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A Retrospective Study of Common Intestinal Parasitic Infections in Two Health Centers in Durame Town, Central Ethiopia Region, Ethiopia

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Abstract

Intestinal parasites are common due to poverty, poor personal hygiene, poor environmental sanitation, overcrowding, a lack of safe drinking water, and a lack of knowledge. As a result, evaluating the intestinal parasite morbidity pattern in low-income countries such as Ethiopia is important for designing intestinal parasite intervention programs that minimize the burden. Despite the high prevalence of the disease, there is a lack of data on the trend of intestinal parasites in current study area. As a result, the study was aimed to stick on the assessment of patterns of intestinal parasite infection for better control and intervention programs. A retrospective study was conducted for the years 2018 to 2022 at Dr. Bogalech Foundation General Hospital and Dongicho Health Center in Durame town, Central Ethiopia Region. The data were collected from the laboratory registration book/s after proper orientation and advice. The data were analyzed by SPSS version 25 as chi-square test was applied to ascertain significant association with socio-demography. During the study period, a direct saline wet mount method was used to diagnose a total of twenty five thousand six hundred sixty six (25,666) stool samples. Nine thousand one hundred twelve (9,112/35.5%) laboratory-confirmed cases were reported with a fluctuating trend ($P = 0.000$). Eight different parasites were reported in each year with *Giardia lamblia* (51.1%) being the predominant parasite followed by *Entamoeba histolytica/dispar* (23.7%) and *Ascaris lumbricoides* (12.7%). Both males (59.8%) and females (40.2%) were equally affected ($P = 0.81$). The intestinal parasite was reported in all age groups in the area but the highest and the lowest prevalence were reported in age groups of 20-29 years and 40-49 years, respectively (26.4% vs 7.9%) ($P = 0.002$).

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Introduction

Infections caused by parasites are one of the main causes of morbidity and mortality, making them a serious challenge for global public health (Aliyo and Geleto, 2022; Okosa *et al.*, 2022). Intestinal parasitic infections (IPIs) are caused by intestinal helminths and protozoan parasites. There are various levels of intestinal parasite

prevalence throughout the world, but they tend to be most common in developing nations. Many of such infections are associated with overcrowding, poor sanitation, contaminated food and water, undernutrition, and other poverty-related determinants (Chala, 2013; Ayelgn *et al.*, 2019; Workineh *et al.*, 2022). The most prevalent helminth parasites are *Ascaris lumbricoides* (*A. lumbricoides*), *Trichuris trichiura* (*T. trichiura*), and

hookworm, which affect about twenty four percent of the world's population (WHO, 2022). Protozoa parasites such as *Giardia lamblia* (*G. lamblia*) and *Entamoeba histolytica* (*E. histolytica*) are also significant causes of morbidity worldwide (Workineh *et al.*, 2022). Intestinal parasite infection has an impact on a person's overall health, particularly on their physical and mental development. Because it causes stunting, anemia, malnutrition, and cognitive impairment, it is a significant global public health problem (Workineh *et al.*, 2022).

In Ethiopia, intestinal parasitic infections are highly endemic and they are the predominant causes of outpatient morbidity due to low living standards, poor environmental sanitation, unsafe human waste disposal systems, lack of safe water supply, and low socio-economic status. The prevalence of intestinal parasitic infection varies from 15% to 82.4% in different geographical areas of the country (Kumar *et al.*, 2016; Feleke *et al.*, 2022). In Sub-Saharan Africa, Ethiopia has been found to be second-highest in ascariasis, third-highest hookworm, and fourth-highest trichuriasis infections (Deribe *et al.*, 2012; Eyayu *et al.*, 2022).

Intestinal parasite infection is an ignored tropical disease and is a major public health problem in Ethiopia. As a result, maintaining regular surveillance and observing the trend of intestinal parasite infections in a specific community is a prerequisite for planning and evaluating existing programs as well as assisting in the development of appropriate intervention strategies (Workineh *et al.*, 2022). Despite the prevalence which can be guessed from the prevailing facilitating favorable conditions, there is a dearth of information on intestinal parasitic infection trends in the current study area. Therefore, this study was aimed to assess the past five years (2018-2022) patterns of common intestinal parasitic infections in Dr. Bogalech General Hospital and Dongicho Health Center in Durame town.

