ADDIS ABABA UNIVERSITY

SCHOOL OF MEDICINE

DEPARTMENT OF MEDICAL MICROBIOLOGY, IMMUNOLOGY AND PARASITOLOGY

M.sc Research Project

PREVALENCE OF INTESTINAL PARASITIC INFECTIONS AMONG PATIENTS WHO ATTENDED TIKUR ANBESSA UNIVERSITY HOSPITAL, ETHIOPIA: A 5-YEAR RETROSPECTIVE STUDY

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List of Abbreviations

AAU ----------Addis Ababa University

DALY ----------Disability Adjusted Life Year

DMIP ----------Department of Microbiology, Immunology and Parasitology

HIV/AIDS-------Human Immuno Deficiency Virus/ Acquired Immuno Deficiency Syndrome

IPIs ----------Intestinal Parasitic Infections

SIM----------Langano Society of International Missionaries

SOM ----------School of Medicine

SPSS----------Statistical package for social science

STH ----------Soil Transmitted Helminthes

WHO ----------World Health Organization

Abstract

Background: Intestinal parasitic infections cause serious public health problems in Ethiopia. They are prevalent in populations with low socio-economic status, overcrowding and poor hygiene.

Objective: The purpose of this study was to determine the prevalence of intestinal parasitic infections among patients who had attended Tikur Anbessa University Hospital, Addis Ababa, Ethiopia.

Methods: This retrospective study was conducted using Hospital data obtained from the Medical Parasitology unit in Tikur Anbessa University Hospital, Addis Ababa, Ethiopia, from April to June 2011. Patients with complete age, sex and stool parasite examination records on the parasitology registration book were included. Data was entered, cleaned and analysed using the SPSS, version 16.0 statistical package. Chi-square test (χ^2) was used to identify associations between the variables using $p<0.05$ as the level of significance.

Results: Over the five years study period, a total of 4977 patients visiting Tikur Anbessa Hospital were included in the study. The patients mean age was 31.86 (± 14.79) with female to male ratio being 1.2:1. A total of 1718 (34.5%) were positive for at least one intestinal parasite. Mixed infections were found in 123 (2.5%) of the total patients included in this study. Up to 3 parasites were detected in 8 (0.2%) of the patients. *E.histolytica* trophozoite was the most commonly reported parasite, which was seen in 13.6% of the patients. *Isospora belli* was the least commonly reported protozoan parasite (0.1%). Among helminths, *Ascaris lumbricoides* was the most prevalent etiology of parasitic infections as reported in 4.4% of the patients. *Enterobius vermicularis* was identified only in 0.1%, thus the least common cause of helminths infections. In this study, the intestinal parasitic infections were most prevalent (43%) in patients between 5-14 years of age group.

Conclusions and Recommendation: A notable finding from this study is the high prevalence of parasitic infections, with *E. histolytica* trophozoite as the most commonly reported one, among patients visiting Tikur Anbessa Hospital from 2006 to 2010. Overall, intestinal parasitic infections were more prevalent in patients among 5-14 years of age (43%). Appropriate heath education should be applied at Hospital level to patients who attend at Tikur Anbessa Hospital.

Keywords: intestinal parasitic infections, helminths, protozoa, Tikur Anbessa Hospital.

1. INTRODUCTION

1.1. Background

Intestinal parasitoses have a worldwide distribution but they are more prevalent in developing countries. Intestinal helminths and protozoan parasites are major public health problems in developing countries (Malenganisho *et al*., 2008). Intestinal parasitic protozoal and helminthic infections are widely distributed throughout the world, especially in developing countries. World Health Organization estimates that some 3.5 billion people worldwide are affected, and that 450 million are ill as a result of these infections, the majority being children (Bdri and Adwen, 2010; WHO, 1998).

Intestinal parasitic infections (IPIs) constitute a global health burden causing clinical morbidity and mortality in the developing world affects about 450 million people, many of these are women of reproductive age and children in developing countries (Mbuh *et al*., 2010).

Ethiopia is one of the countries with high prevalence of intestinal parasitic infections. Intestinal parasite infections are linked to lack of sanitation, lack of access to safe water and improper hygiene; therefore they occur wherever there is poverty (Sayyari *et al*., 2005).

Intestinal parasitic infections have common characteristics - they are highly endemic in populations with low socio-economic status, overcrowding, poor hygiene, conducive warm and humid conditions for the transmission of the parasites, limited access to clean water supply, waste disposal, malnutrition, lack of adequate healthcare facilities and peasant farming, favouring larval skin penetration and oral-faecal transmission (Hailemariam *et al*., 2004; Mazigo *et al*., 2010). These factors are the cause of major proportion of burden of the disease and death in developing countries (Mazigo *et al*., 2010).

The parasites are important causal agents of gastrointestinal disorders such as diarrhoea, dysentery, vomiting, lack of appetite, hematuria, abdominal distension and sometimes mentally related disorders (Ayeh-Kumi *et al*., 2009; Feachem, 1984).

Intestinal parasitic infections are the top global health problems whereby schistosomiasis, amoebiasis, ascariasis, hookworm infection and trichiuriasis are among the ten most common infections (Mengistu *et al*., 2007).

Intestinal Protozoa

Numerous protozoa inhabit the gastro-intestinal tract of humans. The majority of intestinal protozoa are non-pathogenic commensals, or only result in mild disease. Some of these organisms can cause severe disease and life-threatening diarrhea in AIDS patients and other immunocompromised individuals (Chen *et al*., 2007). In general, intestinal protozoa are transmitted by the fecal-oral route and tend to exhibit similar life cycles consisting of a cyst and trophozoite stages. Fecal-oral transmission involves the ingestion of food or water contaminated with cysts. Some of the trophozoites will develop into cysts instead of undergoing replication. Factors which increase the chance of ingesting materials contaminated with fecal material play a role in the transmission of these intestinal protozoa. In general, situations involving close human-human contact and unhygienic conditions promote transmission (Chen *et al*., 2007).

Entamoeba histolytica is a protozoan parasite that is considered pathogenic. Most of the infections (90%) are asymptomatic and the remaining 10% produce a spectrum of clinical syndromes ranging from dysentery to abscesses of the liver or other organs (Farhana *et al*., 2009). More than 500 million people worldwide are infected by *Entamoeba histolytica* and up to 110,000 of those infected die every year (Mehraj *et al*., 2008). The *E. histolytica or E. dispar* species are found throughout the world, but like many other intestinal protozoa, they are more common in tropical countries or other areas with poor sanitary conditions. About 10% of the world's population is infected with *E. histolytica or E. dispar,* and in many tropical countries the prevalence may approach 50% (Bethony *et al*., 2006). It is also estimated that about 100,000 deaths and 50 million cases of amoebiasis occur per year in the world and humans are the only host of *E. histolytica*, passing virulent cysts that are transmitted chiefly by ingestion of contaminated food or water or through direct contact (Bethony *et al*., 2006; Haque *et al*., 2003). Amoebiasis is an infection caused by an intestinal protozoa *Entameba histolytica*, is the third most common cause of death from parasitic disease (after schistosomiasis and malaria). Areas of highest incidence (due to inadequate sanitation and crowding) include most developing countries in the tropics, particularly

Mexico, India and nations of Central and South America, tropical Asia, and Africa (Farhana *et al*., 2009).

