ADDIS ABABA UNIVERSITY

COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCES

DEPARTMENT OF ZOOLOGICAL SCIENCE

Prevalence of Intestinal Parasitic Infections (IPIs) and Associated Risk Factors Among Patients Attending Health Care at Dejen Primary Hospital, Dejen Town, East Gojjam Zone, Amhara Region, Ethiopia

By: Simachew Demissie

Advisor: Fitsum Tigu (PhD)

June, 2024

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List of Acronyms and Abbreviation

AOR=Adjusted odds ratio

ARMSDWS=Amhara Regional Meteorology Service in Dejen woreda Station

CDC=Center of disease control

COR=Crude odds ratio

CSA=Central Statistics Agency

DWRTO= Dejen Woreda Road and Transport Office

EHNRI=Ethiopian Health and Nutrition Institution

ESS= Ethiopian Statistical Service

FMoH=Federal Ministry of Health

GIT= Gastro Intestinal Track

NTDs=Neglected Tropical Disease

IPIs=Intestinal parasitic infections

SPSS=Statically Package for social science

SSA=Sub Saharan Africa

STHs=Soil transmitted helminthes

WHO=World Health Organization

Abstract

The prevalence of IPIs is high in poor and developing countries**,** particularly in Sub-Saharan Africa including Ethiopia. The study was conducted at Dejen primary hospital located in Dejen town, East Gojjam Zone; Amhara Region, Ethiopia aimed to assess the prevalence of IPIs and associated risk factors among patients attending health care at the Hospital. A cross sectional study was carried out at Dejen primary hospital from December, 2022 to June, 2023. A total of 414 patients with clear symptoms of IPIs and visited in the hospital as an outpatient department during the study period were involved. Socio-demographic data were collected from the study participants through face-to-face interviews by well-structured questionnaires and stool samples were taken by medical laboratory experts. Data was analyzed by SPSS version 25 software and Bivariate and multivariate logistic regression analysis was used to identify the associated risk factors with IPs identified by stool examination. The overall prevalence of intestinal parasites in the study area was 43.3%. The protozoan parasites *E.histolytica* and *G.lamblia* with 26.1% and 9.2% respectively were the leading parasites identified in the district. Soil helminthes parasites were also identified among the study participants. Among the soil helminthes Hookworm, *Taenia spp*. and *Strongyloides stercoralis* were identified. The intestinal parasites were strongly associated with occupation, the habit of eating raw vegetables, swimming in river and the source of water they drink. Unemployed and daily labors [AOR:2.942;CI:1.167-7.416] and [AOR:4.254; CI:1.023-17.69] respectively; swimming in rivers [AOR:0.315;CI: 0.111-0.895], eating raw vegetable with [AOR:2.64;CI: 1.02-6.79] and source of drink water with [AOR:2.35;CI: 1.055-5.236] were significant risk factors. Based on the study findings the researcher recommended that the concerned bodies should create awareness about personal hygiene and intestinal parasites, mode of transmission, control and prevention; create awareness about the associated risk factors among the society.

Keywords: *E. histolytica*; *G. lamblia*; *Hookworm*; S. *stercoralis*; *Taenia spp.*

1. Introduction

1.1. Background of the study

Intestinal Parasitic Infections (IPIs) are the greatest worldwide cause of illness and disease. It is estimated that 3.5 billion individuals have been infected with intestinal parasites, of these 450 million individuals developed diseases as a result of this infection (WHO, 2008). The prevalence of IPIs is high in poor and developing countries**,** particularly in Sub-Saharan Africa IPIs are the major public health problems(Hotez *et al*., 2009; WHO, 2012).

The parasites are closely linked with low household income, poor personal and environmental sanitation, and overcrowding, limited access to clean water, tropical climate and low altitude. Among IPIs, Soil-transmitted helminthes (STHs) including *Ascaris lumbricoides* (*A. lumbricoides*), *Trichuris trichiura* (*T. trichiura*), and hookworms and protozoan parasites including *Giardia lamblia* (*G. lamblia*) and *Entamoeba histolytica* (*E. histolytica*) were the most prevalent intestinal parasites identified that cause significant morbidity in the world (WHO, 2020).According to the World Health Organization (WHO) estimates, there are 800–1000 million *A. lumbricoides,* 700–900 million Hookworm infections, 500 million *T. trichiura*, 200 million *Giardia intestinalis,* and 500 million *E. histolytica/dispar*cases globally, despite effort to control intestinal parasite infections, the diseases are still the leading causes of mortality and morbidity in the world (WHO, 2010). In addition, intestinal helminthes contribute for about 39 million disability adjusted life years and thus result in substantial economic loss (Stephen *et al*., 2000).

Infections with intestinal helminthes and protozoan parasites cause health problems including deficiency of micronutrients, growth retardation, poor cognitive development and predisposition to other infections in human (Evans and Stephenson, 1995: Tedla Shibru, 1986;). IPIs are isolated as causes of morbidity and mortality throughout the world particularly in developing countries like Ethiopia. Studies showed that parasitic protozoa and helminthes infections occur in developing countries, especially among the poor communities (de Silva *et al*., 2003). A high prevalence of IPIs individuals is associated with poverty and poor personal hygiene, unsafe water supply and contamination of the environment by human excreta and animal wastes. IPIs increase the hosts' susceptibility to other infections and decrease learning ability and growth in human (Karaman *et al*., 2006). Among the conditions influencing the development of IPIs are; poor

sanitary conditions, malnutrition, poverty, large family size and poor personal hygiene (Stephenson *et al.,* 2000). They can affect human development, educational achievements, reproductive health and social and economic development (Allen *et al.*, 2002).The prevalence of IPIs was reported from different parts of Ethiopia. The prevalence of intestinal helminthes infection is attributable to aforementioned factors . Ethiopia is one of the countries with low quality drinking water supply and latrine coverage (Amare Mengistu *et al*., 2007). Intestinal parasites also showed high prevalence in developing countries, including Ethiopia, this is highly related to low income, poor hygienic and sanitary condition, overcrowding, poor education and lack of safe drinking water (Abate *et al*, 2013). Although several studies have been conducted on the prevalence of IPIS in Ethiopia, there are still several localities in the country including Dejen town where information about the prevalence of IPIs and their risk factors are not available. The current study aimed to assess the prevalence of IPIs and associated risk factor at Dejen Primary Hospital which is located in Dejen town. Therefore, the purpose of this study is to establish the current prevalence and associated risk factors of human intestinal parasitic infection in Dejen primary hospital at Dejen town, East Gojjam zone, Northern Ethiopia.

1.2. Statement of the problem

IPIs caused by pathogenic protozoa and helminthes are worldwide public health concerns. It is estimated that about 3.5 billion people are affected by IPIs and 450 million are ill as result of these infections, more severe in children than adult. Infection with protozoan and helminthes parasites cause health problems like; deficiency of micronutrients, growth retardation, poor cognitive development and predisposition to other infections. IPIs in developing countries in the tropics and sub-tropics is associated with poverty and climatic factor (Montresor *et al.*,2002).In highly endemic area, children are more vulnerable to serious complication of parasite infection than adult (CDC, 2013). IPIs is familiar and endemic in most of Amhara region especially on East Gojjam zone, Dejen district due to socioeconomic factors, poor personal and environmental sanitation, and limited accesses to clean water, poverty and overcrowded conditions. Thus, we hypothesize that the prevalence of IPIs might be too high in such poor settings and so far there is no prevalence report in the district. Similarly, the district also that favors spread and which further transmitted the parasite to the normal greatly died number of individuals. Therefore, the present study aimed to determine the prevalence of intestinal protozoan and helminthes infection among patients attending Dejen Primary Hospital in Dejen town.

1.3. Objectives of the study

1.3.1. General objective

To assess the prevalence of IPIs and associated risk factors among patients attending Dejen Primary Hospital.

1.3.2. Specific objectives

- To assess the prevalence of IPIs among patients attending health care at Dejen Primary Hospital.
- To evaluate the association between socio-demographic factors and intestinal helminthes and protozoan's parasite infection.
- To identify the associated risk factors of human intestinal parasitic infection at Dejen primary hospital.

1.4. Significant of the Study

We believe that the data on the prevalence of IPIs and associated risk factors in the district serves as a source of information for health policy makers and stakeholder to design and plausible interventional strategies and evaluation to the existing efforts in prevention and control of IPIs in the district. Estimating the prevalence of intestinal helminthes and protozoan infection and identifying the associated risk factors are important parameters required in institutional control programs. The study provides information about the current prevalence and associated risk factor of IPIs in the study area is essential to achieve success and sustainability. In addition, the results fill the gap in the literature and serve as a reference to those who carried out further studies on areas relating to the prevalence and associated risk factors of intestinal parasite infections.

2. Literature Review

2.1. The trends of IPIs Worldwide

IPIs have a wide global distribution. Globally two billion individuals were infected by intestinal parasites (Montana *et al*., 2012). The majority of them were human in poor resource settings. Particularly in Sub-Saharan Africa, infections caused by intestinal parasites are the major public health problems (WHO, 2002). About 819 million people are infected by *A. lumbricoides*, 464.6 million people infected by *T. Trichiura*, 438.9 million people infected with hookworm (Pullan *et al*., 2014), 500 million people with *E. histolytica*, and 2.8 million people are infected with *G. lamblia* (Duc *et al*., 2011).

E. histolytica is the causative agent of amoebic colitis characterized by cramping abdominal pain, weight loss and watery or bloody diarrhea. Furthermore, it is responsible for extra intestinal amoebiasis like amoebic liver abscess). High prevalence of *E. histolytica* is reported mainly in countries with low socio-economic status; whereas low prevalence is reported in industrialized countries. The prevalence of *G.lamblia* infection is 2%-7% in industrialized countries and 40% in tropical and subtropical regions with poor sanitation and hygienic conditions (Odoi *et al*., 2004). *G. lamblia* also occurs worldwide and infects an estimated 200 million people epidemically. Infections can be symptomatic clinical manifestations like nausea, anorexia, abdominal bloating, flatulence, eructation and self-limited diarrhea, which can further can develop to chronic diarrhea accompanied by mal-absorption. About one third of the three billion people in developing regions of sub-Saharan Africa, Asia and Americas, who live on less than two Us dollar per day are infected with one or more parasitic helminthes (Hotez *et al*., 2006). Nearly one–sixth of the global population have been infected by soil transmitted helminthes (STHs) such as; *A. duodenale*, *N. americanus* (Hookworm), *A. lumbricoides* and *T. trichiura*, which are among the most prevalent organisms on the planet (Hotez *et al*., 2008). Although, STHs infections have been occurred worldwide, most of their impact is concerned in developing country.

The highest prevalence rate is registered in the northern part of Southeast Asia and southern china, where as the lowest prevalence rate registered in Northern China, Northern India as well as Pakistan (Hughes *et al*., 2004). For instance, *A. lumbricoides* prevalence in china covered

39%, East Asia and pacific islands covered 36%, in South Asia covered 27%, and in Sub Saharan Africa covered 25 % (de Silva *et al*., 2003).

