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Research Paper

Prevalence of *Schistosomahaematobium* Infections and Associated Risk Factors in School-Aged Children in Southern Nigeria

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ABSTRACT
Background*: Nigeria has the greatest number of cases of schistosomiasis worldwide with an estimated 29 million people infected (among which 16 million are children) and 101million people at risk of infection*
Aim*: The study was carried out to assess the prevalence of Schistosoma haematobium infection and its associated factors in Ohaukwu Local Government Area (LGA) Ebonyi state, Nigeria.*
Methods*: Urine samples were collected from 421 children between 6 – 12 years old residing in Ohaukwu Local Government Area and analysed for S. haematobium infection according to standard protocols. Information on demographic data and social habits was collected using a structure PROFORMA data collection sheet. Data was analysed using the SPSS v25 software*
Results*: The prevalence of Schistosoma infection by urine microscopy was found to be 30.2% (127/421). The prevalence of Schistosoma infection was more in males (82 ,34.17%) than females (45, 24.86%), (p = 0.04). Children from the lower social class (124,30.69%) had significantly higher prevalence of infection when compared to those from the middle class (3,17.65%) (p = 0.002). There was a statistically significant association between association of bathing in the stream, swimming, fishing, washing clothes and the occurrence of S. haematobium infection (p <0.001). S. haematobium infection was 2.0 times (95% C.I; 1.2 – 3.1) more likely among persons bathing in the stream/river. S. haematobium infection was 2.3 times (95% C.I; 1.5 – 3.6) likely in persons that swim in public water bodies. S. haematobium was 1.8 times (95% C.I; 1.1 – 3.1) more likely among person who fish, wash clothes or practice swampy farming.*
Conclusion*: The study showed that S. haematobium infection is prevalent in the study area. Urgent public health interventions are need to curb the occurrence of this infection and improve the livelihood of the residents of the area.*
Keywords: *urinary schistosomiasis; Schistosoma haematobium; rural communities; prevalence; risk factors*

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I. INTRODUCTION

Schistosomiasis is a common intravascular infection caused by parasitic *Schistosoma* trematode worm.[1]It is a major neglected tropical disease considered as the third most devastating tropical disease in the world, after malaria and intestinal helminthasis, with more than 200,000 people dying from schistosomiasis each year.[2, 3]It occurs in 78 countries, with 240 million infected people and close to 700 million at risk individuals.[4, 5]It is a disease of poverty with 85% of all schistosomiasis cases occurring in Sub-Saharan Africa, especially in communities without access to safe drinking water and adequate sanitation.[6]Despite the introduction of the Schistosomiasis Control Initiative by the World Health Organization (WHO) since 2002, only sporadic control activities have taken place in Sub-Saharan Africa.[7, 8]Consequently, the current schistosomiasis disease burden remains high and could exceed 70 million disability-adjusted life-years (DALYs).[9]Nigeria has the greatest number of cases of schistosomiasis worldwide with an estimated 29 million people infected (among which 16 million are children) and 101million people at risk of infection.[10] The disease occurs in all 36 states of Nigeria and the Federal Capital Territory.[8] There are two major forms of schistosomiasis –urogenital and intestinal caused by five main species of schistomes.[1, 8]These species are *Schistosoma haematobium* causing urogenital schistosomiasis and *Schistosoma masoni, Schistosoma japonicum, Schistosoma mekongi, Schistosoma intercalatum* causing intestinal schistosomiasis.[1, 6]

Schistosoma haematobium affects over 110,000,000 people across Africa, the Middle East, Mediterranean and more recently some part of Europe and South America.[10]Urogenital schistosomiasis usually presents with haematuria a few weeks after infection and is the first sign of established disease.[1, 2] Dysuria and haematuria can occur in early and late disease.[1, 6] Late manifestations include proteinuria, bladder calcification and ureteric obstruction, secondary bacterial infection in the urinary tract which can lead to renal failure, in addition, it can also lead to morphologic changes in the bladder.[1,6] In Nigeria, an overall prevalence of 34.7% for *S. haematobium* infection in the six geo-political zones was documented from 1994 to 2015 following a systematic review with meta-analysis, the conclusion was that *S. haematobium* infection is still hyper endemic in Nigeria.[10]The trend in the endemicity of urogenital schistosomiasis documented in Ebonyi State has shown a gradual decline over years however it is reported that four in every ten individuals still have the infection[11, 12, 13, 14] The study was carried out to assess the prevalence of *Schistosoma haematobium* infection and its associated factors in Ohaukwu Local Government Area (LGA) Ebonyi state, Nigeria.

