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Prevalence and Factors Associated With the Occurrence of Urinary Schistosomiasis among Primary School Pupil In Kware Local Government Area Sokoto, Nigeria

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Abstract
BACKGROUND: *Schistosomiasis (Bilharziasis) is a controllable and preventable water-borne disease caused by Schistosoma, a trematode found in blood vessels of man and livestock. It is an important public health problem in sub-Saharan Africa, second only to malaria in morbidity, and is one of the most prevalent neglected tropical diseases in about 77 developing countries in the tropics and subtropics with a high socio-economic burden on school-aged children and occupationally exposed individuals. This study aims to assess the prevalence and factors associated with the occurrence of urinary schistosomiasis among primary school pupils in Kware local government area Sokoto state, Nigeria.*
MATERIALS AND METHOD: *This was a descriptive cross-sectional study carried out among 206 pupils selected from three randomly selected primary schools in Kware local government area of Sokoto state. Data were collected using an interviewer-administered semi-structured questionnaire from an Open data kit (ODK) and were analyzed using a statistical package for social sciences (SPSS) version 23.*
RESULTS: *The mean age of the respondents was 11.77 ± 2.587 years. The study found that the prevalence of urinary schistosomiasis among primary school pupils in Kware was 21.5%. However, up to 30.1% of the respondents had a previous history of hematuria while 9.7% were passing blood in urine at the time of data collection. The study also found that age, place of origin, father's occupation, and nature of the place of origin were statistically significantly associated with urinary Schistosomiasis. While sex, tribeand family status were not significantly associated with schistosomiasis.*
CONCLUSION: *Urinary schistosomiasis is highly prevalent among primary school pupils of rural riverine areas in Kware local government area of Sokoto state. It is recommended that governments at all levels should intensify effort to educating the masses especially those in the riverine areas, about schistosomiasis and its preventive measures by providing health education programs in schools, health facilities and communities, and through the mass media such as radio, television, and internet.*

Keywords: *Prevalence, Factors, Urinary Schistosomiasis, Primary School Pupil, Kware*

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I. Introduction

Schistosomiasis (Bilharziasis) is a water borne disease caused by Schistosoma, the digenic trematode found in blood vessels of man and livestock (1). It is one of the most prevalent neglected tropical disease and still considered as a major public health problem in about 77 developing countries in the tropics and subtropics (2). It is second only to malaria in human impact among tropical diseases and the third (after malaria and intestinal helminthiasis) most devastating prevalent parasitic disease in the world, being a major source of morbidity and mortality for developing countries in Africa, South America, the Caribbean, the middle East and Asia (3). According to World Health Organization (2010) more than 207 million people, 85% who live in Africa, are infected with schistosomiasis and estimated 700 million people are at risk of infection in 77 countries where the disease is considered endemic, as their agricultural work, domestic chores and recreational activities expose them to infested water(4).

Despite the complications that may occur, mortality appears to be low in that with 200 million cases, there are an estimated 14,000 deaths per year (4).Though the disease kills few people, its clinical effects, prevalence and association with agriculture and water development project, movement of population and increase in population density makes it a problem of great public health importance (4,5).

In 2019 it was reported that about 200 million people in some 74 countries are infected worldwide and at least 600 million are at risk of infection (4,5). An estimated 120 million suffer severe consequences of the

infection with an estimated annual mortality rate of about 20,000 worldwide (5). An estimated 30 million Nigerians need to be treated annually for the disease (5). In most endemic areas, the highest intensities of infection are found in children between 5 and 15 years of age (5). In sub-Saharan Africa alone, it is estimated that 70 million individuals experience hematuria, 32 million difficulty in urinating (dysuria), 18 million bladder-wall pathology, and 10 million major hydronephrosis from infections caused by S. haematobium annually (5).

It is predominant among school aged children, special occupational groups (fishermen, irrigation workers, farmers) in females and other groups using infected water for their domestic purposes (6).

