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Full Length Research Paper

Urogenital Morbidities Associated with *Schistosoma haematobium* Infection in Nigeria

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The parasitological investigation assessing the ova of *Schistosoma haematobium* in urine of 138 volunteers in Ihieve- Ogben, Edo State, Nigeria revealed a prevalence of 43 (31.2%) . Children had a higher prevalence of urinary schistosomiasis 30 (41.1%) than their adult counterparts 13 (20.0%). More volunteers had light intensity of infection 27 (19.6%) than heavy infection 16 (11.6%). The ultrasonographical investigation carried out on these 43 *S. haematobium*-infected volunteers revealed ten pathological conditions as abnormal wall thickness 24 (55.8%), abnormal shape 30 (69.8%), irregular bladder wall 12 (27.9%), masses 10 (23.3%), pseudopolyp 2 (4.7%), echogenic particles 30 (69.8%), residual volume 12 (27.9%), calcification 24 (55.8%), hydroureter 10 (23.3%) and hydronephrosis 8 (18.6%). These pathological conditions were higher in the volunteers with heavy intensity of infection than those with light infection. Also more pathological conditions were reported among the children than their adult counterparts. Hydronephrosis and hydroureter were absent in the volunteers with light intensity of infection.

Key words: Urinary tract pathology, *Schistosoma haematobium*, rural volunteers, Nigerian, Ultrasound, Light infection, heavy infection.

INTRODUCTION

Urinary Schistosomiasis is a chronic parasitic infection of circulatory system caused by *Schistosoma haematobium* which affects the bladder and subsequently the urinary tract system of man. The effect of *S. haematobium* infection is due to deposition of eggs in the bladder and ureter which elicits chronic granulomatous injury. This granulomatous inflammation causes nodules, polypoid lesions and ulcerations in the lumen of the ureter and bladder which results clinically in urinary frequency, dysuria and terminal haematuria. The disease may progress chronically and terminates in renal failure and carcinoma of bladders as components of the morbidity and at times mortality. The clinical picture and indeed the disease outcome in persons infected with *S. haematobium* varies dramatically and ranging from mild symptoms to severe damage of the urinary tract (Brouwer et al., 2003a) especially the kidney and/or bladder (Brouwer et al., 2003b).

In some endemic areas of Africa where facilities for diagnosis are limited, the estimate of these pathological processes is ascertained by clinical pictures especially using haematuria which is highly limited in ascertaining the morbidity of this disease. The invaluable use of non-invasive techniques such as ultrasound in investigating the morbidity due to *S. haematobium* has been documen-ted (Degremout et al., 1985; Leutscher et al., 1998, 2000; Brouwer et al., 2003b). For instance, Degremout et al. (1985) documented major renal congestion and irregularrity of bladder wall. Also kidney pathology has been reported by Brouwer et al. (2003b) among the rural dwellers of Zimbabwe.

In the locality of this study, the use of ultrasonography in assessing the morbidity of urinary schistosomasis is lacking despite the fact that ultrasound examination read-

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ily demonstrates the structural morbidity caused by *S. haematobium.* The existing data are mainly epidemiological (Nmorsi et al., 2001; Useh and Ejezie, 1996; Arinola, 1995; Osisanya et al., 1990; Akonai, 1992; Anosike et al., 1992). In the present investigation, we report the prevalence of urinary schistosomasis in Ihieve-Ogben, Edo State, Nigeria. Also this investigation was undertaken to assess the level of pathology due to *S. haematobium* infection among some rural Nigerians in a mesoendemic zone using ultrasound examination.

MATERIALS AND METHODS

This investigation was carried out in Ihieve-Ogben in Owan East local government area of Edo State and FaithDome Medical Centre in Ekpoma, Esan West local government area of Edo State, Nigeria. These study areas are located at latitude 6°N and longitude 6°E. Ihieve-Ogben is located within the guinea savanna region of the state. The villagers are mainly farmers and hunters while a few of them especially women are pretty traders.The village have a stream which the inhabitants use for their source of water supply and recreational activities. There are about 1000 inhabitants in this community.

