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Full Length Research Article

PREVALENCE AND RISK FACTORS ASSOCIATED WITH URINARY SCHISTOSOMIASIS (*SCHISTOSOMA HAEMATOBIUM L.*) AMONG SCHOOL CHILDREN IN BIU LOCAL GOVERNMENT, BORNO STATE, NIGERIA

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ABSTRACT
This cross sectional study was conducted between August-October, 2023 among 420 school-age children aged 5-16years attending public primary school in Biu local government, Borno state. The aim was to determine the prevalence, knowledge about the disease and risk factors associated with urinary schistosomiasis in the study area with the view of creating database information and awareness to the stakeholders. 10mls of urine sample was collected from each selected students and determination of *Schistosoma haematobium* eggs was done using standard sedimentation technique while microhaematuria were determined using a reagent strip and a well-structured questionnaire to obtained other required information. The overall prevalence of schistosomiasis among the students was 0.5% and male students that are in age group between 11-13years has the prevalence of 1.5%. The prevalence rate 0.8% and 0.9% was found in Buratai and Tum while no infected student was found in the Biu metropolis. Also, prevalence of urinary schistosomiasis was found in samples with visible haematuria in their urine as 21.3% of male student has visible haematuria while only 8.6% female has visible haematuria in their urine. The different between different age groups and locations was statistically insignificant while sex and visible haematuria was statistically significant. There was high level of ignorance and poor knowledge about transmission, prevention and treatment of schistosomiasis among the student. The study concluded that the parasite is not endemic in the study area despite the high level of ignorance and poor knowledge about parasites among the student in the study area. There is need for public enlightenment to maintain the status in the area.

Keywords: *Schistosoma haematobium*, Prevalence, Parasite, Biu.

INTRODUCTION

Schistosoma haematobium (urinary blood fluke) is a species of digenetic trematode, belonging to a group (genus) of blood flukes (*Schistosoma*). It is found in Africa and the Middle East. It is the major agent of schistosomiasis, the most prevalent parasitic infection in humans WHO, 2017. It is the only blood fluke that infects the urinary tract, causing urinary schistosomiasis, and is the leading cause of bladder cancer (Khurana *et al*., 2005 ; Antoni, 2017). Schistosomiasis mostly affects poor and rural communities, particularly agricultural and fishing populations. Women doing domestic chores in infested water, such as washing clothes, are also at risk and can develop female genital schistosomiasis. Inadequate hygiene and contact with infected water make children especially vulnerable to infection (WHO, 2023). Most human infections are caused by *Schistosoma mansoni, S. haematobium*, or *S. japonicum* (CDC, 2018) less commonly, *S. mekongi* and *S. intercalatum* can cause disease. All *Schistosoma* species affect intestine and liver with the exception of *Schistosoma haematobium* that affect urinary tracts (WHO, 2017). Safe and effective medication is available for treatment of both urinary and intestinal schistosomiasis. Praziquantel, a prescription medication, is taken for 1-2 days to treat infections caused by all schistosome species (CDC, 2023).

The classic sign of urogenital schistosomiasis is haematuria (blood in urine). Kidney damage and fibrosis of the bladder and ureter are sometimes diagnosed in advanced cases. Bladder cancer is another possible complication in the later stages (WHO, 2023). In women, urogenital schistosomiasis may present with genital lesions, vaginal bleeding, pain during sexual intercourse and nodules in the vulva. In men, urogenital schistosomiasis can induce pathology of the seminal vesicles, prostate and other organs (WHO, 2023). This disease may also have other long-term irreversible consequences, including infertility (WHO, 2023).
In this study, we aim at determining the prevalence *Schistosoma haematobium* Among School Children in Biu Local Government, Borno State, Nigeria with the view of creating database information and awareness to the stakeholders that will be used in developing control strategies in the study area.

