

# Infection Prevalence of Intestinal Parasitic Protozoans in Atat Hospital, Gurage Zone, Ethiopia: A Retrospective Study

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## Abstract

Intestinal parasitic protozoan infections remain as the major public health concerns in many developing countries like Ethiopia. A retrospective analysis was conducted to determine the prevalence of intestinal parasitic protozoan infection in patients admitted at Atat Hospital from September 2014 to August 2016. Stool samples collected from the patients were examined using direct wet mount and formal-Ether concentration techniques by experienced laboratory technologists of the hospital. Out of 15, 731 examined stool samples, 7062 (45%) were infected by intestinal protozoan parasites. Most of the infected individuals were infected by *Entamoeba histolytica* (60.0%) and the least was infected by *Cryptosporidium parvum* (3.6%). Higher infection was observed among males, 5-9 year age group, and during wet seasons. This study showed a yearly fluctuation of intestinal parasitic protozoan infections. Therefore, strategic, integrated and community participatory prevention and control program needs to be implemented in the study area.

**Keywords:** Atat Hospital; Amebiasis; Cryptosporidiosis; Giardiasis; Infection prevalence; Intestinal protozoan parasites; Retrospective study

## Introduction

Intestinal protozoa are single-celled eukaryotic microorganisms that reside in the gastrointestinal tract of humans and other animals [1]. Intestinal protozoan parasitic infections are neglected tropical diseases that may cause mild, acute and chronic human infections [2]. They are a global health problem that largely affects tropical and subtropical areas because of their positive association with poverty, fecal contamination of water and food, hot and humid climate, and environmental and socio-cultural factors [2-4].

The most common pathogenic protozoan parasites are *E. histolytica*, *Giardia lamblia* and *Cryptosporidium* species [1]. These parasites cause gastrointestinal disorders such as diarrhea, dysentery, vomiting, lack of appetite, haematuria, abdominal distension and in some cases mental disorders [5]. Intestinal parasitic protozoans affect people of all ages [6], but children are more prone to heavy infection because of their low development of immune system and routine play with fecally contaminated soil [7,8].

*Entamoeba histolytica* causes a disease known as amoebiasis with prevalence close to 50% in many developing countries [3]. *Giardia lamblia* is another major intestinal protozoa parasite which commonly causes a diarrheal disease called giardiasis with 20% to 30% prevalence in developing countries. World Health Organization estimated 500 million of amoebiasis and 200 million of giardiasis worldwide [9].

*Cryptosporidium* species are opportunistic intestinal protozoan parasites that cause severe diarrhea, known as cryptosporidiosis, in immunocompromised patients [10]. They were first recognized as an important cause of infection in HIV/AIDS patients [11]. These parasites include *C. parvum*, *C. hominis*, and *C. canis*. *Cryptosporidium parvum* is the most common opportunistic intestinal

parasite. Cryptosporidiosis was reported in 10%-15% of children with diarrhea and 30%-50% of HIV/AIDS patients with chronic diarrhea in the developing world [3].

In most parts of Ethiopia, people consume unprotected food and water from different sources and the possibility of infection with water born disease is extremely high with varying incidences [12-14]. However, there are still several localities where epidemiological information of intestinal parasitic infection is not available there including Gurage Zone, Cheha district. Hence, the present study was conducted to assess the prevalence of intestinal protozoan parasitic infections from documented data in Atat Hospital from September 2014 to August 2016 and to reflect on the trends of these parasites in the district for three consecutive years.

## Materials and Methods

### Study area and population

This study was conducted in Atat Hospital, Cheha district, Gurage zone, southern nation nationality of people regional states (SNNPR) of Ethiopia which is located 179 km away from Addis Ababa. The gurage zone is geographically located in the rift valley region at a latitude of 80 17' North and longitude of 370 47' East. It lies in the altitudinal ranges of 1500-2400 m a. s. l.

