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RESEARCH ARTICLE

Effects of Urogenital Schistosomiasis on Academic Performance and Anthropometric Parameters of School-aged Children

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ABSTRACT

Objective: The aim of this study was to determine the current prevalence of urogenital schistosomiasis and its effects on academic performance and anthropometric parameters of school-aged children in Akpet community, Nigeria.

Methods: Urine samples from randomly selected 300 school children aged 3-15 years were examined for the presence of ova of *Schistosoma haematobium* in their urine using standard filtration techniques. Questionnaires were also administered.

Results: Urogenital schistosomiasis was observed in 57(19%). Subjects aged 6-8 years had the highest prevalence of infection 10 (37%) while subjects aged 3-5 years had the lowest prevalence 3 (10%) ($p \leq 0.001$). Subjects with weight 30-39 kg had the highest prevalence of infection 6 (25%) while subjects with weight 10-19 kg had the lowest prevalence of infection 2 (10%) ($p \leq 0.001$). Subjects with height 130-139 cm had the highest prevalence 4 (28.5%) while subjects 70-79 cm, 80-89 cm and 140-149 cm had the lowest prevalence 0 (0%) ($p \leq 0.001$). Subjects with shoulder length 15-20 cm had the highest prevalence 6(100%) while subjects with shoulder length 21-26 cm had the lowest prevalence 2 (7.7%) ($p \leq 0.001$). Subjects with average grade score “D and E” had the highest prevalence 6 (27.3%) while subjects with average grade score “F” had the lowest prevalence 1 (8.33%) ($p \leq 0.020$).

Conclusion: Urogenital schistosomiasis is endemic in Akpet community. Age, weight, height, shoulder lengths and academic performance are influenced by the prevalence of this infection.

Urogenital schistosomiasis has also shown to be significantly associated with the presence of hematuria and proteinuria among residents of this endemic community. *J Microbiol Infect Dis 2018; 8(2):49-54*

Keywords: Urogenital schistosomiasis, academic performance, anthropometric parameters, School-age children, Nigeria

INTRODUCTION

Nigeria is one of the most endemic countries for schistosomiasis with approximately 20million people, mostly children needing treatment [1]. Poverty, inadequate water supply, ignorance, lack of hygiene and certain play habits of school-aged children such as swimming, wading or fishing in infested water make them especially vulnerable to infection [2]. Infection has a negative influence on child growth [3,4].

Urogenital schistosomiasis has been reported to cause impaired cognitive potential, anemia, stunted growth and affect academic performance of school children [5,6]. Urogenital schistosomiasis has been reported to affect anthropometric indices in a study among school-aged children in Cameroon [7], in Zimbabwe [8] and in Samaru-Zaria, Kaduna State, Nigeria [2].

Urogenital schistosomiasis is endemic in Akpet community, a rural rice-farming community in Biase L.G.A. of Cross River State, Nigeria [9]. This study was to determine the current prevalence of urogenital schistosomiasis and its effects on academic performance and anthropometric parameters of school-aged school children in Akpet community.

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METHODS

Study Area

The study was conducted at Akpet-1 village, Biase Local Government Area of Cross River State, Nigeria between May and September 2016. Akpet-1 is a typical rural community located at about 110km to the North of Calabar, the state capital within the tropical rainforest belt. The two main seasons in this belt include; the rainy season (April to October) and the dry season (November to March). There is no pipe borne water in this community. The inhabitants depend on several fresh water streams for their domestic, economic and recreational activities. The main occupations of the residents are farming, hunting and fishing. The principal crops grown are rice, “yam” and “cassava”.

Study design

This was a cross sectional study of 300 pupils aged between 3-15 years who were randomly selected from primary 1-6 in the Qua Iboe primary school Akpet-1which is the only public primary school in this rural setting.

Sample size

The sample size was calculated using the formula by Goyal, based on estimating sample size with absolute precision [10]. P=prevalence rate was estimated true rate (p) was accepted 20% according to a previous study [11]. The sample size was found as 251 and it was the minimum sample size. The sample size was rounded up to 300 samples.

Inclusion criteria

a) Any pupil who voluntarily submit his or herself to be registered into the research group. b) Any pupil whose has live in the community for at least six months. c) Any pupil whose has not taken antihelminthic drug in the past 5 days.

Exclusion criteria

a) Any pupil whose parent or guardian refused to submit his or herself to be registered into the research group. b) Any pupil whose had not live in the community for at least six months. c) Any pupil whose had taken antihelminthic drug in the past 5 days.

