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# Water Contact, Infection and Re-Infection Rate of Urogenital Schistosomiasis in Shelleng Local Government Area, Adamawa State, Nigeria

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## Abstract

*Schistosomiasis is on the increase despite intervention by the Government, Non-Governmental Organization (NGOs) and World Health Organization (WHO) due to the method of intervention used. The research on water contact, infection and re-infection rate of urogenital schistosomiasis was carried out in Kiri dam and Shelleng water bodies. Urine samples were collected from the month of March-April 2019 and examined in the laboratory using urine microscopy for schistosoma parasite and from October-November 2019 for re-infection with schistosoma parasite. Results generated ten (10) days after praziquentel administration indicate that the overall prevalence rate for schistosomiasis infection was 13.3% of the 442 study participants examined. Male had the highest rate (18.0%) while female had 8.6% rate of infection. Children that refused to take praziquentel had the highest 25.0%. Participants who adopted Washing/Bathing/Swimming/Drinking (WBSD) had the highest (17.3%). The prevalence rate was low due to the administration of praziquentel. The overall prevalence rate for schistosomiasis re-infection was 52.0% of the 442 study participants examined. Male had the highest rate of 52.9% while female had 51.1%, the intensity of infection shows that male had high intensity of 12.7%. Children whose parents are fishermen had the highest infection of 72.7%, the least infection rate was recorded among children whose parents are in to business (44.9%). Those that involved in picking of snails had the highest rate of 62.6%. Participants who adopted Washing/Bathing/Swimming/Drinking (WBSD) had the highest of 65.7%. The results obtained show that there was equal exposure to the source of infection irrespective of age gender, parents' occupation and education. It is recommended that integrated method of treatment of the water bodies and populace should be carried out simultaneously.*

**Keywords:** Schistosomiasis, Re-infection, Praziquentel, Kiri, Shelleng.

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## INTRODUCTION

Schistosomiasis, also known as snail fever and bilharzia, is a disease caused by parasitic flatworms called schistosomes (Colley *et al*., 2014). Schistosomiasis belongs to the group of helminth infections and the urinary tract or the intestines maybe infected (WHO, 2014). In Nigeria, *Biomphalaria* and *Bulinus* species of snails are involved in the transmission of schistosomiasis (Idris and Ajanusi, 2002). These parasites are released from infected freshwater snails. The disease is especially common among children in developing countries as they are more likely to play in contaminated water (WHO, 2014). Other high risk groups include farmers, fishermen, and people using unclean water during daily living. The urinary tract or the intestines may be infected with the parasite and symptoms include abdominal pain, diarrhea, bloody stool, or blood in the urine. Those who have been infected for a long time may experience liver damage, kidney failure, infertility, or bladder cancer. In children, it may cause poor growth and learning difficulty (WHO, 2014). Diagnosis is by finding eggs of the parasite in a person's urine or stool. It can also be confirmed by finding antibodies against the disease in the blood (WHO, 2014). Methods to prevent the disease include improving access to clean water and reducing the number of snails. In areas where the disease is common, the medication praziquantel may be given once a year to the entire group. This is done to decrease the number of people infected and, consequently, the spread of the disease. Praziquantel is also the treatment recommended by the World Health Organization (WHO) for those who are known to be infected (WHO, 2014).

## MATERIALS AND METHODS

### Description of Study Area

Shelleng Local Government Area (LGA) of Adamawa State is situated on latitude 9˚53’5”N and longitude 12˚0’32”E. The LGA is centrally located in the state. The area has sedimentary rock, which is made up of shale, thin bands of limestone and lignite (United States Trade and Development Agency [USTDA] 2011). Kiri dam is located in Shelleng LGA, it was built in 1982 and has a capacity of 615 million $m^3$ for hydroelectric generation, provision of water for irrigation of sugar cane for the Savannah Sugar Company (SSC); a large-scale sugar cane plantation and processing company set up as a joint venture between the Federal Government of Nigeria and the Commonwealth Development Corporation (CDC), London (USTDA, 2011).