Shistosomiasis remains significant health problem and has economic importance particularly in Sub-Saharan Africa where millions of individuals endure as a result of its morbidity and nearly 200,000 people die annually as a consequence of its chronic nature of infections (Van der Werf *et al*., 2003). The greatest prevalence of shistosomiasis occur only in Africa, which is estimated that around 150,000 people die each year due to Shistosomiasis (van der werf *et al*., 2003). *Hyminolepsis nana* is the most common cause of all Cestode infections caused by poor sanitation and people sharing the same living quarters (King, 2005). *E. vermicular* is also the most successful intestinal nematode to flourish among human population with over 400 million people worldwide (Kucik *et al*., 2004).Cryptosporidiosis is causes of diarrhea, particularly persistent diarrhea among people in developing countries (Griffith, 1998). Epidemiologic studies showed that cryptosporidiosis seen as acute, self-limited diarrheal infection in immune competent individuals, covers 1% - 10% of diarrheal infections in the world (Xian-Ming and La Russo, 1999). It is also seen among 6% of patients with AIDS (acquired immune deficiency syndrome and 21% of AIDS patients with diarrhea, *A. lumbricoides,* which infects about 1 billion people globally is the greatest and the most common helminthes parasite (CDC, 2006).

2.2. Intestinal parasite infection in Ethiopia

The most prevalent and important helminthes parasites are those of the soil transmitted nematodes that causes chronic gut infection in humans commonly results from particularly *A. lumbricoides, T. trichiura* and hook worm health status of individuals. According to epidemiological study of preschool and school age Ethiopian children, the overall prevalence of IPIs is 48% in Ethiopia and 56% in Southern region, 51% in Amhara region, 43% in Oromia and 41% in Tigray region (Chelkeba *et al*, 2020). Intestinal parasitic infections are widely spread and cause serious health problems in Ethiopia. According to the Ministry of Health (MoH) of Ethiopia, helminthiasis is the third leading cause of outpatient visits in health situations in 2005-2006 (FMoH, 2006). The range of infection prevalence, though wide, still high prevalence of these infections in the country, as a result FMoH prioritized IPIs as one of neglected tropical diseases in National Master Plan. In Ethiopia, those are series public health concern (Amare Mengistu *et al.*, 2007), and lot of mortality in <5 five years is due to diarrhea caused by water

born diseases. Another report indicated that the prevalence of *G. lamblia* among diarrhea patients referred to EHNRI (Ethiopia Health and Nutrition Research Institute) was 8.6% (Edenshaw Tekola *et al*., 2004). WHO report also showed that the prevalence of helminthes infection in Ethiopia ranges from 31% -57.8% (WHO, 2003).

An institutional based study conducted in northern Ethiopia showed different protozoan and soil helminthes species identified as single infection, double infection and triple infection, of these detected parasites one is *E. histolytica/dispar* 21.6% which is the most predominant parasite followed by *Hookworm species* 13.3%,*Schistosoma mansoni* 9.4%*G. lamblia* 9.2% , *A. lumbricoides* 2.1, *Entrobious vermicularis* 0.5%, *Hemonolopus nana* 0.3% and *Taenia species* 0.2% (Eyayu T *et al*, 2021)

In the study conducted at university of Gonder Community school northern Ethiopia on the Prevalence of intestinal parasitic infections andrisk factors among school children, Various intestinal parasites (protozoans, trematodes, cestodes and nematodes) were detected, among those parasites Hymenolepis nana infect 13.8%, Entamoeba histolytica/dispar.infect 9.2% are most common parasites. The parasites appear as single infection(Gelaw *et al*, 2013). In another study area, Hintalo-Wajerat, the overall prevalence of intestinal helminthes was 26.53% and the total of eight species were identified as *A. lumbricoides*(10.45%) (Highest), followed by *E. vermicularis* (8.52%) (Tadesse Dejen and Tsehaye Asmelash, 2010).As in other developing countries, In Ethiopia several studies showed that STHs are prevalent with different magnitudes. Like other developing countries, the high prevalence of STH infection in Ethiopia is related to the factors associated with low socio-economic status, poor personal and environmental hygiene, low household income, overcrowded populated area with lack of clean(unsafe) water supplies in several areas of the country. Intestinal helminthes and protozoan parasites that causes parasitic infection in Human are among the most prevalent infections in developing countries results significant morbidity and mortality, and causes anemia, growth retardation and other physical and mental health problems in countries where they are endemic (Evans and Stephenson, 1995; Haque, 2007).The helminthes *S. manasoni*, *A. lumbricoides, T. trichuria, H. Nana and Strongloides stercorallis* were 43. %, 29.9 %, 12.7 %, 10.7%, 4.6%, and 0.7 % respectively (Merem Abdi *et al.*, 2017).Different surveys conducted in different regions showed that the prevalence and possible associated factors are different (Amare Mengistu *et al*., 2007).

2.3. Protozoan Intestinal Parasites

Protozoa are unicellular, eukaryotic, and which are non-pathogenic and only few are parasitic. They can enter the body through food or water and settle the susceptible person and cause diarrhea. Some of the parasitic protozoa that cause diarrhea especially on human are *E. histolytica* and *G.lamblia.*

Species of the genus Entamoeba (4 species) are common to the human gastro intestinal tract (GIT). These are *E. histolytica*, *E. coli*, *E. dispar* and *E. hartmanni*. Among these *E. histolytica* that cause invasive amoebiasis is the only one with medical importance (Diamond and Clark, 1993).

2.3.1. *Entamoeba histolytica*

E. histolytica is cause of invasive amoebiasis and hence the only one with medical importance (Diamond and Clark, 1993).It is found in two forms: a motile trophozoite and an infective cyst (Figure 1). The cyst transmits through the ingestion of fecal contamination with cysts. During the excitation, nuclear and cytoplasmic division occur which gives rise to eight single nucleated trophozoites. Trophozoites are motile forms, so they attached to the intestine and invade epithelial cells which line the GIT then they move and spread to other organs, usually liver, multiply encyst and released eggs.

Epidemiological studies have showed that low standards of hygiene and poor sanitation, low socio-economic status, particularly related to contaminated food and water, improper disposal of feces or poor defecation practice were significant risk factors for the infection. Diagnosis of *E. histolytica* has been carried out by microscopic examination of protozoan morphology. The prevention mechanism of amaebiasis relies on interrupting of the faeco- oral mode of transmission of the cyst stage of amoeba for instance water must be boiled to make it safe to drink (Petri and Singh, 1999).

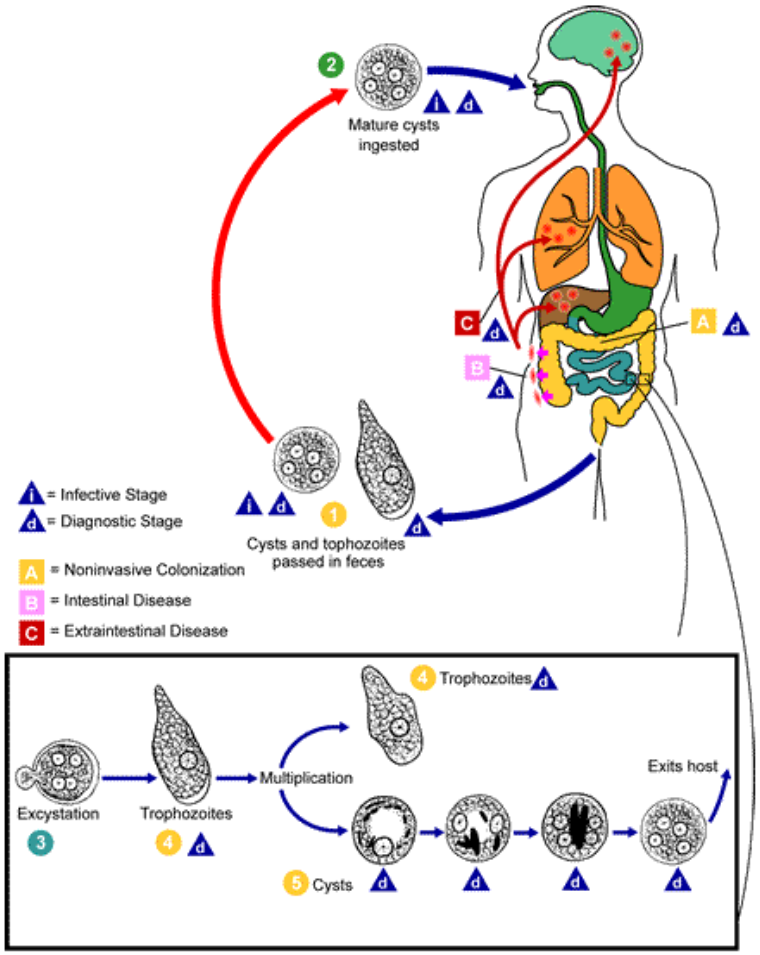

Figure 1Life cycle of *E. histolytica.*

(Source: https://www.cdc.gov/dpdx/amebiasis/index.html)

2.3.2. *Giardia lamblia*

Giardiasis is the other intestinal infection caused by *Giardia lamblia*. *G. lamblia* is a unicellular eukaryotic protozoan (Ford, 2005).*G. lamblia* has been reported as one of the most common disease causing parasite worldwide repeatedly (Piers *et al*., 2015). The WHO has reported symptomatic infections in millions around Asia, Africa, and Latin America, which have estimated that it causes 183 million cases of Giardiasis and 2.8 million people are infected with *Giardia lamblia*(Torgerson *et al*., 2015). However, several epidemiological studies have reported that such rates could be significantly underestimated, with Giardiasis prevalence rates ranging from 10 to 50% in developing countries (Daly *et al*., 2010). This could be explained by the large fraction of asymptomatic carriers, on the other side, in most developing countries with poor

health hygiene, poor toilet training, overcrowded population, and low socioeconomic status (Rodriquez *et al*., 2013). The difference in its prevalence is due to the different factors such as geography, society setting, age group composition and socioeconomic conditions. The prevalence of *G. lamblia* infection ranges from 2%-7% in industrialized countries and up to 40% in tropic and sub tropic countries with poor sanitation and hygienic conditions (Odoi *et al*., 2004). Furthermore, Giardia has developed zoonotic transmission. Five species of Giardia identified based on their hosts: these are *G. racilinanusagilis* (amphibians), *G. lamblia* (mammals), *G. muris* (rodents), *G. psi ttaci, and G. ardeae* mainly in birds (Adam, 2001).

G. lamblia is a flagellated, bi-nucleated protozoan which inhabits the upper part of the small intestine of its host and its reproduction is asexual (binary fission). It exists in two forms: cyst and trophozoite (Figure 2). The cyst survives in feces for weeks, then passes through the stomach and enters the small intestine. In the small intestine excystation occur and the cyst wall ruptures, so that the flagella and other projections emerge from the rupture point, then cyst wall totally shade and enters the trophozoite stage of its lifecycle. The trophozoite is reproductive and motile stage of giardia that attaches to the wall of small intestine via its ventral disc. In most cases, the trophozoites become numerous throughout the intestine and attached to it and absorbs nutrients and block transportation of nutrients along the epithelial lining of the intestine. The trophozoite then undergoes encystations which occur when the trophozoites passes to the posterior region of the small intestine. Overall changes during encystations are those trophozoites gradually rounds up and detaches, loss mobility and becomes retractile. Cysts then leave the body and are transmitted from one person to another through contact with infected faces directly or indirectly through contaminated food and water via other host (Adam, 2001).

