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Parasitic Infection and Associated Factors among the Primary School Children in Motta Town, Western Amhara, Ethiopia

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Abstract **Background:** Globally, about 3.5 billion and 45 million people, particularly children are affected and ill with parasitic infection respectively. Intestinal parasitic infection constitutes one of the ten top major public health problems in resource-limited countries. **Methods:** An institutional based cross sectional study was conducted among 364 randomly selected students from the Motta primary School, November 2014. A pretested structured questionnaire was used to collect data on socio-demographic and associated risk factors. The stool specimens were examined using a direct wet mount and formal-ether concentration techniques. Epi-Info version 3.5.4 and SPSS version16 were used to enter and analyze data respectively. Descriptive statistics and regression analysis were used to describe study objectives and indentify associated factors respectively. The strength of association between the study and outcome variables was described using Odds ratio at a 95% CI. **Results:** The majority (98.3%) of the students gave sample in the study. About 245 (68.4%) of the respondents were infected with one or more species of intestinal parasites. Six types of intestinal parasites were identified and the most prevalent parasite was *Hookworm* 81(33.1%) followed by *Entamoeba histolytica* 42(17.1%), *Ascaris lumbricoides* 38 (15.5%), and *Giardia lamblia* 29 (11.8%). Double parasitic infection was found among 45(18.4%) students. Residence, health education access, family education, shoe wearing habits, hand washing practices, toilet availability and use, family income, availability of safe water, and open defecation practices were significant factors ($p < 0.05$) for intestinal parasitic infection. **Conclusion:** Intestinal parasitic infection is an important major health problem among Motta primary school students. Improving environmental/personal hygiene, availing water supply, providing health education to students and families, and availing toilet services are some of the important interventions to solve the problem.

Keywords: *prevalence of parasitic infections, associated factors, Amhara region, Ethiopia*

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1. Background

Intestinal parasitic infections are among the most common communicable diseases worldwide [1,2]. Globally, about 3.5 billion and 45 million people, particularly children are affected and ill with the parasitic infections respectively [2]. Intestinal parasitic infections are the leading causes of morbidity and mortality in resource-limited countries. Parasitic infections are also the primary causes for the Iron deficiency anaemia, growth retardation in children, physical and mental health problems [3,4,5].

Currently, the protozoan parasites (*Entamoeba histolytica* and *Giardia intestinalis*), and the soil-transmitted helminthes (*Ascaris lumbricoides*, *Trichuris trichiura* and *Hookworm*) are the leading intestinal parasites in causing morbidity and mortality worldwide [2-6]. However, the burden of parasitic infection is higher among the schoolchildren, pregnant women, and immune compromised groups [1,2,3,6].

The incidence and prevalence rates of intestinal parasitic infections vary within and across the countries due to personal, environmental, social, economic, and geographical factors [2,3,4,5]. Study findings from the Tajikistan revealed that the overall prevalence of helminthic and intestinal protozoan infections were 32.0% and 47.1% respectively. *Hymenolepsis nana* (25.8%), *Giardia intestinalis* (26.4%), and *Entamoeba histolytica/ Dispar* (25.9%) were the most prevalent parasite species among the schoolchildren [7].

Evidences from the Bangalore showed that about 69 (26.74%) of the 258 students had intestinal parasite infection. *Ascaris lumbricoides* (27.63%), *Trichuris trichiura* (18.42%), *Hymenolepsis nana* (15.8%), *Entamoeba histolytica* (14.47%), and *Giardia (*6.58%) were identified parasite species there [8]. Based on the evidences from Nigeria, a large number (49.5%) and (67.1%) of the school students were infected with one or

more parasitic infection respectively. The same studies stated that females were highly affected by the intestinal parasitic infections than males [9,10].

In Ethiopia, the major health problems are largely preventable communicable diseases, and nutritional disorders [11,12,13]. Previous findings in Ethiopia showed that there was a high prevalence rate of intestinal parasites infection among students; 83.8% in a rural area near Lake Langano [14], 85.1% in Wondo Genet/Southern Ethiopia [15], and 82.4% in Zarima town/Northwest Ethiopia [16].

