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A Comparative Evaluation of the Prevalence of Urinary Schistosomiasis in Two Contrasting Communities in Benue State, Nigeria

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Abstract: This study comparatively examined the prevalence of Urinary schistosomiasis in a rural and an urban community in Benue State, Nigeria. The sedimentation technique was used to examine 440 urine samples for *Schistosoma haematobium*. A high prevalence of 194(44.1%) was observed in both populations. The prevalence of infection in the rural community 165(55.0%) was higher than the urban area 29(20.7%). There was a significant difference in the infection among the urban and rural settings (χ^2_{cal}=25.41, df=1, p-value <0.05). The prevalence rates was significant in both communities, with age-group >16 in *Guma* recording the highest infection rate 7(77.8%), while age group 16-18 years recorded the highest prevalence 13(25.5%) in the urban area. When compared to other age groups, these differences were also significantly different ($p < 0.05$). In both communities, the pattern of infection between male and female participants showed consistency; in both communities males were more infected. Overall, these gender differences were statistically significant (χ^2_{cal}=4.223, df=1, p-value <0.05). Individuals who wash in streams or river recorded the highest infection rate of 82(18.6%), compared to individuals who are exposed to other predisposing factors. It was concluded that urinary schistosomiasis is endemic in both communities and that factors that enhance the susceptibility of individuals to the disease are still prevalent in Benue state. The study recommends that breaking the cycle of the disease could be realized through a sustained health enlightenment campaign on the disease, the provision of safe water supplies and sanitation.

Keywords: *Schistosoma haematobium,* Makurdi, Guma, Rural, Urban, Benue

1. Introduction

Human schistosomiasis, also known as bilharziasis due to *Schistosoma haematobium*, is widespread ranking second to malaria in terms of socio-economic and public health significance in tropical and sub-tropical areas. It is the most prevalent of the water-borne diseases, with a very great risk on the health of rural populations [1, 2]. Among the helminth infection, *Schistosomiasis* is considered one of the most important health problems, not only for its high prevalence but also for its potential to develop into severe clinical forms precisely at a time of greatest human productivity [3].

Each year, due to *S. haematobium* infection, 70 million people suffer from haematuria, 18 million from bladder wall pathology, 10 million from hydronyphrosis, and 150, 000 people die from kidney failure [4], 85% of Schistosomiasis occur in Africa [5]. The disease is common worldwide causing 56% of known cases of calcification of the bladder

(bladder stone). More than 207 million people in at least 74 countries have active schistosomal infection. Of this population, approximately 60% have disease symptoms, including organ-specific complaints and problems related to chronic anemia and malnutrition from the infection; more than 20 million are severally ill. Nigeria has the most cases of human schistosomiasis within Sub-Saharan Africa with about 29 million cases in 2008 [6].

Schistosomiasis is considered a disease of poverty because poor social and environmental conditions increase the risk of the disease [1]. Lack of safe water supplies, inadequate sanitation, insufficient access to health care and high treatment costs all contribute to the transmission and high morbidities. The distribution of the disease is focal, aggregated and usually related to water resources and development schemes such as irrigation projects, rice/fish farming and dams. It occurs in all the states of the federation, with a high infection rate among school children [7].

This is true both on a global as well as on a smaller scale measured at the village, neighborhood, household or individual level [8].

The prevalence of the disease has been described from other parts of Nigeria [9, 10, 11, and 12]. The uncovering of the infection in areas not previously reported is no doubt indication of the inadequacy of the information on the epidemiology of this parasitic infection in Nigeria [13]. Urinary schistosomiasis is widespread in both rural and urban communities in Nigeria, with prevalence ranging between 2% and 90% and the vast majority of cases occurring among the poor and marginalized. [14 and 15].

To achieve greater success in the control of urinary schistosomiasis in Nigeria, it is important to provide useful data on the epidemiological status and disease distribution among the high risk population in the different parts of the country [16]. This study comparatively examined the prevalence of Urinary schistosomiasis in two contrasting communities in Benue State, Nigeria; to further update and broadens the epidemiological picture of *S. haematiobium* infection in Nigeria.

