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RAPID SCREENING OF URINARY SCHISTOSOMIASIS USING A SIMPLE QUESTIONNAIRE: EAST NILE LOCALITY, KHARTOUM STATE, SUDAN

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ABSTRACT

Background: The use of simple questionnaire to identify communities at highest risk of *Schistosoma haematobium* infection has proven to be very effective in many countries. The success of this approach arises from the fact that *urinary Schistosomiasis is generally* well recognized among health care providers as well as patients by presence of blood in urine. The objective of the current study was to assess the diagnostic performance of simple questionnaire for rapid screening of urinary Schistosomiasis in East Nile locality in Khartoum, Sudan. **Methodology:** Descriptive study was conducted in East Nile locality in Khartoum State, Sudan among children aged 10-15 years. The Sample size was calculated as chosen randomly from 7 schools. A questionnaire was used to record the presence of blood in urine of the children under study. Golden standard sedimentation method for detection of urinary Schistosomiasis was used. The data was analyzed using SPSS. Ethical approval and verbal consent was obtained. **Results:** Percentage of hematuria in the study population by questionnaire and by laboratory examination were nearly the same 91(26.5%) and 94(27.3%) respectively. Cross tabulation of hematuria against presence of schistosoma eggs in urine revealed sensitivity, specificity, positive and negative predictive values as 55.6%, 80%, 43% and 86.9% respectively. **Conclusion:** Questionnaire was found to be rapid, with high diagnostic performance in detecting communities at risk of having urinary Schistosomiasis.

KEY WARDS: Urinary Schistosomiasis, hematuria, rapid screening.

INTRODUCTION

Schistosomiasis is collective name for the clinical syndrome resulting from infection with parasitic helminthes of the family Schistosomatidae.[1] The condition is the second most prevalent tropical disease after malaria in term of socioeconomic and public health importance in developing countries, and it is the leading cause of severe morbidity in large areas of the world.[2] Schistosoma haematobium (urinary Schistosomiasis) is a disease that severely influences and deforms the urinary bladder, the urethra and the kidneys.[3] Hematuria, anemia and under nutrition are correlates of infection in childhood.[1] Schistosoma haematobium is endemic in all parts of Sudan with exception of the Red Sea State , but the prevalence is higher in West and North Sudan.[4] Schistosomiasis started to be a problem in Khartoum due to the migration of people from endemic areas, in addition to the establishment of the irrigated schemes. Both Schistosoma Haematobium and Schistosoma Mansoni were reported in Khartoum since 1992.[5] A sustained Schistosoma Control Program was established in Khartoum State in 1996.[6]

The use of simple questionnaire to identify communities at highest risk of Schistsoma haematobium infection has proven to be very effective in more than ten African countries with different levels of endemicity. The success of questionnaire approach for urinary schistosomiasis arises because Schistsoma haematobium generally is well recognized for health worker by specific and sensitive symptom i.e. the presence of blood in urine.[7] Based on the success of this indirect questionnaire approach, simple guidelines for its use were drawn up by the World Health Organization[8], the aim was to equip district health mangers with this powerful tool, so that they could apply it in a step –wise approach for /diagnosis of Schistosomiasis in School Children.[7]

Although blood in urine (haematuria) has been associated with S. haematobium for a very long time, it was only 19 years ago when Mot assessed the usefulness of asking children in Ghana and Zambia about the presence of blood in urine as an indirect diagnosis of infection.[8] However, interviewer bias and considerable variation in results between the two epidemiological

settings raised concern about the reliability of this approach.[9, 10] Later this method was validated with success in seven other African countries with-in the frame work of a WHO/TDR supported multi-country study.[10, 11] Highly significant correlation was found between the proportion of children reporting blood in urine and the proportion of S. haematobium infected children.[10] Most of the previously reported questionnaires were used to identify high-risk communities by interviewing school children, with the questions mainly focusing on early clinical symptoms of Schistosomiasis.[10, 11]

The control of Schistosomiasis in other parts of Sudan dated back to 1979 by introduction of the Blue Nile Health Project in Gezira and Elrahad schemes when the agreement was signed by the Government of Sudan and the WHO, the project was expected to take ten years to achieve a stable, economical level of control over schistosomiasis and malaria in the population of over two million people.[12-14]

Epidemiological screening represents the initial step towards implementation of morbidity control programs based on chemotherapy. Within endemic countries, high-risk areas need to be defined, either on the basis of existing health statistics or possibly with the use of remotely sensed environmental data.