II. METHODS

Study Area

This study was conducted in Ohaukwu Local Government Area (LGA) of Ebonyi State, Southern Nigeria.The approximate population of the state is 2.1 million with about 196,337 people living in Ohaukwu LGA. It has a tropical climate with rainy and dry seasons. The area is intersected by slow flowing rivers, streams, stagnant ponds which constitute their major sources of household water supply. During both wet and dry seasons, activities increase around these water bodies as people converge to them for domestic, agricultural and recreational activities all of which could predispose them to urinary schistosomiasis. There are few shallow hand-dug wells which are found in homes of affluent families and quarry sites. Bore holes are provided by government in some areas but they are few in number. The people are actively involved in swamp-rice farming and fishing.The primary schools are scattered within the communities, some of them are surrounded by the rivers, streams and rice-farms.

Study Population

The study population consists of children attending public primary schools in Ohaukwu local government area of Ebonyi state. Multistage random sampling technique was used to select the schools and the subjects. There are four zones in Ohaukwu Local Government Area namely: Effium, Ezzamgbo, Ngbo West and Ngbo East.

The sample size estimation for the study was calculated using the Fischer's formula.[11]

Sample size $n = \frac{z^2p(1-p)}{d^2}$

Where; n= expected sample size

z = standard normal deviate at 95% confidence level = 1.96

p= prevalence of *Schistosoma haematobium* in Ebonyi reported in a previous study (46.1%)[12]

d = level of precision = 0.05

$n = (1.96)^2 \times 0.461 \times 0.539 / 0.05 \times 0.05$

Calculated sample size= 382

10% attrition is: 10/100 x 382 = 38.2

382 + 38.2 = 420.2 ~ 421

The sample size for the study was **421**

Specimen Collection and Analysis

The participants were given a wide mouthed screw-capped 40ml code–matched container each to collect at least 20ml or half sample bottle full of urine in the school urinary after running across the school field for 5 minutes as exercise. This was carried out between 10.00am and 2.00pm when the highest egg count is usually obtained.Timing of the collection took into cognisance the school time table in order to minimize interruption of academic activities.

The same urine sample used for urinalysis was transported to microbiology laboratory Federal Teaching Hospital Abakaliki (FETHA) for urine microscopy between 1-3 hours after adding a drop of 10% formalin to prevent the eggs from hatching.Urine microscopy was done according to standard protocols.[13]

Data Collection

Data was collected from the selected pupils using a self-administered questionnaire and a consent form to take home to be filled and signed or thumb printed by the parents/guardian. Final selection of pupils for the study was based on return of a duly signed consent form and filled questionnaire form and the social class of their parents were calculated using Oyedeji classification.

Data Analysis

All data collected was entered into an electronic spreadsheet and analysed using the SPSS v25 software. Descriptive analysis was presented using frequency and percentages as appropriate. The association of demographic variables, selected factors and the occurrence of *S. haematobium* infection was assessed using Chi-square statistics and logistic regression. All analysis was done at a 95% confidence interval and a p-value less than 0.05 was considered significant.

Ethical Consideration

Ethical approval for this study was obtained from the Ethics and Research Committee of the Federal Medical Centre, Owerri. Approval to study the primary school children was obtained from Ebonyi State Universal Basic Education Board, Abakaliki. Permission was obtained from, Ohaukwu LGA Education Authority, the head teachers of the selected schools and consent was obtained from parents/guardian of the selected pupils. Oral consent and thumb printing were possible consenting options allowed by the researcher for illiterate parents/guardians of the children. The children participated in the voluntary basis after being informed about the purposes of the study and giving their assent. Children who were positive for *S. haematobium* infection were treated with praziquantel (at 40mg/kg body weight). The study was at no cost to the participants. Incentives (pencil, exercise book, juice and biscuit) were given to pupils who completed the study.

III. RESULTS

Table 1 shows the general characteristics of the study participants. The age of participants ranged from 6 to 12 years with a mean of 10.22±2.06 years, the mean duration of stay of each of the participants in their respective study areas was 9.11± 3.25years. Four hundred and twenty-one (421) participants were recruited, 240 (57.00%) males and 181 (43.00%) females. The majority of them288 (68.41%) were in age range of 10 -12 years. In addition, 394 (93.59%) were from the lower social class while none of the study participants were from the upper social economic class. Regarding the educational zones, majority of the participants were from Ngbo East 155 (36.82%) followed by Effium 114 (27.08%) and the least number of participants were from Ezzamgbo 79 (18.76) and Ngbo West 73 (17.34%).

