

Prevalence And Intensity Of Human Schistosomiasis In Selected Rural Communities Of Mecha District And Bahir Dar Town Administration, West Gojjam, Northwestern Ethiopia

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Abstract

The study was conducted in Selected Rural Communities of Mecha District and Bahir Dar Town Administration, West Gojjam, Northwestern Ethiopia, to determine the prevalence and intensity of human schistosomiasis. A total of 490 stool and urine specimens were collected using stool cup and test tubes respectively. The overall prevalence and intensity of *Schistosoma mansoni* was 10.4% and 128.03 eggs per gram of stool (EPG) respectively. The prevalence of infection ranging from 7.8% in Wotet Abay Peasant Associations to 12.9% Kudmi Peasant Associations. The prevalence of *Schistosoma mansoni* infection among males and females was 13.2% and 7.5%, respectively, and the intensity of infection was 132.37 EPG and 120.42 EPG, respectively. The prevalence of *Schistosoma mansoni* infection among different age groups ranging from 3.9% in ≥ 30 years to 20.5% in 10-14 years whereas, the intensity of infection was ranging from 89.47 EPG in ≥ 30 years to 168.22 EPG in 10-14 years. It signifies the fact that the age groups 10-14 and 15-19 years are the highest risk groups. It is recommended that to control schistosomiasis in the areas should target at the youngest segment of the population.

Key words: Peasant Association, prevalence, intensity, Kato and sedimentation method

1. INTRODUCTION

Schistosomiasis is endemic in 74 tropical developing countries. The great majority (80-85%) of schistosomiasis is found in sub-Saharan Africa (Bergquist, 2002). Most infections in humans can be accounted by *S. mansoni*, *S. haematobium* and *S. japonicum*, together with a minor contribution from *S. mekongi* and *S. intercalatum* (Gryseels et al., 2006).

Schistosomiasis is also endemic in Ethiopia. While the intestinal form caused by *S. mansoni* is widely distributed, the urinary form caused by *S. haematobium* is limited to some lowland areas (Tedla et al., 1998). In Ethiopia, the over all prevalence of intestinal schistosomiasis in 2005, is ranging from 15-25% (Damte, 2010). Schistosomiasis was reported to be widely endemic in Tigray. Investigations, including the recent ones, reported

that *S. mansoni* has covered quite many localities in the region with different prevalence rates, ranging from (1%) in Maichew to (87%) in Tumuga (Birrie et al., 1994; Woldemichael and Kebede, 1996; Alemayehu et al., 1998; Tadesse and Tsehaye, 2008; Tadesse and Beyene, 2009; Tadesse et al., 2009).

Although potential advantage exists with the development of water resources and irrigation systems in the present study area, this may create more suitable conditions for the transmission of water borne parasites and breeding vector snails; thereby causing an increase in the prevalence of schistosomiasis. Although there is no published report on the prevalence and intensity of human schistosomiasis in the study area, information (unpublished) obtained from local health institutions showed that human schistosomiasis is an important disease in the study area. Therefore, in this study an effort was made to investigate the prevalence and intensity of human schistosomiasis in selected rural communities of Mecha District and Bahir Dar Town Administration, West Gojjam, Northwestern Ethiopia. The finding of this cross-sectional study would serve as a baseline for future monitoring of impact of different water bodies on possible spread of schistosomiasis infection; warn for an early control interventions: through environmental and mass treatment strategies, and to evaluate the impact of such public health interventions.

The Specific objectives of this study are the following:

- To compare the prevalence of *S. mansoni* and *S. haematobium* infection between different sites (PAs).
- To determine the prevalence and intensity of *S. mansoni* and *S. haematobium* infection with respect to sex and age groups.
- To determine the prevalence of schistosomiasis relate with risk factors.

2. MATERIALS AND METHODS

2.1. Description of the Study Area

The study was carried out in rural inhabitants of four selected peasant associations (PAs) namely Wotet Abay, Kudmi and Ambomesk from Mecha district and Sebatamit around Bahir Dar Town, West Gojjam, Amhara Region, Northwestern Ethiopia (Figure 2).