2. Materials and Methods

2.1. Study Area

This study was conducted in Government Secondary School, Nigerian Air Force Base, Makurdi and Guma Local Government Area, both of Benue state, Nigeria. GSS NAF Base is situated in Makurdi which is the capital city of Benue state while Guma is a rural settlement with inadequate basic amenities like potable water, electricity and good access roads. The economic activities of the inhabitants of Makurdi revolve around civil service, farming, trading, fishing and other professional services. Benue state covers an area of about 34,059 km^2 with a population of over 4.2 million people. Majority of the inhabitants speak Tiv language and engage in peasant agriculture. Temperature ranges from 26–29.5°C in dry season and 19.5–24°C in rainy season with mean relative humidity of 78%. The town lies between latitude 7°30'–8° 00'N and longitude 8°30'–9°00'E and situated in the guinea savanna region, a vegetative region in Nigeria.

2.2. Study Design and Data Collection

In Guma, a community-based cross-sectional study was conducted between April and July, 2014. 300 school aged children were randomly selected for sampling at different households. In GSS NAF Base, a total of 140 students were selected. Sampling was not randomized as only senior students were selected. At Guma a preliminary advocacy visit was made to obtain informed consent from heads of households and community leaders, after a detailed explanation of the study protocol was done. Potential subjects who declined to participate were excluded. Subjects were strictly school-aged, without gender bias. At GSS consent was obtained from the school head as well as the participating students. Questionnaires were self-administered to obtain demographic characteristics and some predisposing factors such as water contact activities from each participant.

2.3. Parasitological Examination

Uniquely labeled specimen containers were given to the subjects with instruction to deposit midstream and terminal urine between the hours of 9-11am. The urine samples were transported to the medical Laboratory of NAF Base Medical Laboratory for examination. 10ml of each urine sample was centrifuged at 2,000 rpm for 5 minutes. The supernatant was discarded to leave the sediment, which was placed on a clean glass slide and covered with a cover slip. The slides were observed under a light microscope at X40 objectives lens for the presence of *S. haematobium* eggs. The *S. haematobium* ova were identified by the presence of a terminal spine on the ova.

2.4. Data Analysis

The data obtained were statistically analysed using Chi-square test with a p-value of 0.05 and simple percentage to obtain prevalence. The chi-square test was used to determine if the observed frequency of occurrence of any value conformed to the expected frequency of any value.

3. Results

A total of 440 participants in both communities were parasitologically examined. Results show high prevalence of 194(44.1%) in both populations. Analysis of the infection data in the two communities showed that the prevalence of infection in the rural community 165(55.0%) was higher than in the urban setting 29(20.7%). There was a significant difference in the infection between the urban and rural settings (χ^2_{cal}=25.41, df=1, p-value <0.05) (Tables 1 and 2). The prevalence rates in the two communities was significant in both communities, the age-group of 16 > in *Guma* recorded the highest infection rates 7(77.8%), while age group 16-18 years recorded the highest prevalence 13(25.5%) in the urban area. When compared to other age groups, these differences were also significantly different ($p < 0.05$). In both communities male participants were more infected (50.2%) than the females (37.2%). Overall, these gender differences were statistically significant (χ^2_{cal}=4.223, df=1, p-value<0.05) (Table 2).

An assessment of the epidemiological factors associated with *S. haematobium* transmission in both communities showed that individuals who wash in streams or river (laundry) recorded the highest infection rate of 82(18.6%), compared to individuals who are exposed to other predisposing factors (Table 3).

Table 1. *Prevalence of S. haematobium in relation to age in the study areas.*

Age group	No. examined	No. Infected (%)
Guma (Rural)		
1-5	118	53(44.9)
6-10	131	76(58.0)
11-15	42	29(69.0)
16 >	9	7(77.8)
Total	300	165(55.0)
GSS NAF Base (Urban)		
13-15	30	7(23.3)
16-18	51	13(25.5)
19-21	37	7(18.9)
22-25	22	2(9.1)
Total	140	29(20.7)
Grand Total	440	194(44.1)

(χ^2_{cal}=25.41, df=1, p-value<0.05)