Epidemiological studies indicate that the parasite is responsible for about 5% of acute diarrhea and 20% of chronic diarrhea illness worldwide (Thompson *et al*., 1993). The principal mode of transmission to humans appears to be direct contact of person to person and indirectly transmission from contaminated food and water. Although animal sources of giardia are common, the ability of giardia species found in non-human sources to cause human illnesses is unclear (Thompson, 1994). Concentrations of giardia cysts in water have been found to be significantly associated with the prevalence of giardia in animals (Adam, 2001)

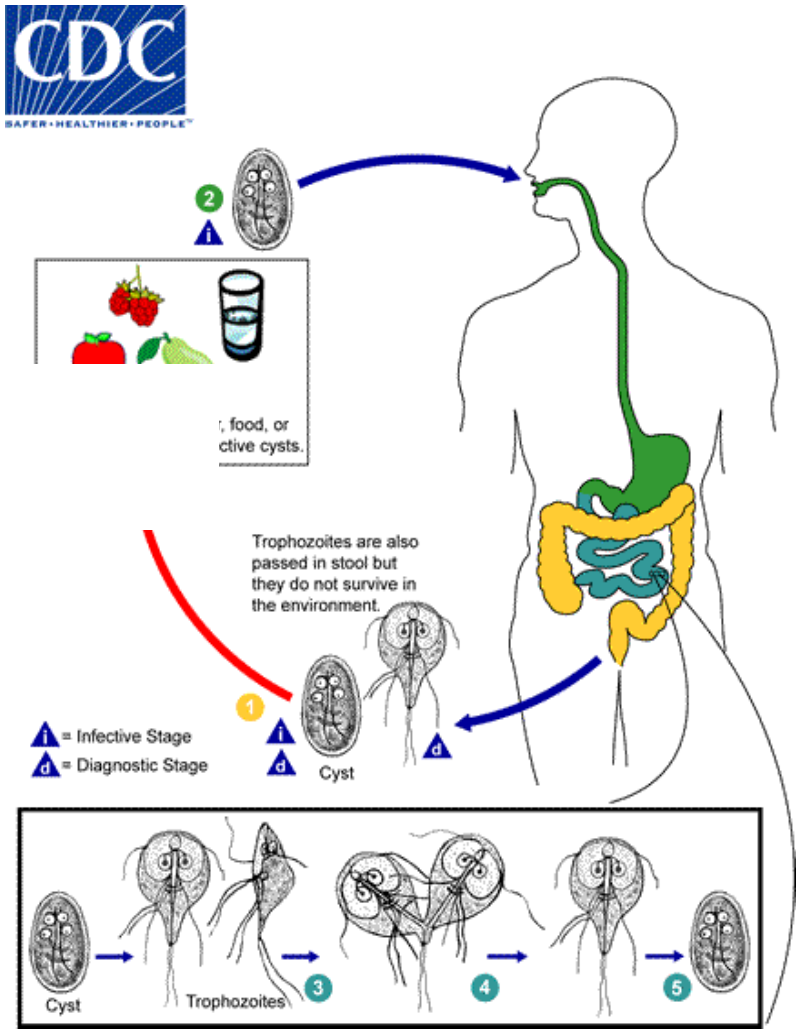

Figure2 The life cycleof *Giardia Lamblia*

(Source: https://www.dpd.cdc.Gov/dpdx/ giardiasis/index.html

2.4. Intestinal helminthes parasites (IHPS)

IHPS are the most common soil transmitted helminthes human infections spread throughout the world.The prevalence of IHPs in developing countries is higher than developed countries. This is due to deficiency of sanitary facilities, improper human waste disposal, lack of safe water supply and low socioeconomic status in developing countries (Raza and Sami, 2009). Soil transmitted helminthes (STHs) are parasitic worms that causes human infection when contact with parasite eggs or larval stage that live in warm and moist soil. More than a billion people are infected with at least one species of the most common STHs such as roundworm (*A. lumbricoides*), whip worms (*T. trichuria*, or hookworms (*N. americanus* and *A. duodenale*) (Jeffrey *et al*., 2006).

2.4.1. *Ascariasis*

Ascariasis is a soil transmitted infection. It is the most common human helminthic infection which is caused by *A. lumbricoide*. The socioeconomic status, defecation practices and cultural differences relating to personal and food hygiene as well as housing and sewage systems are among the significance related factors with the high prevalence of ascariasis. *A. lumbricoides,* the largest and the most common helminthic parasite which inhabit human intestine infects about 1 billion people worldwide (CDC, 2006). The adult parasites inhabit some parts of host small intestine reproduce sexually, and produce eggs which are passed in human faces and deposited in the outside environment. It is estimated that 25 % of the world population harbors the parasite. Most common mode of transmission of the parasite is hand to mouth transmission. The parasite or the infection is associated with poor sanitation, poor personal hygiene, and in place where humans feces are released and serve as fertilizers.

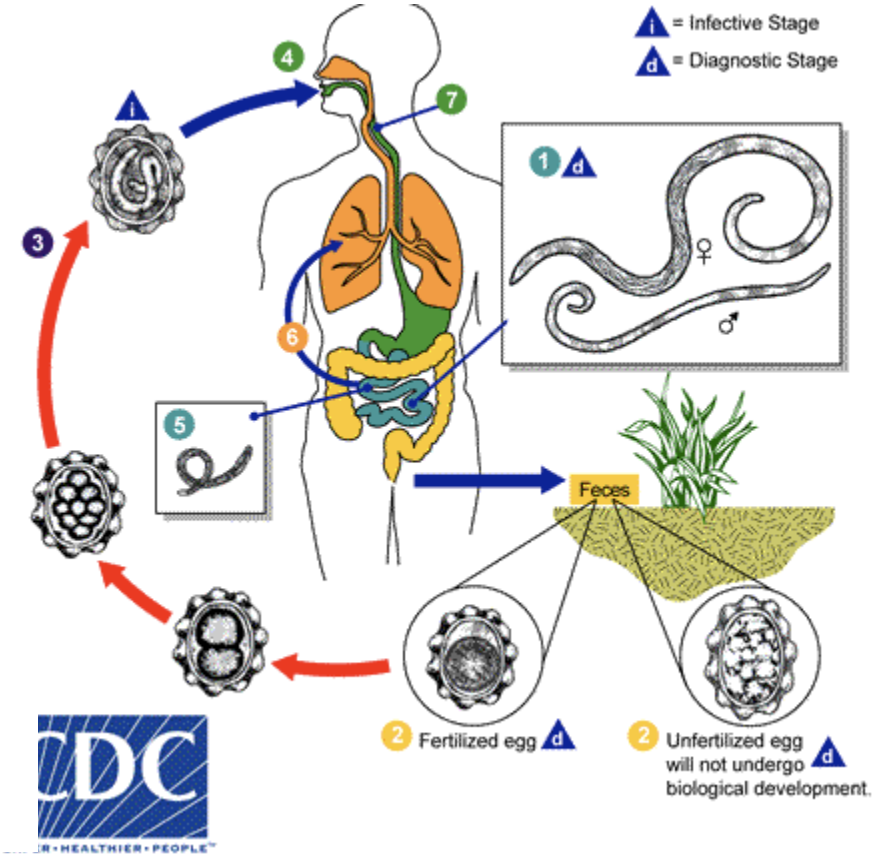

Figure 2 Life cycle of *A.lumbricoides*

https://www.cdc.gov/dpdx/ascariacise/index.html)

2.4.2. Hookworm disease

Hookworm is a parasitic nematode that inhabited small intestine of most mammals such as human, dogs and cats as its host. There are two species of hookworm commonly infect human: *Ancyclomata duodenale (Abbreviation)* and *Necator americanus* (abbreviation), *A. duodenal* is geographically more restricted in distribution and is found at higher elevation and in more climate whereas *N.americanus* is the most common (Fekadu *et al*., 2008). Both species share a common life cycle (Figure 4). Eggs hatch into rabidity form larvae, feed on bacteria in soil, and molt into the infective filariform larvae. With the aids of moist climates and poor hygiene, filariform larvae enter their hosts through pores, hair follicles, and even intact skin. Maturing larvae travel through the circulation system until they reach alveolar capillaries. Breaking into lung parenchyma, then the larvae climb the bronchial tree and are swallowed with secretions. After six weeks of the initial infection, mature worms attached to the wall of the small intestine to feed, and egg production begins. The larvae occasionally cause prurilic erythematic or pulmonary symptoms during their migration to the gut (Kitchen, 1999). Hookworm infection rarely is symptomatic until a significant intestinal worm burden is established. A transient gastroenteritis-like syndrome can occur because mature worms attach to the intestinal mucosa. The greatest concern from infection is blood loss. Aided by an organic anticoagulant, a hookworm consumes about 0.25 mL of host blood per day. Mature hookworms typically inhabit the jejunum where they attach to the intestinal mucosa with their ventral teeth (*A.duodenale*) or cutting plates (*N.americanus*) (Katz *et al*., 1998).

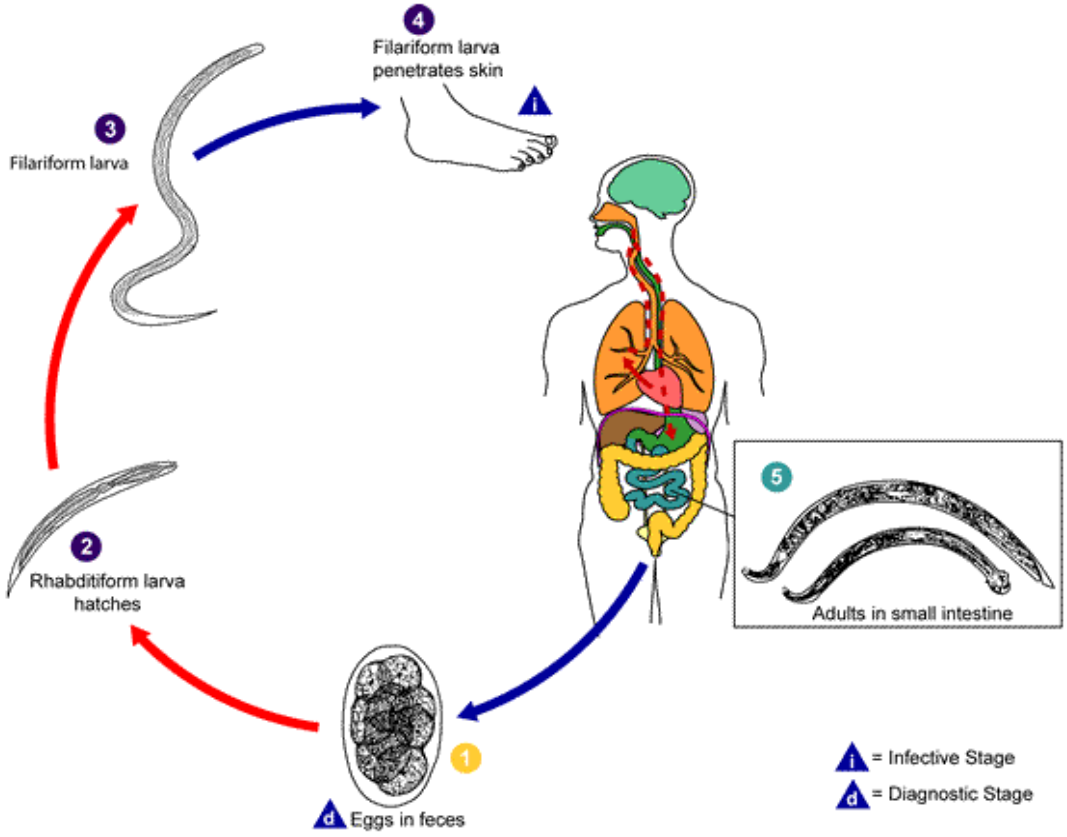

Figure3 Lifecycle of hookworm

(Source:https://www.cdc.gov/parasites/hookworm/biology.html)

2.4.3. *Schistosomiasis*

Schistosomiasis is one of a neglected tropical diseases (NTDs) that ranks with malaria and tuberculosis as a major source of morbidity affects approximately 210 million people in 76 countries, despite strenuous control effect (Stelnman *et al*., 2006). Shistosomiasis caused by blood flukes of the genus Schistosoma (phylum Platyhelminthes), which is dioecious with complex life cycles (Figure 5). It comprises several morphologically distinct phenotypes. The parasite has two hosts: the intermediate host (snail) and the definitive host or final host which is human. It is among the three major human parasites, occurs across much of Sub Saharan Africa, parts of the Middle East, Brazil, Venezuela and some West Indian Islands. Approximately

280,000 deaths per year are atributed as a result of the disease in Sub Saharan Africa alone (Van der Werf *et al*., 2003). *S. manasoni* is a parasitic flatworm that has both an intermediate host and a definite host. Mostly the fresh water snail from the genus Biomphlaria is the intermediate host and definitive human is a definite host. Most commonly the parasite infect a human host by penetrating the skin and moves in to the blood stream. The parasites, miracidium larvae are motile and can swim, allow them to find the intermediate host and Cercariae are also motile; they swim from their intermediate hosts to their definitive host. Adults remain within the host, with male and female often together as a matching pair, with the male residing in a groove in the body of the female (Weil and Kvale, 1985).When the eggs of schistsome hatch in the water; they release miracidia that infect fresh water snails that in turn release cercariae which can penetrate the skin of humans who come in contact with fresh water, and then enter their capillaries and lymphatic vessels (Ross *et al*., 2002) (Figure 5).