MATERIALS AND METHODS

Study Area

The study was conducted in Biu Local Government Area of Borno state from August- October, 2023. Biu Local Government is one of largest town in Borno South Senatorial Zone Nigeria which is located between latitude 100 36'40" N, 12011'42" E and longitude 10.61110N, 12.1950E. The Local Government lies on the Biu plateau at an average elevation of 626 meters above Sea level (Britannica, 2009). The Local Government Area falls within the Northern Guinea savannah and the Sudan savannah regions and has a semi-arid climate with average temperature of 32 ^{o}C. The local government area features two distinct seasons' dry and rainy seasons and has a land mass of about 3,423.86km^2. The total human population in the area is 175,760 in according to the 2006 census. The town located 172km from Maiduguri the state capital and is the administrative headquarter of the local government, other develop areas attached to the local government include Buratai, Garubula, Miringa, Madara-Girau, Yawi, and Gunda among others. Biu is home to many tribes but the most populous

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tribe is Babur (Pabir). Agriculture is an important economic activity for the people in the area (Amaza *et al.,* 2007). The major climate elements that influence the climate of the study area and affecting the farming system are temperature and precipitation (rainfall), Biu usually has the most precipitation in July, August and September, with an average of 23 rainy days and 164 mm (6.5 inches) of precipitation per month. The driest months in Biu are January, February and December. On average, 0 mm (0.0 inches) of precipitation falls during these months (Britannica, 2009).

Sample Size Determination

Simple random sampling technique was used to select individual from the study area. The sample size was determined by taking 50% expected prevalence and 95% confidence level using the formula described by Thrusfield (2007). Accordingly, a total of 384 student was determined as sample size for the study

$N=(Z)^2 P (1-P)/d^2$

Where:

n=required sample size,

d=desired absolute precision,

P_{exp}=expected prevalence.

Sample Collection

A total of four hundred twenty (420) of urine samples were collected from August-October, 2023. A wide mouthed, transparent specimen containers labeled age, sex and location were given to each selected participants in the study area and a structural questionnaire to obtain the information about bio-data and student knowledge about the disease in the study area. Prior to this, an introductory letter from the University was submitted to the selected school management which gives us opportunity to organized proper orientation to participant on how and when to collect the samples. The urine collection was done between 10.00h and 14.00h which is the most active period of the parasite (WHO, 1991).The samples collected were transported immediately to the Biology Laboratory of Nigerian Army University Biu for laboratory analysis.

Sampling Techniques

A random sampling technique was employed to select three (3) areas with high population within the study area. Thirty five (35) urine samples were collected every week from each of the 3 selected areas for a period of twelve weeks from August-October, 2023. A total of four hundred and twenty (420) urine sample were collected for the purpose of this research.

Laboratory Analysis

Urinalysis

The urine samples were examined on collection with naked eyes for visible haematuria and was further tested for micro-haematuria using a reagent strip (Medi-test Cambi 9, Analytic Biotechnologies, Lichtenfels, Germany). The colour change was compared with the manufactures instruction on the reagent container as described by King, (2001).. The remaining urine samples were then preserved by adding a few drops of concentrated formalin solution before microscopic examination for *Schistosoma haematobium* ova.

Microscopic Examination of Urine

The urine samples were allowed to sediment for a while in the laboratory and the supernatant were discarded, leaving only the residue at the bottom of the sample containers. Pasteur pipette was used to take one drop to a clean and grease-free slide and covered gently with a cover slip without the formation of air bubbles. The slide was then mounted on the microscope stage and examined with x10 and x 40 objective lenses for *Schistosoma haematobium* ova as described by CDC (2013).

Data Analysis

The data collected were subjected to Chi-square test as the relationships between two variables were compared and simple percentage to determine the prevalence rate. $P \leq 0.05$ was used to determine the level of significance. The data were all analyzed in Microsoft Office Excel Version 2010.

RESULTS

Out of 420 urine samples examined in this study, an overall prevalence of 2(0.5%) was found with the egg of the parasite and out of the four different age groups, only age group 11-13years was found with prevalence rate of 2(1.5%). The prevalence rate between the different age groups was statistically not significant. Thirty nine 39 (21.3%) urine of male students and 21 (8.9%) of female students had a visible haematuria in their urine. The different in prevalence rate and visible haematuria in the urine of different sex was statistically significant. Buratai and Tum has 1(0.8%) and 1(0.9%) respectively while Biu metropolis has no prevalence rate. The prevalence rate between different locations within the study area was statistically not significant (Table 1).