Table 2. *Prevalence of S. haematobium in relation to sex in the study areas.*

Sex	Guma (Rural)		GSS NAF Base (Urban)		Total	
	No. exam	No. infected (%)	No. exam	No. infected (%)	No. exam	No. infected (%)
Male	170	103(60.6)	63	14(22.2)	233	117(50.2)
Female	130	62(47.7)	77	15(19.5)	207	77(37.2)
TOTAL	300	165(55.0)	140	29(20.7)	440	194(44.1)

(χ^2_{cal}=4.223, df=1, p-value<0.05)

Table 3. *Epidemiological factors associated with S. haematobium transmission in the study area.*

Epidemiological Factors associated with *S. haematobium* transmission	Guma (Rural) (N=300)	GSS NAF Base (Urban) (N=140)	Total (N=440)
	No. infected (%)	No. infected (%)	No. infected (%)
Reside close to river or stream.	30(10.0)	5(3.6)	35(8.0)
Swim in river or stream.	41(13.7)	4(2.9)	45(10.2)
Engage in irrigation farming	23(7.7)	9(6.4)	41(9.3)
Wash in stream or river (laundry).	71(23.7)	11(7.9)	82(18.6)
Total	165(55.0)	29(20.7)	194(44.1)

Note: N= number examined, (%) =Prevalence

4. Discussion

This study revealed that urinary schistosomiasis is endemic in both communities sampled indicating the fact that factors that predisposes the people to the infection is still prevalent in both communities. The prevalence of 55.0% recorded in the rural area was found to be higher than 20.7% in the urban area. It was also higher than 22.1% recorded in Abeokuta [17] and 47% reported Osun state [14], Nigeria. The 55.5% prevalence recorded in Guma is about four times higher than the national Nigerian mean of about 13% [18]. However the prevalence recorded in both communities was found to be lower than that previously reported in other parts of Nigeria such as 71% in Ogun State, South-Western Nigeria [11], 95% in Ondo State [19] and (62%) in Osun State [20].

The findings in this study indicates that urinary schistosomiasis is endemic and common in this areas due to the fact that the recorded prevalence was higher than that of the National mean prevalence of about 13%. It was observed that the pattern of infection increased with age in the rural area implying that intense transmission may be going on among adults in the rural area, thus increasing the probability of high morbidity among adults. The opposite was the case in the urban area where the infection prevalence pattern showed a mild decreased with increase in age.

Severe urinary schistosomiasis adversely affects human performance, reduces physical and intellectual functions, and may cause renal dysfunction, bladder-outlet obstruction, bladder cancer and infertility [21].

In both settings, prevalence appeared to be closely associated with the age and gender of the children. Females were less likely to be infected than males, who were more infected. Similar trends have been recorded before in endemic settings, in Nigeria and elsewhere in Africa. [22, 23, 24, 25, 26, 27, and 28]. A higher infection rate was found in ages above 16 years which agrees with the findings that ages of 13 and above tend to play outdoor water contact activities more [29, 30].

Results show that human to stream water contact has linear relationship with infection rate. This is not surprising because of the level of exposure and duration of contact to the source of infection, the river or stream. Their different activities may probably make them to be intimately in contact with the river for longer periods of time, hence the more likely for them to be infected with the infective larvae of *S. haematobium* high rate of infection. Similar observations were reported that water contact activities and traditional agricultural practices are factors which contribute to the transmission of the disease. [31, 32]

5. Conclusion

A higher prevalence of urinary schistosomiasis was recorded in the rural area than in the urban area in this study. Infection was higher among males and increased with age and water contact activity in both communities; this is a pointer to the fact that males are more exposed to epidemiological factors that predispose them to the infection. Therefore, there is need for more efforts to be directed to especially the rural dwellers on urinary schistosomiais to mount successful control interventions in these areas. The component of control may include population-based chemotherapy in these areas of high schistosomiasis prevalence, the provision of safe and adequate water supplies and sanitation. Therefore, great success would be achieved through the integration of complementary strategies such as disease surveillance, health education, water supply and sanitation in the study area, also a community directed treatment using drug of choice or any other control measure in line with WHO's 2020 target for elimination of NTDs

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