Questionnaire Administration

Structured questionnaires were administered with the help of the class teachers to obtain some personal information of each individual, including; name, age, sex, academic performance, anthropometric parameters and history of hematuria.

Height was measured using height meter and recorded in centimeters, Shoulder length was measured using measuring tape and recorded in centimeters and weight was measured using bathroom scale and recorded in kilograms.

Academic performance of each of the pupils was obtained using examination reports from the classroom teacher. The teachers assisted in administering the questionnaires in the pupils’ own language.

Parasitological Survey

Each pupil was given a clean screw capped universal container. The universal container was labeled as it was given to each pupil

Collection of Urine Samples

Urine samples were collected from a total of 300 pupils randomly selected from primary one to six. All samples were collected between 10:00 am and 2:00 pm after a brief exercise by the school children, a period when maximum egg excretion occurs [12,13]. Hematuria and proteinuria were detected at the spot immediately after collection while 10mls of urine were transferred to 5ml of 1% aqueous solution of carbol fuchsin for staining and preservation of the ova.

Detection of Hematuria and Proteinuria

Hematuria and proteinuria were detected in the field using urinalysis dipsticks manufactured by Ames; Bayer diagnostic, Brussels, Belgium. The results were read and recorded immediately. Hematuria was calibrated as 5-10 ery/μl (+), 50 ery/μl (++), 250 ery/μl (+++). Proteinuria was calibrated as 10 mg protein/dl indicating trace proteinuria, 30 mg/μl (+), 100 mg/μl(++), 500 mg/μl (+++). A report on the appearance of the urine, and the presence or absence of blood was also recorded.

Detection of ova

A Mechanical filtration system by Useh and Ejezie, [14] was used for the filtration of the previously stained eggs of the parasite. A funnel holding a Whatman No.1 filter paper suspended on a conical flask was rested on the circumference of a 20 ml universal container [15]. The thoroughly agitated sample was allowed to pass through the filtration unit. Using a blunt-ended forceps, the filter was carefully removed and transferred to a slide. The filter paper was placed upwards (eggs on the surface) on the slide. Using 10x objective with the condenser iris sufficiently closed to give a good contrast, the entire filter paper was examined for the ova of Schistosoma haematobium. The number of eggs counted was recorded per 10ml of the urine sample collected.

Data Analysis

Data obtained from this study was analyzed using SPSS version 20 (Armonk, New York: IBM Corporation). Pearson Chi square was used to calculate the association between prevalence with demographic data, hematuria and proteinuria. Kendal Wallis X^2 test a non-parametric equivalent of ANOVA was used to compare rank means for mean ova count. Association between infection and hematuria or proteinuria was calculated using a 2x2 contingency table. A p-value of <0.05 was considered statistically significant.

Subjects and Consent

The village head of Akpet-1 was briefed about the study before its commencement. Following his consent, a representative of the village council was mandated to brief the head-teacher of Qua Iboe Primary School Akpet-1 in the presence of the investigators on the benefits of the study. The consent of parents were sought and obtained through the head-teacher. A register from each of the class was brought by the class teacher and a roll call was made. Each pupil has equal opportunity of being selected.

Ethical Clearance

Ethical Clearance was sought and obtained from the Cross River State Ministry of Health.

RESULTS

Of the 300 subjects whose urine samples were collected and analyzed using standard parasitological techniques, infection was observed in 57 (19.0%), Hematuria in 57 (19.0%) and proteinuria in 78 (26.0%). The prevalence and intensity of urogenital schistosomiasis and morbidity indicators according to age of subjects examined. Subjects in the age group 6-8 years had the highest prevalence of infection, 30 (37.0%) while subjects aged 3-5 years had the lowest prevalence of infection 9(10%). This was a statistically significant (X^2=28.263, p=0.000). There was an association between age with hematuria (X^2=24.474, p≤0.001) and proteinuria (X^2=26.308, p≤0.001). The mean ova count among the age groups was not statistically significant (F=0.525, p=0.849). There was an association between infection with hematuria (X^2=171.000, p≤0.001) and Proteinuria (X^2=114.000, p≤0.001) (Table 1).

The prevalence and intensity of urogenital schistosomiasis and morbidity indicators according to gender of subjects examined. Male subjects had a higher prevalence of infection 30 (19.2%) than female subjects 27 (18.8%). This was not statistically significant (X^2=0.158, P=0.691). There was an association between gender with hematuria (X^2=1.421, p=0.233) and Proteinuria (X^2 =0.462, p=0.497) (Table 2).