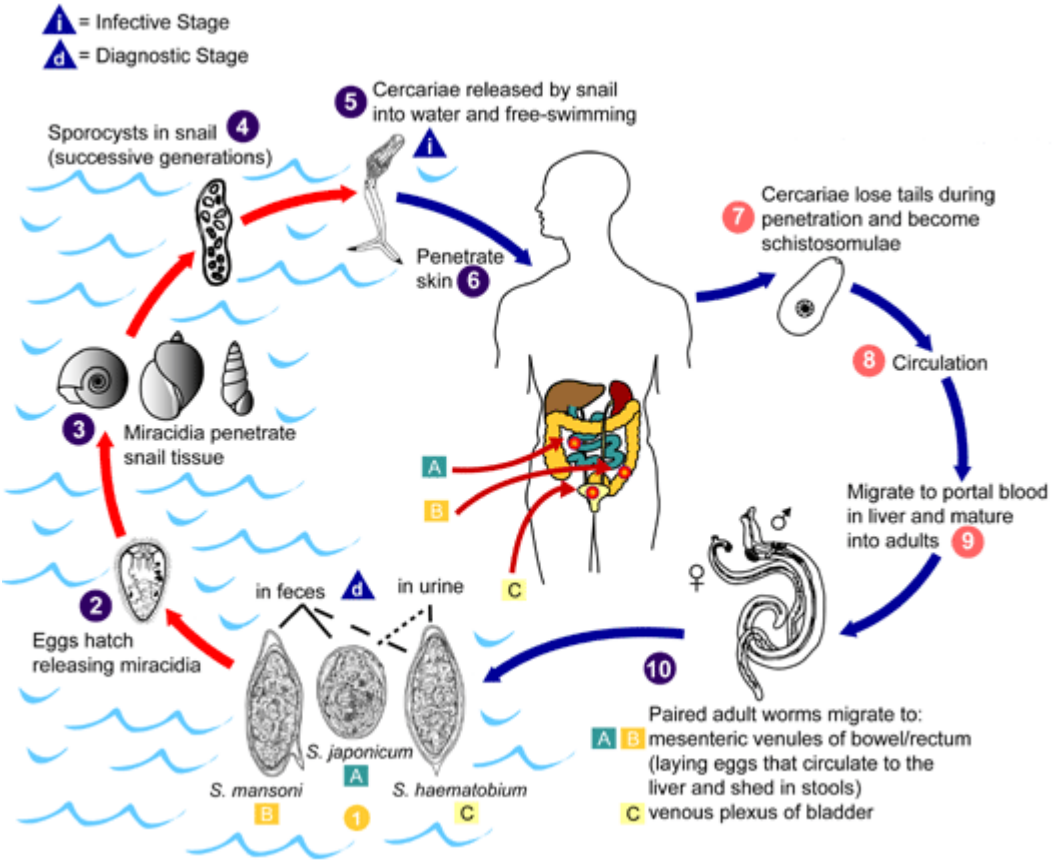

Figure 4- Lifecycle of *S. mansoni*

(Source: https://www.cdc.gov/parasites/schistosomiasis/biology.html)

2.5. Risk factors for intestinal parasitic infection

High prevalence of intestinal parasites is largely by ascaris as a result of contaminated soil. most common, their lack of potable water or farms, the High prevalence of intestinal parasites is largely due to lack of clean water supply, lack of personal and environmental sanitation, human behavior, poverty, ignorance of health promotion practices and impoverished health services (Wakid *et al*., 2009; Nigusse Danel, and Kumie Abera, 2012 ; Sharif *et al*., 2015). IPs transmitted directly by contact or indirectly through objects such as food, water, soil and finger contaminated by feces.

Food handlers with poor personal hygiene works in food establishments could be potential sources of infections of many of the intestinal helminthes and, in particular those related to crowded, contamination of food and water, and inadequate faces disposal. Scholars suggested that factors such as low household income, poor personal and environmental sanitation and overcrowded areas with limited access to clean water and tropical climate are largely associated to IPIs. The majority of infections are associated with poverty conditions such as reduced access to safe drinking water, housing and inadequate access to health care facilities (Mata, 1982).The most common mode of transmission is hand to mouth transmission; its association with poor personal hygiene, poor sanitation, and in places where human feces serve as fertilizers. Consumers feed on uncooked or raw vegetables grown in and/or near soil fertilized with sewage are most at risk for acquiring infection. Water is rarely implicated as a source of Ascarisis (Bogitsh *et al*., 2005).

Children exposed to farming and consume water from streams and rivers contaminated with animal sewage possess conditions which are suitable for the transmission of common infections such as *G. lamblia*, ascaris, hook worm and amoeba. Poor personal hygiene, poor sanitation, and contamination with sewage materials might have contribution to the high prevalence of IPIs. Frequency of IPIs is extremely high, affecting nearly all inhabitants due to the aforementioned socio-demographic variables, behavioral factors, personal hygiene and environmental sanitation fact (Samuel, 2015).

The protozoan parasite and the soil transmitted helminthes are the leading intestinal parasites causing significant morbidity and mortality. Thus Despite the great efforts by the ministry of health, Ethiopia is still known to be heavily affected by IPIs due to the aforementioned socio-

demographic variables, behavioral factors, personal hygiene and environmental sanitation factor(Samuel, 2015). Indeed, ascariasis, hookworm and trichuriasis, giardia and amoeba are listed among the most common public health problem in the study area. Several studies have shown difference prevalence of IPIs in Ethiopia, for instance high prevalence (84%) was reported among children in Debre Elias, north-west Ethiopia though(Workneh *et al*., 2014) and low prevalence rate of IPIs (26.53%) was reported from Mekelle town (Tigray Region, northern Ethiopia (Dejen and Asmelash, 2010). Intestinal parasitic infections have a worldwide distribution with high prevalence found in people with low socio-economic status and poor living conditions as well as people in over-crowded areas with poor environmental sanitation, improper sewage disposal, unsafe water supply and unhygienic personal habits (Noor Azain, 2007). These factors are the causes of a majority of the burden of disease and death in developing countries (Adamou *et al.,* 2006). Surface water which is not well treated is the known vehicle of giardia transmission, because of the chlorine used in drink water treatment does not kill giardia cysts, and inappropriate sewage treatment also linked to spread of giardiasis; well water also be a source of giardiasis (Payment, 1999).

3. Materials and Methods

3.1. Description of Study Area

The study was conducted in Amhara Region, East Gojjam Zone, Dejen town. Dejen town is located at 229 km north-west of Addis Ababa and 335 km from the regional capital city, Bahir-Dar and 70 km from Debre Markos. It is situated between latitude 10° 9' 30" N and 10° 11' 0" N and longitude: 38° 7' 0" E and 38° 10' 30" E. Its altitude ranges from 2421 to 2490 m asl (DWRTO, 2015). The town is the administrative center of Dejen district. Dejen has an estimated total population of 131,930 of whom 63,715 males and 68215 females (ESS, 2022) following 2005 Ethiopian census 15,483, of whom 7,688 are men and 7,795 are women (CEA, 2005).

The mean monthly maximum temperature ranges between 28.3^{0}C to 29.9^{0}C in winter seasons (January to March); whereas the mean monthly minimum temperature varies between 6.8 ^{0}C to 9^{0}C in summer (July to August) . Mean minimum monthly rainfall of the area varies between 2.17 cm (January) and the mean maximum was 35.65 cm (August) (Amhara Regional Meteorology Service in Dejen Woreda Station) (ARMSDWS, 2022). The people in the district live in a crowded manner, especially in Dejen town. There are only two health institutions namely, Dejen Health Center and Dejen Primary Hospital.

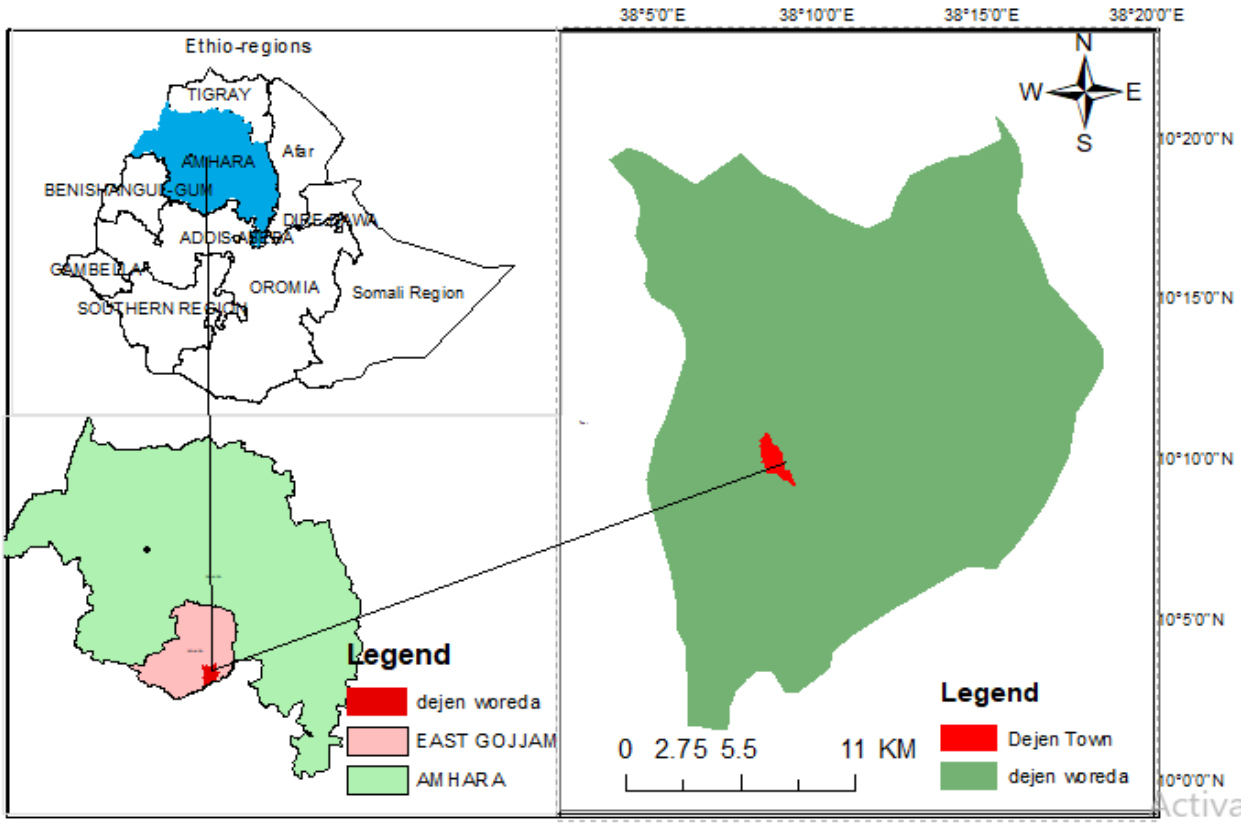

Figure 5. Location map of the study area

3.2. Study design and period

An institutional based cross-sectional study was carried out in Dejen Primary Hospital from December, 2022 to June, 2023, to determine the prevalence and associated risk factors of intestinal parasitic infections among patients attending care at Dejen Primary Hospital during the specified period.