### Determination of Sample Size

The population of shelleng is 198,400 from 2016 census. Sample size for this study was based on the calculation by Cochran (1977).

$$n = \frac{N}{1 + N(e)^2} = \frac{198{,}400}{1 + 198{,}400\,(0.05)^2} = \frac{198{,}400}{198{,}401 \times 0.0025} = \frac{198{,}400}{496} = 400$$

Where:
e = precision level (margin of error)
n = sample size
N = population size.

## DATA COLLECTION AND ANALYSIS

### Data Collection from Structured Questionnaire

Data was obtained from 442 study participants using structured questionnaire. Each participant was administered a questionnaire to collect data on demographic factor.

### Data Collection for Urine Microscopy

Urine samples were also collected from the same 442 study participants from the month of March-April 2019 and examined in Microbiology and Parasitology laboratory of Federal

Medical Center, Yola for *schistosoma* parasite and from October-November 2019 for re-infection with *schistosoma* parasite.

**Data Analysis**

For urine microscopy about 20 mL urine was collected from each person then allowed to stand for 30 minutes for schistosome eggs to settle to the bottom of the plastic containers by ordinary sedimentation method. The supernatant was gently decanted until almost 10 mL was left. The 10 mL was mixed and turned inside a clean centrifuge tubes, and centrifuge at 500-1000 revolution per minute for 5 minutes. The supernatant was gently decanted off to leave only the deposits. Using a clean Pasteur pipette, a drop-off the sediments was placed on a clean grease-free microscope slide and a cover slip was gently lowered on it, avoiding air bubbles. Then, characteristic terminal spine of *S. Haematobium* eggs was observed (Cheesebrough, 2005). Data was analyzed using SPSS version 22.

**Ethical Clearance**

The ethical clearance was obtained from the Ministry of Health Adamawa State, Nigeria. Approval was also obtained from the village heads, and also the Health workers. Informed consent was sought from Head Master of each school and obtained from participants before samples were collected on each sampling day.

**RESULTS AND DISCUSSION**

**Human Contact with Water Bodies and Schistosomiasis**

Children and adults are known to get involved in water activities. The overall prevalence rate for schistosomiasis infection in the first ten (10) days after administration of praziquentel (PZQ) was 13.3% (Table 1) out of the 442 study participants examined. This report could be as a result of the drugs administered. This finding agrees with the report of Dejon-Agobé *et al*. (2019); he recorded egg reduction rate 93% and 95% few days after the first and the third dose of PZQ, respectively. In this study, male had the highest rate of 18.1% while female had 8.6%. For intensity of infection, female recorded high intensity of 0.9% while male 0.5%, very high intensity was recorded among males 0.5% while female had none, statistically there was significant difference ($p<0.05$). This result is in line with the findings of Anzaku *et al*. (2017), that infection in female subjects were significantly high (20.97%) than the male (16.74%) subjects on gender basis. Most studies shows no significant different on gender basis, though there might be slight difference in the number of participants (Anzaku *et al*. 2017). Socio demographic factors, culture in most regions in Nigeria has no strict restriction on the female gender visiting the water body because some domestic activities such as fetching water from the river and washing of clothes and plates are carried out mostly by the female gender and that exposed them to the parasite. In the study area, snail shells are used to wash pots. The age group 5 – 7 years had the highest prevalence rate of the infection 17.9% followed by the age group 8 – 10 years 14.9% while those in age group 11 – 13 years had the lowest prevalence rate of 11.4%. Intensity of infection shows that the age group 8-10 years had high intensity of 1.1% the lowest were age group 5-7 years and 14-16 years 0.0% respectively, very high intensity were still found among age group 8-10 years 0.6% but there was no significant difference as ($p>0.05$). Age group 5-18 years are more vulnerable to the infection due to their kind of activities while ages < 5 years are not allowed to visit the water body. Parents' level of education (PE) shows that, children whose parents had primary education had the highest prevalence rate 20.0% followed by children whose parents had no formal education with 14.5%, the least were children whose parents had tertiary education with prevalence rate of 11.3%, while for intensity of infection, children whose parents had secondary education had high intensity of 9.1% while others had 0.0%. And very high intensity of 0.4% were found among children whose parents had no formal education, others had 0.0%, statistically there was significant difference (p<0.05) in Parents' level of education but the children had equal access to the source of infection. Information recorded on parents' occupation (PO) reveals that, children whose parents are farmers had the highest infection of 15.2% followed by children whose parents are civil servants with 14.6%. The least infection rate was recorded among children whose parents are in to business 11.0%, children whose parent are farmers had high intensity of 1.9% others had 0.0% and 0.6% respectively. Very high intensity were found among children whose parent are into business 0.7%, others had 0.0% there was no significant difference (p>0.05).

