
Addis Ababa University, College of Natural and Computational Science

# Prevalence of Intestinal Parasites and Associated Risk Factors Among HIV Positives and Negatives Individuals at Mugher Health Centre West Showa Zone, Oromia Regional State, Ethiopia

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# Approval Sheet Form

This is to certify that the Research Report by Behayilu Abera entitled "Prevalence of intestinal parasites infection and associated risk factors among HIV positives and negative individuals at Mugher Health Centre west Shewa Zone, Oromia regional state, central Ethiopia" submitted in partial fulfillment of the requirements for the Degree of Masters of Science in Biology. The final and acceptance of this thesis is reliant up on the submission of the final copy of the thesis to the Council of Graduate Studies through the Department of Graduate Committee of the Candidate's major department.

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# Declaration

I, the undersigned, declare that this thesis is my original work and all sources of materials used for this thesis have been acknowledged.

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The thesis, submitted in partial fulfillment for the requirement of MSc degree in Biology at Addis Ababa University with my approval as University advisor.

Name: Diriba Muleta (Ph.D)

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# ABBREVATION

| | |
|---|---|
| AIDS | Acquired Immune Deviancy Syndrome |
| ART | Antiretroviral Therapy |
| CDC | Centers for Disease Control |
| CD4 | Clusters of Differentiation |
| CSA | Central Statistical Agency |
| FHAPCO | Federal HIV/AIDS Prevention and Control Office |
| FMOH | Federal Ministry of Health |
| HIPIs | Human intestinal parasitic infections |
| HIV | Human Immunodefiency Virus |
| IP | Intestestinal parasites |
| MHC | Mugher Health Centre |
| NTDs | Neglected tropical diseases |
| OIP | Opportunistic Intestinal Parasites |
| PCR | Polymerase Chain Reaction |
| SPSS | Statistical package for Social Sciences |
| SSA | Sub _Saharan Africa |
| SNNPR | South Nation, Nationalities, and People Region |
| UNAIDS | United Nation Program on HIV/AIDS |
| WHO | World Health Organization |

# Abstract

*The impact of intestinal parasites are serious human health problem as world wide .The impact of Intestinal parasitic infections are still serious public health problem in poor and developing countries including both urban and rural areas of many developing countries like Ethiopia. The causes of mortality and morbidity are curiously more serious in Sab Saharan Africa, where the majority of people suffer from human immune deficiency virus (HIV) and developed acquired immune deficiency syndrome (AIDS).This study was aimed to assess the spread of intestinal parasitic infection ststatus with in representatives sample of HIV positives in order to compare th e findings with HIV negatives in Mugher Health Centre,West Shawa Zone,Oromia Regional stat e, Ethiopia. Across sectional finding was to direct 154 sample from the total of 256 HIV positive at Mugher Health Centre from February to August 2024 .Stool sample were gathered and observed under microscope using direct wet mount and formal ether concentration techniques. Questionnaires used to collect socio-demographic and associated risk factors with intestinal parasitic infections. Data was analyzed by using Chi-Square($X^2$) test, SPSS Version 22 and P Value <0.05 which was considered for statistically significance. The total prevalence of intestinal parasites was 61.0% and the left 39% were negative . Accordingly, intestinal parasites were observed among HIV positive (64.5%) and negative (57.7%) respectively. Eight numbers of different parasites are separated Among HIV infected indidual, but only seven types were observ ed among HIV negative individuals. Two types of these, (3.3%) reported as opportunistic intestin al parasites (Crypto sporidium and Isospora belli) species .While the remaining (57.7%) were no n opportunistic intestinal parasites. Among them,Teania species(16.9%), Trophozoite of Entamo eba.histolytica(13.%), Ova of Ascaris lumbricoides(9.7%),G.lamblia(7.14%),Ova of Hymenoleps is nana,(2.59%), and Hook worm infection (1.29%) were single intestinal parasites infected participants. On other hand (7.1%) Teania spcies and Entamoeba histolytica were the most dominant prevalent intestinal parasitic infections respectively .During data analysis the potential determinant factors for acquiring intestinal parasites, except presence of animals at home and HIV status, other left association risk factorswere significant($p<0.05$).Therefore, identification a nd treating of parasitic infection ontim is important to improve the life* style of *HIV patients.*



***Keyword**: Prevalence, HIV/ADS ,contamination, mortality and morbidity*

# Introduction

## 1.1. Back ground of the study

Intestinal parasites are among the most widespread infections affecting humans globally, with ap proximately three billion people affected (WHO, 2013). The prevalence of these infections is notably high in sub-Saharan Africa, a region heavily impacted by HIV/AIDS (Olusegun *et al*., 2009). HIV/AIDS weakens the immune system, making individuals more vulnerable to opportunistic infections, including those caused by intestinal parasites. These infections can affect multiple systems in the body, including the gastrointestinal, nervous, and respiratory syste ms (Kato *et al*., 2013). Among the common opportunistic intestinal parasites found in people living with HIV/AIDS are *Cryptosporidium s*pecies and *Isospora belli* (Sangare *et al*., 2013). Other significant parasites include *Entamoeba histolytica*, *Giardia lamblia*, and *Ascaris lumbricoides*, particularly affecting individuals in low- and middle-income settings (Thomas *et al*., 2015).

The high rates of parasitic infections in tropical and subtropical areas are often due to factors such as rapid population growth, poor personal and environmental hygiene, inadequate sanitation facilities, contaminated food and water, and weakened immune systems (Unasho, 2013). The interplay between HIV and intestinal parasitic infections can accelerate the progression from an asymptomatic HIV infection to AIDS (Kaniyarakkal *et al.*, 2016). These parasites are commonly transmitted through raw food, soil, or contaminated water (Bekele *et al*., 2017). Many parasitic infections are asymptomatic, which complicates prevention and control efforts as carriers may unknowingly spread the parasites (Asires *et al*., 2019). In response to these challenges, Ethiopia's Federal Ministry of Health has been training health extension workers to combat intestinal parasitic infections and other diseases. Despite these efforts, the country still experiences a high burden of these infections (Gebreyohannis *et al*., 2018). For example, a prevalence rate as high as 84% was reported among primary school children in Ethiopia (Hailegebriel, 2017).

The global distribution and impact of intestinal parasites highlight their significant health and socio-economic effects, including work absenteeism and treatment costs (Beyene *et al*., 2014). This research aims to evaluate the prevalence of intestinal parasitic infections and related risk factors among HIV-infected and non-infected individuals in Adea Berga Woreda, West

Shawa Zone, Oromia Regional State, Ethiopia. Enhancing healthcare, education, and personal hygiene practices is crucial for controlling and preventing the spread of these infections

## 1.2 Statement of the Problem

The intestinal parasitic infections are particularly problematic for young and economically active individuals. HIV weakens the immune system, making people more vulnerable to opportunistic infections, including parasites, which can significantly increase mortality rates (Konate *et al*., 2005). In Eastern Cape, a study of 1,600 HIV patients revealed a 30% prevalence of intestinal parasites, with a higher prevalence of helminths (70.4%) compared to protozoa (29.6%) (Ifeoma *et al*., 2022). In Ethiopia, prevalence rates vary by region: 46.09% in Dire Dawa City, 38% in Tigray and Harari regions, and around 34.54% in Amhara regional state. Among HIV-positive individuals in Ethiopia, common intestinal parasites include *Giardia lamblia* (6.04%), *Cryptosporidium* spp. (7.16%), and *Entamoeba histolytica* (12.48%) (Wondmieneh, 2020). In Butajira, Ethiopia, a study involving 323 participants found an overall intestinal parasite prevalence of 35.9%. The study identified protozoans such as *E. histolytica* and *G. lamblia, as* well as helminthes *like Hymenolepis nana*,various hookworm species, *Taenia species,* and *Asca ris lumbricoides*. Opportunistic parasites such as *Cryptosporidium parvum, Isospora belli,* and *Strongyloides stercoralis* were also noted (Gedle, 2017).

The Adea Berga district, which hosts large industries like Mugher, Dangote, and Bedrok Cement factories, sees a high influx of workers. This transient population, combined with potentially unsafe practices, contributes to a higher prevalence of HIV/AIDS. Despite this, there is a lack of data on the prevalence of intestinal parasites in Mugher town.

This study aims to fill this gap by assessing the prevalence and risk factors of intestinal parasitic infections among HIV-infected and non-infected individuals in the town. The findings will provide essential data for health planners and researchers, helping to improve health interventions and preventive measures

## 1.3 Objectives of the Study

### 1.3.1 General Objectives

The general objective of this study was to assess and determine the prevalence of intestinal parasisitic infection and their associated risk factors among HIV positive and negative individuals

### 1.3.2 Specific Objectives

**Specific objectives of the study were to:**

- Assess socio-demographic and socio economic Characteristics of HIV positive and negative individuals.
- Investigate and quantify the prevalence of intestinal parasitic infections among both HIV-positive and HIV-negative individuals
- Analyze and compare the prevalence rates of intestinal parasites among HIV positive and negative participants
- Assess and identify risk factors related to the prevalence of intestinal parasitic infections in both HIV-positive and HIV-negative individuals

## 1.4 Research Questions

The study answers the following research questions:

1. What are the socio demographic and socio ecomomic characteristics of HIV positive and negative participants?
2. What are the identified intestinal parasitic infections among HIV positive and negative respondents
3. What are the prevalence rate of intestinal parasitic infection among HIV infected and non infected individuals?
4. What are the associated risk factors related with intestinal parasitic infection among HIV positive and negative individuals individuals ?

## 1.5 Significance of the study

The significance of this study will be distinguished the common intestinal parasitic infections and associated with human immuno deficiency virus that affect the society. From the end outcome of this research the society can separate the causative agents of common intestinal parasitic infection and taking the importance of HIV medication daily as prescribed to prevent

getting intestinal parasitic infections and viral load that become complicated to treat .It also give good awareness of clinical scenario and to providing the future protection and control measure of IPIs of individuals and to generate data to be used as reference in the future for other researcher.