According to the national Central Statistical Agency 2007 report, Gurage Zone has a total population of 1,577,074, of which 763,643 (48.4%) were males and 813,431 (51.6%) were females. The area also has a total of 28,856 (1.98%) people living in rural and 121,603 (9.49%) people living in urban areas. The distinct also has two periods of rainfall patterns, the main and short rain seasons, which occur from June to September and March to April respectively. Atat Hospital is the only public general hospital in the zone. The study population was all patients that were examined for intestinal parasitic infections Atat hospital from September 2014 to August 2016.

## Data collection

Data were collected using a pre-designed data collection sheet. Data related to sex, ages and the number of patients that were examined for intestinal parasites between September 2014 and August 2016 were collected from laboratory records of the patient's registration book of Atat Hospital. This patient's health record review format was developed by principal laboratory investigator of the hospital.

## Data analysis

The patient's medical records were entered into the Excel, summarized and analyzed using descriptive statistical tools such as frequencies and percentages. SPSS version 20 software package crosstab was used for the frequency distribution of both dependent and independent variables. The organized data were presented in the form of tables, graphs, and percentages.

## Results

A total of 15731 patients were provided their stool specimens and examined for different intestinal protozoan parasitic infection in Atat hospital from September 2014 to August 2016. From the total of patients, 7062 (44.9%) were found to be positive for intestinal protozoan infections namely giardiasis, amoebiasis and cryptosporidiosis. Out of the infected individuals, 3694 (52.3%) and 3368 (47.7%) were male and female respectively. Most infections were recorded in 2014 and 2015 has least infections. Males were most infected than females in 2014 and 2016, but females were most infected in 2015 (Table 1).

Year s	No. registered patients	No. of positives		Total no. of infected individuals
		Male	Female	
2014	6143	1314 (18.6%)	1197 (16.9%)	2511 (35.6%)
2015	5132	1073 (15.2%)	1114 (15.8%)	2187 (30.9%)
2016	4456	1307 (18.5%)	1057 (15%)	2364 (33.5%)
Total	15731	3694 (52.3%)	3368 (44.9%)	7062 (44.9%)

**Table 1:** Prevalence of intestinal protozoan parasitic infections by sex in Atat hospital, Ethiopia (September 2014 to August 2016).

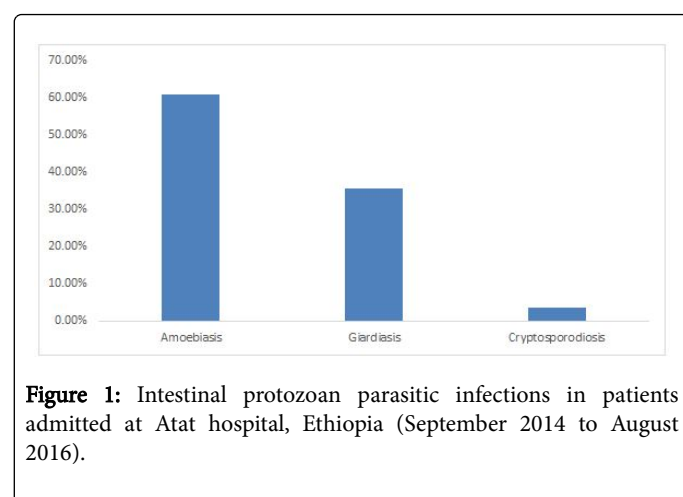
The highest prevalence of intestinal protozoan parasites infection was seen in the age groups of between 5-9 years old, and the least infected individuals were between 0-4 years old. Similar trends were observed in each of the study years (Table 2).

