International Journal of Research Studies in Biosciences (IJRSB)
Volume 3, Issue 8, August 2015, PP 28-32
ISSN 2349-0357 (Print) & ISSN 2349-0365 (Online)
www.arcjournals.org

The Performance of School-Based Questionnaire of Reported Blood in Urine in Diagnosing *Schistosoma Haematobium* Infection in Ogun State

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Abstract*: A study was conducted in 2004 to investigate the performance of school-based questionnaire of reported blood in urine in diagnosing Schistosoma haematobium infection in 3 Local Government Areas of Ogun State in order to validate the effectiveness of questionnaire method in identifying infected schools. 513 primary school pupils aged 5-19 years were interviewed in 8 schools, of which 384 submitted urine samples for microhaematuria testing and parasitological diagnosis. The specificity, sensitivity and predictive value of the questionnaire method was tested against parasitological and microhaematuria methods. The specificity of the questionnaire method against parasitological diagnosis and microhaematuria testing was observed to be 0.5 and 0.43 in high risk, 0.70 and 0.69 in low risk and 0.78 and 0.79 in negative infection schools respectively. The sensitivity of the questionnaire was observed to be 0.75 in high risk schools while it performed poorly in low risk and negative infection schools. The positive predictive value of the questionnaire was 0.86 when compared with parasitological diagnosis in high risk schools. From the results obtained it can be concluded that the questionnaire has a high performance and can be adapted in diagnosing S. haematobium infection in schools.*

Keywords: *questionnaire, microhaematuria, parasitilogical, S. haematobium.*

1. INTRODUCTION

Schistosomiasis is a parasitic disease caused by trematodes belonging to the genus *Schistosoma.* It is the second most prevalent tropical disease and a leading cause of severe morbidity in several foci in Africa, Asia and South America (Rober, 1993). Over 200 million people who reside in rural and irrigated agricultural area are estimated to be infected, while between 500-600 million people are at risk (WHO, 1993). In such areas, poverty, ignorance, poor housing, deplorable hygienic practice and sanitary facilities are common (WHO, 1984).

Schistosomiasis is a complex parasitic infection acquired by man in a wide variety of fresh water habitats and transmitted by aquatic snail intermediate host of the genera *Bulinus* and *Biomphalaria.* The urinary form of the disease is caused by adult worms (*S. haematobium*) depositing eggs in blood vessels which supply the urinary bladder. Haematuria appears as the infection begins, especially in children. Damage to the urinary tract, including bladder cancer is sequel to the heavy infection in childhood (Ogbe, 1995). Haematuria is so common among children in endemic areas that it is accepted as part of development, a natural phase in puberty, particularly as no serious morbid conditions are apparent. The amount of blood loss is not sufficient to cause anaemia (Ukoli, 1995). Morbidity questionnaires have been used to identify high-risk schools for schistosomiasis control in Ogun State (Ekpo *et. al.*2002). The prevalence of *S.* haematobium has been compared with the prevalence of proteinuria and the history of previous haematuria (Akogun and Obadiah, 1996). This study investigates the performance of school-based questionnaires of reported blood in urine as an indicator of the prevalence of *S. haematobium* infection in Ogun State.

2. MATERIALS AND METHOD

The study was carried out in three (3) local government areas out of the 20 local government areas of the state. Ijebu East, Ijebu Nort and Ijebu North-East local government areas were selected for the study. A large proportion of the inhabitants are Yorubas with farming, timber logging and trading as their major occupation.

2.1. Selection of Study Schools

The coordinate mapping of selected schools in the three (3) local government areas was carried out using a Global Positioning System (GPS) to know the longitude, latitude and altitude of the schools in the area. From the list of schools eight (8) schools were selected across the three (3) local government areas, two (2) schools were selected from each L.G.A. except Ijebu North-East from which four (4) schools were selected. The selection was based on a previous survey for urinary schistosomiasis (Ekpo *et. al.,* 2002*)* which has classified schools into high risk, low risk and negative infection schools.

2.2. Ethical Consideration

Before the commencement of the study full approval was obtained from Ogun State Primary Education Board (SPEB) to carry out the research work on school pupils and the collection of urine samples.

2.3. Questionnaire administration

The questionnaire used was adapted from Ekpo *et.al.* (2002) with slight modification. The questionnaire was used to obtain information on name, sex, age, class and history or present blood in urine of pupils in classes 3-6. The pupils were interviewed in English and Local languages. The interview was done in a way that prevents communication between pupils. The school pupils were asked whether they have ever passed blood in urine (local term: Eje ninu ito) or have urinary schistosomiasis (local tern: Atosi aja). Responses were recorded as Yes or No.

2.4. Urine Collection

Based on the responses 50 (25 males and 25 females) pupils were randomly selected from each school. Each selected respondent was given a dark plastic container to provide the terminal urine between 1000 and 1300 hour. 1ml of 10% formalin was added to the urine sample to preserve the eggs and prevent urine odour. It was then transported to the laboratory for further examination.

