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STUDIES ON VESICAL SCHISTOSOMIASIS AMONG RURAL EZZA FARMERS IN THE SOUTHWESTERN BORDER OF EBONYI STATE, NIGERIA

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Abstract: Studies on vesical schistosomiasis and its snail vectors were carried out between October 2001–May 2002 among rural Ezza farmers inhabiting the southwestern border of Ebonyi State, Nigeria. The people are predominantly farmers. Of the 2,104 urine specimens examined in 10 communities, 466 (22.1%) comprising 305 (23.7%) men and 161 (19.7%) women were infected with visible haematuria as the predominant presenting symptom. Ezza people associate bloody urine with sexually transmitted diseases. There were no significant differences in the prevalence rates amongst various villages and sexes (p>0.05). There was a gradual increase in the disease prevalence as the subjects' age increases. About 78.3% of the infected persons are aged 0–20 years. Statistical analysis revealed that the prevalence, intensity and visible haematuria were significantly more (p<0.05) in subjects under the age of 20 than subjects above 20. Among the infected population, 183 (39.3%) and 283 (60.7%) were excreting 50 eggs/10 ml urine and above 50 eggs/10 ml urine respectively. Lack of visible haematuria is a more valid indicator of the absence of vesical schistosomiasis. Of the various snails collected during malacological survey, mainly *B. globosus* were infected. Possible control measures are discussed.

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INTRODUCTION

Schistosomiasis ranks among the major public health problems in the tropics and sub-tropics. The disease is caused by the parasite *Schistosoma*, a fluke with a lifecycle including man as the definitive host and a fresh water snail as the intermediate host. Vesical schistosomiasis due to *S. haematobium* infection affects over 90 million persons, principally in Africa [24]. Both *S. mansoni* and *S. haematobium* are endemic in Nigeria [36], with the latter being more widely distributed. In Africa, *S. haematobium* is known to be transmitted by the planorbid snail *Bulinus* species, including *B. globosus*, *B. africanus*, *B. nasutus* and *B. truncatus*. Also, *B. forskalii* [4] and *B. senegalensis* have been incriminated as intermediate host of *S. haematobium* [8, 12, 33].

The prevalence, intensity and related, morbidity of vesical schistosomiasis on the African continent vary according to the epidemiology, transmission patterns, and ecology of each endemic foci. Recent studies [6, 7, 8, 9, 25] have shown that vesical schistosomiasis is a major public health problem in eastern Nigeria, especially

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among the farming sub-sections. The Nigerian Federal Ministry of Health has had national committees for the control of schistosomiasis since 1988, and a recent National plan of Action on Schistosomiasis Control in Nigeria covers the period 1997–2001. The main goal of that plan is to "reduce the prevalence below 50% within 5 years in operational areas". Almost no mass treatments have been given for schistosomiasis by the public health sector in Nigeria during the past several years, partly because of the high cost of the drug of choice, praziquantel, as well as lack of sufficient baseline data in some parts of the country. This study was undertaken to investigate the prevalence and intensity of vesical schistosomiasis amongst the Ezza rural farmers inhabiting the southwestern border of Ebonyi State, Nigeria.

MATERIALS AND METHODS

The study area and population. The study was carried out between October 2001–May 2002 in 10 villages inhabited by the Ezza rural farmers in the South Western border of Ebonyi State. Ebonyi state occupies the area lying between coordinates 70 31' and 80 30' N and between 50 40' and 60 45E. Several fresh water habitats intersect these villages. Some of these are manmade pools, quarry pits, as well as road ditches. Members of these villages depend on streams, wells and harvested rain water for their water needs. During the dry season, activities increase in these water bodies as people not only come from nearby villages but also from those further away, and even passers-by converge to use the water for domestic, agricultural, recreational and religious purposes. The area is a typically rural settlement. The main occupation of the Ezza people is farming.

The climate of the study area is tropical with a mean daily temperature of 30 ± 5ºC for most of the year. The annual rainfall is between 217–240 cm with distinct wet and dry seasons. The vegetation is typically savannah. The South Western border of Ebonyi State comprises of Ezza people living in Ezza North and South as well as Ishielu and Onicha local Government Areas. It is pertinent to note that apart from the Ezza people inhabiting these areas, there are also other groups, such as the Izzi people, Ohaukwu and Ikwo people. A small number of people from Anambra, Enugu and Imo States are also found in these areas. However, the Ezza people form over 80% of the inhabitants of this border. For the purpose of this work, emphasis was laid on the Ezza rural farmers only. This is necessary to document our observations relating to the epidemiology of vesical schistosomiasis amongst this group of hired labourers vis-a-vis their occupation.

