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Research Article

Trend in Prevalence of Intestinal Parasitic Infections among Students at Oda Bultum University: A 5-year Retrospective Study

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Abstract

Background: The impact of intestinal parasitic infections is not limited to morbidity and mortality, but also extends to impaired cognitive abilities and intellectual deficits in students. However, no known programmed control or prevention interventions are available for university students in sub-Saharan Africa, including Ethiopia. Therefore, this study aimed to determine trends in intestinal parasitic infections among students at Oda Bultum University. *Methods*: A retrospective study was conducted among students suspected of having intestinal parasitic infections between 2019 and 2023. The Kobo Toolbox was used to collect complete age, sex, and stool examination data from the Oda Bultum University Student Clinic Laboratory Registration Book. SPSS version 25.0 was used for the data analysis. *Results*: The overall five-year prevalence of intestinal parasitic infections among university students was 1036/1902 (54.5% [CI = 52.2-56.7%]). Of the nine different parasites reported, *E. histolytica/dispar* (24.3%) was the most common, followed by *G. lamblia* (13.9%) and, among the helminths, *A. lumbricoides* (9.8%). The prevalence trends over five years were inconsistent. In contrast, the number of seasonal parasitic infections consistently increased from spring (44.9%) to summer (67.7%). *Conclusion*: The five-year prevalence in the present study was high (54.5%), with an inconsistent trend and consistent seasonal prevalence. There is a need to develop intervention strategies, including health education and regular deworming for the university community. Regular screening of food handlers in student cafeterias is recommended.

Keywords

Intestinal Parasitic Infection, Oda Bultum University, Chiro, Ethiopia

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1. Introduction

Intestinal parasitic infections (IPIs) are neglected tropical diseases (NTDs) that have affected human quality of life since ancient times [1]. Intestinal parasitic infections can occur through skin penetration, ingestion of fecal contaminated water, food, uncooked meat and uncooked vegetables containing the infective stage of the pathogen [1-3]; Direct human-to-human or animal-to-human transmission and airborne transmission are also possible for several species [3, 4]. Infections are significantly associated with poverty, lack of or inadequate access to safe drinking water, poor sanitation, poor hygiene practices, and a lack of education [3, 5].

Intestinal parasitic infections are a global medical, social and economic problem that, affecting approximately 3.5 billion people each year and cause clinical symptoms in more than 450 million people [6-8]. Infections are disproportionately prevalent in low- and middle-income countries [9]. Some intestinal parasites have significant clinical consequences; however, they are often asymptomatic and can live in the intestine for long periods of time without causing symptoms [10, 11]. These infections can cause severe anemia; reduce the absorption of micronutrients, nausea, vomiting, anorexia, abdominal cramps, flatulence, fatigue, low-grade fever, intestinal obstruction, hematemesis, and weight loss [12]; affect psychological and social well-being [13, 14], impair mental and physical development (reduced school attendance, cognitive impairment, reduced educational attainment, and adult productivity) [15, 16]; and increase susceptibility to diarrhea during infections such as HIV and other infectious diseases [17].

The impact of IPIs is not limited to morbidity and mortality, but also extends to impaired cognitive abilities and intellectual deficits, which may contribute to the variation in cognitive performance within and between populations [18]. For this reason, the World Health Organization (WHO) recommends an integrated approach of control measures, such as adequate sanitation, hygiene education, and preventive chemotherapy (large-scale, regular distribution of anti-helminthic drugs), to achieve the 2030 global target for the elimination of soil-transmitted helminths [19, 20], while preventive deworming is beneficial for improving cognitive and educational performance [21]. However, there is a paucity of studies on university students, especially in sub-Saharan countries, including Ethiopia. Therefore, this study aimed to determine the trend in the prevalence of intestinal parasitic infections among university students at the Oda Bultum University, Chiro, Ethiopia.

2. Methods and Materials

2.1. Study Area

This study was conducted at Oda Bultum University, Chiro, Ethiopia. Chiro is the capital city of the Western Hararghe Zone, Oromia Regional State, Ethiopia; it is located 325 km from Addis Ababa, the capital city of Ethiopia. Oda Bultum University was duly established on the 26th of December 2015 as a higher education institution in Ethiopia [22].

2.2. Study Design and Period

A five-year retrospective study was conducted at Oda Bultum University, Chiro, Oromia Regional State, Ethiopia, from January 2019 to December 2023.

2.3. Study Population

All students suspected of having an intestinal parasitic infection had a stool sample examined and had complete records of age, sex, and stool examination data during the study period.