Diseases	Sex								Totals no. of infected individuals (%)
	Male				Female				
	2014 (%)	2015 (%)	2016 (%)	Total (%)	2014 (%)	2015 (%)	2016 (%)	Total (%)	
Ameobiasis	860 (12.2)	793 (11.2)	833 (11.8)	2486 (35.2)	681 (9.6)	524 (7.4)	612 (8.7)	1817 (25.7)	4303 (60.9)
Giardiasis	436	487	421	1344	391	407	366	1164	2508

Year s	Age in years			
	0-4	5-9	10-14	>15
2014	81 (1.1%)	1023 (14.5%)	824 (11.7%)	583 (8.3%)
2015	84 (1.2%)	897 (12.7%)	721 (10.2%)	485 (6.9%)
2016	96 (1.4%)	901 (12.8%)	794 (11.2%)	573 (8.11%)
Total	261 (3.7%)	2821 (40%)	2339 (33.1%)	1641 (23.3%)

**Table 2:** Prevalence of intestinal protozoan parasites infections by age in Atat hospital, Ethiopia (September 2014 to August 2016).

The distribution of protozoan parasitic diseases in the study area shows a higher prevalence of amoebiasis (60.00%) caused by *E. histolytica* and less infection of cryptosporidiosis (3.6%) (Figure 1).



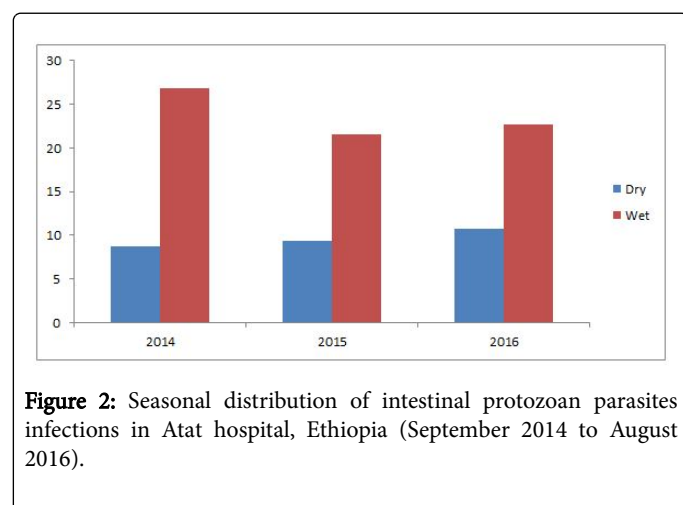
**Figure 1:** Intestinal protozoan parasitic infections in patients admitted at Atat hospital, Ethiopia (September 2014 to August 2016).

The finding of this study showed fluctuation in the prevalence of intestinal parasitic infections from year to year. Each of the parasitic infection has also shown fluctuations from year to year. Out of a total *E. histolytica* infected individuals, 2486 (35.2%) were males and 1817 (25.7%) were females. High infections were observed in 2014, while fewer infections were recorded in 2015. Out of a total *G. lamblia* infected individuals, 1344 (19.1%) were males and 1164 (16.2%) were females. High infections were observed in 2015, while the least infections were recorded in 2016. Out of total *C. parvum* infected individuals, 148 (2.1%) were males and 103 (1.5%) were females. High infections were observed in 2014, while the least infections were recorded in 2015 (Table 3).

	(6.2)	(6.9)	(6.0)	(19.1)	(5.5)	(5.8)	(5.2)	(16.2)	(35.6)
Cryptosporidiosis	59 (0.8)	28 (0.4)	61 (0.9)	148 (2.1)	33 (0.5)	43 (0.6)	27 (0.4)	103 (1.5)	251 (3.6)
Total	1355	1308	1315	3978	1105	974	1002	400	7062

**Table 3:** The prevalence of intestinal parasitic infections by sex and year in Atat hospital, Gurage Zone, Ethiopia from 2014-2016.

Most infections with intestinal protozoan parasites were observed during wet seasons from September 2014 to August 2017. Similar trends were observed in each of the study years (Figure 2).



**Figure 2:** Seasonal distribution of intestinal protozoan parasites infections in Atat hospital, Ethiopia (September 2014 to August 2016).

## Discussion

In the present study, the overall prevalence of intestinal protozoan parasitic infection was 44.9%. This shows that nearly half of the suspected individuals were infected by one or two of intestinal parasitic protozoans. Similar findings were reported from northern Ethiopia [1,15-17] and from Iran [18]. Intestinal protozoan parasitic infections are primarily caused by drinking contaminated water [19]. Hence, a higher prevalence of these diseases in the study area suggests the use of drink water from unsafe sources as well as a lack of awareness about their modes of transmission and prevention by the community. It may also associate with a poor level of personal hygiene, poor sanitation, and low economic status.