Based on the evidences obtained from the Babile town/eastern Ethiopia, nine species of intestinal helminths were identified with an overall prevalence of 27.2% (113 of 415 children). The predominant parasites were *Hymenolepsis nana* 42 (10.1%) and *Hookworm* 28 (6.7%) [17]. Research findings from Jimma/Western Ethiopia [18] also showed that the overall prevalence rate of soil transmitted helminthic infection was 53.5% with the predominant parasites of *Trichuris trichiura* 98 (46.4%) followed by *Ascaris lumbricoides* 83 (39.3%), and *Hookworm* 30 (14.3%).

Evidences from the North Gondar zone indicated that about ten species of intestinal parasites with an overall prevalence of 79.8% were identified among the primary school students. *Ascaris Lumbricoides* 338 (48%), *Giardia lamblia* 295 (41.9%), *Entamoeba histolytica/ dispar* 192 (27.3%), *Schistosoma Mansoni* 112 (15.9%), *Hookworm* 81 (11.5%) were most common identified parasites there [19].

Study findings from East Gojjam Zone/Ethiopia showed the presence of a high intestinal parasitic infection; 486/541 (84.3%) among the primary school students. The most prevalent parasite was *Hookworm* 385 (71.2%) followed by *Entamoeba histolytica/dispar* 36 (6.7%), and *Strongloides stercoralis* 13 (2.4%) [20]. A high prevalence (77.9%) of intestinal parasitic infection; *Hookworm* 94 (23.6%), *Giardia lamblia* 91 (22.8%), and *Entamoeba histolytica* 86 (21.6%) was also reported from Dagi elementary school/ North Gondar, Ethiopia [21].

This study was aimed to assess the magnitude of intestinal parasitic infections and identify factors associated with the intestinal parasitic infections among the Motta primary school students in East Gojjam Zone, Western Amhara, Ethiopia.

2. Methods

2.1. Study Design and Area

An institutional based cross sectional study was conducted among the Motta Primary School Students to determine the prevalence of intestinal parasite infections and associated factors in November 2014. Motta is located in East Gojjam zone, Amhara Regional State, Ethiopia. It is about 365, 120 and 196 kilometres away from Addis Ababa: a capital city of Ethiopia, Bahir Dar: capital city of Amhara Regional State, and Debre Markose: a capital city of East Gojjam Zone respectively. Within the town, there are two high schools, one preparatory school, two Elementary schools, one technical and vocational training center (TVT), one hospital and one health center. The Motta primary school is one of the oldest school and giving teaching learning services for grade 1-8 students. Within the school, there were about 1691(801 male and 890 female) students attending their classes during the study period.

2.2. Sampling Size and Procedures

The sample size of the study was determined using a single population proportion formula based on the following assumptions; prevalence of intestinal parasite infection among school children (P=78%) reported from another study in Amhara Region, Ethiopia [21], 95% CI, (4%) marginal error and adding 10% contingency for the non-response. Therefore, the final sample size became 364. The sample size was distributed proportionally to each grade level according to the number of students in each grade. Finally, each sample student from each grade level was selected randomly using the alphabetical list of students as sampling frame.

2.3. Data Collection Tools and Quality Assurance Techniques

A structured questionnaire was prepared originally in English, translated to Amharic/local language/ and back to English to check its consistency. Data collectors used the Amharic version of the tool to collect data. Two diploma nurses, two senior laboratory technicians and one health officer were recruited for data collection, stool specimens examination and supervision respectively. A one day training on the objective of the study, data quality, data collection processes and data confidentiality was given to the data collectors and supervisor. To check the validity, the questionnaire was pretested on students from Keranio primary school, which is about 17 kilometres away from the study area and has the same settings. Necessary corrections on the tool were done based on the pre-test feedbacks. The principal investigator did strong supportive supervision to the data collectors and supervisor daily.

The principal investigator and data collectors informed the purpose of the study, data confidentiality issues, and data collection processes to the school director and students prior to the actual data collection time. After collecting data related to the socio demographic, environmental and behavioral factors, a dry, clean, and leak proof container labelled with the name, and an applicator stick were given to each student with the adequate information on the stool sample collection. The data collectors collect about 2 grams of stool specimens from each student by checking the size, and code of the sample.

2.4. Specimen Examination and Data Analysis

The investigator and school director prepared a room for microscopic examination inside the school. Laboratory technicians did a direct wet mount examination of the stool samples within the prepared room soon not to miss the trophozoites of protozoa. The rest samples were transported to the Motta hospital laboratory department to be processed using the formal-ether concentration technique. In Motta hospital, 10% formalin, distilled water, cone shaped test tubes, and centrifuge were used to process stool samples. The recruited laboratory

technicians with the help of regular hospital laboratory personnel did the formal-ether concentration technique. Slide smears were prepared from the processed stool samples and examined using 10x and 40x objectives of the Olympus microscope. The laboratory personnel recorded microscopic examination results properly.