Table 1: Association between Urogenital Schistosomiasis and some Socio-economic Factors

| Variables | No. examined | Not infected | No. infected | Intensity of infection | | | P-value |
|---|---|---|---|---|---|---|---|
| | | | | Low* | High** | Very high*** | |
| **Gender** | | | | | | | 0.007** |
| Male | 221(100) | 181(81.9) | 40(18.1) | 39(17.6) | 1(0.5) | 1(0.5) | |
| Female | 221(100) | 202(91.4) | 19(8.6) | 16(7.2) | 2(0.9) | 0(0.0) | |
| Total | 442(100) | 383(86.7) | 59(13.3) | 55(12.4) | 3(0.7) | 1(0.2) | |
| **Age** | | | | | | | 0.851* |
| 5-7 | 39(100) | 32(82.0) | 7(17.9) | 7(17.9) | 0(0.0) | 0(0.0) | |
| 8-10 | 175(100) | 149(85.1) | 26(14.9) | 23(13.1) | 2(1.1) | 1(0.6) | |
| 11-13 | 202(100) | 179(88.6) | 23(11.4) | 22(10.9) | 1(0.5) | 0(0.0) | |
| 14-16 | 26(100) | 23(88.5) | 3(11.5) | 3(11.5) | 0(0.0) | 0(0.0) | |
| Total | 442(100) | 383(86.7) | 59(13.3) | 55(12.4) | 3(0.7) | 1(0.2) | |
| **Parent Education** | | | | | | | 0.023** |
| Non formal | 248(100) | 212(85.5) | 36(14.5) | 35(14.1) | 0(0.0) | 1(0.4) | |
| Primary | 10(100) | 8(80.0) | 2(20.0) | 2(20.0) | 0(0.0) | 0(0.0) | |
| Secondary | 33(100) | 29(87.8) | 4(12.2) | 2(6.1) | 3(9.1) | 0(0.0) | |
| Tertiary | 151(100) | 134(84.8) | 17(11.3) | 17(11.3) | 0(0.0) | 0(0.0) | |
| Total | 442(100) | 383(86.7) | 59(13.3) | 55(12.4) | 3(0.7) | 1(0.2) | |
| **Parent Occupation** | | | | | | | 0.647* |
| Business | 136(100) | 121(89.0) | 15(11.0) | 14(10.3) | 0(0.0) | 1(0.7) | |
| Civil Servant | 157(100) | 134(85.4) | 23(14.6) | 22(14.0) | 1(0.6) | 0(0.0) | |
| Farmer | 105(100) | 89(84.8) | 16(15.2) | 14(13.3) | 2(1.9) | 0(0.0) | |
| Fishing | 44(100) | 39(88.6) | 5(11.4) | 5(11.4) | 0(0.0) | 0(0.0) | |
| Total | 442(100) | 383(86.7) | 59(13.3) | 55(12.4) | 3(0.7) | 1(0.2) | |

Key: * means p>0.05, ** means p<0.05 and *** means p<0.01

Table 2 reveals information on praziquentel administered, water contact and snail contact. Children that refused to take praziquentel had the highest prevalence of 25.0% and very high intensity of infection 1.7% while those that admitted to taking praziquentel had low prevalence of 11.5% and 0.8% for high intensity, statistically there was significant difference (p<0.05). Participants that did not admit to picking snails had the highest rate of 13.8% and 0.6% for very high intensity while those that admitted to picking snails had prevalence of 13.1% and high intensity of 1.1%; there was no significant difference as (p>0.05).