## 1.6 Scope and limitation of the study

The study was conducted in Oromia Regional State, West showa Zone, Adea Berga district by focusing on the occurrence and factors related with intestinal parasites among HIV positive respondents at Mugher Health Centre.The study was limited to Mugher Health Center due to lac k of enough budgets, limit time and lack of necessary materials provided for the research activiti es to cover the left Health Centers and Hospital located in the district during data collection. Thi s prevalence study was carried out in Mugher Health Clinic from February to August, 2024 to identify the common intestinal parasitic infection and the associated risk factors among HIV infected and negative individuals taking collecting their stool sample only.

# 2. Literature Review

## 2.1 The prevalence of intestinal parasites Worldwide

For economic reasons, IPIs are extensively dispersed in tropical regions, especially sub-Saharan Africa.Poverty and its manifestations such as shortage of health facilities, poor toilet coverage, sc arcity of safe drinking water, overcrowded living, illiteracy and thus poor personal and environm ental hygiene are the reasons. Depending on the relative spatial and temporal distribution of these and other risk factors, the prevalence of IPIs and infectious diseases in particular varies from setting to setting (Tatem *et al*., 2012).

Prevalence of intestinal parasites have become health burden and this burden is even higher amo g children in urban area especialy in developing countires.The consequence of such int estinal pa rasitic infections among children leades to impaired cognitive fuctions,inability of learning,stunte d growth, mal nutritionand other problems(interventions (Usip ,2017 ),Intestinal infectious angen ts are common in low income individuals, among children pregnant females ,weakened immuno system, low personal hygiene and area contaminated with soil(Omrani *et al*.,2015). Besides of causing morbidity and mortality, infections with intestinal parasites have been associated low economic level, poor personal and environmental sanitation, and overcrowding, limited access to water, tropical climate and low altitude ( Quihu *et al*., 2006). About one six world wide public h ealth affected by helminthic infectious agents(*A.lumbricoiodes*,*Trichuri* and Hook worm spcies( WHO, 2013). In hand protozoan parasites(*G.lamblia*,*E.histolytica* and *Cryptosporidium* are mo st common known infections in developing countries like Ethiopia that are cause death in most children (Bahmani *et al.*,2017).

Amoebiasis is the third leading cause of death from parasitic diseases with great impact on the people of developing countries (AQ *et al*., 2012). In Ethiopia gastrointestinal infectious agents are one of the top ten health problem among children and Helminthes are the greatest predominant causes of health condition in the countries and Northwestern Ethiopia is highly affected as compared to other parts of Ethiopia( Mulatu *et al*., 2015.)

## 2.2 Prevalence of Intestinal Parasites Infection in Ethiopia

The frequency and occurrence intestinal parasitic infections not the same it is differ from place to place region to region because of many geographical, environmental and social influence( Reji, *et al*., 2010. Intestinal parasites such as Ascaris lumbricoides, Trichuris trichiura and hookworm are the most prevalent and affect about one-sixth of the world population (Harhay *et al*., 2010). Ethiopia, like any other low-income country in the tropics, is heavily affected by IPIs due to poor water quality and toilet coverage, and low community awareness and thus very poor personal and environmental hygienic practices. Various authors reported IPIs from different parts and localities of Ethiopia on different occasions (Megbaru *et al*., 2015).Therefore ,Ethiopia has the highest most load of protozoan parasites: Acarisis, Hook worm, and trichhrisis are the second,third and fourth respectively, which closer with in sub Saharan Africa(Deribe *et al*., 2012) Itestinal parasites are common in Ethiopia and cause serious health problems such as malnutrition, anemia, and growth retardation aswell as well as ahigher susceptibility to other infections (chala, 2013

## 2.3 Prevalence of intestinal parasite infection in oromia Regional state

The total wide spread gastrointestinal infectious agents was (20.6%), from this , (6%) males and about (14.6%) females (Robe *et al*.,2021). Bars and rest aunts (14.0), hotels (25.8%),and dining area (36.0%), in spread of infectious agents with regard to provide organization where they worked and from 315 pregnant women respondent's IPIs was observed in 138 pregnant women with an overall prevalence of IPIs were (43.8%), (Yosuf *et al*., 2019).For the purpose of consumi ng after toilet and preparing reason, food handlers and hand washing were less likely to get intestinal parasites infections. Like in this study, reduced by hand washing with soap prior to eating, after using toilet, or in both situations, and contact with soil, significantly increased the risk of intestinal parasitic infections (Alemu, 2015).Other studies have also shown that hand washing practice to be determinant for intestinal parasitic infection among food handlers (Improper hand washing before handling food is obvious route for dissemination of infections. Parasite eggs in the soill can be transmitted to vegetables, then on to hands and hence directly in to the mouth, food handlers for ova or parasites is one way of indicating the possible contamination of food (Alemu, 2015).

## 2.4 prevalence of Intestinal Parasites Infection in West Showa Zone

The study conducted in Dendi District Sengota primary shool to determine the Prevalence of IPIs and associated risk factors by expecting as provides relevant information for formulating appropriate intervention and input for further studies in the area. From 404 respondents stool sample were gathered and examined by unstained wet mount and formal ethyl acerate concentrat ed technics to detect parasites. The total prevalence of intestinal pathogens was 25.49%and the pr evalence status of protozoan, helminthes, and polyparasitism in participant's were14.1%, 8.17% and 3.22%.respectively.

The most commonly prevalence detected parasites were protozoan and helminthes, among them *G. lamblia* (11.1%), *E.histolytica* (3,0%), *A.lumbricoides* (5,0%) and *H.nana* (3.2%).Males were more infected than females having (14.9%) and ( 10.6%) respectively. Compared with age group the degree of infection scored (12.9%) in the (4_8) age group, (8.7%) in the (9-13) age group and (4.0%) in the (14_18) age group. Whereas, single, double and triple infections 22.3%, 2.9%, and 0,2% respectively. The IPIs among the studies participants were significantly high and open field defection, waste disposal habit, hand washing habit before meal, source water used for drinking and after visiting the toilet were the major predicators for intestinal parasitic infections (Tolera, 2022).

## 2.5 Human Intestinal Parasitic Infection

Human IPIs have been worldwide public health problem (Ojha *et al*., 2014).Such intestinal parasitic infections are necessary in the mojors, countries particularly in equatorial and worm temperature area (*Kia et al., 2008*). Human intestinal parasitic infections can cause significant morbidity and mortality throughout the world. At least one third of the world's population was infected with human intestinal parasites (CDC, 2011) Human intestinal parasitic infection can be moreseries in children and in elderly than in middle aged people and in human i mmune compromised such as Human Immune decency Virus and Immuno deficiency syndrome (HIV/AIDS) patients (Nkenfou *et al*.,2013).Young people have less developed immune compro mised. However, playing on contaminated soil and poor personal hygiene were the main transmission way of human intestinal parasitic infections and can leads to health problems like increased risk of protein and problems like malnutrition, iron deviancy, anemia, growth retardation, faulty cognitive development, and predisposition and other infection in young

children (WHO, 2010). Poverty related factors like adequate health service, open field defection, poor sanitation, scarcity of portal water,unsave human waste disposal system,conducive environmental conditions for the patients and low level of awareness are contributing factors for the rate of human intestinal parasitic infections (pameirim *et al*. 2018).Human Immune deficienc y Virus and intestinal parasitic infections in the intestine interact cause rapid HIV spread and pro gression from asymptomatic HIV infection to Acquired Immune deficiency syndrome (AIDS)(K aniyarakkal *et al*.,2016. Intestinal bleeding, poor nutritional absorption, cell and tissue damage, and other related symptoms are brought on by a heavy and persistent intestinal parasite infection ( Brooker (2010).

### 2.5.1 Intestinal Protozoan and Helminthes Parasites infection

The most common intestinal parasitic infections are caused by different species of protozoan and helminthes. They cause the major public global health problem, commonly in tropical and subtropical areas include soil transmitted helminthes. Intimately 1.45 billion people are infected with soil transmitted helminthes globally (data as of 2010). The studies conducted in several countries focused on soil transmitted helminthes infections among preschool aged children pre_SAC) and school_aged children (SAC), while afew reported soil transmitted helminthes infections adult aged groups (Dunn *et al*., 2016).

In several countries the prevalence of soil transmitted helminthes infections is still high throughout the association of Southern Asian Nation ASEAN), including Thailand (Dunn *et al*., 2016). The most common ntestinal protozoan parasites are:*Giardia lambial, Entamoeba histolyti ca, Cyclosporine cayetanenensis, and Cryptosporidium spp.* The disease caused by these intestin al protozoan parasites is known as giardiasis, amoebiasis cycyclosporiasis, and cryptosporidiosis respectively, and they are associated with diarrhea Gastro intestinal parasites that are most commonily prevalent cause of diarrhea in developed counties, and this infection is also very common in developing counties (Usip *et al*., 2017).

