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Profile of an epidemiological study of urinary schistosomiasis in two local government areas of Benue state, Nigeria

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ABSTRACT

Background: Urinary schistosomiasis is endemic in Nigeria and continues to pose public health challenges especially in inhabitants of rural areas. **Aim:** This study was conducted in an attempt to establish the prevalence of urinary schistosomiasis in relation to epidemiological factors among children in Buruku and Katsina-Ala local government areas, Benue, Nigeria. **Materials and Methods:** Urine filtration technique using polycarbonate membrane filters was employed to determine presence of *Schistosoma haematobium* eggs in urine. Questionnaires were also administered to children to collect information on socio-demographic data and water-contact activities. **Results:** An overall prevalence of 41.5% was observed among the 1,124 children examined. Secondary school children recorded higher prevalence rate than primary school children and pre-school children. A significant difference in prevalence was observed between the three categories of children examined. Males had statistically higher prevalence rate than females. No significant difference was observed between the different age groups, and across the months. Children whose parents have no formal education and whose parents have primary education recorded the highest prevalence with statistical significance. Children whose parents' occupation is farming had the highest prevalence which was statistically significant compared to those whose parents were non-farmers. Children who played/bathed and collected fresh water snails had higher risks of infection with urinary schistosomiasis in the area. **Conclusion:** The study draws attention to the health hazards posed by urinary schistosomiasis among children in in the studied area. The urgent need for a decisive control intervention to stem this problem cannot be overemphasized.

Key words: Prevalence, schistosomiasis, Benue, Nigeria

INTRODUCTION

Urinary schistosomiasis due to *Schistosoma haematobium* is a significant cause of clinical morbidity and disability in the endemic countries of Africa and the Middle East, where more than 110 million people are infected.[1] Recent reports of the World Health Organization (WHO) estimated that about 779 million people in 76 tropical and subtropical countries are at risk of schistosomiasis.[2] Over 207 million people in these countries are infected; of these, 120 million are symptomatic, with 20 million having severe clinical

disease.[2,3] Risk factors include persons living in or travelling to areas where schistosomiasis occurs, and those who come in contact with fresh water where the intermediate host is present.

In sub-Sahara Africa, 192 million are estimated to be infected with the two forms of schistosomiasis (intestinal and urinary), and Nigeria recording the largest number of infection with about 29 million cases.[4] Schistosomiasis is more prevalent in school-aged children, adolescents, and young adults who also suffer from the highest morbidity and mortality.[4] Approximately two-thirds of the cases of schistosomiasis are associated with *Schistosoma haematobium* infection, which represents an important cause of severe urinary tract disease.[5]

Praziquantel has been adopted as the drug of choice for control strategy by the National Policy on Schistosomiasis Control in Nigeria. Recently, an assessment was made on different channels for praziquantel delivery in mass treatment effort.[6] In Nigeria, little has been achieved in the control of schistosomiasis. This is because the disease is mostly a rural occupational disease affecting those engaged in agriculture or fishing, and residents in rural and peri-urban areas. Associated risk factors also include illiteracy, poor socio-economic standard, poverty, poor hygiene, and inadequate public infrastructure. The lack of epidemiological data and basic information regarding prevention of the disease in rural communities with high risk groups has hindered the control efforts.[6]

The dearth of epidemiological data on *Schistosoma haematobium* infection in Buruku and Katsina-Ala LGAs communities can adversely affect adequate patient evaluation, management and control programmes. This study was therefore undertaken in order to determine the level of infection and factors associated with the disease among children. These can be used to plan strategies for control programme for the area in accordance with WHO recommendations.

MATERIALS AND METHODS

Study area

The study was conducted in two neighbouring local government areas (Buruku and Katsina-Ala) of Benue state. The State is also endemic for other parasitic diseases like the different forms of filariasis, intestinal parasites and malaria (7-12). These areas were selected for the study based on previous reports from health facilities where cases of urinary schistosomiasis were common especially among school children. The relative position of the two Local Government Areas in Benue State is about the Middle Eastern part of the State. The areas are drained by streams and rivers among which river Katsina-Ala is the biggest. Ponds are also found all over the areas especially during the wet months. The areas have a monthly temperature ranging from 27°-38ºC. The areas receive 900-1000 mm of rain fall annually with two distinct seasons: the dry season usually begins in late October and ends in March, while rainy season extends from mid-April to early October. This is the period of intensive agricultural activities. Bathing, swimming and washing in the streams are common. There is also a generally low level of educational of most of the inhabitants.