Table 2: Association between Urogenital Schistosomiasis and Praziquentel, Picking of Snails and Water Contact

| Variables | No. examined | Not infected | No. infected | Intensity of infection | | | P-value |
|---|---|---|---|---|---|---|---|
| | | | | Low* | High** | Very high*** | |
| **Preziquentel** | | | | | | | 0.038** |
| Yes | 382(100) | 338(88.5) | 44(11.5) | 41(10.7) | 3(0.8) | 0(0.0) | |
| No | 60(100) | 45(75.0) | 15(25.0) | 14(23.3) | 0(0.0) | 1(1.7) | |
| Total | 442(100) | 383(86.7) | 59(13.3) | 55(12.4) | 3(0.8) | 1(0.2) | |
| **Picking snails** | | | | | | | 0.304* |
| Yes | 268(100) | 233(86.9) | 35(13.1) | 32(11.9) | 3(1.1) | 0(0.0) | |
| No | 174(100) | 150(86.2) | 24(13.8) | 23(13.2) | 0(0.0) | 1(0.6) | |
| Total | 442(100) | 383(86.7) | 59(13.3) | 55(12.4) | 3(0.8) | 1(0.2) | |
| **Washing** | | | | | | | 0.092* |
| Yes | 62(100) | 60(96.8) | 2(3.2) | 2(3.2) | 0(0.0) | 0(0.0) | |
| No | 380(100) | 323(85.0) | 57(15.0) | 53(13.9) | 3(0.8) | 1(0.3) | |
| Total | 442(100) | 383(86.7) | 59(13.3) | 55(12.4) | 3(0.8) | 1(0.2) | |
| **BS** | | | | | | | 0.821* |
| Yes | 13(100) | 12(92.3) | 1(7.7) | 1(7.7) | 0(0.0) | 0(0.0) | |
| No | 429(100) | 371(86.5) | 58(13.5) | 54(12.6) | 3(0.7) | 1(0.2) | |
| Total | 442(100) | 383(86.7) | 59(13.3) | 55(12.4) | 3(0.8) | 1(0.2) | |
| **WBS** | | | | | | | 0.647* |
| Yes | 65(100) | 58(89.2) | 7(10.8) | 7(10.8) | 0(0.0) | 0(0.0) | |
| No | 377(100) | 325(86.2) | 52(13.8) | 48(12.7) | 3(0.8) | 1(0.3) | |
| Total | 442(100) | 383(86.7) | 59(13.3) | 55(12.4) | 3(0.8) | 1(0.2) | |
| **WBSD** | | | | | | | 0.011** |
| Yes | 283(100) | 234(82.7) | 49(17.3) | 45(15.9) | 3(1.1) | 1(0.4) | |
| No | 159(100) | 149(93.7) | 10(6.3) | 10(6.3) | 0(0.0) | 0(0.0) | |
| Total | 442(100) | 383(86.7) | 59(13.3) | 55(12.4) | 3(0.8) | 1(0.2) | |
| **None** | | | | | | | 0.000*** |
| Yes | 19(100) | 19(100) | 0(0.0) | 0(0.0) | 0(0.0) | 0(0.0) | |
| No | 423(100) | 364(86.0) | 59(13.9) | 55(13.0) | 3(0.7) | 1(0.2) | |
| **Total** | 442(100) | 383(86.7) | 59(13.3) | 55(12.4) | 3(0.8) | 1(0.2) | |