Information of associated risk factors with urinary schistosomiasis such as source of water, water contact activities and occupation of the parents showed 209(49.8%) use well as sources of water, 200(47.6%) used borehole while only 11(2.6%) used stream/river. 328(78%) have farming as water contact activity, 46(11%) hunting/ fishing, 6(25%) swimming/ bathing while 21(5%) washing. On 159(38%) of the parents are farmers, 118(28%) traders, 103(24.5%) civil servant while 40(9.5%) are others.(Table 2)

Information about knowledge of urinary schistosomiasis among the students were obtained using a structured questionnaire. The result showed that 277 (66%) of the students have not heard about urinary schistosomiasis, and 109(26%) students had no idea while only 34(8%) heard about urinary schistosomiasis. 228(54.2%) had no idea, 185 (44.1%) heard about it from the parents/guardian, 2(0.5%) heard about it from media while 5(1.2 %) from the school. 418 (99.5%) of the study population have no idea about the causative agent of urinary schistosomiasis, only 2(0.5%) that believed insect is the causative agent of urinary schistosomiasis. 175(41.7%) have no idea about way urinary schistosomiasis transmitted, 112(26.7%) believed it transmit through contaminated food, 57(13.6) believed to be sign of adulthood, 52(12.4%) believed to be through bathing in infected water and 24(5.7%) believed to be inherited disease. Among the population of the study 235(56%) have no idea on how to treat urinary schistosomiasis, 102(24.3%) believed to be cured with time, 45(10.7%) believed that the disease is not treatable while 38(9%) believed the disease can be treated using drugs 38(9%), (Table 3).

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Table 1: Prevalence of *Schistosoma haematobium* according age, sex, location and visible haematuria in the study area

Parameter	Number Examined	Number Effected (%)	Degree of Freedom	Significance Value	Decision
Age					
5-7	88	0	3	4.24	Not significant
8-10	85	0			
11-13	135	2(1.5)			
14-16	112	0			
Sub-total	420	2(0.5)			
Sex					
Male	183	2(1.1)	1	2.60	Significant
Female	237	0			
Sub-total	420	2(0.5)			
Location					
Biu town	195	0	2	0.00	Not significant
Buratai	117	1(0.8)			
Tum	108	1(0.9)			
Sub-total	420	2(0.5)			
Visible haematuria					
Male	183	39(21.3)	1	13.07	Significant
Female	237	21(8.9)			
Sub-total	420	60(14.3)			

Table 2: Factors associated with Urinary Schistosomiasis among school children in the study area

Variable	No. of Response (%)
Source of water	
Stream/river	11(2.6)
Borehole	200(47.6)
Well	209(49.8)
Water contact activities	
Swimming/bathing	25(6)
Washing	21(5)
Hunting/fishing	46(11)
Farming	328(78)
Occupations of Parents	
Trading	118(28)
Farming	159(38)
Civil servant	103(24.5)
Others	40(9.5)

Table 3: Knowledge about Urinary Schistosomiasis among the pupils in the study area

Variable	Categories	Response (%)
Heard about Urinary Schistosomiasis	Yes	34(8)
	No	277(66)
	No idea	109(26)
Where did you heard about it	School	5(1.2)
	Media	2(0.5)
	Parents /guardian	185(44.1)
	No idea	228(54.2)
Causative agent of Urinary Schistosomiasis	Parasitic worms	0
	Virus	0
	Insect	2(0.5)
	No idea	418(99.5)
Transmission of Urinary Schistosomiasis	Hereditary	24(5.7)
	Adulthood	57(13.6)
	Contaminated Food	112(26.7)
	Bathing in infected water	52(12.4)
	No idea	175(41.7)
Treatment of Urinary Schistosomiasis	Drugs	38(9)
	Not treatable	45(10.7)
	Will be cured with time	102(24.3)
	No idea	235(56)

