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Human Water Contact Behaviour and Schistosoma haematobium Infection among Primary School Pupils in Guma LGA of Benue State.

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Abstract: *A study was carried out to investigate "Human water-contact and the transmission of S. haematobium infection among Primary School pupils in Guma Local Government Area of Benue State". Parasitological screening was carried out on 643 pupils, 455 (70.8%) males and 188 (29.2%) females. Out of the total figure, 352 tested positive [252 (55.4%) males and 100 (53.2%)] for the infection of S.haematobium. There was also a significant difference in the prevalence rate in the male and female population with the males having higher infection than females, (X^2_{cal}=6.61 > $X^2_{crit.}$ = 5.99 at P≤ 0.05 and 2df). The prevalence of the infection was significantly higher in Yelwatta (68.0%) than Gbajimba (51.1%) and Daudu (50.4%), (X^2_{cal} = $X^2_{crit.}$ =5.99 at P ≤ 0.05 and 2 df). The intensity of infection on the other hand was significantly higher in Daudu (39.2%) than Gbajimba (31.8%) and Yelwatta (29.0%), (X^2_{cal} =11.83 > $X^2_{crit.}$ =5.99 at P ≤ 0.05 and 2df). Individuals aged 6-10 years old were the most infected, and the intensity of infection was higher among males. The demographical survey data also revealed that pupils who had parents as farmers and fishermen were more exposed to the infection of S.haematobium (43.0% vs 30.4%). To control urinary schistosomiasis, methodologies and managerial tools should be integrated to improve preventive strategies with emphasis on health education, information and communication.*

Key words: *Human, Water Contact, Behaviour and S.haematobium*

I. Introduction

Urinary schistosomiasis caused by Schistosoma haematobium is reported endemic in 53 countries in the Middle East and most of the African continent (Chistulo et al., 2000). It is still one of the major public health problems facing humanity, with severe social and economic consequences (WHO, 1999). Nigeria is one of the countries known to be highly endemic for urinary schistosomiasis with estimated 101.28 million persons at risk and 25.83 million people infected (Chistulo et al., 2000). Accordingly, the estimates for mortality and morbidity in affected populations are high with school age children usually having the highest prevalence and intensity (Okoli and Odaibo, 1999; WHO, 2002). Although an infection with schistosomes does not always result in clinical disease, quite often, the infection assumes an absolutely asymptomatic nature. Persons with these infections in resource-constrained tropical areas of the world often present for care with severe illness only after complications have developed (Latif, 2004). According to Umeh, et al., (2001), the disease is an important determinant of weakness, nausea, and loss of weight, disability, morbidity and attrition.

Urinary schistosomiasis, therefore, ranks high among parasitic diseases in terms of socioeconomic and public health importance in tropical and subtropical areas. In spite of intensive research, there is still no easy means of control. The extensive human water-contact activities such as in rice padding, cloth washing, fishing, swimming and brick laying etc with lack of political will for a concerted national initiative have collectively increased the potential danger on the transmission of the disease. In Nigeria, the National Policy on Schistosomiasis Control adopted praziquantel as the main drug of use in the control strategy aimed at reducing morbidity. Unfortunately, not much has been achieved in the control of urinary schistosomiasis in the country, largely because the disease is mainly a rural occupational disease that affects people engaged in agriculture, fishing or water related occupations and other people residing in rural agricultural and periurban areas (Nmorsi et al., 2005).

In many parts of Benue State, much has not been reported on the prevalence of 88.00% in Eastern Benue State and Southern Taraba State. Amali (1993) also reported high prevalence among primary school children in Benue State, information on its existence and epidemiology in Guma Local Government Area, a largely rural and agrarian community is scanty. From available records, there appears to be no previous report on water-contact activities/behaviour and the transmission of urinary schistosomiasis in Guma Local Government Area of Benue State. It is in view of this that this research was conducted to investigate water-contact activities/behaviours and their association with S.haematobium infection and to access the need for improved water supplies and sanitary facilities for the development of health programmes in the area. The aim is to determine the prevalence and intensity of urinary schistosomiasis in the study area and establish the relationship between age, sex or locality and S. haematobium infection.