3.3. Study population

Patients in all age groups attending Dejen Primary Hospital during the study period were the study populations and among the patients attending Dejen Primary Hospital, those who have related symptoms with IPIs considered as study samples.

3.4. Sample size and sampling technique

The sample size for the study was determined by single population proportion formula N= $\frac{z^2}{d^2} * p(1-p)$ using overall prevalence of 42.9% (Destaw Damtie *et al.*, 2021).

Where, N=the minimum required sample size; Z is marginal error at 95% confidence interval [Z (ά/2) = 1.96]; P is prevalence of intestinal parasites; d is margin of sampling error assumed to be 0.05. Therefore, $N = (1.96)^2/(0.05)^2$ (0.429) (1-0.429) =376

From the normal calculation the sample size obtained was 376, 10% was added by considering non-response rate and to minimize errors so the total samples were 414. The samples were selected using random sampling technique.

3.5. Inclusion and exclusion criteria

3.5.1. Inclusion criteria

Patients who have symptoms related to parasitic infections such as vomiting, diarrhea, abdominal pain, nausea, appetite loss, weight loss; bloody feces are included under the study.

3.5.2. Exclusion criteria

Patients who are admitted as non-parasitic patients and who take anti- parasitic drugs before a couple of weeks and during the study time were excluded in the study.

3.6. Study variables

3.6.1. Independent Variables

Socio demographic characteristics: sex, age, occupation, educational status, marital status; and behavioral characteristics; contact to river when crossing, hand washing after toilet, hand washing before a meal, swim in river, wash cloth on rivers, irrigation activity, finger nail status, shoes wearing habit, eating raw vegetable, eating raw meat, source of drink water

3.6.2. Dependent Variables

Prevalence of intestinal parasitic infections

3.7. Data collection

3.7.1. Survey for socio-demographics

The socio-demographics characteristics including the information about IPIs of the respondents were collected by face-to-face interview using well-structured questionnaires. The questionnaires were first developed in English and translated into Amharic. Before the actual interview was administered, the questionnaires were pre-tested by 5% of the patients who were not included in the study. During the interview, the finger nails, the general hygienic conditions and the foot wear of individual are inspected by the interviewers.

3.7.2. Stool sample collection and examination

Prior to taking stool sample collection, verbal consent was obtained from patients. After explanation verbal consent was obtained from the patients, the subjects were instructed on how to provide sizable stool samples (5g) and provided labeled clean cartons, toilet tissue papers and pieces of applicator sticks. The stool samples were labeled and processed and examined microscopically using direct wet mount method for IPIs diagnosis including protozoan and helminthes parasites identification through a light microscope. All standard procedures were strictly followed starting from specimen collection up to recording and results notifications.

Direct wet mount was conducted by a drop of normal saline (0.85% NaCl solution). About 1-2 mg of stool samples was emulsified with 1-2 drops of normal saline solution using an applicator stick. After homogeneous thin film preparation on each slide, cover slips were placed on each preparation and examined for the presence of parasites under light microscope of 10x and 40x objectives.

3.8. Data quality control

To collect quality Data, Questionnaires constructed in English (appendix 1) and translated to Amharic (appendix 2). Clear explanation was given for the laboratory professionals about the questionnaires. Clear introduction was also given for the respondents how to handle stool. Pre-tested questionnaires also given for the professionals.

3.9. Data Analysis

After the row data was collected through face-to-face interview, and parasitological examination, the results were initially fed in to Microsoft Excel 2007 software and then copy to Statistical

Package for Social Sciences (SPSS) software version 25. Descriptive logistic regression was used to quantify the degree of association of IPIs with socioeconomic and potential risk factors. Bivariate and multivariate logistic regressions were performed to determine the association between the dependent and independent variables as well as for risk factors.

3.10 Ethical clearance Ethical consideration

Ethical clearance was obtained from medical director of Dejen primary hospital after clear explanation of the study and its objective and the letter given from Department of Zoological science, Addis Ababa University. Consent from lab professionals who interview and take stool and the respondents. Before the interview the respondents (patients) were aware about the issue and codes given for them to keep their secret.

4. Result

4.1. Socio-demographic characteristics of the respondents

According to Table 1 among the patients who attended Dejen primary hospital for stool examination during the study period the majority 223 (53.9%) were females and <15 years old;. The Table 1also shows that 225 (54.3%) of the respondents were urban dwellers and 189 (45.7%) were rural dwellers. Based on the occupational categories of the respondents most of them were students 73 (17.6%) and 120(29%) were farmers. Based on their religion the majority 382 (92.3%) of them were orthodox Christians and the remaining 32(7.7%) of the respondents were Muslims. The educational status and marital status of the respondents also presented in Table 1. Accordingly, majority of them 96(23.2%) of the respondents were illiterate and 94 (22.7%) of the respondents were can read and write in their educational status. Marital status 167 (40.3%) and 240 (58.0%) of the respondents were single and married, respectively, whereas 6(1.4%) and 1(0.2%) were divorced and widowed, respectively.

Table1 The socio-demographic characteristics of the respondents attending Dejen primary Hospital for stool Examination.

Variable	Categories	Frequency	Percent
Sex	Male	191	46.1
	Female	223	53.9
Age	≤14	78	18.8
	15-29	168	40.6
	30-45	103	24.9
	>45	65	15.7
Residence	Urban	225	54.3
	Rural	189	45.7
Occupational status	Students	73	17.6
	Unemployed	35	8.5
	Daily labors	9	2.2
	House wives	52	12.6
	Farmers	120	29.0
	Merchants	39	9.4
	Government employees	70	16.9
	Family dependents	16	3.9
Religion	Orthodox	382	92.3
	Muslim	32	7.7
Educational status	Illiterate	96	23.2
	Only read and write	94	22.7
	Primary	57	13.8
	Secondary	95	22.9
	Diploma and above	72	17.4
Marital status	Single	167	40.3
	Married	240	58.0
	Divorced	6	1.4
	Widowed	1	0.2

4.2. Prevalence of intestinal parasitic infections

Table2 showed that five known intestinal parasites were identified among patients attending Dejen primary hospital. According to this study, five parasites were identified from wet mount technique including *Entamoeba histolytica, Giardialamblia, Hookworm, Taeniaspps* and *Strongyloides stercoralis*. These parasites were identified as a single parasitic infection or co-infection forms. Among the five IPIs identified in this study, protozoan parasites, *E. histolytica*

and *G. lamblia* were the leading parasites with 108 (26.1%) and 38(9.2%) prevalence, respectively. The rest of the parasites were soil helminthes parasites including *Hookworm*, *Taenias spps* and *Strongyloides stercoralis.* According to Table 2, co-infection/double infection by protozoan parasites, *E. histolytica* and *G. lamblia* accounts 17(4.1%) of prevalence which was the highest. The overall intestinal parasites account 179 (43.3%) prevalence in the study area.

Table2 Prevalence of IPs among patients attending Dejen primary Hospital during the study period.

Intestinal parasites	**Frequency**	**Percent**
Single infection		
Entamoeba histolytica	108	26.1
Giardia lamblia	38	9.2
Hookworm	12	2.9
Taenia spp.	3	0.7
Strongyloides stercoralis	1	0.2
Double infection		
E. histolytica and Hookworm	1	0.2
E. histolytica and *G. lamblia*	17	4.1
Total	179	43.3

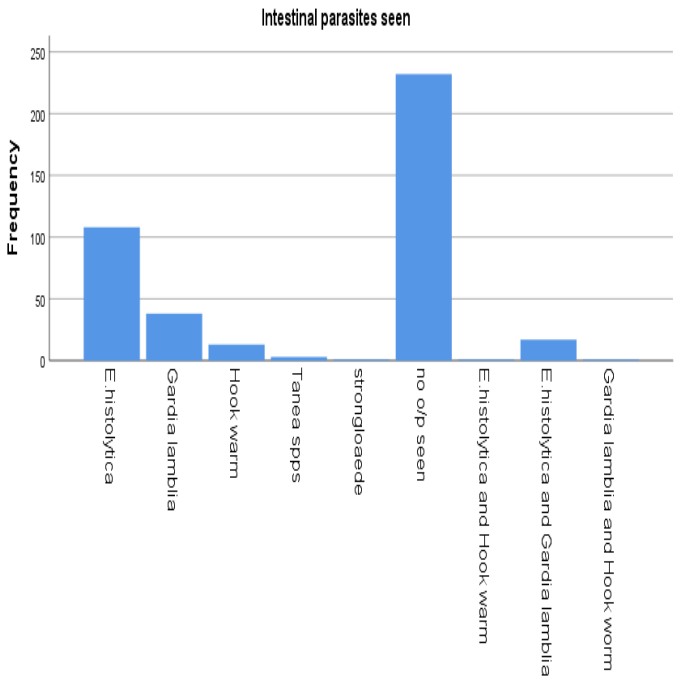

Figure 6. Prevalence of intestinal parasites

4.3. IPIs and associated risk factors

According to Table 3, many risk factors are associated with intestinal parasites in the study area. From the Bivariate analysis sex, age, residence, and occupation among the socio demographic characteristics of the respondents and contact to river when crossing, swimming in rivers, hand washing habit before a meal, latrine utilization, finger nail status, habit of eating raw vegetables and source of drink water among the behavioral characteristics are moderately associated with IPIs with p value < 0.25. However, from the multivariate logistic regression analysis among the socio-demographic characteristics ; occupation of the respondents was significantly associated with prevalence of intestinal parasites with $p<0.05$ and behavioral characteristics: swimming in rivers, habit of eating raw vegetable and source of drink water were significantly associated with intestinal parasites with $p<0.05$.

Unemployed patients and those who were daily labors were highly infected than the others (AOR: 2.942; CI: 1.167-7.416, p=0.022, which was $p<0.05$); AOR: 4.253; CI: 1.023-17.69: p=0.046, which was $p<0.05$), the chance of unemployed respondents to be infected with intestinal parasites was 2.942 times greater than who were government employees, on the other hand daily labors also infected by intestinal parasites 2.253 time than government employees.

Among the behavioral characteristics of the respondents swimming in rivers with AOR: 0.51, CI: 0.20 -1.25, p=0.031 which is p<0.05; and raw vegetable eating habits, those who eat always and sometimes with AOR: 2.64, CI: 1.02-6.79, p=0.046 and AOR: 1.888, CI: 1.029-3.465, p=0.040 which is p<0.05, respectively were significantly associated with IPIs. Those respondents who used river water as sources of drink water had highly infected by intestinal parasites with AOR: 2.350, CI: 1.055-5.236, p=0.036 than who used pipe or tap water sources. The chance of infection of individuals who drink river water is 2.35 more likely than those who drank tap water. All other risk factors are not statistically significant at p<0.05 (Table3).

