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Intestinal Schistosomiasis: Prevalence, Infection Intensity (Burden) and Associated Risk Factors, A School-Based Study

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ABSTRACT

Background: Schistosomiasis, a disease caused by parasitic flatworms, is commonly attributed to two common species, S. haematobium and *S. mansoni* in Ethiopia. Profoundly, it is a significant medical and veterinary concern.

Objective: The primary objective of the study was to determine the burden of the disease and associated risk factors of intestinal schistosomiasis in and around Delo-Mena district from March to June 2022.

Methodology: The study included students aged 5-14 years with a mean age of 9.25 years. A school-based quantitative cross-sectional study was conducted in two selected primary schools after completing interviews using a prepared questionnaire. Stool samples were collected from each individual and processed in the field and facility using single Kato-Katz and Ritchie's concentration techniques to detect the presence of *S. mansoni* eggs and assess infection burden or intensity.

Result: A total of 250 school children were included in the study, with 37.6% female and 62.4% male participants. The overall prevalence of *S. mansoni* infection was 39.2% (moderate). Among the compared determinant risk factors and sociodemographic characteristics, sex (male to female), residence (urban to rural), sources of water (tap to river water), and swimming habits (swimmer to non-swimmer) showed a strong statistical association, with odds of 3.11 (1.75, 5.51), 0.26 (0.15, 0.45), 0.37 (0.21, 0.63), and 16.92 (8.11, 35.29), respectively, $p < 0.000$. The intensity of *S. mansoni* infection was higher in male students (11.2%) compared to females, $p < 0.000$. Similarly, students who engaged in swimming were more exposed to heavier infections than non-swimmers, with 13.6% and 1.2% respectively, and an OR of 16.92 (8.11, 35.29), $p < 0.000$. Furthermore, frequent swimming was strongly associated with heavier *S. mansoni* infection, with 11.2% and 1.2% for students who swam always and sometimes, respectively.

Conclusion: The study concluded with a recommendation for integrated control strategies due to the moderate level of infection burden observed according to WHO cut-off values for preventive chemotherapy in human helminthiasis.

Keywords: Intestinal Schistosomiasis Prevalence; Infection Intensity; Delo-Mena District

Introduction

Schistosomiasis, caused by parasitic flatworms, is a disease of significant medical and veterinary importance, affecting over 240 million people, with over 90% of these in sub-Saharan Africa (SSA) countries (Gower, et al. [1]). It is endemic in Ethiopia, where more than 37.3 million people are living in endemic areas and about 5 million people are infected (Gebreyesus, et al. [2,3]), consequently considered as one of the major causes of outpatient morbidity in the country (Jember, et al. [4,5]). The disease schistosomiasis is commonly caused by two major species, namely, Shaematobium and Smansoni in Ethiopia, the latter being the most prevalent and widely distributed species. The burden and prevalence of intestinal schistosomiasis are significantly varied from area to area depending on the suitability of snail intermediate hosts and the level of environmental sanitation. Some conducted parasitological studies in the country showed that the prevalence of

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Smansoni is ranged from 10% to 92% (Aemero, et al. [6-10]). Recently in Ethiopia, S mansoni infection is reported in almost all administrative regions and is rapidly spreading in connection with water resource development and intensive population movements (Hussen, et al. [11]).

People become infected with S mansoni when the larval forms or stages of the parasite released from the intermediate host freshwater snails penetrate the skin through contact with infested water (Nelwan, [12]). Transmission or life cycle of the disease occurs when people suffering from schistosomiasis contaminate freshwater sources with their excreta containing parasite eggs, then hatch in the water to infect intermediate host fresh water snails (Organization, [13,14]). In the human body, the larvae or infective cercaria develop into adult schistosomes. Adult worms live in the blood vessels where the females release eggs, and some amounts of eggs are passed out of the body in the faeces or urine to continue the parasite's life cycle. Others become trapped in body tissues, causing immune reactions and progressive damage to organs (Toor, et al. [14]). Individuals who have been exposed to fresh or salt water may develop a pruritic rash due to cercarial dermatitis (also called swimmer's itch) (Barsoum, et al. [15,16]). Patients with acute schistosomiasis (Katayama fever) present usually 4-8 weeks after contact with infested water. It occurs 2-8 weeks after exposure to S japonicum or S mansoni. Symptoms of schistosomiasis are caused not by the worms themselves but by the body's reaction to the eggs. Eggs shed by adult worms that do not pass out of the body can become lodged in the intestine or bladder, causing inflammation or scarring. Children who are repeatedly infected can develop anemia, malnutrition, and learning difficulties. After years of infection, the parasite can also damage the liver, intestine, spleen, lungs, and bladder. Without treatment, schistosomiasis can persist for years. Signs and symptoms of chronic schistosomiasis include: abdominal pain, enlarged liver, blood in the stool or blood in the urine, and problems passing urine. Chronic infection can also lead to an increased risk of liver fibrosis or bladder cancer (King [17]). The main objective of the study was to determine the burden of the disease and its associated risk factors. Specifically, the study aimed to determine the prevalence, measure the infection intensity (burden) based on EPG count, and assess other common related risk factors.