Upon ingestion, the cysts pass through the stomach and excyst in the lower portion of the small intestine, and undergo repeated rounds of binary fission (Stanley, 2003). The amoebas can also metastasize to other organs and produce an extra intestinal amoebiasis (Haque *et al*., 2003). The non-invasive disease is often asymptomatic, but can cause diarrhea or other gastro-intestinal symptoms such as abdominal pain or cramps. This non-invasive infection can persist or progress to an invasive disease in which trophozoites penetrate the intestinal mucosa and kill the epithelial cells (Stanley, 2003).

Giardia lamblia is a common intestinal protozoan infection which is found especially in temperate and tropical countries. The prevalence rate of giardiasis has been found to be 2 to 5% in developed countries and 20 to 30% in developing countries, *G. lamblia* infects infants early in life and in children younger than 10 years are common and children are more frequently infected than adults particularly those who are malnourished (Mehraj *et al*., 2008). It was estimated that about 200 million people are infected each year in Africa, Asia and Latin America. *G. lamblia* exhibits a typical fecal-oral transmission cycle. The infection is acquired through the ingestion of cysts. Factors leading to contamination of food or water with fecal material are correlated with transmission (Partovi *et al.*, 2007). The ingested cyst passes through the stomach and excystation takes place in the duodenum, the trophozoites are predominantly found attached to epithelial cells of the small intestine (especially the duodenum and jejunum) and are rarely found in stools, except in the cases of severe diarrhea. (Partovi *et al.*, 2007).

Opportunistic parasitic infections such as C*ryptosporidum parvum, Isospora belli*, *Cyclospora cayetanensis* and *Microspordia* are the most frequent causes of diarrhea. Cryptosporidiosis and Isosporiasis are rare infection of normal human, although it is being seen in increasing numbers in AIDS patients (Escobedo *et al*., 2009). The diarrhea caused by *Cyclospora* species in AIDS patients is much more severe than in immunocompetent persons. These infections have been linked to contaminated water and food (Sears and Kirkpatrick, 2001). Infections with opportunistic parasitic infections are acquired by ingestion of the mature sporulated oocyst. These thick walled oocysts are capable of surviving for long periods of time in the environment (Sears and Kirkpatrick, 2001 and Escobedo *et al*., 2009).

These parasite mainly characterised by watery diarrhoea, abdominal pain, vomiting, dehydration, weight loss and malaise (Escobedo *et al*., 2009).

Intestinal Helminths

Intestinal helminths are widely distributed mostly in tropical and sub tropical regions of Asia, especially China, India and South East Asia as well as Sub-Saharan Africa. Parasitic helminthic infections are the second most predominant causes of morbidity in Sub-Saharan Africa (Al-Shammari *et al*., 2001). Helminthic infections make the host more susceptible to HIV infection and enhance its progression due to the chronic immune activation they cause (WHO, 1996).

It was estimated that almost 2 billion people are infected by one or more of intestinal helminthes infection worldwide, approximately 300 million infections result in severe morbidity, which are associated with the heaviest worm burdens (Hotez *et al*., 2004; Chan *et al.*, 1994; De Silva *et al*., 2003). In Ethiopia the prevalence and distribution of intestinal helminthes varies from place to place (Legesse and Erko, 2004; Tadesse, 2005).

Hookworm infection in humans is caused by two species of nematodes, *Necator americanus* and *Ancylostoma duodenale* (Jemaneh and Tedla, 1985). Both of the human hookworm species are known to exist in Ethiopia. The infection is acquired by skin penetration of filariform larva during contact with contaminated soil or water or by ingestion of contaminated water. The infection occurs in areas where the standard of living of the population is low. Sanitary and environmental conditions favor the development of filariform larvae and infection of hosts (Jemaneh and Tedla, 1985). Inspite of considerable advances in chemotherapy and control, hookworms rank amongst the wide spread of soil-transmitted intestinal helminth parasites and affect a significant proportion of the world population (Bundy *et al*., 1995). The infection is very intense in the tropics and sub-tropics with an estimated 740 million cases (De Silva *et al*., 2003), and the global DALYs for hookworm is estimated to be 22.1 million life years lost (Chan, 1997). A study done by Hawdon and Hotez (1996) showed that hookworms cause severe anemia and malnutrition in developing countries of the tropics. Hookworms contribute to iron deficiency by actively feeding on blood from the capillaries in the intestinal mucosa, resulting in significant gastro-intestinal hemorrhage, loss of serum proteins, and intestinal inflammation. Children under five years are particularly vulnerable to disease caused by soil-transmitted helminths (STH). Periodic

deworming has been shown to improve growth, micronutrient status (iron and vitamin A), and motor and language development in preschool children (Kirwan *et al*., 2009).

Blood loss occur when the worms use their cutting apparatus to attach themselves to the intestinal mucosa, sub mucosa and contact their muscular esophageal to create negative pressure, which sucks a plug of tissue into their buccal capsules (Hotez *et al*., 2004). Capillaries and arterioles are ruptured both mechanically and chemically through the action of digestive enzymes of the hookworms (Hotez et al., 2004). Hookworm infections also contribute to poor appetite and decreased food intake (WHO, 1996).

Trichuris trichiura, the whipworm, is the most common in the warm moist tropical and sub tropical countries. Heavy infection of *T. trichiura* has long been known to be associated with anemia, protein-energy malnutrition and chronic diarrhea and dysentery (Stephenson *et al*., 2000). Furthermore, the effect of helminthes and *T. trichiura* infections on cognitive function has been reported (Partovi *et al*, 2007). Some studies also have showed anemia was prevalent in children with heavy infection of *T. trichiura* (Stephenson *et al*., 2000).

Enterobius vermicularis commonly referred to as pinworm. It is found worldwide in both temperate and tropical areas. Prevalence is highest among the 5-10 year-old age group and infection is uncommon in children less than two years old. Enterobiasis has been reported in every socioeconomic level; however spread is much more likely within families of infected individuals, or in institutions such as child care centers, orphanages, Hospitals and mental institutions. Humans are the only natural host for the parasite. Infection is facilitated by several factors including overcrowding, wearing soiled clothing, lack of adequate bathing and poor hand hygiene, especially among young school-aged children. Infestation follows ingestion of eggs which usually reach the mouth on soiled hands or contaminated food. Transmission occurs via direct anus to mouth spread from an infected person or via airborne eggs that are in the environment such as contaminated clothing or bed linen. The migration of worms out of the gastrointestinal tract to the anus can cause local perianal irritation and pruritus. Scratching leads to contamination of fingers, especially under fingernails and contributes to autoinfection. Finger sucking and nail biting may be sources of recurrent infection in children (Satoskar *et al*., 2009).

Strongyloidiasis is the disease caused by the protozoan parasite *Strongyloides stercoralis*. This organism is an intestinal nematode with worldwide distribution, but is especially

common in tropical and subtropical regions. The number of individuals infected with this nematode is unknown, but estimates range from 30 million to 100 million. The disease usually manifests as intestinal symptoms (mild diarrhea). Most roundworms or their eggs are found in the soil and can be picked up on the hands and ingested or can enter through the skin (Satoskar *et al*., 2009).