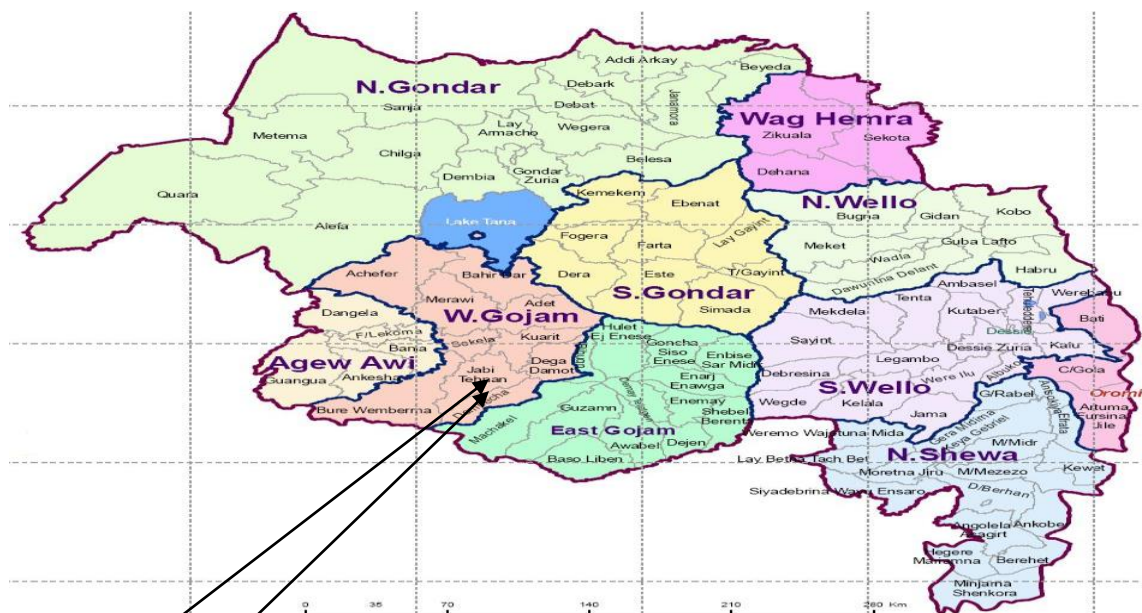


Figure 1: Map of the study areaSource: <http://www.ethiodemographyandhealth.org/Amhara.html>

2.2. Study Design and Period

Cross sectional descriptive survey was employed to determine the prevalence and intensity of human schistosomiasis among rural inhabitants in the selected study villages in Mecha District and around Bahir Dar Town during July 2010 - January 2011.

2.3. Study Population

There are 40 and 4 rural PAs from Mecha district and Bahir Dar Town Administration, respectively. Four PAs were selected purposively based on the following criteria: the PAs have water bodies or irrigation canals for bilharizia (snail) breeding potential and the population as a result may have frequent exposure to their water bodies making it prone to bilharizia transmission. The following four PAs were selected based on the above criteria; namely Wotet Abay, Kudmi, Ambomesk and Sebatamit. Therefore, the randomly selected households of the above PAs were the target population of this study.

Inclusion criteria:

From the randomly selected households, all their family members > 4 years who were available during the study period in the houses were eligible for stool and urine tests respectively.

Exclusion criteria:

Relatives who was come during the study period, children's < 5 years of age and family members who was not available in the home was excluded from the study. If houses included in the sample were found to be closed, the next nearest house was substituted.

2.4. Sample Size Determination and Sampling Procedure

2.4.1. Sample Size Determination

Calculation of the sample size (n) was done using the formula for estimating single proportion at 95% CI level ($Z_{\alpha/2} = 1.96$). However, since there were no previous related studies conducted in the area, 50% was assumed for prevalence (P). A minimum of 384 samples (n) will be generated using 5% marginal error (d) as shown below.

$$n = Z^2 P (1-P)/d^2$$

$$n = Z^2 \alpha/2 (50\%) (1-50\%) / d^2$$

$$n = (1.96) (1.96) (0.5) (1-0.5) / (0.0025)$$

$$n = 384$$

Where n = sample size

P = average prevalence

 $Z_{\alpha/2}$ = P- value at 95% CI from table

d = worst accepted value/marginal error

To compensate for the non-response 106 (27.6%) individuals were added, so, the total sample size required for the study was 490. Based on the assumption of five average family sizes (Statistical Report of Population and Housing Census, 2005), 98 households were selected randomly from four PAs. From selected 98 households, 490 individuals were sampled. Then, by using proportional sampling, the share of households of each of the four study PAs was proportionally distributed.