Methods

Study Area and Period

Delo-Mena district is located in the Bale Zone of South Eastern Ethiopia, approximately 600 kilometers far from the capital city, Addis Ababa. The altitude of the area is less than 1,500 meters above sea level. The region is renowned for its cultivation of cereals, chickpeas, and haricot beans as key crops, with coffee being the primary cash crop grown in the area (Birrie, et al. [18]). Yadot (urban) and Birbire (rural) primary schools are found in the center and periphery of Delo-Mena town where almost all students are urban and rural residents, respectively (Tulu, et al. [19]). The study was conducted from March to June, 2022 (Figure 1).

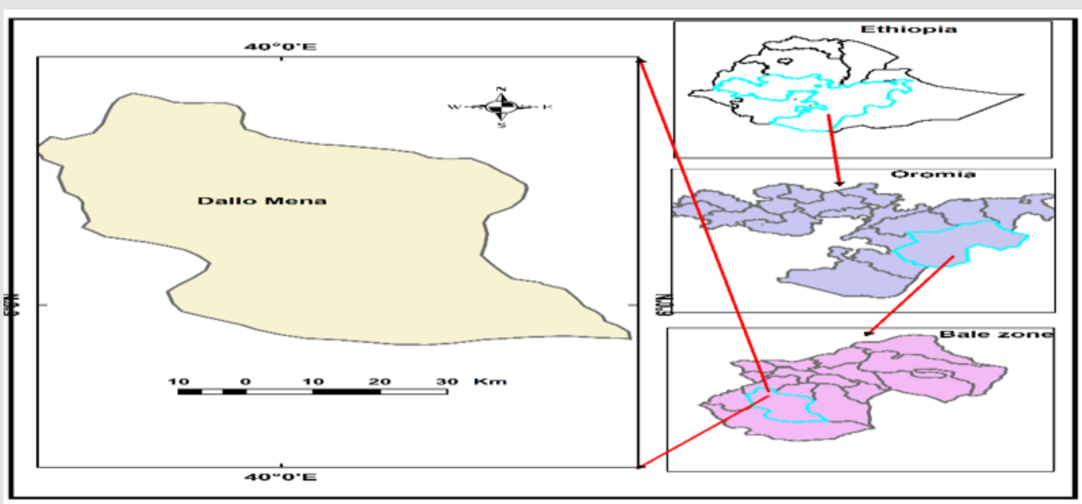

Figure 1: Map of the study area.

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Study Design

A school-based quantitative cross-sectional study was conducted in two selected primary schools in Delo-Mena district, Bale Zone. The schools were chosen based on their proximity to the main river stream called Yadot. Stool samples were collected, labeled, and processed from all students using both the Kato-Katz and Ritchie's concentration techniques. Additionally, a socio-demographic questionnaire administered by trained experts was used to assess potential risk factors associated with the study.

Population:

Source of Population: All school students who were attending in both Yadot (urban) and Birbire (rural) schools were used as a source population.

Study Population: Both Yadot (urban) and Birbire (rural) primary/elementary school students who were attending classes were used as the study population.

Inclusion and Exclusion Criteria

Inclusion Criteria: Both Yadot (urban) and Birbire (rural) primary/elementary school students who were attending classes from grades 1-8th and age between 5 to 14 years were included during the study.

Exclusion Criteria: All students who were older than 15 years of age and who were not willing to participate in the study are intentionally excluded from the study to control the sampling distribution and bias.

Sample Size and Sampling Technique Determination: Two schools, one from Yadot (urban) and one from Birbire (rural) sub-areas were purposively selected to ensure a representative sample. Stratification was employed due to the homogeneity of the district sub-areas in terms of urban and rural area, allowing for representation of other similar subareas. The sample size was determined using a single population proportion formula with a 5% margin of error, 95% confidence level, and based on a previous study showing a schistosomiasis prevalence of 12.6% (Tulu, et al. [19]). Therefore, the minimum sample size required for the study was

$$n_0 = \frac{Z^2 pq}{e^2}$$

The sample size (n) required for the study will be determined using a single population proportion formula =1.962*0.126*0.814/0.0025=170, since the population size was less than 10,000 and expected to be 1,500, therefore, the corrected sample size will be determined by =169.14/ (1+(169.14-1)/1500) =242=168. Finally, the calculated sample size was 170. However, the target population (N) is less than 10,000 (1500), so a correction formula was used. Therefore, the final required sample size is determined as 250.

Data Collection Procedure:

Questionnaire Method: After obtaining informed consent from the research participants, data were collected using a pretested and structured questionnaire administered by trained health workers. The questions were close-ended and read aloud to each participant or child, and their responses were recorded as it presented. The questionnaire included questions on sociodemographic factors, environmental and behavioral factors, and other associated risk factors.