DISCUSSION

The prevalence and risk factors associated with urinary schistosomiasis among school children in Biu local government was evaluated. The overall prevalence of 2(0.5%) was recorded in this study which indicates that urinary schistosomiasis is not endemic in this study area despite the high level of ignorance and poor knowledge about transmission among the student. This observation is in agreement with the earlier reports of Usman *et al*. (2017) and Usman (2017) in the neighboring state who recorded similar prevalence rate with the present study. Similarly many study reported higher prevalence rate elsewhere such Dawet *et al*. (2012) and Bigwan *et al*. (2012). The low prevalence rate in this present study is not surprised due to the fact that most of the participants live in urban areas that has improved water supply and have less water activities. Also the intermediate host of the parasite was not visible in the area which reduce the chance of the parasite to complete it life cycle and transmission process. Male students has higher prevalence rate of 2(1.1%) than females counterparts with 0%. This could be due to the greater water contact activities by males compared to their female's counterpart. This agreed with Abdullahi and Saidu (2011) and Usman *et al.* (2016) in Wushishi Local government and Bauchi state respectively. Females are usually less prone to water contact activities such as farming and

swimming in an opening water bodies. This exposure males to high risk with the parasite than their female's counterparts. Females are seen as weaker gender and are therefore restricted but allow to assist their mother in carrying out house chores at home especially in the kitchen Folahan *et al*. (2021). Similarly the high visible haematuria in the urine of males student were observed 21.3% than female with 8.9%. The different in visible haematuria between the sexes were statistically significant. All infected students has a visible haematuria in their urine which has been reported as a major symptom of urinary schistosomiasis (Burton *et al*., 2013 and Folahan *et al*., 2021).

Age group 10-12years out of the four groups has the prevalence rate of 1.5% and statistically the prevalence was not significant between the groups. The prevalence in this age group could be attributed to exposure factor such as swimming, washing and bathing in the open water bodies while at the higher age group such activities is less which could be due to the age and maturity level of the students. These also agrees with Biu *et al*. (2009) and Usman *et al*.(2016) in Konduga and Bauchi respectively.
Buratai and Tum has 1(0.8%) and 1(0.9%) respectively while Biu metropolis has 0 prevalence rate. The different in prevalence rate between the different locations of the students were statistically not significant. This pattern of infection of individuals in different location in the same study area had been recorded earlier in Ebonyi and Bauchi state Nigeria by Uneke *et al*. (2007) and Usman *et al.* (2017) respectively. The major factors that might be responsible for the difference may be low literacy level, poor sanitation, lack of water source, indiscriminate disposal of human wastes among other.

The three major risk factors associated with urinary schistosomiasis are source of water, water contact activities such swimming or bathing in an open water bodies and occupation of the parents such as fishing or farming. The result revealed that the people of this study has good source of water and has less water contact activities unless farming. Few involve in fishing but no species of the intermediate host was seen around the area. This may also be part of the reason of very low prevalence rate of the parasite in the area. Parent's occupation such as fishing, farming and laundry in rural areas has been reported to play a crucial role in the transmission of *Schistosoma haematobium* and mostly determine infection status of their children (Awosolu *et al*., 2020). In this area children assist their parent in their occupation such as farming and fishing which expose them to the infective stage of the parasite but due to the inability of the parasite to complete their life cycle there is less prevalence rate.

The results of this study revealed poor knowledge about transmission, prevention and treatment of urinary schistosomiasis among the student in the area. This observation is similar to previous report of Salawu *et al*., (2023) in Oke-Awo Rural Community Ile -Ife, Southwestern Nigeria. Although, it is a common attitude of people to contaminate their open water bodies with their waste especially the rural residents that lack adequate knowledge about the life cycle of the parasite (Ogbonn *et al*., 2012) and other effect of such. This attitude provide opportunity for the parasite to complete their life cycle by getting in contact with the snail intermediate host and develop the infective stage of the parasite that is capable of infecting other warm blooded animal including human when they come in contact with infect water bodies during swimming or bathing. In this study area the intermediate host of the parasite *Bulinus* species was not seen and the life cycle of the parasite cannot be completed with the intermediate host. This may be the reason for very low prevalence rate of the parasite in the study area.

In conclusion urinary schistosomiasis is not endemic despite the high level of ignorance and poor knowledge about transmission, prevention and treatment of schistosomiasis among the student. There is need for public enlightenment to maintain the status in the area.

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Conflict of interest
None

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