The investigator edited the collected data manually before entering in to the computer. Epi Info version 3.5.4 and SPSS version 20 were used to edit and analysis data respectively. Descriptive statistics and Bivariate analysis were done to describe the study objectives and identify associated factors. Variables having p-value of < 0.2 in the Bivariate analysis were adjusted to the multiple logistic regression analysis to check the presence of confounding effect on the existing association. Odds Ratio with a 95% CI and p-values < 0.05 were used to describe the strength of association between the study and outcome variables.

2.5. Ethical Consideration

Ethical clearance was obtained from the Ethical Review Committee of the University of Gondar. Supporting letter was also obtained from the East Gojjam Zone health and education offices. Informed consent was taken from the school director and students after the explanation of study objectives, data confidentiality, and benefits of the study. Students were given full rights, even to withdraw from the study at any time if they get inconveniences.

3. Results

3.1. Socio Demographic Characteristics of the Study Subjects

A total of 358 students were participated in the study with a response rate of 98.3%. Among the studied students, 190 (53.1%) were female students. The mean age of students was 12 years with the minimum and maximum age of 7 and 21 years respectively. More than half (53.1%) of the students were within the age group of ≤14 years. The majority, 299 (83.5%), and 202 (56.4%) of the students were orthodox in religion and their families are farmers respectively. More than half, 198 (55.3%) of the students were from the rural areas. About 246 (68.7%) and 290 (81.0%) of the students reported as their fathers and mothers are illiterate respectively. Nearly half, 47.0% and 53.0% of them were from the first cycle (1-4) grades) and secondary cycle (5-8 grades) respectively (Table 1).

Table 1. Socio-demographic characteristics of students in Motta primary School, Amhara Region, Ethiopia, 2014

Variables		Frequency	Percent (%)
Age in year:	≤14	190	53.1
	>14	168	46.9
Sex:	Male	168	46.9
	Female	190	53.1
Religion:	Orthodox	299	83,5
	Muslim	59	16.5
Residence:	Urban	160	44.7
	Rural	198	55.3
Grade level:	1-4 /First cycle	168	47.0
	5-5/Second cycle	190	53.0
Family education level:	Father: Literate	112	31.3
	Illiterate	246	68.7
	Mother: Literate	68	19.0
	Illiterate	290	81.0
Family occupation:	Farmer	202	56.4
	Merchant	99	27.6
	Governmental employee	50	14.0
	Private employee	7	2.0
Families monthly income in birr:	≤600	165	46.0
	>600	193	54.0

Table 2. Behavioral and Environmental variables of students in Motta Primary school, Western Amhara, Ethiopia, 2014

Variables		Frequency	Percent (%)
Health education access:	Yes	101	28.2
	No	257	71.8
Availability of protected water:	Yes	60	16.7
	No	298	83.3
Participation in school health clubs:	Yes	70	19.6
	No	288	80.4
Functional toilet availability:	Yes	201	56.1
	No	157	43.9
Hand washing habits:	Yes	168	47.0
	No	190	53.0
Presence of environmental hygiene:	Yes	64	17.9
	No	294	82.1
Shoe wearing habit:	Yes	182	50.8
	No	176	49.2
Open defecation practices:	Yes	160	44.7
	No	198	53.3
Reasons for open defecation:	No toilet	50	31.3
	No water	70	43.8
	No functional toilet	30	18.7
	No toilet use habit	10	6.2
Health facility visit:	Yes	145	40.5
	No	213	59.5

Table 3. Intestinal Parasitic Infections among the Motta primary School Students, Western Amhara, Ethiopia, 2014

Variables		Frequency	Percent (%)
Having parasitic infection:	Infected	245	68.4%
	Not infected	113	31.6%
Level of infection:	Single	200	81.6
	Double	45	18.4
Hookworm infection:	Infected	81	33.1
	Not infected	164	66.9
Entamoeba Histolytica:	Infected	42	17.1
	Not infected	203	82.9
Ascaris Lumbricoides infection:	Infected	38	15.5
	Not infected	207	84.5
Giardia Lamblia infection:	Infected	29	11.8
	Not infected	216	88.2
Trichuris Trichiura infection:	Infected	6	2.5
	Not infected	239	97.5
Enterobius Vermicularis:	Infected	4	1.6
	Not infected	241	98.4
Double parasitic infection:	*Hookworm + A. Lumbricoides*	18	40.0
	Hookworm + E. histolytica	10	22.2
	A. Lumbricoides + E. histolytica	9	20.0
	Hookworm + G. Lamblia	8	17.8