Stool Sample Collection and Laboratory Procedure: After completing the interview and questionnaire, all participant children were asked to provide approximately 2 grams of their stool samples in labeled sterile plastic containers. The collected stool samples were processed using the single Kato-Katz and Ritchie's concentration techniques. The Kato-Katz stool smear method involved taking 41.7 mg of stool samples (Organization, [20]). All eggs of Smansoni are counted from the template and converted to eggs per gram of feces (EPG) by multiplying with 24. The infection intensities are potentially classified as light, moderate, and heavy based on EPG of 1-99, 100–399, and >400, respectively, according to WHO cut-off values (Lim, et al. [21]). The remaining stool sample was processed using Ritchie's concentration technique. About 0.5 grams of stool sample was placed in a concentration tube that contained 2.5 ml of formalin. The mixture was shaken very well to make it a uniform suspension followed by the addition of 1mL ether. Then, the test tubes were properly mixed and centrifuged at 1500 rpm for three minutes. After discarding the supernatant, the sediments were examined microscopically for the presence of ova and larvae (Anécimo, et al. [22]).

Data Analysis Procedure: The collected data including the questioner are entered into a Microsoft Excel work book. Data analysis was done by using IBM SPSS version 26 to assess the prevalence of *S. mansoni* infection and infection intensity. S mansoni infection intensity can be calculated as the geometric mean of eggs per gram of stool and arithmetic mean. A one-way analysis of variance (ANOVA) will be used to compare geometric mean parasite counts where two or more than two groups are compared, respectively. A binary logistic regression analysis, risk estimates of odds ratio, and Pearson Chi-Square was conducted to estimate an overall statistical association among associated or determinant risk factors. The magnitude of the association was expressed as an odds ratio with a 95% confidence interval and a p-value less than 0.05 was considered as statistically significant.

Operational Terms:

Infection Intensity: The infection intensity is potentially classified as light, moderate, and heavy based on EPG of 1-99, 100–399, and >400, respectively, according to WHO cut-off values (Lim, et al. [21]).

Stage of Childhood: Based on some specific published articles, childhood can be categorized into three stages. In childhood, there is the highest general physical activity from 1to 13years of age. We can

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conventionally split it into three stages: nursery (1-3years), kindergarten(3-7years), and elementary school (7-13years) (Dyussenbayev [23]).

Ethical and Consent of the Participant: Informed consent was obtained from both study participants including the questionnaire and sample contributors. Finally, A code number was used to ensure the confidentiality of the participants' information and the result was given to the researchers.

Results

Sociodemography

A total of 250 school children from Yadot and Birbire elementary schools participated in the study, with 94 (37.6%) females and 156 (62.4%) males aged between 5-14 years, with a mean age of 9.25 years. The participants included 120 (48%) students from grades 1-4 and 130 (52%) from grades 5-8, with the majority (65.6%) aged between 8-14 years. Among the participants, 79 (31.6%) students used a river water for drinking and cooking (Table 1).

Table 1: Study population or socio-demographic characteristics of the study.

Socio demographic characteristics	Frequency (%)
Gender	250
Male	156(62.4)
Female	94 (37.6)
School name	250
Yadot	128 (51.2)
Birbire	122(48.8)
Age group	250
5-7 years old	86 (34.4)
8-14 years old	164 (65.6)
Residence	250
Urban	120 (48)
Rural	130 (52)
Grade	250
1-4th	120 (48)
5-8th	130 (52)
Source of water	250
Tap	171 (68.4)
River	79 (31.6)

Prevalence of Intestinal Schistosomiasis

The overall prevalence of *S. mansoni* infection in the study area was 39.2% (n=98). Among the risk factors considered, a higher prevalence of *S. mansoni* infection was observed in males (48.7%), rural residents (28%), non-latrine users (31.2%), and school children who swim (35.2%). A binary logistic regression analysis and risk estimate of odds ratio were conducted to assess the statistical association among the risk factors. Strong statistically significant associations ($p<0.001$) were found for sex (male to female) (OR=3.11, 95% CI: 1.75-5.50), residence (urban to rural) (OR=0.26, 95% CI: 0.15-0.45), source of water (tap to river) (OR=0.36, 95% CI: 0.21-0.63), latrine usage (latrine to non-latrine) (OR=0.37, 95% CI: 0.21-0.67), defecation site (far from river site to around) (OR=2.42, 95% CI: 1.43-4.07), swimming habit (swimmers to non-swimmers) (OR=16.92, 95% CI: 8.11-35.29), and swimming frequency. Despite the strong association between swimming habit and *S. mansoni* infection (OR=16.92, 95% CI: 8.11-35.29), a higher prevalence rate was observed among school children who swim frequently (35.2%) (Table 2).

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Table 2: Prevalence of S. mansoni among socio-demographic characteristics and determinant associated risk factors.

