                                                                                  | No      | 3         | 8.3         |
| Simplicity of HIV surveillance system                                            |         |           |             |
| simplicity of CBS forms to complete                                              |         | 34        | 94.4        |
| able to access the REDCap                                                        |         | 36        | 100.0       |
| Edit or update an CBS data                                                       |         | 23        | 63.8        |
| Median time taken to complete a CBS notification form in REDCap system           |         | 10        | (IQR, 6–12) |
| Acceptability of HIV reporting system                                            |         |           |             |
| Health workers willing to participate in the system                              |         | 36        | 100         |
| Health workers able to do data analysis and use                                  |         | 34        | 94.4        |
| Health workers who notified a case in the CBS system                             |         | 34        | 94.4        |
| Health workers who completed an HIV CBS case notification form                   |         | 31        | 86.1        |
| Flexibility of the HIV CBS system                                                |         |           |             |
| Ease of introducing new technology                                               |         | 35        | 97.2        |
|                                                                                  |         | 32        | 88.9        |
| Ease of integrating with other systems                                           |         |           |             |
| Easy of integrating new information requirements                                 |         | 27        | 75          |
|                                                                                  |         | 4         | 11.1        |
| New demands when using the system                                                |         |           |             |
| Usefulness of the HIV CBS system                                                 |         |           |             |
| Held meeting or discussion on HIV CBS data                                       |         | 28        | 77.8        |
| Data analysis done at facility level                                             |         | 31        | 86.1        |
|                                                                                  |         | 33        | 91.7        |
| Public Health action taken                                                       |         |           |             |
| Generate reports or graphs from HIV CBS data                                     |         | 10        | 27.8        |
| HIV test kits supply management                                                  |         | 32        | 88.9        |
| Drug supply chain management                                                     |         | 31        | 86.1        |
| Identify hotspots for new infections for community interventions                 |         | 34        | 94.4        |
| Identify risky behaviors for communication strategies                            |         | 29        | 80.6        |

### **Usefulness**

From participants 28/36(77.8%) respondents mentioned that there were meetings or discussions about the HIV CBS data. Another 32 (89%) also reported that data analysis was done at the facility level and utilized within their institutions. The most common uses for the data included managing the drug supply chain 29/36(81%) and managing the supply of HIV test kits 32/36(89%). A further 29 health workers (80.6%) reported that the data was also used to find out risky behaviors for targeted communication strategies and for finding new hotspots for community-level interventions (Table 5).

## **7. Discussion**

This evaluation of the HIV Case-Based Surveillance system in East Shewa Zone, Oromia Region, was aimed to assess the performance of the system based on CDC surveillance system evaluation attributes: data quality, representativeness, timeliness, simplicity, acceptability, flexibility, stability, and usefulness. The findings have shown strengths and challenges in the implementation of the HIV CBS system through the REDCap platform.

The CBS system demonstrated a moderate level of representativeness, with 67.2% of HIV cases captured in REDCap compared to DHIS-2. This suggests an increase from the previous years, from 41.4% in 2019 to 64.6% in 2023, but gaps persist due to non-participation by private facilities and irregular reporting from organizations. Similar findings were reported in Zimbabwe and Tanzania, with private sector data integration identified as limited, thus compromising completeness of national data on HIV. Improvement in linkage between private and public health facilities is critically important for full representativeness (19).

Data completeness and validity were high at 87.3% and 95%, respectively, which agrees with findings from Afghanistan and Kenya where patient demographics were well captured, though clinical details were not as complete (20). World Health Organization clinical staging and ART initiation data showed a lower completeness, pointing to the need for refresher training on appropriate data entry and verification.

Regular supervisory visits and data audits were associated with improved data quality across facilities.

Timeliness was good, with 63.9% of health workers performing daily entry of the HIV CBS data and 91.7% reporting automatic real-time transmission to the national level. This represents significant efficiency compared to traditional paper-based reporting. Similar studies in Kenya and South Africa indicated that the introduced digital surveillance systems significantly improved the timeliness of reporting and data availability for decision-making.

Most respondents (94.4%) found the CBS forms easy to complete, with an average time of 10 minutes taken to complete the forms, which was less than 18 minutes required for the DHIS-2 forms. This suggests that REDCap is user-friendly and efficient. Acceptability of the system was high, with all the respondents willing to continue with the system and having sent in case reports previously. This is as expected from the evaluations in both Nigeria and Mozambique, where an electronic CBS system was well accepted due to reduced paperwork and effective data management.

The system was also found to be flexible: 97% of health workers reported that new technologies, like mobile or tablet-based data entry, could easily be integrated into the system; 89% reported that CBS could be linked with other health information systems. However, regarding system stability, operational challenges, such as frequent power outages and fuel shortages affecting generators, were negative factors. This is similar to findings from other resource-limited settings characterized by gaps in infrastructure that hinder consistent performance of surveillance (21).

The various uses of the CBS data in this period include the following: drug supply management, 81%; HIV test kit logistics, 89%; and identification of new infection hotspots and risk behaviors, 80.6%. On the other hand, despite such successes, the number of analytical reports and visual summaries generated remained low at 27.8%, reflecting the still limited analytical capacity among facility staff. This suggests that

the system will require sustained capacity-building in data analysis and interpretation to fully realize its potential for local decision-making and program planning.

### **Limitations of the Study**

the assessment being based on self-reporting from health professionals might have introduced recall and social desirability biases; there was no direct observation of data entry processes, nor independent verification of the accuracy of the CBS data against patient records, which limited objective validation of data quality; the evaluation was done only in 16 purposively selected health facilities implementing HIV CBS, which may limit generalizability.

### **Conclusion**

Overall, the assessment indicated that the CBS for HIV in East Shewa Zone, Oromia region is functional, acceptable, and exhibits good data quality, timeliness, and flexibility. The overall representativeness of the system stands at 67.2%, which is an improvement compared to previous years, although the integration of private health facilities is a huge gap. Strong willingness to continue with the system and high levels of engagement recorded among health workers indicates good acceptability. Data completeness and validity were also encouraging, reflecting increased familiarity with the REDCap platform.

### **Recommendations**

#### **For the Federal Ministry of Health (MoH) and Ethiopian Public Health Institute (EPHI)**

- Enhance integration and coordination between the HIV CBS system and other national health information systems, including DHIS-2, to reduce data duplication and improve consistency.
- Develop and disseminate clear national guidelines and standard operating procedures for HIV CBS reporting, data entry, and feedback mechanisms to ensure uniform implementation across all regions.

- Ensure continued financial and technical support towards infrastructure improvements in terms of reliable power supply, internet connectivity, and server maintenance to secure system stability and data flow.

#### **For Oromia Regional Health Bureau (ORHB) and East Shewa Zonal Health Department**

- Provide regular supportive supervision and mentorship at all reporting facilities to enhance data quality, accuracy, and completeness.
- Provide continued capacity-building and refresher training for health workers, data clerks, and facility managers in the use of REDCap, data analysis, and interpretation for programmatic decision-making.
- Strengthen the mechanisms of giving feedback to make sure that the facilities at lower levels receive timely and constructive feedback about reporting performance and data quality.

#### **For Health Facilities and Implementing Partners**

- Provide continuous power and internet supplies by ensuring generator maintenance and giving adequate fuel to avoid delays in the transmission of data.
- Integrate newer technologies like mobile and tablet-based data entry tools to ensure smooth reporting with reduced delays.
- Work closely with partner organizations conducting outreach and community testing programs to assure that all HIV-positive cases are reported through the CBS system.

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### Annex III : Surveillance System Evaluation Questionnaire for HIV.

| S. No                                            | Questions                                                                                                                       | Coding Classification                                                                                                             |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <b>Part one: Background Information</b>          |                                                                                                                                 |                                                                                                                                   |
|                                                  | Name of district/zone                                                                                                           | _____                                                                                                                             |
|                                                  | Name of Health Facility                                                                                                         | _____                                                                                                                             |
|                                                  | Health Facility Type                                                                                                            | A. Hospital<br>B. Health Center<br>C. Clinic<br>D. Other, Specify_____                                                            |
| 1.1                                              | Health Facility Owner                                                                                                           | A. Public<br>B. Private<br>C. NGO                                                                                                 |
|                                                  | Catchment population                                                                                                            | _____                                                                                                                             |
|                                                  | How many Clients are currently on ART?                                                                                          | _____                                                                                                                             |
|                                                  | How Many HCT (HIV counseling and testing) outlets are in the Health Facility?<br>Circle all sites where HCT service is provided | A. Adult OPD<br>B. Pediatric OPD<br>C. MCH<br>D. IPD<br>E. Emergency OPD<br>F. VCT<br>G. ART<br>H. PMTCT<br>I. Other Specify_____ |
|                                                  | When did HIV Case based surveillance system implementation started?                                                             | _____                                                                                                                             |
| 1.9                                              | What are the objectives of surveillance?                                                                                        | _____<br>_____<br>_____                                                                                                           |
|                                                  | What are the strengths of your surveillance system?                                                                             | _____<br>_____<br>_____                                                                                                           |
|                                                  | What are the weaknesses of your surveillance system?                                                                            | _____<br>_____<br>_____                                                                                                           |
| <b>Part two: Case Detection and Registration</b> |                                                                                                                                 |                                                                                                                                   |
|                                                  | Is there national manual/guideline for surveillance at your office?                                                             | A. Yes B. No                                                                                                                      |
|                                                  | Do you have HIV/AIDS guidelines/manual?                                                                                         | A. Yes B. No                                                                                                                      |
|                                                  | Do you have HIV/AIDS case definition?                                                                                           | A. Yes B. No                                                                                                                      |
|                                                  | If yes, is it posted?                                                                                                           | A. Yes B. No                                                                                                                      |
|                                                  | Does all professionals are aware of it?                                                                                         | A. Yes B. No                                                                                                                      |
| <b>Part Three: Case Confirmation</b>             |                                                                                                                                 |                                                                                                                                   |
|                                                  | Does your health facility have the capacity to collect sputum, blood/serum, stool or other specimens?                           | B. Yes B. No                                                                                                                      |
|                                                  | Does your health facility have the capacity to transport specimens to a higher- level lab.?                                     | C. Yes B. No                                                                                                                      |
|                                                  | Does your health facility have guidelines/manual for specimen collection, handling and transportation?                          | D. Yes B. No                                                                                                                      |
| <b>Part Four: Case Reporting</b>                 |                                                                                                                                 |                                                                                                                                   |



|                                                                |                                                                                                                                                                                 |                                                                                                                                                                                                                                                       |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                | Please complete the following information for number of New HIV Case were identified in the last 12 months                                                                      | A. # of New Cases Identified (HMIS/Register) _____<br>B. # of Case report form completed _____<br>C. # of Case report form reported _____<br>D. # of Cases refusal form completed _____<br>E. Percentage of Case report form reported (B/C*100) _____ |
|                                                                | Recency test                                                                                                                                                                    |                                                                                                                                                                                                                                                       |
|                                                                | Cases >15 years                                                                                                                                                                 | _____                                                                                                                                                                                                                                                 |
|                                                                | Cases >15 years with recency information completed                                                                                                                              | _____                                                                                                                                                                                                                                                 |
|                                                                | % agreement of verification line with national algorithm                                                                                                                        | _____                                                                                                                                                                                                                                                 |
|                                                                | Does the health worker distinguish the eligibility criteria to enroll clients in HIV Case reporting?                                                                            | A. Yes B. No                                                                                                                                                                                                                                          |
|                                                                | Does the health worker provide information on CBS and obtain verbal consent before completing the CRF? (Observe, if possible, otherwise ask health worker to describe process.) | A. Yes B. No                                                                                                                                                                                                                                          |
|                                                                | Did you send HIV/AIDS surveillance data to the next level?                                                                                                                      | A. Yes B. No                                                                                                                                                                                                                                          |
|                                                                | Did you know national deadline report for immediately and weekly reportable diseases?                                                                                           | A. Yes B. No                                                                                                                                                                                                                                          |
|                                                                | If answer for 4.6 is Yes, in what time and when did you report to the next level respectively?                                                                                  | _____                                                                                                                                                                                                                                                 |
|                                                                | Does your health facility have access to communication facility?                                                                                                                | A. Yes B. No                                                                                                                                                                                                                                          |
|                                                                | If answer for 4.8 is yes which type of communication facility exist?                                                                                                            | A. Internet B. Fax<br>C. Phone D. other, specify _____                                                                                                                                                                                                |
|                                                                | When do you expect to send HIV surveillance data to next level?                                                                                                                 | _____                                                                                                                                                                                                                                                 |
|                                                                | Have you lacked a recommended format in last 6 months?                                                                                                                          | A. Yes B. No                                                                                                                                                                                                                                          |
| <b>Part Five: Data management, analysis and interpretation</b> |                                                                                                                                                                                 |                                                                                                                                                                                                                                                       |
|                                                                | Does the health facility have an established data quality monitoring mechanism?                                                                                                 | A. Yes B. No                                                                                                                                                                                                                                          |
|                                                                | If yes for question 5.1, Specify the procedure<br>If No, why?                                                                                                                   | _____                                                                                                                                                                                                                                                 |
|                                                                | Does the health care provider who completed the CRF submit to PHEM focal person by himself/herself?                                                                             | A. Yes B. No                                                                                                                                                                                                                                          |
|                                                                | Did the Health care providers submit the completed CRF (case reporting format) timely?                                                                                          | A. Yes B. No                                                                                                                                                                                                                                          |
| 5.1.                                                           | Date Form Completed                                                                                                                                                             | Date sent by PHEM focal person                                                                                                                                                                                                                        |
|                                                                | Are all the completed and submitted CRFs kept in a lockable cabinet? (tick by observation)                                                                                      | A. Yes B. No                                                                                                                                                                                                                                          |
|                                                                | Have all Health Care providers involved signed the confidentiality agreement? Circle Yes if all involved signed the agreement otherwise circle No and state your                | A. Yes B. No                                                                                                                                                                                                                                          |

|                                           |                                                                                                                          |                                                                     |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
|                                           | observation.                                                                                                             |                                                                     |
|                                           | Is there a mechanism designed to address and report data confidentiality breach?                                         | A. Yes    B. No                                                     |
|                                           | If there have been any data confidentiality breaches in the last six month?                                              | A. Yes    B. No                                                     |
|                                           | Does the health facility report as per the standard? (Observe)                                                           |                                                                     |
|                                           | a. Timeliness (describe standard)                                                                                        | A. Yes    B. No                                                     |
|                                           | b. Uses (sealed?) envelope                                                                                               | A. Yes    B. No                                                     |
|                                           | Does the MDT (multi-disciplinary team) review performance of CBS implementation in their regular meeting?                | A. Yes    B. No                                                     |
|                                           | If yes, what is the generated evidence and response? Please specify                                                      | _____                                                               |
|                                           | Are the required data elements complete? (Randomly take five completed CRF and check their completeness and consistency) |                                                                     |
|                                           | # of Required Data elements                                                                                              | # of Completed Required Data element                                |
|                                           | Did you have computer?                                                                                                   | A. Yes    B. No                                                     |
|                                           | Is it functional?                                                                                                        | A. Yes    B. No                                                     |
|                                           | Do you have computer skills?                                                                                             | A. Yes    B. No                                                     |
|                                           | Did you analyze HIV/AIDS surveillance data?                                                                              | A. Yes    B. No                                                     |
|                                           | Did you use computer to analyze HIV/AIDS surveillance data?                                                              | A. Yes    B. No                                                     |
|                                           | If the answer for Ques. 5.17 is yes, did you describe data by time, place and person?                                    | A. Yes    B. No                                                     |
|                                           | Did you have appropriate denominator for data analysis?                                                                  | A. Yes    B. No                                                     |
|                                           | Did you notify me of the results of your analysis to the next level?                                                     | A. Yes    B. No                                                     |
|                                           | How often did you analyze collected data?                                                                                | A. Daily<br>B. Weekly<br>C. Monthly<br>D. Quarterly<br>E. As needed |
| <b>Part six: Epidemic preparedness</b>    |                                                                                                                          |                                                                     |
|                                           | Did your health facility have written plans for Epidemic preparedness and response?                                      | A. Yes    B. No                                                     |
|                                           | Did your health facility always have emergency stocks of drugs and supplies in the last 1 year?                          | A. Yes    B. No                                                     |
|                                           | Has your health facility experienced shortage of drugs, vaccines or supplies during the most recent epidemic/outbreak?   | A. Yes    B. No                                                     |
|                                           | Is there a budget line or access to funds for epidemic responses?                                                        | A. Yes    B. No                                                     |
|                                           | Does your health facility have rapid response team for the epidemics?                                                    | A. Yes    B. No                                                     |
|                                           | If yes was rapid response team functional?                                                                               | A. Yes    B. No                                                     |
| <b>Part Seven: Outbreak investigation</b> |                                                                                                                          |                                                                     |