### 2.5.2 Intestinal parasitic Infection Transmission routes

Intestinal parasites are commonly spread when bits of fecal matter come into contact with the mouth. This can happen through contaminated food or water, oral and anal sex, or non-sexual intimate contact, such as diaper changing. Parasites can also enter the body through the skin or if

contaminated soil is ingested accidentally.Some parasites live in animals like pigs and cows. People can become infected by consuming undercooked meat or drinking unpasteurized milk. Contamination of food, such as raw fruits or vegetables that have not been properly washed, can also lead to infection. Drinking water contaminated with feces or swimming in polluted water can further spread parasites .Out breaks of intestinal parasitic infections are often seen when several people exhibit symptoms at the same time, typically due to exposure to the same source of contamination (CDC, 2011). Food handlers with gastrointestinal parasitic infections and poor personal hygiene can be significant sources of transmission. As these individuals may be asymptomatic carriers, they might not be aware of their role in spreading infections, which complicates efforts to control and eliminate these parasites (Ayeh *et al.,* 2009). The impact of food handlers is especially notable in places like restaurants, hotels, factories, canteens, schools, hospitals, and prisons, where they can transmit infections through food, water, and personal contact (Saed *et al*., 2010; Tessema *et al*., 2014)

## 2.6 Risk Factors of Intestinal Parasitic Infections

Risk factors they may be exposed to (Alemegede *et al*., 2015). For people with weakened immune systems, especially those with HIV/AIDS, these infections can speed up the progression of the disease. That's why it's important to follow carefully designed treatment plans to fight these opportunistic infections (Mbabazi *et al.,* 2011). Screening for intestinal parasites is crucial, particularly because people who are already vulnerable are more likely to suffer from multiple infections, including those caused by parasites like Schistosoma mansoni (Nkenfou *et al*., 2013).Children, especially those in preschool and school, are particularly at risk for these infections. Their natural behaviors, such as playing in dirt or not always washing their hands, make them more exposed to parasites. This makes it essential to provide immediate treatment and take preventive measures to protect them (WHO, 2010). If left untreated, these infections can cause serious health problems in young children, including stunted growth, difficulties in learning, anemia, malnutrition, and a higher likelihood of getting other infections (WHO, 2010)

## 2.7 Clinical Signs and Symptoms of Intestinal Parasitic Diseases

Intestinal parasites can cause a wide variety of symptoms that affect different parts of the body. People might experience things like abdominal pain, chest pain, chronic fatigue, coughing, diarrhea, and digestive issues. Other symptoms can include fever, chills, headaches, joint pain, and weight loss due to malnutrition. Some might notice swelling in their face, jaundice, or feel generally weak and fatigued. In some cases, the infection can even lead to more serious issues like immunodeficiency, mental health problems, or lung congestion. There are also physical signs like nausea, vomiting, skin ulcers, and muscle spasms, while children might become irritable and restless (Garcia *et al*., 2004). These symptoms can be confusing because they're not unique to parasitic infections they can also indicate other health problems. For example, common issues like coughing, stomach cramps, bloating, and diarrhea could be caused by many different conditions. Some parasites are especially tricky because they can lower red blood cell counts, leading to anemia, or move between the lungs and intestines, causing a range of symptoms. Because these signs can be so varied, it's important to have lab tests done to figure out exactly what's going on (Dariel, 2013).

## 2.8 Life Cycle of Intestinal Parasites

Intestinal parasites are primarily caused by two main types: protozoa and helminths. Protozoa typically enter the human body through contaminated food or water, in the form of mature cysts. Once ingested, these cysts travel through the stomach and into the intestines, where they release active forms known as trophozoites. These trophozoites can cause damage to the intestinal lining, and in some cases, they might even reach other organs like the liver, as seen with infections such as *Endameba histolytic*. *Helminthes*, on the other hand, often have a more straightforward life cycle. For example, pinworms *(Enterobius vermicular is*) only need one host species to complete their development. However, some helminthes, like filarial worms and Diphyllobothrium datum, require intermediate hosts to go through certain stages of their life cycle. Generally, nematodes, which are a type of helminthes, start as eggs, develop into larvae, and pass through several stages before becoming adults. Unlike treaties and custodies, many nematodes have a free-living stage outside the host (Schulz *et al*., 2014).

In recent times, there hasn't been as much research into the life cycles of many helminthes species, with much of our knowledge still coming from studies conducted in the mid-20th century, particularly in Europe and North America during the 1950s to 1970s. As a result, the juvenile stages of many of these parasites and their intermediate hosts are still not well understood (Faltýnková *et al*., 2016).

## 2.9 Epidemiology of intestinal Parasitic Infections

The spread and impact of diseases caused by opportunistic parasites have been greatly influenced by the emergence of AIDS (Kill *et al*., 2009). Whether these infections are made worse by HIV or occur on their own, intestinal parasitic infections (IPIs) continue to be a major cause of illness and death around the world (Hatamu *et al*., 2006). Epidemiological studies show that parasitic infections are some of the most widespread health issues globally, posing a significant challenge to public health. These infections are especially common in sub-Saharan Africa, where they are a major concern. (Tegegne *et al.*, 2018).

## 2.10 Epidemiology of confection of intestinal parasites

### 2.10.1 Epidemiology of TB /Tuberculosis/ Confection

In Eastern Europe, tuberculosis (TB) and HIV/AIDS have become separate epidemics, with many TB patients developing the disease without the influence of HIV related immunosuppressi on. However, for people living with HIV (PLHIV), the risk of contracting TB is higher in regions where TB is already prevalent. For example, in 2004, TB was reported as the most common disease linked to AIDS in both Western and Eastern Europe. In Western Europe, TB accounted for 24% of newly reported AIDS cases, while in Eastern Europe, it made up 56% of these cases (Corbett *et al*., *2005).*

### 2.10 .2 Influence of TB on HIV morbidity and mortality

Active tuberculosis (TB) can lead to mild immune deficiency on its own. In areas where TB and HIV/AIDS are both prevalent, having TB doesn't always signal a severe weakening of the immune system for people with HIV. TB may occur before HIV infection or in its early stages, when the immune system hasn't yet significantly declined. However, when TB does occur in someone with HIV, it often worsens the immune deficiency related to HIV. This exacerbation

can increase susceptibility to other opportunistic infections, such as Candida albicans esophagitis , *Cryptococcus meningitis*, and particularly *Pneumocystis jirovecii* (*Formerly Pneumocystis carinii*). As a result, TB can indirectly contribute to higher mortality rates among people with HIV (Badri *et al*., 2010).

## 2.11 Prevalence of HIV/AIDS

### 2.11.1 Prevalence of HIV/ADS in Ethiopia

Approximately 613,000 people in Ethiopia are HIV positive and the different prevalence rates are significant when looking at the total number of PLHIV per region as population size varies from one region to another. Seventy-four percent of PLHIV are from Amhara, Oromia and Addis Ababa (Samd, 2013). HIV/AIDS in Ethiopia is regularly categorized as generalized among the adult population with heterogeneity among regions and population groups. The rural spread appears to be comparatively epidemic but heterogeneous, with the majority of rural areas having a comparatively low prevalence of HIV-infected people (Feked *et al,* 2018). Country ownership of the HIV/AIDS prevention and control programs,strong political will and commitmentto achiev e the 90 90 90 targets by 2020 i.e., 90% of people living with HIV who know their HIV positive status are accessing treatment and 90% of people on treatment have suppressed viral loads has be en instrumental to the successes (UNAIDS *et al,* 2018).The number of HIV patients in the Gambella region is 4.17 times the number of HIV positive cases in the Tigray region and Amhara which is 1.84 times the reference region. The problem is less in SNNPR than the reference region by 48% and less in Somali which is 13% than the Tigray reference region **(**Biressaw *et al*., 2021**).**

### 2.11.2 Prevalence of HIV/ADS in Oromia

Prevalence of HIV infected Within four years (2020_2019) in ten health institutions of West Hararghe Zone, total of 113,242 individuals were tested (44,853) males and 68,389 females and 1,005 of them were HIV positive (438males and 567 female) prevalence of HIV/ADS in Oromiaes and the average HIV prevalence rate was 0.89%( Gemechu,2019). Contributing nearly to 17.7% of the most hot PLHIV population in the country .While it contributes 3.5% to the total population of the country spots in Addis Ababa are areas where bares, groceries, pensions, guest houses, hotels, khat houses, shisha houses, night clubs, drinking establishment and tourist

frequented settings are concentrated as hotspot areas because sex workers commonly rent condoms and are becoming canter of sexual transmission disease including HIV /ADS. The percentage of men who had sex with non marital is highest in Addis Ababa (26%) compared to national (16%) . From the total HIV positive couples in Addis Ababa 4.3%of them were found to be discordant and the proportion of disclosure of HIV /AIDS diagnosis to HIV infected children is low. Almost one to ten HIV exposed infected become HIV positive in Ethiopia with two and four percent of HIV exposed babies were HIV positive by 6 and 18 months, respectively (Melaku, 2019).

### 2.11.3 Prevalence of HIV/AIDS in West Showa Zone

The study were 421 exposed infants delivered at three study hospitals; among them 41(9.7%), acquired HIV down from their mother, from 41 infected infants 24 (58.5%) as cases. The study included from Gedo, Ambo, and Gindabarat Hospitals.More than half of participants mothers we re housewives (53.13%),the majority were Married (89.5%), Gedo Hospital has 135 exposed infa nts, among them 13(9.6% were HIV positive under 5 and last 4 years. About 8.5 % of transmission rate of HIV from mother to child from 94 exposed infants in Gindabarat Hospitals . There were 192 exposed infants in Ambo Hospital over the last 4 years .From these 20 (10.4%) were HIV positive. Among them 75% were from rural areas had not start ART during gestation period and 37.5% was did not start ART during breast feeding, 70.8% delivered at home and were vaginal deliveries of cases. The majority of controls partners were in HIV care (86.1%) , but only 33% of them case were involved in HIV care, among controls all started art during pregnancy and 97.2% of them adhered appropriately to the medication(Hundu ma *et al*., 2021).

### 2.11.4 Prevalence of HIV/AIDS in Adea Berga Woreda

From the total woreda population 182709 (1396) (0.8%) were HIV positive. Among them 859(0. 5%) females and 537 (0.3%) males were exposed with HIV /AIDS on ART and non ART .In this Woreda their is no any published data about the prevalence of intestinal parasites and HIV/ADS including the study area. (Adea Beraga Woreda HIV/ADS Prevention and Control Office Report, 2023).

### 2.11.5 Prevalence HIV/AIDS in Mugher Town

From the total study area population 30917 (256 ) (0.83%) were HIV positive among them 167(0 .54%) females and 89(0.29%) males were exposed with HIV/AIDS,and on ART.There is no for mal published study that indicates about the prevalence of intestinal parasites (Mugher Health C enter, ART report, 2023).

## 2.12 Prevention and Control of Intestinal parasitic Infections among HIV/AIDS patients

Total control of the transmission of HIPIs and the reduction of possible aggravating factors are among the components of the sustainable development goals of the United Nations (2030 Agenda; Goal 3.3). Despite the effects of intestinal parasites remain to be public health burdens, specifically in the tropical and subtropical regions (Hotez, 2014).Control office(HAPCO) collabo rationwith international and local,partners,conducted single points estimate for adult HIV prevale nce in Ethiopia. Consequently,the adult HIV infection rate was estimated at 21% and this figure is all planning activati(FHPCO, 2007). Prevention and control of coinfection of intestinal parasit es has been suggested to worsen the outcome of infection in addition to HIV infection . HIV and intestinal parasites infection is being needed to tackle the problem, undertake the integrated prevention and control program (Badri *et al*., 2010).