Table 1: General characteristics of the study participants

Variable	Mean±SD*
Age (years)	10.22±2.06
Duration of stay (years)	9.11±3.25

Variable	Frequency n = 421 (%)
Gender	
Male	240 (57.00)
Female	181 (43.00)
Age Group (Years)	
6 – 9	133 (31.59)
10 – 12	288 (68.41)
Social class	
Upper	0
Middle	27 (6.41)
Lower	394 (93.59)
Class grouping	
1 – 3	183 (43.50)
4 – 6	238 (56.50)
Educational Zone	
Effium	114 (27.08)
Ezzamgbo	79 (18.76)
Ngbo East	155 (36.82)
Ngbo West	73 (17.34)

The prevalence of Schistosoma infection by urine microscopy in Ohaukwu LGA was found to be 30.2% (127/421) and shown in Figure 1.

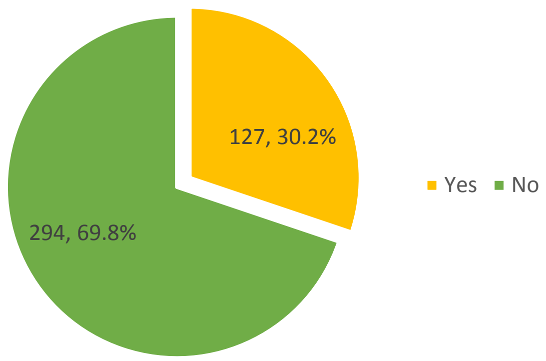

Figure 1: Presence of Schistosoma haematobium infection

Table 2 shows that gender, place of residence and social class were significantly associated with Schistosoma infection. The prevalence of Schistosoma infection was more in males (82 ,34.17%) than females (45, 24.86%), (p = 0.04). Children from the lower social class (124,30.69%) had significantly higher prevalence of infection when compared to those from the middle class (3,17.65%) (p = 0.002). Other sociodemographic factors did not show any significant relationship with Schistosoma infection.

Table 2: Association between sociodemographic factors and schistosoma infection

Risk factors	Schistosoma ova Present n(%)	Absent n(%)	Total	Chi-square value	O.R (95% C.I)	p-value
Gender						
Male	82 (34.17)	158 (65.83)	240	4.16	1.5 (1.0 – 2.4)	**0.041***
Female	45 (24.86)	136 (75.14)	181			
Age Group (years)						
6 – 9	45 (33.83)	88 (66.27)	133	1.24	1.2 (0.8 – 1.9)	0.269
10 – 12	82 (28.47)	206 (71.53)	288			
Duration of Stay						
≤ 6 months	35 (38.04)	57 (61.96)	92	3.46	1.5 (0.9 – 2.5)	0.062
≥ 6 months	92 (27.96)	237 (72.04)	329			
Social Class						
Lower	124 (30.69)	280 (69.31)	404	1.31	2.1 (0.5 – 7.3)	**0.250**
Middle	3 (17.65)	14 (82.35)	17			

**Statistically significant (p<0.05)*

Table 3 shows the association of bathing in the stream, swimming, fishing, washing clothes and its association with *S. haematobium* infection among the study participants. There was a statistically significant association between association of bathing in the stream, swimming, fishing, washing clothes and the occurrence of *S. haematobium* infection (p <0.001). *S. haematobium* infection was 2.0 times (95% C.I; 1.2 – 3.1) more likely among persons bathing in the stream/river. *S. haematobium* infection was 2.3 times (95% C.I; 1.5 – 3.6) likely in persons that swim in public water bodies. *S. haematobium* was 1.8 times (95% C.I; 1.1 – 3.1) more likely among person who fish, wash clothes or practice swampy farming.