The distribution of urogenital schistosomiasis and morbidity indicators according to weight and height of subjects examined. Subjects who weighed 30-39 kg had the highest prevalence of infection 18 (25.0%) while Subjects who weighed 10-19 kg had the lowest prevalence of infection 6 (9.09%). This was statistically significant (X^2=19.263, p≤0.001). There was an association between weight with hematuria (X^2=19.263, p≤0.001) and Proteinuria (X^2=25.154, p≤0.001). There was also an association between height with infection (X^2=29.053, p≤0.001), hematuria (X^2=29.053, p≤0.001) and Proteinuria (X^2=53.538, p≤0.001) (Table 3).

The distribution of urogenital schistosomiasis and morbidity indicators according to shoulder length and academic performance of subjects examined. Subjects with shoulder length 15-20 cm had the highest prevalence of infection 6 (100%) while subjects with shoulder length 21-26 cm had the lowest prevalence of infection 6 (7.7%). This was statistically significant (X^2=19.421, p≤0.001). There was an association between shoulder length with hematuria (X^2=19.421, p≤0.001)) and proteinuria (X^2=18.923, p≤0.001). Subjects with average grade score “D & E” had the highest prevalence of infection 18 (30%) while subjects with average grade score “F” had the lowest prevalence of infection 3 (10%). There was a statistically significant difference in the prevalence of infection according to academic performance (X^2=11.684, p=0.020). There was also an association between average grade score with hematuria (X^2=11.684, p=0.020) and proteinuria (X^2=17.769, p≤0.001) (Table 4).

DISCUSSION

This study showed that 57 subjects were infected out 300 subjects examined. This has confirmed the endemicity of urogenital schistosomiasis in Akpet-1 Community with a prevalence rate of 19%. This is lower than that of Akeh et al, [9] in Akpet central who had a prevalence rate of 42.5%, Inyang-Etoh et al, [16] and Inyang-Etoh et al, [17] & [11] in Adim who had a prevalence rate of 36.5%, 39.7% and 21% respectively. It is on the other hand higher than that of Adie et al., [18] who had a prevalence of 0.2% in Odukpani. According to World Health Organization, prevalence rates greater than 25.0% is classified as moderate while those less than 25% is low [19], therefore the prevalence of urogenital schistosomiasis in Akpet-1 is considered to be low.

Factors which determine the prevalence of infection in any community are known to include the presence of natural bodies of water suitable as habitats for the snail intermediate host as well as satisfying human needs, presence of the appropriate snail intermediate host, human contact with natural bodies of water, pollution of water with infected human wastes and low socio-economic status of the people [20]. All these factors were observed in this community.

The low prevalence rate may be partly due to the seasonal pattern of infection being low during the rainy season and high during the early and mid-dry season [8]. The peak prevalence rate of infection 30(37.0%) found among subjects aged 6-8 years may probably be due to the fact that this age group display ignorance and delinquency in terms playing anyhow in the water bodies. This result differs from that of Inyang-Etoh et al, [17] who reported the peak prevalence of 36 (66.7%) among subjects aged 14 years and above. There was a higher prevalence rate of infection 30(19.2%) among the male subjects than the female subjects 27 (18.8%). This might probably be due to the fact that in this part of the country males are more involved in fetching of water from the streams and also farming activities which predisposes the males to more infection than females who in the other hand are mostly inclined to domestic activities. This agrees with that reported by Akeh et al., [9] who had a higher prevalence rate of infection (57.7%) among the male subjects but differs from that of Nkegbe, [21] who had a higher prevalence rate of infection (64.0%) among female subjects in Volta basin of South Eastern Ghana.

The 25% prevalence recorded amongst subjects with weighed 30-39 kg differs from that of Inyang-Etoh et al [22], in Adim who had the highest prevalence rate of infection (54.6%) among subjects weighed 50-60 kg. This may be due to the fact that these age group display ignorance and delinquency in terms playing anyhow in the water bodies. Subjects with height 130-139cm had the highest prevalence of infection (28.5%). This is similar to that of Inyang-Etoh et al, [22] who had the highest prevalence of infection (48.3%) occurring within the range of 121-140cm. The highest prevalence rate of infection 6 (100%) was seen among subjects with shoulder length 15-20cm. Subjects in these weight range are also those children who may display ignorance and delinquency in terms playing anyhow in the water bodies.. This differs from that of Ekanem et al, [5] in Ugep who had no significant difference according to mid-upper arm circumference.