## 2.13 Vaccines

### 2.13.1 Vaccines against Intestinal Parasites

Vaccines are another to avoid intestinal parasites by applying recombinant protein to increase immuno-preventive responses. These vaccines have been classified as hidden antigens which are not known by host's immune system that are normally exist in the parasite's and normal antigens, that conveyed during the infection process .These Vaccination of intestinal parasites prevents many diseases that affect animal's species of veterinary interest including human being which has increased the level of sureness in public health (Unnikrishnan *et al.*, 2012). Vaccination is recogonized as one of the most feasible and effective opportunity for governing diseases before infection. However, progress of protective vaccine against these parasites has been confirmed to be vastly challenging for scietific and economic reason (Versteeg *et al*., 2019).

### 2.13.2 Vaccines against HIV /ADS

HIV Vaccine is difficult to make, because of the unique features of the virus that evade vaccine governor, and the implications for likely safety difficulties from an HIV vaccine .HIV is the greatest intensively studied veirus of all time.'HIV vaccine untrue at least numerous years. Presently licensed vaccines for catching disease were developed when much less was known about the target parasites and its infections (Li *et al*., 2012 ).

Vaccine protects HIV infection and decrease the distribution of AIDS. Vaccine prevent HIV has been delayed because of concerns about responsibility of vaccine preparation and has guided legislation that would boundary the liability of preparation of HIV vaccines. There are three maj or possibilitys for controlling HIV infection. 1,Stop transmission of virus from one to another ind ividuals by awaring the society and behavioral changes; 2.Treat HIV infected persons with thera peutic drugs after infections recognized; 3.Protect infection through overview of" prophylactic" HIV Vaccines that prevent the formation of infection. Treatment of infected women with the anti viral drug Zidovudine (AZA) has reduced transfer of HIV infection to infants, important success (Versteeg *et al*., 2019).

# 3. Material and Methods

## 3.1 Description of the Study Area

The study took place at Mugher Health Centre, which is located in the Adea Berga District of the West Showa Zone in Oromia Regional State, Ethiopia. Nestled(positioned about 95 km west of Addis Ababa, Mugher Health Centre serves a vital role in the community, offering a variety of health services including outpatient and inpatient care, pharmacy, and laboratory services. In addition, since 2008 the, center has been a cornerstone in providing counseling and testing for HIV, for individuals undergoing antiretroviral therapy (ART).

During the study, 256(89 males and 167 female) HIV-positive individuals were encountered a in the area , but two individuals were passed away before they give their stool samples. One was a female who had interrupted her ART regimen for an extended period, leading to a severe case of pulmonary tuberculosis. The other was a male who faced psychological challenges, which caused him to fall behind on his ART and suffer from a heightened viral load (Mugher Health Centre ART Information Center, 2023).

The Adea Berga District has a population of 182,709 people, with roughly equal numbers of men and women. In Mugher town specifically, there are 16,358 men and 14,559 women (Adea Berga District Information Center Report, 2023).

## 3.2 Study Design and Duration

A Health Centre based on Cross-sectional study was conducted at Mugher Health Centre from February to August 2024 to identify the prevalence and association risk factors of intestinal parasitic infection among HIV infected and non infected individuals taking their stool samples by laboratory technologists.

### 3.2.1 Study Subjects

The study subjects were HIV positive patients who were on antiretroviral therapy (ART) at Mugher Health Centre for check up to take their prescription, or other medical issues .These stud y also including HIV negative individuals voluntary gave informed consent and stool sample for laboratory anasis used as control group.

## 3.3 Inclusion and Exclusion criteria

The aged above 18 years old participants were included in this research study to give stool sample and aged 15_18 years old participants participated by requiring informed consent from parents or legal guardian. But those below fifteen years were excluded. Individuals who are on anti-helminthic treatment during data collection were not included in the study.

## 3.4 Sampling Techniques

From the total population 256 on ART, participants were selected by using systematic random sampling method from a list of households, choosing every even-numbered household until the number reached the required sample size. This ensured an equal number of HIV-positive and HIV-negative individuals for comparison. Unfortunately, during the data collection process, two HIV-positive participants had to withdraw from the study.

### 3.4.1 Sample Size Determination

Across-sectional study was conducted to classify and to determine enteric intestinal parasites among HIV infected individuals (individuals living with HIV/AIDS). The subjects were included HIV infected and non infected individuals who were involved for comparison. The sample size for this study was resolved based on HIV infected participants attending at Mugher Health Centre from February to August (2024).Using Yamane's (1967) formula, the required sample size was determined from the total population of 256 HIV infected individuals. The calculation is as follow:

$$n = \frac{N}{1+N(e)^2}$$

N=256

e =0.05

whereas n= sample size calculated

N=the population size

e= allowable margin error

$$n = \frac{256}{1+256(0.05)2}$$

$$n = \frac{256}{1+256\ (0.0025)}$$

$$n = \frac{256}{1+0.64}$$

$$n = \frac{256}{1.64}$$

- 156.09 n= **156**

## 3.5 Methods of data collections

### 3.5.1 Stool examination

For the study, participants were provided with clean, sterile plastic containers with screw caps to collect their stool samples. These containers were labeled and leak-proof to ensure the samples remained uncontaminated. Once collected, the stool samples were examined immediately using direct wet mount microscopy to preserve the motile stages of the parasites. and checked for various parasites, including trophozoites, eggs, and cysts. To improve the chances of detecting parasites, used both wet mount preparation and the formal-ether concentration technique to identify single, double, and triple infections. Additionally Acidic _fast Ziehl-Neelsen Method primarily used to detect organisms that are partially acidic _fast or those that my not retain under stronger acid conditions. This method particularly useful for diagnosing infections caused by organisms like Crytosporidium, Cyclospora, and Isospora, The results were then recorded based on the labels given to each participants.

### 3.5.2 Questionnaires

Distributed organized questionnaires to both HIV-positive and HIV-negative participants to gather socio-demographic information, such as age, sex, residence, education level, marital status, occupation, monthly income, and HIV status. The questionnaires also explored participants' knowledge, attitudes, and practices regarding antiretroviral (ART) drugs, health practices, lifestyle, and environmental conditions like water supply, food type, and presence of domestic animals, toilet availability, hand washing habits, and waste disposal methods.

The questionnaires were prepared in both English and Afan Oromo. They were designed to be close ended that participants could complete independently. For those who were not write and read either language, conducted interviews after obtaining their consent and ensured that the questionnaires were clear , understandable and provided proper orientation before starting data collection.

## 3.6 Methods of Data Analysis

Data was analyzed for its completeness, entry and analysis by using excel and SPSS version 22 statistical software. Adescriptive analysis, including the occurrence spreading and the percentage were used to determine the magnitude of intestinal parasitic infections. Data were analyzed to m easure the association between parasitic infection in HIV positive and negative individuals .Diffe rences between proportions were evaluated using Person's chi squared test. Also chisquare good ness of fit test was conducted to measure the significant difference within avariable. Observed di fference data was considered and important and noted in the text if $p<0.05$), was considered stati stically significant.Finally the result were presented in words, charts, tables and figures.

## 3.7 Pilot study

The draft of the questionnaires was administered to 15 HIV infected and 12 non infected individuals who on treatment in Mugher Health Center. These participants who selected for pilot test were not included for the final source of data. Pilot study is the rehearsal of the research allowing testing the research approach with small number of test participants before conduct the main research to get feedback in order to improve ambiguous and unclear statements to the questionnaires that were administered to the respondants.

## 3.8 Ethical Considerations

The study was obtain support letter from Addis Ababa University, Department of Zoological Science. Then a letter informing to Mugher Cement factory management office and Mugher Health Centre .The respondent will be explained about objective and purpose of the study to participate and the right of the participant to participate on this study was voluntarily of her or him and any information obtained, their laboratory result was consulted with physician and treated according to the protocol.

# 4. Results and Discussion

## 4.1 Socio-demographic characteristics

The socio-demographic and socio-economic characteristics of the study participants are presented in Table1. Among them, 88 (57.1%) were women and 66 (42.9%) were men. From this group, 78 (50.65%) were HIV-negative, while 76 (49.35%) were HIV-positive and were receiving antiretroviral therapy (ART) for varying lengths of time. The participants ranged in age from 15 and above older, with the largest group (35.7%) between 26 and 36 years old. This was followed by those aged 37 to 47 years (27.3%), those over 47 years old (18.8%), and those aged 15 to 25 years (18.2%). When it came to where they lived, a significant majority (59.1%) were from urban areas, while 40.9% lived in rural settings, a trend similar to what has been observed in the Eastern Cape (Ifeoma, 2022). Regarding marital status, most participants were married (66.9%), with a smaller percentage unmarried (19.5%), divorced (7.1%), or widowed (6.5%). In terms of occupation, the largest group was day laborers (35.1%), followed by farmers (25.3%), merchants (17.5%), employed in government or private sectors (13.0%), and students (9.1%). Educationally, most participants had no formal education (45.5%), with fewer having completed primary school (28.6%), secondary school (14.3%), or higher education (11.7%). Monthly household income varied, with nearly half (49.4%) earning between 0 and 2000 birr. The rest were distributed across the 2001–4000 birr (26.0%), 4001–6000 birr (15.6%), and above 6000 birr (9.1%) ranges. These socio-demographic and economic factors play a significant role in the prevalence of intestinal parasite infections in the area. Limited income often means less access to proper sanitation, clean water, and nutritious food, which are essential for preventing these infections.