Key: * means $p>0.05$, ** means $p<0.05$ and *** means $p<0.01$

Participants that do not wash in the water body had the highest prevalence (15.0%) and high intensity (0.8%) and very high intensity (0.3%) while those that wash had the lowest prevalence and intensity of 3.2% and 0.0% respectively, and there was no significant difference ($p>0.05$). Participant that do not bath and swim in the water body had the highest infection rate of 13.5% and high intensity of 0.7% and very high intensity of 0.2% while participant that bath and swim had the lowest infection rate and intensity of 7.7% and 0.0% respectively, there was no significant difference as ($p>0.05$). Participants that do not Wash/Bath/Swim (WBS) had the highest infection rate of 13.8%, high intensity (0.8%) and very high intensity (0.3%) while those that WBS had the lowest infection rate of 10.8% and no intensity was recorded, therefore, there was no significant difference as ($p>0.05$). Participants who chose (Yes) for Washing/Bathing/Swimming/Drinking (WBSD) had the highest prevalence (17.3%) and high intensity (1.1%) and very high intensity (0.4%) while participant that do not WBSD had the lowest prevalence and intensity of 6.3% and 0.0% respectively, ($p<0.05$). For those that chose none of the above had 0.0% prevalence and intensity while participant that chose other options had the highest prevalence (13.9%) and high intensity (0.7%) and very high (0.2%), statistically there was significant difference ($p<0.05$). The prevalence rate was low generally due to the administration of praziquentel ten (10) days before urine samples were collected for microscopy.