Study population

Permission was sought from the Local Government Chairmen and Local Government Education Authorities of both areas prior to the commencement of the study. Announcements were made in churches and a pre-survey visit was made to the communities, while consultation/discussions were held with communities' heads that assisted in mobilizing the people for study. Six communities and 10 schools (6 primary and 4 secondary) were visited. The communities included: Sev-Av, Mbajor and Ishan from Buruku LGA; Mbayer, Ikowe and Tavachan from Katsina-Ala. The schools visited were: St Peters Primary school, NKST Ishan primary school, Roman Catholic Mission (RCM) primary school Abwa, Binev community Secondary school and Tombo community secondary school from Buruku LGA and UBE central primary school, Local Government Education Authority (LGEA) primary school Tavachan, LGEA primary school Ikowe, Government Secondary School Abaji, Universal Basic Education (UBE) central secondary school from Katsina-Ala LGA. In each local government, school children were screened during school hours. However, pre-school children in the communities were screened in the house of community heads. Pupils were selected randomly from different classes; class 3 to class 6 for primary schools and junior class 1 to senior class 3 for the secondary schools. Their ages ranged from 1 year among the pre-school to > 18 years among the school children.

Questionnaire administration

A questionnaire consisting of questions relevant to urinary schistosomiasis was issued to each child to obtain information on: age, sex, level of education and occupation of parents and water contact

activities. Pre-school pupils who took part in the study were excluded for interview. Their mothers however provided relevant information on their water contact activities. Using the form, some of the primary school pupils in lower classes (Class 3, 4 and 5) and adults in the communities were interviewed individually. Some of the questions were translated and communicated to them in the local language for better understanding with the assistance of a local health worker and teachers, while those in higher classes (primary six and those in secondary schools) were grouped in the respective classes and were directed to appropriately fill the form.

Sampling technique and laboratory analysis

A total of 1,124 urine samples were collected from pre-school, primary and secondary school pupils between November 2008 and September 2009. 20ml of clean-catch, midstream urine samples was collected in 20ml capacity autoclaved wide mouthed, universal containers by participants following thorough instructions. Samples were obtained between 10:00hrs and 14:00hrs as described by Cheesbrough.[13] The specimens were appropriately labeled with identification numbers and put in a cooler.

The standard parasitological method, the filtration technique using a 10 ml syringe, swinney filter holder (13mm diameter) and polycarbonate membrane filters (13µm porosity and 13mm diameter) was employed to recover *Schistosoma haematobium* eggs in the laboratory.[13] Examination was done under the 10x and 40x objectives.

Statistical analysis

Microsoft Excel 2007 and SPSS version 18.0 were used to perform data analyses. Frequency distribution tables, percentage prevalence of urinary schistosomiasis infections were estimated using standard formulae. Chi-square test was used to compare the differences in prevalence of infection between groups of children, sex and age groups as well as socio-demographic variables. Multinomial logistic regression was used to test association between water contact activities considered as risk factors and prevalence of infection.

RESULTS

Table 1 outlines the general prevalence rate of urinary schistosomiasis among pre-school, primary and secondary school children in Buruku and Katsina-Ala LGAs of Benue State, Nigeria. An overall prevalence of 41.5% was recorded. The prevalence varied between 37. 45.4% among the three groups children. There was, however, a statistically significant difference in prevalence between the different groups of children (χ^2=92.8, *p=0.000*).

Table 2 shows the prevalence rate of urinary schistosomiasis in relation to sex among pre-school, primary and secondary school children in Buruku and Katsina-Ala LGAs of Benue State, Nigeria. Males recorded higher prevalence rate of 45.2% than females (37.2%). There was a statistically significant difference in prevalence between males and females (χ^2= 7.9, *p=0.005*).