Materials and Methods

Study area

Data collection was carried out in Dr. Bogalech Foundation General Hospital and Dongicho Health Center, Durame town, Kembata Tembaro zone in Central Ethiopia Region of Ethiopia from February to May, 2023. Durame is located 370 km South to Addis Ababa with 07° N' North latitude and 38° 00' East longitude. The minimum and maximum average temperature of the area is 18-24⁰ C; and the average rain fall being 1200-

1300mm. According to the 2020 Durame town report, the total population was 52,513, from which 20,138 are males' and 32,375 are females. According to the town health office, there are three kebeles with 11,460 households and there is one general hospital, two health centers and sixteen health posts (Bedore and Geinoro, 2018; Geltore and Lakew, 2022).

Study design

A retrospective study was conducted within four months (January-May/2023) to determine the trend of common intestinal parasitic infections from laboratory registration books over the past five years (2018–2022) at the two health institutions, Dr. Bogalech Foundation General Hospital and Dongicho Health Center, Durame town.

Study population and data collection

The study participants were all individuals who had been suspected of having intestinal parasitic infections and requested a stool examination during the study period. The laboratory results, such as the stage and species of the intestinal parasites, were collected from the laboratory registration book by the data collection tool designed for this purpose. The whole stool direct wet mount results reported over 10 years in the Health Centers and contained sex of patient, age of patient, year of examination, and microscopy results were incorporated and recorded.

Exclusion and inclusion criteria

All the intestinal parasites positive patients recorded during the five years study period were included. Whereas any data lacking socio-demographic characteristics and the year of stool examination performed, as well as data lacking species and stage of intestinal parasites were excluded.

Data quality control

Prior to data collection, training and advice from research advisors was consumed. Data were collected with properly organized tabular question format with the help of laboratory professionals in the health posts.

Data management and analysis

Statistical Package for Social Studies (SPSS) version 25 software was used to enter and analyze the collected data. A chi-square test was employed to compare the

proportion of intestinal parasite isolates with patients' socio-demographic information. A p-value of < 0.05 was considered statistically significant.

Ethical consideration

Prior to data collection, Arba minch University's College Education provided ethical clearance and cooperation letter to each health centers. Individual names were not included to maintain confidentiality, and only unique identification numbers were used to identify individuals.

Results and Discussion

Socio-Demographic Characteristics and Annual Prevalence of IPIs

Over a five-year period (2018-2022), 25,566 stool wet mounts were requested for the identification of intestinal parasites at Dr. Bogalech Foundation General Hospital and Dongicho Health Centre, from which 15,348 (59.8%) were from males and 10,318 (40.2%) were from females. The total of 16,756 (65.3%) (10,026 males and 6,730 females) and 8,910 (34.7%) (5,322 males and 3,588 females) were from Dr. Bogalech Foundation General Hospital and Dongicho Health Centre, respectively.

The highest (6,069; 23.6%) and lowest (4,692; 18.3%) numbers of stool samples were examined in 2018 and 2022, respectively. IPI prevalence was 35.5% (n = 9,112), with males making up 5,440 (59.8%) and females making up 3,672 (40.2%). Males were equally affected as females (Table 2).

Annual Prevalence Trend of Intestinal Parasitic Infections

The findings of this study revealed a significant ($X^2=275.18$; $P=0.000$) fluctuating trend of IPIs from 2018 to 2022. Despite variations over a five-year period, intestinal parasite occurrences happened all year long.

The highest peak of IPIs was observed in 2022 (2,029 cases; 43.2%) and the lowest peak was observed in 2020 (1,640 cases; 31.8%) (Figure 1). The mean annual case of intestinal parasites was 1,820.2 (range 1,640-2,029).

As to the prevalence of individual parasitic species in relation to the different years in the study period, *E. histolytica/dispar*, *G. lamblia*, *S. mansoni*, *S. stercularis*,

Hymenolepis nana, *Taenia species* and *Hookworm* were higher in 2022. Only *T. trichiura* was higher in 2018 (Figure 2).