Table 4. Factors associated with Intestinal parasitic infections among Motta Primary School Students, Western Amhara, Ethiopia, 2014

Variables		Parasitic infection		COR (95% CI)	AOR (95% CI)	p-value
		Infected	Not infected			
Age in years	≤14	137(38.3%)	53(14.8%)	1.44[0.90- 2.30]	1.21[0.54-1.78]	0.110
	>14	108(30.2%)	60(16.7%)	1	1	
Sex	Male	123(34.4%)	45(12.6%)	1.52[0.95-2.46]	1.30[0.61-2.11]	0.070
	Female	122(34.0%)	68(20.0%)	1	1	
Residence	Rural	122(34.0%)	38(10.6%)	1.96[1.20-3.20]	1.38[1.09-2.35]	0.004
	Urban	123(34.4%)	75(21.0%)	1	1	
Family education level	Literate	55(15.4%)	57(16.0%)	1	1	0.0001
	Illiterates	190(53.0%)	56(15.6%)	3.52[2.13-5.82]	2.8[1.56-4.65]	
Family income in Birr	≤600	126(35.2%)	39(11.0%)	2.01[1.23-3.28]	1.65[1.18-2.57]	0.0003
	>600	119(33.2%)	74(20.6%)	1	1	
Grade level	1-4	120(33.5%)	48(13.4%)	1.30[0.81-2.09]	0.82[0.56-1.67]	0.251
	5-8	125(35.0%)	65(18.1%)	1	1	
Health education access	Yes	50(14.0%)	51(14.2%)	1	1	0.0001
	No	195(54.5%)	62(17.3%)	3.21[1.92-5.36]	2.35[1.42-4.26]	
Protected water access	Available	18(5.0%)	27(7.6%)	1	1	0.001
	Not available	227(63.4%)	86(24.0%)	3.96[1.92-7.94]	3.12[1.88-7.42]	
Toilet availability	Available	119(33.2%)	82(23.0%)	1	1	0.003
	Not available	126(35.2%)	31(8.6%)	2.80[1.68-4.68]	2.31[1.31-4.17]	
School health club	Participate	34(9.5%)	36(10.0%)	1	1	0.061
	No participate	211(60.0%)	77(21.5%)	2.90[1.64-5.14]	2.28[0.86-4.68]	
Hand washing habit	Yes	83(23.2%)	85(23.7%)	1	1	0.00001
	No	162(45.3%)	28(7.8%)	5.93[3.49-10.12]	3.86[2.17-7.51]	
Environmental hygiene	Present	31(8.6%)	34(9.4%)	1	1	0.0008
	Absent	214(60.0%)	80(22.0%	2.93[1.63-5.28]	2.19[1.23-4.39]	
Shoe wearing practice	Yes	101(28.2%)	81(22.6%)	1	1	0.0001
	No	144(40.2%)	32(9.0%)	3.61[2.17-6.02]	3.20[1.85-5.32]	
Open defecation- practices	Yes	125(35.0%)	35(9.8%)	2.32[1.41-3.82]	2.15[1.26-3.27]	0.0004
	No	120(33.4%)	78(21.8%)	1	1	
Health facility visit	Yes	105(29.3%)	40(11.2%)	1.37[0.84-2.23]	1.28[0.91-2.26]	0.181
	No	140(39.1%)	73(20.4%)	1	1	

3.2. Behavioral and Environmental Related Variables of the Respondents

A large number (71.8%) of the students did not get health education from either health extension workers or other concerned bodies. The majority, 298 (83.3%) of the students reported the absence of protected /safe water. More than half (53.0%) of the students did not have a hand washing habits before meals and after the toilet. A limited number, 70 (19.6%) of the students participated in school health clubs. Only 6.1% and 17.9% of the students stated the presence of functional toilet and environmental hygiene respectively. Nearly half, 49.1% of the students did not have a shoe wearing habit for various reasons. About 44.7% of the school students practiced open defecation due to toilet absence (31.3%), water shortage (43.8%), non-functional toilet (18.7%) and no toilet use habit (6.2%) (Table 2).