Figure 1 shows the prevalence rate of urinary schistosomiasis in relation to age among pre-school, primary and secondary school children in Buruku and Katsina-Ala LGAs of Benue State, Nigeria. The age group >18 years had the highest prevalence rate of 48.6%, while the least prevalence rate (37.0%) was observed in the 3-7 years age group. However, there was no significant difference in prevalence rate between age groups (χ^2= 8.9, *p=0.31*).

Figure 2 shows the monthly prevalence of urinary schistosomiasis in Buruku and Katsina-Ala LGAs of Benue State, Nigeria. Prevalence rate of urinary schistosomiasis varied between 31.9%-52.7% with the month of January 2009 having the lowest rate (31.9%) and the month of June 2009 having the highest rate (52.7%). However, there was no significant difference in prevalence between months (χ^2= 20.6, *p=0.14*).

Table 3 shows the prevalence of urinary schistosomiasis in relation to the education of the parents of the children examined in Buruku and Katsina-Ala LGAs of Benue State, Nigeria. It was observed that children whose parents had no formal education recorded the highest prevalence of 47.0%, while the least prevalence was observed among children whose parents had post-secondary education (27.0%). A statistically significant difference was also observed in prevalence between the different level of education of the parents of the children (χ^2= 20.0, *p=0.000*). With regards to occupation, children whose parents were farmers had the highest prevalence rate of infection (44.0%), while the prevalence rate of 35.0% was observed among children of non-farmers. However, a statistically significant difference was observed in

prevalence between children of farmers and non-farmers ($\chi^2_= 33.7$, *p=0.000*).

Table 4 summarizes the various activities of the children that are associated with water contact in Buruku and Katsina-Ala LGAs of Benue State. Children that washed in water bodies had the highest rate of urinary schistosomiasis with 87.1%, while the least prevalence rate was observed among children that swam & fished in water bodies (42.7%). Children that played/bathed and those that collected fresh water snails from infested water were at higher risk of becoming infected with urinary schistosomiasis in the area with odd ratios (OR) of 2.16 [1.51-3.10, *p = 0.000*] and 2.00 [1.45-2.76, *p = 0.000*] respectively.

Table 1: Prevalence of urinary schistosomiasis among pre-school, primary and secondary school children in Buruku and Katsina-Ala LGs of Benue State, Nigeria

Distribution	No. examined	No. infected (%)
Pre-school	124	46(37.1)
Primary school	500	193(38.6)
Secondary school	500	227(45.4)
Total	1,124	466(41.5)
	($\chi^2_=$92.8, *p=0.000*)	

Table 2: Prevalence of urinary schistosomiasis in relation to sex among pre-school, primary and secondary school in Buruku and Katsina-Ala LGAs of Benue State, Nigeria

Sex	No. examined	No. infected
Male	583	265(45.5)
Female	541	201(37.2)
Total	1,124	466(41.5)
($\chi^2_=$ 7.9, *p=0.005*).		

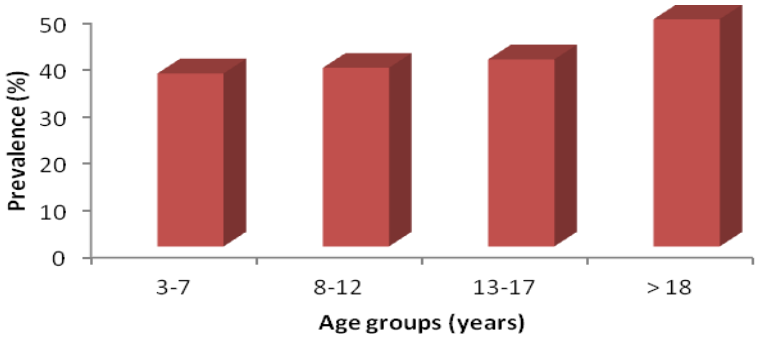

Figure 1: Prevalence of urinary schistosomiasis in relation to age among pre-school, primary and secondary school children in Buruku and Katsina-Ala LGAs of Benue state, Nigeria