The Ezza people are mainly special farmers who are usually engaged as hired labourers. They make large heaps of soil during cultivation with large holes. They are known as 'ndi ogu ukwu' in Ibo language. Both sexes are engaged in farm work. The Ezza people move from one community to another in search of labour. At times, they may stay away for several months to a year working for other people in the rice farms, cassava, yam, potatoes among others. Consequently, they are prone to diseases such as dracunculiasis, schistosomiasis, onchocerciasis, malaria etc. Usually they return to their homes during the non-farming dry season.

Parasitological survey. A pre-survey visit was made to the villages in the study area during which time consultation/discussion were held with the village heads and school teachers who assisted in mobilizing the people for the studies.

Collection of specimens and determination of schistosome ova. Urine examinations were drawn from randomly selected individuals from randomly selected villages, (i.e. rested samples) using both centrifugation and visible haematuria technique [8]. Urine specimens were collected during a house-to-house visit by our team between 10:00 and 14:00 h. Each person was given a pre-numbered bottle in the field, and the name of the person including age and sex was entered against the appropriate number on a form kept by the investigating team.

Those who are in the area on a visit were secluded from the study. Also women on their monthly periods were recorded differently and excluded from visible haematuria counts [7]. This was necessary to avoid false positive results from menstrual blood [3]. Sampled subjects also were interviewed on other clinical signs of the disease. The specimens were collected and taken to the laboratory, processed for determination of the presence of schistosome ova according to the method earlier described [23]. In each case, the eggs were quantified by directly counting these under an inverted microscope. Each microscope slide was examined independently by 3 technicians and the mean expressed as eggs/10 ml of urine. Specimens were collected from each subject for microscopic examination 3 times on 3 different days and at roughly the same time of day before the individual mean infection intensity was calculated. Any specimen with more eggs than 50 eggs/10 ml of urine was recorded as a heavy infection, being above the WHO threshold for morbidity.

Infected samples were further re-examined following the methods of Anosike *et al.* [5] for miracidia. Those with eggs that hatched out miracidia were recorded as having patent infections. The frequency of visible haematuria based on the appearance of bloody urine was recorded. Its specificity and sensitivity as a diagnostic tool in the area was calculated. Infected persons were duly referred to either the Federal Medical Centre Abakaliki or Ebonyi state University teaching Hospital Abakaliki for treatment with praziquantel.

As the urine samples were being collected, simultaneous snail collection was being carried out in the local fresh water habitats using a 'one-time' snail sweep net. Snails collected were taken to the laboratory where they were washed and identified using reference specimens from the Danish Bilharziasis Laboratory, Charlottenlund, Denmark. The snails were also checked for cercarial shedding. The schistosome type cercariae isolated were confirmed to be that of *S. haematobium* by experimental infection of mice in the laboratory using conventional techniques [9].

Statistical analysis. The prevalence rate of infection was calculated using percentages. Independence and relationship of age, sex and visible haematuria (VH) were tested using chi-square analysis. The Karl Pearson's equation of coefficient of correlation and the students' t-distribution were used to assess the correlation and significance of correlation respectively between prevalence and intensity of infection.

RESULTS

A total of 2,104 persons were examined between October 2001–May 2002 in 10 villages of Ezza people in the southwestern border of Ebonyi state, Nigeria. Of these, 466 (22.1%) persons were infected with *S. haematobium* ova. Nkomoro village had the highest prevalence (24.7%) followed by Nchionu (23.8%) with Azu Awoke as the least (20.1%). There was no significant variation amongst villages (p>0.05). Of the 2,104 persons examined, 1,285 and 819 were men and women respectively. 305 (23.7%) of the men examined were infected while 161 (19.7%) of the women examined were infected. While the highest infection rate of 29.0% for men was recorded in Nkomoro village, the highest prevalence of 21.9% was recoded for women in Okworike village. The lowest prevalences of 20.4% and 16.7% were recorded for men in Okworike and for women in Nchionu villages respectively (Tab. 1). Although more men than women were infected, there was no significant difference in infection among sexes (p>0.05).