**Table : Socio demographic and Socio economic characteristics**

| Characteristics | Category | HIV(positive (%,(n=76) | HIV Negative(%,(n=78) | Total%(n=154) |
|---|---|---|---|---|
| Sex | Male | 31(40.8) | 35 ( 44.9 | 66(42.9) |
| | Female | 45(59.2 ) | 43(55.1) | 88 (57.1) |
| Age | 15-25 | 10 (13.2) | 18(23.1) | 28(18.2) |
| | 26-36 | 29(38.1 ) | 26(33.4) | 55(35.7) |
| | 37-47 | 23(30.3) | 19(24.3) | 42(27.3) |
| | >47 | 14(18.4 ) | 15(19.2) | 29(18.8) |
| Marital status | Single | 13(17.1) | 17(21.8) | 30(19.5) |
| | Married | 2 (68.4) | 51(65.4) | 103(66.9) |
| | Divorced | 6(7.9%) | 5(6.4%) | 11(7.1) |
| | Widowed | 6(6.6%) | 5(6.4%) | 10(6.5) |
| Residence: | Rural | 26(34.2) | 37(47.4) | 63(40.9) |
| | Urban | 50(65.8) | 41(52.6) | 91 (59.1) |
| Occupation: | Farmer | 16 (21.1) | 23(29.5 | 39 (25.3) |
| | Student | 2 (2.6) | 12 (15.4) | 14(9.1) |
| | Merchant | 13 (17.1) | 14 (17.9) | 27 (17.5) |
| | Employed | 13(17.1) | 7(9.0) | 20(13.0) |
| | Unemployed | 32 (42.1) | 22(28.2 | 54(35.1) |
| Educational: | Primary level | 20(26.3) | 24(30.8) | 44(28.6) |

| | | | |
|---|---|---|---|
| Secondary level | 8(10.5) | 14(17.9) | 22(14.3) |
| Higher level | 8(10.5) | 10 (12.8) | 18 (11.7) |
| Day laborers | 40(52.6) | 30 (38.5) | 70 (45.5) |
| Monthly income | | | |
| 0-2000 | 37 (48.7) | 39(50.0) | 76(49.4) |
| 2001-4000 | 18(23.7) | 22(28.2) | 40 (26.0) |
| 4001-6000 | 14 (18.4) | 10(12.8) | 24(15.6) |
| Above 6000 | 7(9.2) | 7 (9.0) | 14(9.1) |

## 4.2 Distribution of Intestinal parasitic species

The analyzed 154 stool samples for intestinal parasites and found that 94 of these tested positive for one or more types of parasites, leading to an overall prevalence rate of 61.0% (***Table 2***). This means that 39.0% of the participants were free from intestinal parasites. This rate is comparable to the 59.8% reported in Southern Ethiopia (Assefa, 2009) and the 61.9% from Eastern Ethiopia (Adamu, 2009), but higher than the 44.6% observed in Aksum town (Padmaja, 2014). Among those who were infected, 53.85% had a single type of parasite. The most common parasite was *Taenia* spp., which was found in 16.9% of samples. This result was higher than 0.25% reported in West Cameroon (Nkenfou, 2013). Next in prevalence was *Entamoeba histolytica* trophozoites, present in 13.0% of the samples, similar to the 13.5% reported in Eastern Ethiopia (Teklemariam, 2023), but higher than the 7.2% found at Kombolcha Health Centre (Gebretsedik, 2018). *Ascaris lumbricoides* ova were detected in 9.7% of the samples, which is close to the 8.8% found in food handlers in Uberlandia (Udeh *et al.,* 2019) but higher than the 4.12% observed in other Ethiopian studies (Alemnew, 2020) and 5.9% in Gonder (Gelaw, 2023). It was lower than 14.6% reported in Jimma (Tadesse *et al*., 2013) .*Giardia lamblia* was found in 7.14% of samples, which aligns with 7.0% reported in Hawasa (Mulatu *et al.,* 2015). Other parasites identified included *Hymenolepis nana* (2.59%), *Cryptosporidium* spp. (1.95%), *Isospora belli* (1.3%), and hookworm infection (1.29%). These figures are lower than the 8.63% reported in Southern Ethiopia (Alemu *et al*., 2015) but are comparable to the 1.35% observed in a later study from the same region (Alemu *et al.,* 2016).Among the 61.0% prevalence of intestinal parasites, 53.89% had only one type of infection, while 7.15% had mixed infections. The most common mixed infections were *A. lumbricoides* + *E. histolytica* (3.25%), followed by *E. histolytica* + *G. lamblia* and *E. histolytica* + *H. nana* (1.95% each). These mixed infection rates were higher than those reported in Aksum town (Gebreselassie, 2015) and Bahir Dar (Hailegebriel, 2017). Differences in these findings might be due to variations in socio-economic status, handwashing habits, individual immune responses, and dietary practices, such as eating raw food. Improvements in health intervention programs, alongside better health-service coverage and the active involvement of health extension workers, may have significantly contributed to the reduction of intestinal parasite prevalence among HIV/AIDS patients in the study area.

**Table 2. Intestinal parasitic infection among HIV positive and negative individuals**

| Type of parasites | Prevalence | Percentage (%) |
|---|---|---|
| Non-opportunistic | | |
| Hook worm infection | 2 | 2.9 |
| *A.Lumbericoides* | 15 | 9.7 |
| *E. histolytic a/dispar* | 20 | 13.0 |
| *Giardia lamblia* | 11 | 7.14 |
| *Teania Species* | 26 | 16.9 |
| *Hymenolepsis nana* | 4 | 2.59 |
| Total | 78 | 50.6 |
| Opportunistic Parasites | | |
| *Isospora belli* | 2 | 1.3 |
| *Cryptosporidium species* | 3 | 1.95 |
| Total | 5 | 3.25 |
| Mixed infection | | |
| A.*lumbericoides+E.histolytica* | 5 | 3.25 |
| *E .histolytica +G.lamlia* | 3 | 1.95 |
| *E.histolytica+H.nana* | 3 | 1.95 |
| Total | 11 | 7.15 |
| **Overall prevalence** | 94 | 61.0 |

### 4.3 Prevalence of intestinal parasites among HIV positive and negative individuals

The checked 154 stool samples for intestinal parasites and found that 61.0% were positive. Among those, 64.5% were HIV-positive and 57.7% were HIV-negative (Table 3). This rate is higher than what's been reported in in other studies: 42.4% and 42.5% in South Ethiopia (Alemseged *et al*., 2015) and 44.8% in Southwest Ethiopia(Awole, 2013). The difference was significant ($p < 0.05$), meaning HIV-positive individuals had a noticeably highigher prevalence of intestinal parasites compared to those who were HIV-negative. For HIV-positive individuals, the most common parasite was *Entamoeba histolytica trophozoites*, found in 19.7% of samples. This is higherthan 12.48% seen in Western Ethiopia (Wondmiene, 2020) and 14.09% in another Ethiopian study (Tegen *et al*.,2020). Next was *Ascaris lumbricoides ova*, found in 15.8% of the samples, which is higher than the 4.12% reported in another Ethiopian study (Wondmieneh, 2020). We also found *Giardia lamblia* in 10.7% of the samples, which is close to the 10.6% reported in Nigeria (Udeh, 2019) but lower than the 14% from South Ethiopia(Alemsegede, 2015) and 3.8% from Eastern Cape (Ifeoma *et al*., 2022).Other parasites included hookworm, *Hymenolepis nana*, *and Cryptosporidium* species, found in 2.6% of the Samples. This is lower than the rates reported in South Ethiopia (Alemsegede, 2015) but higher than the 1.6% seen in Nigeria and Libya (Akinbo *et a*l., 2010) *Isospora belli* was found in 1.3% of samples, which is less thanthe 5% reported in South Ethiopia (Alemseged *et al*., 2015). In the HIV-negative group, *Taenia species* were the most common, showing up in 26.9% of samples,followed by *E. histolytica* (6.4%), *Ascaris lumbricoides* and*Giardia lamblia* (3.84%), *Hymenolepis nana* (2.6%), and *Isospora belli* and *Cryptosporidium species* (1.3%).The prevalence of *Taenia species* was lower than the 65.3% reported in Faso (Sangare *et al*., 2015) and 57.48%in Cameroon (Voukin, 2014). Non-opportunistic intestinal parasites showed a significant difference($p < 0.05$) between HIV-positive and HIV-negative individuals, However, opportunistic parasites did not ($p > 0.05$). This might be due to HIV positive individuals on effective ART may improve immune function, which reducetheir susceptibility to opportunistic infections ,including intestinal parasites. This could lead to similar resistant infection rates as in HIV-negative individuals, because ART (antiretroviral therapy) can help to improvepatients' quality of life, boost survival rates, slow disease progression, reduce viral loads, strengthen immunesystems, and lower the risk of opportunistic infections.

**Table:3 Prevalence of intestinal parasites among HIV positive and negative individuals**

| Parasites Species | HIV positive n% (n=76) | HIV Negative n %( n=78) | Chi-square | P-value |
|---|---|---|---|---|
| *Hook worm* | 2(2.6) | 0(0.0) | 23.964 | 0.000 |
| *A.Lumbericoides* | 12(15.8*)* | 3(3.84) | 46.495 | 0.000 |
| *E. histolytica* | 15(19.7) | 5 (6.4) | 60.326 | 0.000 |
| *Gardia lamblia* | 8(10.7) | 3(3.84) | 26.548 | 0.000 |
| *Teania species* | 5 (6.6) | 21(26.9.) | 52.304 | 0.000 |
| *Hymenolepsis nana* | 2(2.6) | 2(2.6) | 1.67 | 0.433 |
| *Isospora belli* | 1(1.3*)* | 1(1.3) | 1.568 | 0.651 |
| *Cryptosporidium spp* | 2(2.6*)* | 1(1.3) | 1.493 | 0.345 |
| *A.lumbericoides+E.histolytica* | 0(0.0) | 5(6.4) | 49.982 | 0.000 |
| *E.histolytica +G.lamlia* | 2(2.6) | 1(1.3) | 1.634 | 0.43 |
| *E.histolytica+H.nana* | 0(0.0) | 3(3.84) | 37.493 | 0.000 |
| Over all prevalence | 49(64.5) | 45(57.7) | 9.012 | 0.015 |

## 4.4 Prevalence of opportunistic intestinal parasitic infections

Out of the 154 stool samples examined, 3.25% tested positive for opportunistic intestinal parasiti c infections in both HIV-positive and HIV-negative individuals ( Table 4**).** The infections found were more common among those with HIV compared to those without it, with a significant association ($p < 0.05$) between infection rates and HIV status. Specifically, 3.95% of HIV-positive individuals had opportunistic infections, while 2.56% of HIV-negative individuals did. This is lower than the rates reported in other studies 48% in Eastern Ethiopia (Adamu, 2009) and 44.8% in Southwest Ethiopia (Awole, 2003). *Cryptosporidium* species, the prevalence was 1.95%, which is less than that was found in Northwest Ethiopia (Kiros *et al*., 2015) and much lower than the 8.63% reported in South Ethiopia (Alemu *et al.,* 2015). *Isospora belli* was present in 1.3% of the samples, similar to the findings in South Ethiopia (Alemu *et al.*, 2016). And also observed a higher prevalence of these opportunistic infections among patients with diarrhea compared to those without, and this difference was statistically significant ($p < 0.05$).The variations in these findings could be due to a range of factors, such as differences in socio-economic and educational backgrounds, access to sanitation facilities, animal contamination, environmental cleanliness, immune system, handwashing habits, and effectiveness of diagnostic techniques could also influence these results.