Age Distribution of Intestinal Parasites

Intestinal parasites were reported in all age groups though the difference is statistically significant ($X^2=19$; $P=0.002$). The highest prevalence (26.4%) was observed in the age group 20-29 years and the least prevalence (7.9%) was recorded in the age group 40-49 years.

The highest case of each intestinal parasite species was reported at the age group of 20-29 years. *G. lamblia* is the predominant intestinal parasite recorded in each age group, followed by *E. histolytica/dispar* (Table 3).

A total of eight different genera of intestinal parasites (two intestinal protozoans and six intestinal helminths) were detected. Protozoa to helminth ratio was approximately 3:1. *Giardia lamblia* was the most common parasite among the eight intestinal parasites identified (51.1%, 4,653/9,112), followed by *Entamoeba histolytica/dispar* (23.7%, 2163/9112).

Other intestinal parasites identified were *Ascaris lambricoides*, *Hookworm*, *Hymenolepis nana*, *Taenia species*, *Strongyloides stercoralis*, and *Trichuris trichiura* with a prevalence of 12.7%, 6.7%, 2.4%, 1.7%, 1% and 1%, respectively (Table 3).

The overall prevalence of IPIs in current study was 35.5% even if the used diagnostic tool was only direct wet mount, which might compromise the sensitivity in detecting light intensity infections. This finding is equivalent with the report from Mizan-Tepi University Teaching Hospital (33.33%) (Duguma and Tekalign, 2023) but lower than earlier retrospective studies conducted in different parts of Ethiopia; Dembia district (53.3%) (Addisu *et al.*, 2020), Yabelo General Hospital (48%) (Aliyo and Geleto, 2022), Gondar Poly Health Centre (41.3%) (Ayelgn *et al.*, 2019), University Gondar student's Clinic (45.6%) (Derso *et al.*, 2021) and higher than the findings in Debre Tabor Comprehensive Specialized Hospital (27.3%) (Workineh *et al.*, 2022), Bale Robe Health Centre (6.23%) (Chala, 2013) and Mojo Health Centre (9.3%) (Chala, 2013).

This variation in prevalence might be due to differences in local endemicity of particular intestinal parasites across different countries.

Table.1 Prevalence of IPIs in the two health centers

		Health center		Infection	Not yet	Total
Dr.Bogalech	Sex	Male	Number	3,520	6,506	10,026
			% of Total	21.0%	38.8%	59.8%
		Female	Number	2,376	4,354	6,730
			% of Total	14.2%	26.0%	40.2%
	Total		Number	5,896	10,860	16,756
			% of Total	35.2%	64.8%	100.0%
Dongicho	Sex	Male	Number	1,920	3,402	5,322
			% of Total	21.5%	38.2%	59.7%
		Female	Number	1,296	2,292	3,588
			% of Total	14.5%	25.7%	40.3%
	Total		Number	3,216	5,694	8,910
			% of Total	36.1%	63.9%	100.0%
Total	Sex	Male	Number	5,440	9,908	15,348
			% of Total	21.2%	38.6%	59.8%
		Female	Number	3,672	6,646	10,318
			% of Total	14.3%	25.9%	40.2%
	Total		Number	9,112	16,554	25,666
			% of Total	35.5%	64.5%	100.0%