Ekpoma is an urban town with a university, and a population structure of civil servants, university wokers and traders. The population is about 300,000. It is located within the rainforest belt and the town lacks a stream. The inhabitants depend on pipe borne water as well as ponds and wells.

This investigation commenced by community mobilization campaign at Ihieve-Ogben. This involves educating them on the significant of the study as well as seeking their consent. Also ethical permission were obtained from the State Ministry of Health, Benin City, Nigeria and FaithDome Medical Centre, Ekpoma, Edo State. A pre-designed questionnaire containing data on their sexes, age, occupations, gross macro- haematuria were obtained from the consenting inhabitants. Mid stream urine samples were collected from the 138 individuals as well as 20 control subjects between 11.00 and 13.00 GMT after a slight physical exercise with a wide mouthed screw capped 50 (mL) size containers. These bottles containing the urine samples were immediately transported to our Parasitological Laboratory in our unit for examination for the ova of *S. haematobium.* The ova were quantified and classified as light infection 50 ova/10 ml and heavy infection >50 ova/10 ml according to WHO standard (WHO, 1983).

The 43 volunteers who excreted *S. haematobium* ova in their urine were recruited for the next phase of this study. These voluntees were subjected to transabdominal ultrasonographical investigation in the Radiology Unit of FaithDome Medical Centre. The examinations were conducted using a Fuduka Denshi UF 4000 (Japan) ultrasound machine with a 3.5 MH_2 frequency curulinear real time probe. Here, they were asked to drink 0.1 – 1.5 litre of water depending on their age and were examined on surpine position for the bladder and kidney abnormalities within 30 min to one hour later. The kidneys were also scanned from the back in the prone position. The patients were asked to empty their bladder within 30 min to one hour and subjected to post voiding examination. The urinary pathologies were documented and classified according to WHO standard (WHO, 1996) as follows: The pathological rounded (distorted) bladder shape was recorded as 1 against normal bladder which is rectangular. The wall thickness was graded as 1 = >5 mm and focal. It is graded 2 = >5 mm and multifocal or diffuse. The mass is indicated as localized thickening of the bladder wall protruding into the lumen (>10 mm) with the score of 2. Also the number of masses (n) is indicated as n+2.

Pseudopolyp is defined as an outgrowth of the wall, attached by a slender base (narrower than the mass). Single pseudopolyp is designated as 2. The hydroureter is classified as 3 when the ureter dilated and 4 when it is grossly dilated. The hydronephrosis is classified as 6 when the kidney is moderately dilated. In all cases, 0 is the grade for normal and non-pathological condition which was not recorded in our tables. The data obtained in this study were subjected to statistical analysis using Microsoft Excel package

RESULTS AND DISCUSSION

Table 1 shows the prevalence and intensity of *S. haematobium* infection among the 138 volunteers examined in Ihieve – Ogben, Nigeria according to their sexes and age. Of the 138 volunteers, 43 (31.2%) of them excreted *S. haematobium* ova in their urine and had terminal haematuria. Children were more infected 30 (41.1%) than the adults inhabitants 13 (20.0%) ($t = 8.89$, $P<0.01$). The male and female volunteers are almost equally infected. More volunteers had light infection 27 (19.6%) than heavy infection 16 (11.6%) ($^2 = 22.90$, $P<0.05$).

The Urinary tract pathology according to the intensity of *S. haematobium*
infection is presented in Table 2, and include pathological condition namely wall thickness 24 (55.8%), abnormal shape 30 (69.8%), pseudopolyp 2 (4.7%), significant residual volume 12 (27.9%), echogenic particles 30 (69.8%), calcification 24 (55.8%), hydroureter 10 (23.3%) and hydronephrosis 8 (18.6%). Amongst the volunteers with light intensity of infection, the highest pathological conditions, abnormal bladder shape and echogenic particles, were observed among 18 (66.7%) of them. Also volunteers with heavy infections and calcified bladder 14 (87.7%) had the most prevalent pathological conditions. In all, the structural urinary tract diseases found in volunteers with heavy infections were more prevalent than those with light infection, but this difference was statistically non-significant ($t = -2.19$, $P>0.02$).