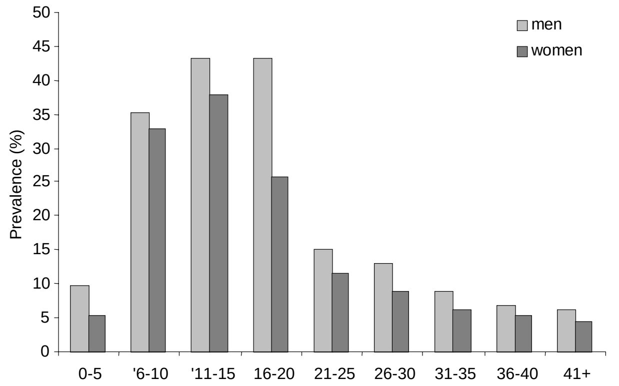

Figure 1. Sex-related prevalence of vesical schistosomiasis in the study area.

The prevalence of visical schistosomiasis in relation to age and sex is shown in Figure 1. The highest infection rate for men (42.8%) is among the age group 16-20 and for women (38.8%) in the 11-15 age group. 234 (76.7%) of the infected men is within the age group 0-20 years, while 131 (81.4%) of the infected women is also found is this age group.

Statistical analysis of sex-related prevalence among the different age groups using the chi-square shows a significant variation in infection rate (p<0.05). The sex-age related intensity (mean egg/10 ml of urine) of S. haematobium infection in the study area is shown in Table 2 and Figure 2. The mean egg count/10 ml of urine sample increased with increase in age up to the 11-15 age group, and decreased thereafter among both sexes. The least mean egg count of 39.6% for men and 33.1% for women was recorded in persons of 41 years and above. The highest mean egg count of 104.9 for men and 91.6 for women was found in the 11-15 age group. The overall mean egg count for men and women in the study area is 81.7 and 75.7 respectively.

Table 1. Prevalence of haematobium infection among Ezza rural farmers in Nigeria.

Villages	Men		Women		Total	
	No. of subjects examined	No. of subject infected (% of the total count)	No. of subjects examined	No. of subject infected (% of the total count)	No. of subjects examined	No. of subject infected (% of the total count)
Azu Awoke	186	38 (20.4)	53	10 (18.9)	239	48 (20.1)
Enyibuchiri	88	20 (22.7)	38	7 (18.8)	126	27 (21.4)
Igweledioha	120	29 (24.2)	82	17 (20.7)	202	46 (22.8)
Isinkwo	106	24 (22.6)	104	21 (20.2)	210	45 (21.4)
Nchionu	142	38 (26.8)	60	10 (16.7)	202	48 (22.8)
Nkomoro	145	42 (29.0)	94	17 (18.1)	239	59 (24.7)
Ohanyan	151	32 (21.2)	105	20 (19.0)	256	52 (20.3)
Ojiegbe Nchagu	126	31 (24.6)	100	20 (20.0)	226	51 (22.6)
Okwoike	102	24 (23.5)	96	21 (21.9)	198	45 (22.7)
Omege	119	27 (22.7)	87	18 (20.7)	206	45 (21.8)
Total	1285	305 (23.7)	819	161 (19.7)	2104	466 (22.1)

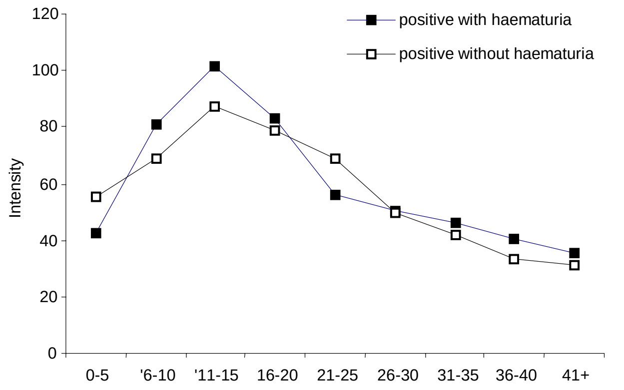

Figure 2. Sex-age related intensity (mean egg/10 ml of urine) of *Schistosoma haematobium* infection in the study area.

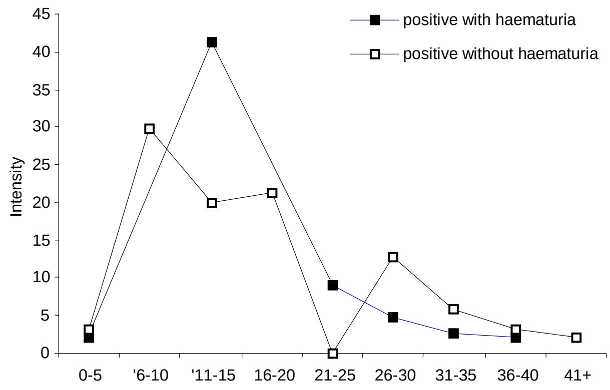

Figure 3. Age-related haematuria in *Schistosoma haematobium* infection in the study area.