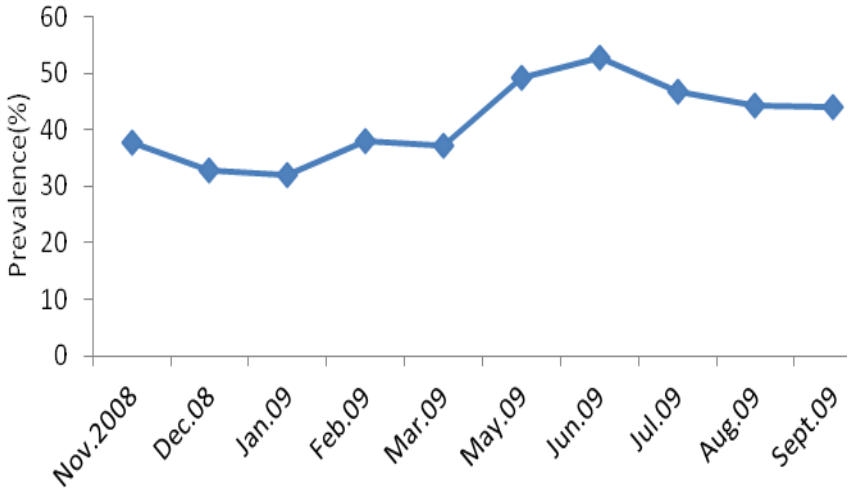

Figure 2: Monthly prevalence of urinary schistosomiasis in Buruku and Katsina-Ala LGAs in Benue state, Nigeria

Table 3: Prevalence of urinary schistosomiasis in relation to the level of education and occupation of the parents of the children in Buruku and Katsina-Ala LGAs of Benue state, Nigeria

Parameters	No. examined	No. infected	χ^2-value	*p*-value
Level of education			20.0	*0.000*
No formal education	460	216(47.0)		
Primary education	219	96(43.8)		
Secondary education	297	114(38.4)		
Post-secondary education	48	40(27.0)		
Total	1,124	466(41.5)		
Occupation			33.7	*0.000*
Farmers	821	361(44.0)		
Non-farmers	303	106(35.0)		
Total	1,124	466(41.5)		

DISCUSSION

The prevalence of urinary schistosomiasis (41.5%) as indicated in this study suggests that Buruku and Katsina-Ala LGAs of Benue State fall within the W.H.O classification as endemic.[14] The present study supports studies conducted in other parts of Nigeria which have shown endemicity of *S. haematobium* infection in the rural areas.[15-17] The main factors that might be associated with the endemicity of urinary schistosomiasis in the areas are low literacy, presence of infested water bodies like streams, ponds and the biggest river (River Katsina-Ala) where daily chores activities like washing, fetching of water for domestic purposes, fishing, bathing and swimming take place. Activities like collecting edible snails for feeding or selling is also common in the area. Such predisposing factors have been also reported to putting individuals at risk of infection in a study conducted by Mbata *et al*.[18] who found similar prevalence (45.7%) in Ogbadibo LGA of Benue State, Nigeria.

Table 4: Summary of water contact activities of participants in Katsina-Ala and Buruku LGAs of Benue state, Nigeria

Water contact activity	No. examined	No. negative (%)	No. infected (%)	OR (odd ratio)	(C.I), 95% *p-value*
Swimming					
Yes	466	155(33.3)	311(66.7)	0.99	0.71-1.36 *0.958*
No	658	269(40.9)	389(59.1)		
Fishing					
Yes	466	242(51.9)	224(48.1)	0.92	0.55-1.36 *0.764*
No	658	384(58.4)	274(41.6)		
Swimming & fishing					
Yes	466	267(57.3)	199(42.7)	1.02	0.58-1.78 *0.946*
No	658	424(64.4)	234(35.6)		
Playing/Bathing					
Yes	466	61(13.1)	405(86.9)	2.16	1.51-3.10 *0.000*
No	658	197(29.9)	461(70.1)		
Washing					
Yes	466	60(12.9)	406(87.1)	1.65	1.13-2.39 *0.008*
No	658	181(27.5)	477(72.5)		
Collection of snails					
Yes	466	118(25.3)	348(74.7)	2.00	1.45-2.76 *0.000*
No	658	572(86.9)	86(13.1)		
Rice farm					
Yes	466	215(46.1)	251(53.9)	1.03	0.79-1.34 *0.812*
No	658	354(53.8)	304(46.2)		