II. Materials/Methods

Study area and population

Guma Local Government Area is found between longitude 6^0E and 9^0E of the Greenwich meridian and Latitude 6^0N and 8^0N of the equator. It is bounded by Logo Local Government Area to the East, Makurdi LGA and Tarka LGA to the South, Awe LGA of Nasarawa State to the West and Keana LGA to the North. The climate of the area is tropical and the vegetative characteristics are predominantly low land rainforest with an average temperature of 30^0C. This study was conducted from January 2008 through December 2008. A total of 9 schools were randomly selected from the three zones, a total of 643 pupils were screened for urinary schistosomiasis between the ages of 5-20 years considering age and sex

Sampling Techniques

Sterile sample bottles were provided to the pupils who collected about 20ml of clean midstream urine samples between 10.00hrs and 14.00hrs since eggs output reach peak value at this time of the day (WHO, 2003). The specimens were labeled appropriately with identification numbers and packed in a thermo cool flask loaded with ice packs to prevent egg hatching by adding 2 drops of 10% formaldehyde (WHO, 2003; Cheesbrough et al., 1998).

Sample Analysis

The urine concentration technique was used in screening the samples (Theinpoint et al., 1986) through sedimentation by centrifugation. 10ml of each urine sample was centrifuged at 500rpm for 5 minutes. Thereafter, the supernatants were discarded and the sediments transferred onto a clean microscope slide by the use of a suction tube covered with a clean slip and examined for the eggs of S. haematobium. The result was analyzed as the number of eggs/10ml of urine and was categorized as light (≤50 eggs/10ml of urine) and heavy (≥50 eggs/10ml of urine) according to school, age, sex and water contact activities of the pupils. A few drops of saponin solution were added to samples with visible haematuria to enhance clarity of eggs in microscopy. Data was presented in tables and differences were evaluated using the chi-square test (X^2).

III. Results

Results as revealed in Table 1 indicates that a total of 352 (54.7%) pupils tested positive for urinary schistosomiasis in relation to sex and the highest prevalence of 68.0% was recorded in the both sexes in Yelwatta alone followed by males in Gbajimba with a prevalence of 52.0%. Daudu on the other hand recorded the least prevalence of 51.6% and 47.7% among the males and the females respectively. The differences in prevalence of urinary schistosomiasis among the different sexes were statistically significant (P≤0.05).

Table 1: Prevalence of S.haematobium infection in relation to sex in the study area

	Male					Female					Overall Total		
Study Areas	**No. S**	**No. +ve O**	**%**	**E**	**X^2**	**No. S**	**No. +ve O**	**%**	**E**	**X^2**	**No S**	**+ve**	**%**
Gbajimba	167	87	52.0	80.2	0.58	52	25	48.0	31.8	1.45	219	112	51.1
Daudu	188	97	51.6	98.8	0.03	86	41	47.7	39.2	0.08	274	138	50.4
Yelwatta	100	68	68.0	73.0	1.66	50	34	68.0	29.0	2.81	150	102	68.0
Total	455	252	55.4	252	2.27	188	100	53.2	100	4.34	643	352	54.7

$X^2_{cal} = 6.61$ $X^2_{crit} = 5.99$ df = 1×2 = 2 P≤0.05

Result: Significant

Key O - Observed frequency

No. – Number

X^2 – Chi Square

No. S – Number screened

E – Expected frequency

+ve – Positive cases

% - Percentage

Results presented in Table 2 shows the intensity rate of the disease with the highest intensity rate in Daudu (39.2%) followed by Gbajimba (31.8%). Exposure to severity of infection was more in the males (44.4%) than their female counterparts (41.0%). There was also a significant difference in the intensity of the infection in relation to sex in the study area ($X^2_{cal} = 11.83 > X^2_{crit.} = 5.99$ at P ≤ 0.05 and 2df).