This parasite has different types of life cycles. One is direct, similar to that of the hookworm. Once inside a human body they pass through the right side of the heart to the lungs. From the lungs, the adolescent parasites go up the windpipe into the mouth, are swallowed, and reach the upper part of the small intestine where they develop into mature worms. Mild to Severe symptoms of pneumonia during migration to air-sacs of lungs (Cases of reproduction in the air-sacs have been observed but they are relatively rare). Inflammation of the intestinal mucosa may also result. This phase of Strongyloides infection can present to the physician as an acute asthma attack (Satoskar *et al*., 2009).

The effects of Strongyloides infection can be exacerbated in patients with comorbid pulmonary or autoimmune diseases who are treated with systemic steroids. This may lead to hyperinfection and respiratory compromise. People exposed to endemic areas with a history of immunosuppression and respiratory complications should be considered for Strongyloidiasis (http://www.ivdresearch.com/strongyloides.php, 2008 assessed on June 25, 2010).

Ascaris lumbricoides, a soil-transmitted infection, is the largest nematode to infect humans. The adult worm lives in the small intestine and can grow to a length of more than 30 cm. Current estimates indicate that more than 1.4 billion people are infected worldwide (Satoskar *et al*., 2009. *A. lumbricoides* is a well-known cause of malnutrition, intestinal obstruction, biliary colic, pancreatitis, minute hemorrhage and pneumonia (due to heart-lung migration) (Basavaraju and Schantz, 2006).

Many reports illustrated that *A. lumbricoides* is the most prevalent intestinal parasite in different communities usually occurring together with *Trichuris* infections (Mengistu *et al*., 2007). Hookworm infection, Strongyloidiasis and Enterobiasis are also public health problem though the magnitude is lesser compared to Ascariasis. *A. lumbricoides* infection is generally more prevalent in Africa (Partovi *et al.*, 2007). *A. lumbricoides* infection in primary school

children also affected cognitive function iron deficiency anemia, growth retardation in children and other physical and mental health problems (Partovi *et al.*, 2007).

Schistosomiasis is one of the tropical diseases caused by digenetic trematodes belonging to the genus *Schistosoma*. The disease affects both human and animal health. Schistosomiasis is endemic in 76 countries worldwide and besides malaria is the second important parasitic disease affecting large number of people in the world. Of the 662 million people infected worldwide, 85% are from Africa (Mazigo *et al*., 2010; Steinmann *et al*., 2006). Schistosomiasis in humans is mainly caused by *Schistosoma haematobium, S. mansoni* and *S. japonicum*. Other two species, *S. mekongi* and *S. intercalatum* also infect humans (Wu and Halim, 2000; WHO, 2007). *S. haematobium* alone is believed to infect more than 193 million people in the tropics with more than 85% infections occurring in Africa (Richens, 2004).

In Ethiopia, both *S. mansoni* and *S. haematobium* pose considerable public health and socioeconomic problem. In the country, distribution of schistosomiasis is highly focal and discontinuous (Erko *et al*, 1997; Kloss *et al, 1988*). *S. mansoni* has been reported in places with an altitude range of 650 and 2400 above sea level (Erko *et al*, 1997); most transmission sites of *S. mansoni* infections are in agricultural communities along streams between 1300 and 2000 m above sea level which are infested with *Biomphalaria pfeifferi*, the major snail intermediate host in the country (Kloss *et al*, 1988).

The life cycle of schistosome parasite requires snail intermediate hosts and definitive hosts. In the life cycle, fresh water snails are essential for the survival of the parasite because they are sites for enormous replication of the larval stages (Wu and Halim, 2000). Human beings get infected by schistosome parasite when contacting infested surface waters by the infective larval stage called cercariae which bore through skin. Adult parasites form pairs with an opposite sex and reside in mesenteric venules or plexus venules of bladder and release eggs through feaces or urine depending on the parasite species (Wu and Halim, 2000).

There are different important pathogenic species of *Taenia*, these are: *Diphyllobothrium latum* (fish tape worm), *H. nana* (dwarf tapeworm), *H. diminuta* (rate tapeworm), *T. saginata* (Beef tape worm), *T. solium* (pork tape worm), *Echinococcus granulosus* (Hydatid tapeworm), *E. multilocularis* (Hydatid tape worm) and *Diphylidium caninum* (dog tape worm). Tape-worms inhabit the intestinal tracts of vertebrates, and the larvae inhabit the tissues of vertebrates and invertebrates. The low economic standard, poor sanitation and

ignorance of simple health promotion practices favor the wide distribution of intestinal helminths in Ethiopia. Several studies in the country have also revealed that intestinal parasite infections are widely distributed with high prevalence rates (Merid *et al*., 2001).

H. nana infection has cosmopolitan distribution and most commonly infects humans living under conditions of poor hygiene and poverty (Willms and Sotelo, 2001). It is prevalent in school-aged children, particularly most common in children aged 4-10 years, in tropical and subtropical climates of the developing world (Willms and Sotelo, 2001 and Robert and Tolan, 2009). Humans become infected with *H. nana* by ingestion of water and food contaminated with mouse feces, and can also transmitted from one child to another by passing infective eggs on dirty hands (Willms and Sotelo, 2001). *H. nana* affects millions of people, worldwide. An estimated the majority of infections are asymptomatic in various regions range from 0.1-58% (Robert and Tolan, 2009). It is estimated and is probably associated with a low number of parasites symptoms are vague abdominal distress in light infections, but this can be accompanied by abdominal pain, nausea, vomiting, weight loss and diarrhea (Willms and Sotelo, 2001). Human infection with *H. diminuta* results from accidental ingestion of insects (immature fleas, flour beetles, meal worms, cockroaches) that carry the parasite in their body cavities (Robert and Tolan, 2009).

The main transmission route for most intestinal parasites is fecal-oral, through contaminated food or water. Protozoan parasites, such as *C. parvum, G. lamblia, E. histolytica/dispar* and *Cyclospora* sp, and helminthic parasites, including *Ascaris lumbricoides*, hookworms (*Necator americanus* and *Ancylostoma duodenale*), *Enterobius vermicularis(*pin worm*)* and whipworm (*Trichuris trichiura*), are causes of water- and food-borne diseases (Ayeh-Kumi *et al.,* 2009) and also by penetration of the skin, such as Hookworms , *Strongyloides stercoralis* and Schistosomiasis(*Schistosoma haematobium, S. mansoni* and *S. Japonicum).* These parasites are widespread in the environment, and may lead to major disease outbreaks as a result of contaminated drinking water and food. Recently, it has been estimated that over one quarter of the world's population is infected with one or more helminthic parasites (Chan *et al.,* 1994; de Silva *et al*., 2003).

Children are particularly vulnerable to parasitosis, often carrying higher burdens of parasites than adults (Brooker *et al*., 2006). According to Brooker *et al*., (2006) the greatest obstacle to effective control of parasites in at risk populations is inadequate knowledge of the geographical distribution of infection and the demographic variables that influence the

prevalence of infection. Next to children, pregnant women are at risk for infection with intestinal parasites (Adedayo and Nasilro, 2004).

The routine test for diagnosis of intestinal parasitic infections was stool examination methods, e.g a direct smear and formol-ether concentration technique (WHO, 1991). The formalin-ether concentration sedimentation procedure was also followed to check for intestinal parasites in the stool samples (Beaver *et al.,* 1984). The Preparation should be examined systematically using low (X 10) and high (X 40) power microscope.