2.4. Exclusion and Inclusion Criteria

Over a five-year period, all students suspected of having IPIs were included, and all data missing sex, age, month, and year of stool examination performed, as well as data missing parasite species and stages, were excluded.

2.5. Data Collection and Data Quality Control

The data collectors were trained in the data collection tool and provided with the necessary instruments. Data were extracted using the Kobo Toolbox, and all necessary information was obtained from the Oda Bultum University Students Clinic registration/record books.

2.6. Data Analysis

After data collection, the data were rechecked, cleaned and imported into SPSS (version 25.0) statistical packages. Descriptive analysis was used to summarize the study population, and the chi-square test ($\chi 2$) was used to determine the association between IPIs and sex.

3. Results

From 2019 to 2023, 1,902 stool examinations were performed at the student clinic of the Oda Bultum University. Of those examined, approximately 1231 (64.7%) and 671 (35.3%) were male and female, respectively. The ages of the study participants ranged from 18 to 35 years, with a median age of 21 years. The highest number of stool examinations was 745 (39.2%) in 2022, whereas the lowest number of stool examinations was 183 (9.6%) in 2020 (Table 1).

Table 1. *Annual trend in the distribution of intestinal parasitic infections among students at the Oda Bultum University Student Clinic, 2019-2023.*

Intestinal parasitic infections	2019 *n* (%)	2020 *n* (%)	2021 *n* (%)	2022 *n* (%)	2023 *n* (%)	Total *n* (%)
Helminthes	37 (16.5)	36 (19.7)	52 (16.8)	122 (16.4)	32 (7.3)	279 (14.7)
A. lumbricoides	25 (11.2)	27 (14.8)	42 (13.5)	79 (10.6)	13 (2.9)	186 (9.8)
E. varmicularism	5 (2.2)	4 (2.2)	5 (1.6)	25 (3.4)	16 (3.6)	55 (2.9)
T. spp.	3 (1.3)	5 (2.7)	2 (0.6)	3 (0.4)	-	13 (0.7)
H. nana	3 (1.3)	-	1 (0.3)	11 (1.5)	2 (0.5)	17 (0.9)
T. trichuria	-	-	2 (0.6)	2 (0.3)	-	4 (0.2)
H. worm	1 (0.4)	-	-	1 (0.1)	1 (0.2)	3 (0.16)
S. mansoni	-	-	-	1 (0.1)	-	1 (0.05)
Protozoan	116 (51.8)	76 (41.5)	168 (54.2)	249 (33.4)	117 (26.6)	726 (38.2)
E. histolytica/dispar	69 (30.8)	50 (27.3)	123 (39.6)	179 (24.0)	41 (9.3)	462 (24.3)
G. lamblia	47 (21.0)	26 (14.2)	45 (14.5)	70 (9.4)	76 (17.3)	264 (13.9)
Mixed infection	-	-	17 (5.5)	13 (1.7)	1 (0.2)	31 (1.6)
A. lumbricoides with *T. trichuria*	-	-	-	1 (0.1)	-	1 (0.05)
A. lumbricoides with *E. histolytica*	-	-	12 (3.9)	11 (1.5)	-	23 (1.2)
A. lumbricoides with *G. lamblia*	-	-	1 (0.3)	-	1 (0.2)	2 (0.11)
H. worm with *E. histolytica*	-	-	1 (0.3)	-	-	1 (0.05)
H. nana with *G. lamblia*	-	-	-	1 (0.1)	-	1 (0.05)
E. histolytica with G. lamblia	-	-	3 (0.9)	-	-	3 (0.16)
Total positive	153 (68.3)	112 (61.2)	237 (76.5)	384 (51.5)	150 (34.1)	1036 (54.5)
Total stool examination	224 (11.8)	183 (9.6)	310 (16.3)	745 (39.2)	440 (23.1)	1902

The overall prevalence of intestinal parasitic infections among university students attending the student clinic at Oda Bultum University between 2019 and 2023 was 1036/1902 (54.5% [CI = 52.2-56.7%]). The prevalence was greater in males (670/1902, 35.2%) than in females (366/1902, 19.3%). This difference was not statistically significant (p = 0.507) (Table 2).

The prevalence rates of helminth, protozoan, and mixed infections were 14.7%, 38.2% and 1.6% respectively. *E. histolytica/dispar* (24.3%) was the most common protozoan parasite, followed by *G. lamblia* (13.9%). Among the helminths, *A. lumbricoides* (9.8%) was the most common helminth parasite, followed by *E. vermicularis*, Tinea species, *H. nana, T. trichuria, H. worm and S. mansoni*, with a prevalence of 2.9%, 07%, 0.9%, 0.2%, 0.16% and 0.05%, respectively. There were 31 (1.6%) patients had mixed infections. Among the mixed infections, *A. lumbricoides* with *E. histolytica/dispar* was the most common (1.2%) (Table 2).