The classification of the urinary tract diseases and kidney pathology according two major groups of volunteers namely children and adults are presented in Table 3. Children had more urinary tract diseases than their counterparts ($t=3.23$, $P<0.03$). Hydronephrosis and hydroureter were absent in the volunteers with light infec-tion. The highest prevalent abnormal shape bladder with echo-genic particles 22 (73.3%) occurred among the children. Also amongst the adult the abnormal bladder shape and echogenic particles (61.5%) were most prevalent.

The data on the prevalence of *S. haematobium* infections among the volunteers screened which indicated that 31.3% of them excreted ova in their urine delineated mesoendemcity of infection. This level of endemicity appears higher than the earlier reports of Nmorsi et al. (2001), Arinola (1995) and Osisanya et al. (1990) within the same zoogeographical region. The data in this pre-sent study reflect the level of exposure in the locality where there is absence of portable pipe borne water

Table 1. Prevalence and intensity of *Schistosoma haematobium* infection in Ihieve-Ogben, Nigeria.

Subject	Population examined		Light infection <50 ova/10 ml		Heavy infection >50 ova/10 ml		Total
	Male	Female	Male (%)	Female (%)	Male (%)	Female (%)	Total (%)
Children	38	35	10 (26.4)	8 (22.9)	7 (18.4)	5 (14.3)	30 (41.1)
Adult	36	29	6 (16.7)	3 (10.3)	2 (5.6)	2 (6.9)	13 (20.0)
Total	74	64	13 (17.6)	14 (21.9)	9 (12.2)	7 (10.9)	43 (31.2)
Grand Total	**138**		**27 (19.6)**		**16 (11.6)**		**43 (31.2)**

Table 2. Urinary tract diseases according to the intensity of *S. haematobrum* infection.

Pathology	Classification	Light infection	Heavy infection	Total
	No	No (%)	No (%)	No (%)
Urinary bladder pathology		27	16	43
(a) Wall Thickness	1	12 (44.4)	8 (50.0)	24 (55.8)
	2	-	4 (25.0)	
(b) Shape	1	18 (66.7)	12 (75.0)	30 (69.8)
(c) Irregularity	1	2 (7.4)	6 (37.5	12 (27.9)
	2	-	4 (25.0)	
(d) Masses	2	-	4 (25.0)	10 (23.3)
	n+2, (n=1) = 3	-	6 (37.5)	
(e) Pseudopolyp	2	-	3 (18.8)	2 (4.7)
(f) Echogenic Particles	-	18 (66.7)	12 (75.0)	30 (69.8)
(g) Residual Urine	1	5 (18.5)	7 (43.8)	12 (27.9)
(h) Calcification	1	6 (22.2)	14 (87.5)	24 (55.8)
	2	-	4 (25.0)	
Hydroureter	3	-	10 (62.5)	10 (23.3)
Hydronephrosis	6	-	8 (50.0)	8 (18.6)

*n = number of masses.

which compels the inhabitants to frequently visit the only stream in the community for their domestic and recreational activities. The high level of water contact among the children as well as acquired immunity among adult can also be advanced as for greater preponderance of infection among the children than the adults. The assertions are proved valid by the earlier report of Nmorsi et al. (2001).