A review of the burden of schistosomiasis has shown that over 200, 000 people die from the complications due to the disease in Sub-Saharan Africa (SSA) annually while children suffer anemia, stunted growth, urinary tract damage and reduced mental ability to cope with academics (7).

II. Materials And Methods

2.1 Methods

This was a across-sectional study conductedfrom October to November, 2019 among 206 Primary school Pupilsselected by multistage sampling techniquein Kware LGA Sokoto, Nigeria. Pupils who are currently studying in primary schools in Kware local government area were selected for the study whose parents have given consent and children given assent.

Those pupils who are not attending Kware primary schools, who are not willing to participate and those who are currently under treatment for schistosomiasis were excluded from the study.

The sample size was estimated at 206 using the Fisher's formula for calculating sample size for cross-sectional descriptive studies [8], 14.5% prevalence of Schistosomiasis previous study [9], a precision level of 5% and an anticipated participant response rate of 95% were used.

2.2 Design

The eligible participants were selected by a multistage sampling technique [10].

Stage 1; One out of the wards was selected for the study by simple random sampling.

Stage2; Three primary schools were selected from the ward by balloting.

Stage3; The required number of study subject was selected from the three schools by proportionate allocation.

2.3 Data Collection

A standardized, semi-structured, interviewer-administered questionnaire was administered using Open Data Kit (ODK) to collect information on socio-demographic characteristics of study subjects, history of exposure to schistosomiasis, and history of symptoms suggestive of schistosomiasis. Urine sample was collected for detection of schistosome ova using light microscopy.

questionnaire was administered to the participants using Open Data Kit (ODK), to collect demographic data(age, and gender), socio-economic background (educational level, occupation etc.), behavioral risks (personal hygiene such as hand washing, habit of wearing boots outside the house and water contact activities), environmental sanitation and living conditions (types of water supply, latrine system, water proximity) and health conditions (dysuria, hematuria, awareness of the disease),(11). The participants were interviewed by the researcher and the research assistants who received specific training on how to apply the questionnaire (11).

Each pupil was given a 30-ml sterile wide mouth, screw-capped plastic container carrying their identification number and was instructed on how to collect the urine sample (12). A total of 206 urine samples were collected between 10:00 am and 02:00 pm (12). The samples were taken to parasitology laboratory, Usmanu Danfodiyo University Teaching Hospital, Sokoto, and were analysed using standard filtration technique (12).

Data was manually sorted out, inputted into the computer system and cleaned, analyzed using SPSS version 20 and presented using charts, graphs and frequency tables. Frequency distribution tables were constructed; and cross tabulations were done to examine the relationship between categorical variables. The chi-square test was used to compare differences between proportions. All levels of significance were set at $p < 0.05$.

Data cleaning involved manually checking for completeness and errors on the ODK. This was followed by data export to IBM® SPSS version 20. Exploratory data analysis was done to further identify errors. The exploratory analysis involved running descriptive statistics of all variables and use of graphs like histograms and box plots to identify odd values, missing values and outliers.

2.4 Data Analysis

Univariate Analysis

Frequency distribution and the proportions of the socio-demographics, history of exposure to schistosomiasis, history of symptoms suggestive of schistosomiasis and the Prevalence of respondents with schistosomiasis were reported. Mean age of the respondents and the standard deviation (SD) were also reported.

Bivariate analysis

Chi square test was used to determine the socio-demographic factors associated with schistosomiasis.

3.1 Ethical Consideration

Ethical clearance was obtained from state Ministry of Education and Ministry of Health, ethical clearance committee. After explaining the importance, purpose and procedure of the study, permission was obtained from school headmaster and consent was obtained from parents or guardian of the children. Anyone not willing to take part in the study was not included. Those participants who were found to be infected with Urinary Schistosomiasis were referred for treatment. Confidentially of the study participants was also maintained.