Treatment of intestinal parasitic infections: for protozoal infections use Metridazole or Tridazole (Margaret and Samuel, 2006) and for helminths infection use Albendazole or Mebendazole. In addition to this for *Enterobius vermicularis* (pyrantel pamoate), *Hymenolopis nana,* Taenia species, and *Schistosoma mansoni use* Praziquantel (Loukas & Hotez, 2006).

1.2. Statement of the problem

Diarrhoea, including that of parasitic origin, remains one of the most common illnesses in children, and one of the major causes of infant and childhood mortality in developing countries, as reported by the WHO (Mbuh *et al*., 2010).

IPIs, mostly helminths, have been linked with an increased risk of nutritional anemias, protein-energy malnutrition and growth deficits in children, low pregnancy weight gain and intrauterine growth retardation followed by low birth weight. An estimated 44 million pregnant women have hookworm infections which can cause chronic loss of blood from the intestines and predisposes the women to developing iron deficiency anemia (Adedayo and Nasilro, 2004).

In addition, the most common intestinal helminths leading to digestive tract disorders including *Taenia saginata, Hymenolepis nana, Ascaris lumbricoides, Strongyloides stercoralis, Trichuris trichiura, Enterobius vermicularis* and Hookworms are usually transmitted from contaminated food or water or from the environment. The most common protozoans reported to lead to digestive tract disorders include *Giardia lamblia* and *Entamoeba histolytica* (Bethony *et al*., 2006). Outbreaks of protozoan infections in humans have been linked to contaminated food from improper environmental sanitation and to inadequate personal hygiene by food-handlers (Bethony *et al.,* 2006). In countries where the

infection is widespread, most cases infected with *G. lamblia* were found to be asymptomatic (Khan *et al*., 1989 & Bethony *et al*., 2006). *E. Histolytica* is associated with poor socioeconomic conditions and low hygiene standard, as well as malnutrition in developing countries (Bethony *et al*., 2006).

In Ethiopia, there are many researches done on prevalence of intestinal parasitic infections on different part of the countries. There is inadequate reliable information on the epidemiology of intestinal parasitic infections among patients visiting at Tikur Anbessa University Hospital, Ethiopia. Therefore, the aim of this study was to determine prevalence of intestinal parasitic infections among patients who had been visiting this Hospital.

1.3. Literature review

According to the study conducted in Princess Margaret Hospital, Dominica, the prevalence of parasites was found in 393 out of 3,752 stool samples (10.47%). Three-hundred-fifty-two out of 393 (89.6%) parasite-positive stools had a single parasite while 41 out of 393 (10.4%) had multiple parasites. The main parasites identified were *Entamoeba coli*, 5.1% (193/3,752); *hookworm*, 1.5% (56/3,752); *Giardia lamblia*, 1.4% (51/3,752); *Strongyloides stercoralis*, 1.0% (37/3,752); *Ascaris lumbricoides*, 0.8% (28/3,752); *Trichuris trichiura*, 0.9% (34/3,752); *lodamoeba butchlii*, 1.2% (46/3,752); and *Enterobium vermicularis*, 0.1% (4/3,752) (Malenganisho *et al*., 2008).

In a study conducted in the Ahli Arab Hospital, Gaza, the results of 8,417 stool specimens was analyzed. The overall prevalence of parasites was 29.77%. The overall frequency of parasites has decreased from 36.35% in the year 1995 to 21.20% in the year 2000. The most common parasites identified were; *E. histolytica*, *A.lumbricoides* and *G. lamblia.* In general, *E.histolytica* was the most commonly isolated parasite and represented around three quarters of all parasites throughout the investigated years. Moreover, *E. histolytica* was the only parasite that showed consistent and significant ($p \leq 0.001$) annual increase. Most of the remaining identified parasites, however, showed a significant decrease. For instance, *A. lumbricoides* and *G. lamblia* which were respectively responsible for 14.56% and 12.30% of parasitoses in the year 1995 became numerically less in the year 2000 and represented only 9.22% and 8.53% of the positive specimens, respectively. *T. saginata* and *E. garanulosus* remained uncommon parasites in Gaza and only 2 cases of each were recorded in the whole study period (Abboud *et al.*, 2004).

A recent study conducted at Bugando Medical Centre in Mwanza, north-western Tanzania showed the prevalence of parasite from a total of 3152 stool samples (1887 in 2008, 963 in 2009 and 302 in 2010). A total of 1153 patients out of 3152 (36.6%) were positive for intestinal helminths while 646 patients out of 3152 (20.5%) had stools positive for intestinal protozoa. *Hookworm* accounted for the most prevalent parasitic infection (25.2% (95%CI, 22.2-28.2; n=793) followed by *Schistosoma mansoni*, 5.6% (95%CI, 2.2-9; n=177). *Entamoeba histolytica/ E. dispar* (13.6%, 95%CI, 6.6-20.8) and *Giardia lamblia* (6.9%, 95%CI,-0.001-14.3) were the only intestinal protozoan observed in the study (Mazigo *et al*., 2010).

In a study conducted in Palestine in a10- year retrospective study on prevalence of intestinal parasitic infections in Jenin Governorate Hospital from January 2000 to December 2009. The prevalence rate ranged from 32.0-41.5%. There were at least 7 different parasites. The most common pathogenic parasites identified were: *Entamoeba histolytica* (8.2-18.2), *Enterobius vermicularis* (15.6-28.9%). The other parasites present were *Giardia lamblia*, *Ascaris lumbricoides*, *Strongyloides stercoralis*, *Taenia* species and Hookworms (Bdri and Adwen, 2010).

In a study conducted in West Indias in a4-year retrospective study on epidemiology of intestinal parasitic infections and the presence of Schistosomiasis in the island of St. Lucia Hospital from January 2002 to December 2005. The overall parasitic prevalence was 26.1%. The overall prevalence of helminthes infection was 13.3% with hookworm, *Ancylostoma duodenale* or *Necator americanus* contributing most to the prevalence with 4.8%, followed by *Strongyloides* 2.9%, *Ascaris lumbricoides* 2.5%, *Trichuris trichiura* 2.5%, *Schistosoma mansoni* 0.3% and *Taenia sp*. 0.1%. The prevalence for all intestinal protozoans was 12.9% with *Entamoeba coli* contributing most to the protozoan prevalence with 5.6%, followed by *Endolimax nana* 4.1%, *Iodamoeba butschli* 1.1%, *Entamoeba histolytica/ E.dispar/ E. moshkovski* 1.1%, *Giardia lamblia* 0.6% and *Entamoeba hartmanni* 0.2% (Kurup and Hunjan, 2010).

In a study conducted in East African countries (including Somalia, Ethiopia, Eritrea, Kenya and Sudan), one hundred and thirty-five children were included. The commonest organisms reported were *B. hominis*, *Entamoeba coli* and *Endolimax nana*. Thirty-three children (25%) had multiple organisms identified in the single stool specimen; 11 children (8%) had two

parasites and 18 (14%) had three parasites causing infection. None of the children carrying pathogenic organisms were symptomatic at the time of diagnosis (Rice *et al.*, 2003).