Table3 Bivariate and Multivariate analysis of risk factors in association with IPs among patients attending Dejen primary hospital.

Risk factors	Categories	IPs-ve	IPs +ve	COD (95% CI)	AOR (95% CI)	P-value
Occupation	Student	47(54.7%)	39(45.3%)	1.59 (0.81-3.09)	2.218 (0.959-5.131)	0.063
	Unemployed	21(50%)	21(50%)	1.91 (0.86-4.23)	2.942(1.167-7.416)	**0.022**
	Daily labor	4(33.3%)	8(66.7%)	3.82 (1.03-14.10)	4.254(1.023-17.69)	**0.046**
	House wife	23(54.8%)	29(45.2%)	1.58 (0.71-3.50)	1.443 (0.575-3.621)	0.434
	Farmer	63(50.4%)	57(49.6%)	1.88 (1.01-3.51)	1.637(0.693-3.868)	0.261
	Merchant	32(74.4%)	7(25.6%)	0.66(0.28-1.55)	0.598(0.249-2.988)	0.251
	Government employee	42(65.6%)	28(34.4%)	1	1	-
Direct contact with water in river when crossing	Yes	57(49.1%)	59(50.9%)	1.47(0.96-2.27)	1.671(0.935-2.988)	0.083
	No	175(58.7%)	123(41.3%)	1	1	-
Cloth wash on river	Yes	49(53.3%)	43(46.7%)	1.16 (0.73-1.84)		
	No	183(56.8%)	139(43.2%)	1		
Irrigation activity	Yes	36(60.0%)	24(40.0%)	0.83 (0.47-1.44)		
	No	196(55.4%)	158(44.6%)	1		
Swimming in river	Yes	17 (70.8%)	7 (29.2%)	0.51 (0.20-1.25)	0.315(0.111-0.895)	**0.031**
	No	215(55.1%)	175(49.9%)	1		
Times of swimming per month	None	221(55.5%)	177(44.5%)	1		
	1-2time/month	11(68.8%)	5(31.3%)	0.57 (0.19-1.66)		
Hand washing habit after toilet	Always	190(56.4%)	147(43.6)	1		
	Sometimes	36(55.4%)	29(44.6%)	1.04(0.61-1.78)		
	Not at all	6(50.0%)	6(50.0%)	1.29(0.41-4.09)		
Hand wash before meal	Always	184(59.4%)	126(40.6%)	1	1	
	Sometimes	45(46.4%)	52(53.6%)	1.69 (1.07-2.67)	1.380 (0.753-2.531)	0.297
	Not at all	3(42.9%)	4(57.1%)	1.95 (0.43-8.85)	2.543(0.43-14.959)	0.302
Shoes wearing habit	Always	147(57.0%)	111(43.0%)	1		
	Sometimes	79(53.7%)	68(46.3%)	1.14(0.76-1.71)		
	Not at all	6(66.7%)	3(33.3%)	0.66(0.16-2.71)		
Latrine utilization	Always	156(56.1%)	122(43.9%)	1	1	
	Sometimes	52(51.5%)	49(48.5%)	1.21 (0.76-1.90)	0.784(0.427-1.441)	0.434

	Not at all	24(68.6%)	11(31.4%)	0.59 (0.28-1.24)	0.418 (0.173-1.011)	0.053
Finger nail status	Trimmed	204(58%)	148(42%)	1	1	-
	Not trimmed	28(45.2%)	34(54.8%)	1.67(0.97-2.88)	1.211(0.593-2.472)	0.599
Eating raw vegetable	Always	17(54.8%)	14(45.2%)	1.40(0.61-3.24)	2.64 (1.02-6.79)	**0.046**
	Sometimes	164(54.3%)	138(45.7%)	1.43(0.86-2.881)	1.89 (1.03-3.47)	**0.040**
	Not at all	51(63.0%)	30(37.0%)	1	1	-
Eating raw meat	Yes	80(55.2%)	65(44.8%)	1.06(0.70-1.59)		
	No	152(56.5%)	117(43.5%)	1		
Source of drink water	Pipe	152(61.0%)	97(39.0%)	1	1	-
	River	36(46.8%)	41(53.2%)	1.79 (1.06-2.99)	2.350 (1.055-5.236)	**0.036**
	Stream	3(30.0%)	7(70.0%)	3.66(0.92-14.48)	4.008(0.803-20.012)	0.091
	Well	41(52.6%)	37(47.4%)	1.41(0.85-2.36)	1.419(0.644-3.121)	0.385

* P-valueat < 0.05 was taken as statistically significant, indicated in bold

5. Discussion

The study showed that the overall prevalence of intestinal parasites in the study area was 43.3%. The protozoan parasites *E. histolytica* and *G. lamblia* were the predominant parasites which is supported by other studies (Damtie D *et al*, 2021; Adam Y and Muche A, 2005-2008; Sitotaw B *et al*; Kumma WP *et al*, 2019; Menjetta *et al, 2019;* Gelaw *et al*, 2013; Muhamed J *et al*, 2022) about 35.3% of the total prevalence followed by soil helminthes hook worm 12 (2.9%), *Taenia spps* 3 (0.7%) and *Strongyloides stercoralis* 1 (0.2%) prevalence. This was related to the study conducted in other studies such as the study conducted in Merawi town conducted on school children with 42.9% prevalence (Damte D *et al*., 2021); the study conducted in Hara Health center, Tehuludere District 42.3% prevalence (Endris N and Mamo H, 2020); the study conducted in Metema District Hospital 44.5% prevalence, northern Ethiopia (Adam Y and Muche A, 2005-2008); the study conducted in Maksegnit, northern Ethiopia among school age children 40.5% (Shiferaw K *et al*., 2021); the study conducted in Bahir Dar and Han health centers among under five children42% prevalence (Mohamed J *et al.,* 2022) With protozoan parasites (*E. histolytica/dispar* 10.86% and *G. lamblia* 4.53% rate of prevalence were the most prevalent parasites in the study.

The study conducted on the prevalence and associated risk factors of intestinal parasitic infections among primary school children at Bure town, north west Ethiopia identified the above protozoan parasites, *E .histolytica/dispar* 22.1%, *G, lamblia* 8.6% and soil helminthes Hookworm 6.7%, *A. lumbricoides* 3.7% and *Taenia spps* 0.2% prevalence (Sitotaw B *et al*, 2020), almost a little difference is due to the methods, sample size and materials used during the study. The parasite in the study area also exists as single infection and as co-infection, supported by other studies (Damte D *et al*, 2021; Shiferaw K *et al*, 2021). Single infections cover 35.3% and the rest 5.0% appears as double infections. In most research conducted in Ethiopia and other countries infections show single infections and double infections such as the study conducted in Metema District Hospital, northern Ethiopia (Adam Y and Muche A, 2005-2008); Debre Ealias School Children (Workneh T *et al*, 2014) and Debark Primary Hospital, northern Ethiopia (Alelign A *et al.*, 2024).

The prevalence of intestinal parasites in this study is also different among many other studies in different part of Ethiopia such as research among under five children in Haro Dumal Town, Bale

zone 38.5% (Gadisa E and Jote J, 2019), research conducted in Teda Health centers in Northern Ethiopia 62.3% high prevalence (Abate A *et al.*, 2013); the study conducted in Debre Ealias on primary school children in East Gojjam Zone 84.3% (Workneh T *et al*.,2014); the study conducted in Shashamane Town, Southern Ethiopia 19.7% (Sahiledengle *et al*., 2020),the possible reasons may be the geographical area, climate change, study period and way of human life.

The protozoan parasites including *Entamoeba histolytica* and *Giardia lamblia* were the leading parasites with 26.1% and 9.2% prevalence, respectively (Table 2). This is also similar to the study conducted in Hara health center, Tehuledere District, northeast Ethiopia (*E. histolytica* 30% and *G. lamblia* 6.1%) (Endris N and Mamo H, 2020) and merawi town northern Ethiopia (*E.histolytica* 19.1% and *G.lamblia* 17%) prevalence (Damtie D *et al*., 2021). The soil helminthes parasites including Hookworm, *Taenia*spps, and *Strongyloides stercoralis* also seen in the study area which is similar to the study conducted in Maksegnit (Shiferaw K *et al.*, 2021), northern Ethiopia but the prevalence was different, and the difference might be the material used during the study and the works done to reduce the environmental sanitation.

Similarly the socio-demographic characteristics of the respondents and behavioral factors associated with the prevalence of intestinal parasites in the study area. In this study occupation of the respondents among the socio-demographic characteristics of the respondents show closely linked with the parasites, meaning statistically significant. Unemployed respondents and daily labors were highly infected by the parasites as compared to students, merchants, government employees, house wife and farmers; among unemployed respondents 21(50%), p= 0.022 and Daily Labors 8(66.7%), p=0.046 were positive for the parasites (Table 3). The prevalence of IPIs in this study was highly linked with swimming in rivers, eating raw vegetables and source of Drink water which were statistically significant (p-value < 0.05). multivariate analysis shows that among the patients infected with IPs who have habit of swim in rivers were highly infected, respondents who swim in rivers 7(29.2%), p= 0.031; , again as compared to those who didn't ate raw vegetables patients who ate raw vegetables were greatly infected [respondents who ate raw vegetables always 14(45.2%), p=0.046 and respondents who ate raw vegetables sometimes 138(45.7%), p=0.040]i.e. the parasites were closely associated with eating unwashed or

uncooked vegetable, this is supported by other studies (Alelign et al, 2024; Gadisa E and Jote K, 2019; Stotaw *et al*, 2019).

The parasites also significantly associated with the source of drink water, this is also supported by other studies (Shiferaw *et al*, 2020); Workneh T *et al*, 2014) patients who got their drink water from rivers were highly infected as compared to those who got their drink water from pipe [respondents who got drink water from river 41(53.2%), p=0.036; were positive (table 3). The reasons were the parasites infect individual respondents as a result of poor personal and environmental sanitation and lack of clean water and uncooked or raw vegetables because these are main mode of transmission of parasite. In Similar study conducted in Sanja primary hospital also the habit of eating raw vegetable and source of drink water among the behavioral factors were significantly associated with intestinal parasites (Eyayu T *et al*, 2021))

Limitations

The study conducted in Dejen primary hospital which is the only hospital in the town as well as in the district but there are health centers around the town. Due to time and finance constrain, the study conducted only in the hospital with limited number of samples for only months and the materials and methods used were not sufficient.

6. Conclusion and Recommendation

6.1. Conclusion

The overall prevalence of IPIs among patients who attended for Health care at Dejen Primary Hospital showed 43.3%. The protozoan parasites mainly *E.histolytica* and *G.lamblia* were the leading parasites identified in the study area. The prevalence of IPIs in the study area highly linked with the occupation, swimming in rivers, the habit of eating raw vegetable, and the source of water they drink. Among the patients attended the hospital, daily labors and unemployed individuals were highly infected with intestinal parasites. Similarly individuals who had habit of eating raw vegetables and habit of swim in rivers were more vulnerable. Among patients who attend the hospital those who gain their drink water from rivers were highly infected with intestinal parasites than who used tap water as well as well water.

6.2. Recommendation

Based on the above study findings the researcher recommended the following recommendations:

- The concerned bodies should create awareness about personal hygiene and intestinal parasites, mode of transmission, control and prevention of IPIs.
- IPIs in the study area were highly associated with contact to rivers when crossing, hand washing after defecation, eating raw meat, and drink stream/river water, so create awareness about IPIs with such associated risk factors should be expected from health professionals and concerned government bodies to reduce the risk of infection.
- The society should properly cook raw vegetable, wearing shoes, develop hand washing habit after toilet and other risk factors to reduce intestinal parasitic infections.