Key: C.I = Confidence Interval

The prevalence rate in the present study is similar to various reports across Nigeria, 37.9% in Sankwala, Cross-River State, Nigeria,[19] 43.7% and 41.6% in two endemic areas of Ondo State and in the Danjarima community of Kumbotso LGA, Kano State[20,21] 46.2% in four local government areas of Benue State,[22] 41.5% in Bende LGA of Abia State.[23] In contrast, the result obtained in this study is lower than the reports of Sulyman *et al*.[24] and Nmorsi *et al.*[25] who recorded 71.1% in four States (Borno, Niger, Ondo and Ogun) of Nigeria and 65.0% in Edo State respectively. However, Akinwale *et al*.[26] and Agi and Awi-waadu[27] obtained higher prevalences of 54.6% and 51.9% in Ogun State and the Niger-Delta respectively. Ugbomoiko *et al*.[28] also reported higher prevalence of 62.0% in two peri-urban communities of south-western, Nigeria. The prevalence recorded in this present study is higher than findings of Okoli *et al*.[29] and Ejima and Odaibo[30] who reported prevalences of 11.3% and 18.7% in Ohaji/Egbema LGA, Imo State and the Niger-Benue basin of Kogi State respectively.

Similar studies in other sub-Saharan areas of Africa have been reported. These include a prevalence of 47.6% in Dar-es-Salam, Tanzania,[31] 50.8% in South-west Cameroon,[32] 32.1% in Kumba, Cameroon,[33] 60.0% among Zimbabwean school children,[34] 10.4% among school children in Blantyre district, Malawi.[35]

Few studies have dealt with urinary schistosomiasis among pre-school children and this is because researchers assume that at that period, children have less contact with water bodies or are still under the custody of their parents, hence preventing them from infection. With regards to the

prevalence of urinary schistosomiasis among primary school pupils, a prevalence rate of 38.6% was observed. The lower prevalence observed in this study among primary school pupils might be because children at that level of study are cared for more (restricted, monitored and supervised) than their counter part in secondary schools. However, 38.6% is unacceptably high and this may be attributed to their care-free attitudes towards swimming, fishing, bathing and playing in infested water bodies which encourage infection.

Prevalence recorded in primary school children contrasts other studies conducted within and outside Nigeria which reported peak prevalence of urinary schistosomiasis among primary school children.[36-38] Children of pre-school age were found to have a considerable number of urinary schistosomiasis (37.1%). Various studies of urinary schistosomiasis have focused on school-age children and adults, with little or no emphasis on pre-school children and where pre-school children were part of the study, information about them was always subsumed.[39-41] Prevalence recorded among the pre-school children in this study (37.1%) is lower than 58.1% and 71.8% in a rural community near Abeokuta and settlements around Oyan reservoir in Ogun State, but higher than 19.8% found among pre-school children in a rice farming community of Adim in Cross-River State, Nigeria.[42-44] The considerable prevalence in this group could be the result of early exposure to infested water bodies when these children were taken along with their mothers. It was also observed that pre-school children in the areas were also exposed to infection through the learning process of swimming.

The prevalence rate observed among the secondary school children in this study is higher than 17.1% reported among two secondary schools in Minna, Niger State, Nigeria.[45] Oniya and Olofintoye[20] found slightly higher prevalence (53.4%) among secondary school children in Ipogun and Ifedore LGAs of Ondo State, Nigeria than the present study.

The lower prevalence rate of 37.2% among the females when compared to the males 45.5% can be attributed to higher tendencies of water contact among the males through swimming, playing and engagement in other activities like the making of burnt bricks along the streams and ponds besides the primary domestic activities of washing and fetching water which expose both sexes to infection. The findings of the present study corroborates with those reported earlier by Sulyman *et al*.[24] and Odaibo *et al*.[46] who found higher prevalence in males than females in Lagos and Ondo States respectively. Agi and Awi-waadu[27] in the Niger-Delta, Uneke *et al*.[47] and Uneke *et al*.[17] in Ebonyi State also found similar results reporting males having higher prevalence than females. This study, however, disagrees with the findings of Etim[48] who stated that more females are exposed to urinary schistosomiasis than males in rural communities of Nigeria. However, other studies reported that sex related prevalence is not significant in the distribution of urinary schistosomiasis but could differ due to some variations in behaviour and cultural practices regarding water uses and contact.[5,49-52] Thus, the variations in the infection pattern may be attributed to differences in geographic and environmental settings or in cultural and religious beliefs.