The five-year trends in the prevalence of intestinal parasitic infections at the Oda Bultum University student clinic were inconsistent; and were 68.3%, 61.2%, 76.5%, 51.5% and 34.1% in 2019, 2020, 2021, 2022, and 2023 respectively (Figure 1). The seasonal distribution of parasitic infections in the present study was 44.9%, 47.4%, 62.3% and 67.7% in spring, winter, autumn, and summer respectively (Table 3).

Table 2. *Prevalence of intestinal parasitic infections in relation to sex among students at the Oda Bultum University Student Clinic, 2019-2023.*

Intestinal parasitic infection	Male No. (%)	Female No. (%)	Total No. (%)	X^2	P value
Helminthes	185 (15.0)	94 (14.0)	279 (14.7)	0.735	0.947
A. lumbricoides	123 (10.0)	63 (9.4)	186 (9.8)	0.106	0.744
E. varmicularism	39 (3.2)	16 (2.4)	55 (2.9)	0.950	0.330
T. spp.	8 (0.6)	5 (0.7)	13 (0.7)	0.058	0.810
H. nana	8 (0.6)	9 (1.3)	17 (0.9)	1.725	0.189
T. trichuria	3 (0.2)	1 (0.1)	4 (0.2)	-	-
H. worm	3 (0.2)	-	3 (0.16)	-	-
S. mansoni	1 (0.08)	-	1 (0.05)	-	-
Protozoan	466 (37.8)	260 (38.7)	726 (38.2)	1.39	0.500
E. histolytica/dispar	296 (24.0)	166 (24.7)	462 (24.3)	0.085	0.771
G. lamblia	170 (13.8)	94 (14.0)	264 (13.9)	0.161	0.923
Mixed infection	19 (1.5)	12 (1.8)	31 (1.6)	0.552	0.907
A. lumbricoides with *T. trichuria*	-	1 (0.1)	1 (0.05)	-	-
A. lumbricoides with *E. histolytica*	14 (1.1)	9 (1.3)	23 (1.2)	-	-
A. lumbricoides with *G. lamblia*	2 (0.16)	-	2 (0.11)	-	-
H. worm with *E. histolytica*	1 (0.08)	-	1 (0.05)	-	-
H. nana with *G. lamblia*	1 (0.08)	-	1 (0.05)	-	-
E. histolytica with G. lamblia	1 (0.08)	2 (0.3)	3 (0.16)	-	-
Total positive	670 (54.4)	366 (54.5)	1036 (54.5)	0.441	0.507
Total stool examination	1231 (64.7)	671 (35.3)	1902	-	-

Table 3. *Seasonal distribution of intestinal parasitic infections among students at the Oda Bultum University Student Clinic, 2019 -2023.*

Intestinal parasitic infections	Season				
	Spring *n* (%)	Winter *n* (%)	Autumn *n* (%)	Summer *n* (%)	Total *n* (%)
Helminthes	36 (10.2)	110 (15.9)	92 (16.1)	41 (14.4)	279 (14.7)
A. lumbricoides	19 (5.4)	79 (11.4)	58 (10.2)	30 (10.5)	186 (9.8)
E. varmicularism	10 (2.8)	19 (2.7)	19 (3.3)	7 (2.5)	55 (2.9)
T. spp.	1 (0.3)	9 (1.3)	3 (0.5)	-	13 (0.7)
H. nana	4 (1.1)	2 (0.3)	9 (1.6)	2 (0.7)	17 (0.9)
T. trichuria	-	-	2 (0.3)	2 (0.7)	4 (0.2)
H. worm	1 (0.3)	1 (0.1)	1 (0.2)	-	3 (0.16)
S. mansoni	1 (0.3)	-	-	-	1 (0.05)
Protozoan	119 (33.8)	208 (30.0)	258 (45.2)	141 (49.5)	726 (38.2)
E. histolytica/dispar	73 (20.7)	139 (20.0)	152 (26.6)	98 (34.4)	462 (24.3)
G. lamblia	46 (13.1)	69 (10.0)	106 (15.6)	43 (15.1)	264 (13.9)
Mixed infection	3 (0.9)	11 (1.5)	6 (1.0)	11 (3.9)	31 (1.6)