|                                               |                                                                                                                                                            |                                                                                                                                 |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 7.1.                                          | Has there been an outbreak of HIV/AIDS in the last 12 months? (Obs. Report and make copies if possible)                                                    | A. Yes    b. No                                                                                                                 |
|                                               | If answer for 7.1 is Yes, has your health facility investigated the outbreak?                                                                              | A. Yes    B. No                                                                                                                 |
| <b>Part Eight: Responses and Controls</b>     |                                                                                                                                                            |                                                                                                                                 |
|                                               | Has your health facility implemented prevention and control measures based on local data for HIV/AIDS?                                                     | A. Yes    B. No                                                                                                                 |
|                                               | Does your health facility respond within 48 hours of notification of most recently reported outbreak?                                                      | A. Yes    B. No                                                                                                                 |
|                                               | Does your health facility rapid response team have evaluated their preparedness and response activities in the last year? (Obs. written report to conform) | A. Yes    B. No                                                                                                                 |
| <b>Part Nine: Human Resource and Training</b> |                                                                                                                                                            |                                                                                                                                 |
|                                               | Did you take training on HIV/AIDS case-based surveillance?                                                                                                 | A. Yes    B. No                                                                                                                 |
|                                               | Number of healthcare providers at this point received CBS training?                                                                                        | A. ART _____<br>B. PMTCT _____<br>C. VCT _____<br>D. PITC _____<br>E. Laboratory _____<br>F. PHEM Focal _____<br>G. Other _____ |
|                                               | Number of healthcare providers at this point received onsite orientation on HIV CBS?                                                                       | A. ART _____<br>B. PMTCT _____<br>C. VCT _____<br>D. PITC _____<br>E. Laboratory _____<br>F. PHEM _____<br>G. Other _____       |
|                                               | Number of staff currently providing HIV/AIDS service? By service category                                                                                  | A. ART _____<br>B. PMTCT _____<br>C. VCT _____<br>D. PITC _____<br>E. Laboratory _____<br>F. Other _____                        |
|                                               | Number of staff who were trained on Rapid Test for Recent Infection (RTRI)                                                                                 | _____                                                                                                                           |
|                                               | Number of staff who were trained on CBS but left the health facility or changed their role?                                                                | _____                                                                                                                           |
|                                               | Do you think the numbers of staffs trained or oriented are adequate to implement the program?                                                              | a. Yes    b. No                                                                                                                 |
| <b>Part Ten: Procedure</b>                    |                                                                                                                                                            |                                                                                                                                 |
|                                               | Is screening process to determine eligibility in place? Look for standard operation procedure (SOP)/JOB AID and complete accordingly                       | a. Yes    b. No                                                                                                                 |
|                                               | Are guidelines describing how client identification documented is available at the testing point?                                                          | a. Yes    b. No                                                                                                                 |
|                                               | Are SOP/job aids on testing procedures available at the testing point?                                                                                     | a. Yes    b. No                                                                                                                 |

|                                                      |                                                                                                                                                                                |                                                                                     |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                                      | Is lighting sufficient in designated testing areas?                                                                                                                            | a. Yes      b. No                                                                   |
|                                                      | Review process for performing RTRI (labeling of test devices with client identifier, using timer, following SOPs, test interpretation, repeat testing of invalid tests, etc.). |                                                                                     |
|                                                      | Is quality control (QC) routinely performed for RTRI and reviewed by guidelines?                                                                                               | a. Yes      b. No                                                                   |
|                                                      | Is Test kit name, lot #, expiration date documented in each page of recency logbook?                                                                                           | a. Yes      b. No                                                                   |
| <b>Part Eleven: Supervision and Feedback</b>         |                                                                                                                                                                                |                                                                                     |
|                                                      | Did you conduct supervision in the last 12 months?                                                                                                                             | b. Yes      b. No                                                                   |
|                                                      | If answer for 10.1 is yes, how many times did you supervise?                                                                                                                   | _____                                                                               |
|                                                      | How often do you supervise?                                                                                                                                                    | a. Weekly,<br>b. Monthly,<br>c. Quarterly<br>d. As needed<br>e. Other specify _____ |
|                                                      | Did you have supervision checklist?                                                                                                                                            | a. Yes      b. No                                                                   |
|                                                      | Did you provide feedback to lower level/service outlets in the last 12 months?                                                                                                 | a. Yes      b. No                                                                   |
|                                                      | How did you give your feedback?                                                                                                                                                | a. Oral      b. Written                                                             |
|                                                      | If answer for 9.2 is yes, how often did you provide?                                                                                                                           | a. Weekly<br>b. Monthly<br>c. Quarterly<br>d. Every six months<br>e. Annually       |
|                                                      | Did you receive feedback from higher level in the last 12 months on the data you provided?                                                                                     | a. Yes      b. No                                                                   |
| <b>Part Twelve: Resource/Logistics</b>               |                                                                                                                                                                                |                                                                                     |
| 12.1.                                                | Are the following supplies available at the facility? Should be completed through observation for availability and adequacy of copies                                          |                                                                                     |
| 12.2.                                                | Is there HIV CBS Case reporting form available?                                                                                                                                | a. Yes      b. No                                                                   |
|                                                      | Is there HIV Case Reporting Job AID available at each outlet?                                                                                                                  | a. Yes      b. No                                                                   |
|                                                      | Is there HIV Recency test Quality logbook available?                                                                                                                           | a. Yes      b. No                                                                   |
|                                                      | Is there HIV Recency Test Kit available?                                                                                                                                       | a. Yes      b. No                                                                   |
|                                                      | Is any expired recency test kit being used?                                                                                                                                    | a. Yes      b. No                                                                   |
|                                                      | Are test kits kept in a temperature-controlled environment conforming to the manufacturer's instructions? Please check and record the temperature                              | a. Yes      b. No                                                                   |
| <b>Part Thirteen: Surveillance system attributes</b> |                                                                                                                                                                                |                                                                                     |
|                                                      | <b>Completeness</b>                                                                                                                                                            |                                                                                     |
| 13.1.                                                | Number of sites expected to report and report in the last 1 year respectively                                                                                                  | _____ and _____                                                                     |
|                                                      | Are all new HIV cases in the last one year from registry was reported                                                                                                          | a. Yes      b. No                                                                   |

|  |                                                                                                                                                                               |                                                                    |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
|  | Number of new cases from registry and report format in the last 1 year respectively                                                                                           | _____ and _____                                                    |
|  | <b>Timeliness</b>                                                                                                                                                             |                                                                    |
|  | Is the surveillance data sent/received on time?                                                                                                                               | a. Yes      b. No                                                  |
|  | Percentages of HF submit their report on time?                                                                                                                                | _____                                                              |
|  | Do you think that the existing surveillance system is timely detecting the outbreak?                                                                                          | a. Yes      b. No                                                  |
|  | <b>Usefulness</b>                                                                                                                                                             |                                                                    |
|  | Does the surveillance system help to detect outbreaks of these selected priority diseases early?                                                                              | a. Yes      b. No                                                  |
|  | Does the surveillance system help to estimate the magnitude of morbidity and mortality of these diseases, including identification of factors associated with these diseases? | a. Yes      b. No                                                  |
|  | Did the response initiate in a timely manner?                                                                                                                                 | a. Yes      b. No                                                  |
|  | Does the surveillance system help to assess the effect of prevention and control programs?                                                                                    | a. Yes      b. No                                                  |
|  | For what purposes do you use surveillance data? (E.g. early warning and routine program monitoring)                                                                           | _____                                                              |
|  | <b>Simplicity of the system</b>                                                                                                                                               |                                                                    |
|  | Is the case definition of HIV easy for case detection?                                                                                                                        | a. Yes      b. No                                                  |
|  | Does the system allow all levels of professionals to fill data?                                                                                                               | a. Yes      b. No                                                  |
|  | Does the system help to record and report data on time?                                                                                                                       | a. Yes      b. No                                                  |
|  | How long does it take to fill the format?                                                                                                                                     | a. < 5 min<br>b. 10-15 min<br>c. >15 min<br>d. Other specify _____ |
|  | How long does it take to have laboratory confirmation?                                                                                                                        | _____                                                              |
|  | <b>Acceptability</b>                                                                                                                                                          |                                                                    |
|  | Did you believe surveillance is important for public health intervention?                                                                                                     | a. Yes      b. No                                                  |
|  | Did you accept HIV surveillance system?                                                                                                                                       | a. Yes      b. No                                                  |
|  | Do you think the reporting agents accept and are well engaged to HIV surveillance activities?                                                                                 | a. Yes      b. No                                                  |
|  | If yes, how many active participants are in your health facility?                                                                                                             | _____                                                              |
|  | If No, what is the reason for their poor participation in the surveillance activity                                                                                           | _____                                                              |
|  | Were all participants using the standard case definition to identify cases?                                                                                                   | a. Yes      b. No                                                  |
|  | Were all the reporting agents sending their report using the current and appropriate surveillance reporting format?                                                           | a. Yes      b. No                                                  |
|  | <b>Flexibility</b>                                                                                                                                                            |                                                                    |
|  | Can the current reporting formats be used for other newly occurring health events (disease) without much difficulty?                                                          | a. Yes      b. No                                                  |
|  | Did you think that any change in the existing procedure of case detection and reporting format will be difficult to implement?                                                | a. Yes      b. No                                                  |

|  |                                                                                                           |                              |
|--|-----------------------------------------------------------------------------------------------------------|------------------------------|
|  | Is the system easy to add new variables?                                                                  | a. Yes    b. No              |
|  | Is the system easy to integrate with other systems?                                                       | a. Yes    b. No              |
|  | <b>Data quality</b>                                                                                       |                              |
|  | Are all reported forms Complete?                                                                          | a. Yes    b. No              |
|  | Is the recorded data clear to read and understand?                                                        | a. Yes    b. No              |
|  | <b>Representativeness</b>                                                                                 |                              |
|  | Do you think that the population under surveillance have good health seeking behavior for these diseases? | a. Yes    b. No              |
|  | Whom do you think is well represented by the surveillance data?                                           | a. Rural<br>b. Urban c. Both |
|  | <b>Stability</b>                                                                                          |                              |
|  | Was any new restructuring affecting the procedures and activities of the surveillance?                    | a. Yes    b. No              |
|  | Was there lack of resources that interrupted the surveillance system?                                     | a. Yes    b. No              |
|  | Was there any time /condition in which the surveillance is not fully operating?                           | a. Yes    b. No              |
|  | <b>Sensitivity</b>                                                                                        |                              |
|  | Does HIV/AIDS case definition used for identifying HIV case                                               | a. Yes    b. No              |
|  | Does HIV case meet case definition of HIV standard                                                        | a. Yes    b. No              |

## **Chapter 5: - Health Profile Description**

## **Basona Worana Woreda Health Profile Description, North Shewa- Amhara Region, Ethiopia**

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### **Abstract**

**Background:** Health profile provides summary health information to support local authority members, officers and community partners to lead for health improvement.

**Methods:** Descriptive cross sectional study design was applied from January 15 to 30, 2023 in Basona Worana Woreda, North shewa zone. Health and health related data were collected from the Woreda health, water, finance, and education and agriculture offices from January 15/2023 up to 30/2023. Checklist has been developed and used for collecting data from all relevant key informants and afterwards, data compilation was processed by using Microsoft office 2013.

**Results:** In the woreda there were 21 rural health posts, 3 health centers and 2 private clinics delivering health care services. Furthermore, 20 health posts that are staffed with one diploma nurse and for 14 health posts have two health extension workers and for 6 health post have three health extension workers. In 2023 potential health service coverage was 79.6% with total health workforce density of 2 per 7,700 populations. 1<sup>st</sup> ANC visit, PNC, delivery, PMTCT and contraceptive coverage rate was 78%, 70%, 63%, 53% and 70.4% respectively were performed.

From ten top diseases seen in 2023 diarrhea, 29.7% were the leading problem followed by pneumonia, other specified upper respiratory tract disorders and acute tonsillitis. From all cases of under five years of age, 172(29.7%) were affected by diarrhea. Out of the 172 cases who came to the district health facilities, 162(94.2%) of them were treated and recovered, and 9(5.8%) of them were referred to get better medical services because there is no inpatient service in the district. And there was no death caused by the diarrhea. In 2014 E.C total of 14,732 people were tested for HIV, of them 13,362(90.7%) by PICT and the rest 1,370 (9.3%) are tested by VCT service. From the total tested, 82 were positive for HIV.

**Conclusion and recommendation:** some health indicators are below the target or the standard, and it needs improvement. Those gaps which needs improvements such as immunization or vaccine of Penta, measles, Rota and safe water supply, typhoid fever and diarrhea prevention measures, low outpatient per capita, high health workers to population ratio, high health center to population ratio, health centers and health posts were without water and electric supply, absence of high school and primary hospital were some of the major problems.



## **Introduction**

Health profile provides summary health information to support local authority members, officers and community partners to lead for health improvement. Health Profiles is a program to improve availability and accessibility for health and health-related information. Health Profiles are produced annually, designed to help local government and health services to make decisions and plans to improve local people's health and reduce health inequalities. The profiles present a set of health indicators that show how the area compares to the national average. The indicators are carefully selected each year to reflect important public health topics (1).

Community health profile describes health determinants such as Economic growth, income distribution, geographical difference, education gender, food and nutrition behavior, lifestyle related factors, environmental factors related to water and sanitation, waste management, and other livelihood conditions should be included. Community health may be influenced by different factors including physical and social environments, climatic variations, economic and educational status, accessibility of health service and facilities, living conditions and other factors are dominant to effects of community health. (2)

The Ethiopia country health profiles provide an overview of the situation and trends of priority health problems and the health systems profile, including a description of institutional frameworks, trends in the national response, key issues and challenges. They promote evidence-based health policymaking through a comprehensive and rigorous analysis of the dynamics of the health situation and health system in the country (2).

Health profile of a district is a comprehensive document that contains information about the history and location of the district, its accessibility, its cultural value, political and administrative set-up, demographic characteristics of its population, general health status, health indicator, education and socioeconomic status of the district (3).

The purpose of the assessment is to describe health and health related issues in the given district (woreda) and communication of the local burden of morbidity, mortality, any disaster and other public health related information of the district and it is very important document to be utilized by any stake holders in general and public health professionals in specific(3).

In the previous time in Basona Worana woreda health office health profile description was not prepared and the health status of the woreda was not documented and known in compiled and organized way. In other word the planning and intervention program was not based on priority problems of the community. Therefore, this study was conducted to prepare health profile of Basona Worana woreda and to identify the major problems of the woreda on health system

### **Rational of the woreda health profile description**

Basona worana woreda health profile assessment was not done before. Therefore, the purpose of this health profile assessment is to understand the status of health and health related indicators in the given woreda/ district and to identify strategies that improve the access of the community to effective health care and health promotion. Describing health profiles is helpful to understand the current health of population and factors that influence community life. This Health profile generates information that is useful at community level. The data generated from the health profile description will also help the woreda and other stakeholders for public health decision making resource allocation and priority setting.

### **Objectives**

#### **General objective**

To assess and describe health related issues about health status, health indicators and to identify problems for priority setting of Basona Werana woreda, North Showa zone, Amhara, Ethiopia 2023.

### **Specific objectives**

- To describe the demographic characteristics of the population in Basona Werana woreda.
- To identify the availability of existing health infrastructures of Basona Werana woreda.
- To describe the health service status and health indicators of Basona Werana woreda.
- To indicate the major problem related to communicable diseases of the woreda

### **Method and Materials**

#### **Study period**

From January 15/2023 to 30/2023 G.C

#### **Study design**

Descriptive cross sectional study design was applied from January 15 to 30, 2023 in Basona Worana Woreda, North shewa zone. Health and health related data were collected from the Woreda health, water, finance, and education and agriculture offices. Checklist has been developed and used for collecting data from all relevant key informants.

#### **Sampling techniques**

For health profile description there is no need for sample size determination as well as sampling technique. Because the study was conducted by gathering information (performance) from different offices concerned and by using annual reports of different sectors at woreda office level. The study area was selected among 21 Woredas found in the zone by discussing with zonal health department PHEM officer to avoid redundancy.

#### **Source of data**

Secondary data (administrative data) was used to prepare/compile this profile. The data was collected by reviewing hard and soft records, reports, and interviewing and discussing with different key informants. In health office, most data have been

collected by discussing with HI experts and receiving organized HMIS report. Data source including the following sectors

- Health office,
- Youth and sport office
- Agriculture and veterinarian office,
- Education office, woreda finance and economy office
- Water office and other sectors of the woreda
- Review of related Literatures conducted in the woreda.
- Some data also has collected by phone, Gmail Telegram contacts with concerned people.

### **Data analysis**

Finally, the raw data was analyzed by Microsoft excel to compile and clean the raw data and ArcGIS to construct the area map. Descriptive statistics like frequencies, percentages and ratio were calculated to describe the collected health profile data. The result is presented by table, graph and appropriate charts.

### **Ethical Consideration**

A formal letter was received from Ethiopian public health institute (EPHI) and submitted to the woreda sector leaders, and the leaders contact to data managers at each source organizations to get access to the data. Confidentiality was assured and maintained.

### **Dissemination of findings**

The result of the study was disseminated to Addis Ababa university school of public health, North shewa zone Health office, and Basona Worana Woreda Health Office.

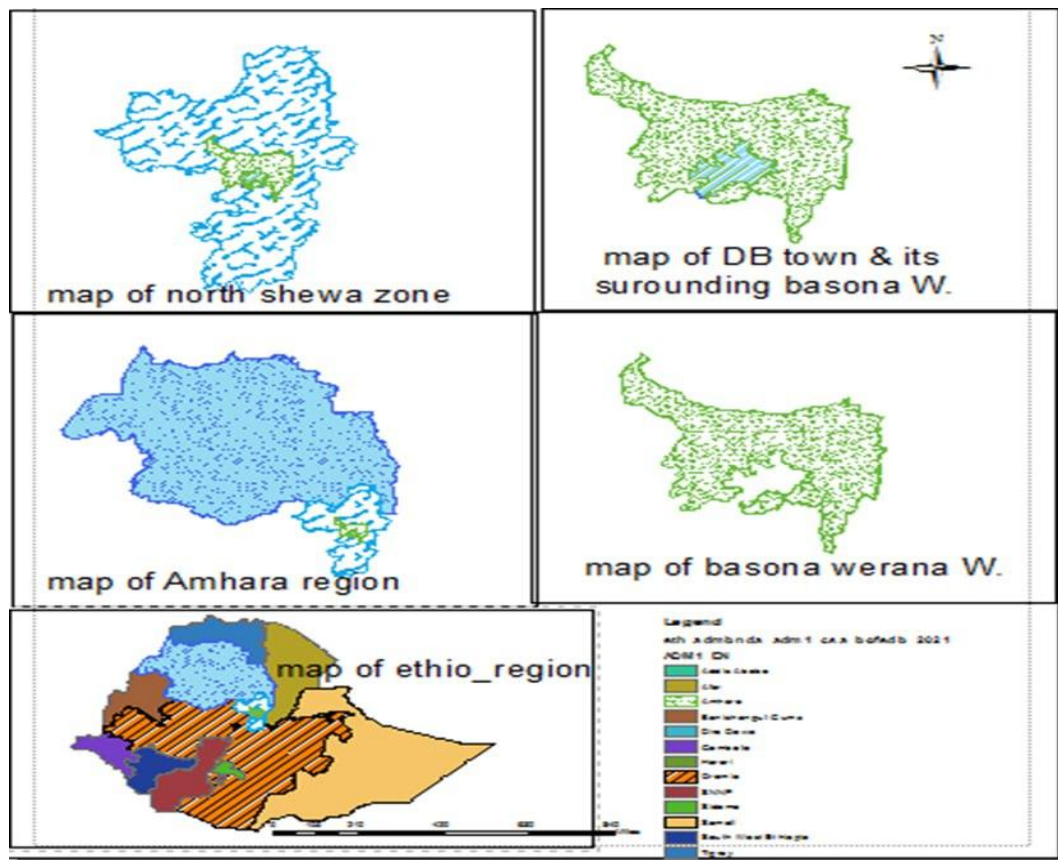
### **Result and discussion**

#### **Historical background and culture**

Basona Werana (& quot; Baso and Werana & quot;) is a woreda in the Amhara Region of Ethiopia. Located at the eastern edge of the Ethiopian highlands in the

North Shewa Zone, Basona Werana is bordered on the south by Angolalla Tera, on the southwest by the Oromia Region, on the west by Siya debrina Wayu, on the northwest by Moretna Jiru, on the north by Mojana Wadera, on the northeast by Tarmaber, and on the east by Ankober.