2.5. Microhaematuria Testing

Rapid micro-haematuria testing was carried out on the urine sample by using Combi-screen $^{(R)}$ 9 urine test strip. The urine test strip was immersed into the urine for approximately 2 seconds. The reagent area on the strip was compared with the corresponding colour chart on the container about 60 seconds after immersion, the result was recorded.

2.6. Microscopic Examination for S. Haematobium Egg

The urine samples were processed using the sedimentation technique of Asaolu and Ofoezie 1988-1990. The urine was thoroughly mixed, 10ml aliquot was drawn and transferred into sterile bottle. It was screwed and allowed to stand upright for about 4 hour for the eggs to sediment by gravity. From the bottle, 9ml of the supernatant was carefully withdrawn using a needle and syringe. The residue was transferred onto a glass slide with few drops of iodine covered with cover slip and then examined microscopically using x40 objective lens to view and count the number of eggs of *S. haematobium.* Eggs were counted and recorded as eggs/10ml urine.

2.7. Data Management and Analysis

Questionnaire, parasitological and haematuria data were analysed using descriptive statistics. Performance of questionnaire was assessed by comparing the questionnaire response with the result of haematuria and parasitological examination. Diagnostic indices were calculated as sensitivity = True Positive test results/All patients with disease, specificity = True Negative/ All patients without disease, predictive value were calculated as negative predictive value = True Negative/ All negative and Positive predictive value = True Positive/All positive. Prevalence was calculated as all patients with disease/ All patients tested.

3. RESULTS

A total of five hundred and thirteen (513) pupils between the ages of 5-19 years were interviewed in eight (8) schools in Ijebu East, Ijebu North-East and Ijebu North Local Government Area of Ogun State. 250 pupils (48.7%) were males while 263 (51.3%) pupils were females.

3.1. Prevalence of Reported "Blood in Urine"

In Ijebu East L.G.A., of 134 pupils interviewed, 49 (36%) responded positively to the question "have you passed blood in urine" while 85 (64%) responded negatively to the same question. 277 pupils were interviewed in Ijebu North-East L.G.A., 55 (20%) reported Yes to blood in urine while 222 (80%) reported No to blood in urine. Of the 102 pupils interviewed in Ijebu North L.G.A., 25 (25%) reported passing blood in urine, while 77 (75%) reported not passing blood in urine (Table 1).

Table1. *Prevalence of reported "Blood in urine"*

L.G.A	No. of respondents	Reported blood in urine			
		Yes	%	No	%
Ijebu East	134	49	36	85	64
Ijebu North-East	277	55	20	222	80
Ijebu North	102	25	25	77	75
Total	**513**	**129**	**25**	**384**	**75**

3.2. Prevalence of Microhaematuria

384 pupils submitted terminal urine sample for microhaematuria test. 47 (12%) were positive for microhaematuria, while 337 (88%) were negative. In Ijebu East, 92 pupils were tested, 39 (42%) tested positive while 53 (58%) tested negative to microhaematuria test. Of 194 pupils tested in Ijebu North-East, 2 (1%) were positive, while 192 (99%) were negative.98 pupils were tested in Ijebu North, 6 (6%) tested positive to microhaematuria while 92 (94%) tested negative (Table 2).

Table2. *Prevalence of Microhaematuria*

L.G.A	No. of respondents	Microhaematuria				
		No. tested	+	%	_	%
Ijebu East	134	92	39	42	53	58
Ijebu North-East	277	194	2	1	192	99
Ijebu North	102	98	6	6	92	94
Total	**513**	**384**	**47**	**12**	**337**	**88**

3.3. Prevalence of S. Haematobium Ova

384 urine samples were screened for *S. haematobium* ova. 45 (11.7%) had *S. haematobium* infection, while 339 (88.3%) were uninfected. 16 (33.5%) had heavy infection that is >50 eggs/10mls urine. 40 (43%) of 92 pupils whose urine samples were examined in Ijebu East had the infection. There were no infected pupils in Ijebu North-East while 5 (5%) had the infection out of 98 pupils examined in Ijebu North L.G.A. (Table 3).

Table3. *Prevalence of Schistosoma haematobium ova*

L.G.A	No. of respondents	*Schistosoma haematobium*				
		No. tested	+	%	_	%
Ijebu East	134	92	40	43	52	57
Ijebu North-East	277	194	-	-	194	100
Ijebu North	102	98	5	5	93	95
Total	**513**	**384**	**45**	**48**	**339**	**88.2**

3.4. Questionnaire Diagnosis Versus Microhaematuria

Out of 384 that submitted terminal urine for microhaematuria test, 127 (33%) responded positively to the question "have you passed blood in urine" while 257 (67%) responded negative. 47 (12%) were positive for microhaematuria, while 337 (88%) were negative. 35 pupils (70%) out of 50 pupils interviewed in high risk schools responded positively to the question "have you passed blood in urine" and 36 (72%) positive to microhaematuria test. In low risk schools, 234 pupils were interviewed, 70 (30%) responded positively to the question and only 9 (4%) were positive for microhaematuria. Out of 100 pupils interviewed in negative infection schools, 22 (22%) pupils responded positively to the question while 2 (2%) were positive for microhaematuria (Table 4).