About 190 (62.3%) of the infected men had light infection (1-100 eggs/10 ml urine). The figure for the women is 121 (72.2%). 106 (34.8%) of the infected men and 39 (24.2%) of the infected women were excreting 101-300 eggs/10 ml urine. This is described as moderate infection. However only 3.0% of the infected men and 0.6% of the infected women had heavy infection (>300 eggs/10 ml urine). Details of these are shown in Table 3.

Results shown in table indicate that haematuria is a significant manifestation of vesical schistosomiasis. 276 (59.2%) of the infected subjects (466) had visible haematuria. 9 (1.9%) presented no symptom at all, while 238 (51.1%) showed more than one symptom.

The age-related haematuria in *S. haematobium* infection in the study area illustrating positive infection with and without haematuria is presented in Figure 3. Of the 466 infected persons observed in the study, 191 (41.0%) were found to be positive for visible haematuria as being positive for *S. haematobium* Ova, while 275 (59.0%) had no haematuria. It was also observed that visible haematuria was highest (41.4%) amongst persons within 11-15 years age group. Statistical analysis shows a strong relationship between haematuria and *S. haematobium* infection.

Vector/malacological studies. Table 5 is a summary of various types of snails encountered from water bodies in the study area during the snail collection. The species encountered include *B. globosus*, *B. truncatus*, *B. senegalensis*, *Biomphalaria pfeiffer*, *Melanoides tuberculata*, *Lymnaea natalensis*, *Physa waterloti* and *Gyraulus* spp. A total of 349 snails of the different species were collected and only 45 (12.9%) were infected or shedded human schistosome bifid cercariae.

The infected snails were mainly *B. globosus* which are the established intermediate hosts for *S. haematobium* in different parts of tropical Africa. However, one of the *B. senegalensis* spp. was also infected.

DISCUSSION

The Ezza people, as revealed in the present work, showed moderate susceptibility to *S. haematobium* infection with an overall prevalence of 22.1%. This is

Table 2. Sex-age related intensity (mean egg/10ml of urine) of *S. haematobium* infection in the study area.

Age groups (in years)	Men			Women			Total	
	No. of subjects examined	No. of subjects infected (% of the total count)	Mean number of eggs/10 ml of urine	No. of subjects examined	No. of subjects infected (% of the total count)	Mean number of eggs/10 ml of urine	No. of subjects examined	No. of subjects infected (% of the total count)
0–5	71	8 (11.3)	48.3	38	2 (5.5)	50.9	109	10 (9.2)
6–10	222	81 (36.5)	76.1	155	54 (34.8)	68.2	377	135 (35.8)
11–15	181	77 (42.5)	104.9	139	54 (38.8)	91.6	320	131 (40.9)
16–20	159	68 (42.8)	94.0	88	21 (23.9)	89.9	247	89 (36.0)
21–25	148	22 (14.9)	61.5	70	7 (100)	73.0	218	29 (13.3)
26–30	168	24 (14.3)	57.3	136	12 (8.8)	51.5	304	36 (11.8)
31–35	103	10 (9.7)	49.6	76	5 (6.6)	45.5	179	15 (8.4)
36–40	89	6 (6.7)	14.4	57	3 (5.3)	38.8	146	9 (6.2)
41+	144	9 (6.3)	39.6	60	3 (5.0)	33.3	204	12 (5.9)
Total	1285	305 (23.7)	81.7	819	161 (19.7)	75.7	2104	466 (22.1)

Table 3. Sex-related egg counts in *S. haematobium* infection in the study area.

Egg count	Men infected	% of total count	Women infected	% of total count	Total (%)
1–50	103	33.8	80	49.7	183 (39.3)
51–100	87	28.5	41	25.5	128 (27.5)
101–150	48	15.7	18	11.2	66 (14.2)
151–200	25	8.2	11	7.8	36 (7.7)
201–250	19	6.2	7	4.3	26 (5.6)
251–300	14	4.6	3	1.9	17 (3.6)
301–350	6	2.0	1	0.6	7 (1.5)
351–400	2	0.7	0	0	2 (0.4)
401+	1	0.3	0	0	1 (0.2)
Total	305		161		466 (100)

Table 4. Signs and symptoms associated with *S. haematobium* infection in the study area.