3.3. Magnitude of Intestinal Parasitic Infection in the Study Area

Six species of intestinal parasites were identified with an overall prevalence of 68.4% (245 of 358 students). Of 245 infected students, 45 (18.4%) were double parasite infections. The most predominant parasite among the school students was *Hookworm* 81 (33.1%) followed by *E. Histolytica/dispar* 42 (17.1%), *A. lumbricoides* 38 (15.5%), *G. lamblia* 29 (11.8%), *T. trichiura* 6 (2.5%), and *E. vermicularis* 4 (1.6%). About 18 (40.0%), 10 (22.2%), 9 (20.0%) and 8 (17.8%) were *Hookworm + A. Lumbricoides*, *Hookworm + E. histolytica*, *A. lumbricoides + E. histolytica*, and *Hookworm + G. lamblia* double parasitic infections respectively (Table 3).

3.4. Factors Associated with the Intestinal Parasites Infection

Health education access, water availability, participation in school health clubs, functional toilet availability, hand washing habits, environmental hygiene, shoe wearing habits, open defecation practices, and health facility visit were variables used to assess the potential associated factors of high parasitic infection in addition to the socio demographic variables in the study area.

Students from the rural areas and illiterate families were 1.38 [1.09-2.35] and 2.8 [1.56-4.65] times more likely to get intestinal parasitic infection compared with students from the urban and literate families respectively. Students whose family income is ≤ 600 Ethiopian birr/ ETB were 2.01 [1.23-3.28] times more likely to acquire parasitic infections than those whose family income is > 600 ETB. Students who did not get health education, protected water and functional toilet were 2.35 [1.42-4.26], 3.12 [1.88-7.42] and 2.31 [1.31-4.17] times more affected by intestinal parasite infection than their counter parts.

Students who did not have a hand washing habit were 3.86 [2.17-7.51] times more likely to get parasitic infection compared with their counter parts. Similarly, students from no hygienic environment, practiced open defecation, and no she wearing habits were 2.19 [1.23-4.39], 2.15 [1.26-3.27] and 3.20 [1.85-5.32] times more likely to get the parasitic infection compared with their respective counter parts respectively (Table 4).

On the other hand, variables such as age, sex, grade level, participation on school health clubs, and health institution visits did not show significant association with the intestinal parasitic infection among the Motta primary school students (Table 4).

4. Discussion

The overall prevalence of intestinal parasites infection among students of Motta primary school is high, 68.4%. This is comparable with 67.1% from Nigeria [10], 62.3% in Ted health center, Northern Ethiopia [22], and 66.7% in Gorgora and Chuahit towns [23].

The current prevalence is higher compared with 47.1% in western Tajikistan [7], 26.74% in Bangalore [8], 49.5% in Anambra State [9], 27.2% in Eastern Ethiopia [17], 53.5% in Jimma town [12] and 47.1% Jimma Zone/Southwest Ethiopia [18]. The most possible reasons are presence of inadequate and unprotected water, limited health education access, high family illiteracy, poor shoe wearing practices, poor hand washing habits, open defecation practices, low family income, and poor personal and environmental hygiene. However, this prevalence is smaller than 83.8% around Lake Langano [14], 85.1% in Wondo Genet [15], 82.4% in Zarima [16], 79.8% in Delgi primary school [19], 84.3% in East Gojjam [20], 77.9% in Dagi primary school [21], 73.3% in Malaysia [24], and 81.0% in Chincha Town [25].

The most prevalent parasite in the study area was *Hookworm* (33.1%), which is higher than 4.4% in Anambra state [9], 6.4% in Nigeria [10], 6.7% in Eastern Ethiopia [17], 14.3% in Jimma zone [18], 11.5% in Delgi primary school [19], 6.6% in Teda Health center [22], 4.9% in Gorgora and chuahit health center, and 2.25% in Chencha town. The possible reasons might be the presence of poor shoe wearing habits, high open defecation practices, poor personal and environmental hygiene, family education, and income levels. Nevertheless, the current Hookworm prevalence is almost smaller by half than 60.2% in Lake Langano [14], 71.2% in East Gojjam [20] and 76.4% in Dagi primary school [21].