The town and woreda of Debre Berhan is an enclave inside this woreda. The town in this woreda is Gudoberet and others are rural kebeles. This woreda was originally named Debre Berhan Zuria (& quot; Greater Debre Berhan & quot;), the name used in the 1994 national census, but it was changed before the Ethiopian Agricultural Sample Survey in October 2001, which used the present name. The Battle of Segale was fought on 27 October 1916 in this woreda. In this battle, the supporters of Lij Iyasu of Ethiopia were defeated, which secured the outcome of the palace coup the previous month, in which Zewditu had been proclaimed Empress.



**Figure 16: Maps showing area in which health profile description conducted, 2023**

### Demographic information

Based on the 2007 national census conducted by the Central Statistical Agency of Ethiopia (CSA), this woreda has a total population of 120,930, an increase of 7.81% over the 1994 census, of whom 61,924 are men and 59,006 women; 1,219 or 1.01% are urban inhabitants. The Woreda cover with an area of 1,208.17 square kilometers, Basona Werana has a population density of 100.09, which is less than the Zone average of 115.3 persons per square kilometer.

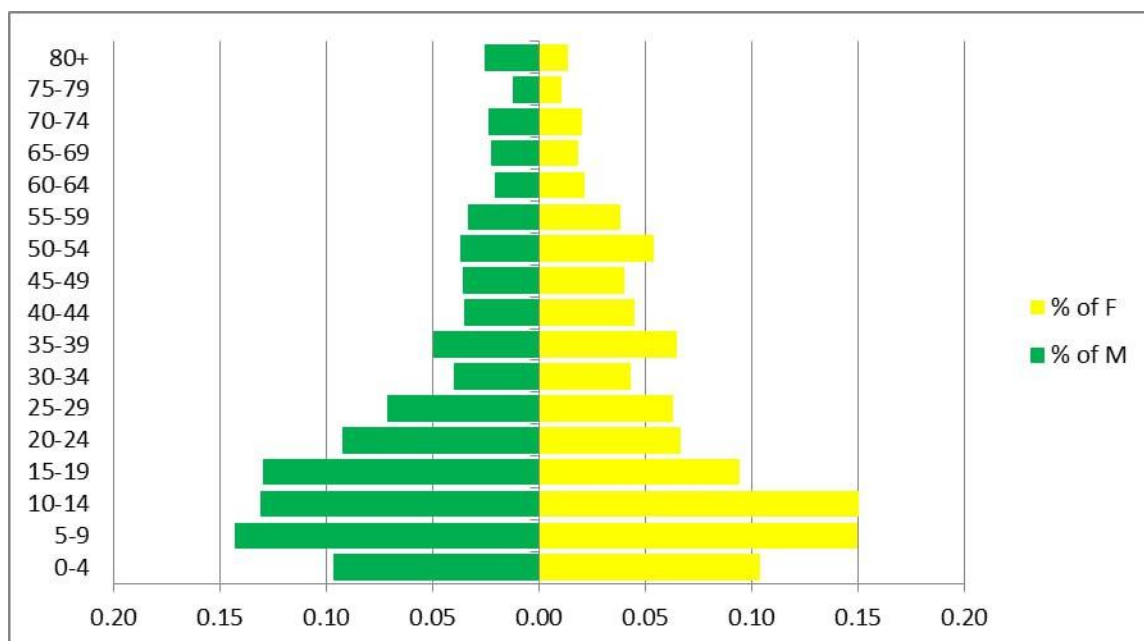
Total of 77663 households were counted in this woreda, resulting in an average of 4.36 persons to a household, and 26,918 housing units. The largest ethnic group reported in Basona Werana was the Amhara (98%), and others 2% are Oromo's. Amharic was spoken as a first language by 99.3%. In religious view the majority

of 92% Orthodox Christianity followers' others were protestant Christianity followers (2).

**Table 15: population size of basona worana for each kebele in 2023**

| No | Name of Kebele | Both urban + rural |         |       |
|----|----------------|--------------------|---------|-------|
|    |                | Males              | Females | Total |
| 1  | Mati           | 2123               | 1798    | 3920  |
| 2  | Chin brie      | 2175               | 1880    | 4055  |
| 3  | Gifat          | 2775               | 4031    | 6806  |
| 4  | Metqoriya      | 5019               | 1680    | 3630  |
| 5  | Moy meda       | 1534               | 1297    | 2831  |
| 6  | Moy amangult   | 2109               | 1782    | 3890  |
| 7  | Muticherkos    | 3199               | 2702    | 5901  |
| 8  | Dibut          | 2430               | 2027    | 4457  |
| 9  | Wayo           | 3672               | 3123    | 6795  |
| 10 | Debelie        | 3279               | 2876    | 6154  |
| 12 | Zendegur       | 1978               | 3094    | 3665  |
| 13 | Kasima         | 3454               | 1724    | 6629  |

|    |                |        |        |         |
|----|----------------|--------|--------|---------|
| 14 | Goshu ager     | 1962   | 1724   | 3686    |
| 15 | Abamotie       | 2316   | 1971   | 4287    |
| 16 | Gudobertzuriya | 1100   | 966    | 2066    |
| 17 | Gudobertketema | 1605   | 1410   | 3015    |
| 18 | Addisge        | 4443   | 3706   | 8149    |
| 19 | Basodengora    | 3253   | 2778   | 6032    |
| 20 | Chirarodebr    | 2476   | 2021   | 4479    |
| 21 | Mehalamba      | 2091   | 1747   | 3839    |
| 22 | Nas            | 3334   | 2877   | 6211    |
|    | Total          | 53,337 | 47,178 | 100,515 |



**Figure 17: Population pyramid of Basona Worana district, North Showa zone, 2015 E.C**

The total population of the district is 120,930, of which 61,924 are men and 59,006 are women. In terms of religion and ethnicity, more than 98% of residents are Amhara and 2% are Oromo in ethnic group and 92% of them are orthodox Christian religion followers.

### **Economic situation**

When we look at the economic source of the people of the district, The main source of income of the populations is agricultural productions, thus according to district agriculture office, 98% mainly depend on agriculture and farming; farmers grow monastic crops such as barley and wheat either for their own consumption or for market. About 2795 people are working in government offices on permanent and temporary basis. According to the data of the financial and economic office of the district, until this data was compiled on 21/02/2023, about 2846 unemployed people in different age groups were registered.

### **Budget and finance allocation**

According to the District Finance and Economic Office data, the district's annual budget for 2010 to 2014 E.C shows that there is an increment by 8% to 37.7% but for 2014/15 (2022/23) annual budget is 196,396,108 Birr. In 2014, the budget allocated for 32 kebeles was 8,826,102 birrs. In 2015, the budget allocated for 21 kebeles was 8,239,254 birrs, which is a decrease by 586,848 birrs compared to the previous budget. The reason for this is that 11 kebeles have been incorporated into Debre Berhan Region Pollutant city from their budget, but when we look relative to the number of kebeles, we do not see a decrease but an increase. Other than government, no additional budget has been allocated for the district health office, from donors or partners. The five-year budget we used for comparison above was adjusted before 11 kebeles were reduced and included to Debre Berhan city. But relative to 21 kebeles it was proportional.



**Table 16: Government budget allocated for Basona Werana woreda and its health office starting from 2010-2015 E.C.**

| year       | Annual<br>woreda<br>budget | Budget for<br>health sector | Compared to<br>woreda and<br>health budget<br>in% | Increment<br>with the<br>pervious<br>health budget<br>(%) |
|------------|----------------------------|-----------------------------|---------------------------------------------------|-----------------------------------------------------------|
| 1 2010E.C  | 140390535                  | 5,768,477                   | 4.1                                               |                                                           |
| 2 2011 E.C | 151829329                  | 7,189,821                   | 4.7                                               | 8.148                                                     |
| 3 2012 E.C | 171101045                  | 6,553,553                   | 3.8                                               | 12.69                                                     |
| 4 2013 E.C | 235594803                  | 8,835,148                   | 3.8                                               | 37.69                                                     |
| 5 2014 E.C | 272627518                  | 8,826,102                   | 4.5                                               | 15.72                                                     |
| 6 2015 E.C | 196396108                  | 8,239,254                   |                                                   |                                                           |

Health status & infrastructures in the district in 2014/15 E.C Health promotion, preventive intervention and curative services are working by 21 staffed health posts and 3 health centers. There are also 2 private clinics in the woreda that provide community health need services. All rural Kebele have 20 health posts that are staffed with one diploma nurse and for 14 health posts have two health extension workers and for 6 health post have three health extension workers. Health centers mainly provide basic curative health care services but also support health extension programs by acting as referral and technical assistance center for health extension workers. But not any hospital exists in the woreda.

## Health system

### Human resource in Basona Werana woreda health facilities

Table 17: Basona Werana woreda health office numbers of health professionals and others admin staff in 2014 E.C /2023 G.C

| SNO          | Health profession    | GRAND TOTAL |            |            |
|--------------|----------------------|-------------|------------|------------|
|              |                      | sex         |            | TOTAL      |
|              |                      | male        | female     |            |
| 1            | Health officer HO    | 9           | 2          | 11         |
| 2            | C/NURSE              | 5           | 11         | 16         |
| 3            | BSc nurse            | 4           | 2          | 6          |
| 4            | BSc midwives         | 1           | 1          | 2          |
| 5            | diploma midwives     | 1           | 7          | 8          |
| 6            | LAB                  | 2           | 3          | 5          |
| 7            | pharmacy             | 2           | 5          | 7          |
| 8            | HIT                  | 2           | 1          | 3          |
| 9            | field epidemiology   | 0           | 1          | 1          |
| 10           | MPH                  | 2           | 1          | 3          |
| 11           | nutrition            | 2           | 0          | 2          |
| 12           | environmental health | 4           | 0          | 4          |
| 13           | HEW                  | 0           | 46         | 46         |
| 14           | admin                | 20          | 23         | 43         |
| <b>Total</b> |                      | <b>54</b>   | <b>103</b> | <b>157</b> |

Based on the existing health professionals and total population of the woreda, the ratio of health facility to population and health professional to population is almost equivalent to the standards, except health center to population there were 8,505 populations are loaded to available health centers.

**Table 18: Ratio of HF & health professionals to the population in 2014 E.C**

| S. N | Name of Facility or health professional | Population with HF or health professional Ratio in woreda | Standard ratio    |
|------|-----------------------------------------|-----------------------------------------------------------|-------------------|
| 1.   | Health center to population             | 1:33,505                                                  | 1: 25,000         |
| 2.   | Health post to population               | 1:4,787                                                   | 1: 5,000          |
| 3.   | Health officer to population            | 1:9,138                                                   | No known standard |
| 4.   | Nurses (BSc & diploma) to population    | 1:4,569                                                   | 1: 5000           |
| 5.   | Midwifery to population                 | 1:10,051                                                  | No known standard |
| 6.   | Health extension worker to population   | 1:2,186                                                   | 1 : 2,500         |

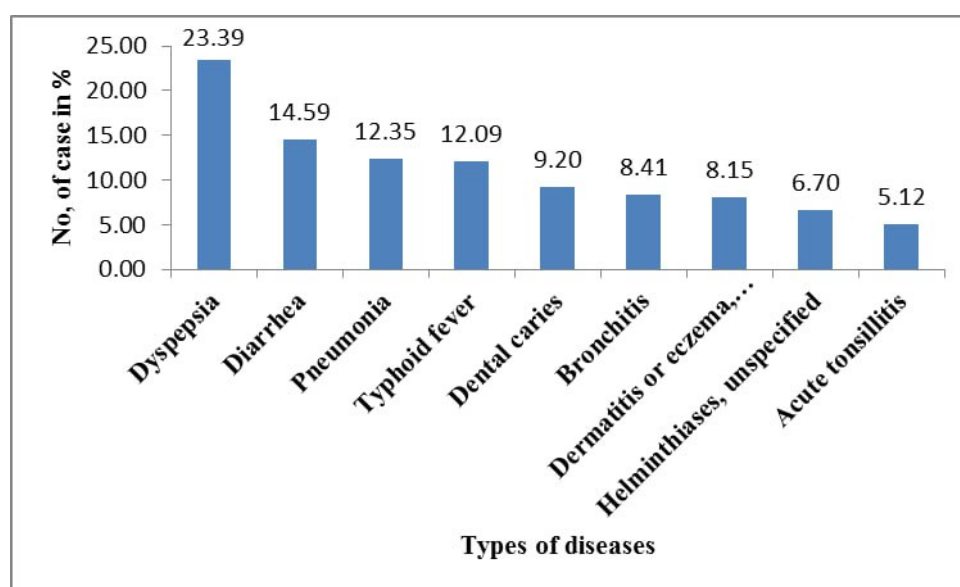
**Table 19 causes of morbidity, mortality & admission in the woreda**

| Types of disease                                  | Numbers of case | In % |
|---------------------------------------------------|-----------------|------|
| Diarrhea                                          | 172             | 29.7 |
| Pneumonia                                         | 169             | 29.1 |
| Other specified upper respiratory tract disorders | 54              | 9.3  |
| Acute tonsillitis                                 | 43              | 7.4  |
| Dermatitis or eczema, unspecified                 | 38              | 5.6  |
| Typhus fever                                      | 33              | 5.7  |
| Upper respiratory tract disorders, unspecified    | 28              | 5.7  |
| Helminthiasis, unspecified                        | 25              | 4.3  |
| Giardiasis                                        | 6               | 1.0  |
| Scabies                                           | 12              | 2.1  |
| Total                                             | 580             | 99.9 |

The leading cause of Under-five and adult OPDs visit were diarrhea and typhoid fever respectively. Most of the children under the age of five in the district & health facilities are suffering from diarrhea. Diarrhea is comparatively more common in children, but affects people of all age groups, according to the report format of the health office. Typhoid fever was more common in adult OPDs. From all cases of above five years of age, 100 % were outpatient cases of Typhoid fever because there was no inpatient service in the woreda health facilities. Similarly, from all of diarrhea cases under five years of age were outpatient and not inpatient service. Pneumonia and dyspepsia were the second leading cases of under-five and adult OPDs respectively

**Table 20: Top ten leading causes of OPD Visit in the Basona Worana Woreda Health under five years Children**

The leading cause of under-five years Children visits, and admission rate of the district community was diarrhea. All age groups of the population were affected by diarrhea, From all cases of under five years of age, 172(29.7%). Out of the 172 cases who came to the district health facilities, 162(94.2%) of them were treated and recovered, and 9(5.8%) of them were referred to get better medical services because there is no inpatient service in the district. And there was no death caused by the diarrhea.



**Figure 18: Top ten causes of morbidity of above five years of age in the Basona Worana Woreda Health office in adult**

The leading cause to adult OPDs visit of the district community was typhoid fever. All age groups of the population were affected by diarrhea, from all cases of under five years of age, 356(23.7%).

Out of the 356 patients who came to adult OPDs, 329(92.4%) of them were treated and recovered, and 27(7.6%) of them were referred to the zone hospital for better treatment because there is no inpatient treatment service for both adults and under-five children in the district. 2 deaths were also reported due to typhoid fever.

### **Birth and Death Notification**

Birth and death rates are the main determinant of population size within a specified location and period. The birth and death data are used as evidence or accepted only if it is recorded in health facility registration. For the health sector of our country, no other means to acquire data of all birth and death occurred in a community within a year or any period unless it recorded health facility.

In addition, it is not common to go to health facility when the health condition of a person is reached to death. In our country, the most common information is given only when the child is born or died in the health facility, but if the childbirth and death are outside the health facility, it is not customary to come to the health facility of the childbirth and death to provide the information.

Even after birth in a health facility, if it is estimated that there are health problems that are considered to be life-threatening and a referral is sent, or after they are born and discharged home in good condition, if a sudden health problem occurs and they die before they reach the health facility, the parents are not used to telling the health facility about the death. Birth and death data may be because the data of children who died due to these reasons were not given and not recorded. Due to this and other reasons, basona worana woreda health office died not recorded within a year in the district. Therefore, the data shows that there was no death among the children born.

## Status of primary health care components

### MCH service status in Basona worana Woreda in 2014 E.C

#### *Child health*

Infant vaccination coverage is relatively low because there are more than thousands of children who have not completed their fully vaccinated schedule. For example, 1228 children didn't uptake full Penta vaccine, and 1179 children also didn't get Rota vaccine.