**Schistosomiasis Re-infection**

Out of the 442 study participants examined, the overall prevalence rate for schistosomiasis re-infection after six (6) months was 52.0% (Table 3 and 4). This finding agrees with the report of Dejon-Agobé *et al*. (2019); who recorded 25% re-infection rate at nine (9) months post-treatment. This is higher than what has been reported by Senghor *et al*. (2015) among children living in a low-transmission area in Senegal two to three months after treatment. The risk of infection is highest amongst those who lived near lakes or rivers (Kabatereine et al., 2004). The findings of Njaanake *et al*. (2016) on *S. haematobium* and soil-transmitted Helminths also showed high prevalences (94%) of *S. haematobium* infection. Schistosomiasis re-infection is common in areas with moderate or high risk (Kabuyaya *et al*., 2017). Male had the highest rate of infection (52.9%) while female had (51.1%). The intensity of infection shows that male had high intensity of 12.7% and very high intensity of 5.4% while female had (6.8%) and (3.6%) respectively, statistically there was no significant difference ($p>0.05$). The result in this study disagrees with the finding of Dawaki *et al*. (2016) who reported that infection rate was significantly higher among male than female (20.6% vs 13.3%; $p=0.029$) but similar to the findings of Anzaku *et al*. (2017) who reported that though female subjects had high prevalence (20.97%) than the male (16.74%) subjects on gender basis, there was no significant difference. Similar report by Mbata *et al*. (2009) showed that there was no sharp difference between the rate of infection between the males (23.13%) and the females (22.53%). This is apparently due to equal exposure to the risk factors as there were no limitations on movement and water contact activities between the genders (Anzaku *et al*., 2017). Ekejindu *et al*. (2002) reported that prevalence and intensity of infection is significantly higher in males (29.4%) than in females (21.1%) even though both males and females are exposed to the same water bodies, this report agrees with the findings in this study. High prevalence in male was due to prolonged swimming than females who may be processing their food outside. The age group 11 – 13 years had the highest prevalence rate of 61.4% followed by the age group 14– 16 years 50.0% while those in age group 5 – 7 years had the lowest prevalence rate of 35.9%. The age group 14-16 years recorded high intensity of 11.5% the lowest was age group 11-13 years with 9.3%. Age group 8-10 years recorded very high intensity of 5.7% the lowest was age group 11-13 years. Statistically there was significant difference as ($p<0.05$). This results agrees with the result of Dawaki *et al*. (2016) who recorded that the age 11-20 years had the highest prevalence (27.4%) while children aged ≤ 10 years had the lowest prevalence (10.7%) but disagrees with the report of Anzaku *et al*. (2017) that recorded highest (11.94%) occurrence in age bracket 5-10 years. In this research, the age group 14-16 years recorded high intensity of 11.5%, the lowest was age group 11-13 years with 9.3%. Age group 8-10 years recorded very high intensity of 5.7% the lowest was age group 11-13 years. Stecher *et al*. (2017) recorded that *S. haematobium* prevalence (79.8%) and infection is likely to impact on child growth and possibly also anemia in all age groups. With regards to age, Khalid et al. (2018) reported that children aged between 10 and 13 years were the most infected with an infection rate of 81.8% compared with the other age groups, his report is in line with the findings in this research. Nale *et al*. (2003) recorded (70%) of the daily egg output excreted into the environment was contributed by children between the ages of 10-19yrs. Water pollution with schistosome eggs is more in school age children. Parent level of education (PE) shows that, children whose parents had primary education had the highest prevalence of 60.0% followed by children whose parent had no formal education with 54.8%, the least were children whose parent had tertiary education with prevalence rate of 46.4% while for intensity of infection, children whose parent had tertiary education had high intensity 10.6%, the lowest 9.1% were children whose parent had secondary education and very high intensity of 9.1% were found among children whose parent had secondary education, the lowest 0.0% were children whose parent had primary education, statistically there was no significant difference ($p>0.05$). Information recorded on parent occupation (PO) reveals that, children whose parents are fishermen had the highest infection of 72.7% followed by children whose parents are farmers with 61.9%. The least infection rate was recorded among children whose parents are in to business 44.9%, children whose parent are farmers had high intensity of 13.3%, the lowest 6.8% were children whose parent are in to fishing. Very high intensity were found among children whose parent are into fishing (6.8%), lowest was among children whose parents are in to business (3.7%), there was significant difference ($p<0.05$). Similar report by Okanla *et al*. (2003), shows that parental occupation is also an important epidemiological factor, children of civil servants exhibited less prevalence rate 22.4% than those who do other jobs with a prevalence of 49.3%. Daniel et al. (2001) recorded a high prevalence rate of 75.3% in farmers, compared to public servants (35.9%). Table 4 shows that children who refused to take praziquentel had the highest infection rate of 73.2% and high intensity (40.2%) and very high intensity (6.1%) while those that took the drug had lower prevalence (47.2%) and high intensity (2.8%) and very high intensity (4.2%) statistically, there was significant difference ($p<0.05$). Those that admitted picking of snails had the highest prevalence of 62.6% and high intensity (9.9%) and very high intensity (5.3%) while those that do not pick snails had lower prevalence of 39.2% and high intensity of 9.5% and very high intensity of 3.5%; there was significant difference as ($p<0.05$). Those that do not wash in the water body had the highest infection rate of 56.6% and high intensity (10.4%) and very high intensity (5.2%) while participants that wash in the water body had lower prevalence of 21.1% and high intensity (5.3%), there was significant difference as ($p<0.05$). For Bathing/Swimming (BS), participant that do not only bath and swim in the water body had the highest infection rate of 52.2% while participant that BS had the lowest infection rate of 44.4%. High intensity of 9.9% was found among those participate that do not only bath and swim in the water body and very high intensity was among those that bath and swim in the water body, there was significant difference as ($p<0.05$). Participant who do not only do the following Washing/Bathing/Swimming (WBS) had the highest infection rate of 52.1% while those that only WBS had (51.6%), there was no significant difference as ($p>0.05$). Participants who do the following, Washing/Bathing/Swimming/Drinking (WBSD) had the highest prevalence of 65.7% and high intensity 12.3% and very high intensity 6.5% while participant who do not WBSD had the least prevalence 29.1%, least high intensity (5.5%) and least very high intensity (1.2%), there was significant difference as ($p<0.05$). Those that do not have contact with the water body had no infection while those that do all their domestic activities and also drink the water had the highest prevalence of 56.8% and high intensity 10.6% and very high intensity 4.9%, statistically there was significant difference ($p<0.05$). This result was similar to the findings of Nse *et al*. (2020) he reported high infection rate was found amongst participants who engaged in swimming, compared with other activities that involved contact with freshwater sources.