Table 3: Association between selected practices and Schistosoma infection

Variable	Schistosoma ova Present n(%)	Absent n(%)	Total	Chi-square value	O.R (95% C.I)	p-value
Bathing in the Stream/River						
Yes	89 (36.03)	158 (63.97)	247	9.723	2.0 (1.2 – 3.1)	0.002*
No	38 (21.84)	136 (78.16)	174			
Swiming						
Yes	88 (37.93)	144 (62.07)	232	14.326	2.3 (1.5 – 3.6)	0.001*
No	39 (20.74)	150 (79.26)	188			

Fishing						
Yes	36 (40.91)	52 (59.09)	88	5.721	1.8 (1.1 – 3.1)	0.017*
No	91 (27.33)	242 (72.67)	333			
Washing Clothes						
Yes	71 (37.17)	120 (62.83)	191	7.737	1.8 (1.2 – 2.7)	0.005*
No	56 (24.35)	174 (75.65)	230			
Swampy Farming						
Yes	75 (36.59)	130 (63.41)	205	7.409	1.8 (1.1 – 2.8)	0.006*
No	52 (24.07)	164 (75.93)	216			

**Statistically significant (p<0.05)*

IV. DISCUSSION

The prevalence of *Schistosoma haematobium* infection among children of public primary school in Ohaukwu LGA was 30.17%. This is consistent with the reports of similar studies which reported a prevalence between 20.8% - 32.1%.[14–17] The combination of the prevalence of these two areas may have caused a dilutional effect in the overall prevalence that they documented and this could have accounted for the higher prevalence observed in this study. Although, both studies used filtration method, the reason for the higher prevalence in the present study could be attributed to the fact that the current study surveyed all the zones in the study area while a previous study carried out by Oyeyemi et al[15] could not complete their survey in some of the selected endemic study areas due to lack of access to those areas. In addition, the current study observed that there were a lot of swampy rice farms in the study area where as the study by Oyeyemi et al[15] noted that during the period of the study, most of the swamps in that area had dried up and more children were enrolled in school. The presence of swamps increases the chances of exposure to contaminated water and consequently the prevalence of the infection. This may have accounted for higher prevalence in the current study.

The prevalence of *S. haematobium* in the current study was noted to be significantly higher in males than in females. This finding is similar to the earlier reports by similar studies.[18–20] Similarly, there was a statistically significant association between association of bathing in the stream, swimming, fishing, washing clothes and the occurrence of S. haematobium infection (p <0.001). Males have increased outdoor activities and water contact through swimming, rice farming, and fishing; and thus are at a greater risk of exposure to cercariae infected water leading to increased *S. haematobium* infection.[15–17] On the other hand, the higher prevalence of the infection in females reported by in other studies[21, 22], this could be explained by the fact that they recruited more females than males. However, some studies have reported that gender is not a significant factor in the distribution of *S. haematobium* infection but rather the difference could be due to some variations in behaviour and cultural practices regarding water use and contact.[16, 19, 23]Furthermore, it has been documented that, the distribution of schistosomiasis in some endemic communities fits a negative binomial curve, where most infected children in those communities, have low worm burden despite endemicity. This has been attributed to acquired immunity to Schistosoma infection as a result of repeated exposure to the organism.[76, 84] This may provide a further explanation for the light intensity in the current study area.

V. CONCLUSION

The study showed that *S. haematobium* infection is prevalent in the study area, with the male gender, bathing in the stream, swimming, fishing, washing clothes found to be significantly increase the likelihood of *S. haematobium* infection (p <0.001). Urgent public health interventions are need to curb the occurrence of this infection and improve the livelihood of the residents of the area.

References

[1]. Awosolu OB, Shariman YZ, Farah Haziqah MT, et al. Will nigerians win the war against urinary schistosomiasis? Prevalence, intensity, risk factors and knowledge assessment among some rural communities in Southwestern Nigeria. Pathogens; 9. Epub ahead of print 2020. DOI: 10.3390/pathogens9020128.

[2]. Rollinson D, Knopp S, Levitz S, et al. Time to set the agenda for schistosomiasis elimination. Acta Trop 2013; 128: 423–440.

[3]. Okeke OC, Akinwale OP, Ubachukwu PO, et al. Report of high prevalence of schistosome infection in Biomphalaria snails from a geographic area with no previous prevalence of human schistosomiasis in Nigeria. Acta Trop; 210. Epub ahead of print October 2020. DOI: 10.1016/j.actatropica.2019.105326.

[4]. Morenikeji OA, Adeleye O, Omoruyi EC, et al. Anti-Schistosoma IgG responses in Schistosoma haematobium single and concomitant infection with malaria parasites. Pathog Glob Health 2016; 110: 74–78.

[5]. Aribodor DN, Bassey SA, Yoonuan T, et al. Analysis of Schistosomiasis and soil-transmitted helminths mixed infections among pupils in Enugu State, Nigeria: Implications for control. Infect Dis Heal 2019; 24: 98–106.