The four selected PAs are Wotet Abay, Kudmi, Ambomesk and Sebatamit with 5301, 9182, 8410 and 5654 people and based on assumption of five average family size (Statistical Report and Housing Census, 2005), they have 1060, 1836, 1682 and 1131 households respectively.

2.4.2. Sampling Procedure

The study household heads were randomly selected from the list of households (sample frame) that was obtained from the respective PA Health Extension Workers. Thus, the study units were the randomly selected households from each study PA. The household to be sampled from each PA was systematically drawn, taking every fifth household from a random start and if the fifth is inconvenient, the household next to it was sampled.

2.5. Data Collection Instruments and Data Collection Procedure

Data collection tools were adapted from similar studies. These tools include questionnaires that include age, sex and risk factors about the transmission of human schistosomiasis. The risk factors those are important for the transmission of human schistosomiasis includes swimming, fishing, washing clothes and their bodies, playing in water bodies, irrigation usage, and fetching water. The questionnaire was originally developed in English and then translated into local language (Amharic).

Training was given for data collectors regarding the purpose of the study and the procedures to be followed for data collection. The selected study population was administered at their respective residential places using a structured questionnaire. The questionnaire were conducted by the Health Extension Workers who have certificate and can fluently speak Amharic before they were provided stool and urine specimen. No personal identifier was included and individuals had given a unique code number to be attached to the questionnaire and their laboratory specimens.

2.6. Laboratory Parasitological Examination

2.6.1. Kato-Katz Technique

To determine *S. mansoni* infection, stool samples were processed using 41.7 mg templates according to the modified Kato–Katz technique (Peters et al., 2005). A small amount of faecal material was placed on scrap paper and a piece of nylon screen was pressed on top so that some of the faeces sieved through the screen and accumulated on top. A flat-sided spatula was scraped across the upper surface of the screen to collect the sieved faeces. A template was placed on the slide and the sieved faeces were added with the spatula so that the hole in the template was completely filled. The spatula was passed over the filled template to remove excess faeces from the edge of the hole. The template was removed carefully so that a cylinder of faeces was left on the slide. The faecal material was covered with a pre-soaked cellophane strip. The slide was inverted and the faecal sample was pressed firmly against the hydrophilic cellophane strip to spread evenly. The slide was then placed on the bench with cellophane upwards to enable the evaporation of water while glycerol cleared the faeces. The slide was kept at least 30 minutes at room temperature to clear the faecal material, prior to microscopic examination.

To determine the intensity of infection, the EPG of faeces was calculated as follows: if “n” number of eggs of parasite species are found in 41.7 mg of stool specimen, then 1000 mg (i.e. 1 g) of the faecal specimen contains “n” X (1000/41.7) or (“n” X 24) EPG.

2.6.2. Sedimentation Technique

To determine *S. haematobium* infection, the tube that contains 10 ml of urine was centrifuged at 1000 rpm for 5 minutes. The top 9 ml was aspirated off. The sediment was re-suspended in the remaining 1 ml. A Pasteur pipette, which was calibrated to discharge 1 ml in 20 drops was used to release 1 drop of the sample to a microscope slide. A cover slip was placed on it and *S. haematobium* eggs present were counted under the 10X objective of a light microscope. To obtain the number eggs in 1 ml, the number of eggs counted in 1 drop was

multiplied by 20, which also the total egg passed in the total volume of urine was originally obtained. The number in 10 ml of urine was then calculated (Okanla, 1991).

2.7. Ethical Consideration

The study was carried out after obtaining ethical clearance from ethical committee of the College of Health Science, Haramaya University.