Symptoms	No. of cases	% of the total count (n = 466)
haematuria	276	59.2
suprapubic pain	88	18.9
strangury	93	20.0
no symptom	9	1.9
more than one symptom	238	51.1

n – number of patients examined

Table 5. Schistosome infection rates of fresh water snails collected from water bodies in the study area.

Snail species	No. of snails collected	No. of snails infected (% of the total count)
Bulinus globosus	141	44 (31.2)
Bulinus truncatus	59	0
Bulinus senegalensis	10	1 (10.0)
Biomphalaria pfeiffer	16	0
Melanoides tuberculata	38	0
Lymnaea natalensis	56	0
Physa waterloti	8	0
Gyraulus spp.	21	0
Total	349	45 (12.9)

similar to the observations of Ugbomoiko [33] in Edo State (22.9%), Anosike *et al.* [7] in parts of Ebonyi State (21.5%) and Kallaayoune and Laamrani [22] in Morocco (21.2%). A higher prevalence has been reported by Anosike *et al.* [8] in the north-central zone of Abia State (42.3%), Ozumba *et al.* [29] in Amagunze village (79%) and Ofoezie *et al.* [27] in Ogun State (80%). However, in contrast to these moderate and high prevalence rates, Arene *et al.* [11] recorded low prevalence of (5.7%) in the urban city of Port Harcourt, and Chungh *et al.* [16] in Maiduguri (6.17%).

It is interesting to note that the Ezza people are mainly rural farmers and as they work in several rice fields and swampy areas, they contact infection in these infected water bodies. This perhaps was responsible for the observed high prevalence rate of vesical schistosomiasis amongst the Ezzas. In addition, the prevalence rate found amongst the Ezza people mirrors the filthy nature of their water-logged environment because most of the subjects are deficient in personal hygienic practices, and also because of the non-availability of sanitary facilities. Although, infection varied among subjects in various villages, it is not statistically significant. This is expected because the villages studied have similar environmental and ecological status (infested water pools, quarry pits, etc.), suitable for the breeding of the snail intermediate host. In addition, their occupation and similar social habits predispose them to an equal degree of exposure to the infested water bodies.

The prevalence and intensity of infection was higher in men than women, similar to the reports in the lgwun River basin [32], in Bauchi State [5], in Anambra State [21] and in Republic of Mail [35]. They reported that sex is not significant in the distribution of infection but could be due to variation in behaviour regarding water use and contact. Therefore, persons who have greater contact with the breeding foci have higher prevalence of the disease, irrespective of the sex of the individual. In contrast, observations in other parts of Nigeria [1, 3, 33] and Zimbabwe [14] revealed a higher prevalence and intensity of infection in men than women. They attributed this to difference in local and social habits. Cardinal among these is the higher tendency among males to swim, play and engage in other activities in the river and other water bodies, besides the domestic activity of washing and collection of water which exposes both sexes to infection. On the other hand, Adeoye and Akabogu [2] and Nnoruka [25] recorded a significantly higher prevalence and intensity of infection among women than men. They argued that the higher prevalence and intensity rates observed in men in most endemic areas are not due to sex *per se* but to the greater opportunities afforded to men for exposure and that when women assume typical men roles, their risk and prevalence of infection increases. In the present study, the general pattern of an initial rise in infection in young ones followed by a decrease in older age was observed for both sexes. It was shown in this study that prevalence and intensity of infection are age dependent and this is true of other endemic areas [11, 18, 20]. The peak prevalence and intensity of infection found on the 11-15 years age group is similar to the findings of Edungbola *et al.* [19] and Abolarinwa [1]. The prevalence and intensity of infection reducing to lower levels is in conformity with other reports [9, 3, 27].

The higher prevalence and intensity of infection in the age group 11–15 compared with others, was expected as young people spend more time in water either washing, fishing or playing, they were therefore more exposed to infection. The same explanation goes for the age group 6–10 and 16–20. The reason for the decline in prevalence and intensity after peaking in adolescence is controversial [17]. Although there is definitive evidence to support the role of immunity [31]. Betterton *et al.* [13] showed that the shape of the age prevalence curve was a function of intensity of transmission, this being related to the extent of water contact activities. It could therefore be presumed that the age related changes in infection are mainly a combined function of immunity and water contact [9, 26].