Table 2: Overall intensity of S.haematobium in relation to sex in the study area

	Male		**Female**		**Overall total**						
Study Areas	**MH(%)**	**GH(%)**	**MH(%)**	**GH(%)**	**+ve(%)**	**MH**			**GH**		
	≤50 egg/10ml	**≥50 egg/10ml**	**≤50 egg/10ml**	**≥50 egg/10ml**		**O**	**E**	**X^2**	**O**	**E**	**X^2**
Gbajimba	58 (66.7)	29(33.3)	16(64.0)	9(36.0)	112(31.8)	74	63.31	1.80	38	48.68	2.34
Daudu	56 (57.7)	41(42.3)	25(61.0)	16(39.0)	138(39.2)	81	78.01	0.11	57	59.98	0.14
Yelwatta	26 (38.2)	42(61.8)	18(52.9)	16(47.1)	102(29.0)	44	57.66	3.23	58	44.33	4.21
Total	**140(55.6)**	**112(44.4)**	**59(59.0)**	**41(41.0)**	**352(100)**	**199**	**198.98**	**5.14**	**153**	**152.99**	**6.69**

$X^2_{cal} = 11.83$ $X^2_{crit.} = 5.99$ df = 1× 2 = 2 $P \leq 0.05$

Result: Significant

Key

GH – Gross haematuria
MH – Micro haematuria
O – Observed frequency
+ve – Positive cases
X^2 – Chi Square
% - Percentage
E – Expected frequency

Results presented in Table 3 shows the age group that was most infected in relation to sex; the pupils aged between 6-10 years were most infected and the female population was more exposed to heavy infection (GM) with intensity rate of 36.0% than the males recording 33.3%. For mild infection (MH), the males had higher disease burden than the females (66.7% vs 64.0%).

	Male			Female		
Age	No. +ve	MH(%) ≤50 **egg/10ml**	GH(%)≥50 **egg/10ml**	No.+ve	MH(%)≤50 **egg/10ml**	GH(%)≥50 **egg/10ml**
0-5	4	3(75.0)	1(25.0)	2	2(100)	0(0.0)
6-10	56	34(60.7)	22(39.3)	10	5(50.0)	5(50.0)
11-15	16	13(81.3)	3(18.7)	9	6(66.7)	3(33.3)
16-20	11	8(72.7)	3(27.3)	4	3(75.0)	1(25.0)
Total	**87**	**58(66.7)**	**29(33.3)**	**25**	**16(64.0)**	**9(36.0)**

Key

MH – Micro haematuria
GH – Gross haematuria
+ve – Positive cases
% - Percentage

Results in Table 4 shows the prevalence of infection recorded more in pupils whose parents were farmers and fishermen with rates of 43% and 30.4% respectively, followed by pupils whose parents were civil servants, businessmen and bricklayers with prevalence rates of 10.5%, 10.0% and 6.3% accordingly.

	Gbajimba			Daudu			Yelwatta			Overall total	
Occupation	No S	No +ve	% +ve	No S	No +ve	% +ve	No S	No +ve	% +ve	No S	% +ve
Farming	76	36	32.1	114	59	42.8	82	56	54.6	272	151(43.0)
Fishing	88	52	46.4	85	45	32.6	13	10	9.8	186	107(30.4)
Bricklaying	-	-	-	-	-	-	30	22	21.6	30	22(6.3)
Civil servant	20	9	8.0	47	20	14.5	15	8	7.8	82	37(10.5)
Business	35	15	13.4	28	14	10.1	10	6	5.9	73	35(10.0)
Total	219	112	100	274	138	100	150	102	100	643	352(100)

IV. Discussion

Among the 643 pupils screened in the study area, the study revealed 54.7% overall prevalence of the disease in the study area. This is in consonance with Bajah (2004) who reported 54.1% overall prevalence in Katsina-Ala Township. Banke (1995) in his studies reported 51.74% overall prevalence in the settlements around Katsina-Ala River Basin. Okon and Emenayon, (2006) elsewhere in Adim Community Cross River State found a prevalence of 45.3% among 150pupils screened. These similarities in the overall prevalence in the various study areas indicate similar water related practices in the various localities by the school children. Moreover, total dependence on freshwater bodies as a source of water supply may have contributed to the high prevalence rate reported in this present study.