In another local study conducted at southeast of Lake Langano, Ethiopia**,** out of 170 stool samples collected from Kime schoolchildren, 150 (88.2%) were positive for at least one parasite. Similarly, of the 89 stool samples collected from Langano Society of International Missionaries (SIM) schoolchildren, 67(75.3%) were positive for at least one parasite. The overall prevalence of intestinal parasitic infection was 83.8% in the study subjects. Among the intestinal helminths, hookworm was the predominant parasite, 64.7% in Kime schoolchildren and 51.7% in Langano SIM. Non-pathogenic protozoan parasites such as *Entamoeba coli and Iodamoeba buetschlii* were not found in the stool samples collected from Langano SIM students. On the other hand, cysts of protozoan parasites such as *Entamoeba histolytica/dispar* and *Giardia duodenalis* were found in some of the stool samples collected from Langano SIM and Kime students. Prevalence of infections with more than one parasite was higher in students from Kime than from Langano SIM (Legesse & Erko, 2004).

A study conducted in Jimma, southwest Ethiopia**,** of the total, 754 (83%) had one or more intestinal parasitic infections. *T. trichiura*, *A. lumbricoides* and *S. mansoni* were detected in single infection in 124 (16.4%), 44 (5.8%) and 11 (1.5%) of the infected study subjects, respectively. Polyparasitism was found in 515 (56.7%) of the total examined. Up to 5 parasites were detected in some individuals. *T. trichiura* with *A. lumbricoides*, Hookworm and *S. mansoni* constituted 102 (13.5%), 33 (4.3%) and 17 (2.2%) of the double infections, respectively. *H. nana* and *S. mansoni* predominantly affected males than females ($P<0.05$). The prevalence of Giardia trophozoite and *H. nana* were significantly higher in pre-school children than other age groups ($P<0.05$) (Mengistu *et al.,* 2007).

Another study conducted in Babile town, eastern Ethiopia, a total of 422 school children were invited to participate and 415 (98.3%) provided proper stool samples and complete information. Among these, 271 (65.3%) were males and 144 (34.7%) females. The mean age of the children was 11.2 years. Nine species of intestinal helminths were identified with an overall prevalence of 27.2% (113 out of 415 children). The predominant parasite involved was *H. nana* which was observed in 42 (10.1%) of the students followed by hookworm in 28 (6.7%) and *S. mansoni* in 18 of the students (4.3%). The prevalence of Soil Transmitted Helminths (STH) was 14.2% (59 out of 415 students). There was no discrepancy on the stool examination results between the first and the quality control test (Tadesse, 2005).

1.4. Significance of the study

The study provides the prevalence of intestinal parasitic infections among patients visiting Tikur Anbessa University Hospital.

There has been no adequate information about the prevalence of intestinal parasitic infections in department of parasitology laboratory at Tikur Anbessa University Hospital. Therefore, there was a need to generate current prevalence data on intestinal parasites infections to enable decision on the control of these neglected but poverty related diseases.

Hence, the information already obtained from this study is believed to serve as a baseline data for the future intervention. And also, this information may provide invaluable statistics needed for planning meaningful public control programmes that aim at reducing the prevalence and morbidity of parasitic infections.

2. OBJECTIVES OF THE STUDY

2.1. General Objective

To determine the prevalence of intestinal parasites infections among patients who had attended Tikur Anbessa University Hospital, Addis Ababa, Ethiopia**.**

2.2. Specific Objectives

- To determine the prevalence of intestinal protozoan parasitic infections.
- To determine the prevalence of intestinal helminthic parasitic infections.

3. MATERIALS AND METHODS

3.1 Study design:

A retrospective study using secondary data on prevalence of intestinal parasitic infection was conducted on patients who had been visiting at Tikur Anbessa University Hospital, Addis Ababa, Ethiopia.

3.2 Study Area and Period:

The study was conducted in Tikur Anbessa University Hospital, Addis Ababa, Ethiopia. Tikur Anbessa is a Tertiary referral Hospital giving service to approximately 370,000-400,000 patients annually. It is situated along 9.03° North latitude and 38.74° East longitude. This is the largest teaching Hospital in the country, under AAU having 800 beds; there are about 130 specialists, 350 Residents, 50 non-teaching doctors and 600 Interns. This retrospective study was conducted from April 2011 to June 2011.

3.3 Source population

The population of this study were all patients who attended Tikur Anbessa University Hospital for the last five years (from July 2006 – June 2010).

3.4 Study subject

All Patients who had been examined for stool sample and those who had complete age, sex, and stool examination documentation over the aforementioned study period.

3.5 Sample size determination

All patients that fulfill eligibility criteria were included in this retrospective study.

3.6 Inclusion and Exclusion criteria

- **Inclusion criteria**
  - Who had complete age, sex and stool examination records on registration book.
- **Exclusion criteria**
  - Patients' record that had incomplete age or sex or stool examination results data.

3.7 Definition of terms/ standard or working terms

- **Intestinal parasites**: are organisms that live in the hosts' intestine of man or animals, take up the nutrition from the host, and cause abdominal discomfort, dysentery, mechanical irritation of intestinal mucosa, malabsorption syndromes and obstruction.
- **Protozoa:** are Single-celled organisms belonging to the kingdom *Protista*, are multiply in human host.
- **Helminths:** are multicellular worms belonging to the kingdom Animalia**,** Do not normally multiply in human host except *Strongyloides stercoralis.*
- **Nematodes:** are elongated, symmetric round worms. These can be classified as intestinal or tissue nematodes. Largest group of helminthic infections of humans. Some of the intestinal nematode species are *Strongyloides stercoralis, Enterobius vermicularis, Trichuris trichuira, Ascaris lumbricoides, Necator americanus and Ancylostoma duodenale*.
- **Trematodes or flatworms:** are a group of morphologically and biologically heterogeneous parasitic helminthes that belong to the phylum platyhelminthes, human trematode infections are classified according to the site they involve; the adult flukes may involve blood, biliary tree, intestines and lungs. Blood flukes are *S. mansoni, S.haematobium*, *S.japonicum*, *S.intercalatum*, and *S. mekongi*.
- **Cestodes or tapeworms:** are segmented worms which include *Taenia* species, Diphyllobothrium, *Hymenolopis* species and Dipylidium Canium.
- **Mixed infections:** are the simultaneous infections of a host by two or more parasites.

3.8 Variables:

- **Dependent variable:**

  Intestinal parasite
- **Independent variables:**

  Age

  Gender

3.9 Procedures

The stool specimens in Tikur Anbessa Hospital are routinely examined using direct wet mount saline preparation by medical technicians or technologists and the results are recorded in the Parasitology laboratory register book. For the purpose of this study, all such complete records were extracted and the results for helminths eggs, larvae and protozoan cyst or trophozoite infections were analyzed.

3.10 Data collection and analysis

Using data extraction sheet/form, all required information for this retrospective study was obtained from the registration/record books of the Parasitology Unit of Tikur Anbessa University Hospital. The data covered the period of 60 months from July 2006 – June 2010.

All data generated during laboratory data registration book was double entered, cleared, verified and analysed using SPSS version 16.0 (SPSS Inc, Chicago, Illinois).

Chi-square test (χ^2) was used to carry out significance between prevalence by gender and age. Appropriate statistical analysis was also performed by P-value. Values were considered statistically significant when P-values were less than 0.05.

3.11 Quality controls

The data was double entered and cleaned.