A. Lumbricoides infection was the top leading parasite infection in the majority of studies [8,9,10,18,19,22,23,25], but it took the third level of parasitic infection (15.5%) in the present study. This figure is comparable with 16.8% in Dagi primary school [21], but higher than 6.2% around Lake Langano [14] and 3.9% in Eastern Ethiopia [17]. The most acceptable reason may be poor hand washing habits, unprotected water, limited health education, family education and food handling habits, unavailability of toilet, and environmental hygiene in the study area. However, this A. lumbricoides prevalence is smaller figure as jugged with 27.6% from Bangalore [8], 37.2% from Anambra State [9], 30.7% from Nigeria [10], 39.9% from Jimma Zone [18], 48% from Delgi primary school [19], 23.2% from Teda Health center [22], 39.8% from Gorgora and Chuahit towns [23], and 60.5% from Chencha primary school [25].

The second top parasite infection in this study was *E. Histolytica/Dispar* (17.1%). It is in line with different studies from Ethiopia and abroad [8,14,19,25], but higher than the study findings from East Gojjam [20] and Teda Health center [22] where *E. histolytica/ Dispar* was 6.7% and 4.6% respectively. Important justification for this figure could be absence of protected water, poor hand washing practices before meals and after the toilet, open defecation, poor personal and environmental hygiene. This prevalence is lower as evaluated with 25.9% in Tajikistan [7] and 27.3% in Delgi primary school [19].

The prevalence of Giardia lamblia in this study was 11.8%, which is in line with 12.4% from Teda Health center [22] and (11.8%) from Chencha [25], but higher number compared with 6.6% from Bangalore [8], 6.2% around Lake Langano [14] and 6.6% from Jimma Zone [18]. It is however lower as observed from different studies: 26.4% in Tajikistan [7], 41.9% in Delgi primary school [19] and 22.8 in Dagi primary school [21]. The least prevalent intestinal parasites in this study were T. Trichiura (2.5%) and E. Vermicularis (1.6%). This figure is opposite with the study findings from Bangalore [8] and Jimma [18] where T. Trichiura prevalence were leading (18.4% and 46.8%) respectively. The most possible reason may be geographic variation.

Students from the rural areas were 1.96 [1.20-3.20] times more likely to get intestinal parasitic infections compared with students from urban. It is different from other evidence in Ethiopia [19] where residence showed no significant association with intestinal parasitic infection. The possible reasons may be the presence of relatively poor personal and environmental hygiene, poor hand washing habits, unavailability and poor toilet use, open defecation practices, and unprotected water sources in the rural areas than urban.

Students from Illiterate families and those who did not get health education were 3.52 [2.13-5.82] and 3.21 [1.92-5.36] times more likely to contract intestinal parasite infection than their counter parts respectively. It is

supported by different study findings [9,10,19,21,22,25] where students handled with literate mothers were less affected with parasitic infections. It is true that health education can change individual's knowledge, and literate mothers will have better knowledge on proper family and food handling, environmental and personal hygiene, toilet use, hand washing practices, risk of bear foot walking and they will also be eligible to educate their families compared with illiterate mothers.

In this study, family income was found to be important factor to prevent intestinal parasitic infections. Students from families with income of ≤ 600 ETB were 2.01 [1.23-3.28] times more likely to contract parasitic infection than whose income is > 600 ETB. The reason could be if families have enough money, they will construct toilet, buy shoes for the students, access protected water and health information resources.

Students who did not have protected water, hand washing habits, functional toilet and shoe wearing practices were 3.96 [1.92-7.94], 5.93 [3.49-10.12], 2.80 [1.68-4.68], and 3.61 [2.17-6.02] times more affected by the intestinal parasite infection than their counter parts respectively. It is supported by different study findings [7,8,9,11-21]. The best explanation for this could be that the major transmission routes for intestinal parasitic infections are personal, environmental, food, and water related issues and these are major problems in Motta town.

5. Conclusion

Intestinal parasitic infections were the primary health problems in the study area. The majority of studied students were affected by the helminthic and protozoan infections. Residence, family education, family income, health education, availability of protected water, presence of functional toilet, hand washing practices before meal and after the toilet, shoe wearing habit, and open defecation practices are determinants for the presence of high intestinal parasitic infection. Improving health education, protected water supply, toilet services, environmental and personal hygiene, shoe wearing and hand washing habits is very important to solve the problem in the study area.

Competing Interests

The author declared, as he has not any competing interest.

Authors' Contributions

The author, Mulusew Andualem, designed the study, analyzed the results, and wrote the manuscript with the consultation of senior advisors and researchers.

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