Intestinal parasitic infections	Season				
	Spring *n* (%)	Winter *n* (%)	Autumn *n* (%)	Summer *n* (%)	Total *n* (%)
A. lumbricoides with *T. trichuria*	-	-	1 (0.2)	-	1 (0.05)
A. lumbricoides with *E. histolytica*	3 (0.9)	9 (1.3)	3 (0.5)	8 (2.8)	23 (1.2)
A. lumbricoides with *G. lamblia*	-	1 (0.1)	-	1 (0.35)	2 (0.11)
H. worm with *E. histolytica*	-	-	-	1 (0.35)	1 (0.05)
H. nana with *G. lamblia*	-	1 (0.1)	-	-	1 (0.05)
E. histolytica with G. lamblia	-	-	2 (0.3)	1 (0.35)	3 (0.16)
Total positive	158 (44.9)	329 (47.4)	356 (62.3)	193 (67.7)	1036 (54.5)
Total stool examination	352 (18.5)	694 (36.5)	571 (30.0)	285 (15.0)	1902

Spring: September-November; Winter: December-February; Autumn: March-May; Summer: June-August

4. Discussion

Intestinal parasitic infections are a major public health concern in Ethiopia. Regular surveillance and monitoring of community prevalence trends are important tools for formulating appropriate prevention and control programes. The present study showed the five-year prevalence of IPIs at the Oda Bultum University Student Clinic in Chiro, Eastern Ethiopia.

The overall prevalence of IPIs in this study was 54.5% (CI=52.2-56.7%), which is consistent with a study in Sanja Primary Hospital, Northwest Ethiopia (52.9%) [23], and Primary Health Facilities in Northwest Ethiopia (53.3%) [24]. However, this percentage was higher than that reported in studies at the Poly Health Center, Gondar 41.3% [25], Hawassa University Students' Clinic 47.9% [26], Debre Tabor Comprehensive Specialized Hospital 27.3% [16], Mizan-Tepi University Teaching Hospital 33.3% [27], and University of Gondar, students' clinics 45.6% [28]. Differences in prevalence between studies may be due to differences in diagnostic methods and sociodemographic, socioeconomic, and geographic differences in study participants.

In the present study, nine different species of intestinal parasites were observed, and protozoan infections (38.2%) were more common than helminth infections (14.7%). Similarly, the prevalence of protozoan infections was greater than that of helminth infections in studies conducted at the University of Gondar Student's Clinic (28.5%) [28], whereas the prevalence of helminths was 17.2%, that of Hawassa University students' clinic protozoan infections was 27.6%, and that of helminths was 20.3% [26]. This higher incidence of protozoan infection agrees with the WHO report, which showed that protozoan parasitic infections are more common than helminth infections in Ethiopia [23]. The higher prevalence of protozoan parasites may be due to poor personal and environmental hygiene, since the main transmission route of protozoan parasites is feco-oral.

Of all the parasites identified, *Entamoeba histolytica*/*dispar* (24.3%) was the predominant parasite in the study area, which was higher than that reported in previous studies at the University of Gondar Students' Clinic (20.3%) [28] and Hawassa University Student Clinic (18%) [29]. These differences may be due to the low level of sanitation and susceptibility to contamination of water and vegetables in the study area.

The five-year trend of the IPIs in this study was inconsistent (Figure 1). There is a greater percentage (76.5%) of infections in 2021 and a lower percentage (34.1%) of infections in 2023. This inconsistency in trends was similar to the findings of studies conducted at the University of Gondar Student Clinic [28] and the Poly Health Center in Gondar [25]. A possible reason for the inconsistency in prevalence over the years might be the limited prevention and control strategies rather than the limited diagnoses and treatment of intestinal parasitic infections in higher education institutions in Ethiopia.

In terms of IPIs by gender, 35.2% of the participants were male and 14.3% were female; these differences were not statistically significant (p = 0.507). The prevalence among males in the present study was similar to that reported in studies conducted at Gondar University Student Clinic [30], Poly Health Center in Gondar [25], and Hawassa University Student Clinic [26]; In contrast to the present study, male sex was significantly associated with IPIs in these studies. The greater likelihood of being infected in males than in females may be due to their daily participation in outdoor activities [26, 28], in the present study, there was no statistically significant association between being male and IPIs, which is why there was no difference in the outdoor activity of males compared to females at the university.

