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Schistosoma haematobium Infection among the Students of Government Day Junior Secondary School Garki, Jigawa-Nigeria

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Abstract

Schistosomiasis is among the most prevalent but neglected tropical diseases (NTDs). It is a human disease caused by the parasitic infection of the blood trematode worm belonging to the family Schistosomatidae A descriptive cross-sectional study was carried out to evaluate the prevalence and intensity of *Schistosoma haematobium* infection among the students of the Government Day Junior Secondary School (GDJSS) Garki in Jigawa State for a period of 17 days. A total of 120 students from class 1-3, who randomly participated in the study, were diagnosed for the *S. haematobium* infection. The intensity of the infection was assessed by counting and recording the number of eggs present in the 10ml urine samples of the positive individuals. The results obtained showed a 25% prevalence of the *S. haematobium* infection among the students. The students in contact with the water bodies in the community were infected more as compared to the students who did not have any contact with the water bodies (odd ratio = 0.002). The positive predictive value recorded at 93.3% quantified the diagnostic test employed (syringe filtration method) and the negative predictive value of 97.8% showed that the prevalence of *S. haematobium* infection was marginal among the student population. The gender of the students did not relate significantly ($p < 0.05$) with the results of the diagnosis, as more male students were infected than female students (odd ratio = 1.455). The students' age group related significantly ($p < 0.05$) with the results and the students of the age group 14-15 years were more infected than those of the age group 12-13 years (odd ratio = 0.337). There were many more eggs in the urine samples of the positive students than the Poisson distribution would predict. Therefore, the model assumes that the intensity of *S. haematobium* infection is very high and thus the students should be treated and prevented from further exposure.

Keywords: intensity, Jigawa, prevalence, *Schistosoma haemtobium*, urine sample

1. Introduction

Schistosomiasis is among the most prevalent neglected tropical diseases (NTDs). It is a human disease caused by the parasitic infection of the blood trematode worm belonging to the family Schistosomatidae [1] and genus *Schistosoma*. In the tropical and subtropical regions of the world, about 77 emerging countries consider Schistosomiasis as a major public health setback [2, 3]. Worldwide estimation shows that more than 240 million people are infected and another 700 million people bear the risk of infection [4]. Approximately 90% of the infected population is reportedly in found in the sub-Saharan Africa with more or less 300,000 deaths, annually [5, 6]. In Nigeria, the prevalence level of urinary Schistosomiasis is in the range of 2% and 90% in rural and urban communities respectively, infecting more of the poor

and the unheeded groups of people [7]. Previous studies reported 29 million cases of urinary Schistosomiasis and 101 million people bearing the risk of infection in the country. However, recent information has shown a rapid increase of the infection in all geographical zones of the country, mainly among school children [8]. The prevalence and morbidity of Schistosomiasis are higher more among the school children, adolescents and young adults [9]. The untreated infection has a negative impact on school performance and the weakening of individuals depresses the social and economic development in the endemic area [6]. Epidemiological studies associated sustainable infection in many endemic areas to many causes which include human behavior, regular agricultural practices and unsuccessful water projects [10]. The transmission of this infection is facilitated by sociocultural factors such as fishing, washing and recreational activities in fresh water containing the infected snail; indeed, in the rural areas of Nigeria such practices are very common [11]. This study, therefore, aims to determine the prevalence and intensity model of *Schistosoma haematobium* among the students of GDJSS Garki.

2. Materials and Method

2.1. Study Area

The urine samples for the study were collected from the students of GDJSS Garki, Jigawa-Nigeria. The school is located in the Garki Local Government Area of Jigawa State, at longitude 12° 26' 10" N and latitude 9° 11' 25" E. The urine samples were analyzed in the laboratory of the Garki Primary Health Care Hospital in pathology laboratory bench. The hospital is located close to the school.

2.2. Population Size and Sampling

A total of one hundred and twenty (120) students were randomly selected from class 1-3. They included ninety (90) males and thirty (30) female students in the age range of 12-15 years. The fact that the sample contained fewer female students as compared to male students is attributed to their fewer number in the school, as most of girls in the community get married in this age range.

2.3. Study Design

The current research is a descriptive cross-sectional study about the incidence of *S. haematobium* infection among the students of GDJSS Garki in Jigawa State. It was carried out from 15th December, 2017 to 2nd January, 2018.

2.4. Ethical Clearance

Ethical approval for the current research with the assigned reference number PHDA/PER/819/1/3 dated 13th December, 2017 was obtained from the ethical committee, Jigawa State Ministry of Health, and the Primary Health Care Development Agency. The study was conducted in accordance with the universal ethical principles. Before the commencement of the study, approval was obtained from the school and the informed consent of all the individuals who participated in the study was sought and secured.