Table 1. The prevalence and intensity of urogenital schistosomasis and morbidity indicators according to age of subjects examined

Age (years)	No. of Examined	No. of Infected (%)	No. with Hematuria (%)	No. with Proteinuria (%)	Mean-ova count/10 ml of urine
3-5	90	9 (10.0)	9 (10.0)	9 (10.0)	5 ± 2.5
6-8	81	30 (37.0)	30 (37.0)	36 (44.4)	8 ± 4.0
9-11	105	15 (14.28)	12 (11.4)	24 (22.85)	6 ± 3.0
12-14	24	3 (12.5)	6 (25.0)	9 (37.5)	2 ± 1.0
Total	300	57 (19.0)	57 (19.0)	78 (26.0)	5 ± 2.5

		X^2=28.263, p=0.000	X^2=24.474, p=0.000	X^2=26.308, p=0.000	F=0.525, p=0.849

Table 2. The prevalence and intensity of urogenital schistosomasis and morbidity indicators according to gender of subjects examined.

Gender	No. of Examined	No. of Infected (%)	No. with Hematuria (%)	No. with Proteinuria (%)	Mean ova count/10 ml of urine
Male	156	30(19.2)	24(15.4)	36(23.1)	6±3.0
Female	144	27(18.8)	33(22.9)	42(29.2)	5±2.5
Total	300	57(19.0)	57(19.0)	78(26.0)	5±2.5
			X^2=0.158, p=0.691	X^2=1.421, p=0.233	X^2=0.462, p=0.497

Table 3. Distribution of urogenital schistosomiasis and morbidity indicators according to weight and height of subjects examined.

Weights (Kg)	No. of Examined	No. of Infected (%)	No. with Hematuria (%)	No. with Proteinuria (%)
10-19	66	6 (9.09)	6 (9.09)	9 (13.63)
20-29	162	33 (20.37)	33 (20.37)	45 (27.78)
30-39	72	18 (25.0)	18 (25.0)	24 (33.3)
		X^2=19.263, p=0.000	X^2=19.263, p=0.000	X^2=25.154, p=0.000
Heights (cm)				
70-79	12	0 (0)	0 (0)	3 (25)
80-89	9	0 (0)	0 (0)	0 (0)
90-99	27	6 (22.2)	6 (22.2)	12 (44.44)
100-109	57	6 (10.53)	6 (10.53)	9 (15.79)
110-119	36	6 (16.67)	6 (16.67)	6 (16.67)
120-129	111	27 (24.32)	27 (24.32)	36 (32.43)
130-139	42	12 (28.57)	12 (28.57)	12 (28.57)
140-149	6	0 (0)	0(0)	0(0)
Total	300	57 (19.0)	57 (19.0)	78 (26.0)
		X^2=29.053, p=0.000	X^2=29.053, p=0.000	X^2=53.538, p=0.000

Table 4. Distribution of urogenital schistosomasis and morbidity indicators according to the academic performance and shoulder length of subjects examined.

Shoulder Length (cm)	No. of Examined	No. of Infected (%)	No. with Haematuria (%)	No. with Proteinuria (%)
15-20	6	6 (100)	6(100)	6(100)
21-26	78	6 (7.7)	6(7.7)	15(19.23)
27-32	135	21 (15.6)	21(15.6)	27(20.0)
33-38	81	24 (29.6)	24(29.6)	30(37.0)
		X^2=19.421, p=0.000	X^2=19.421, p=0.000	X^2=18.923, p=0.000
Average Grade Score				
A	66	15 (22.73)	15 (22.73)	21 (31.82)
B	81	9 (11.11)	9 (11.11)	12 (14.81)
C	63	12 (19.05)	12 (19.05)	18 (28.57)
D&E		60	18 (30)	18 (30)
F	30	3 (10)	3 (10)	3 (10)
Total	300	57 (19.0)	57 (19.0)	78 (26.0)
		X^2=11.684, p=0.020	X^2=11.684, p=0.020	X^2=17.769, p=0.001

Subjects with Average Grade score “D & E” had the highest prevalence of infection 18 (30%). Probably this infection has effects on their attendance leading to their poor academic performance as reported earlier by Ekanem et al, [5]. This also corresponds with that of Ekanem et al, [5] even though there was no significant difference regarding school performance.

Conclusion: The study has shown that urogenital schistosomiasis is endemic in Akpet community. Age, weight, height, shoulder lengths and academic performance have influence on the prevalence of this infection. Urogenital schistosomiasis has also shown to be significantly associated with the presence of hematuria and proteinuria among residents of an endemic community. There is need to put in place an integrated control strategy in order to effectively control this infection.

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