2.8. Data Analysis

The quantitative data generated from questionnaire survey about the clinical findings, their associations with positivity of *S. mansoni* were entered into a computer, and SPSS 12 version statistical software package was used for statistical analysis. Chi-Square test and ANOVA were applied to test whether differences between values were significant. P values < 0.05 were considered as statistically significant.

3. RESULTS AND DISCUSSION

3.1. Distributions of the Study Population

During a six months study period, 490 (98 households) individuals > 4 years of age from the three-selected rural PAs of Mecha District, and one rural PAs from Bahir Dar Town Administration were examined for schistosomiasis. The sex and age group distributions of individuals are given in Table 1. Of the 490 individuals, 250 (51.0%) were males and 240 (49.0%) were females resulting in an overall male to female ratio of 1:1. The age of the studied population ranges from 5-70 years. Of the entire study subject, 97 (19.8%), 73 (14.9%), 86 (17.5%), 107 (21.9%) and 127 (25.9%) individuals were placed between the years of 5-9, 10-14, 15-19, 20-29 and ≥ 30, respectively (Table 1).

Table 1: Distribution of the study population (n = 490) examined for schistosomiasis in Wotet Abay, Ambomesk and Kudmi PAs in Mecha District, and Sebatamit PAs, in Bahir Dar Town Administration during the 6 months study period (July 2010-January 2011) by age group and sex

| Age group (in years) | Sex | | Total No. (%) |
|-------------------------|-----------------|-------------------|------------------|
| | Male No. (%) | Female No. (%) | |
| 5-9 | 45 (46.4) | 52 (53.6) | 97 (19.8) |
| 10-14 | 40 (54.8) | 33 (45.2) | 73 (14.9) |
| 15-19 | 40 (46.5) | 46 (53.5) | 86 (17.5) |
| 20-29 | 49 (45.8) | 58 (54.2) | 107 (21.9) |
| ≥ 30 | 76 (59.8) | 51 (40.2) | 127 (25.9) |
| Total | 250 (51.0) | 240 (49.0) | 490 (100) |

No. (%) = Number of percentage

3.2. The Over All Prevalence of Schistosomiasis

Schistosomiasis is one of the most prevalent parasitic infections and an important public health problem in many developing countries (Deganello et al., 2007). The finding of the current cross-sectional study shows that *S. mansoni* infection is important in the study PAs. The over all prevalence of *S. mansoni* infection was 10.4% (51 out of 490) (Table 1).

3.2.1. Prevalence of Schistosomiasis in the four Study Peasant Associations

In “Wotet Abay” PAs, 90 stool samples were examined, and out of these 7.8% were found positive for *S. mansoni*. In “Ambomesk” PAs, 145 stool samples examined, out of these 10.3% were found positive for *S. mansoni*. In “Kudmi” PAs, 155 stool samples were examined and out of these 12.9% were found positive for *S. mansoni*. In “Sebatamit” PAs, 100 stool samples examined and out of these 9.0% were found positive for *S. mansoni* (Table 2). In this investigation, the prevalence of *S. mansoni* infection ranged from 7.8% in Wotet Abay to 12.9% in Kudmi PAs. Infection prevalence of *S. mansoni* has not shown a significant difference among the four study PAs ($X^2 = 1.917$ and $P = 0.590$).

S. haematobium parasite absent from the urine samples investigated. This is may be because of the distribution of the parasite and intermediate hosts limited to low land areas at altitude below 800 meters above sea level (Birrie, 1996).

Table 2: Prevalence of schistosomiasis among individuals in Wotet Abay, Ambomesk and Kudmi PAs in Mecha district, and Sebatamit PAs, in Bahir Dar Town Administration during the 6 months study period (July 2010-January 2011) by study site

| Parasite species | Study site | % (No. positive/No. examined) | | |
|----------------------------|------------|-------------------------------|--------------|---------------|
| | | Male | Female | Total |
| <i>Schistosoma mansoni</i> | Wotet Abay | 12.2 (5/41) | 4.1 (2/49) | 7.8 (7/90) |
| | Ambomesk | 14.1 (10/71) | 6.8 (5/74) | 10.3 (15/145) |
| | Kudmi | 14.9 (13/87) | 10.3 (7/68) | 12.9 (20/155) |
| | Sebatamit | 9.8 (5/51) | 8.2 (4/49) | 9.0 (9/100) |
| Total | | 13.2 (33/250) | 7.5 (18/240) | 10.4 (51/490) |