7. References

Abate A, Kibret B, Bekalu E, Abera S, Teklu T, Yalew A, Edris M, Worku L, Tekeste Z. (2013). Prevalenceof intestinal parasites and associated risk factors in Teda Health Centre, Northwest Ethiopia. InternationalScholarly Research Notices. 2013; 2013.

Adam RD. (2001). Biology of Giardia lamblia. Clinical Microbiology Review. 14:447-475

Adamou H, Endeshaw T, Teak T, Kife A, Petros B. (2006). Prevalence of intestinal parasite. Ethiop J Health Div. 20 (1);39-47

Adem Y. and Muche A. (2010). Prevalence of intestinal parasites in Metma districthospital. Ethiop J Health Biomed Sci. 2(2):119–123.

Alelign A, Mulualem N, Tekeste Z. (2024). Prevalence of intestinal parasitic infections and associated risk factors among patients attending Debarq Primary Hospital, northwest Ethiopia. PLoSONE 19(3): e0298767. https://doi.org/10.1371/ journal.pone.0298767

Allen H.E, Crompton DWT, Silva N, Loverde P.T, and Olds G.R. (2002). New policies for using antihelmintics in high risk groups. Trends Parasite.18: 381-382.

Mengistu A, Gebreselassie S, and Kassa T. (2007). Prevalence of intestinal parasitic infections among urban dwellers in southwest Ethiopia: a community based cross sectional study. EthiopJ Health Dev21: 12-17

Sitotaw B, Mekuriaw H, Gebeyaw Y. (2021). Prevalence and associated risk factors of intestinal parasitic infections among primary school children at Bure town, north-west Ethiopia.

Bogitsh B.J, Carter C.E, and Oeltmann T.N. (2005). Human *Parasitology*.3rd ed. Elsevier Academic Press. London. pp. 348-353.

CDC. (2006). Laboratory Identification of Parasites of Public Health Concern. Atlanta: Center for Disease Control &Prevention Centers for Disease Control and Prevention, 2010. Retrieved Feb. 2013.Anon. "Parasites – Trichuriasis (also known as Whipworm Infection).Retrieved Feb. 2013.

Chelkeba L, Mekonnen Z, Alemu Y, and Emana AD. (2020). Epidemiology of intestinal parasitic infections in preschool and school-aged Ethiopian children: a systematic review and meta-analysis BMC Public Health 20:117

CSA. (2013). Population Projections for Ethiopia 2007–2037. Central Statistics Agency, Addis Ababa, Ethiopia; Available from: https://www.statsethiopia.gov.et/wp content/uploads/2019/05/ICPSPopulation-Projection-2007-2037-produced-in-2012.pdf.

Daly ER, Roy SJ, Blaney DD, Manning JS, Hill VR, Xiao L, Stull JW. (2010). Outbreak of giardiasis associated with a community drinking-water source. Epidemiology and Infection. 138:491-500

Damtie D. (2021). Prevalence and Associated Risk Factors among Elementary School Children in Merawi Town,Northwest Ethiopia. HindawiJournal of Parasitology Research Volume 2021, Article ID 8894089, 10 pages https://doi.org/10.1155/2021/8894089

Dejene T and Asmelash T. (2010). *Schistosoma mansoni* among school children of different water source users in Tigray northern Ethiopia. Mekelle University MEJS, 2(1): 49

De Silva NR, Brooker S, Hotez PZ, Montresor A, Engels D, Savioli L. (2003). Soiltransmitted helminth infections: updating the global picture.TrendsParasitol. 2003;19(Suppl 12):547–51

Dimond L.S, and Clark C.G. (1993). A description of *Entamobahistolytica*. J EUK microbial 40: 340-344

Duc P.P, Nguyen-Viet H, Hattendorf J, Zinsstag J, Cam P.D, Odermatt P. (2011) Riskfactors for Entamoeba histolytica infection in an agricultural community in Hanam province, Vietnam.Parasit Vectors.; 4:102–11.

Endeshaw T. Mohamod H. M. and Tilahun W. (2004). *Cryptosporidium parvum* and other intestinal parasites among diarrhoeal patients referred to EHNRI in Ethiopia. Ethiop. Med.J. 42:195-198.

Eyayu T, Kiros T, Workineh L, Sema M,Damtie S, Hailemichael W. (2021). Prevalence of intestinal parasitic infections and associated factors among patients attending at Sanja Primary Hospital, Northwest Ethiopia: An institutional-based cross-sectional study. PLoS ONE 16(2): e0247075.https://doi.org/10.1371/journal.pone.0247075

Evans AC, Stephenson LS. (1995). Not by drugs alone: the fight against parasitic helminths. World Health Forum 16: 258-261.

Gadisa, E, andJote, K. (2019). Prevalence and factors associated with intestinal parasitic infection among under-five children in and around Haro Dumal Town, Bale Zone, Ethiopia," BMC Pediatrics,vol. 19, no. 1, p. 385

Federal Ministry of Health (FMOH). (2004). Health and Health Related Indicators. Planning and Programming Department, FMOH, Addis Ababa, Ethiopia 2003/04

Fekadu Demissie, BeyenePetros and Amha Kebede. (2008). Hook worm species distribution among children in Asendabo town Jimma zone, south Ethiopia. Ethiop.J, Heath Sci.Vol.18 No.2.Giardiasis . Clinical Microbiology Review. 24:110-140

Ford BJ, Feng Y, Xiao L. (2005). Zoonotic potential and molecular epidemiology of Giardia species and) the discovery of giardia. Microscope. 53:147-153

Gelaw, A., Anagaw, B., Nigussie, B. (2013). Prevalence of intestinal parasiticinfections and risk factors among schoolchildren at the University of Gondar Community School, Northwest Ethiopia: a cross-sectional study.BMC Public Health 13:304.

Griffiths, J.K. (1998). Human cryptosporidiosis: epidemiology, transmission, clinical disease, treatment, and diagnosis. Adv. Parasitol 40: 37 85.

Haque R. (2007) Human intestinal parasites. J Health Popul Nutr 25: 387-391.

Hotez PJ, Fenwick A, Savioli L, Molyneux DH. (2009). Rescuing the bottom billion through control of neglected tropical diseases. Lancet. ;373: 1570–5

Hotez P. J, Brindley P.J, Bethony J. M, King C.H, Pearce E. J,and Jacobson J. (2008). Helminth infections: the great neglected tropical diseases. J Clin Invest. 118(4):1311–1321

Hotez P, Ottensen E, Fenwick A, and Molneux D. (2006). The neglected tropical disease.The ancient afflictions of stigma and poverty and prospects for their control and elimination Advances in experimental Med Bio.528:23-33

Hughes R, Sharp Hughes M, Akau'ola S, Heinsbrok P, Velayudhan R, Schulz D, Piamer K, Cavalli-SforzaT, and Galea G. (2004). Environmental influences on helminthiasis. IntJEnvi Health Research.14:163-177.

Mohammed J, Shiferaw A, Zeleke A, Eshetu Y , Gebeyehu Z, Ayehu A and Adem Y. (2022). Prevalence and Associated Risk Factors of Intestinal Parasites among Diarrheic Under-Five Children Attending Bahir Dar and Han Health Centers, Northwest Ethiopia: A Cross-Sectional Study. Hindawi Journal of Parasitology ResearchVolume , Article ID 7066529, 9 pages https://doi.org/10.1155/2022/7066529

Karaman U. M, Atambay M, Aycan O, Yologlu S, and Daldal N. (2006). Incidence of intestinal parasites in municipal sanitary workers in Malatya.TurkiyeParazitol. Derg.30: 181-183

Katz M, Despommie D.D, and Gwadze R.W. (1989). Parasitic disease. 2nd Ed. New YorkInc: Springer-verlag.

Shiferaw K, Tesfay T, Kalayu G, and Kiros G. (2020). Human Intestinal Parasites: Prevalence and Associated Risk Factors among Grade School Children in Maksegnit, Northwest Ethiopia.

Kitchen LW. (1999). Case studies ininternationalmedicine.Am FAM Physician. 59:3040-4.

Kucik C.J, Martin G.L, and Sort B.V. (2004). Common intestinal parasites. Am. Family Physi.69:1161-1168.

Kumma WP, Meskele W and Admasie A. (2019). Prevalence ofIntestinal Parasitic Infections and Associated Factors Among FoodHandlers in Wolaita Sodo University Students Caterings, Wolaita Sodo,Southern Ethiopia: A Cross-SectionalStudy. Front. Public Health 7:140.doi: 10.3389/fpubh..00140.

Jemaneh, L. (2001). Soil transmitted helminthic infections and S. Mansoni in schoolchildren from Chilga District, North West Ethiopia. Ethiop J Health Science. 11:79–87.

Mata L. (1982). Socio cultural factors in the control and prevention of parasitic disease. Reviews of infectious disease4 (8):71-79.

Menjetta T, Simon T, Anjulo W, Ayele K, Haile M, Tafesse T, Asnake S. (2019). Prevalence of intestinal parasitic infectionsin Hawassa University students' clinic, SouthernEthiopia: a 10‑year retrospective study. BMC Res Notes 12:702 https://doi.org/10.1186/s13104-019- 4747-5

Merem Abdie, Endalkachew Nibret, and Abayineh Munshea. (2016). Prevalence of intestinal helminthic infections and malnutritionin human of Zegie Peninsula, Northwestern Ethiopia J of INF. And Public Health. 10:84-92.

Montresor A, Crompton A.W.T, GyorkosT.W T.W, and Savioli L. (2002). Helminth control in school- age children. World Health Organization, Geneva, Switzerland.

Montana L. Mbmobtogomey A, Nels A, Noodle , pindolio D, Yetmena. (2012). Providing special demographic data for infection disease modeling and metric deviation population metric10(1):8.

Nigusse Danel, and Kumie Abera. (2012). Food hygiene practices and prevalence of intestinal parasites among food Handlers working in Mekelle University student's Cafeteria, Mekelle. GARJSS; 1(4):65–71.

Noor Azain MY, San YM, Gan CC, Yusri MY, Nurulsyamzawaty Y, Zuhaizam AH, Amzawaty MN, Norparina I, Vythilingam. (2007). Prevalence of intestinal protozoa in an aborigine community in Pahang, Malaysia. Trop Biomed. 24: 55-62.

Nuru Endris N and Mamo H, (2020). Status of individual, household and environmental sanitary practices in relation to intestinal parasitic infections among patients visiting Hara health center, Tehuledere District, northeast Ethiopia. *SINET: Ethiop. J. Sci*., 43(2):114–124.

Odoi A.S.W, Martin P, Michel J, Holt D, Middleton, and Wilson J. (2004. Determinants of the geographical distribution of endemic giardiasis in Ontario, Canada: a spatial modeling approach. *Epidemiol Infect* 132: 967-976

Organization WH. (2020). Global Distribution and Prevention of soiltransmitted helminth infections. Geneva: world health organization key fact sheet. Available from: http://www.who.int/news

Payment, P. (1999). Poor efficacy of residual chlorine disinfectant in drinking water to inactivate Water borne pathogens in distribution systems. *Can. J. Microbiol*. 45(8): 709- 715

Petri W.A, and Singh. (1999). Diagnosis and Management of amoebiasis.*ClinInfectDis*.29:1117-1125.