The children in Ihieve-Ogben and those with heavy infection of *S. haematobium* have more urinary bladder pathology. Also of the eight different pathological conditions observed among these volunteers, abnormal wall thickness, shape, echogenic particles and calcification which were predominantly greater than other disease conditions will constitute the principal pathological conditions involved in bladder dysfunction and consequent bladder damage in Ihieve-Ogben, Nigeria. Also the level prevalence of the urinary bladder pathology at Ihieve-Ogbe corroborates the investigation of Brouwer et al. (2003a) in rural Zimbabwe children where the reported bladder pathology was 50%. Of pathological significance is the preponderance of these conditions with the high intensity of *S. haematobium* infection. This strongly correlation of irregularity of bladder wall and major renal congestion with prevalence and intensity of *S. haematobium* as well as the microhae-maturia has been documented earlier (Degremont et al., 1985).

The report of urinary masses and pseudopolyp among these volunteers are of pathological significiance despite the low prevalence. This observation is similar to the reports of other authors (Mostafa et al., 1999; Thomas et al., 1990; Chen and Mott, 1989). For instance, Thomas et al. (1990) revealed that bladder cancer was common in Zimbabwe and reported that the preponderance was possibly due to high prevalence of *S. haematobium* infection in some areas investigated. Also Mostafa et al. (1999) and Chen and Mott (1989) documented the association of bladder cancer with schistosomiasis which they considered to be related to the endemicity of the parasite.

We reported the hydroureter and kidney pathology, namely the hydronephrosis, in both children and adult with high intensity of infection. The present findings contradicts the earlier investigations of King et al. (1988)

Table 3. Classification of urinary tract diseases according to the age of the volunteers infected with *S. haematobium* Ihieve-Ogben, Nigeria.

Pathology	Classification	Children	Adult	Total
		No (%)	No (%)	No (%)
Urinary Bladder pathology		30	13	43
(a) Wall thickness	1	16 (53.3)	4 (30.8)	24 (55.8)
	2	43 (10.0)	1 (7.7)	12
(b) Shape	1	22 (73.3)	8 (61.5)	30 (69.8)
(c) Irregularity	1	6 (20.0)	2 (15.4)	12 (27.9)
	2	2 (6.7)	2 (15.4)	
(d) Masses	2	4 (13.3)	-	10 (23.3)
	n+2, (n=1) = 3	3 (10.0)	3 (23.1)	
(e) Pseudopolyp	2	6 (20.0)	-	2 (4.7)
(f) Echogenic particles	-	22 (73.3)	8 (61.5)	30 (69.8)
(g) Residual Urine	1	7 (23.3)	5 (38.5)	12 (27.9)
(h) Calcification	1	17 (56.7)	3 (23.1)	24 (55.8)
	2	4 (13.3)	-	
Hydroureter	3	4 (13.3)	6 (46.2)	10 (23.3)
Hydronephrosis	6	3 (10.0)	5 (38.5)	8 (18.6)

* n = number of masses

who indicated that hydroureter and hydronephrosis were not associated with higher infection intensity among the inhabitants screened in Coast Province, Kenya. However, the assertion by King et al. (1988) that structural forms of urinary tract disease such as hydronephrosis progress during the course of untreated *S. haematobium* infection despite age related reductions in egg burden is proved valid by report in this present study where we documented the prevalence of higher prevalence of hydronephrosis and hydroureter among the adults despite lower intensity of infection.

These bladder and kidney pathology revealed in this present investigation can be used as important tools in monitoring the morbidity of *S. haematobium* in Ihieve-Ogben, Nigeria. Life threatening late disorders associated with *S. haematobium* infection such as kidney dysfunction, obstruction of the ureters or bladder outflow and/or urothelial metaplasia and cancer formation which had been documented by King (2001) and ureteric stone formation, hydronephrosis, renal functional abnormalities and ultimately renal failure with a calcified bladder (Haslet, 2002) could result from the urinary tract morbidi-ties elicited in Ihieve-Ogben as the diseases progresses without treatment. Since it has been documented that these urinary tract pathology especially hydronephrosis regress upon treatment of *S. haematobium* infection (Subramanian et al., 1999; Wagatsuma et al., 1999), it is therefore very imperative to institute chemotherapy for these volunteers and indeed control as well as treatment at the community level.

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