High risk communities in these areas need to be identified and questionnaires are an attractive screening tool for this purpose because they are well accepted, rapid, relatively reliable and inexpensive. Responses to such simple questions are likely to reflect the ability of the questionnaire to detect urinary schistosomiasis.

The aim of this study was to evaluate the diagnostic performance of simple school questionnaire for rapid screening of urinary schistosomiasis in East Nile locality-Khartoum-Sudan

METHODOLOGY

Descriptive, cross-sectional and school-based study was conducted in East Nile locality in Khartoum State, Sudan. The study population was the Primary school children aged 10-15 years residing in the area and who did not receive prazequantil as treatment of schistosomiasis for the last four months. The Sample size was calculated as 345 chosen by simple random sampling from 7 schools in the areas.

A questionnaire was used to record the presence of blood in urine in each child. Children were interviewed by the researchers and their answers were recorded. The questionnaire was similar to that used in 10 African countries (the red urine group).[15] The questionnaire covered the following areas: population structure, environmental setting and presence of blood in urine. The questionnaire was pre-tested in two schools other than the ones in which data was collected but in the same area. Thirty questionnaires were distributed randomly for 15 girls and 15 boys aged 10-15 years who didn't receive prezequantil during the last 6 month. After the pretest no modification made to the questionnaire. Golden standard sedimentation method for detection of urinary Schistosomiasis was used. Ten mills of urine at mid-day after running for 5 minutes were taken. The urine was centrifuged for 10 minutes using the manual centrifuge. Pasture pipette was used to discard the urine leaving the precipitate with small amount of urine; this precipitate was put in slide and covered with cover glass. The deposit was tested for presence of Schistosoma haematobium egg. The slides were examined under the microscope using X 40 power. Presence of Schistosoma eggs were reported in a sheet. The urine was also tested for detection of hematuria using reagent strips (Combi screen urine tests strips) and the result was recorded on a laboratory sheet. The test is based on the peroxidase-like activity of hemoglobin which catalyses the oxidation of the indicator in the presence of organic peroxide on the test pad. The label shows two color scales for the detection of intact erythrocyte and free hemoglobin. The test is sensitive to free hemoglobin and may detect concentration corresponding to approx. 5 Ery/µL equivalents to approx. 0.015 mg hemoglobin/dl urine. Fresh well-mixed un-centrifuged urine is collected in clean container. The test strip was emerged in the urine for two seconds. The reagent area on the strip was compared with the corresponding color chart on the container about 60 seconds after immersion and the reading is recorded as positive or negative.

Data obtained was analyzed using the Statistical Package for Social Sciences (SPSS), version 20.

Ethical approval was obtained from Khartoum State Ministry of Health Research Ethics Committee. All positive children were treated (single oral dose of prezequantil 40 mg/kg). The purpose and outcome of the study were explained to the selected children. Permission from the Schools' headmaster was taken and verbal consent from children's parents/guardian was obtained. The data was kept confidential and used only for the purpose of this research work.

RESULTS

The mean age of the study population was 13 years (± 2.24). Sex ratio between males and females was 3.1:1.0. Two hundred sixty of the sample (75.7%) was males and 84 (25.3%) were females. The numbers of females were less than males because more boys attend schools than girls do in these areas. The distribution of the respondents' age group was as follows: 80 (23.2%) were from age group 9-12 years, 167 (48.4%) were from age group 12-15 and 78 (22.6%) were from age group 15-18 and 20 (5.8%) were more than 18 years of age.