This result is similar to the findings of Daniel et al. (2001) who examined the relationship between water contact and infection and recorded a high prevalence rate of 94.3% due to swimming. Swimming is also an important factor of transmission regardless of gender. Emily *et al*. (2019) simulation-based study showed that achieving schistosomiasis morbidity reduction targets (<5% prevalence in children aged 5–14 years) with current WHO guidelines was going to be difficult in high-prevalence settings, but modified adaptive strategy could be more effective in achieving public health targets.

Table 3: Association between Urogenital Schistomiasis Re-infection and some Socio-economic Factors

| Parameters | No. examine | Not infected | No. infected | Intensity of the infection | | | P- value |
|---|---|---|---|---|---|---|---|
| | | | | Low* | High** | Very high*** | |
| **Gender** | | | | | | | 0.121* |
| Male | 221(100) | 104(47.1) | 117(52.9) | 77(34.8) | 28(12.7) | 12(5.4) | |
| Female | 221(100) | 108(48.9) | 113(51.1) | 90(40.7) | 15(6.8) | 8(3.6) | |
| Total | 442(100) | 212(48.0) | 230(52.0) | 167(37.8) | 43(9.7) | 20(4.5) | |
| **Age** | | | | | | | 0.023** |
| 5-7 | 39(100) | 25(64.1) | 14(35.9) | 8(20.5) | 4(10.3) | 2(5.1) | |
| 8-10 | 175(100) | 96(54.9) | 79(45.1) | 52(29.7) | 17(9.7) | 10(5.7) | |
| 11-13 | 202(100) | 78(38.6) | 124(61.4) | 98(48.5) | 19(9.3) | 7(3.5) | |
| 14-16 | 26(100) | 13(50.0) | 13(50.0) | 9(34.6) | 3(11.5) | 1(3.8) | |
| Total | 442(100) | 212(48.0) | 230(52.0) | 167(37.8) | 43(9.7) | 20(4.5) | |
| **Parent Education** | | | | | | | 0.637* |
| Non formal | 248(100) | 112(45.2) | 136(54.8) | 103(41.5) | 23(9.3) | 10(4.0) | |
| Primary | 10(100) | 4(40.0) | 6(60.0) | 5(50.0) | 1(10.0) | 0(0.0) | |
| Secondary | 33(100) | 15(45.5) | 18(54.5) | 12(36.4) | 3(9.1) | 3(9.1) | |
| Tertiary | 151(100) | 81(53.6) | 70(46.4) | 47(31.1) | 16(10.6) | 7(4.6) | |
| Total | 442(100) | 212(48.0) | 230(52.0) | 167(37.8) | 43(9.7) | 20(4.5) | |
| **Parent Occupation** | | | | | | | 0.014** |
| Business | 136(100 | 75(55.1) | 61(44.9) | 46(33.8) | 10(7.4) | 5(3.7) | |
| Civil Servant | 157(100) | 85(54.1) | 72(45.9) | 49(31.2) | 16(10.2) | 7(4.5) | |
| Farmer | 105(100) | 40(38.1) | 65(61.9) | 46(43.8) | 14(13.3) | 5(4.8) | |
| Fishing | 44(100) | 12(27.3) | 32(72.7) | 26(59.1) | 3(6.8) | 3(6.8) | |
| Total | 442(100) | 212(48.0) | 230(52.0) | 167(37.8) | 43(9.7) | 20(4.5) | |