Determinant risk factor/ sociodemographic characteristics	Observation	Positive (%)	OR (CI)
Sex	**250**	**98(39.2%)**	
Female	94	22(23.4%)	1
Male	156	76(48.7%)	3.109(1.756,5.506)**
School name	**250**	**98(39.2%)**	
Yadot	128	40(31.2%)	1
Birbire	122	58(47.5%)	1.994(1.190,3.339)**
Age group	**250**	**98(39.2%)**	
5-7 years old	86	24(27.9%)	1
8-14 years old	164	74(45.1%)	2.124(1.210,3.729)**
Residence	**250**	**98(39.2%)**	
Rural	130	70(28%)	1
Urban	120	28(11.2%)	0.261(0.151,0.450)**
Grade	**250**	**98(39.2%)**	
1-4th	120	34(14.8%)	1
5-8th	130	61(24.4%)	1.983(1.181,3.330)**
Source of water	**250**	**98(39.2%)**	
River	79	44(17.6%)	1
Tap	171	54(21.6%)	0.367(0.212,0.635)**
Latrine usage	**250**	**98(39.2%)**	
No	168	78(31.2%)	1
Yes	82	20(8%)	0.372(0.207,0.670)**
Defecation site	**250**	**98(39.2%)**	
Around river	140	42(16.8%)	1
Far from river	110	56(22.4%)	2.420(1.439,4.070)**
Swimming habit	**250**	**98(39.2%)**	
No	110	10(4.0%)	1
Yes	140	88(35.2%)	16.923(8.115,35.289) **
Swimming river	**250**	**98(39.2%)**	
Birbire	122	58(23.2%)	1
Yadot	128	40(16.0%)	0.052(0.299,0.840)**
Swimming frequency	**250**	**98(39.2%)**	
No	110	10(4.0%)	
Sometimes	52	21(8.4%)	
Always	88	67(26.8%)	

Note: **Strong statistical significance.

Infection Intensity of *S. mansoni*

From a total of n=250 students, n=41 (41.56 ± 3.56), n=23 (234.78 ± 16.04), and n=34 (955.35 ± 518.39) had light, moderate and heavy (Mean ± SE) infections, respectively. The intensity of *Smansoni* infection was found to be heavier in male students n=28 (11.2%) when compared with female n=6 (2.4%), p<0.000. Similarly, students engaged in swimming are more exposed to heavier *Smansoni* infection than non-swimmers, n=31 (13.6%) and n=3 (1.2%), respectively, with OR= 16.92(8.11, 35.29), p<0.000, see Table 2. Despite the student swimming habits, frequent swimming is also strongly related with heavier infection with n= 28(11.2%) and n=3(1.2%),

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respectively, when students swim always and sometimes p<0.000. The residence of students also had a significant statistical association with intensity of infection, *Smansoni* was observed among rural n= 31(12.4%) community students than urban n= 3(1.2%), with OR= 0.261(0.151,0.450) see Table 2, p<0.000. Moreover, the infection intensity of *Smansoni* was analyzed for all considered determinant risk factors and sociodemographic characteristics of the studied students and their statistical association was found to be significant. Definitely, the intensity of the resulting infection was associated with sex, age group, residence grade, source of drinking water, swimming habit, river, and swimming frequency (Tables 3 & 4) (Figures 2 & 3).

Table 3: Infection intensity of S mansoni.

Infection intensity	Count	Mean ± SE	95% CI	Significance
Negative (0)	152	0	0	-
Light infection (1-99 EPG)	41	41.56 ± 3.56	34.37, 48.75	0
Moderate infection (100-399 EPG)	23	234.78 ± 16.04	201.53, 268.04	0
Heavy infection (>400 EPG)	34	955.35 ± 518.39	774.48, 1136.23	0
Total	250	158.34 ± 23.75	111.56, 205.13	0.6

Table 4: Infection intensity of S mansoni and its determinant factors in and around Delo-Mena district