3.12 Ethical Consideration

Ethical clearance was obtained from DMIP Research and Ethical Review Committee, School of Medicine, Addis Ababa University. A letter of permission was obtained from DMIP to department of Parasitology laboratory at Tikur Anbessa University Hospital. Permission was obtained from department of Parasitology laboratory for study after explaining the purpose of the study.

4. RESULTS

A total of 21,313 patients visiting for stool examination of parasitology department in Tikur Anbessa University Hospital, 4977 patients have complete age, sex and stool examination results over the 5 year period from 2006 to 2010. From a total of 4977 patients record had complete age, sex, and stool examinations where 20.9% in 2006, 11.3% in 2007, 2.9% in 2008, 36.2% in 2009 and 44.5% in 2010. As see in Figure 1, the majority of patients complete record were seen in 2010 (44.5%) and in 2009 (36.2% %).

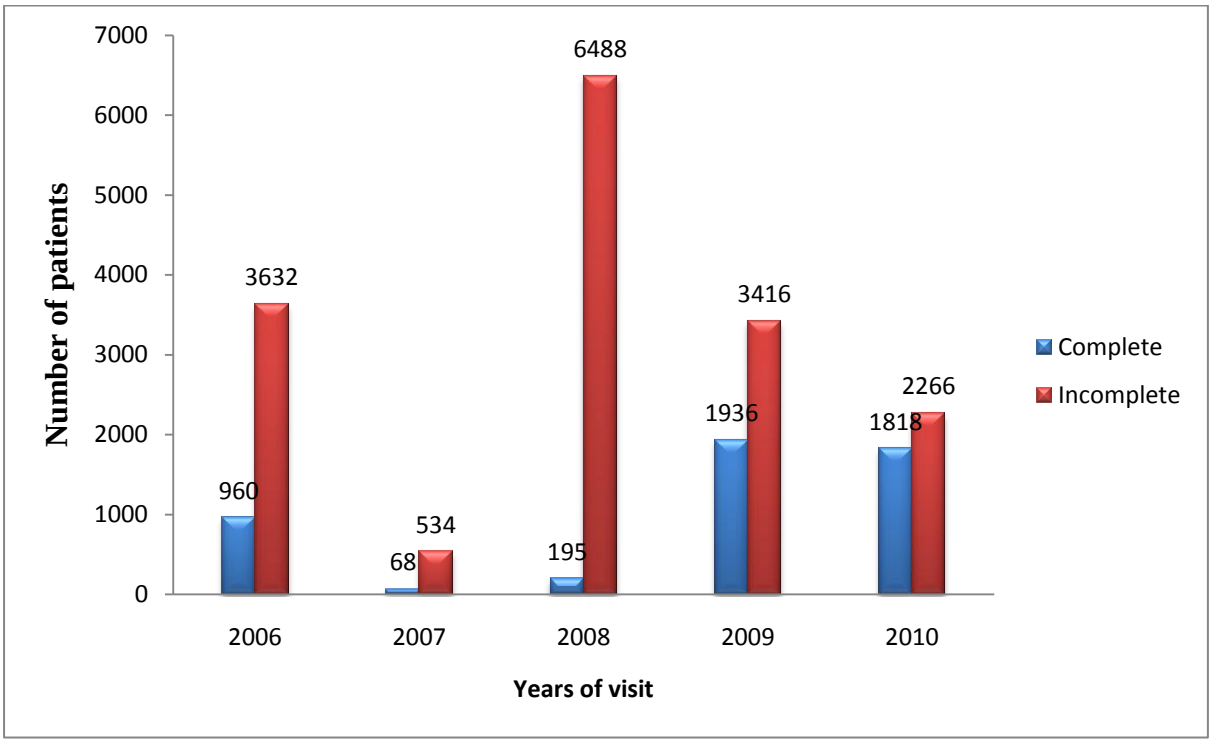

Figure 1: Number of patients visiting Parasitology department for stool examination in Tikur Anbessa University Hospital, from 2006 to 2010, Addis Ababa, Ethiopia.

The patients mean age was 31.86 (± 14.79), with a minimum of 1 year and maximum of 92 years. The majority of the patients (71.7%) were aged between 15 and 44 years of age. Female to male ratio was 1.2: 1. The sex and age distribution of the study subjects as shown in Table 1.

Table 1: Sex and Age distribution of patients examined of intestinal parasitic infections in Tikur Anbessa University Hospital from July 2006-June 2010, Ethiopia.

Sex of patient	Age of patient (years)				
	<=4	5-14	15-44	>=45	**Total**
Male	60	135	1579	466	2240
Female	52	186	1988	511	2737
Total	112	321	3567	977	4977

A total of 1718 patients were found to be positive for at least one intestinal parasite making the overall prevalence of parasitic infections 34.5% (1718/4977). From these, 26.8% (1336/4977) were positive for intestinal protozoa and 10.3% (513/4977) for intestinal helminths, as shown in Table 2. Mixed infections were found in 123 (2.5%) of the total patients included in this study. Up to 3 parasites were detected in 8 (0.2%) of the patients.

Infection with *Entamoeba* species was found to be the commonest protozoan infection. *E.histolytica/ E.dispar* trophozoite accounted for the majority of such protozoan parasitic infection, .i.e., 13.6%, while *E.histolytica/ E.dispar cyst*, *Giardia lamblia* trophozoite and *Giardia lamblia* cyst contributed to 8%, 4.5% and 0.7% of the protozoan infections respectively. *Isospora belli* was identified in 0.1% of the patients, hence the least common cause of protozoan infections.

Among helminths, *Ascaris lumbricoides* was the most prevalent etiology of parasitic infections, with a prevalence of 4.4%. *Enterobius vermicularis* was identified only in 0.1%, thus the least common cause of helminths infections, as shown in Table 2.

Table 2: Prevalence of helminths and protozoan infections in Tikur Anbessa University Hospital from July 2006-June 2010, Ethiopia.

Parasite	2006	2007	2008	2009	2010	Overall prevalence
Helminth infections						
Hookworms	22(2.3%)	1(1.5%)	1(0.5%)	21(1.1%)	31(1.7%)	76(1.5%)
A.lumbricoides	49(5.1%)	4(5.9%)	8(4.1%)	27(1.4%)	129(7.1%)	217(4.4%)
E. vermicularis	3(0.3%)	0(0%)	0(0%)	1(0.1%)	2(0.1%)	6(0.1%)
T. trichiura	16(1.7%)	0(0%)	3(1.5%)	10(0.5%)	11(0.6%)	40(0.8%)
S. mansoni	4(0.4%)	0(0%)	3(1.5%)	12(0.6%)	0(0%)	19(0.4%)
Taenia species	7(0.7%)	0(0%)	1(0.5%)	10(0.5%)	2(0.1%)	20(0.4%)
H. nana	5(0.5%)	2(2.9%)	2(1.0%)	11(0.6%)	8(0.4%)	28(0.6%)
S.stercoralis	22(2.3%)	2(2.9%)	9(4.6%)	51(2.6%)	23(1.3%)	107(2.1%)
Overall prevalence of helminths						**513(10.3%)**
Protozoan infections						
E.histolytica/ dispar cyst	81(8.4%)	0(0%)	23(11.8%)	111(5.7%)	181(10.0%)	396(8%)
E.histolytica/dispar trophozoite	106(11.0%)	3(4.4%)	32(16.4%)	239(12.3%)	299(16.4%)	679(13.6%)
G. lamblia cyst	7(0.7%)	2(2.9%)	5(2.6%)	8 (0.4%)	12(0.7%)	34 (0.7%)
G. lamblia Trophozoite	43(4.5%)	2(2.9%)	21(10.8%)	100(5.2%)	58(3.2%)	224(4.5%)
I. belli	0(0%)	0(0%)	0(0%)	3(0.2%)	0(0%)	3(0.1%)
Overall prevalence of protozoa						**1336(26.8%)**
Over all prevalence of parasitic infections						**1718(34.5%**
Total sample	960	68	195	1936	1818	4977

The overall prevalence of protozoan infections was 26.8% and it was significantly higher among females (58.2%) than males (41.8%) (*P*=0.008). The Prevalence of intestinal helminth infections was 10.3% higher in males (50.9%) than females (49.1%) (*P*=0.006), as shown in Table 3.