Pires SM, Fischer-Walker CL, Lanata CF, Devleesschauwer B, Hall AJ, Kirk MD, Duarte AS, Black RE, Angulo FJ. (2015).An etiology-species estimates of the global and regional incidance and mortality of diarrhoeal diseases commonly transmitted through food. PLoSOne.10:e0142927

Pullan R.L, Smith J.L, Jasrasaria R, and BrookerS.J. (2014). Global numbers of infection anddisease burden of soil transmitted helminth infections in 2010. Parasite Vectors; 7(1):37.

Raza H.H, and SamiR.A. (2009). Epidemiological study on gastrointestinal parasites amongdifferent sexes, occupations, and age groups in Sulaimani district .JDuhokUniversity.12 (1):317-23.

Rodriguez-Morales AJ, Granados-Alvarez S, Escudero-Quintero H, Vera-PolaniaF, Mondragon-Cardona A, Diaz-Quijano FA, Sosa-Valencia L, Lozada-Riascos CO, Escobedo AA, Lizeth O, Haque U. (2009-2013). Estimating and mapping the incidence of giardiasis In Colombia.

Ross A.G.P, Bartlet P. B, Sleigh A.C, Adrian C, Olds G.R, Li Y. G.M, McManus D.P. (2002). Current concepts; Schstosomiasis. New Engl. J Med. 346:1212-1220

Sahlemariam Zewdneh and Mekete Girma. (2001). Examination of finger nail contents and stool for ova, cyst and larva of intestinal parasites from food handlers working in Mama and Alemu BMC Public Health (2016) 16:105 Page 6 of 7 Student cafeterias in three higher institutions in Jimma. *EthiopJHealthSci*; 11(2):131–7

Samuel F. (2015). Status of soil transmitted helminthes infection in Ethiopian. Am J Public Health Res. 5(3):170–6

Sahiledengle B, Beker S, Girum Y. (2020). Prevalence and risk factors of intestinal parasites among primary school children in Shashamane town, southern Ethiopia. *MOJ Public Health.* 2020;9(3):55–61. DOI: 10.15406/mojph.2020.09.00325

Sharif M, Daryani A, Kia E, Rezaei F, Nasiri M, and Nasrolahei M. (2015). Prevalence of intestinal parasites among food handlers of Sari, Northern Iran. Rev Inst Med Trop Sao Paulo; 57(2):139–44

Stelnmann P, Keiser J, Bos R, Tanner M, and Utzinger J. (2006). Schistosomiasis and water resources development: Systematic review, meta-analysis, and estimates of people at risk. Lancet infects. Dis. 6, 411-425. Article/PubMed

Stephenson S, Holland V, and Copper S. (2000). The public health significance of Trichuris trichiura.Parasitol.122:575-595

Sitotaw B, Mekuriaw H, Damtie D. (2019). Prevalence of intestinal parasitic infectionsand associated risk factors among Jawi primary school children, Jawi town, northwestEthiopia, BMC Infectious Diseases. 19:341

Tedla Shibru. (1986). Intestinal helminthiasis of man Ethiopia. Helminthologia, 23: 43-48

Tadesse Dejen and Beyene Petros. (2009). Irrigation practices and Intestinal helminth infections in Southern and Central Tigray. *Ethiop J Health Dev*.23:48-56.

Thompson, S.C. (1994). Infectious diarrhoea in children: Controlling transmission in a childcare setting. *J. Paediatr. Child Health*. 30:210-219.

Torgerson PR, Devleesschauwer B, Praet N, Speybroeck N, Willingham AL, Kasuga F, Rokni MB, Zhou XN, Fever EM, Sripa B, Gargouri N, Furst T, BudkeCM,Carrabin H, Kirk MD, Angulo FJ, Havel Aar A, de Silva (2015). A data Synthesis. PLoS Medicine. 12:e1001920

Van der Werf MJ, de Vlas SJ, Brooker S, Looman CW, Nagelkerke NJ, Habbema JD, Engels D. (2003). Quantification of Clinical Morbidity associated with shcistosome infection in Sub Saharan Africa. Acta Trop. 86.125-139.Article/PubMed

Wakid M.H, Azhar EI, and Zafar TA. (2009). Intestinal parasitic infection among food handlers in the holy city of Makkah during Hajj season JKAU. Med Sci.; 16(1):39–52’

WeilC, and Kvale K. (1985). Current research on geographical aspects of Schistosomiasis. Geographical Review, 75:186-216.

WHO. (2002). Expert Committee. Prevention and control of Schistosomiasis and soil transmitted helminthiasis. WHO Technical Report Series, 912:1-57.

WHO. (2003).Controlling disease due to helminthes infection.World Health Organization, Geneva, Switzerland.

WHO. (2008). The global burden of disease: 2004 update. Geneva: WHO.

WHO. (2010). Overcome the global impact of neglected tropical diseases: first WHO report on neglected tropical diseases. Geneva: WHO; 2010

World Health Organization. (2012). Accelerating work to overcome the global impact of neglected tropical diseases: a roadmap for implementation. World Health Organization; [Google Scholar]

Workneh T, Esmael A, Ayichiluhm M. (2014). Prevalence of IntestinalParasitic Infections and Associated Factors among Debre Elias Primary Schools Children, East Gojjam Zone, Amhara Region, North West Ethiopia. J BacteriolParasitol 5: 181. doi: 10.4172/2155-9597.1000181

Xian-Ming, C. and. LaRusso, F.N (1999). Human intestinal and biliary cryptosporidiosis. World J. of Gastroenterology.5 (5): 424-429.

Appendix

This study focuses on assessing the IPIs prevalence and associated risk factors and to recommend the solution to overcome the problem. Your consent is needed to achieve the objective of the study so if you or your family is volunteer please answer the interview and give stool for the professionals. The parasite identified after stool examination in this study will be secret.

THANK YOU FOR YOUR PARTICIPATION

Appendix 1: Questionnaire (English Version)

Data collection sheet

Date of data collection----------

Study site----------

Sample code/patient ID----------

Sex: M---- F-----

Age ----------

Residence: Urban----- Rural----

Occupation: student------- unemployed------daily labor------housewife------farmer------

Merchant ------- government employee------

Religion: Orthodox---- Muslim------- Protestant----------

Educational status: Illiterate----- only read and write ----- primary---- secondary----- diploma and above------

Marital status: single------ married----- divorced------ widowed-----

1. Do you have contact to river when crossing? Yes ------ No------
2. Do you wash your cloth on river? Yes----- no------
3. Do you work irrigation activities? Yes------ no -----
4. Do you swim in rivers? Yes----- no-----
5. How many times do you swim per month? None----- 1-2 times/month ------ 3-4 times/month------ >4 times/ month-------
6. Do you have hand washing habit after defecation? Always---- sometimes---- not at all-----
7. Do you wash your hand before a meal? Always----- sometimes----- not at all------
8. Do you have shoes wearing habit? Always----- sometimes----- not at all-----
9. Latrine utilization: always----- sometimes ------ not at all------
10. Finger nail status: trimmed-------- not trimmed------
11. Eating raw vegetable? Always------- sometimes------- not at all-------
12. Eating raw meat? Yes-------- no-----
13. Where is your source of drinking water? Pipe---- River----- stream------ Well----

Appendix 2: Questionnaire (Amharic Version)

ይህ ጥናት የሚያተኩረዉ በአንጀት ጥገኛ ትላትል እና ተዋስያን አማካኝነት የሚከሰቱ በሽታዎች እና ተያያዥ ምክንያቶች ያሉበትን ደረጃ ለማወቅ እና ከጥናቱም በኋላ የመፍትሄ አቅጣጫዎችን ለማስቀመጥ ሲሆን በጥናቱ ላይ ለመሳተፍ እርሶም ሆኑ ቤተሰብዎት ፈቃደኛ ከሆኑ ለሚቀርብልዎት ጥያቄ መልስ እንዲሰጡ ና የአይነምድር ናሙና በመውሰድ የፓራሳይት ምርመራ ብቻ እንዲካሄድ ይደረጋል፡፡ በዚህ ምጥናት ላይ በመሳተፍዎ ምንም አይነት ችግር የማያጋጥምዎት መሆኑን እገልፃለሁ፡፡ እንደዚሁም በርሶም ሆነ በቤተሰብዎት አባል ላይ በሽታ አምጪ ጥገኛ ትላትልና ተዋስያን ከተገኙ በሚስጥር እንዲያዝ ይደረጋል፡፡ በጥናቱ ላይ ለመሳተፍ ፈቃደኛ ካልሆኑ በማንኛውም ሰዓት ማቋረጥ ይችላሉ፡፡ ይህም በመሆኑ ምንም አይነት የሚያጋጥምዎት ችግር አይኖርም፡፡ እንደዚሁም ግልፅ ያልሆኑ ጥያቄዎች ቢኖርዎት የመጠየቅና መልስ የማግኘት መብትዎ ትተጠብቆ የተሟላ ማብራሪያ እንዲያገኙ ይደረጋል፡፡

መጠይቅ

ጥናቱ የተደረገበት አካባቢ ..... ቀን.....

የታካሚው የህይወት ታሪክ መሙያ ቅጽ

የታካሚው መለያ ኮድ ..... ጾታ ..... ዕድሜ .....

የመኖሪያ አድራሻ፡- ገጠር ..... ከተማ .....

ሰራ:- ተማሪ ----- ስራአጥ----- የቀን ሰራተኛ..... የቤት እመቤት.....ገበሬ..... ነጋዴ..... የመንግስት ሰራተኛ.....

ሀይማኖት፡ኦርቶዶክስ ..... ሙስሊም..... ፕሮቴስታንት.....

የትምህርትደረጃ፡- ያልተማረ------ ማንበብእናመፃፍ ----- 1ኛደረጃ------- 2ኛደረጃ----- ዲፕሎማእናበላይ-----

የጋብቻ ሁኔታ፡- ያላገባ ------ ያገባ ------ የተፋታ------ ባል ወይም ሚስት የሞቱበት-------

1. **ወንዝ ተሻግረህ ትጓዛለህ/ሽ ? አወ ------- የለም-------**
2. **ልብስ ወንዝ ታጥባለህ/ሽ ? አወ -------- የለም-------**
3. **የመስኖ ስራ ትሰራለህ/ሽ ? አወ--------- የለም------**
4. **ወንዝ ዉስጥ ትዋኛለህ/ሽ ? አወ --------- የለም-------**
5. **በወር ምን ያህል ጊዜ ትዋኛለህ/ሽ? ምንም------ 1-2 ጊዜ------ 3-4 ጊዜ------ ከ4በላይ-----**
6. **ከተፀዳዳህ/ሽ በኋላ የመታጠብ ሁኔታህ/ሽ? ሁሌም----- አልፎአልፎ ------ የለም--------**
7. **ከምግብ በፊት የመታጠብ ልምድ፡- ሁሌም------- አልፎአልፎ-------- የለም---------**
8. **ጫማ የመልበስ ልምድ አለህ/ሽ? ሁሌም------- አልፎአልፎ------- የለም---------**
9. **ሽንት ቤት የመጠቀም ሁኔታ፡- ሁሌም------- አልፎአልፎ------- የለም-------**
10. **የጣት ጥፍር ሁኔታ፡ ተቆርጧል------ አልተቆረጠም------**
11. **ጥሬ አትክልት ትመገባለህ/ሽ ? ሁሌም------ አልፎአልፎ---------- የለም-------**
12. **ጥሬ ስጋ ትመገባለህ ? አወ------- የለም--------**
13. **የምትጠቀሙት ዉሃ ከየት ታገኛለህ/ሽ? ከቧንቧ ------ ምንጭ------ ወንዝ------ ጉድጓድ-----**