Determinant risk factor/ sociodemographic characteristics	Observation, (%)	Non infected, (%)	Light infection, (%)	Moderate infection, (%)	Heavy infection, (%)	Association, p value
Sex	**250 (100)**	**152(60.8)**	**41(16.4)**	**23(9.2)**	**34(13.6)**	**0**
Female	94 (37.6)	72(28.8)	7 (2.8)	9 (3.6)	6 (2.4)	
Male	156 (62.4)	80 (32.0)	34 (13.6)	14 (5.6)	28 (11.2)	
School name	**250 (100)**	**152(60.8)**	**41(16.4)**	**23(9.2)**	**34(13.6)**	**0.016**
Yadot	128 (51.2)	88(35.2)	13(5.2)	9(3.6)	18(7.2)	
Birbire	122(48.8)	64(25.6)	28(11.2)	14(5.6)	16(6.4)	
Age group	**250(100)**	**152(60.8)**	**41(16.4)**	**23(9.2)**	**34(13.6)**	**0.004**
5-7 years old	86	62(24.8)	12(4.8)	9(3.6)	3(1.2)	
8-14 years old	164	90(36.0)	29(11.6)	14(5.6)	31(12.4)	
Residence	**250(100)**	**152(60.8)**	**41(16.4)**	**23(9.2)**	**34(13.6)**	**0**
Rural	130	60(24.0)	23(9.2)	16(6.4)	31(12.4)	
Urban	120	92(36.8)	18(7.2)	7(2.8)	3(1.2)	
Grade	**250(100)**	**152(60.8)**	**41(16.4)**	**23(9.2)**	**34(13.6)**	**0.004**
1-4th	120	83(33.2)	20(8.0)	10(4.0)	7(2.8)	
5-8th	130	69(27.6)	21(8.4)	13(5.2)	27(10.8)	
Source of water	**250(100)**	**152(60.8)**	**41(16.4)**	**23(9.2)**	**34(13.6)**	**0.001**
River	79	35(14.0)	20(8.0)	12(4.8)	12(4.8)	
Tap	171	117(46.8)	21(8.4)	11(4.4)	22(8.8)	
Latrine usage	**250(100)**	**152(60.8)**	**41(16.4)**	**23(9.2)**	**34(13.6)**	**0.003**
No	168	90(36.0)	36(14.4)	18(7.2)	24(9.6)	
Yes	82	62(24.8)	5(2.0)	5(2.0)	10(4.0)	
Defecation site	**250(100)**	**152(60.8)**	**41(16.4)**	**23(9.2)**	**34(13.6)**	**0.008**
Around river	140	98(39.2)	17(6.8)	9(3.6)	16(6.4)	
Far from river	110	54(21.6)	24(9.6)	14(5.6)	18(7.2)	

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Swimming habit	**250(100)**	**152(60.8)**	**41(16.4)**	**23(9.2)**	**34(13.6)**	**0**
No	110	100(40.0)	5(2.0)	2(0.8)	3(1.2)	
Yes	140	52(20.8)	36(14.4)	21(8.4)	31(12.4)	
Swimming river	**250(100)**	**152(60.8)**	**41(16.4)**	**23(9.2)**	**34(13.6)**	**0.016**
Birbire	122	64(25.6)	28(11.2)	14(5.6)	16(6.4)	
Yadot	128	88(35.2)	13(5.2)	9(3.6)	18(7.2)	
Swimming frequency	**250(100)**	**152(60.8)**	**41(16.4)**	**23(9.2)**	**34(13.6)**	**0**
No	110	100(40.0)	5(2.0)	2(0.8)	3(1.2)	
Sometimes	52	31(12.4)	13(5.2)	5(2.0)	3(1.2)	
Always	88	21(8.4)	23(9.2)	16(6.4)	28(11.2)	

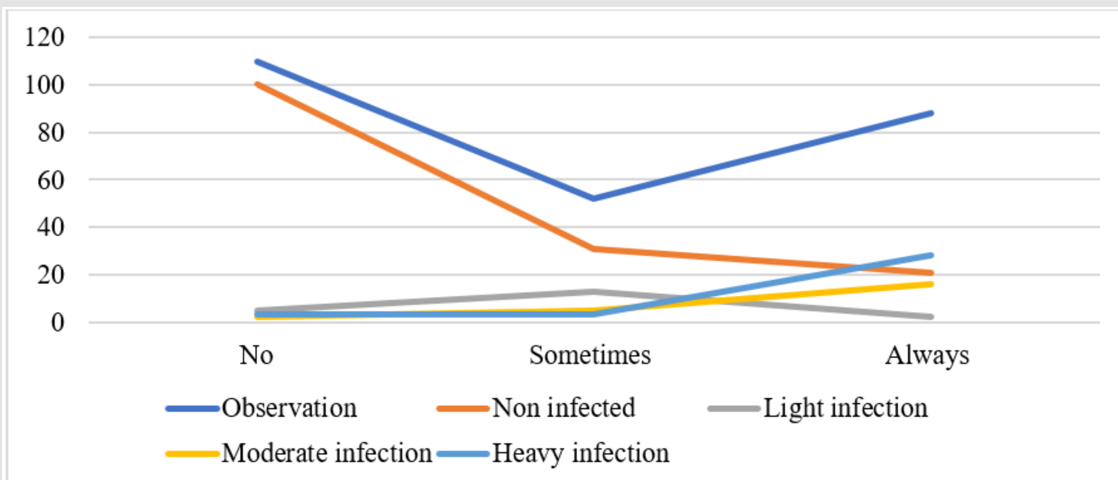

Figure 2: Infection intensity/pattern of S mansoni among frequently swimming children of Delo-Mena district from March to June,2022 study period.