Table.2 Age distribution of different species of intestinal parasites

Species	Sex		Age						Total
	Male	Female	</=9	10-19	20-29	30-39	40-49	>/=50	
<i>E. histolytica</i>	1,284	879	455	364	586	366	160	232	2,163
	14.1%	9.6%	5.0%	4.0%	6.4%	4.0%	1.8%	2.5%	23.7%
<i>Hookworms</i>	355	230	106	127	135	98	48	71	585
	3.9%	2.5%	1.2%	1.4%	1.5%	1.1%	0.5%	0.8%	6.4%
<i>Ascaris</i>	691	463	250	197	285	215	96	111	1,154
	7.6%	5.1%	2.7%	2.2%	3.1%	2.4%	1.1%	1.2%	12.7%
<i>T. trichuria</i>	50	39	17	18	25	9	5	15	89
	0.5%	0.4%	0.2%	0.2%	0.3%	0.1%	0.1%	0.2%	1.0%
<i>G. lamblia</i>	2,800	1,853	903	762	1,261	823	366	538	4,653
	30.7%	20.3%	9.9%	8.4%	13.8%	9.0%	4.0%	5.9%	51.1%
<i>H. nana</i>	128	92	43	38	50	43	15	31	220
	1.4%	1.0%	0.5%	0.4%	0.5%	0.5%	0.2%	0.3%	2.4%
<i>S. stercularis</i>	41a	50b	13	10	26	14	12	16	91
	0.4%	0.5%	0.1%	0.1%	0.3%	0.2%	0.1%	0.2%	1.0%
<i>Taenia species</i>	91	66	29	27	36	31	14	20	157
	1.0%	0.7%	0.3%	0.3%	0.4%	0.3%	0.2%	0.2%	1.7%
Total	5,440	3,672	1,816	1,543	24,04	1,599	716	1,034	9,112
	59.7%	40.3%	19.9%	16.9%	26.4%	17.5%	7.9%	11.3%	100.0%

(X²= 19; P = 0.002)

Figure.1 Annual trend of IPIs

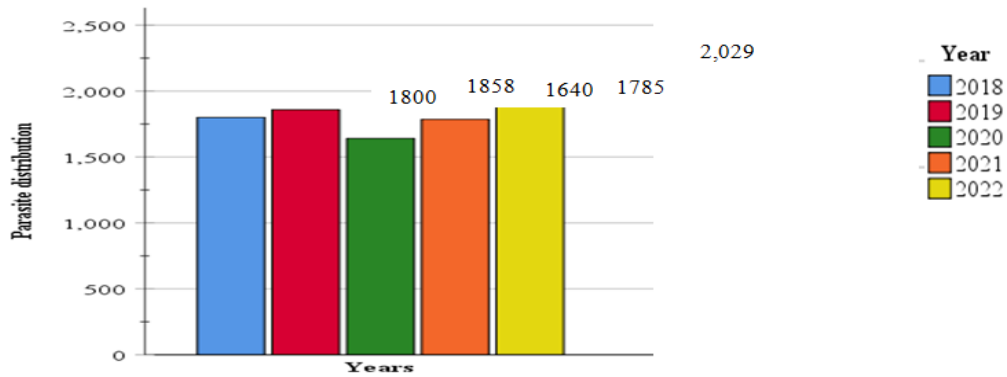
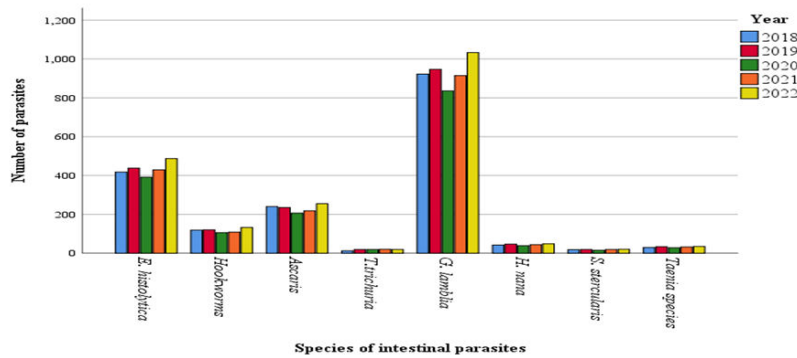


Figure.2 Annual trend of different species of intestinal parasites



In addition, possible factors like unavailability of safe drinking water, difference in socio-economic status, poor personal or environmental hygienic conditions, poor sanitary disposal of feces, lack of awareness about the transmission of parasites, and different cultural activities might lead to the high prevalence of IPIs.