**Table : Prevalence of opportunistic intestinal parasitic infections**

| Variable | Status of infection, n (%) | | Total Examined | Chi-square | P-value |
|---|---|---|---|---|---|
| HIV status | Infected | Not- infected | | | |
| HIV positive | 3 (3.95) | 73 (96.05) | 76 (49.35) | 12.45 | 0.001 |
| HIV Negative | 2 (2.56) | 76 (97.44) | 78 (50.65) | | |
| Diarrheal status | | | | | |
| Yes | 2 (3.92) | 49 (96.08) | 51 (33.11) | 7.24 | 0.035 |
| No | 1 (0.97) | 102 (99.03) | 103 (66.89) | | |

## 4.5 Associated risk factories with Intestinal parasitic infection among the study subjects

The asseements of associated risk factors and Intestinal parasitic infection among HIV positive a nd negative individuals attending at Mugher Health Centre is presented in (Table 5.).Based on the chi-square ($X^2$) test, statistically significant association ($p<0.05$) were observed between the selected risk factors and the prevalence of intestinal parasites. Risk factors includes; sex ($X^2$ 11.92, p=0.008),age group($X^2$=21.27,p=0.0103),Marital Status($X^2$=164.75,p=.0.000),residence ( $X^2$=12.701,p= 0.005), occupational level ($X^2$=59.506,p=0.000), educational level ($X^2$=,59.506,p= 0.000),source of water ($X^2$=97.325, p=0.000), presence of toilet ($X^2$=10.62,p=0.014,habit of eati ng raw food ($X^2$=16.026,p=0.001), presence of diarrhea ($X^{2=}$ 26.727, p=0.000 ,condition of was te disposal ($X^2$=,36.909. p=0.000) and presence of animals in the house ((X2=,7.922,p=0.048) w ere significantly associated ($p<0.05$). However HIV status and presence of animals were not sign ificantly linked to the prevalence of intestinal parasites ($p > 0.05$). This might be due to both HIV-positive and HIV-negative individuals may engage in similar risk factors and leads to similar exposure to infectious agents, as result there is no significant difference in risk factors between two groups.

The people who ate raw vegetables had a higher chance of having parasitic infections, which is consistent with a study from Dessie, Northeast Ethiopia (Hailegebriel, 2017). Those with lower incomes (0-2000 birr per month) were more likely to be infected compared to those with higher incomes, aligning with findings from Butajira, South Central Ethiopia (Gedle *et al.*, 2017). Partic ipants who used tap water were more affected by parasites than those using other sources, a finding similar to what was observed in Midwestern Nigeria (Akinbo *et al.,* 2010).

Urban residences who had use tap water more affected by intestinal parasites than rural esidence and other water source .This might be due to when water not be adequately treated or could be contaminated during distribution due to old poorly maintained or leaking pipes. This contamination can introduce intestinal parasites in to the tap water supply,increasing These might be due inadequate differences might be due to a variety of factors, such as access to clean water, awareness about hygiene, environmental conditions, and the quality of diagnostic tools. Additionally, avoiding eating raw food, and providing facilities enhance prevention and control of intestinal parasitic infection

**Table 5: Selected risk factors associated with Intestinal Parasitic Infection among HIV positive and negative Individuals.**

| | | Intestinal parasites | | | |
|---|---|---|---|---|---|
| Risk factors | Category | Has(Present n(% ) | Not parasite(%) | Chi-square | P-_value |
| | Male | 38(24.7) | 28(18.2) | | |
| Sex | Female | 56(36.4 ) | 32(20.8) | 11.92 | 0.008 |
| | 15-25 | 14(9.1) | 9(16.9) | | |
| Age | 26-36 | 26(16.9) | 15(9.7) | | |
| | 37-47 | 33(21.4) | 21(13.6 ) | 21.273 | 0.003 |
| | >47 | 21(13.6) | 15(9.7) | | |
| | Single | 15(9.7) | 15(9.7) | | |
| Marital | Married | 64(41.6) | 39(24.7) | 164.753 | 0.000 |
| Status | Divorced | 9(5.8) | 2(1.3) | | |
| | Widowed | 6(3.9) | 4(3.2) | | |
| Residence | Rural | 41(26.6) | 22( 14.3 ) | | |
| | Urban | 53( 34.4) | 38 (24.7 ) | 12.701 | 0.005 |
| | Farmer | 24(15.6) | 15(9.7 ) | | . |
| Occupation | Student | 3(1.9) | 11(7.1) | | |
| | Merchant | 14(9.1) | 13(8.4) | | |
| | Employees | 12(7.8) | 8(5.2) | | |
| | Day laborers | 41(26.6 ) | 13(8.4) | 63.792 | 0.000 |
| | Primary | 31(20.1) | 13(8.4) | | |
| | Secondary | 10(6.5) | 11(7.1) | | |
| Educational | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| level | Higher level | 10(6.5) | 9(5.8) | | |
| | No formal E | 43(27.9) | 27(17.5 ) | 59.506 | 0.000 |
| Monthly income | 0-2000 | 54( 35.1) | 22(14.3 ) | 86.416 | 0.000 |
| | 2001-4000 | 24(15.6 ) | 16(10.4 ) | | |
| | 4001-6000 | 11(7.1 ) | 13(8.4 ) | | |
| | Above 6000 | 5(3.2) | 9 ( 5.8) | | |
| Presence Of diarrhea | Yes | 30(19.5) | 21(13.6 ) | 26.727 | 0.000 |
| | No | 64(41.6 ) | 39 (25.3) | | |
| Source of water | River | 6(3.9 ) | 10(6.5 ) | | |
| | Spring water | 20(13.0) | 12 (7.8 ) | | |
| | Well water | 13(8.4 ) | 8(5.2 ) | | |
| | Tap water | 55(35.7 ) | 30 ( 19.5) | 97.325 | 0.000 |
| Presence of animals at home | Yes | 49(31.8 ) | 28(18.2 ) | 7.922 | 0.048 |
| | NO | 45(29.2) | 32(20.8 ) | | |
| Presence of toilet | Yes | 55(35.1) | 34(22.7) | | |
| | No | 39(25.3) | 26(16.9) | 10.623 | 0.014 |
| Eating raw food | Yes | 57(37.0) | 38 (24.7 ) | 16.026 | 0.001 |
| | No | 37(24.0) | 22 (14.3) | | |
| Condition of Waste disposal | Daily | 51(33.1 ) | 26 (16.9) | 36.909 | 0.000 |
| | Two day | 29(18.8 ) | 19(12.3 ) | | |
| | >two days | 14(9.1 ) | 15( 9.7) | | |
| HIV status | Positive | 49(31.8 ) | 27(18.2 ) | 7.299 | 0.063 |
| | Negative | 45(28.6 ) | 33(21.4 ) | | |

### 4.6 Distributions of intestinal parasites prevalence by gender (sex group)

In the  study, 33.7% of females and 27.3% of males had intestinal parasitic infections, with a slightly higher rate among females. This finding is higher than what was reported in Gonder (Gelaw *et al*., 2013) but lower than the rates seen in Tigray, Ethiopia (Gebrewahid *et al*., 2019). However, research from Eastern Cape (Ifeoma *et al*., 2022) and Northwestern Ethiopia (Edris, 2010).In other hand 23.4% of females and 15.6% males were observed as none infected with any intestinal parasites.

These differences might be due to various factors like the specific study populations, the length of the study, living conditions, hygiene practices, waste management,& individual immunity.