2.5. Urine Sample Collection

The standard procedure of World Health Organization (WHO) [12] was adopted with slight modification for the collection of urine samples from the students. The students were sensitized about the urine collection with the aid of their teachers and the samples were collected on the same day. They contained a single terminal urine sample

of at least 10ml in a wide mouth, transparent, and caped plastic container. Each container was labeled with the respective student's demographic information such as sex, age and identification number. All samples were immediately transported to Garki Primary Health Care laboratory for diagnosis.

2.6. Urine Preparation

Following the standard syringe filtration method prescribed by the WHO [12], the urine samples were prepared with slight modification. In each sample, a filter paper (No 1. Whatman) was folded and placed in a plastic funnel serving as the filter paper holder. The urine sample was agitated by filling and emptying a 10ml syringe twice before collecting the sample for filtration. Using the syringe, 10ml urine was drained and expelled onto the filter paper in the funnel over a sink. Air was drawn into the syringe and expelled onto the filter paper so as to remove the excess urine and to make sure that the eggs present attach with the filter paper in the funnel. Using a pair of scissors, the bottom side of the filter paper was cut and placed on a microscope slide. A drop of Lugol's iodine was placed on the filter paper for fifteen seconds, so that the stain penetrated the eggs.

2.7. Urine Examination

Urine examination was also performed according to the standard procedures of the WHO [12]. The stained filter on the slide was examined under a light microscope (Model: Olympus cx22Rx1) at low power objective (x40). *S. haematobium* eggs were seen clearly (stained orange) and they were counted and recorded.

2.8. Data Analysis

The collected information was subjected to sensitivity and specificity analysis. Chi square test was performed to evaluate the prevalence of *S. haematobium* infection. The number of *S. haematobium* eggs was subjected to the Poisson distribution in order to evaluate the ova distribution among the infected students. The sensitivity and specificity analysis and the Poisson probability were performed using the Statdisk statistical software (version 10.0.0) and the chi square test was performed using the WINKS statistical software (version 7.0.8).

3. Results

Table 1 shows the prevalence of *S. haematobium* among the student population of the study. A total of thirty students (25.0%) were diagnosed with the *S. haematobium* infection. Twenty-eight students (23.3%) reported restricted contact with the water bodies in the community through different activities, while two (1.7%) infected students reported free contact with the water bodies. Ninety students (75.0%) were tested negative for the infection, out of which eighty-eight students (73.3%) reported free contact with the water bodies and two students (1.7%) reported restricted contact with the water bodies. The prevalence of *S. haematobium* infection recorded among the students was twenty-five percent (25%) with the odd ratio of 0.002, the positive predictive value of 0.933 and the negative predictive value of 0.978.

Table 2 shows the number of male and female students of GDJSS Garki infected with *S. haematobium*. The number of male and female students examined during the study was ninety (75.0%) and thirty (25.0%), respectively.

Twenty-four (20.0%) male and six (5.0%) female students were diagnosed as positive for the infection. The relationship between the students' gender and the prevalence of *S. haematobium* infection did not differ significantly (p > 0.05). The odd ratio recorded was 1.455.

Table 3 shows the prevalence of *S. haematobium* infection among the various age groups of the students. A total of seventy-nine (65.9%) students were in the age group of 12-13 years, while forty-one (34.1) students were in the age group 14-15 years. Fourteen (11.7%) students of the age group 12-13 years and sixteen (13.3%) students of the age group 14-15 years were tested positive. There was a significant (p < 0.05) relationship between the age group of the students and the results of the diagnosis. The odd ratio recorded was 0.337.

Table 4 shows the intensity of *S. haematobium* infection among the students during the period of the study. A total of seven hundred and forty *S. haematobium* eggs were recorded in the 10ml urine samples of all the positive tested students. The urine samples of ninety students had no *S. haematobium* eggs in them. Three students had either 1 or 2 *S. haematobium* ova in their urine samples. Twenty-seven students had 3 or more *S. haematobium* eggs in their urine samples. There was an average of 1.117 eggs per 10ml of students' urine with a variance of 4.053

Table 1. Prevalence of *Schistosoma haematobium* infection in Relation to Contact with Contaminated Water

Test result	Contact with water bodies		
	Free%	Involved%	Total%
Positive result	1.7	23.3	25.0
Negative result	73.3	1.7	75.0
Total%	75.0	25.0	100.0
Sensitivity			0.933(93.3%)
Specificity			0.978(97.8%)
Prevalence:			0.250(25.0%)
Positive predictive value			0.933(93.3%)
Negative predictive value			0.978(97.8%)
Odd ratio			0.002