% = Percentage, NPNE = Number of positive per number of examined

3.2.2. Prevalence of Schistosomiasis among Peasant Associations of Different Sexes

Chi-square test analysis was employed to assess the association between prevalence of schistosomiasis and sex. Among the males (250) and females (240), the prevalence of *S. mansoni* was 13.2% and 7.5%, respectively (Table 3). In this investigation, the prevalence of *S. mansoni* infection was found to be significantly higher in males than in females ($X^2 = 4.266$ and $P = 0.039$).

Table 3: Prevalence of schistosomiasis in Wotet Abay, Ambomesk and Kudmi PAs in Mecha district, and Sebatamit PAs, in Bahir Dar Town Administration during the 6 months study period (July 2010-January 2011) by sex

| Parasite species | Sex | % (No. positive/No. examined) |
|----------------------------|--------|-------------------------------|
| <i>Schistosoma mansoni</i> | Male | 13.2 (33/250) |
| | Female | 7.5 (18/240) |
| Total | | 10.4 (51/490) |

% = Percentage, NPNE = Number of positive per number of examined

3.2.3. Prevalence of Schistosomiasis among Peasant Associations of Different Age Groups

In this finding of cross-sectional study, the age groups were classified into 5-9, 10-14, 15-19, 20-29 and ≥ 30 years (Pedro et al., 1996). As indicated in Table 4, among the 97 individuals aged 5 to 9 years, 9.3% were

positive for *S. mansoni*. Among the 73 individuals in the 10 to 14 years age category, 20.5% were found positive for *S. mansoni*. Among the 86 individuals of age between 15 to 19 years, 16.3% were found positive for *S. mansoni*. Among the 107 individuals of age between 20-29 years, 7.5% were found positive for *S. mansoni*. Within 127 individuals of age ≥ 30 years, 3.9% were found positive for *S. mansoni*. The difference in the prevalence of *S. mansoni* among the different age groups was significant ($X^2 = 18.050$ and $P = 0.001$). In this investigation, the peak prevalence registered for *S. mansoni* infection in the age group 10-14 years, and followed by the age group and 15-19 years, and the lowest in the age group 5-9, 20-29 and ≥ 30 years. In this age group related study as the age increase the prevalence of *S. mansoni* was increase 5 to 14 years and thereafter decreased (Figure 4). The high prevalence in the age group 10-14 and followed by 15-19 years could be due to which have the responsibility to look after cattle which gives ample time for water contact, increasing the likelihood of infection. Due to the high susceptibility and high contact during swimming with infected water.

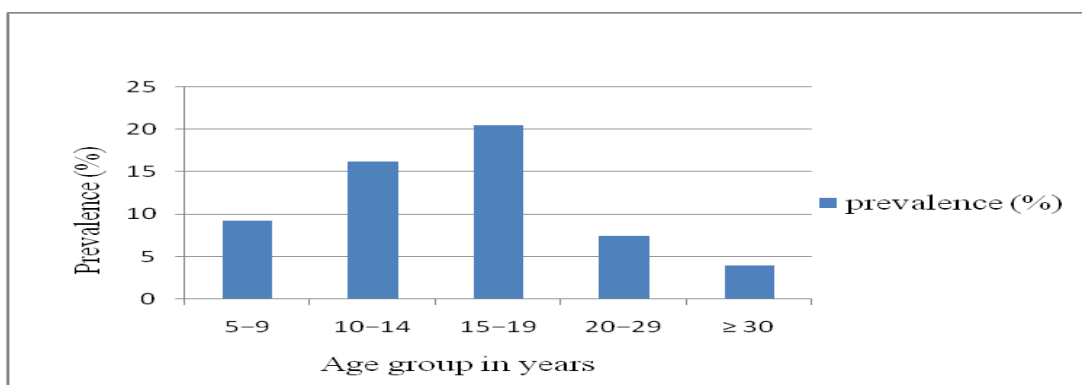


Figure 2: Prevalence of schistosomiasis in Wotet Abay, Ambomesk and Kudmi PAs in Mecha district, and Sebatamit PAs, in Bahir Dar Town Administration during the 6 months study period (July 2010-January 2011) by age group