[6]. Adekolujo DR, Olayinka SO, Adeniji JA, et al. Poliovirus and other enteroviruses in children infected with intestinal parasites in Nigeria. J Infect Dev Ctries 2015; 9: 1166–1171.

[7]. Othieno JO, Njagi O, Azegele A. Opportunities and challenges in antimicrobial resistance behavior change communication. One Heal; 11. Epub ahead of print December 2020. DOI: 10.1016/j.onehlt.2020.100171.

[8]. Morenikeji OA, Eleng IE, Atanda OS, et al. Renal related disorders in concomitant Schistosoma haematobium-Plasmodium falciparum infection among children in a rural community of Nigeria. J Infect Public Health 2016; 9: 136–142.

[9]. Salawu OT, Odaibo AB. Urogenital schistosomiasis and urological assessment of hematuria in preschool-aged children in rural communities of Nigeria. J Pediatr Urol 2014; 10: 88–93.

[10]. Norseth HM, Ndhlovu PD, Kleppa E, et al. The Colposcopic Atlas of Schistosomiasis in the Lower Female Genital Tract Based on Studies in Malawi, Zimbabwe, Madagascar and South Africa. PLoS Negl Trop Dis; 8. Epub ahead of print 2014. DOI: 10.1371/JOURNAL.PNTD.0003229.
[11]. Kirkwood B, Sterne J. Calculation of required sample size. In: Essential Medical statistics. 2003, pp. 191–200.
[12]. Chiamah O, Ubachukwu P, Anorue C, et al. Urinary schistosomiasis in Ebonyi State, Nigeria from 2006 to 2017. J Vector Borne Dis 2019; 56: 87.
[13]. Cheesbrough M. Distric Laboratory practice in tropical countries. Second Edi. New York, NY, US: Cambridge University Press (CUP), 2006.
[14]. Gadanya MA, Ahmad KA. Quality assessment of praziquantel tablets sold in medicine stores in Kano Metropolis. Bayero J Pure Appl Sci 2018; 11: 208–210.
[15]. Oyeyemi OT, Odaibo AB. Maternal urogenital schistosomiasis; monitoring disease morbidity by simple reagent strips. PLoS One; 12. Epub ahead of print November 2017. DOI: 10.1371/JOURNAL.PONE.0187433.
[16]. Ekpo UF, Hürlimann E, Schur N, et al. Mapping and prediction of schistosomiasis in Nigeria using compiled survey data and Bayesian geospatial modelling. Geospat Health 2013; 7: 355–366.
[17]. Oyeyemi OT, de Jesus Jeremias W, Grenfell RFQ. Schistosomiasis in Nigeria: Gleaning from the past to improve current efforts towards control. One Heal 2020; 11: 100183.
[18]. Akinwale O, Oso O, Salawu O, et al. Molecular characterisation of Bulinus snails – intermediate hosts of schistosomes in Ogun State, South-western Nigeria. Folia Malacol 2015; 23: 137–147.
[19]. Okorie PN, Bockarie MJ, Molyneux DH, et al. Neglected Tropical Diseases: A Systematic Evaluation of Research Capacity in Nigeria. PLoS Negl Trop Dis; 8. Epub ahead of print August 2014. DOI: 10.1371/JOURNAL.PNTD.0003078.
[20]. Salawu OT, Odaibo AB. Schistosomiasis among pregnant women in rural communities in Nigeria. Int J Gynecol Obstet 2013; 122: 1–4.
[21]. Houmsou RS, Agere H, Wama BE, et al. Urinary schistosomiasis among children in Murbai and Surbai communities of Ardo-Kola Local Government Area, Taraba State, Nigeria. J Trop Med; 2016. Epub ahead of print 2016. DOI: 10.1155/2016/9831265.
[22]. Umoh NO, Nwamini CF, Inyang NJ, et al. Prevalence of urinary schistosomiasis amongst primary school children in Ikwo and Ohaukwu Communities of Ebonyi State, Nigeria. Afr J Lab Med; 9. Epub ahead of print 2020. DOI: 10.4102/AJLM.V9I1.812.
[23]. Odeniran PO, Omolabi KF, Ademola IO. Epidemiological dynamics and associated risk factors of S. haematobium in humans and its snail vectors in Nigeria: a meta-analysis (1983–2018). Pathog Glob Health 2020; 114: 76.