3.2 Limitation of Study

Limitation of study included pupil's refusal to participate and mis-information on procedures on urine sample collection from the subjects, which was tackled by creation of awareness and health education on detail information of study for the study subjects.

IV. Results

A total of 206 primary school pupils were interviewed and the response rate was (100%)

4.1 Socio-demographic Profile of the Respondents

Themean age of the respondents was 11.77 ± 2.587 years.

Majority of the respondents (67.0%) were within the range of 10 – 14years.There are more males (73.8%) than females (26.2%). About (81.6%) were Hausa/Fulani while (18.4%) were other tribes, (100%) of the respondents were Muslims. Most of the respondents' parents' educational status were Primary school certificate holders (40.8%), while some of them were Qur'anic (39.3%), Secondary (18.4%), and Tertiary (1.5%) certificate holders. About (83.5%) of them were from Rural riverine and (16.5%) were from Rural non-riverine. (51.9%) of the respondents' father's occupation were Business Men, (40.8%) were farmers and (7.3%) were civil servants. (Table 1)

*Table 1**: Sociodemographic characteristics of the respondents***

Variables	Frequency (n=206)	Percentage (%)
Age group (years)		
5 – 9	36	17.5
10 – 14	138	67.0
≥15	32	32
Sex		
Male	152	73.8
Female	54	26.2
Tribe		
Hausa/Fulani	168	81.6
Others	38	18.4
Religion		
Islam	200	100
Education status of parents		
Qur'anic only	81	37..3
Primary	84	40.8
Secondary	38	18.4
Tertiary	3	1.5
Place of residence		
Bankanu	73	35.5
Durbawa	64	31.0
Kware	69	33.5
Nature of place of Residence		
Rural riverine	172	83.5
Rural non-riverine	34	16.5
Fathers occupation		
Farming	84	40.8
Business	107	51.9
Civil servant	15	7.3

4.2 Prevalence of Schistosomiasis among the Respondents

Only 30.1% have previously passed blood in urine, while 67.5% have no history of passage of blood in urine. Majority of them 90.3% were not currently passing blood in urine. About 21.5% of the respondents were tested to have presence of Schistosome ova in urine, while 78.5% were not. (Table 2)

*Table 2**: Prevalence of schistosomiasis among respondents***

Variable	Frequency (n=206)	Percentage (%)
Ever passed blood in urine		
Yes	62	30.1
No	139	67.5
I don't know	5	2.4
Currently passing blood in urine		
Yes	20	9.7
No	186	90.3
I don't know	0	0
Presence of Ova of Schistosome in urine		
Yes	43	21.5
No	157	78.5

4.3: Distribution of Schistosomiasis among the Respondents

Majority 65.5% of the respondents were found to have a history of swimming in rivers, streams or pool of water on ground, 34.0% have no such history while 0.5% could not remember. Most of them 78.6% use well water for domestic use,18.0% use River water,2.9% use stream water and 0.5% use Tap water. (Table 3)

Table 3: Distribution of schistosomiasis among respondents

Variables	Frequency (n=200)	Percentage (%)
Swim in rivers, streams or pool of water on ground		
Yes	135	65.5
No	70	34.0
I can't remember	1	0.5
Source of water for domestic use in place of residence		
Well water	162	78.6
Stream water	6	2.9
Tap water	1	0.5
River water	37	18.0

4.4 Factors Associated with the Presence of Schistosomiasis among the Respondents

This study showed that there was statistically significant association between urinary Schistosomiasis and Age (P= 0.000), Place of resident (P = 0.007), nature of place of origin of origin (0.000) and source of water in place of origin (P=0.002) and father's occupation (p=0.000).However, there was no statistically significant association between Urinary Schistosomiasis and sex (0.190), Tribe (0.051), current family status (0.420). (Table 4)

*Table 4**: Factors associated with presence of schistosomiasis among the respondents***