Table 4: Prevalence of schistosomiasis among individuals in Wotet Abay, Ambomesk and Kudmi PAs in Mecha district, and Sebatamit PAs, in Bahir Dar Town Administration during the 6 months study period (July 2010-January 2011) by age group

| Parasite species | Age group (in years) | % (No. positive/No. examined) | | |
|----------------------------|----------------------|-------------------------------|-------------|---------------|
| | | Male | Female | Total |
| <i>Schistosoma mansoni</i> | 5-9 | 13.3 (6/45) | 5.8 (3/52) | 9.3 (9/97) |
| | 10-14 | 25.0 (10/40) | 15.2 (5/33) | 20.5 (15/73) |
| | 15-19 | 17.5 (7/40) | 15.2 (7/46) | 16.3 (14/86) |
| | 20-29 | 12.2 (6/49) | 4.1 (2/49) | 7.3 (8/107) |
| | ≥ 30 | 5.3 (4/76) | 2.0 (1/51) | 3.9 (5/127) |
| Total | | (33/250) | (18/240) | 10.4 (51/490) |

3.2.4. Prevalence of Schistosomiasis Associated with Risk Factors

As shown in Table 5, bivariate analysis was done to assess the association between prevalence of schistosomiasis and the selected risk factors. Subsequently, the following variables were found to be associated with an increase of *S. mansoni* infection using logistic regression analysis: (a) swimming (OR = 0.340, CI = 0.177-0.650, $X^2 = 15.196$ and $P = 0.001$) (b) fishing (OR = 0.306, CI = 0.071-1.312, $X^2 = 4.202$ and $P = 0.040$) (c) washing clothes and bodies (OR = 2.831, CI = 0.840-9.542, $X^2 = 4.027$ and $P = 0.045$) (d) irrigation usage (OR = 0.564, CI = 0.259-1.226, $X^2 = 3.972$ and $P = 0.046$) (e) playing in water bodies (OR = 0.417, CI = 0.196-0.886, $X^2 = 3.897$ and $P = 0.048$)

Table 5: Prevalence of schistosomiasis associated with risk factors among individuals in Wotet Abay, Arbomesk and Kudmi PAs in Mecha district, and Sebatarit PAs, in Bahir Dar Town Administration during the 6 months study period (July 2010-January 2011).

| Risk factors | <i>Schistosoma mansoni</i> infection | | | | | |
|--------------------------------------|--------------------------------------|--------------|--------------|---------------------|----------------|-------------|
| | | Positive (%) | Negative (%) | OR (95%CI) | X ² | Df P-values |
| Do you swim? | Yes | 23 (20.2) | 93 (79.8) | 0.340 (0.177-0.650) | 15.196 | 1 *0.001 |
| | No | 28 (7.4) | 348 (92.6) | | | |
| Do you Fishing? | Yes | 3 (30.0) | 7 (70.0) | 0.306 (0.071-1.312) | 4.202 | 1 *0.040 |
| | No | 48 (10.0) | 432 (90.0) | | | |
| Do you wash clothes and body? | | | | | | |
| Protected water | | 3 (3.9) | 73 (96.1) | 2.831 (0.840-9.542) | 4.027 | 1 *0.045 |
| Unprotected water | | 48 (11.6) | 366 (88.4) | | | |
| Do you use irrigation? | Yes | 12 (17.1) | 58 (82.9) | 0.564 (0.259-1.226) | 3.972 | 1 *0.046 |
| | No | 39 (9.3) | 381 (90.7) | | | |
| Do you play in water bodies? | Yes | 13 (16.7) | 65 (83.3) | 0.417 (0.196-0.886) | 3.897 | 1 *0.048 |
| | No | 38 (10.2) | 374 (90.8) | | | |
| Do you fetch water? | Yes | 10 (6.6) | 141 (93.4) | 1.527 (0.527-2.515) | 3.354 | 1 NS0.067 |
| | No | 41 (11.8) | 298 (87.9) | | | |