Table4. *Distribution of schools by level of endemicity for reported blood in urine and microhaematuria*

Level of endemicity	No. of schools	No. of pupils examined	Blood in urine		Microhaematuria	
			Yes (%)	No (%)	+ (%)	- (%)
High	1	50	35 (70)	15 (30)	36 (72)	14 (28)
Low	5	234	70 (30)	164 (70)	9 (4)	225 (96)
Negative	2	100	22 (22)	78 (78)	2 (2)	98 (98)
Total	**8**	**384**	**127 (33)**	**257 (67)**	**47 (12)**	**337 (88)**

3.5. Questionnaire Diagnosis Versus Parasitological Examination

In high risk school out of 50 pupils, 35 (70%) reported blood in urine, 40 (80%) were positive for *S. haematibium* ova, 10 (20%) were negative. In low risk schools, 234 pupils were interviewed, 70 (30%) reported passing blood in urine, 5 (2%) had *S. haematobium* ova. In negative infection schools, 100 pupils were interviewed, 22 (22%) reported blood in urine and there were no egg count (Table 5).

Table5. *Distribution of schools by level of endemicity for reported blood in urine and parasitological diagnosis*

Level of endemicity	No. of schools	No. of pupils examined	Blood in urine		Parasitological diagnosis	
			Yes (%)	No (%)	+ (%)	- (%)
High	1	50	35 (70)	15 (30)	36 (72)	14 (28)
Low	5	234	70 (30)	164 (70)	9 (4)	225 (96)
Negative	2	100	22 (22)	78 (78)	2 (2)	98 (98)
Total	**8**	**384**	**127 (33)**	**257 (67)**	**47 (12)**	**337 (88)**

3.6. Diagnostic Performance of Questionnaire

The sensitivity, specificity and predictive value of questionnaire versus parasitological diagnosis and questionnaire versus haematuria were computed using 2 by 2 table. In high risk school, the questionnaire method performance was high with a sensitivity of 0.75 against parasitological diagnosis and haematuria test. It however, performed poorly in low risk and negative infection schools. Specificity ranges between 0.50 and 0.79 across the three levels of endemicity. The negative predictive value was lowest in high risk school, while it was high in low risk and negative infection schools, positive predictive values was high in high risk school and it performance was poor in low risk and negative infection schools (Table 6).

Table6. *Diagnostic performance of questionnaire in high, low and negative infection schools.*

Diagnostic Parameters	High risk school		Low risk school		Negative infection school	
	Q vs. P	Q vs. H	Q vs. P	Q vs. H	Q vs. P	Q vs. H
Sensitivity	0.75	0.75	0.20	0.11	0.00	0.50
Specificity	0.50	0.43	0.70	0.69	0.78	0.79
Negative predictive value	0.33	0.40	0.98	0.95	1.00	0.99
Positive predictive value	0.86	0.77	0.01	0.01	0.00	0.05

4. DISCUSSION

Questionnaires are considered attractive in terms of its relative simplicity, low cost and fast response in diagnosing schools with high prevalence of *S. haematobium* infection (Helen *et. al.*, 1999). The use of interviews to elicit a history of haematuria is an appealing approach to identify infected individuals of *S. haematobium* infection because of its low cost (Poggensee *et. al.*, 2000). However, in persons with light infections, haematuria is a frequent but not a constant indicator of urinary schistosomiasis (Feldmeier *et. al.*, 1993).

In high risk schools, the prevalence of reported blood in urine was lower than microhaematuria while the prevalence of parasitological diagnosis was highest which means that in high risk school, reported blood in urine and microhaematuria test under estimates *S. haematobium* infection. For low risk schools, the prevalence of reported blood in urine was higher than that of *S. haematobium* ova count, while in negative infection schools, the prevalence of reported blood in urine was moderately high and *S. haematobium* infection was negative. This means that in low and negative infected schools, reported blood in urine cannot be used to identify infected pupils.

The use of questionnaire to determine infected pupils in high risk school was highly sensitive with a value of 0.75, while in low and negative infected schools, it performed poorly. This result supports the report of Helen *et. al.*, (1999) that reported blood in urine cannot be used in low and negative infection schools to diagnose infected pupils. The questionnaire method will need to be complemented by either reagent strip test for microhaematuria or parasitological screening for *S. haematobium* ova.

The low specificity value on high risk schools as compared to low and negative infection school implies that the ability of the questionnaire to distinguish between infected and non-infected individuals in high risk schools is very poor but effective in low and negative infection schools.

The probability of the questionnaire to predict disease among patients with positive test and no disease among patients with negative test varies among the three levels of endemicity. It is high in

high risk school and low in low and negative infection schools. The negative predictive value was low in high risk school and high for low and negative infection schools.

5. CONCLUSION

This study shows that the use of questionnaire in diagnosing infected schools is an effective approach. However, it is most effective in high risk school and can be used alone while in low risk and negative infection schools other methods such as microhaematuria testing and parasitological diagnosis should be employed alongside questionnaire to identify infected individuals.

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