	Presence of Schistosome ova in urine			
Variables	**Yes n (%)**	**No n (%)**	**Test statistics**	**Significance**
Age group (years)				
5 – 9	9 (26.5)	25 (73.5)		
10 – 14	24 (17.8)	111 (82.2)	Fisher Exact	P=0.000
15 – 19	10 (32.3)	21 (67.7)		
Sex				
Male	41 (25.3)	107 (72.3)	Fisher Exact	P=0.190
Female	2 (3.8)	50 (96.2)		
Tribe				
Hausa/Fulani	41 (25.3)	121 (74.7)	Fisher Exact	P=0.051
Others	2 (5.3)	36 (94.7)		
Place of residence				
Bankanu	11 (15.3)	61 (84.7)		
Durbawa	17 (27.4)	45 (72.6)	Fisher Exact	P=0.007
Kware	15 (22.7)	51 (77.3)		
Nature of place of residence				
Rural riverine	43 (25.4)	126 (74.6)	Fisher Exact	P=0.000
Rural Non – riverine	0 (0)	31 (100)		
Educational status of parents				
Qur'anic only	13 (6.5)	66 (83.5)		
Primary	23 (28.4)	58 (71.6)	Fisher Exact	P=0.547

Secondary	7 (18.9)	30 (81.1)		
Tertiary	0 (0)	3 (100)		
Father's occupation				
Farming	21 (25.3)	62 (74.7)		
Business	19 (18.3)	85 (81.7)	Fisher Exact	P=0.000
Civil servant	3 (23.0)	10 (77)		
Current family status				
Both parents are married and stay together	42 (21.9)	150 (75.1)		
Both parents are married but live in different town	1 (20)	4 (80)	Fisher Exact	P=0.42
Parents are divorced	0 (0)	2 (100)		
One parent is dead	0 (0)	1 (100)		
Source of water for domestic use in place of origin				
Well water	27 (13.5)	129 (64.5)		
River water	16 (8)	27 (13.5)	Fisher Exact	P = 0.002
Tap water	0 (0)	1 (0.5)		

V. Discussion

Majority of children in this study were within the age range of 10-14 years,(67 %) ,this may be due to the fact that this constitute the older age group in the school age populations and also due to the fact that children at that age performed more water contact activities than other age group. Children at the age of 5-9 years usually have less water contact activities that may expose them to infection since parent may not allow them by virtue of their age. The age range of the children that characterize this study is similar to that obtained by Hassan J (21), but different from the study conducted by Duwa (22).

Out of 206 participants used in this study, 152 (73.8%) were males and 54 (26.2%) were females. The distribution of the disease based on the gender showed that males have higher prevalence than females. This may be due to the fact that males engage more in water contact activities than females leading to their higher exposure which is similar to a study carried out by Hassan J (21). The findings observed in this study contradicts that of a study conducted on Urogenital schistosomiasis in children in endemic rural community in Nigeria, where prevalence of S. haematobium infection was higher among females (60.3%) than males (54. %) although the difference is not statistically significant (23). However, the higher prevalence among females may be due to their exposure to water contact activities related to domestic works such as fetching water from the ponds, washing clothes and utensils. It may also be due to the fact that in some communities, women engage in agricultural and irrigation works than their males counter parts which may likely expose them to infections.

The prevalence based on tribe showed that Hausa/ Fulani have the highest prevalence of infected individuals 168 (81.5%). This may be due to the fact that they are the predominant people in the area where the study was conducted. It was observed that the occurrence of urinary Schistosomiasis by educational status of the parents of study subjects (Qur'anic 6.5%, primary 28.4%, secondary 18.9% and tertiary (0%) is similar to the finding in the study conducted by (10).However, a study conducted by (24)observed that there was no significant difference in the distribution of schistosomiasis by parent's educational status of the study subjects(24).