The seasonal distribution of IPIs in the present study showed a consistent increase in infections, which were low in the spring (44.9%) and high in the summer (67.7%) (Figure 2), which was different from the findings of studies conducted in Northwest Ethiopia, where the seasonal IPIs varied [24]. In

the case of helminths, the prevalence of infection was highest in autumn (16.1%), followed by winter (15.9%), summer (14.4%), and spring (10.2%), similar to findings from Northwest Ethiopia [24]. In the case of protozoa, the IPIs were greater in summer (49.5%), followed by autumn (45.2%), spring (33.8%), and winter (30.0%), which was consistent with findings from Northwest Ethiopia [24]. The seasonal variation in IPIs could be due to variations in temperature, humidity, and light, which are known to affect the hatching and development of helminth eggs and survival of infective larvae [31].

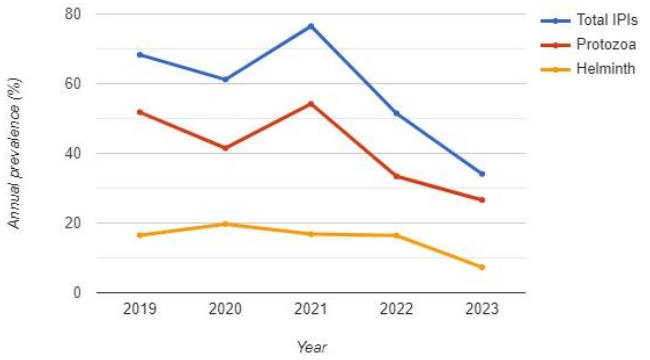

Figure 1. *Trend of intestinal parasitic infections among students at Oda Bultum university students' clinic, 2019-2023.*

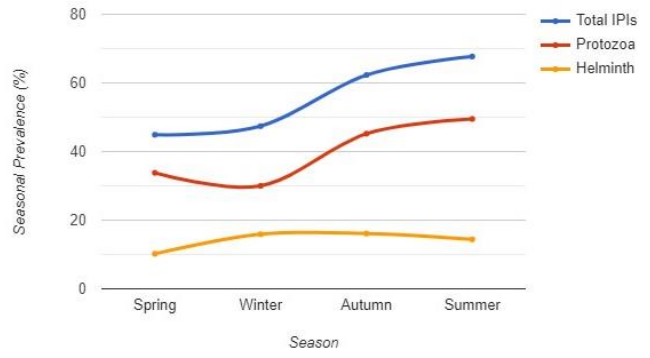

Figure 2. *Seasonal distribution of intestinal parasitic infections among students at the Oda Bultum university students' clinic, 2019-2023.*

Limitations of the Study

The most commonly used diagnostic method for intestinal parasitic infection in the study area was direct wet mount, which was unable to detect low concentrations of parasites and differentiate *E. histolytica and E. dispar* due to their morphological similarities. Due to the retrospective nature of this study, predisposing factors for IPIs were not identified.

5. Conclusion

The five-year prevalence in the present study was high (54.5%), with an inconsistent trend and consistent seasonal prevalence. There is a need to develop intervention strategies, including health education and regular deworming, for the university community. Regular screening of food handlers in student cafeterias is recommended.

Abbreviations

IPIs	Intestinal Parasitic Infections
IP	Intestinal Parasite
NTD	Neglected Tropical Diseases
WHO	World Health Organization

Ethics Approval and Consent to Participate

Ethical approval was obtained from the Oda Bultum University. Official permission was also obtained from the clinic administrators. A unique identification number is used to ensure confidentiality.

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Author Contributions

Alegntaw Abate: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Supervision, Software, Validation, Writing-original draft, Resources, Visualization, Writing-review & editing

Eyasu Bamlaku Golla: Data curation, Investigation, Methodology, Project administration, Writing-original draft, Resources, Visualization, Writing-review & editing

Habtamu Geremew: Formal analysis, Investigation, Methodology, Project administration, Validation, Resources, Visualization, Writing-review & editing

Hawi Kumbi: Investigation, Methodology, Project administration, Resources, Visualization, Writing-review & editing

Mohammed Ahmed Ali: Investigation, Methodology, Project administration, Resources, Writing-review & editing

Mulat Belay Simegn: Investigation, Methodology, Project administration, Resources, Visualization, Writing-review & editing, Writing-review & editing

Smegnew Gichew Wondie: Investigation, Methodology, Project administration, Resources, Visualization, Writing-review & editing

Samuel Abdisa: Investigation, Project administration, Resources, Visualization, Writing-review & editing

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Data Availability Statement

The datasets used in this study can be obtained from the corresponding author upon reasonable request.

Conflicts of interest

The authors declare no conflicts of interest.

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