Most the people of Ethiopia live in rural areas depending on agriculture for their livelihood, and this exposes them with cyst contaminated soil leading them to frequent infections [17]. It was, however, higher than the reports of Taye and Abdulkarim [6] from Bereka Medical Center in southeast Ethiopia, Tssema et al. [19] from Tikur Anbessa University hospital in Addis Ababa, Ahsan-ul-wadod et al. [20] from Quetta hospital in Pakistan and Amer et al. [21] from King Fahd Medical City in Saudi Arabia. This difference might be due to the variation in environmental factors, hygienic practices and the level of awareness of the study populations toward the intestinal protozoan infections.

*Entamoeba histolytica* was the most prevalent parasitic protozoa in the study area. This finding is in agreement with most parasitic study reports [1,2,6,15,16,19,22]. This might be associated with the wide distribution of these parasites in throughout tropical countries. This

finding disagrees with the finding of Supram et al. [4] that recorded higher *G. lamblia* from Nepal. This variation might be due to geographic, climatic and lifestyle differences of the two study populations.

The prevalence of intestinal protozoan parasitic infection in the current study was higher in males than females. Similar findings also reported from eastern Tigray in northern Ethiopia [17] and elsewhere. On the contrary, Mahmud et al. [23] from Egypt and Mazigo et al. [22] from Tanzania have reported a higher prevalence of intestinal protozoan parasitic infection in females. This might be due to the difference in the lifestyles and environmental factors between the study areas.

At the species level, all three protozoan parasites were higher in males than females. Similar findings are reported from different parts of Ethiopia [6,16] and elsewhere [24,25]. In contrary to this, higher infection prevalence of amoebiasis [26] and giardiasis [27] was reported in females than males. This might be due to the difference in the lifestyles of these societies. However, male and female individuals had similar positive rates for cryptosporidiosis in Kwa Zulu-Natal population and cryptosporidiosis. This difference might be attributed to the genetic variability of the study populations. Similar to most studies, the prevalence of cryptosporidiosis in the study area was low prevalence [3,28]. This may suggest that immunocompromised patients made a small portion of the study population.

On the basis of ages, individuals between 5-9 years old age were more infected than other age groups in the study years. This finding is similar to the report of Dobo [1] from Hawassa city administration Millennium health center and Nyamngee et al. [29] from Guma in Nigeria. This may be associated with low personal hygiene and sanitation levels, and lower resistance of the youngsters to intestinal protozoan infection as compared to their elders. However, this is inconsistent with the study from northern Ethiopia [17], and southeast Nigeria in Awkka [30]. The possible reason for the difference is might be variation in the awareness levels toward parasitic infection, child handling, and economic status.

Intestinal protozoan parasitic infections were most common in the wet season than dry seasons. This is in agreement with the general characteristics of intestinal parasitic infections [17,31-33]. Higher intestinal protozoan parasitic infection in the wet season is associated with the increasing amount of rainfall.

Intestinal protozoan parasitic infections in the study area have shown prevalence differences from year to years. A similar finding was reported by Feleke et al. This might be due to the inconsistency of health education about personal and environmental sanitation given to the people and other interventions used to tackle intestinal parasite in the area. The prevalence of giardiasis, cryptosporidiosis, and amebiasis in the present study are higher in males and lower females in each year

of the study years. This could be associated with the lifestyles of the local community.

## Conclusion

The burden of intestinal protozoan parasites in the study area is very high. This three years retrospective study showed higher infection in males, 5-9 years age groups and a variable prevalence of intestinal protozoan parasites from year to year. Health education and practical measures on personal and environmental sanitation such as proper waste disposal are important to reduce intestinal parasitic infection in the study area. In addition, adequate and safe water supply for the community plays a paramount role to alleviate these health problems.

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