The study has indicated similar prevalences in the under 18 years. This shows similar behavioural habits of exposure of these children to infested water bodies. From other parts of Nigeria peak prevalence of *S. haematobium* was reported from children aged 10-20 years.[50,53,54] The prevalence rate of 38.2% found in the 8-12 years in this study contrast findings of Agi and Awi-waadu[27] and Ugbomoiko *et al*.[28] who found high prevalence rates of 62.0% and 66.5% respectively in the similar age group. However, prevalence rate of 40.0% observed in the 13-17 years corroborates with the findings of Okanla *et al*.[54] and Sama *et al*.[33] who reported similar prevalence rates in the same age groups among subjects in Cape coast Region of Ghana and Kumba in the South west Region of Cameroon respectively. Older children (> 18 years) tend to be more infected than the younger ones. This is because of their exposure to infested water through water related activities.

The high prevalence of *S. haematobium* infection observed during the month of June and the rainy season (May 2009-September 2009) may be due to the increased agricultural activities during the season. In the area, people are found to be working in swampy areas commonly known as 'fadama'. The rainy season in the area is also a period of intense fishing where people are found in ponds and streams hunting for fish. Spending time in *S. haematobium*-infested water bodies raises the rate and endemicity of the disease. This corroborates the reports of Nmorsi *et al.*[23] observed in a rural community of Edo State, Nigeria. The observed high prevalence during rainy season may also coincide with the breeding time, attainment of

maturity and abundance of the snail vectors. Akogun and Okin[39] in an ecological study of fresh water snails in an agro-industrial estate in Yola, Nigeria found that snail vectors infectivity with cercariae depends on seasons with the peak of infectivity during the beginning of rainy season (May, June). This could to some extend explain the highest prevalence observed during the months of May and June 2009. The low prevalence observed during the months of December 2008 and January 2009 may be as a result of reduced water contact activities of the residents because water remains high in the river bed, streams and ponds. This could be also due to the cold-dry period referred to as 'harmattan period' in the area where people have less contact with water. The relatively high prevalence during the months of November 2008, February 2009 and March 2009 may be due to the fact that during the month of November inhabitants are engaged in the collection of edible snails from the ponds and streams and the months of February and March corresponding to the beginning of the hot season where inhabitants sought for water and increased contact with streams, ponds and rivers through recreational or domestic activities. The high prevalence of urinary schistosomiasis during rainy season observed in this study is similar to reports of Sarkinfida *et al*.[21] in Danjarima community of Kano State. This study also agrees with findings of Biu *et al*.[55] who reported peak prevalence during rainy season in Konduga LGA of Borno State. However, this study is in contrast to reports of Nwabueze and Opara[56] who found higher prevalence of urinary schistosomiasis during dry season among school children of some riverine communities in Delta State. Their reason was that during rainy season the small ponds and lakes are merged with river Niger and Ase creek forming a continuous body of water around the communities. As a result of the increased volume of water, inhabitants are scared of swimming and fishing and other related activities are reduced to the heavy rainfall which could actually meet these needs. Thus differences in prevalence may be influenced by peculiar ecological characteristics of the snail vectors, climate and level of water contact activities with infested water bodies. In this study, urinary schistosomiasis does not have a seasonal transmission though with peak prevalence during rainy season, this means that transmission is perennial in the area.

Educational and occupational background of parents of the children did not significantly affect the prevalence of urinary schistosomiasis, though children whose parents had no formal and primary education had the highest prevalence of infection. This could be due to lack of proper knowledge of the disease which leads to inability to properly educate their children/wards about the preventive measures against the disease. The fact that educational backwardness has a great impact on the distribution of schistosomiasis in rural communities has been reported in Cross River State of Nigeria.[48]

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