Table 2. Gender Wise Distribution of *Schistosoma haematobium* Infection

Test result	Students' Gender		
	Male%	Female%	Total%
Positive result	20.0	5.0	25.0
Negative result	55.0	20.0	75.0
Total%	75.0	25.0	100.0)
X^2			0.533
P value			0.466
Odd ratio			1.455

Table 3. Distribution of *Schistosoma haematobium* Infection according to the Age Group

Test result	Students' Age Group		
	12-13%	14-15%	Total%
Positive result	11.7	13.3	25.0
Negative result	54.2	20.8	75.0
Total%	65.9	34.1	100.0
X^2			6.533
P value			0.011
Odd ratio			0.337

Table 4. The Intensity (eggs/10ml of urine) of *Schistosoma haematobium* and Fit of Model

Number of eggs per urine sample	Frequency	Absolute expected frequency	Poisson probability (x)
0	90	39.94	0.3273
1	1	43.93	0.3656
2	2	24.16	0.2042
3	1	8.86	0.0760
4	4	2.44	0.0212
5+	22	0.54	0.0047
Total	120	119.90	

Mean = 1.117, $S^2 = 4.053$, S^2 = variance

4. Discussion

In the current study, the prevalence rate of *S. haematobium* infection among the students was found to be 25% which is higher than the national Nigerian average of 13% [12]. This is similar to the findings of Biu *et al*. [13]. They reported the prevalence rate of 24.3% among schoolchildren in Konduga Local Government Area, North Nigeria. Okwori *et al*. [14] reported the prevalence rate of 22.7% from the Local Government Education Authority Primary School Garagwa. In contrast, Ekpo *et al*. [15] reported a high prevalence rate of 58.1% among preschool children in a community near Abeokuta, South-western Nigeria. They also reported a relatively less high prevalence rate of 45.6% in the selected rural communities of the Kwara state, Nigeria [16]. However, Dawaki *et al*. [1]

reported a low prevalence rate of 17.8% among the Hausa community in the Kano state, 11.5% in the Adamawa state [17], 15.3% in the Ebony state [18], 17.4% in the Oyo state [19], and 18.7% in the Platue and Nasarawa states of Nigeria [20]. These differences could be attributed to ecological, social and cultural variations between these communities. The recorded odd ratio indicates that students having contact with water bodies through different activities such as swimming and washing are infected more than those that remain free of contact with the water bodies used in the community. This is in agreement with Okwori *et al*. [14] who reported a high prevalence of 60.6% in school children engaged in fishing. The positive predictive value points out the high quality of the diagnostic method employed for the evaluation of the *S.*

haematobium infection and the negative predictive value shows the marginalization of the *S. haematobium* infection among the student population.

The findings of this study show from the odd ratio that the male students were infected with *S. haematobium* more than the female students. This is consistent with the findings of Okwori *et al*. [14], who reported its prevalence in 60% of males. It is also consistent with the findings of the the previous studies carried out in Nigeria [18, 21, 22]. However, the low enrollment rate of girls in the schools of the community led to their lower participation in the study. Henceforth, demonstrating the low engagement of the girls in contact with the water bodies used in the society. This may be associated to the cultural and religious practices.

The study also had an odd ratio which indicated that the students of the age range 12-13 years were less infected with *S. haematobium* than the students of the age range 14-15 years. This is similar to the findings of Okwori *et al*. [14] who reported the highest prevalence rate of 62.8% among the age group of 10-14 years. Also, Dakul *et al*. [23] in the Plateau state reported the highest prevalence rate of 65.8% among the age group of 10-14 years.

The variation in the intensity of *S. haematobium* recorded in the current study is quite larger than the mean, indicating that the *S. haematobium* eggs are not distributed randomly or in a Poisson fashion in the urine samples of the students. Therefore, there are many more eggs in the urine samples of the positive tested students than the Poisson distribution would predict. The prevalence model assumes that the intensity of the *S. haematobium* infection is quite serious and it probably arises

either because the infected students are not treated or because of recurrent infection as a result of continued interaction with the contaminated water bodies used in the community. Hence, the students should be prevented from further exposure.

5. Conclusion

The prevalence of *S. haematobium* infection among the students was not too high but the intensity of the infection was predicted to be very serious among the students. Therefore, there is a need to treat and prevent the students from further exposure by educating the students about personal hygiene and the numerous ways of contracting the disease. Generally, in Nigeria, the disease should not be neglected by the stakeholders since it occurs at an alarming rate and has a high prevalence.

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