Table (1) presents the source of drinking water for the respondents. Three hundred and eight (89.3%) of those who participated in the study got their water from tanks,

31(8%) from wells, 6 (1.7%) from the river, 3 (0.8%) from the canals. Other sources of drinking water constituted 0.2%.

Table (2) shows the presence of latrines in the area. Three and eight (78.8%) have latrines while 37(10.7%) did not have latrines.

Table (3) shows symptoms and presence of schistosomiasis in the sample; 91 (26.5%) had blood in the urine, 100 (29.2%) had headache, 84 (24.5%) had schistosomiasis, whereas 77 (23.8%) had past history of schistosomiasis.

Table (4) shows the validation of the questionnaire by cross tabulation of haematuria against presence of Schistosoma eggs in urine. The sensitivity, specificity, positive and negative predictive values were calculated as 55.6%, 80%, 43%, and 86.9% respectively.

Table (1) sources of drinking water

Sources of drinking water	No.	Percent
Water tank	308	89.3%
Wells	31	8.0%
River	6	1.7%
Canals	3	0.8
Others	1	0.2
Total	345	100%

Table (2) Availability of latrines

Availability of Latrine	No.	Percent
Yes	308	89.3%
No	37	10.7%
Total	345	100%

Table (3) Symptoms and presence of schistosomiasis

Item	Yes	Percent
Symptoms		
Blood in urine	91	26.3%
Headache	100	29.0%
PH history of schistosomiasis		
Yes	77	22.3%
No	268	77.7%
Presence of schistosomiasis		
Yes	84	24.3%
No	261	75.7%

All patients received treatment

Table (4): Validation of the questionnaire with the urine test

Hematuria / Schistosomiasis	Yes	No	Total
Yes	40	53	93
No	32	212	244
Total	72	265	337

Sensitivity = $\frac{40 \times 100}{72}$ = 55.6%

Specificity = $\frac{212 \times 100}{265}$ = 80%

+ ve predictive value= $\frac{40 \times 100}{93}$ = 43%

- ve predictive value= $\frac{212 \times 100}{244}$ = 86.9%

Efficiency = Specificity + [(sensitivity-specificity × prevalence) = 53%

DISCUSSION

Once high-risk populations are identified control measures should be initiated. One possibility is to decide on the number of communities that will benefit from treatment as a function of the overall available resources. Another possibility is to define an intervention threshold above which all communities will benefit from specific control measures (e.g. availability of praziquantel in health services).

Self-administered questionnaires are a low-level technology. Health workers and community members can easily use them for detection of Schistosomiasis. Questionnaires build on communities disease perception and this could lead to an increase involvement of key stakeholders into control activities.[10] Questionnaires reveal a remarkable consistency in schistosomiasis disease perception across different endemic settings, which emphasizes how tightly the fate of the millions of sufferers of this disease are linked.[11]

The application of this method will allow utilization of scare resources available for control of schistosomiasis in Sudan more efficiently, but further validation is mandatory to convince the health authorities about the usefulness of this method. The question "Do you have blood in urine?" or "Do you have red urine?" revealed sensitivity, specificity, negative and positive predictive values which are in agreement with previous results of a study done in many countries.[16] A highly significant correlation was found between proportion of children with reported schistosomiasis, as well as reported blood in urine and proportion of children infected with S. haematobium as detected/confirmed by sedimentation method. The questionnaire was validated with reagent stick test, strong agreement was found from study in Nigeria[17] and eight African countries[15, 16], the results revealed high specificity, sensitivity and predictive values.[10]

CONCLUSION

Questionnaire about Hematuria was found to have a high diagnostic performance in detecting communities at risk of having urinary Schistosomiasis. Questionnaire about Hematuria is specific in urinary schistosomiasis diagnosis in communities with high prevalence of the disease: However further studies are highly welcomed in this area

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