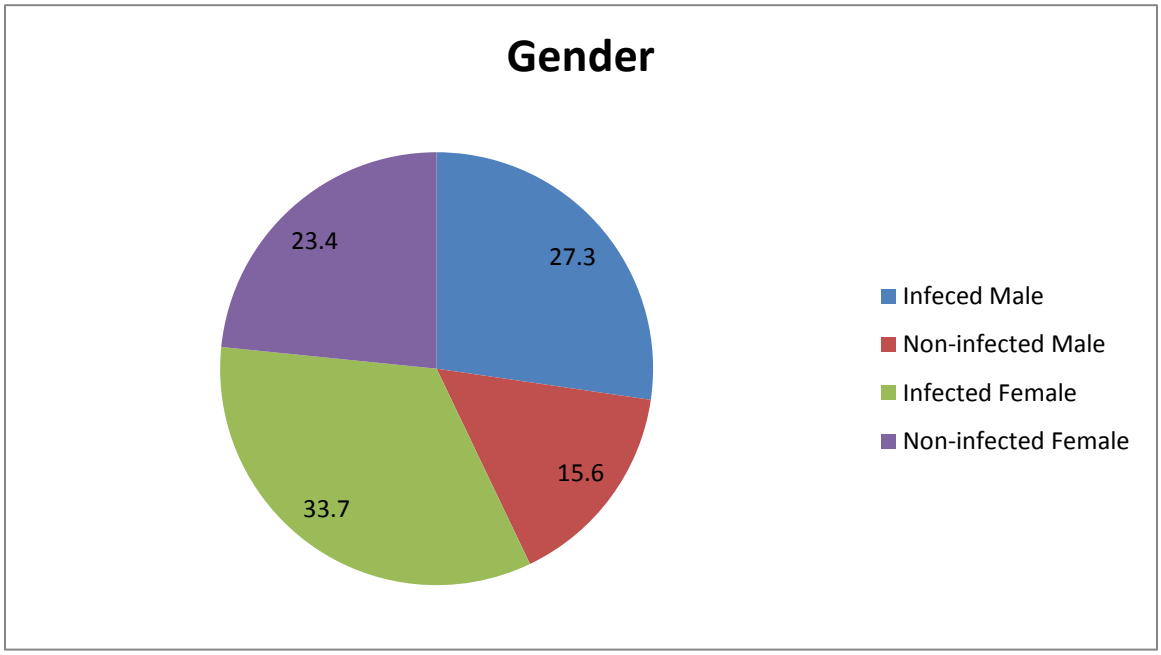


**Figure .**The rate of intestinal parasites infection by gender

### 4.7 Risk factors associated with hand washing habit after defection

The study, participants who did not washed their hands at all after defecation had a higher rate of intestinal parasitic infections (25.3%) compared to those who washed sometimes their hands (23.4%) and those who washed their hands regularly (12.3%). These results were lower than findings from studies in Motta (Hailegebriel, 2017) and Berber (Adualem *et al*., 2014). In other hand 15% who did not wash their hands at all 13% that washed their hands sometimes and 11% who washed their hands regularly were observed as none infected with any intestinal parasites.

The differences in infection rates could might to factors like environmental sanitation,lack clean water, the efectiveness of diagnostic techniques, individual immune responses, personal hygiene, absence toilet and its qualits are inhance the prevalence rate of intestinal parasites (Figure **2**)

Improving this problem by educating people about good hygiene practices, Community based initiatives about hand washing to increase awareness, active involvement of health extension workers and other better health-service coverage are crucial to the reduction of intestinal parasite prevalence among HIV/AIDS patients in the study area

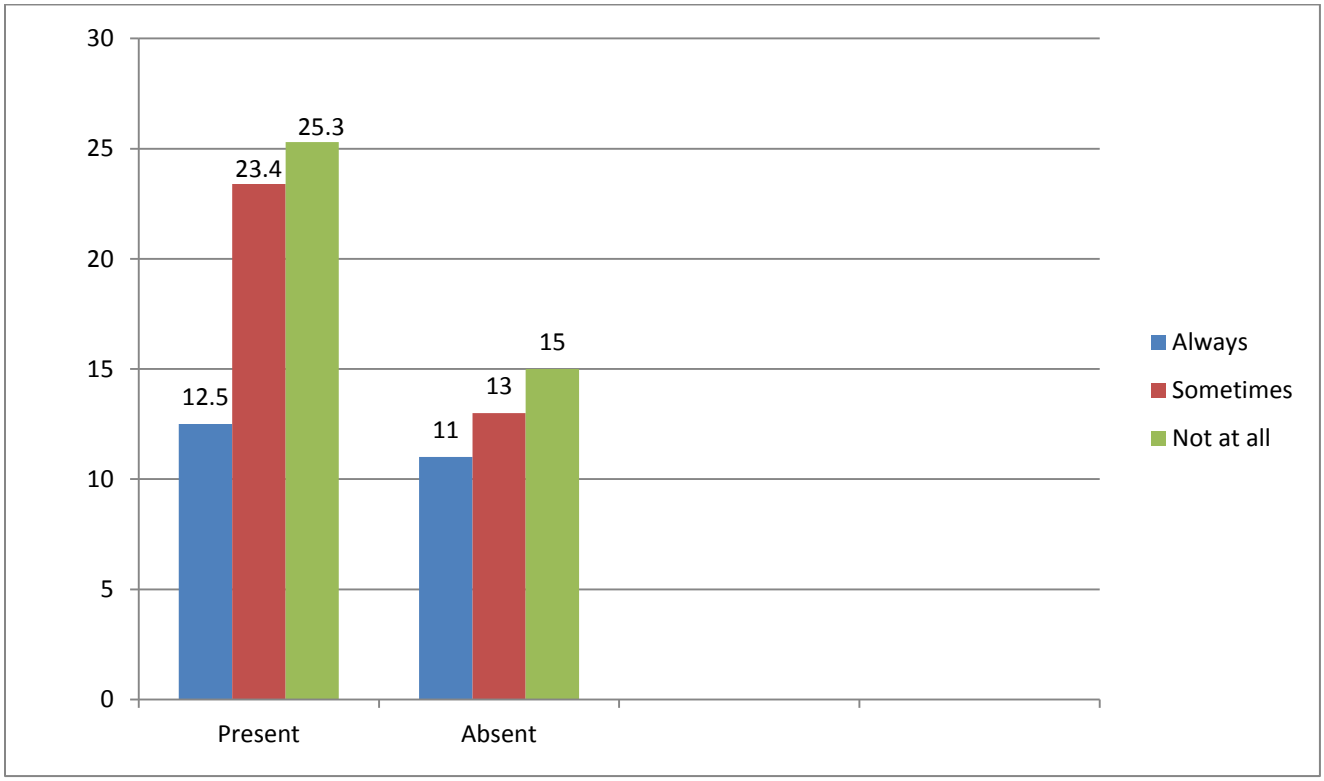

**Figure 2**.The risk of hand washing habit after defection in the occurence intestinal parasite

## 4.8 Prevalence of gastrointestinal agents related with washing fruits and vegetables before eating

The study, practice of washing fruits and vegetables before eating was linked to the prevalence of intestinal parasitic infections. Participants who regularly washed produce had a lower infection rate (17.4%) compared to those who washed sometimes (21.4%) or didn't wash at all (22.2%). However, the infection rates observed were lower than those reported in studies from Aksum, Northern Ethiopia (Gebewahid *et al*., 2019), and Dassies, Northeast Ethiopia (Feleke *et al*., 2022).In other hand 16.% who did not wash at all, 13.6% who washed some times and 9.1% who regularly washed were observed as none infected with any parasites (Figure 3).

The variations in infection rates might be due to differences in environmental sanitation; the effectiveness of diagnostic techniques, immune status, and personal hygiene practices, such as the habit of washing fruits and vegetables, this suggests that washing fruits and vegetables can help to reduce the risk of intestinal parasitic infection.

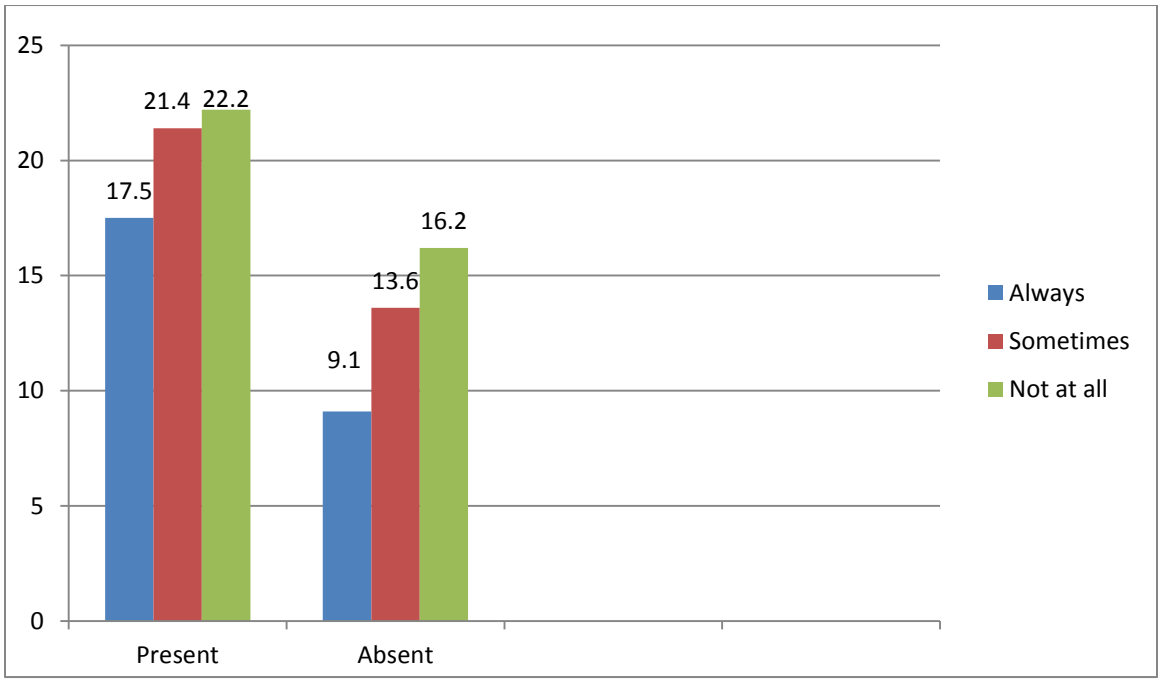


**Figure .**Risk of intestinal parasitic infection related with washing fruits & vegetables before eating

## 4.9 Risk of intestinal parasitic infection related with hand washing habit before & af ter meal

In the study, participants who regularly washed their hands before and after meals showed a higher rate of intestinal parasitic infections (48.1%) compared to those who washed their hands occasionally (13.0%). This was unexpected, as studies from Gonder (Gelaw *et al.*, 2013) and Motta town (Asemanahagn, 2014) .However, 22.1% and 16.8% were observed as none infected with any intestinal parasites individuals respectively (Figure 4).

The differences in the findings might be due to various factors such as, quality of laboratory equipment used, hand washing practices, quality of water, area of conserving food ,and truthfuln ess of respondent response, living condition and these elements can all affect the prevalence of intestinal parasites and other communicable diseases.