Table 3: Prevalence of helminths and protozoan infections stratified by gender in Tikur Anbessa University Hospital from July 2006-June 2010, Ethiopia.

Parasite	**Males**	**Females**	**Overall prevalence**	**P-value**
Hookworm	47(2.1%)	29 (1.1%)	76 (1.5%)	0.003
A. lumbricoides	98 (4.4%)	119 (4.3%)	217 (4.4%)	0.963
E. vermicularis	3 (0.1%)	3 (0.1%)	6 (0.1%)	0.806
T. trichiura	18(0.8%)	22 (0.8%)	40 (0.8%)	0.999
S. mansoni	13 (0.6%)	6 (0.2%)	19 (0.4%)	0.040
Taenia species	10 (0.4%)	10 (0.4%)	20 (0.4%)	0.653
Hymenolepis nana	13(0.6%)	15(0.5%)	28(0.6%)	0.879
Strogyloides stercoralis	62(2.8%)	45(1.6%)	107(2.1%)	0.007
E. histolytica/ E.dispar cyst	167(7.5%)	229(8.4%)	396(8%)	0.237
E. histolytica/E.dispar trophozoite	276 (12.3%)	403(14.7%)	679(13.6%)	0.014
G. lamblia cyst	18 (0.8%)	16(0.6%)	34 (0.7%)	0.351
G. lamblia trophozoite	92(4.1%)	132(4.8%)	224(4.5%)	0.226
Isospora belli	0(0%)	3(0.1%)	3(0.1%)	0.117
Total samples	2240	2737	4977	

In this study the Overall, intestinal parasitic infections were most prevalent in patients between 5-14 years of age group were 43%. Age group specific prevalence of helminths was highest among 5-14 years age group (11.5%) and lowest in the 0-4 years' olds (5.4%). Age group specific prevalence for protozoan infections was highest in the 5-14 years age group (31.5%) and lowest in the 0-4 years' age group (18.8%) as shown in Table 4.

Table 4: Prevalence (%) of helminths and protozoan infections stratified by age in Tikur Anbessa University Hospital from July 2006-June 2010, Ethiopia.

Type of infection	**Age groups (Years)**			
	0 -4	5 -14	15 – 44	45+
Helminths				
Hookworm	0 (0%)	8 (2.5%)	62 (1.7%)	6 (0.6%)
A. lumbricoides	4 (3.6%)	14 (4.4%)	161 (4.5%)	38 (3.9%)
E. vermicularis	0 (0%)	1(0.3%)	4 (0.1%)	1 (0.1%)
T. trichiura	2 (1.8%)	5 (1.6%)	28 (0.8%)	5 (0.5%)
S. mansoni	0 (0%)	4 (1.2%)	13 (0.4%)	2 (0.2%)
Taenia species	0 (0%)	2 (0.6%)	16 (0.4%)	2 (0.2%)
Hymenolepis nana	0 (0%)	0 (0%)	26 (0.7%)	2 (0.2%)
Strogyloides stercoralis	0 (0%)	3 (0.9%)	85 (2.4%)	19 (1.9%)
Age group prevalence	**6 (5.4%)**	**37 (11.5%)**	395 (11%)	75 (7.6%)
Protozoan				
E.histolytica/ dispar cyst	5 (4.5%)	28 (8.7%)	283 (7.9%)	80 (8.2%)
E.histolytica/ dispar trophozoite	11(9.8%)	52 (16.2%)	505 (14.2%)	111 (11.4%)
Giardia lamblia cyst	1 (0.9%)	6 (1.9%)	27 (0.7%)	0 (0%)
Giardia lamblia trophozoite	4 (3.6%)	14 (4.4%)	167 (4.7%)	39 (3.9%)
Isospora belli	0 (0%)	1 (0.3%)	2 (0.06%)	0 (0%)
Age group prevalence	**21 (18.8%)**	**101 (31.5%)**	984 (27.5%)	230 (23.5%)
Total samples	112	321	3567	977

5. DISCUSSION

The overall prevalence rate of intestinal parasitic infections among patients record that had complete sex, age and stool examination at Parasitology department in Tikur Anbessa University Hospital from July 2006- June 2010 was 34.5% (1718/4977).

Such a rate of parasitic infections recorded in this retrospective study could generally be attributed to the low socio economic condition, characterized by inadequate water supply, poor sanitary disposal of faeces, the tropical climate, low altitude, and lack of knowledge about parasite transmission typical of many developing countries such as those in Africa (Damen *et al.*, 2011; Obeng *et al.*, 2007).

These findings were similar to results from previous studies in Gaza Khan Younes patients attending Nasser Hospital in the period 1996-2000 the records of 17,746 stool specimens. In these groups of patients direct saline techniques were used and a total of 5,704 (32.14%) patients were found to be positive for intestinal parasitic infections (Fadel, 2002).

Another similar finding from Jenin Hospital in Palestine showed that the prevalence of intestinal parasitic infections during 10 years from 2000 to 2009 ranged from 32.0%-41.5 %; the stool specimens in this particular study were examined using direct and concentration techniques (Bdri and Adwan, 2010).

Our finding of a prevalence rate 34.5 % was higher than the finding from Saudi Arabia, where an overall parasite prevalence rate among Hospital recording patients, from 1996 to 2003, was 2.3%; the Stool examinations were carried out using direct and concentration techniques. The reason for this difference could be the difference in socioeconomic status between the kinds of patients visiting the two Hospitals and the difference in civilization between the two countries (Ibrahim, 2006), as Ethiopia is less developed than Saudi Arabia.

The prevalence rate of 34.5 % identified in our study was found to be lower than the finding of a study in Mwanza, Tanzania where intestinal parasitic infections were identified in 57.1% of the stool samples collected over a period of 3 years between 2008 and 2010 (Mazigo *et al*., 2010). One possible reason may be the shortcoming in data record keeping at the Parasitology registration book in Tikur Anbessa Hospital, where many incomplete data were found. Among the patients who had stool parasitology examination, in completeness of the

data could lead to exclusion of patient data contributing to this low figure than what would have happened if all patients positive for parasites were properly registered and counted as positives. Another possible reason may be using Simple microscopy of unconcentrated stool samples among the patients visiting Tikur Anbessa Hospital as opposed to the concentration techniques applied in Mwanza tertiary Hospital (Mazigo *et al*., 2010).