**Table 21: Child vaccination service coverage in Basona Werana woreda**

| S. N | Types of vaccine             | Plan   | Coverage | Coverage% |
|------|------------------------------|--------|----------|-----------|
| 1.   | BCG                          | 4031   | 2620     | 65        |
| 2.   | Pneumococcal conjugate (PCV) | 1 4031 | 2881     | 71        |
|      | Vaccine                      | 3 4031 | 2803     | 70        |
| 3.   | Rota                         | 1 4031 | 2881     | 71        |
|      |                              | 2 4031 | 2852     | 71        |
| 4.   | Penta                        | 1 4031 | 2881     | 73        |
|      |                              | 3 4031 | 2803     | 70        |
| 5.   | Meningococcal vaccine (MCV)  | 1 4031 | 2519     | 62        |
|      |                              | 3 4031 | 2419     | 60        |
| 6.   | Measles                      | 4031   | 2883     | 72        |
| 7.   | Fully immunized              | 4031   | 2580     | 64        |

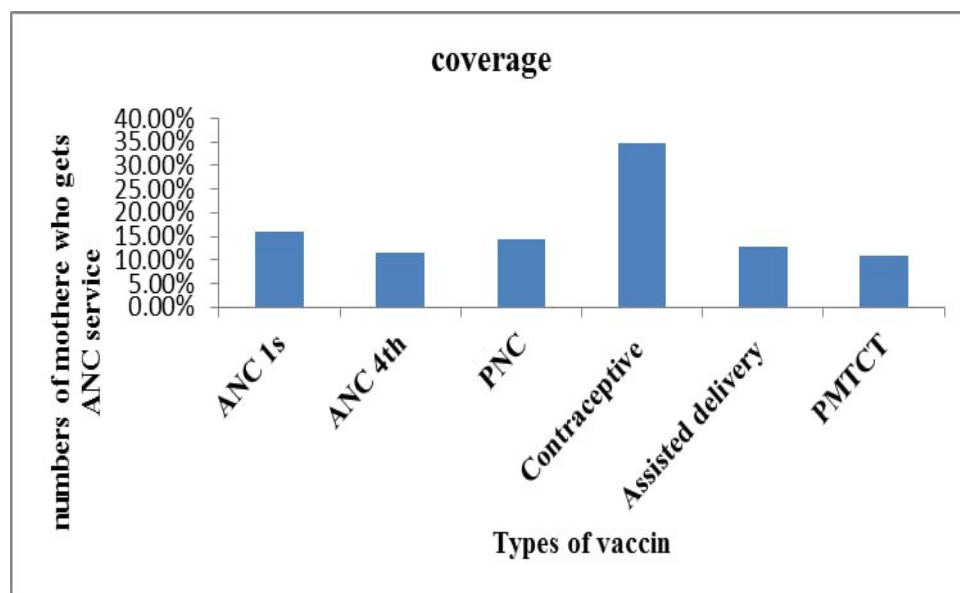
#### *Maternal health*

When we look at the maternal health services coverage, apart from the first round of ANC and PNC services, the others are not impressive and need attention because when we compare their performance with the plans, it is not that much. In the district there were 4,279 pregnant women and about 3,348(78%) mothers have got first round ANC service and from 4,279 pregnant women about 2,410(56%) have got at least fourth visits services. Contraceptive Prevalence was 70.4% and assisted delivery

coverage was 63%. The PMTCT coverage was 2268(53%), there were no positive to HIV.

**Table 22: Maternal health service coverage in Basona Werana Woreda**

| S. N | Service                     |                       | Plan   | Coverage | Coverage % |
|------|-----------------------------|-----------------------|--------|----------|------------|
| 1.   | ANC                         | 1 <sup>st</sup> round | 4,279  | 3,348    | 78         |
|      |                             | 4 <sup>th</sup> round | 4,279  | 2,410    | 56         |
| 2.   | PNC                         |                       | 4,279  | 2995     | 70         |
| 3.   | Contraceptive<br>Prevalence |                       | 10,426 | 7,345    | 70.4       |
| 4.   | Assisted delivery           |                       | 4,279  | 2696     | 63         |
| 5.   | PMTCT                       |                       | 4,279  | 2268     | 53         |
| 6.   | TT2+for pregnant            |                       | NR     | NR       | NR         |



**Figure 19: Maternal health service coverage in number in Basona worana woreda**

### **Environmental health conditions in the woreda**

Sanitation coverage of basona Werana woreda was 100% in 2014 EFY, this means all households have own latrine. Access to safe water coverage of the woreda was from all kebeles 24084(80.5%) household get safe water supply and 83% from urban and

80.4% from rural get safe water supply. However, 5834(19.5%) households haven't any safe water supply system up to 2014 E.C. all 21 kebeles were open defecation free (ODF).

**Table 23: Environmental health condition for Basona Werana woreda in 2024**

| S. N | Service                                               | Numbers (%)   |       |       |
|------|-------------------------------------------------------|---------------|-------|-------|
| 1    | Total latrine in the district                         | 18756 (62.7%) |       |       |
| 2    | Numbers of HH having latrine                          | 4250(1.4%)    |       |       |
| 3    | Safe water coverage                                   | 29918HH       | Urban | Rural |
|      |                                                       |               | 83%   | 80.4% |
| 4    | Number of kebeles fully accessed to safe water supply | 21(100%)      |       |       |
| 5    | Open Defecation Free (ODF) kebeles                    | 6(28.6%)      |       |       |

### **Health Education services**

Awareness creation or health education and community mobilization also referred to as life skills-based education is used to acquire knowledge and to develop attitudes and skills which support the adoption of healthy behaviors. Health education is used as a tool to promote primary health components in the community. Without awareness creation or health education and community mobilization about healthy behaviors the community residents will not act well to prevent their health from any risks.

In Basona Werana woreda, about 31369 people participated in health education about non communicable & 28754 peoples about communicable diseases in 2014 E.C. In malaria prevention and control program 8 campaigns addressed. As you have seen on the next table others like child health, nutritional awareness is provided in 2014 E.C. and in 2015 planed it to improve and addressed it by 50% from the privacies.

### **Communicable disease prevention and control in each woreda health facility**

The strategic, simultaneous use of different classes of prevention, to respond to the specific needs of audiences and modes of HIV transmission, and to make efficient use



of resources through prioritizing, partnership, and engagement of affected communities.

**Table 24: PICT, VCT and HCT 12 Months Achievement/2014 E.C**

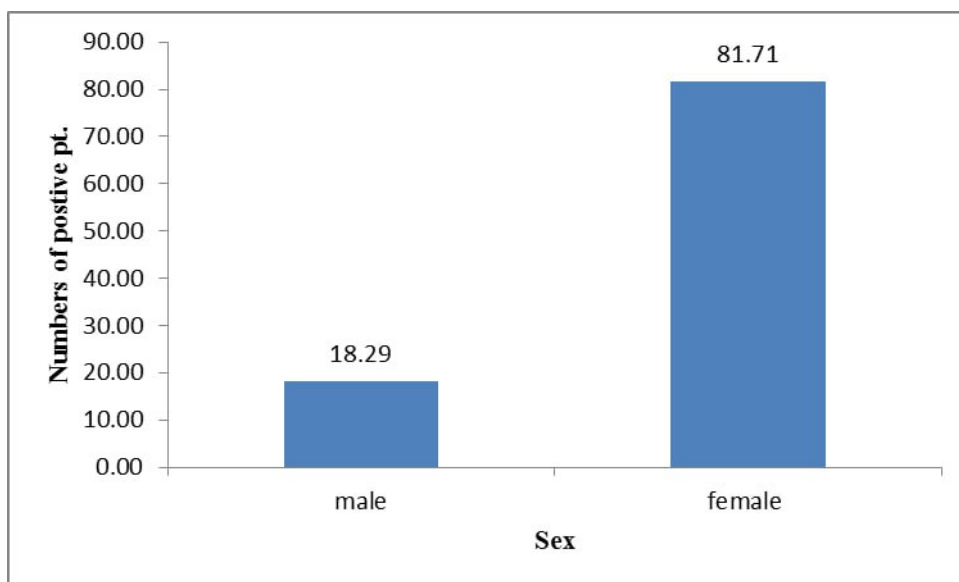
| Name Health facility | PICT   | VCT   | HCT   |
|----------------------|--------|-------|-------|
| Woreda health center | 6681   | 685   | 7366  |
| Atseminilik H.C      | 2318   | 8     | 2326  |
| Bereager             | 1089   | 209   | 1298  |
| Gift                 | 591    | 32    | 623   |
| Gudo beret           | 967    | 102   | 1069  |
| Goshbado             | 364    | 150   | 514   |
| Keyit                | 1352   | 184   | 1536  |
| Total                | 13,362 | 1,370 | 14732 |

VCT and PICT services were provided to the community in all health centers. However, VCT lacked any qualified medical personnel. Additionally, customers received HIV/AIDS health education in all health centers. Conversely, health extension workers provided health education to the community in all health posts while also facilitating the timetable for VCT services in the health post.

Main streaming was introduced in nearly every industry. Approximately twenty-seven sectors began allocating two percent of their budget to HIV-related activities. This budget provided financial support to about 20 PLWHA.

#### **Prevention and control of HIV/AIDS**

About 14,732 people were tested for HIV in 2014 E.C, of them 13,362(90.7%) by PICT and the rest 1,370 (9.3%) are tested by VCT service. From the total tested, 82 were positive for HIV. Based on HMIS report, most tested at woreda health office and females were more affected than males. All positive patients took ART drug.



**Figure 20: Number of positive people with HIV & taken ART drug in basona Werana woreda, 2014**

#### **Nutrition intervention program**

Nutrition is a major factor in bringing out the maximum potential that one is endowed both physically and mentally. Widespread malnutrition is largely a result of dietary inadequacy and unhealthy lifestyles. The great advantage of looking at malnutrition as a problem in human ecology is allowing for variety of approaches towards its prevention.

Basona Werana woreda has 37 outpatient therapeutic Programme (OTP) site and 6 therapeutic feeding units. Woreda health office coordinated with agricultural office to provide cooking demonstration, and they are working once a month to create awareness about food diversity by assigning one day as the Food Field Day.

#### **Disaster status in the woreda**

No disasters happened in all woredas but there are IDP sites in the surrounding zonal city Debre Berhan town and they participated in different roles like nutritional and disease prevention activities with collaborating agricultural sectors and different woreda stakeholders. But they have no list of their activities that are recorded in document.

### **Educational coverage in Basona Werana woreda**

Education has its own role to increase awareness of disease prevention and control methods way of quality of life and decreases the spread of communicable and non-communicable diseases, the acceptability of utilization of health services. As you can see table 10: In the year 2014 E.C. there were 47 schools in the district with a total of 12,039 students, 6,266 (52.1%) male and 5,773 (48.9%) female

**Table 25: School coverage proportion by Sex in Basona worana woreda, 2014 E.C**

| Grade level | sex   |        |        | Proportion in % |        |
|-------------|-------|--------|--------|-----------------|--------|
|             | male  | Female | Total  | Male            | Female |
| 1-6         | 4,949 | 4,434  | 9,383  | 52.7            | 47.2   |
| 7-8         | 1,317 | 1,339  | 2,656  | 49.6            | 50.4   |
| 1-8         | 6,266 | 5,773  | 12,039 | 52.1            | 48.9   |

In school, students celebrate and practice different health days with their teachers and unit leaders like sport for health, HIV Day, environmental cleaning campaign day and hand-washing day.

### **Drug and need prevalence in the woreda health facilities**

It makes the health service more efficient when there is a supply of medicine according to the needs of the patient and the health professional. If this is not balanced, it will inevitably create a gap in the healthcare service. There is disproportion between client drug need and provision of drugs to the woreda health facilities. In the woreda total number of clients received prescription for drug requirement were 6, 4958 patients but number of clients received 100% prescribed drugs were 4, 7770 so the gap between need and distribution was 1, 7188 deference. Look the bottom table 11.

**Table 26: Total number of clients received prescription Vs. Number of clients received 100% prescribed drugs 2014 in each health facility**

| Facility             | Total number of clients received prescription | Number of clients received 100% prescribed drugs | Difference |
|----------------------|-----------------------------------------------|--------------------------------------------------|------------|
| Woreda health center | 32,933                                        | 24,339                                           | 8594       |
| Atseminilik          | 3,209                                         | 2,484                                            | 725        |
| Bereager             | 8,057                                         | 7,594                                            | 463        |
| Gift                 | 3,749                                         | 2,800                                            | 949        |
| Gudoberet            | 4,357                                         | 4,162                                            | 195        |
| Goshubado            | 5,510                                         | 5,387                                            | 123        |
| Keyit                | 7,143                                         | 1,004                                            | 6139       |
| Total                | 64958                                         | 47770                                            | 17188      |

#### **Major gaps identified**

- Health center to population was not proportion standard ratio is 1: 25,000 but 8505 population was
- Woreda was not given in patient service
- There were no secondary and preparatory school to woreda
- Low like Penta and Rota
- No report to TT2+for pregnant and non-pregnant mothers
- Low coverage for 4th round ANC service
- Generally poor documentation system

#### **Discussion**

The Woreda covers an area of 1,208.17 square kilometers with a population density of 00.09, which is less than the Zone average of 115.3 persons per square kilometer. A total of 27,753 households were counted in this woreda, resulting in an average of 4.36 persons to a household, and 26,918 housing units.

Basona Werana woreda health profile indicates that the general health coverage has reached 80.5%. But Infant vaccination coverage was low relative to regional and

national performance. Expanded immunization program is one of preventions and control measures program performed under child health department.

WHO set EPI coverage target for the control of vaccine preventable diseases. Basona Werana woreda in the last five years, the overall EPI performance was less than the target. Penta 3 coverage was 70% so it was less than regional and national performance of 2014, which was 87% and 84.7% respectively. In addition, measles and fully immunization coverage in basona worana woreda was 72% and 64% respectively it also was less than regional and national coverage like that of penta 3, which was 84% and 81.5% measles and 79.6% and 74.5% fully immunization coverage at regional and national level respectively. But the newly introduced vaccine (PCV-3) coverage was less than national target, 85% and 86% for regional but for basona Worana woreda PCV- 3 coverage was 70%. Similarly low coverage of BCG and Rota -2 in this woreda relative to regional performance 81% for BCG AND 73% for Rota but in the woreda 65% and 71% respectively.

Globally, there are nearly 1.7 billion cases of childhood diarrheal disease and is responsible for killing around 525 000 children every year. According to diarrhea epidemic control guideline diarrheal can be caused by a variety of bacterial, viral and parasitic organisms.

Infection is spread through contaminated food or drinking water, or from person-to-person because of poor hygiene. Interventions to prevent diarrhea, including safe drinking-water, use of improved sanitation and hand washing with soap can reduce disease risk. Diarrhea disease was most frequently occurred and leading cause of health problems under- five years old to the basona worana woreda community for the past five year. Following diarrhea, Pneumonia had occurred diseases in the woreda.

However, the safe water and latrine coverage of the woreda shows that it is around 80.7% and 85% respectively, so the reason for the spread of diarrhea may be due to the 20% of personal and environmental sanitation gaps that are not covered, as well as improper food handling or processing and shortage of food and other nutrients or minerals. On the other hand, just having adequate coverage of safe drinking water and

latrine only cannot prevent or stop the disease, because if the community does not understand the usage system, it will be random and the disease will continue to spread and can be considered as a reason for the spread of the disease.

The other most frequently occurred and leading case was typhoid fever, which is widely spread in the woreda, especially among adults. In most cases, the causes of diarrhea and typhoid fever are similar. In addition to the reasons I have mentioned above for diarrheal disease, the problems of eating raw foods bought from the market and not diagnosing and screening people who are sick with the disease, and not vaccinating at the right time can be considered as reasons because rotaviruses are the most common cause of severe diarrheal disease in young children throughout the world.

To reduce maternal mortality rate different activities are delivered at health post and health center level in the woreda. ANC service is one of the activities done in all health facilities and 78% of the pregnant women in the woreda were taken 1st visit ANC services within five years and the accessibility of the service is not that much deference to national performance, 82% compared to 2003 national report. On the other hand, PNC coverage was 70% and it was better than national, 42.1% performance of 2003. All over the country including basona Werana woreda, coverage of delivery services attended in health facility was good performance.

Delivery attended in the past five years at health facilities in basona worana woreda was 63% by skilled professional with national, 31.3% performance of 2003. However, federal ministry of health is working on it to increase utilization of delivery services by implementing health developmental armies, by skilled professional on clean and save delivery, and supplying delivery kits to health facilities. To give quality health service to the community and to get acceptance from the community infrastructure is the major and the key component.

As Human systems dynamics (HSD) prepares plans, health post was constructed in each kebele. In basona Werana woreda one health post serve for 4,787 populations and it meet the HSD plan target (1: 5,000 population). On the other hand, to give

delivery and other services for water supply and electric power is important. But 18 health posts had no water and electric power supply in the health post, but water supply is available in all kebeles and only 3 kebeles had electric power and water supply. In basona worana woreda one health center was served for 4,787 populations and greater compared to national performance, 1: 5,000 population in 2020.

In addition, in the woreda primary hospital were not constructed yet. According to the assessment of the woreda at the beginning of 2015 there were health workforce densities of about 0.011, 0.016, 0.006 ,0.002and 0.46 per 1000 population for Health officer HO,C/NURSE, BSc nurse, BSc midwives and health extension worker respectively (HO 1:45502, C/Nurse 1:6283, BSc nurse 1:16753 BSc M. Wife 1:50258, and HEW 1:2185). Compared to 2006 national report relatively it is low, which was HO 1:38619 at national level, Nurse 1: 13920, M. Wife 1:53238 and HEW 1:5390 national level.

On the other hand, the available health workers are 11 HO, 22 nurses (BSc and Diploma), BSc. mid wife and diploma 10, pharmacy 7, laboratory 5, field epidemiology 1, environmental 4, nutrition 2, and 3 HIT with a total of 65 health workers who are working in health centers.

**Conclusion:** Based on findings of woreda health profile assessment, in basona Werana woreda utilization health service was good like PNC, assisted delivery and others. On the other hand, some health indicators are below the target or the standard, and they need improvement. Those gaps which needs improvements such as immunization or vaccine of Penta, measles, Rota and safe water supply, typhoid fever and diarrhea prevention measures, low outpatient per capita, high health workers to population ratio, high health center to population ratio, health centers and health posts were without water and electric supply, absence of high school and primary hospital were some of the major problems.

**Recommendation:** Services which were in a good status during the study time should be improved and maintained like ANC, EPI, and family planning services and Services which was less than the target or expected during the study period should be need improvements within short period of time for the better health of the community as well to achieve national and global targets.....the staff of the woreda health facilities should carry out intensive community mobilization and awareness creation work on child vaccination and maternal health as well as birth control services. Addressing unfulfilled needs such as schools and health centers by talking with the relevant government and other stakeholders like zonal and regional health and education office. In addition, district health office should improve documentation and data filling systems, giving a capacity building for professional bout data quality and management. District water and energy office should give immediate remedy for communities which are without safe water supply system. I would like to emphasize that the delivery of medicine and other logistical supplies should be done at the right time. Fill the gaps by communicating and collaborating with other governmental and non-governmental partners.



