



Intestinal Parasitic Infections at Tikur Anbessa University Hospital, Ethiopia: A 5-Year Retrospective Study

Alemnesh Tssema¹, Berhanu Yitayew^{2,*}, Taddese Kebede²

¹College of Medicine and Health Sciences, School of Medicine, Debre Berhan University, Debreberhan, Ethiopia

²Department of Microbiology, Immunology, and Parasitology, Addis Ababa University, Addis Ababa, Ethiopia

Email address:

aleminat@gmail.com (A. Tessema), yitayewb2011@gmail.com (B. Yitayew), Kadk@med.aau.edu.et (T. Kebede)

*Corresponding author

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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. 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 from April to June 2012. Data was entered, cleaned and analysed using the SPSS, version 16.0. 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%).

Keywords: Intestinal Parasite, Tikur Anbessa University Hospital, Ethiopia

1. Introduction

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 [1]. World Health Organization estimates that 3.5 billion people worldwide are affected, and that 450 million are ill as a result of these infections, the majority being children [2, 3]. In developing world it affects about 450 million people, many of these are women of reproductive age and children in developing countries [4]. Ethiopia is one of the countries with high

prevalence of intestinal parasitic infections which linked to lack of sanitation, lack of access to safe water and improper hygiene; therefore they occur wherever there is poverty [5].

Numerous protozoa inhabit the gastro-intestinal tract of humans. The majority of them 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 [6]. 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 [7]. Helminthic infections make the host more susceptible to HIV infection and enhance its progression due to the chronic immune activation they cause [8].

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 [9]. In Ethiopia the prevalence and distribution of intestinal helminthes varies from place to place [10]. Although, in Ethiopia, there are many researches have been 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.

2. Materials and Methods

A retrospective study using secondary data on prevalence of intestinal parasitic infection was conducted. 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. Using data extraction sheet/form, all required informations for this retrospective study were 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.

Ethical Clearance

The study had been approved by Microbiology,

Immunology and Parasitology Department Research and Ethical Review Committee (DREC).

3. Results

A total of 21,313 patients had requested 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. The majority of patients complete record were seen in 2010 (44.5%) and in 2009 (36.2%).

The patients mean age was 31.86 (\pm 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.

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, *Giardialambli* 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 1.

Table 1. Prevalence of helminths and protozoan infections in TikurAnbessa 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%)
<i>A. lumbricoides</i>	49(5.1%)	4(5.9%)	8(4.1%)	27(1.4%)	129(7.1%)	217(4.4%)
<i>E. vermicularis</i>	3(0.3%)	0(0%)	0(0%)	1(0.1%)	2(0.1%)	6(0.1%)
<i>T. trichiura</i>	16(1.7%)	0(0%)	3(1.5%)	10(0.5%)	11(0.6%)	40(0.8%)
<i>S. mansoni</i>	4(0.4%)	0(0%)	3(1.5%)	12(0.6%)	0(0%)	19(0.4%)
<i>Taenia</i> species	7(0.7%)	0(0%)	1(0.5%)	10(0.5%)	2(0.1%)	20(0.4%)
<i>H. nana</i>	5(0.5%)	2(2.9%)	2(1.0%)	11(0.6%)	8(0.4%)	28(0.6%)
<i>S. stercoralis</i>	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						
<i>E. histolytica/ dispar</i> cyst	81(8.4%)	0(0%)	23(11.8%)	111(5.7%)	181(10.0%)	396(8%)
<i>E. histolytica/dispartrophozoite</i>	106(11.0%)	3(4.4%)	32(16.4%)	239(12.3%)	299(16.4%)	679(13.6%)
<i>G. lamblia</i> cyst	7(0.7%)	2(2.9%)	5(2.6%)	8 (0.4%)	12(0.7%)	34 (0.7%)
<i>G. lamblia</i> Trophozoite	43(4.5%)	2(2.9%)	21(10.8%)	100(5.2%)	58(3.2%)	224(4.5%)
<i>I. belli</i>	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 2. In the current 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 3.

Table 2. 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
<i>A. lumbricoides</i>	98 (4.4%)	119 (4.3%)	217 (4.4%)	0.963
<i>E. vermicularis</i>	3 (0.1%)	3(0.1%)	6 (0.1%)	0.806
<i>T. trichiura</i>	18(0.8%)	22 (0.8%)	40 (0.8%)	0.999
<i>S. mansoni</i>	13 (0.6%)	6 (0.2%)	19 (0.4%)	0.040
<i>Taenia</i> species	10 (0.4%)	10 (0.4%)	20 (0.4%)	0.653
<i>Hymenolepis nana</i>	13(0.6%)	15(0.5%)	28(0.6%)	0.879
<i>Stroglyoidesstercoralis</i>	62(2.8%)	45(1.6%)	107(2.1%)	0.007
<i>E. histolytica/ E. dispar</i> cyst	167(7.5%)	229(8.4%)	396(8%)	0.237
<i>E.histolytica/E. dispartrophozoite</i>	276 (12.3%)	403(14.7%)	679(13.6%)	0.014
<i>G. lamblia</i> cyst	18 (0.8%)	16(0.6%)	34 (0.7%)	0.351
<i>G. lambliatrophozoite</i>	92(4.1%)	132(4.8%)	224(4.5%)	0.226
<i>Isospora belli</i>	0(0%)	3(0.1%)	3(0.1%)	0.117
Total	2240	2737	4977	

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

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

4. 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). The overall prevalence of parasitic infection is found to be 34.5%. 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 [11, 12]. The

finding is similar to results from previous studies in Gaza Khan Younes patients attending Nasser Hospital in the period 1996-2000 which is 32.14% [13]. 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 [2]. However, this finding 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 [14], as Ethiopia is less developed than Saudi Arabia. On the other hand 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 [15]. 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 [15].

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 [16]. 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 the current study. 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 [17].

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 [4]. 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 [17]. Also, a recent retrospective study conducted in Tanzania reported prevalence of *E. histolytica* and *G. lamblia* of 13.5% and 6.6% respectively [15]. 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 *Entamoebahistolytica / dispar* leading to higher trophozoite forms of the parasite [4]. Also this finding may be attributed to the possible presence of unsafe drinking water, which is the major potential source of infection.

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 may be a reflection of male behavior [18]. 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 [19]. The prevalence of *A. Lumbricoides* was 4.4% which is similar to that reported in Malatya state Hospital, in Turkey was 3% [20]. Also similar study done in the island of St.lucia, in West Indias was 2.5% [21]. 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% [22] was similar to the findings of previous studies in Addis Ababa reported by Tesfa-Yohannes M & Kloos K, 1998 which was 2.1% [23].

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% [17]. 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% [24]. In this study the prevalence of *S. mansoni* was 0.4%, similar prevalence rate was reported in St.lucia, West Indias, which was 0.3% [21].

5. Conclusion

The overall prevalence of intestinal parasitic infections in this retrospective study 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.

Availability of Data and Materials Section

The dataset(s) supporting the conclusions of this article is (are) available in Addis Ababa University Libraries electronic thesis and dissertations. <http://etd.aau.edu.et/dspace/>

List of Abbreviations

AIDS: Acquired Immuno Deficiency Syndroms
HIV: Human Immuno Deficiency Virus

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