*Significant difference at P<0.05 OR= Odds Ratio, CI = Confidence Interval

NS Non-significant difference at P>0.05 Df= Degree of freedom

Significant (OR = 0.340, CI = 0.177-0.650, X² = 15.196, and P = 0.001) association between swimming and contracting *S. mansoni* infection was observed in the present study. Those PAs who were swimming are more

than 2 times at risk of having schistosomiasis compared to those who did not swim. Since during swimming, the whole body exposed to cercariae infested water.

Fishing in different water sources continues to be important risk factor for contracting schistosomiasis (Pedro et al., 1994). In the current study, there was a significant association between the risk of contracting *S. mansoni* infection and fishing in water. The association was significant, (OR = 0.306, CI = 0.071-1.312, $X^2 = 4.202$ and $P = 0.040$). The odds of individuals who have exposed with water during fishing 3 folds at risk of contracting schistosomiasis when compared with those who did not fishing in water.

When PAs were washing clothes and their bodies from unprotected water, predispositions to infection were considered. In the present study there was a significant effect of washing clothes and their bodies from unprotected water (OR = 2.831, CI = 0.840-9.542, $X^2 = 4.027$, and $P = 0.045$) on *S. mansoni* infections. This figure indicates that individuals who washed clothes and their bodies from protected water are less likely to have schistosomiasis when compared with those who washed from unprotected water. There was significant association between the risk of contracting schistosomiasis and poor living household conditions.

It is known that irrigation and the construction of dams with poor sanitary practice results in rapid spread of *S. mansoni*. In the present study, there was a significant association between the risk of contracting *S. mansoni* infection and irrigational activities. The association was significant, (OR = 0.564, CI = 0.259-1.226, $X^2 = 3.972$, and $P = 0.046$). This figure indicates that individuals who did not use irrigational activities are less likely to have schistosomiasis when compared with those who used irrigation during agricultural activities.

Playing in different water sources specially children's in school age continues to be important risk factor for contracting schistosomiasis. The prevalence of *S. mansoni* was 71.9% and 28.3% those who are playing and not playing in different water bodies respectively (Pedro et al., 1994). In the current study, there was a significant association between the risk of contracting *S. mansoni* infection and playing in different water bodies. The association was significant, (OR = 0.417, CI = 0.196-0.886, $X^2 = 3.897$ and $P = 0.048$).

Cristiano et al. (2004) in Brazil reported the risk of contracting *S. mansoni* infection are more frequently occurring in non- fetching water (79%) than that happened in fetching water (21%). In contrast to this, the present study showed no significant statistical difference (OR = 1.527, CI = 0.527-2.515, $X^2 = 3.354$ and $P = 0.067$). This could be possibly due to most of the people fetching protected water in the study PAs may not acquired schistosomiasis. Because the most important characteristics of water body that determine the habitation and density of the snail are physical factors including altitude, water temperature, and chemical factors like pH, anion and cation concentrations, hardness and dissolved oxygen concentration. These factors should be within tolerable range of the intermediate host for effective transmission of the disease (Parry et al., 2004) and protected water is not exposed to defecation.

3.3. The Over All Intensity of Schistosomiasis

The severity of the disease in an individual is related to the intensity of infection: measured in eggs per gram of stool (EPG) and eggs per ml of urine. In the present study, the geometric mean intensity of *S. mansoni* was 128.03 EPG (Table 5)

3.3.1. Intensity of Schistosomiasis among Peasant Associations of Different Sexes

Analysis of variance was employed to determine the associations between infection load between sexes. Similar to this, in the current finding, the geometric mean intensity of *S. mansoni* in males and females were 132.37 and 120.42 EPG, respectively (Table 6). No significant difference was obtained in egg counts among sexes of PAs (F

= 0.396 and P = 0.532). This may be denotes a similar exposure risk to infection by these parasite. Factors like environmental sanitation, water supply, socio-economic status of the households, immunity and similarities in exposure to infection probably play important roles in affecting intensity of infection and distribution of schistosomiasis, and the reason may be both sexes were equally infected (Moyou Somo et al., 2003).