Key: * means p>0.05, ** means p<0.05 and *** means p<0.01

Table 4: Association between Urogenital Schistomiasis Re-infection and Praziquentel, Picking of Snails, and Water Contact

| Parameters | No. examined | Not infected | No. infected | Intensity of infection | | | P-value |
|---|---|---|---|---|---|---|---|
| | | | | Low* | High** | Very high*** | |
| **Preziquentel** | | | | | | | 0.055* |
| Yes | 360(100) | 190(52.8) | 170(47.2) | 145(40.3) | 10(2.8) | 15(4.2) | |
| No | 82(100) | 22(26.8) | 60(73.2) | 22(26.8) | 33(40.2) | 5(6.1) | |
| Total | 442(100) | 212(48.0) | 230(52.0) | 167(37.8) | 43(9.7) | 20(4.5) | |
| **Picking snails** | | | | | | | 0.038** |
| Yes | 243(100) | 91(37.4) | 152(62.6) | 115(47.3) | 24(9.9) | 13(5.3) | |
| No | 199(100) | 121(60.8) | 78(39.2) | 52(26.1) | 19(9.5) | 7(3.5) | |
| Total | 442(100) | 212(48.0) | 230(52.0) | 167(37.8) | 43(9.7) | 20(4.5) | |
| **Washing** | | | | | | | 0.000*** |
| Yes | 57(100) | 45(78.9) | 12(21.1) | 9(15.8) | 3(5.3) | 0(0.0) | |
| No | 385(100) | 167(43.4) | 218(56.6) | 158(41.0) | 40(10.4) | 20(5.2) | |
| Total | 442(100) | 212(48.0) | 230(52.0) | 167(37.8) | 43(9.7) | 20(4.5) | |
| **BS** | | | | | | | 0.030* |
| Yes | 9(100) | 5(55.6) | 4(44.4) | 3(33.3) | 0(0.0) | 1(11.1) | |
| No | 433(100) | 207(47.8) | 226(52.2) | 164(37.8) | 43(9.9) | 19(4.4) | |
| Total | 442(100) | 212(48.0) | 230(52.0) | 167(37.8) | 43(9.7) | 20(4.5) | |
| **WBS** | | | | | | | 0.647* |
| Yes | 62(100) | 30(48.4) | 32(51.6) | 25(40.3) | 6(9.7) | 1(1.6) | |
| No | 380(100) | 182(47.9) | 198(52.1) | 142(37.4) | 37(9.7) | 19(5.0) | |
| Total | 442(100) | 212(48.0) | 230(52.0) | 167(37.8) | 43(9.7) | 20(4.5) | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **WBSD** | | | | | | | 0.000*** |
| Yes | 277(100) | 95(34.3) | 182(65.7) | 130(46.9) | 34(12.3) | 18(6.5) | |
| No | 165(100) | 117(70.9) | 48(29.1) | 37(22.4) | 9(5.5) | 2(1.2) | |
| Total | 442(100) | 212(48.0) | 230(52.0) | 167(37.8) | 43(9.7) | 20(4.5) | |
| **None** | | | | | | | 0.000*** |
| Yes | 37(100) | 37(100) | 0(0.0) | 0(0.0) | 0(0.0) | 0(0.0) | |
| No | 405(100) | 175(43.2) | 230(56.8) | 167(41.2) | 43(10.6) | 20(4.9) | |
| Total | 442(100) | 212(48.0) | 230(52.0) | 167(37.8) | 43(9.7) | 20(4.5) | |

Key: * means p>0.05, ** means p<0.05 and *** means p<0.01

## CONCLUSION

The results obtained show that there was equal exposure to the source of infection irrespective of age gender, parents' occupation and education. The socio cultural behavior of the people also promotes the spread of *S. haematobium*. The intervention method was not effective as the re-infection rate was high six (6) months after the intervention.

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