Finding of similarity in proportion of occurrence of schistosomiasis among children resident in rural riverine (83.5%) and rural non-riverine area (16.5%) were also obtained in the study conducted in the Lilongwe National schistosomiasis control program (25), which observed closed proximity in the proportion of occurrence of schistosomiasis among children resident in rural riverine area (30.0%) and those from rural non- riverine (20.6%). The wide use of irrigation farming, and therefore exposure to cercariae infested swampy farmland may explain the similarity in prevalence of schistosomiasis in rural riverine and rural non- riverine residence of the school children (25).

Observed similarity in proportion of children in occurrence of urinary schistosomiasis by type/ nature of place of residence among children resident in rural riverine and those from rural non – riverine area in this study differed from the findings in the study by Phiri et. al. where it was observed that the difference in proportions of occurrence of Schistosomiasis among children resident in rural riverine (86.1%) and those from rural non – riverine area (12.1%) was quite different(26).

Occupation of father is associated with urinary schistosomiasis where children whose father were farmer were more affected (25.3%). This result agreed with studies from Sudan, Ghana and Nigeria (27-29).

This shows lack of awareness towards risk of urinary schistosomiasis among fathers to make their children aware of the risk of urinary schistosomiasis. A protective role of head of the family being literate and informed on urinary schistosomiasis was reported by a study in South- western Nigeria (30).

This study shows a prevalence of (21.5%) among study subjects.This contradicts a study carried out by Southgate VR et. al. that reported a higher prevalence (39.3%) of Schistosomiasis among children (32).

High prevalence was observed (65.5%) among children with the habit of swimming in rivers, streams and pool of water on ground reported from a study in Nigeria (27). This indicates that long duration of hours of water contact was considered as an important risk factor for exposure to urinary Schistosomiasis rather than frequency of water contact (33).

In this study, it was observed that Schistosoma infection was found in a large proportion of children (78.6%) whose source of water for domestic use was stream/well. This could be explained on the premises that majority of rural area from which the participants came from, had no access to protected water sources. They therefore stand the huge risk of Schistosoma infection from their exposure to cercariae infected streams and wells when accessing these sources to obtain water for the purpose of domestic use (33).

Similar findings were observed in the study by Kloos et. al. who observed that 58.9% of respondents whose source of water for washing was streams and 42.1% whose source of water for bathing was river had Schistosoma infection(34).

The overall prevalence of urinary schistosomiasis in the study was 43 (21.5%) with positive samples out of 206 samples that were tested.

There was statistically significant association between urinary Schistosomiasis and Age (P= 0.000), Place of resident (P = 0.007), nature of place of origin of origin (0.000) and source of water in place of origin (P=0.002) and father's occupation (p=0.000).However, there was no statistically significant association between Urinary Schistosomiasis and sex (0.190), Tribe (0.051), current family status (0.420).

Targeted Schistosomiasis control programs by government should focus on wide age range of children (5-14 years) for greater coverage and effective control in school populations.

History of hematuria in children aged 5-14 years and residence in rural population should be adopted for presumptive diagnosis of Schistosoma infection by health workers to facilitate prompt treatment and prevent development of complications especially in resource poor settings.

Health education messages need to be developed and directed at school children by health workers through special health education programs on schistosomiasis to mitigate this source of infection among them.

There is need to update and step up prevention and control programs of schistosomiasis amongst topics by the ministry of education for the school health education program.

Adequate potable water should be provided for washing, bathing, and drinking, by government in schools and communities in order to reduce and eliminate human contact with infested water.

The identified predictors of Schistosoma infection such as past history of hematuria, positive history of swimming in river/ponds, non-utilization of protective foot wear while working on swampy farm can be used as criteria by health workers for selection of school children for enrolment in targeted mass chemotherapy when cost is a constraint in resource poor settings

There is need for further researchon this study for the prevention and control of urinary Schistosomiasis.

Conflict of interest by the authors

There was no conflict of interest by any of the authors of this article

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