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## ANNEXES IV: Checklist for Health Profile Assessment

### 1. Historical Aspects of the area (if available)

1.1. How and why the name given basona worana for the district? \_\_\_\_\_

1.2. When was the district established? \_\_\_\_\_

1.3. Any other historical aspect \_\_\_\_\_

### 2. Geography and Climatic condition

2.1. Map of the district

2.2. Square area of the district \_\_\_\_\_

2.3. Altitude \_\_\_\_\_ latitude longitude

2.4. Average Annual rain fall \_\_\_\_\_

2.5. Average Annual temperature \_\_\_\_\_

2.6. Distance from: zone town Region town Addis Ababa

2.7. Types of climates

2.8. Land bodies \_\_\_\_\_

2.9. Water bodies \_\_\_\_\_

### 3. Political and administrative organization

3.1. Total number of Kebele: \_\_\_\_\_

3.2. Rural \_\_\_\_\_

3.3. Urban \_\_\_\_\_

3.4. Boundaries, north, east, west south

### 4. Population & population structures- Demographic information

4.1. Estimation of total Population in 2007 E.C 2008 E.C

4.1.1. Male

4.1.2. Female

4.1.3. Urban

4.1.4. Rural Household

4.2. Population size

a) lt;1 year

b) lt; 3 years

c) lt;5 years

d) lt;15 \_\_\_\_\_ 15-24 \_\_\_\_\_

e) it; 65 Years \_\_\_\_\_

4.3. Estimated Population size by Kebele

4.4. Types of religion found in the district and estimation

4.5. Ethnic Composition

Types of ethnic No %

a. Amhara c. Oromo e. Sidama Tigrie

b. Siltie d. Guragie f. Gamo

## **CHAPTER 6: Disaster Response**

## **Public health emergency disaster situation report in Gedeo zone, Serot September 30, 2023**

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### **Executive Summary for public health disasters response**

This report shows a thorough assessment of the flooding situation in (Kalehiwot village, Sesole Kebele) of Gedeb Town, Gedeo Zone, with a specific focus on the occurrences from September 16-18, 2023, along with subsequent rainfall on October 24-25, 2023. It emphasizes the effects on the community, identifies risk factors, and acknowledges the commendable response efforts by the Gedeb town administration to mitigate the crisis. Additionally, the report provides pertinent recommendations for swift and effective action.

### **Background:**

Last September 16-18, 2023, 66 households were displaced due to flooding caused by continuous heavy rainfall lasting for three days, from September 16 to September 18, 2023 heavy rains. An additional two-day rainfall event occurred on October 24-25, 2023, further exacerbating the situation.

So currently 66 HH have been displaced from their homes and are sheltering with the surrounding community. However, due to the emergency, various things such as huts and shanty houses were damaged by the flood and faced the risk of being completely or partially destroyed. Therefore, because of these things, such as fountains and other tap water that were used for drinking, there is a possibility of contamination and they can be the main reason for the spread of cholera, so much works have been done so far. However, a multi-stakeholder approach is needed to permanently solve the problem and return people to their homes. Also, the area is prone to malaria, so it's better to be careful now.



- **Affected Population:**
- Total Affected: 423 individuals from 66 households
- Family Heads: 60 male, 6 female
- Severely Affected: 28 individuals requiring urgent intervention
- Pregnant Women: 7
- Lactating Women: 5
- Under 5 Children: 49
- Severe Acute Malnutrition (SAM) Cases Linked to OTP:1
- Students: 38

#### **Infrastructure and livelihood impact**

- Latrines: Damaged and overfilled, posing a significant health risk.
- Hand Dug Wells: Destroyed, impacting access to clean water.
- Agricultural Crops: Significant damage to Enset, maize, and cabbage.



**Risk Factors:**

- Cholera Outbreak: Gebeb town shares borders with woredas affected by a cholera outbreak, heightening the risk of disease transmission.
- Sanitation: Overfilled latrines and damaged wells contribute to unsanitary conditions, increasing health hazards.
- Overcrowded living conditions due to displacement

**Response and Interventions:****Works done so far**

- Experts from Zone, district and EPHI went to the place to identify the factors that can be the cause of various infectious diseases and give awareness to the public to be careful and prevent them.
- Severe Acute Malnutrition (SAM) Cases Linked to OTP
- Work to save lives of people and animals
- Identification of mothers and children with food problems
- Severe Acute Malnutrition (SAM) Cases Linked to OTP
- Identification of mothers and children with food problems
- Provide various food products such as flour and other nutritious foods to avoid food problems
- Distribution of water treatment chemicals at appropriate levels
- Drain the accumulated water even temporarily
- Providing psychological education to the displaced/victims of society
- To take the injured people to treatment and make them receive treatment
- The Gedeb town administration, in coordination with the community, undertook commendable efforts to address the crisis:
- Flood Diversion: The community actively participated in redirecting flood waters, mitigating overflow within the village.

- Health care Services: Hospital services provided free of charge to affected individuals.
- Health Education: Health education disseminated to prevent potential outbreaks.
- Water treatment chemical provision: Aqua tabs distributed to ensure safe drinking water for the affected community.
- Cholera Prevention: House-to-house mobilization efforts to prepare for cholera prevention.
- Food Assistance: Food items, including barley flour, distributed to malnutrition-affected communities.

#### Conclusion:

- The flooding in Gebeb town has had significant impacts on the community, particularly affecting vulnerable groups such as pregnant women, lactating mothers, and children under five.
- The response efforts led by the Gedeb town administration, in collaboration with the community, have been crucial in alleviating immediate challenges.
- However, sustained efforts are required to address ongoing risks, including sanitation concerns and the potential for disease outbreaks. Continued support, both in terms of resources and expertise, is essential to ensure the recovery and resilience of the affected population.

#### Recommendations:

In response to the flooding situation in Gebeb town, Gedeo Zone, the following tailored

recommendations are put forth to effectively address the needs of the affected population and mitigate future risks:

For Partners, including WHO and NGOs:

1. Partner organizations, including WHO and NGOs, should actively mobilize resources, including funding, relief supplies, and technical expertise, to support the affected communities and the overall response.
2. Offer training and capacity-building opportunities to local authorities and healthcare workers to enhance their response capabilities and flood risk management.
3. Foster collaboration and coordination among partners and stakeholders to ensure a harmonized and efficient response, with a focus on complementary activities and



resource allocation.

4. Conduct localized hygiene promotion campaigns and health education activities to raise awareness and enhance community resilience.
5. Oversee the provision of emergency shelter and the repair of sanitation facilities, such as latrines, at the woreda level.
6. Strengthen disease surveillance and reporting mechanisms, facilitating early detection and response to potential outbreaks.



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## **Chapter 7: Scientific manuscript**

**Magnitude and factors associated with treatment interruption among HIV-positive adolescents in selected public hospitals, Addis Ababa, Ethiopia 2025.**

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## Abstract

**Background:** According to the 2018 UNAIDS report, an estimated 1.6 million adolescents aged 10–19 years were living with Human Immunodeficiency Virus (HIV) worldwide. Although antiretroviral therapy (ART) programs have expanded rapidly and are freely available in Ethiopia, treatment interruption remains a major public health challenge.

**Objective:** To assess the magnitude and factors associated with treatment interruption among adolescents living with HIV in four public hospitals of Addis Ababa, Ethiopia.

**Methods:** A cross-sectional study using retrospective record review of patient charts and computerized medical records was conducted from September 2020 to December 2022. Data were collected from 297 adolescent patients, proportionally allocated to the four hospitals based on patient flow. Data extraction was performed using a structured form by trained ART clinic medical staff. After data cleaning and coding in Microsoft Excel, the dataset was exported to SPSS Version 26.0 for analysis. Descriptive statistics were computed, and both Bivariate and multivariate logistic regression analyses were performed to identify factors associated with ART interruption. Adjusted Odds Ratios (AOR) with 95% Confidence Intervals (CI) were reported, and variables with p-values <0.05 were considered statistically significant.

**Results:** Among the study participants, 17.5% (95% CI: 9.56–33.38) experienced at least one interruption in their ART appointments. Factors significantly associated with ART interruption included the presence of oral thrush (AOR = 3.34, 95% CI: 1.47–7.59), not taking Cotrimoxazole prophylaxis (AOR = 3.42, 95% CI: 1.42–8.24), having only one year on ART (AOR = 3.75, 95% CI: 1.47–9.55), not taking Dolutegravir-based regimens (AOR = 3.85, 95% CI: 1.60–9.27), and being in WHO clinical stage I (AOR = 3.50, 95% CI: 1.25–9.78) or stage II (AOR = 3.52, 95% CI: 1.02–12.12).

**Conclusion:** Nearly one in five adolescents living with HIV experienced ART interruption. Targeted interventions to enhance adolescents' understanding of ART importance, strengthen adherence counseling

**Keywords:** Antiretroviral Therapy, Treatment Interruption, Adolescents, HIV/AIDS, Determinants, Ethiopia.

## 1. Introduction

Human Immunodeficiency Virus (HIV) continues to pose a significant global public health challenge. According to the UNAIDS 2018 report, approximately 1.6 million adolescents aged 10–19 years were living with HIV globally. Adolescents represent a vulnerable population with unique psychosocial and developmental challenges that may influence their adherence to lifelong ART.

In Ethiopia, ART has been scaled up nationwide and is provided free of charge in all public hospitals. Despite this, treatment interruption remains prevalent, undermining the effectiveness of ART programs. Interrupting ART can lead to virologic failure, drug resistance, disease progression, and increased risk of transmission. Understanding the factors contributing to ART interruption among adolescents is vital to improving treatment outcomes and achieving the UNAIDS 95-95-95 targets.

## 2. Objective

This study aimed to determine the magnitude and associated factors of ART interruption among adolescents living with HIV in selected public hospitals of Addis Ababa, Ethiopia.

## 3. Methods

### 3.1. 2.1 Study Design and Setting

A facility-based cross-sectional study was conducted using retrospective record review from September 2020 to December 2022 in four public hospitals in Addis Ababa, Ethiopia. These hospitals provide comprehensive HIV care and treatment services.

### **3.1. Study Population and Sample Size**

The study included all adolescents aged 10–19 years who were enrolled in ART follow-up during the study period. A total of 297 adolescent records were selected proportionally from the four hospitals based on patient flow.

### **3.2. Data Collection Procedures**

Data was extracted using a structured checklist from both patient charts and electronic medical records. Data collectors were ART clinic medical staff trained in data abstraction. The collected data were cleaned, coded, and entered Microsoft Excel, then exported to SPSS version 26.0 for analysis.

### **3.3. Data Analysis**

Descriptive statistics such as frequencies and percentages were used to summarize the data. Bivariate and multivariate logistic regression analyses were performed to identify factors associated with ART interruption. Variables with a p-value <0.05 in the multivariate model were considered statistically significant.

### **3.4. Ethical Considerations**

Submit my research plan to Addis Ababa university school of public health ethical review board (IRB) and Addis Ababa Health Bureau ethical review board for approval, ensuring that the proposed participant population, recruitment methods, sensitivity of information collected, and data collection methods are adequate for maintaining confidentiality and protecting participants' privacy. And then Ethical clearance was obtained from Addis Ababa university health science Campus ethical review committee and further letter was obtained from Addis Ababa Health Bureau ethical review board. Since, we were going to collect secondary data from the participant's medical and electronics medical charts; informed consent wavier was requested and if they have phone numbers and call by their health care giver who were working in ART room and then approach them to investigate about their reasons for interruption.

## 4. Results

### 4.1. Participants' Sociodemographic characteristics in the study

A total of 297 HIV positive adolescent patients participated with a 100% response rate. Most respondents 283(95.3%) were in the 15–19 age range. 126 (42.4%) of the participants had completed their secondary education. 243 (81.8%) of the respondents were single. Most respondents 85 (28.6%) were students. **(Table 1)**

**Table 27** shows the frequency distribution among adolescents who are HIV positives adolescents based on Sociodemographic characteristics of participants (n=297).

| Sociodemographic Variables | Category            | Frequency | Percent |
|----------------------------|---------------------|-----------|---------|
| Sex                        | Female              | 178       | 59.9    |
|                            | Male                | 119       | 40.1    |
| Age                        | 10-14               | 14        | 4.7     |
|                            | 15-19               | 283       | 95.3    |
| Marital status             | single              | 243       | 81.8    |
|                            | Married             | 35        | 11.8    |
|                            | Divorced            | 17        | 5.7     |
|                            | Widowed             | 2         | .7      |
| Occupational status        | Student             | 85        | 28.6    |
|                            | No work             | 73        | 24.6    |
|                            | Daily laborer       | 61        | 20.5    |
|                            | Female sex worker   | 31        | 10.4    |
|                            | Housewife           | 25        | 8.4     |
|                            | merchant            | 14        | 4.7     |
|                            | private employee    | 8         | 2.7     |
|                            |                     |           |         |
| Educational status         | No formal education | 53        | 17.8    |
|                            | Primary             | 118       | 39.7    |
|                            | secondary           | 126       | 42.4    |

## 4.2. Clinical characteristics

Over 65.3% of the participants were in WHO stage I at the time of the study, and Participants with a BMI (kg/m<sup>2</sup>) **18.5-24.99** and **<18.5** were interruption in treatment (55.6%) and 35.0%, respectively, then those with a BMI between 25 and 30+. At the time of recruitment, sixty-seven (22.6%) study participants had been receiving antiretroviral therapy (ART) longer than one year, compared to patients who had been receiving treatment for less than a year. Merely 36.7% of the participants were placed in a medication combination based on DTG at the time of the investigation. Of the adolescents, 24 (8.1%) had a history of tuberculosis infection during their lifetime. Of the adolescents, 11.8% were married and 4.0% were pregnant at the time of the study.

Comparing patient's treatment regimen, more participants, 72% of the individuals were on a first-line regimen, and 29.3% of participants had viral load suppression. Furthermore, 26.3% of participants were poorly adhered to antiretroviral therapy (ART). Of those 52 participants had interruptions in treatment and merely 36.0% of the individuals were receiving Cotrimoxazole Prophylaxis, while 21.2% of the participants had failed their first line of ART. (Table)

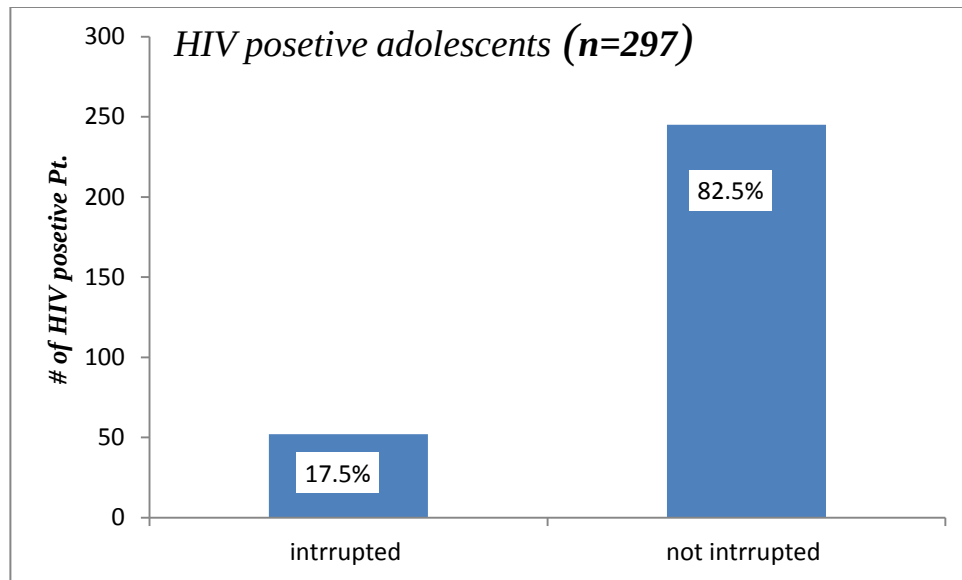
**Table 28 frequency distribution according to clinical related characteristics of respondents among HIV positive adolescents (n-297)**

| Clinical related characteristics | Category                 | Frequency | Percent |
|----------------------------------|--------------------------|-----------|---------|
| BMI                              | <18.5/Undernourished     | 104       | 35.0    |
|                                  | <b>Normal 18.5-24.99</b> | 165       | 55.6    |
|                                  | 25-30/Overweight         | 28        | 9.4     |
| Oral Thrush                      | absent                   | 231       | 77.8    |
|                                  | present                  | 66        | 22.2    |
| WHO Stage                        | I                        | 194       | 65.3    |
|                                  | II                       | 36        | 12.1    |
|                                  | III                      | 39        | 13.1    |
|                                  | IV                       | 28        | 9.4     |
| Drug type/Regimen Line           | 1                        | 214       | 72.1    |
|                                  | 2                        | 83        | 27.9    |
| The Reason for Interruption      | Loss to follow up        | 28        | 53.8    |
|                                  | OT/transfer to out       | 24        | 46.2    |
| Failed for First Line ART        | Yes                      | 63        | 21.2    |
|                                  | No                       | 234       | 78.8    |
| Cotrimoxazole Prophylaxis        | Yes                      | 107       | 36.0    |
| Taking History                   | No                       | 190       | 64.0    |
| Duration on ART                  | Greater Than One Year    | 187       | 63.0    |
|                                  | One Year                 | 110       | 37.0    |
| VLR suppression                  | not suppressed           | 210       | 70.7    |
|                                  | suppressed               | 87        | 29.3    |
| TB_ Screening Status             | TB_ Negatives            | 273       | 91.9    |
|                                  | TB_ Positives            | 24        | 8.1     |
| On anti-TB medications           | Yes                      | 15        | 62.5    |
|                                  | No                       | 9         | 37.5    |
| DTG related drug                 | Yes                      | 109       | 36.7    |
|                                  | No                       | 188       | 63.3    |
| Pregnancy status                 | Yes                      | 12        | 4.0     |
|                                  | No                       | 166       | 55.9    |

### **Magnitude of ART interruption**

Of those 17.5% of participants with (95% CI: 9.51–33.38%) interrupted from ART follow up. (Fig 3)





**Figure 1 magnitude of ART interruption among HIV positive adolescents (n=297)**

#### **4.3. Factors associated with treatment interruption among HIV positive adolescents in selected public hospitals, Addis Ababa 2024 (n=297)**

More than fourteen variables were included in the binary logistic regression analysis to examine relationships between independent and dependent variables in people with HIV undergoing antiretroviral therapy (ART). The multivariate logistic regression was then conducted using ten variables that had a P value of less than 0.25. The variables ultimately demonstrated statistical significance (p-value less than 0.05) at a 95% confidence interval in relation to adolescents' interruptions in treatment in the multivariate logistic regression model (**Table 3**).