The result also showed that, males had higher prevalence rate (55.4%) than the females (53.2%). Statistical analysis also showed a significant difference in the trend. The higher infection in males is presumably due to higher water contact activities by the male pupils where they easily expose their entire bodies to the infested water than the female folk's particularly in activities like fishing and hunting for the snail intermediate host, swamp rice farming and bricklaying where fathers engage every male in their household in the profession. This, therefore, shows that, poverty and ignorance are eating up the health of the entire people of Guma LGA and perhaps the State at large where pupils of as young as the school age cadre are being engaged in hard labored occupations in order to augment the needs of the family.

The intensity rate of infection of S. haematobium infection in relation to sex in the study area as presented was significantly higher in Daudu (39.2%) than Gbajimba (31.8%) and Yelwatta (29.0%). Statistical analysis showed that there was also a significant difference in the trend. It was observed here that, the general percentage of pupils with heavy infection (Gross Haematuria) was considerably lower than those with light infection (Micro Haematuria). This is in harmony with an earlier report, (Mahmond, 2000) which indicated that, the distribution of urinary schistosomiasis in endemic communities fits a negative binomial curve with most infected persons harbouring low burdens and only a small proportion having heavy infections. This may also explain the trend we have observed here in the present study. However, the aggregation of worm burden in a small proportion of infected individuals may have multiple explanations including genetic susceptibility (Secor et al., 1996). Generally, the prevalence of heavy infection (Gross Haematuria) among the males and the females was recorded as 33.3% for males and 36.3% for females showing a higher infection in females than in males. This may be because, while the males work on the farms, the females undertake domestic washing and cooking. Water is very scarce in the study area and the main source of water for these inevitable activities originated from the river. As the females get into the river in search of water, they get infected easily with the viable cercariea indicating that domestic chores put females closer to the infested water than their male counterparts.

In this study area, result shows that, a steady rise in the prevalence for S.haematobium infection was observed from pupils of 0-5 years age group and peaked within 6-10 years age bracket before declining with increase in age. Similarly, Uneke et al., (2007) reported highest prevalence among individuals aged 5-10 years old in Ebonyi State and also Adeoye and Akabogu (1996) in Ogun State. In another study, peak prevalence was reported as follows: 10-14 years (Ekejindu et al., 1999). This may be because at this age, young boys and girls are emerging from late childhood to adolescence when they would like to be independent of every respective individual. Also, due to their excellent involvement in strenuous work, most often, unrest as they try to engage in one thing or the other thereby increases the chances of disease transmission. This decrease in prevalence with increase in age may be attributed to reduced exposure to human water contact rate and increase in immunity with age.

The demorgraphic survey data indicated that, the majority of pupils that tested positive had parents as farmers followed by fishermen with rates of 43.0% and 30.4% respectively. The reason for the retrogressive phenomenon in the Fish sector has already been documented by Agishi and Annune (1995) that fish production in Benue State has decreased from 15,845 metric tonnes in 1980 to 6,765 metric tonnes in 1990. This trend has made fishing non lucrative and unattractive and as such the reason why there is drastic shift to paddy rice and vegetable farming.

This study supports a number of previous reports which have consistently shown that S.haematobium endemicity in Nigeria is on the upsurge, particularly in the rural areas with school-age children at greater risk (Bello and Edungbola, 1992). The higher prevalence rate of the disease in this study also reflects the high level of exposure and dependence of the inhabitants of Guma LGA on the infested water bodies. Nmorsi et al., (2005) also reported high prevalence in Edo State of Nigeria and discovered that, high prevalence of volunteers with haematuria and proteinuria was a reflection of the level of renal involvement and morbidities which need further investigations. Poverty, ignorance, poor living conditions, inadequate sanitation and water supplies as well as deplorable personal and environmental hygiene which are the characteristics of many rural countries were identified as important factors exacerbating the transmission of urinary schistosomiasis. Indiscriminate disposal of human sewage and lack of portable water are other factors that may be responsible for the endemicity of the disease in the study area.

The disparity between different communities as regards prevalence and intensity could be related to how long streams and ponds could support transmission before drying up in the dry season, streams and ponds that last longer encourage more transmission with its attendant prevalence and intensity (Dalton and Pole, 1978).

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