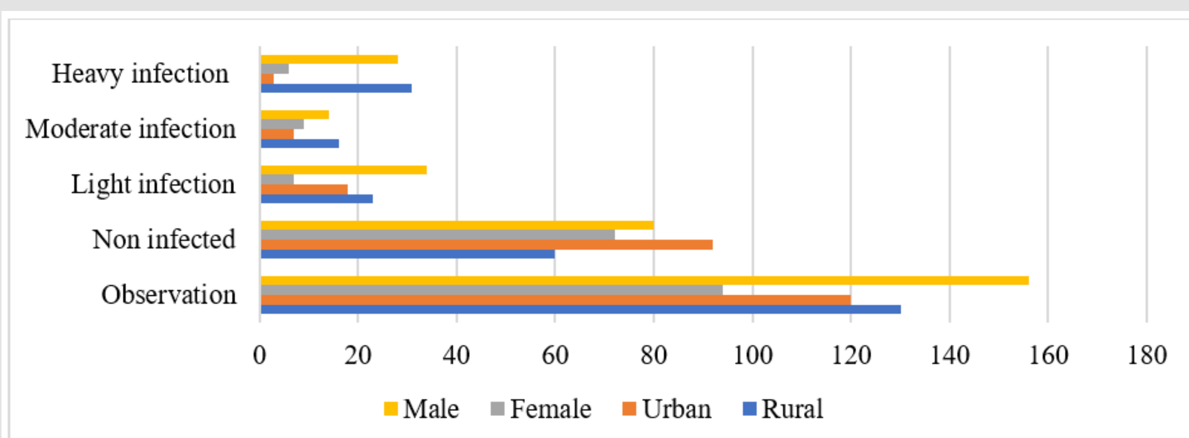

Figure 3: Infection intensity of S mansoni among sex and residence areas of Delo-Mena district.

Discussion

The prevalence and burden of intestinal schistosomiasis in the study area are comparable to or higher than those reported in similar studies (Bajiro, et al. [24-27]). Some studies have shown even higher prevalence and infection burden than the current findings (Jejaw, et al. [28,29]). The overall prevalence can be classified as moderate (between 10% to 50% by parasitological methods) according to WHO guidelines for preventive chemotherapy in human helminthiasis (Organization, [30]). The Ethiopian government launched a mass drug administration (MDA) for school-aged children during 2015, after a year letter of persistent intervention, somewhat comparatively 9.6% of the prevalence rate was reported at the study area before six years ago (Tulu, et al. [31]). This increase in prevalence may be attributed to the interruption of the MDA program in the study area, leading to a gradual rise in infection rates. Despite the resulted comparatively higher prevalence rate and infection burden in the study area, other countries like Togo have successfully reduced the prevalence and intensity of schistosomiasis infection through persistent implementation of MDA following WHO guidelines (Bronzan, et al. [32]). Similarly, in Western Kenya, annual school-based MDA with high coverage led to significant reductions in overall prevalence and intensity of infection, particularly in school-attending children (Abudho, et al. [33]). The lack of sustainability and irregularities in the deworming program in the study area may contribute to future infections due to poor environmental sanitation and high-water contact behavior among schoolchildren. Therefore, it is essential to implement integrated strategies such as snail control, health education, access to sanitation facilities, and environmental sanitation alongside the ongoing MDA program to effectively combat schistosomiasis (Hailegebriel, et al. [9]).

The prevalence and intensity of *S. mansoni* infection varied significantly among different age groups in this study, consistent with findings from Tanzania, Northwest Ethiopia, and Mekelle city (Assefa, et al. [34-36]). However, studies from Bahir-Dar city and Jimma town reported similar prevalence and intensity of *S. mansoni* infection across age groups. This difference may be attributed to age variations and the frequent bathing habits of older children (8-14 years) compared to younger children (5-7 years) (Wiegand, et al. [37]). According to an article review and meta-analysisof 128 relevant studies (Ayabina, et al. [38]) involving over 200,000 participants from 23 countries, differences in the prevalence of infection between males and females were only statistically significant in 41% of cases for S. mansoni. The analysis showed a higher prevalence of infection in males, with pooled prevalence ratios of 1.15 (95% CI 1.08–1.22) for S. mansoni. The result of this finding is consistent with the idea that males are more exposed to outdoor environments, while females typically work in and around their homes or kitchens with less exposure. The study findings reveal that the lack of safe water for bathing, washing, and swimming, along with poor sanitation and hygiene practices, increases the risk of schistosomiasis infection. For example, a significantly higher prevalence of schistosomiasis was found in students who used river (surface) water compared to tap water, which is consistent with another research. Additionally, using surface water for drinking, poor handwashing habits, and inadequate latrine use were significantly associated with Schistosoma mansoni infection (Hailu, et al. [39]). Moreover, among the considered determinant risk factors including swimming habits, frequency, and use of untreated river water were strongly associated with both higher prevalence and infection burden/intensity of Smansoni, similar or consistent with the other studies also (Hailegebriel, et al. [9,26,36,40]).

Conclusion and Recommendation

A quantitative cross-sectional study was conducted in two selected primary schools in Delo-Mena district, Bale Zone, based on their proximity to the main river streams Yadot and Birbire. The study found a moderate prevalence of *S. mansoni* in the area, indicating a lack of effective control and eradication measures for the parasite and its intermediate host. The study recommends implementing integrated strategies such as snail control, health education, improved access to toilets and hygiene services, and better environmental sanitation to address the issue with an integrated MDA at lower and higher schools targeting different age group students.