In the multivariate logistic regression model, a  $p < 0.05$  was applied (**Table 3**). When comparing the likelihood of interruption, HIV-positive adolescents with a history of oral thrush were approximately three times more likely to experience an interruption in treatment (IIT) than those without a history of oral thrush (AOR: 3.343, 95% CI: 1.47–7.57).

The probability of experiencing an interruption in treatment (IIT) is almost four times higher for adolescents living with HIV who were not taking DTG-related medications (AOR: 3.85, 95% CI: 1.59–9.27) than for adolescents who were taking DTG-related

drugs. In addition, HIV positive adolescents with WHO stages III and IV had around three and four times the probability of an interruption in treatment (IIT) compared to WHO stage one HIV positive adolescents (AOR: 3.496, 95% CI: 1.25–9.72 and (AOR: 3.51, 95% CI: 1.02-12.12), respectively.

Adolescent Individuals who adhered to their medication regimen poorly (AOR: 0.154, 95%CI: 0.57-0.417)) were 0.8 times less likely a treatment interruption than those who adhered to their regimen good, it implies that poorly adherence was not increased the likelihood of IIT.

Additionally, participants in the research who had been receiving antiretroviral therapy (ART) for one year had approximately four times greater chance of experiencing treatment interruption than those study participants had been receiving antiretroviral therapy (ART) longer than one year (AOR: 3.75, 95% CI: (1.47, 9.55)). Antiretroviral therapy (ART) treatment interruption in adolescents living with HIV was significantly correlated with their use of Cotrimoxazole prophylaxis. Patients who did not take prophylaxis had a treatment interruption rate approximately three times higher than those who did (AOR=3.42, 95% CI :( 1.41-8.24)), suggesting that prophylactic users had a lower risk of infection-related treatment termination.

The factors that decreased the likelihood of treatment termination were female in sex (AOR: 0. 31, 95% CI (0.14-0.68), body mass index (BMI) less than 18.5 to 24.99 kg/m<sup>2</sup> (AOR: 0. 25, 95% CI (0.11-0.60), ART duration of less than 1 year (AOR: 0.72, 95% CI 0.65–0.81), and failed first line ART drug (AOR: 0. 38, 95% CI: (0.16-0.92).

While the variable Viral load status was statistically significant in the binary logistic regression analysis, that is, they were not the factors that were independently associated with treatment interruption they lost their statistical significance level in the multivariate logistic analysis: Not Suppressed AOR: 1.215, 95% CI: (0.526-2.808).

**Table 29: factors associated with treatment interruption among HIV positive adolescents who have a follow up in selected public hospitals, Addis Ababa 2024 (n=297)**

| <b>Factors</b>                          | <b>Treatment interrupted</b> |           | <b>COR (95% CI)</b>           | <b>AOR (95% CI)</b>            | <b>P-Value</b> |
|-----------------------------------------|------------------------------|-----------|-------------------------------|--------------------------------|----------------|
| <b>Sex</b>                              | Yes                          | No        |                               |                                |                |
| Male                                    | 76                           | 25        | 1                             |                                |                |
| Female                                  | 169                          | 27        | <b>0.486(0.265,0.892) *</b>   | <b>0. 311 (0.141,0.685) **</b> | <b>.004</b>    |
| <b>Oral thrush</b>                      |                              |           |                               |                                |                |
| Absent                                  | 191                          | 25        | 1                             |                                |                |
| Present                                 | 54                           | 27        | <b>3.820 (2.050, 7.117) *</b> | <b>3.343 (1.471, 7.597) **</b> | <b>.004</b>    |
| <b>BMI/ nutritional indicator</b>       |                              |           |                               |                                |                |
| 25-30+ kg/m2 or Overweight              | <b>21</b>                    | <b>14</b> | 1                             |                                |                |
| 18.5-24.99kg/m2 or Normal               | <b>147</b>                   | <b>26</b> | <b>0.234 (0.094, 0.581) *</b> | <b>0. 259(0.111,0.604) **</b>  | <b>.002</b>    |
| <18.5 kg/m2 or undernourished           | <b>77</b>                    | <b>12</b> | 0.265 (0.120, 0.587)          | 0.266(0.100, 0.709)            |                |
| <b>Failed for first line ART drug</b>   |                              |           |                               |                                |                |
| Yes                                     | <b>47</b>                    | <b>19</b> | <b>0.412 (0.216, 0.788) *</b> | <b>0. 388 (0.163,0.924) **</b> | <b>.033</b>    |
| No                                      | <b>198</b>                   | <b>33</b> | <b>1</b>                      |                                |                |
| <b>Cotrimoxazole Prophylaxis Taking</b> |                              |           |                               |                                |                |
| Yes                                     | 125                          | 13        | 1                             |                                |                |
| No                                      | 120                          | 39        | <b>3.125 (1.590, 6.143) *</b> | <b>3.417 (1.417, 8.240) **</b> | <b>.006</b>    |
| <b>Duration on ART</b>                  |                              |           |                               |                                |                |
| Greater Than One Year                   | <b>136</b>                   | <b>19</b> | 1                             |                                |                |
| one year                                | <b>67</b>                    | <b>14</b> | <b>3.238 (1.570, 6.679) *</b> | <b>3.751 (1.473,9.553) **</b>  | <b>.006</b>    |
| less than one year                      | <b>42</b>                    | <b>19</b> | 1.496 (0.707, 3.166)          | 1.53(0.59,3.99)                |                |
| <b>DTG related drug</b>                 |                              |           |                               |                                |                |
| Yes                                     | 142                          | 10        | 1                             |                                |                |
| No                                      | 103                          | 42        | <b>5.790 (2.777,12.073) *</b> | <b>3.851 (1.599, 9.273) **</b> | <b>.003</b>    |
| <b>WHO Stages</b>                       |                              |           |                               |                                |                |
| Stage 1                                 | 169                          | 25        | <b>1</b>                      |                                |                |
| Stage 2                                 | 31                           | 5         | 1.090(0.388,3.065)            | 1.22(0.357,4.19)               |                |
| Stage 3                                 | 26                           | 13        | <b>3.380(1.538,7.426) *</b>   | <b>3.496(1.250,9.778) **</b>   | <b>.017</b>    |
| Stage 4                                 | 19                           | 9         | <b>3.202(1.305,7.856) *</b>   | <b>3.518(1.021, 12.124) **</b> | <b>.046</b>    |
| <b>Viral load status</b>                |                              |           |                               |                                |                |
| Not suppressed                          |                              |           | <b>1.837(0.987,3.421) *</b>   | 1.215(0.526,2.808)             |                |
| Suppressed                              |                              |           | <b>1</b>                      |                                |                |

## **5. Discussion**

This study found that nearly one in five adolescents interrupted their ART, consistent with previous findings in similar settings. Clinical factors such as opportunistic infections (e.g., oral thrush), shorter duration on ART, and absence of Cotrimoxazole prophylaxis were associated with treatment interruption. Adolescents in early WHO clinical stages may feel asymptomatic and underestimate the importance of consistent ART use. Additionally, Dolutegravir-based regimens have been shown to improve adherence due to lower pill burden and fewer side effects, which could explain the association observed.

These findings highlight the need for adolescent-friendly adherence counseling, early treatment education, and targeted clinical follow-up for those at risk of interruption.

## **6. Conclusion and Recommendations**

Nearly one-fifth of adolescents living with HIV in Addis Ababa interrupted their ART. Strengthening adherence support mechanisms, improving adolescent awareness on the importance of ART continuity, and ensuring consistent access to Cotrimoxazole and Dolutegravir-based regimens are critical interventions. According to these findings, adherence counseling for adolescents should be improved, psychosocial support in ART clinics should be strengthened, Dolutegravir-based ART regimens should be consistently available, and prospective studies should be conducted to investigate other behavioral and social factors that influence ART interruption.

## **7. List of abbreviations**

|       |                                                 |
|-------|-------------------------------------------------|
| AAU   | Addis Ababa University                          |
| ART   | Antiretroviral Therapy                          |
| BMI   | Body Mass Index                                 |
| CI    | Confidence Interval                             |
| DTG   | Dolutegravir                                    |
| HIV   | Human Immunodeficiency Virus                    |
| GBD   | Global Burden of Diseases                       |
| IIT   | Interruption in Treatment                       |
| LTFU  | Loss to Follow-up                               |
| PLHIV | People Living with Human Immunodeficiency Virus |
| WHO   | World Health Organization                       |

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## **8. Authors' Contribution**

TBM, WD and AW, equally contributes for entire paperwork. Review and comment

## **9. Availability of data**

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request Availability of data

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## **Chapter 8: Abstracts for Scientific Presentation**

## **Magnitude and factors associated with treatment interruption among HIV-positive adolescents in selected public hospitals, Addis Ababa, Ethiopia 2025.**

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### **Abstract**

**Background:** Treatment interruption among adolescents living with Human Immunodeficiency Virus (HIV) continues to pose a series problem to sustaining viral suppression and achieving the UNAIDS 95–95–95 targets. Even though Antiretroviral Therapy (ART) is provided free of charge in Ethiopia, adherence among adolescent's remains below optimal levels. This study aims to determine the magnitude of ART treatment interruption and identify the factors associated with it among HIV-positive adolescents attending selected public health facilities.

**Methods:** Cross-sectional study was applied using medical records of 297 adolescents living with HIV from four public hospitals between September 2020 and December 2022. Data was extracted using structured checklists. Descriptive statistics were used to summarize characteristics of participants. Bivariate and multivariable logistic regression analyses were performed to identify factors associated with treatment interruption at 95% confidence level.

**Results:** The pooled magnitude of ART interruption among adolescents was 17.5% (95% CI: 9.56–33.38). Oral thrush (AOR = 3.34, 95% CI: 1.47–7.59), Those not used Cotrimoxazole prophylaxis (AOR = 3.42, 95% CI: 1.42–8.24), use of ART for more than one year (AOR = 3.75, 95% CI: 1.47–9.55), not use Dolutegravir-based regimens (AOR = 3.85, 95% CI: 1.60–9.27), Patient within WHO clinical stages III (AOR = 3.50, 95% CI: 1.25–9.78), and IV (AOR = 3.52, 95% CI: 1.02–12.12) were factors significantly associated with treatment interruption.

**Conclusion:** One in every five adolescents on ART experienced a treatment interruption. Advanced stages of disease, oral thrush, lack of Cotrimoxazole prophylaxis, and a non-DTG-containing regimen were the major contributors to the outcome. Therefore, strengthening adherence support and ensuring continuous follow-up will be important for improving treatment continuity among adolescents.

**Keywords:** HIV/AIDS, Adolescents, Antiretroviral Therapy, Treatment Interruption, Addis Ababa, Ethiopia

## **Chapter 9: - Multiple Public Health Emergency (PHE) Situational Update**

## **Multiple public health emergency (PHE) situational update/report and eight months response activities of the zonal and national cholera response team in Gedeo zone**

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### **Executive Summary**

In April 2023, highly pathogenic Vibrio Cholera was detected in the Gedeo Zone for the first time. From April 10, 2023, to December 19, 2023, Gedeo Zone Health Department received 869 cholera cases from eight Woredas 'health facilities, Oromia region and Sidama region. The first infected Cholera was identified on April 10, 2023, in Wonago Health Center of Wonago Woreda. From April to May, the disease spread slowly to multiple Woredas of the zone, including Dilla Town, Dilla Zuria, and Yirgachefe Woreda. A significant increase in cholera cases occurred through early August in Chelelektu Town, followed by a rapid increase in Yirgachefe Woreda in late September and throughout October, where large numbers of Cholera cases were reported. The last Cholera case was reported by Kara Kebele of Wonago Woreda. This outbreak was the largest cholera outbreak ever recorded in the Zone and the most significant death in history. This outbreak was the second largest cholera outbreak since 2007 G.C.

In response to the outbreak, Gedeo Zone Health Department (GZHD) and Ethiopian Public Health Institute (EPHI) coordinated the zonal response activities in the support of World Health Organization (WHO). The response to the outbreak included the following major activities at zonal levels:

- Action plan prepared and implemented
- Revising case definitions performing sample collection and diagnostic testing
- Planning and conducting disease surveillance
- Planning and carrying out community-based surveillance and epidemiological investigation
- Conducting regular meeting and information management at the zonal level

- Ensuring the availability of financial resources and conducting and providing other resources logistics and guidance for mass depopulation and euthanasia.
- Conducting and providing subject matter expertise for Woreda health offices and CTUs
- Providing overall incident management, support, and objectives.
- Providing guidance, options, and contracted support for cleaning and disinfection.

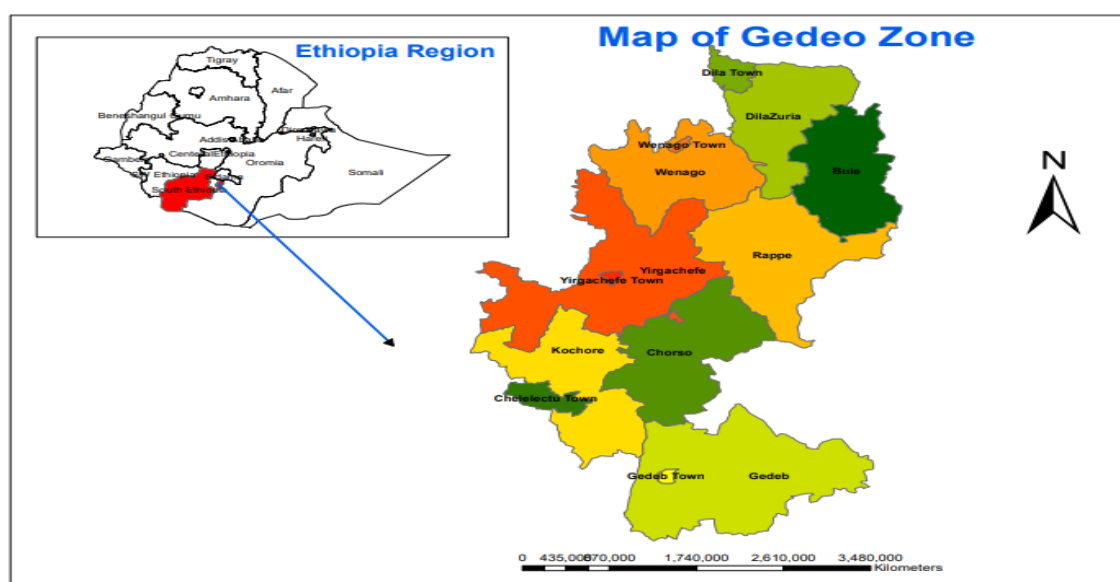
Gedeo Zone Health Department EPHI RRT and WHO AVHOC team personnel were deployed to the outbreak response activities from April 2023 and continued deploying throughout the response effort. Emergency Operation Center (EOC) was also established in June 2023. This coordination activity was scaled up significantly in April, reflecting the increasing number of detections and broadening response requirements. The number of zonal responders dedicated to the response continued to increase as the outbreak grew in scale. Over the course of the outbreak, there were around four teams deployed by WHO and EPHI.

This Cholera outbreak ended in the late December 2023, many response operations—including case management, Surveillance activities, health education, and WaSH intervention activities continued throughout the fall. On December 19, 2023, the Gedeo zone sent a final report to the zonal health department and after 45 days of the final report the zonal health department and EPHI field team was considered closed. Extensive planning and preparation efforts continued to prepare for the possible reemergence of Cholera in the next rainy season.

*There are many individuals and groups that contributed data or information to this report and deserve recognition, including—but not limited to—the Extension Workers, Health Centers, Woreda health Offices and Officers, Zonal Health departments and officers and Epidemiologist.*

## Background

**Gedeo** is a zone in the South Ethiopia region (SERS) of Ethiopia. This zone is named for the Gedeo people, whose homelands lie in this zone. Gedeo is an exclave of the SERS consisting of a narrow strip of land along the eastern escarpment of the highlands. It is surrounded by the Oromia region which borders the Zone on the east, south and west; Gedeo shares its northern boundary with the Sidama Region. Dilla is the administrative center; and other towns include Dilla, Wonago, Yirgachefe, Chelelektu and Gedeb.



**Figure 21 Map illustrates the Gedeo Zone, 2023**

The Gedeo Zone has been frequently affected by various types of natural and man-made public health emergencies and disasters like disease outbreaks (e.g. cholera, malaria, measles, and others), flood and conflict driven displacements arising from the neighboring or bordering regions due to armed group attacks. The Zone is among the high-risk zones for malaria and cholera in the region. The presence of high number of flood risk areas, low latrine utilization, and low safe water coverage are exposing factors for cholera outbreaks in the region. In the last eight months, the outbreaks of cholera, measles and malaria, and floods are the active public health emergencies of the zone which needs urgent humanitarian support. In Gedeo Zone, the population's main sources of water supply are the river and shallow wells in villages. Population

living in the rural areas is exposed to unsafe water sources. Moreover, access to latrines was also low which, when combined with poor hygiene practices, results in conditions that enable the spread of diarrhea such as cholera.

On the 10<sup>th</sup> April 2023, the Wonago Woreda Health office issued a cholera outbreak alert following the first Cholera suspect was identified in Wonago Health Center. Then, epidemiologic investigations and Specimen collection activities were conducted by the local health office and Gedeo Zone Health Department Public Health Emergency Management Unit. After the laboratory confirmation the Gedeo zone health department and the South Ethiopia Health Bureau declared as the availability the cholera outbreak in the zone. As of 19<sup>th</sup> December 2023, a total of 869 cases with 20 deaths had been reported from eight districts and with majority of the cases being reported between September and October 2023, which indicated that the numbers of cases were rising at the time. Wonago had the largest number of cholera cases in the zone as a district in the Zone with 207 cases (23.8%) of those reported with 4 deaths.