This prevalence was compared with reports from urban dwellers in South Western Ethiopia; it was found to be lower than the rates documented by Mengistu *et al.* (2007) who reported 83% intestinal parasitic infection using direct saline and formol-ether concentration methods among urban dwellers in South Western Ethiopia. Possible reasons for this inconsistency may be the fact that the main reasons patient visits at the tertiary level Tikur Anbessa Hospital are serious medical/surgical conditions instead of trivial parasitic infections, unlike the community based work of Mengistu *et al.(* 2007).

It is also possible that some of the study participants may have had undergone treatment with an anti-helminthic or anti-protozoan drug before visiting Tikur Anbessa hospital before coming as serious medical cases and/or submission of stool specimens for examination. It is also possible that the obtained parasite rates were underestimated since prior intake of deworming drugs may have had an effect.

Age specific parasite prevalence rates were analyzed. In this study the Overall, parasitic infections were most prevalent (43%) in patients aged between 5-14 years of age. This finding was found to be lower than the finding of Legesse and Erko (2004) who reported a prevalence of parasitic infections among school children around Lake Langano area of 83.8% ,samples were processed using both Kato and formol-ether concentration Methods.

Prevalence of protozoan infections was 26.8% (1336/4977) and it was significantly higher among females (58.2%) than males (41.8%) P=0.008. In a recent study in Cameroon, it was found that the higher prevalence of human intestinal protozoans in females was attributed to the fact that women usually eat unwashed fruits and vegetables or unboiled salads which may be contaminated with protozoan cysts (Mbuh *et al*., 2010).

The prevalence of *E. histolytica (13.6%)* and *G. lamblia* (4.5%) reported in the present study was similar to that reported from south east Ethiopia, 12.7% and 6.2% respectively (Legesse and Erko, 2004). Also, a recent retrospective study conducted in Tanzania reported

prevalence of *E. histolytica* and *G. lambila* of 13.5% and 6.6% respectively (Mazigo *et al*., 2010). The high prevalence of *E. histolytica* trophozoite found in this study could be explained by the fact that the existence of resistant cysts of the *Entamoeba histolytica / dispar* leading to higher trophozoite forms of the parasite (Mbuh *et al*., 2010). Also this finding may be attributed to the possible presence of unsafe drinking water, which is the major potential source of infection (Mbuh *et al*., 2010).

The Prevalence of intestinal helminths infections was 10.3% (513/4977) and it was higher in males (50.9%) than females (49.1%), *P*=0.006. Such sex predominance in infections rates is likely to be a reflection of different behaviour between the two groups (Albanico *et al*., 1997; Hotez *et al*., 2006) may be a reflection of male behavior (Albonico *et al*., 1997). One reason may be males are mainly infected when working and walking bare footed when compared to female.

Although helminths such as *Ascaris*, *Trichiuris* and Hookworm are considered to be the most Common helminths especially in developing countries (Belizario, 2001; Cross & Basaca, 1984). The prevalence of *A. Lumbricoides* was 4.4% which is similar to that of reported in Malatya state Hospital, in Turkey was 3% (Koroglu *et al*., 2007). Also similar study done in the island of St.lucia, in West Indias was 2.5% (Kurup and Hunjan, 2010).

The prevalence of hookworm infections in this study was 1.5%. The rate is similar findings of previous school-based study by Haile *et al*. (1994) which was 0.3%. The present findings on prevalence of *S. stercoralis* 2.1% was similar to the findings of previous studies in Addis Ababa reported by (Tesfa-Yohannes & Kloos, 1998) which was 2.1%.

The finding of *T. trichiura* and *E. vermicularis* were 0.4% and 0.1% respectively. Similar result in Philadelphia, the infection rates of *T. trichiura* and *E. vermicularis* were 0.19%, and 0.29% respectively. The infection rate of *E. vermicularis* found in the present study was certainly lower than the result of a study conducted by Legesse and Erko (2004) among school-children who reported prevalence of *E. vermicularis* was 2.7%.

Cestode infections such as *Hymenolepis nana* and *Taenia* species have low prevalence, accounting for 0.6% and 0.8% respectively. This value was comparable with the finding from Vientiane ranging between 0.5% and 3.7 % (Sayasone *et al*., 2011).

In this study the prevalence of *S .mansoni* was 0.4%, similar study done in St.lucia, West Indias, which was 0.3 % (Kurup and Hunjan, 2010).

6. LIMITATIONS OF THE STUDY:

- Incompleteness of the parasitology stool examination record may have led to the underestimation of the overall and individual parasite prevalence rates among patients visiting Tikur Anbessa Hospital.
- The use of wet mount techniques for stool examination in the study area may lead to the lack of detection of certain parasites that demand other techniques for their identification.

7. CONCLUSIONS

- The overall prevalence of intestinal parasitic infections among patients who attended Tikur Anbessa University Hospital from 2006 to 2010 was 34.5% (1718/4977) and found to be positive for at least one intestinal parasite. Out of 4977, 1336 were positive for intestinal protozoa and 513 for intestinal helminths. *E.histolytica* trophozoite was the most commonly reported parasite, which was seen in 13.6% of the patients.
- Age group specific prevalence of helminths and protozoan infections were highest among 5-14 years age group and lowest in the 0-4 years' olds.

8. RECOMMENDATIONS

- ✓ It is necessary to improve record keeping of Tikur Anbessa Hospital Parasitology laboratory register for use in future studies. Training should be given for staff on the importance of having complete Parasitology laboratory documentation.
- ✓ Appropriate heath education should be applied at Hospital level to patients who attend at Tikur Anbessa Hospital to abort the transmission of the parasites to other patients or healthy members of the community as well as to decrease the morbidity.
- ✓ Increasing the parasite detection rate at Tikur Anbessa Hospital Parasitology laboratory by using other techniques such as formal-ether concentration techniques in addition to simple saline preparation examination methods.
- ✓ National control programs should be developed and linked to existing programs in primary health care (e.g nutrition, water supply and sanitation, maternal and child health, control of diarrheal diseases, school health programs, family planning).

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ANNEXES

Annexe1: **Data collection form**

Serial No	Date of examination	Sex	Age	Lab result										
				Type of parasite										
				Protozoan parasites					Helmin					
									Nematodes					
				Amoeba cyst	Amoeba trophozoite	Giardia cyst	Giardia trophozoite	Isospora belli	Trichuris trichiura	Ascaris lumbricoides	*E.vermicularis*	Hookworms	*Strongyloides*

Annexe 2: **Declaration**

Title of project: Prevalence of intestinal parasitic infections among patients who attended Tikur Anbessa University Hospital, Ethiopia: A 5-Year Retrospective study.

I, the undersigned, declare that this M.Sc research project is my original work. It has not been presented for a degree in any other University. False statements could be cause for invalidating this research project and may lead to other administrative or legal action.

Principal investigator:

Name: **Alemnesh Tesema**

Address: DMIP, School of Medicine,AAU

Signature: _____ Date: _____

Advisors:

Name: **Mr. Nigus Fikrie**

Address: DMIP, School of Medicine, AAU

Signature: _____ Date: _____

Name: **Mr. Taddese Kebede**

Address: DMIP, School of Medicine, AAU

Signature: _____ Date: _____

Name of examiner:

Address: _____

Signature: _____ Date: _____