The present study finding showed a significant ($P = 0.000$) fluctuating trend of intestinal parasite prevalence over a five-year period. This is supported by studies conducted at University of Gondar students’ clinic, Northwest Ethiopia (Derseo *et al.*, 2021) and Gondar Poly Health Center, Northwest Ethiopia (Ayelgn *et al.*, 2019) which reported a fluctuating trend of IPIs. However, studies conducted in Bale-Robe Health Centre, Ethiopia (Chala, 2013), and Istanbul, Turkey (Köksal *et al.*, 2010) reported a gradual increasing trend of IPIs. Studies done in Yabelo General Hospital, Southern Ethiopia (Aliyo and Geleto, 2022), Mojo Health Center, Central Ethiopia (Chala, 2013) University of Parma, Italy (Peruzzi *et al.*, 2006) and North Central Iran (Karimazar

et al., 2019) reported a decreasing trend in IPIs. Cyclic pattern of fluctuation in IPIs was also reported from a previous study conducted in Debre Tabor Comprehensive Specialized Hospital, Northwest Ethiopia (Workineh *et al.*, 2022). The possible reason for the fluctuating trend of parasite prevalence might be due to lack of safe water supply in some seasons for routine use like personal and environmental hygiene and differences in preventive measures taken by the community each year. Moreover, it might also be due to different prevention and control measures applied which might be unsatisfactory in our study area.

A total of eight different genera of intestinal parasites (two intestinal protozoans and six intestinal helminths) were detected. Of the eight intestinal parasite species identified, *G. lamblia* was the predominant parasite and *E. histolytica/dispar* was the second intestinal parasite identified. *Ascaris lambricoides*, *Hookworm*, *Hymenolepis nana*, *Taenia species*, *Strongyloides stercoralis*, and *Trichuris trichiura* ranked third, fourth,

fifth, sixth, seventh and eighth, respectively. Insufficient access to clean water supply and open field defecation practice in the society might contribute to a higher diversity and prevalence of intestinal parasites in and around the town. The studies conducted at University of Gondar student's clinic, Northwest Ethiopia (Derso *et al.*, 2021), Debre Tabor Comprehensive Specialized Hospital, Northwest Ethiopia (Workineh *et al.*, 2022), Gondar Poly Health Centre, Northwest Ethiopia (Ayelgn *et al.*, 2019), and Yabelo General Hospital, Southern Ethiopia (Aliyo and Geleto, 2022) reported that *E. histolytica/dispar* was the predominant intestinal protozoa followed by *G. lamblia* and *A. lumbricoides* was the leading intestinal helminth detected. Another study done in West Dembia district, Northwest, Ethiopia reported *A. lumbricoides* and *hookworm* as the most frequently diagnosed soil-transmitted helminths and *E. histolytica/dispar* and *G. lamblia* as the most frequently diagnosed protozoa (Addisu *et al.*, 2020). Local endemicity and difference in health-seeking behavior of society might be a reason for varied frequency of the identified intestinal parasite species.

Though the difference is statistically significant ($P < 0.05$), intestinal parasites were reported in all age groups. The highest and the lowest cases were reported in age groups of 20-29 and 40-49 years, respectively. This finding agrees with the report of Ayelgn *et al.*, (2019).

Strength and Limitations of the Study

This study manipulated a large amount of data from Dr. Bogalech Foundation General Hospital and Dongicho Health Centre, Southern Ethiopia and allowed me to evaluate a five-year trend of intestinal parasitic infections. However, a single stool sample analyzed by direct wet mount is inadequate and might underestimate the prevalence. Moreover, due to the nature of the study, we were unable to illustrate the possible risk factors that could have been predisposing to IPIs.

Conclusion and Recommendations

Intestinal Parasitic infections are considerably prevalent in the Dr. Bogalech Foundation General Hospital and Dongicho Health Centre. A fluctuating trend of prevalence was exhibited in the past five years. *G. lamblia* and *E. histolytica/dispar* were the predominant protozoan parasites. *Ascaris lumbricoides* and *Hookworm* were helminths predominantly identified followed by the protozoans. This conclusion raises concerns about developing effective infection prevention

methods by taking into account various contributing factors. Therefore, there should be a strong surveillance system in the study area to lower the burden of IPIs in the community to a level that has no longer an impact on public health. Regular health education on personal cleanliness and environmental protection, as well as awareness creation regarding intestinal parasite prevention and control methods, are all strongly advised.

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Conflict of interest

There is no any conflict of interest on it.

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Data availability

Datasets are available upon reasonable request.

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