During the outbreak period there were outbreak response activities to control the outbreak. As a result, we established and activated the local level Emergency Operation Center (EOC) by developing the Incident Management System and structure to strengthen the close intersectoral coordination within government and between government staff and partner agencies.

This report serves as an overview of multiple Public Health Emergencies or outbreak (Cholera, Measles, and Malaria) situation in the Gedeo Zone, South Ethiopia Region. In addition, the key objective of the reports to review the outbreak situation to inform future emergency operations, specifically those related to the cholera. This document focuses on the characteristics of the outbreak; organizational structure employed in the response, activities of the Incident Coordination Group, and summarized highlights of the field activities that occurred.

## **Outbreak Situation**

On 10 April 2023, the clinician working at OPD of Wonago Health Center identified probable cholera cases as an outbreak and reported a to the local Public Health Emergency Management department of Woreda health office. Then the first Cholera Case was identified on April 10, 2023, from Wonago Health Center in Wonago Town. The local public health unit was then notified to assess and manage the situation and initiated the epidemiological investigation and reported the same day to Gedeo Zone Health Department. Then, Gedeo Zone Health Department Public Health Emergency management unit issued a cholera outbreak alert to all health offices and HC found in the zone.

Soon after, five samples were collected from the affected individuals and sent to national and regional laboratory for laboratory investigation. Outbreak investigations were conducted by the Gedeo Zone Health Department Public Health Emergency Management Disease Surveillance and Response Unit. The findings indicated that the cholera outbreak probably began after the alert reported and following the index case confirmation.

But during the cholera response time, other public health Emergencies (PHE) like outbreaks (Measles, Malaria and Malnutrition) and other PHE events (Flood) were reported from the districts of the zone and this report contains the outbreaks situation, and the response activities took place in the last nine months starting April 2023.

## **Cholera**

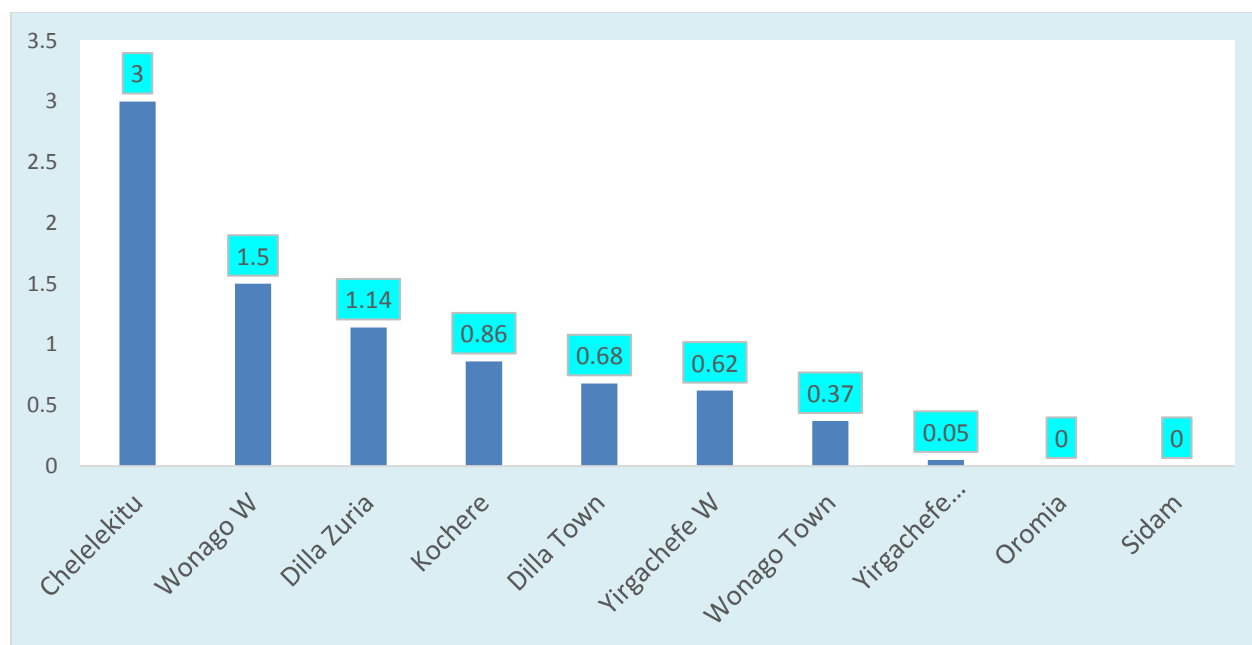
In April 2023, highly pathogenic and suspected *Vibrio Cholera* case was notified from the Wonago health center of Wonago Woreda in Gedeo Zone based on the case definition of the national cholera response guideline. Immediately after this notification, the three stool specimens were collected from cholera suspected patients for culture test and *Vibrio cholerae* has been isolated from two specimens. On April 12, 2023, the suspected cholera cases were confirmed as cholera outbreak. From April 10, 2023 to December 19, 2023, the Gedeo Zone Health Department received a total of 869 cholera cases from the health facilities and eight Woreda health Offices.



**Table 30 Number and proportion of Cholera cases by region in Gedeo Zone, 2023**

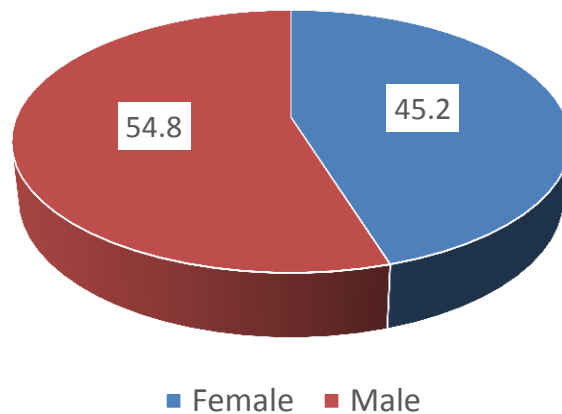
| Region                | # of Cases | %            |
|-----------------------|------------|--------------|
| Oromia                | 75         | 8.6          |
| South Ethiopia Region | 792        | 91.1         |
| Sidama                | 2          | 0.2          |
| <b>Total</b>          | <b>869</b> | <b>100.0</b> |

The overall attack rate for this outbreak is  $869/100,000 = 67.0\%$  in the estimated population of 1296769. The highest attack rate was reported from Chelelektu (**3cases/1000 population**), and followed Wonago Woreda (**1.5 cases/1000 population**), The list attack ate was reported from Yirgachefe Town (**0.05cases/ 1000 pop**) and the rest cases were from different neighboring Districts of Oromia and Sidam.



**Figure 22 Cholera Attack rate by Woreda in Gedeo Zone, 2023**

Among the total cases or the people affected with cholera, around 476 were male in the sex category and the rest were also female in sex. Of all suspected cases, **54.8% are males and 45.2% are also females in proportion as shown in the next figure.**



**Figure 23 Proportion of Cholera cases by sex category in Gedeo Zone, 2023 (N=869)**

The mean age was 23.99 (SD: 17.6) for the 869 cholera cases notified and reported. Of the total cases reported since the beginning of the outbreak, **age group 5 - 14 years** is the most affected age group for both male and female.

**Table 31 Number and its proportion of cholera cases by age category in Gedeo zone, 2023**

| Age 2Catagory | # of Cases | %     |
|---------------|------------|-------|
| < 5 Years     | 69         | 7.9   |
| 5 - 10 Years  | 165        | 19.0  |
| 11 - 15 Years | 110        | 12.7  |
| 16 - 20 Years | 102        | 11.7  |
| 21 - 25 Years | 95         | 10.9  |
| 26 - 30 Years | 100        | 11.5  |
| 31 - 35 Years | 65         | 7.5   |
| 36 - 40 Years | 51         | 5.9   |
| 41 - 45 Years | 23         | 2.6   |
| 46 - 50 Years | 16         | 1.8   |
| 51 - 60 Years | 32         | 3.7   |
| > 60 Years    | 41         | 4.7   |
| Total         | 869        | 100.0 |

The majority of cases, 792 (making up 91.1 %) came from Gedeo Zone of the South Ethiopia region and 71 (8.2%) were from West Gujji Zone of the Oromia Region.

**Table 32 Number of Cholera Cases and proportion by residency Zones, 2023**

| <b>Zone</b>  | <b># of Cases</b> | <b>%</b>     |
|--------------|-------------------|--------------|
| Central      | 2                 | 0.2          |
| East Guji    | 4                 | 0.5          |
| Gedeo        | 792               | 91.1         |
| West Gujji   | 71                | 8.2          |
| <b>Total</b> | <b>869</b>        | <b>100.0</b> |

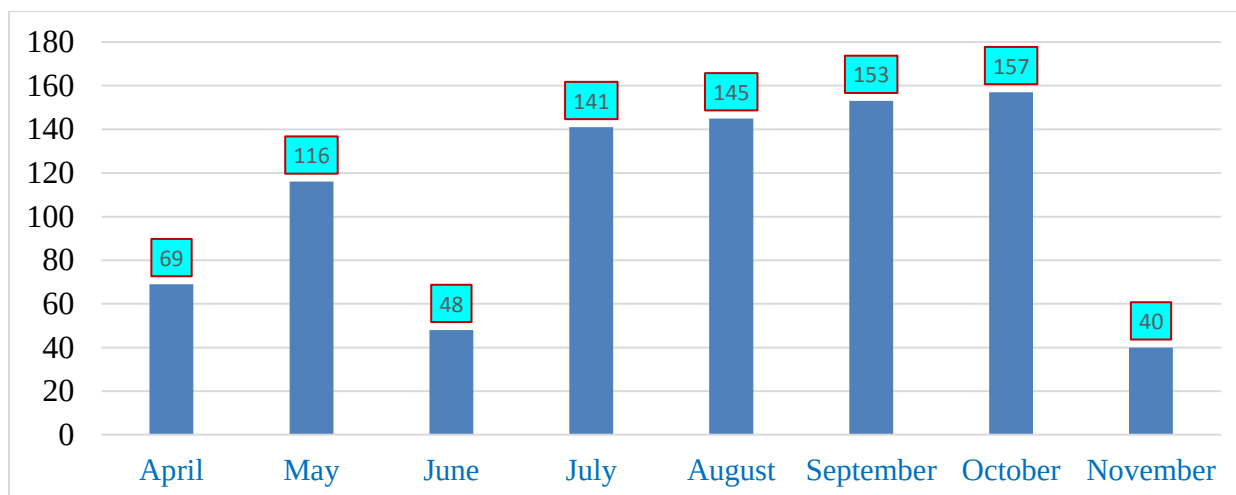
The residency of these Cholera cases was from eight Woreda of Gedeo Zone of South Ethiopia regions, Seven Woreda of the Central and West Gujji Zones of the Oromia region and One Woreda of the Sidama region.

**Table 33 Number and proportion of Cholera cases by residency Woreda, 2023**

| <b>Woreda</b>     | <b># of cases</b> | <b>%</b>   |
|-------------------|-------------------|------------|
| Wonago woreda     | 207               | 23.8       |
| Dilla Zuria       | 165               | 19.0       |
| Yirgachefe Woreda | 133               | 15.3       |
| Kochere           | 114               | 13.1       |
| Chelelektu Town   | 89                | 10.2       |
| Oromia            | 75                | 8.6        |
| Dilla town        | 69                | 7.9        |
| Wonago Town       | 11                | 1.3        |
| Yirgachefe Town   | 4                 | 0.5        |
| Sidama            | 2                 | 0.2        |
| <b>Total</b>      | <b>869</b>        | <b>100</b> |

The residency of the cases was from 87 Kebeles of the Gedeo Zone with 793Cases, 24 Kebeles of the Oromia region with 74 cases and two Kebeles Sidama regions with 2 cases. The largest 55(6.3%) from the total 869 Cholera cases were reported from Chelelektu 02 Kebele, followed by Chichu and Hassie Town with 52 (5.9%) and 47 (5.4%) respectively from the total 869 cases.

The largest numbers of cases were reported in Epi Week-38 and the least number of cases were reported in Epi week-27 as shows in Figure 4 of the epidemic curve.



**Figure 24 Number of Cholera cases reported by month in Gedeo Zone, 2023**

During the outbreak time, there were a total of 20 deaths with the Case Fatality Rate (CFR 2.3 %) from 869 both confirmed, and epidemiological linked cases. We noted that largest number of deaths occurred in the Dilla Zuria district and followed by Wonago, Kochere and Yirgachefe districts. There was not any reported death from Dilla Town, Yirgachefe Town and Wonago Towns. Among the total death 10 deaths were at CTUs, and the rest deaths are community death.

### **Measles**

The current measles outbreak started on September /02/ 2023 in Gedeb Woreda and two affected Kebeles of the district. As of December 25, 2023, a total of 152 cases were reported from the district. Most measles cases are reported by Gedeb woreda, Gotiti Kebele.

### **Malaria**

As of 25 December 2023, eight (8) woredas are reporting at least one confirmed malaria case, the majority in Dilla town 3753(12.8%), followed by Wonago woreda1245(41.8%), and Dilla Zuria 994 (28.1%). Total of 9,089 malaria confirmed cases are now reported in six months.

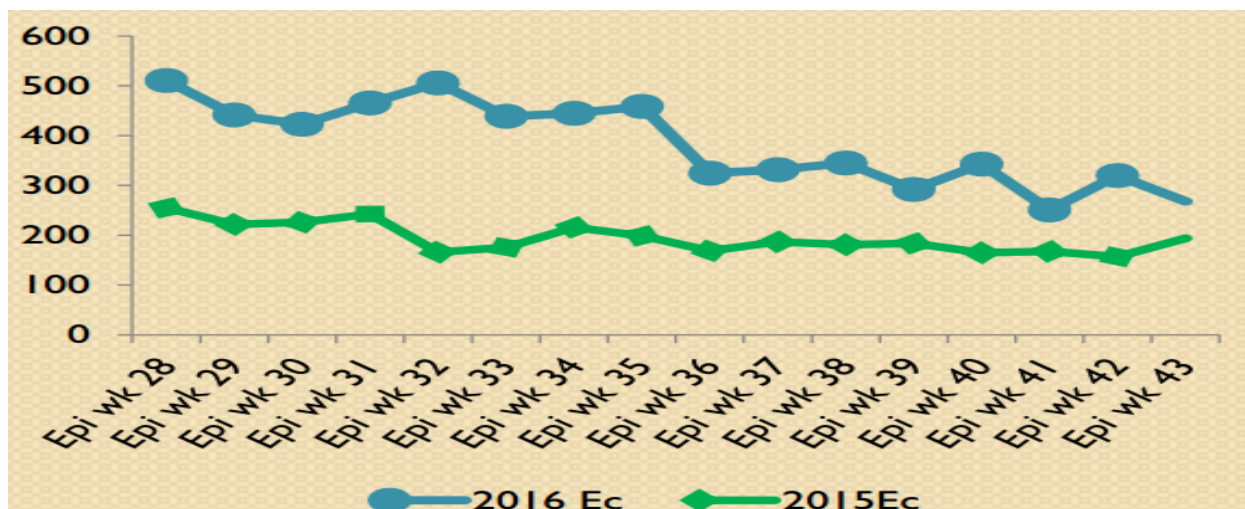


Figure 25 Trends Malaria Cases by Epi Week in Gedeo Zone, 2023

### Malnutrition

Malnutrition was one of the public health issues in Gedeo Zone during 2023.

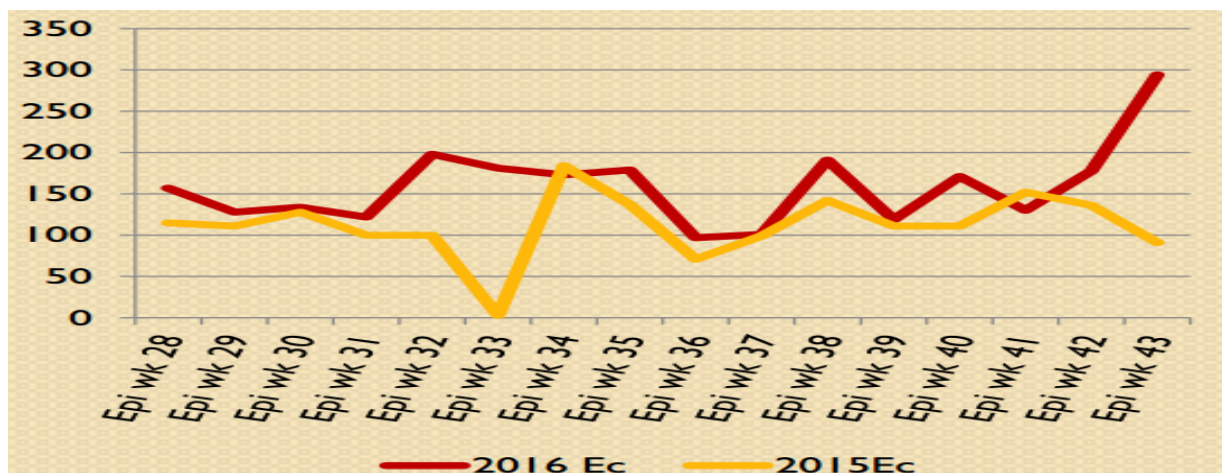


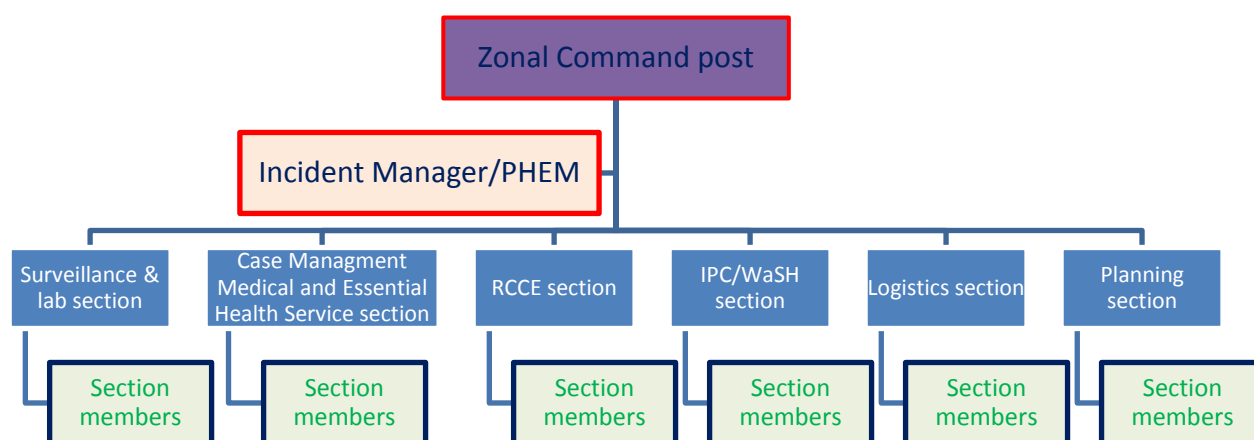
Figure 26 Trends Malnutrition cases by Epi Week in Gedeo Zone, 2023

## Overview of Response Effort

### Incident management System/Coordination

After the confirmation of the Cholera outbreak, the zonal health department in collaboration with Ethiopian Health Institute and WHO representative activated the local level Emergency Operation Center with the aim to control the submultiples outbreaks situations in the Gedeo zone, decrease the number of secondary cases and

minimize transmission into the community setting. Then, emergency response team was constituted with appropriate Incident Management System establishment. As coordination, Zonal level Emergency Operation Center (EOC) and Woreda level Rapid Response team were integrated to provide coordinated response activities for these multiple outbreaks. Effective incident management was critical to respond to the outbreaks including the Cholera outbreak. The Zonal incident was managed through use of the Zonal Incident Management System (ZIMS), which provided a flexible and scalable organizational approach throughout the response. So, the organizational Structure developed with appropriate sections to this Incident Management System (IMS) was established as shown in the next figure.