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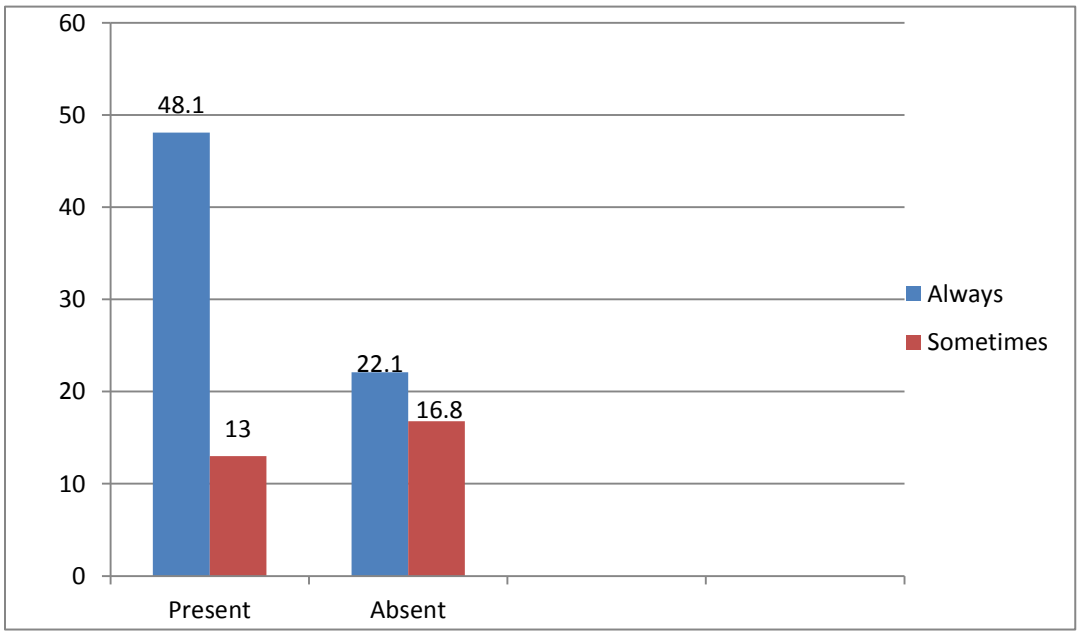


**Figure: 4**. Prevalence of intestinal parasites with the relation of practice offhand washing before and after meals

## 5. Conclusion

The study found that intestinal parasitic infections were more common among individuals with HIV compared to those without. The prevalence rate of IPIS were, higher in women than in men. About eight numbers of parasites were identified among HIV positive and only seven parasites were countered among HIV negative individuals. *Taenia species, Entamoeba histolytica/dispar and,* Ascaris lumbricoides were the most common dominant parasites in the study respectively. Certain factors seemed to increase the likelihood of these infections. These included having animals in the household, a lower income, eating unwashed fruits and vegetables, lack of formal education, occupationally, day laborers, and eating raw food were significant health issue of HIV patient in the area.

## 6. Recommendation

**According to the above investigation, the following measures are recommended**:

- Given the high prevalence of intestinal parasites found in this study, there's a need to focus on improving sanitary conditions. Efforts should be made to enhance hygiene practices, ensure proper sanitation facilities in both urban and rural areas, and regularly monitor these conditions.
- People with HIV/AIDS should be advised on how to avoid infection, including potential benefits of drinking clean water, washing fruit and vegetable before eat , proper waste disposal and avoid contact with domestic animals
- Future studies should involve larger sample sizes to explore and identify other intestinal parasites that may not have been detected in this study. This will help in gaining a deeper understanding of parasitic infections and developing better control strategies

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## 8. Appendices

# Appendix I

Addis Ababa University College of Natural and computational Sciences. This questionnaire format is prepared to collect data on the prevalence of intestinal parasites among HIV positive and negative individuals attending in Mugher health center to assess, clinical, demographic and socio economic condition, assessment of HIV/AIDS patients. From February _June, 2024

Card no/ code of patient (Respondent) _____

Circle to the appropriate answer from the given alternatives

**A. Section A: socio demographic information**

1. Sex: 1. Male, 2. Female
2. Age: 1. 15-30, 2. 31-46, 3. 47 -62, 4. 63 and above
3. Marital status: 1. Pingle, 2. Married, 3. Divorced, 4. widowed
4. HIV status: 1. Positive, 2. Negative-
5. Residential Address: 1. Rural 2.Urban
6. Occupational status: 1. Employed 2. Day laborers 3. Farmers 4. Merchant 5. Students
7. Educational level: 1.Primary 2. Secondary 3. College 4. Uneducated
8. Monthly income: 1. 0_2000 2. 2001__4000 3. 4001_6000 4. >6001

**B. Section B: Associated Risk factors information's**

1. Have you ever faced diarrhea? 1. Yes, 2. No

   If your answer for question for the above yes is it? 1. Acute, 2. Chronic `

2. What type of symptoms do you faced?

1. Nausea, 2.Headeche 3. Abdominal pain, 4 Fever

3. What type of water source do you use for drinking and cooking?

   1. River 2. well water 3. Spring water 4.Tape water

4. Do animals use these water sources? 1. Yes 2. No

5 Dou you have toilet? 1. Yes 2. No

6 .If your answer is yes what type toilet? 1. Traditional 2. Modern

7. Hand washing practice before and after meal. 1. Yes 2, No

8. Hand washing after toilet: 1. Always 2. Sometimes 3. Tot at all

9. Do you have eaten raw vegetables? 1. Yes 2. No

10. Do you wash well fruits before eat? 1. Yes 2. NO

11. Do you store cooked food 1.Yes 2. No

12. Duration of waste disposal:

1. Dailly 2. Within two day 3. Above two days

13. Irrigation practices? 1 Yes 2. No

14. Do you have Swimming practice? 1. Yes 2. No

# APPINDEX II

Gaafanno kun odeeffannoo haala jireenya fi ,qabeenyaa ,Buufata Fayyaa Mugar keessatti namoota qoricha umurii dheeressu ART jedhamu fudhachaa jiran irraa funanuf kan qophaa'edha.

Kabajamoo/ttuu gaafatamaa/ttuu hudduma dura qorannoo gaggeessuuf gaafannoo armaan gadiitif deebii naaf kennuuf eeyyamamoo ta'uu keessaniif galatoomaan jedha. Kaayyoon qorannoo kanaa haala fayyaa, baay'ina uummataa fi hawaas diinagdee namoota dhukkuba HIV/AIDS waliin jiraatin fi tatamsa'ina maxxantoota garaa keessaafi rakkoo isaan geessisan addaan baasee beekuuf gargaara.Kanaafuu odeeffannoo isin naaf kennitan fiixaan ba'umsa qorannoo kanaaf ga'ee guddaa waan qabuuf gaafannoo armaan gadiitif debii sirriidha Kan jettaniif lakkoofsa deebii sirrii gaafannichaa qabatee jirutti maruun guutaa. HUB.Deebin gaafannoo kennamanii tokkoo olis ta'uu waan danda'uuf sirriidha Kan jettan hundattuu maraa.

Koodii lakkoofsa dhukkubsattootaa (gaafatamaa/ttuu)_____

**Hub .**Deebin gaafannoo kanaa waan dhugaa ta'e yoo ta' malee firii qorannoo kanaa waan faallessuuf waan dhugaa ta'ee qofa akka deebiftan kabajaa fi dhiifama waliin isin gaafanna

A) **Kutaa 1ffaa**: **Gaetannoo haala dhukkubsatichaa**

1. Koorniyaa; 1. Dhiiraa 2. Dhalaa

2. Umurii: 1. 15-30 2. 31-46, 3. 47-62 4. 63 and above

3. Haala gaa'elaa:1. Kan hin dhaabne 2. Kan qabu 3. Kan hiike 4.kan irraa du'e

4. Haal a HIV? 1. Positiiva 2.Negatiiva

5. Teessoo gaafatamtootaa: 1. Baadiyyaa 2. Magaalaa

6. Haala hojii: 1.Qacaramaa 2 .Barataa 3. Daldalaa 4. Qotee bulaa 5. Kan hin qacaramne

7. Sadarkaa barnootaa: 1Sadarkaa 1ffaa, 2.Sadarkaa 2ffaa 3.Koollejjii/Universiit 4. Hin baranne

8. Galii ji'aan argattan : 1. 0_2000 2. 2001_4001 3. 4001_6000 4. 6001 fi isaa ol

**B) Kutaa 2ffaa: Gaafannoo waa'ee sababoota dhibee /dhukkubaa**

1. Garaa kaasaa qabdaa? 1. Eeyyee 2. Lakki

2. Deebiin kee gaaffii 1ffaaf eeyyee yoo ta'e: 1.Garmalee rakkisaa 2. Kan addaan hin cinne

3. Mallattoo akkamiitu sirratti mul'ta?

1. Garaa ammeessaa 2. Garaa kaasaa 3.Ho'aqaamaa 4. Bo'oo mataa 5.Hoo'a qaamaa

4. Bishaan dhugaatii fi nyaata ittiin qopheeffachuuf eessaa arggattu:

1. Bishaan yaa'u 2. Bishaan burqaa 3. Bishaan ciisu 4. Bishaan ujummoo

5. Bishaan ati itti fayyadamtu kanatti bineeldonni itti fayyadamuu? 1. Eeyyee 2. Lakki

6. Mana finchaanii qabduu? 1. Eeyyee 2. Lakki

7. Deebiin kee eeyyee yoo ta'e gosa mana fincaanii, 1. Aadaa 2. Ammayyaa

8. Mana fincaanii duraa fi booda harka dhiqattaa? 1.Yeroo hunda 2. Darbee darbee 3. Hin dhiqadhu

9. Mana keessan keessa horiin jiraa? 1. Eeyyee 2. Lakki

10. Balfa horiin baasan garaagarummaa ammamiin dhabamsiiftu?

1. Garaagarummaa: 1.Guyyaan 2 .Guyyaa lamaan 3. Guyyaa sadii fi isaa oliin

11. Kuduraa fi muduraa dheedhii Ni soorrattaa? 1. Eeyyee 0. Lakki

12. Nyaata bilchaataa soorrachuuf ni kuuftaa? 1. Eeyyee 2. Lakki

13. Jallisii ni hojjettuu? 1. Eeyyee 2.lakki

14. Bishaan ni daaktaa ? 1. Eeyyee 2. Lakki