Table 5: Intensity schistosomiasis of among individuals in Wotet Abay, Ambomesk and Kudmi PAs in Mecha district, and Sebatamit PAs, in Bahir Dar Town Administration during the 6 months study period (July 2010-January 2011) by sex

| Parasite species | Sex | | | | | |
|-------------------|------|--------|--------|--------|-------|--------|
| | Male | | Female | | Total | |
| | F | GMNEPG | F | GMNEPG | F | GMNEPG |
| <i>S. mansoni</i> | 33 | 132.37 | 18 | 120.42 | 51 | 128.03 |

F = Frequency, GMNEPG= Geometric mean number of eggs per gram of stool

3.3.2. Intensity of Schistosomiasis among Peasant Associations of Different Age Groups

Analysis of variance was employed to determine the association between infection loads with age group. As indicated in Table 7, the geometric mean intensity of *S. mansoni* infection in the age group 5-9, 10-14, 15-19, 20-29 and ≥ 30 years was 113.78, 168.22, 137.58, 96.64 and 89.47 EPG, respectively. The intensity of infection among the age groups was significant (F = 0.396 and P = 0.030) (Appendix II).

Table 6: Intensity of schistosomiasis among individuals in Wotet Abay, Ambomesk and Kudmi PAs in Mecha district, and Sebatamit PAs, in Bahir Dar Town Administration during the 6 months study period (July 2010-January 2011) by age group

| Sex | Age group (in yours) | | | | | | | | | | Total | |
|--------|----------------------|--------|-------|--------|-------|--------|-------|-------|-----------|-------|-------|--------|
| | 5-9 | | 10-14 | | 15-19 | | 20-29 | | ≥ 30 | | | |
| | F | GM | F | GM | F | GM | F | GM | F | GM | F | GM |
| Male | 6 | 111.55 | 10 | 191.88 | 7 | 142.96 | 6 | 96.86 | 4 | 94.46 | 33 | 132.37 |
| Female | 3 | 118.38 | 5 | 129.28 | 7 | 132.40 | 2 | 96.00 | 1 | 72.00 | 18 | 120.42 |
| Total | 9 | 113.78 | 15 | 168.22 | 14 | 137.58 | 8 | 96.64 | 5 | 89.47 | 51 | 128.03 |

F = Frequency, GM = Geometric mean number of eggs per gram of stool

4. CONCLUSIONS AND RECOMMENDATIONS

4.1. Conclusions

From this prevalence and intensity study, it can be concluded that, schistosomiasis also impairs the mental and physical development of individuals. Therefore, *S. mansoni* is one of the etiologies of schistosomiasis that causes anemia both in adults and children. It signifies the fact that the age groups 10-14 and 15-19 years are the highest risk groups in the PAs and serve as sources of infection and transmission. These parasites are well known to be associated with lowered work capacity and productivity both in children and adults and increased susceptibility to other infections.

It can be concluded also that, the prevalence rate of *S. mansoni* infection increased with the utilization of irrigation schemes, freely swimming, washing clothes and bodies from unprotected water, fishing, walking bare foot in rivers, streams, stagnant water, and irrigation areas will be of great public health concern unless appropriate control measures are designed.

4.2. Recommendations

To reduce the schistosomiasis infections, proper management of the water and the canal system is recommended. There is a need for community mobilization towards provision of safe and adequate water supply, latrine construction to reduce open field defecation and health education aimed at bringing behavioral change in the PAs, and any control attempts towards schistosomiasis in the areas should target at the youngest segment of the population (school-aged children).

It can be recommended also that, combined efforts from the community, education, and health sectors are urgently needed to identify the factors, which led to the apparent failure, and to come up with participatory approaches, which will involve all stakeholders. Although health education by itself cannot guarantee the control of schistosomiasis, it is a fundamental starting point around which other measures can be built to create a favorable environment for the promotion of higher levels of health consciousness and more critical thinking towards improving the quality of life of PAs.

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