**Figure 27 Figure 1 Incident Management System (IMS) and its structure for multiple outbreak response in Gedeo Zone, South Ethiopia region, Ethiopia 2023**

### Personnel

The activities were implemented in coordination manner with all the stakeholders involved in the outbreak response. Section chiefs and members of staff were assigned for each section to provide integrated response. The political and administrative leaders of Gedeo Zone were very engaged in leading the outbreak response and put all possible efforts into stopping the outbreak.

Regular joint meetings were held the Zonal EOC at the zonal level by updating and briefing the outbreak situation report and reviewing the local response activities including the zonal essential health service activities of the zone to facilitate

coordination of the response and planning and implementation of response measures as well identify major gaps and challenges and provide the future direction as an action point.



**Photo on EOC meeting conducted at Gedeo Zone on September 7 and 15, 2023, respectively**

Supervisory teams were assigned for each affected Woreda from the zone staff, partners and EPHI staff. Daily supervision and follow up were performed for each Woreda and Health Facilities and CTUs under the Woreda. The zonal outbreak response plan was developed, and reports were prepared regularly and provided to the regional health Bureau and EPHI. Cholera Treatment Units (CTUs) were established in the health facilities and other selected areas of the affected Kebele to isolate and treat the cases. A total of 25 CTUs were established in affected eight Districts.

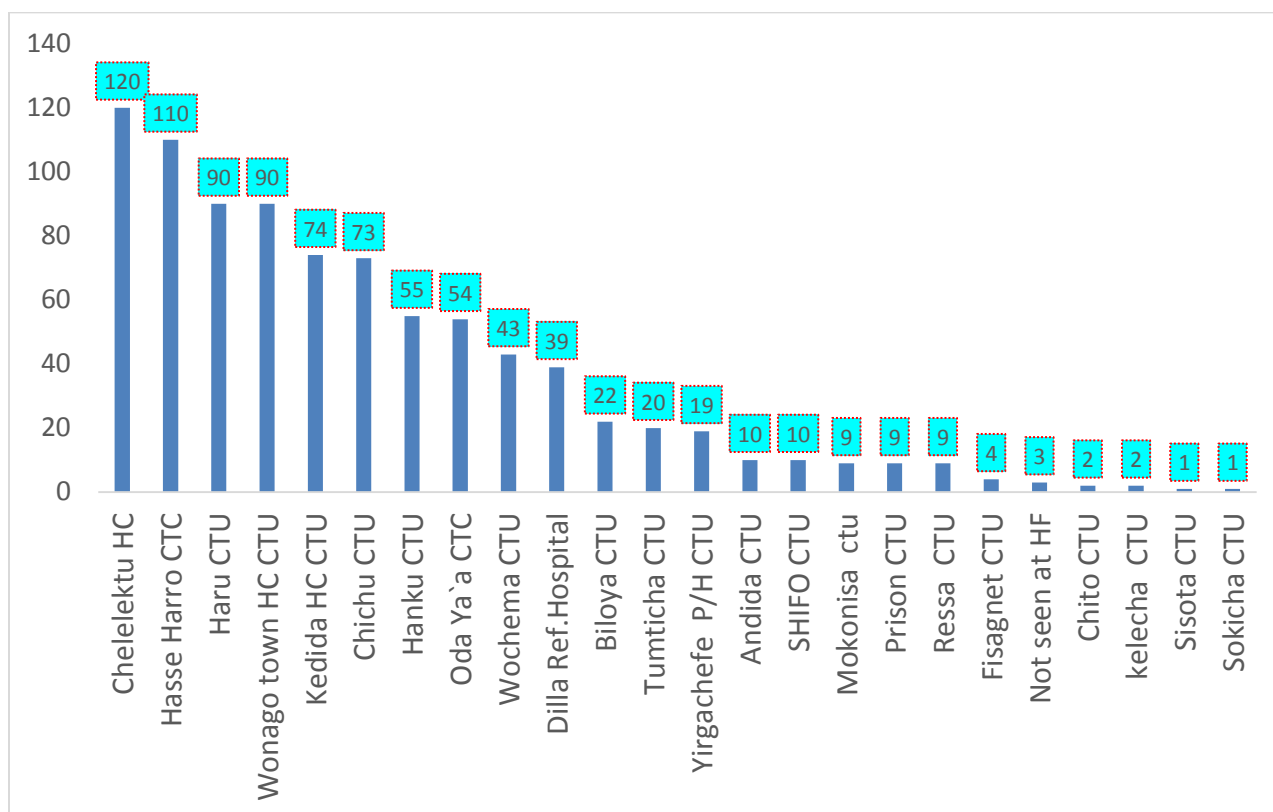
### **Risk Communication and Community Engagement (RCCE)**

As the outbreak occurred in zone, religion area and schools' leaders were contacted and advised to inform their students and communities about the outbreak. Students were advised and instructed to immediately report any symptoms within the cholera case definition. Partner coordination for communication takes place through the Advocacy, Communication and Social Mobilization Committee (ACSM) with broad membership. This committee provides oversight to activities and reports to the Zonal EOC team.

Through continuous social mobilization, health providers raised community awareness and engaged households in the response activity and supported surveillance and early case detection with support from health providers in coordination with the health professionals at the respective Kebeles.

## Case Management

Case management was one of the intervention activities which were done by health professionals. To provide an appropriate and standard case management service, a total of 25 Cholera Treatment Units (CTUs) were established. Among the total 829 cases, 746 (85.8%) of the cases were managed and treated at 10 Cholera Treatment Units (CTUs) in the zone. The rest 123 (14.2) of the cases were also treated in the rest 15 CTUs. The largest number of cases 120 (13.8%) were received the case management service in Chelelektu CTU and the least number of the cases were also treated in Sokicha CTU.



**Figure 28 Number of cases treated by CTU in Gedeo Zone, 2023**

## Infection Prevention and Control/WaSH

Infection Prevention and Control materials were requested from the region and EPHI and distributed to health centers and cholera treatment units. The zonal and district IPC/WaSH team deployed to the health facilities and community's level.





**Picture, during Involvement of local volunteers and health workers on the disaffection and safe water in Geddo Zone, 2023**

The district and zonal IPC/WaSH teams were involved in designing on the CTUs establishment at the treatment center. The health providers and other cholera response teams provided technical support to the local communities on the building and safe utilization of toilets. The teams also tried to improve the availability, accessibility and quality of water at the community level.



**Pictures for WaSH intervention to improve the water quality in Geddo Zone, 2023**

## Surveillance and Epidemiology

Detection of the cholera case was performed by strengthening the routine surveillance as a Zone. In addition, community based active surveillance and investigations were conducted in selected two Woredas of the zone to strengthen the surveillance activities and provide integrated response to the affected community. Therefore, a total of 6,189 households were planned for these community-based surveillance activities. Among these 6,189 households 5,172 (83.6 %) HHs were visited and provided the community-based interventions activities to break the community transmission.

## Vaccination (Oral Cholera Vaccine)

In August and November 2023, Ethiopian Public Health Institute (EPHI) and Gedeo Zone Health Department jointly carried out the first rounds of the Oral Cholera Vaccination (OCV) campaign in selected Woredas (Yirgachefe and Wonago) of the Zone. A total of 133,208 cholera vaccines were allocated to vaccinate 373,048 individuals living in the three districts (Yirgachefe, Dilla Zuria and Wonago) of the Gedeo Zone. Over 332,149 people have so far been vaccinated with single one dose Oral Cholera Vaccine (OCV).

**Table 34 Coverage of OCV form the allocated OCV dose and target population by Woreda in Gedeo Zone, 2023**

| Woreda      | OCV<br>Allocated | Target<br>Population | Vaccinated | Percentage (%) from |                   |
|-------------|------------------|----------------------|------------|---------------------|-------------------|
|             |                  |                      |            | Allocated dose      | Target Population |
| Dilla Zuria | 110790           | 110790               | 110751     | 99.9%               | 99.9%             |
| Yirgachefe  | 108663           | 114382               | 108631     | 99.97               | 95.0              |
| Wonago      | 112755           | 118690               | 112728     | 99.98               | 95.0              |
| Total       | 332,208          | 343,862              | 332,110    | 99.89               | 96.6              |

A total of 332,208 vials were received to vaccinate the population and among these 332,110 vials were used with 0.03% wastage rate.

## **Reporting and Communicating Information**

Information management is a challenge in any large emergency, and many individuals in both the districts and zone staff were responsible for collecting and reporting the report. Communication of this information both internally and externally is critical for effective coordination and communication; this was a daunting task as the number of cases increased dramatically, outpacing available resources. The outbreak Situational reports were prepared and shared to the response team and other public health officials.

## **End of Outbreak and Cost**

This Cholera outbreak ended in the late December 2023 after many response operations conducted including case management, Surveillance activities, health education, and WaSH intervention activities continued throughout the fall. The last cholera cases were reported on December 19, 2023, from Kara Kebele, Wonago health center CTU of the Wonago district. Then, after 45 days of the last report from this district, the Gedeo zone health department EOC declared as controlled the cholera outbreak as a zone. Finally, the zonal health department and EPHI field team was considered the outbreak as closed. Then, CTUs were demolished by Woreda and Zonal staff with disinfection procedure and collected all the necessary materials. Extensive planning and preparation efforts continued to prepare for the possible reemergence of Cholera in the next rainy season.

## **Major Challenges**

**Due to the presence of multiple emergencies and outbreaks (cholera, malaria, measles ... Flood) in the Zone:**

- Shortage of medical supplies to provide essential health services
- CTC kit (Fluids, ORS, Chlorine powder and solution, water treatment chemicals, PPE etc.)
- Limited partners' support in these cholera response activities.
- Shortage of WaSH facilities and safe water access.
- Shortage of rotos (water reservoirs)
- Shortage of disinfectants and sanitary materials (bleach, soap, Omo, ...)
- No budget allocated for malaria prevention and control activities at development corridors.
- Budget shortage to cascade trainings, per diem for field responses
- Insecurity across different areas of the region has affected the field responses.

- Vehicle shortage to mobilize response teams and medical supplies and equipment to service delivery points
- Lack of ambulance at the CTC sites for referral linkage

## **Recommendations**

- Rework or develop and invest in zonal-level Preparedness Plans that include awareness creation to the health workers and community as an essential service.
- Improve the collaboration between the emergency response team and the other sectors at all levels
- Advocate for a multisectoral outbreak response and capitalize on new stakeholders (donors, research institutions, suppliers, private sector etc.)
- Immediately develop a communication response plan to ensure the sensitization and mobilization of all targeted populations.
- Include specific messages that address the concerns of specific population groups
- Develop an “outbreak emergency” message to the public and government leaders to create an awareness about Cholera and other outbreaks
- Immediately engage political and community leaders at every level to share information about the outbreak, the importance of response activities including the campaigns conducted during the response period (Like OCV)
- Focus on durable solutions for safe drinking water supply systems and combating open defecation to prevent cholera

## Annexes

### Annex I : Report and Feedback flow

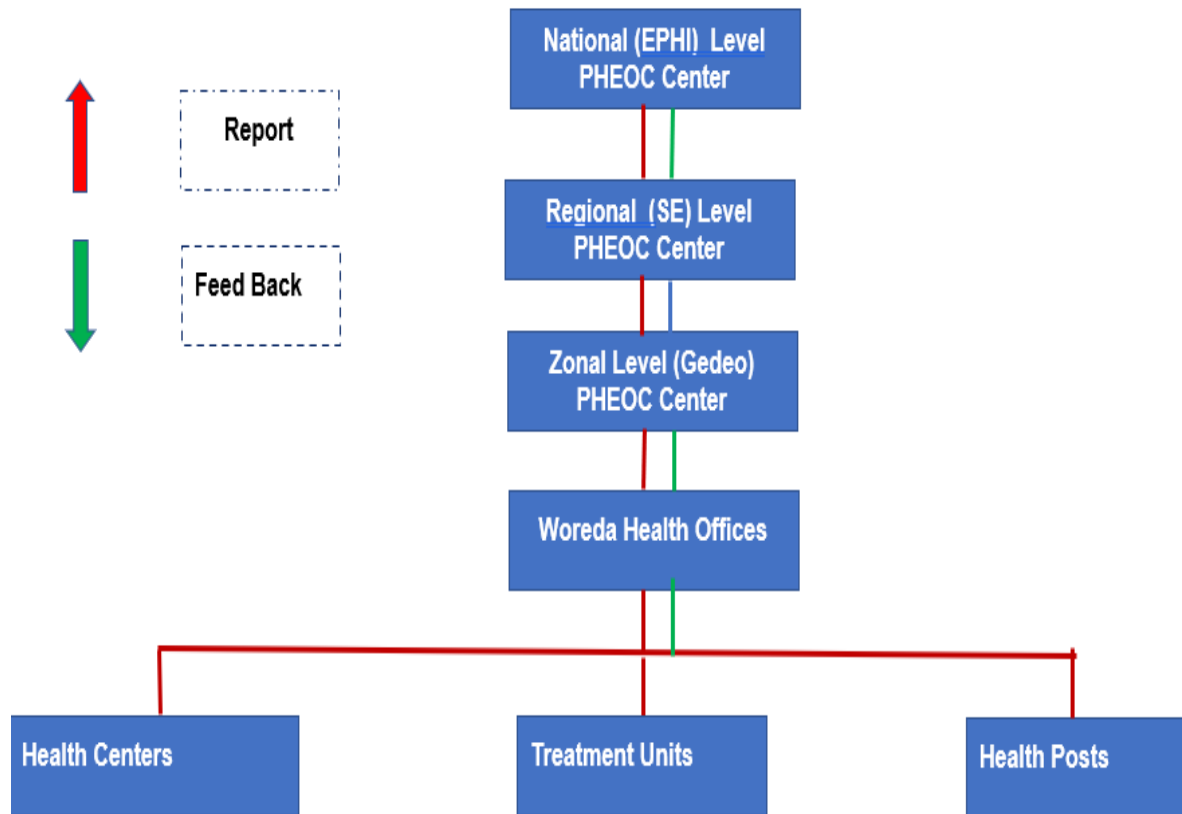
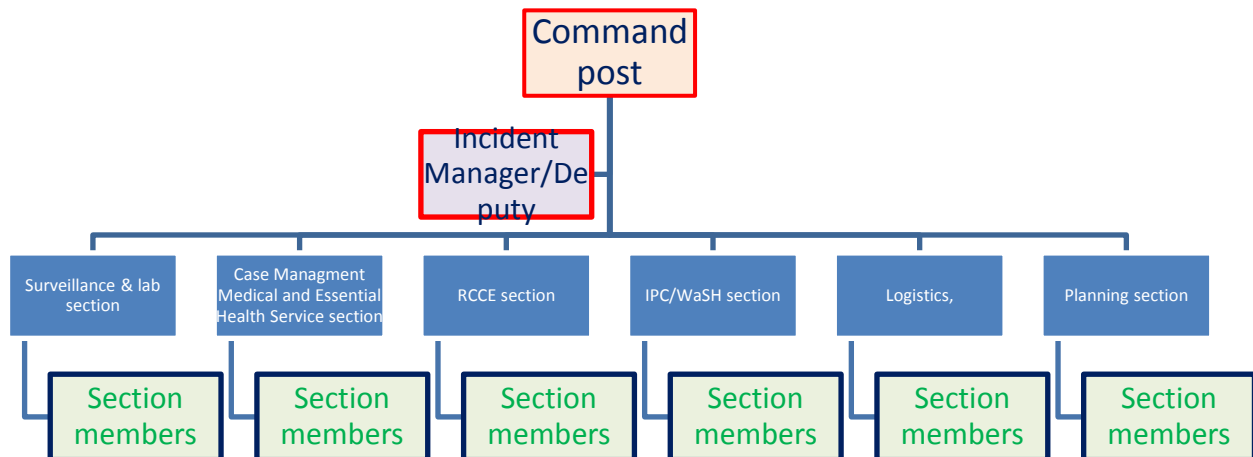


Figure 29 Incident data reporting flow and information sharing diagram



## IMS Structure or Organogram for Incident management



**Figure 30** Incident management structure used during the outbreak response in Gedeo Zone, 2023

### Annex III: Photo Gallery

*Photo gallery of the eight months outbreak (Measles, Cholera, Malaria ...) response activities in Gedeo Zone, Southern Ethiopia Region, 2023*