There is usually a progressively increasing level of naturally acquired immunity against infection and the changes in water contact habit or activities of persons with age. The low prevalence and intensity in older persons must be due to the fact that many in this category would rather send younger people to wash things and fetch water for them rather than becoming exposed to infested water. The onset of infection noticed in boys and girls in the age group 0–5 years could be because of early exposure to ponds as mothers in the study communities usually go to the farms with their infants and bathe them in infested water.

The findings that most infected individuals had light intensity (50 eggs per 10 ml urine) and that a small proportion of the population had heavy intensity of infection is in conformity with the report of Wilkins [36] and Anosike *et al.* [7] that a few individuals in an endemic community carry a disproportionate share of the total worm burden/load. This could be as a result of some individual being more exposed to infection than others owing to the differences in water contact behaviour. However, Individual differences between inhabitants in their immunological capacity may also be a contributive factor [15, 34].

The rise in both prevalence and intensity in the age group 0–20 years indicate the high transmission rate in children and adolescences. The drop in mean intensity in the older age groups could be due to either a decreasing transmission rate or reduced survival of worms already in the host. The intensity of infection reflects morbidity status, but current methods of assessing intensity directly are labour intensive. Thus, data on prevalence of infection might be useful to predict intensity of infection. This would provide a practical tool for identifying communities at greatest risk of disease since infection prevalence data are relatively simple and inexpensive to collect [30].

About 191 (41.0%) of the 466 infected individuals had visible haematuria. There was a significant relationship between haematuria and *S. haematobium* infection. This agrees with the earlier reports of Anosike *et al.* [7]. They observed that visible haematuria is a major manifestation of vesical schistosomiasis. The difference in the prevalence (41.0%) of the present study and those of earlier studies [1] 84.8%, and Osegbe and Amaku [28] 56.0% may probably be due mainly to individual variation in assessing different shades of red and the time of the day at which observations were made [37]. Other symptoms associated with vesical schistosomiasis in the present study include suprapubic pain and strangury.

The relatively low infection rate of *B. globosus* - the proven intermediate host of *S. haematobium* - might have greatly contributed to the recorded low prevalence and intensity among the Ezza people. The discovery of *B. senegalensis* specimen naturally infected with Schistosoma larval stages in Ezza communities could be related to the report from Gambia and Ghana [38]. *B. senegalensis* has been reported previously from Nigeria and regarded as an important potential intermediate host for *S. haematobium* [13]. But a confirmatory test to determine the schistosome species harboured is recommended.

The study revealed that more than half of the pupils were neither aware of the disease nor the etiologic agents. Over 75% of the affected persons associated visible haematuria with sexually-transmitted diseases. This is contrary to the observations made in other endemic areas, particularly in northern Nigeria where haematuria is regarded as the coming of age [5, 10]. This initially affected free interaction with the infected persons. However, with proper health education on the disease transmission pattern, clinical signs and symptoms, as well as preventive measures, further studies in the area would be easier.

As vesical schistosomiasis is often focal, studies in small communities like the Ezza rural communities have several advantages, such as the examination of the entire population and the provision of excellent means of testing guidelines for control programmes. For any attempt at control of this disease in the area, efforts and resources must be directed mainly on subjects within the first 2 decades of life. They make up the bulk of the disease burden. The findings of these studies would therefore provide baseline information necessary for the formulation of viable control strategies to deal with the infection in Ebonyi State, Nigeria.

CONCLUSIONS

Vesical schistosomiasis has been recognized as an important public health problem among the Ezza rural farmers and calls for active intervention. Urgent control measures with emphasis on the provision of pit toilets and portable water are strongly recommended. For the control of the disease, the use of village-based health workers in providing free diagnosis and treatment through primary health facilities of the local government could be useful. There is the need for adequate health education for the Ezza people on the disease, feasible control strategies as well as other preventive measures. This will increase their knowledge of schistosomiasis, consequently modifying their attitudes and behavioural practices related to vesical schistosomiasis transmission. However, control of vesical schistosomiasis among the Ezza people who are constantly in motion in search of farm land to cultivate could be difficult. This being so, efforts must be made to educate and mobilize them on the need for protective attire when working in the water logged areas.

Aspects of sensitivity and specificity of visible haematuria in community diagnosis of vesical schistosomiasis infection as it relates to these endemic areas would be the subject of another publication.

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