Data Availability

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Conflict of Interest

The corresponding author declared that there is no conflict of interest.

Authors Contribution

BM- Correspondence author, Formal analysis, Software, Principal investigator, Manuscript preparation, Writing original draft

- BM- Data collection and Data Edition
- TR- Manuscript edition, Conceptualization

MH- Methodology, Data curation.

References

1. Gower CM, Gehre F, Marques SR, Lamberton PH, Lwambo NJ, et al. (2017) Phenotypic and genotypic monitoring of Schistosoma mansoni in Tanzanian schoolchildren five years into a preventative chemotherapy national control programme. Parasites & vectors 10: 1-12.
2. Gebreyesus TD, Tadele T, Mekete K, Barry A, Gashaw H, et al. (2020) Prevalence, intensity, and correlates of schistosomiasis and soil-transmitted helminth infections after five rounds of preventive chemotherapy among school children in Southern Ethiopia. Pathogens 9: 920.
3. Negussu N, Mengistu B, Kebede B, Deribe K, Ejigu E, et al. (2017) Ethiopia schistosomiasis and soil-transmitted helminthes control programme: progress and prospects. Ethiopian medical journal 55: 75.

4. Jember TH (2014) Challenges of schistosomiasis prevention and control in Ethiopia: Literature review and current status. Journal of Parasitology and Vector Biology 6: 80-86.
5. Misganaw A, Mariam DH, Ali A, Araya T (2014) Epidemiology of major non-communicable diseases in Ethiopia: a systematic review. Journal of health, population, and nutrition 32: 1.
6. Aemero M, Berhe N, Erko B (2014) Status of Schistosoma mansoni prevalence and intensity of infection in geographically apart endemic localities of Ethiopia: a comparison. Ethiopian journal of health sciences 24: 189-194.
7. Eyayu T, Yimer G, Workineh L, Tiruneh T, Sema M, et al. (2022) Prevalence, intensity of infection and associated risk factors of soil-transmitted helminth infections among school children at Tachgayint woreda, Northcentral Ethiopia. PloS one 17: e0266333.
8. Hailegebriel T, Nibret E, Munshea A (2021a) Prevalence of Schistosoma mansoni and Associated Risk Factors in Human and Biomphalaria Snails in Ethiopia: A Systematic Review and Meta-analysis. Acta Parasitologica, p. 1-18.
9. Hailegebriel T, Nibret E, Munshea A, Ameha Z (2021b) Prevalence, intensity and associated risk factors of Schistosoma mansoni infections among schoolchildren around Lake Tana, northwestern Ethiopia. PLoS neglected tropical diseases 15: e0009861.
10. Worku L, Damte D, Endris M, Tesfa H, Aemero M (2014) Schistosoma mansoni infection and associated determinant factors among school children in Sanja Town, Northwest Ethiopia. Journal of parasitology research 2014.
11. Hussen S, Assegu D, Tadesse BT, Shimelis T (2021) Prevalence of Schistosoma mansoni infection in Ethiopia: a systematic review and meta-analysis. Tropical diseases, travel medicine and vaccines 7: 1-12.
12. Nelwan ML (2019) Schistosomiasis: life cycle, diagnosis, and control. Current Therapeutic Research 91: 5-9.
13. (2004) Organization WHO. Prevention and control of schistosomiasis and soil-transmitted helminthiasis: World Health Organization/Unicef joint statement: World Health Organization.
14. Toor J, Alsallaq R, Truscott JE, Turner HC, Werkman M, et al. (2018) Are we on our way to achieving the 2020 goals for schistosomiasis morbidity control using current World Health Organization guidelines? Clinical Infectious Diseases 66: S245-S252.
15. Barsoum RS, Esmat G, El-Baz T (2013) Human schistosomiasis: clinical perspective. Journal of advanced research 4: 433-444.
16. Ferrari TCA & Moreira PRR (2011) Neuroschistosomiasis: clinical symptoms and pathogenesis. The Lancet Neurology 10: 853-864.
17. King CH (2010) Parasites and poverty: the case of schistosomiasis. Acta Tropica 113: 95-104.
18. Birrie H, Tedla S, Tilahun G, Kloos H, Eshete H (1998) Schistosomiasis and its distribution in Ethiopia and Eritrea. Schistosomiasis in Ethiopia and Eritrea 2: 29-86.
19. Tulu B, Taye S, Amsalu E (2014) Prevalence and its associated risk factors of intestinal parasitic infections among Yadot primary school children of South Eastern Ethiopia: a cross-sectional study. BMC research notes 7: 1-7.
20. (1991) Organization WHO. Basic laboratory methods in medical parasitology. World Health Organization.
21. Lim MD, Brooker SJ, Belizario Jr VY, Gay-Andrieu F, Gilleard J, et al. (2018) Diagnostic tools for soil-transmitted helminths control and elimination programs: A pathway for diagnostic product development: Public Library of Science San Francisco, CA USA.
22. Anécimo RS, Tonani KA, Fregonesi BM, Mariano AP, Ferrassino MD, et al. (2012) Adaptation of Ritchie's method for parasites diagnosing with minimization of chemical products. Interdisciplinary perspectives on infectious diseases 2012.
23. Dyussenbayev A (2017) Age periods of human life. Advances in Social Sciences Research Journal 4.
24. Bajiro M, Dana D, Ayana M, Emana D, Mekonnen Z, et al. (2016) Prevalence of Schistosoma mansoni infection and the therapeutic efficacy of praziquantel among school children in Manna District, Jimma Zone, southwest Ethiopia. Parasites & vectors 9: 1-6.
25. Mathewos B, Alemu A, Woldeyohannes D, Alemu A, Addis Z, et al. (2014) Current status of soil transmitted helminths and Schistosoma mansoni infection among children in two primary schools in North Gondar, Northwest Ethiopia: a cross sectional study. BMC research notes 7: 1-7.
26. Hailegebriel T, Nibret E, Munshea A (2020) Prevalence of Soil-transmitted helminth infection among school-aged children of Ethiopia: a systematic review and meta-analysis. Infectious Diseases: Research and Treatment 13: 1178633720962812.
27. Tefera A, Belay T, Bajiro M (2020) Epidemiology of Schistosoma mansoni infection and associated risk factors among school children attending primary schools nearby rivers in Jimma town, an urban setting, Southwest Ethiopia. PloS one 15: e0228007.
28. Jejaw A, Zemene E, Alemu Y, Mengistie Z (2015) High prevalence of Schistosoma mansoni and other intestinal parasites among elementary school children in Southwest Ethiopia: a cross-sectional study. BMC Public Health 15: 1-7.
29. Mekonnen Z, Meka S, Zeynudin A, Suleman S (2014) Schistosoma mansoni infection and undernutrition among school age children in Fincha'a sugar estate, rural part of West Ethiopia. BMC research notes 7: 1-8.
30. (2006) Organization WHO. Preventive chemotherapy in human helminthiasis. Coordinated use of anthelminthic drugs in control interventions: a manual for health professionals and programme managers. World Health Organization.
31. Tulu B, Taye S, Zenebe Y, Amsalu E (2016) Intestinal Parasitic Infections and Nutritional Status among Primary School Children in Delo-mena District, South Eastern Ethiopia. Iranian Journal of Parasitology 11.
32. Bronzan RN, Dorkenoo AM, Agbo YM, Halatoko W, Layibo Y, et al. (2018) Impact of community-based integrated mass drug administration on schistosomiasis and soil-transmitted helminth prevalence in Togo. PLoS neglected tropical diseases 12: e0006551.
33. Abudho BO, Ndombi EM, Guya B, Carter JM, Riner DK, et al. (2018) Impact of four years of annual mass drug administration on prevalence and intensity of schistosomiasis among primary and high school children in Western Kenya: a repeated cross-sectional study. The American journal of tropical medicine and hygiene 98: 1397.
34. Assefa A, Dejenie T, Tomass Z (2013) Infection prevalence of Schistosoma mansoni and associated risk factors among schoolchildren in suburbs of Mekelle city, Tigray, Northern Ethiopia. Momona Ethiopian Journal of Science 5: 174-188.
35. Mazigo HD, Uisso C, Kazyoba P, Nshala A, Mwingira UJ (2021) Prevalence, infection intensity and geographical distribution of schistosomiasis among pre-school and school aged children in villages surrounding Lake Nyasa, Tanzania. Scientific Reports 11: 1-11.
36. Zeleke AJ, Addisu A, Tegegne Y (2020) Prevalence, intensity, and associated factors of Schistosoma mansoni among school children in Northwest Ethiopia. Journal of parasitology research.

37. Wiegand RE, Odiere MR, Kinung'hi S, N'Goran EK, Mwinzi P, et al. (2024) Age-group associations of schistosomiasis prevalence from trial data, Côte d'Ivoire, Kenya and the United Republic of Tanzania. Bulletin of the World Health Organization 102: 265.

38. Ayabina DV, Clark J, Bayley H, Lamberton PH, Toor J, et al. (2021) Gender-related differences in prevalence, intensity and associated risk factors of Schistosoma infections in Africa: A systematic review and meta-analysis. PLoS neglected tropical diseases 15: e0009083.

39. Hailu T, Wondemagegn M, Abera B (2020) Effects of water source, sanitation and hygiene on the prevalence of Schistosoma mansoni among school age children in Jawe District, Northwest Ethiopia. Iranian Journal of Parasitology 15: 124.

40. Kahisay M, Birhanie M, Derso A (2021) Prevalence and intensity of Schistosoma mansoni infection and its associated risk factors among patients with and without HIV at Chuahit Health Center, Dembia District, Northwest Ethiopia. Research and reports in tropical medicine 12: 25.

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