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Prevalence of Intestinal and Urinary Schistosomiasis among Pupils in Digil Community, Mubi North Local Government, Nigeria

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Abstract

Schistosomiasis constitutes significant public threat in sub Saharan Africa especially in the rural areas. This study was carried out to determine the prevalence of schistosomiasis among pupils in Digil community between February and May, 2018. Urine and stool samples were collected from 300 pupils from Digil, Worobarka, Kelluje, Hurda and Didif primary schools. Urine sedimentation and stool microscopy was used to analyze samples collected. Results obtained showed a total prevalence 15.0% for *S. haematobium* and 7.3% for *S. mansoni*. Male pupils showed the highest prevalence of 18.7% for *S. haematobium*. While age group 8-10 years expressed the highest rate of infection for urinary schistosomiasis, the highest rate of infection occurred at Wurobarka for urinary schistosomiasis and 11-16 years for *S. mansoni*. Chi square analysis showed that the rate of infection is not significantly different between sex, age groups and locations (P>0.05). The observed cases of schistosomiasis in all age group and schools sampled indicate active transmission. This implies that there is need for health education and treatment of infected individual in order to curb the spread of the disease.

Keywords: Digil; schistosomiasis; prevalence schistosome; soci-economic

Introduction

Schistosomiasis ranks high among parasitic diseases in terms of socio-economic and public health important in tropical and sub-tropical regions (Adenowo *et al*., 2015). It is one of the most prevalent neglected tropical diseases with over 200 million people infected and about 700 million at risk of infection worldwide (French *et al*., 2018; Bruun and Aagaard-Hansen, 2008). It is mainly a rural occupational disease that affects people engaged in Agriculture or fishing and those that frequently contact water (Singh *et al*., 2016). An important feature of schistosomiasis transmission is its association with poverty and underdevelopment. Perpetuation of the schistosoma requires water contamination by human sewages while exposure to infection results from lack of safe, alternative water for agriculture, domestic and recreational activities (King, 2010). If schistosomiasis is left untreated, the schistosomal worms will persist for an average of two to five years (Anderson and May, 1991). People at risk could experience multiple waves of infection during childhood and early adulthood. The dynamics of infection and reinfection implies that people at risk could experience active schistosoma infection for several years (Singh *et al*., 2016)

Six species of schistosoma have been recognized as important metazoan parasites of human. These include; *Schistosoma guineensis, Schistosoma mansoni, Schistosoma haematobium, Schistosoma japonicum, Schistosoma intercalatum* and *Schistosoma mekongi* (WHO, 2017). Of these six species, three species namely, *schistosoma mansoni, Schistosoma haematobium* and *schistosoma japonicum* accounts for more than 95% of all human cases of schistosomiasis in the world (Singh and Muddasiru, 2014). The species common in Nigeria include the *S. haematobium* and *S. mansoni* (Dawaki *et al*., 2016).

The disease caused by *S. haematobium* is characterized by bloody urine, lesion of bladder, kidney failure and bladder cancer in children (Butterworth, 1997) and is the major cause of female genital schistosomiasis (FGS), which is a risk factor

for transmission of sexually transmitted diseases and HIV (Tropical Disease Research (TDR), 1996). On the other hand, *S. mansoni* infection is characterized by bleeding from gastro-oesophageal region, splenohepatomegaly, growth retardation, delayed sexual maturity and chronic dermatitis (W.H.O., 1998). Though the disease kills few people, its clinical effects, prevalence and association with other diseases, expansion of agriculture and water development projects, movement of population and increase in population density and some social habits like passing urine and faeces near water bodies makes it a problem of great health importance (W.H.O., 2010).

Although several studies have been conducted in various communities in Nigeria, there is paucity of information on the prevalence of schistosomiasis in Digil community. The availability of this information will not only help in implementation of control programmes but also will serve to guide control intervention in areas with the greatest need and allocation of resources. It is against this backdrop that this study was carried out to determine the prevalence of urinary and intestinal schistosomiasis in primary school pupils in Digil community.

Materials and Methods

Study Area

This study was carried out at Digil; a rural community in Mubi North local government area, Adamawa state between February and May 2018. The inhabitants of this area are predominantly farmers although few are civil servants and business men.

The temperature regime in Digil is warm to hot throughout the year, however there is usually a slightly cool period between November and February, and a gradual increase in temperature from January to April with seasonal maximum occurring in April (Adebayo, 2004). Digil lies between latitude $10°18^1$ and $10°21^1$ North of the equator and longitude $13°13^1$ and $13°16^1$ East of the Greenwich meridian and on an elevation of 556 meter above sea level. Settlements that make up combine Digil as an area include, Wurobarka, Didif, Hurda, Kelluje and Digil. The vegetation falls within the southern savannah belt of the Nigeria's vegetation zone. The vegetation type is best referred to as combretaceous woodland savanna. The mean annual rainfall ranges from 900mm to 1050mm. Rainfall in the area starts around May to October with the maximum rainfall in July and September (Adebayo, 2004).

Sample Collection

Urine and stool samples were collected from pupils in Digil, Wurobarka, Kelluje, Hurda and Didif primary schools. Sixty participant comprising 30 from each sex were randomly selected from each primary school given a total sample size of 300.

After obtaining informed consent from the school authority and parent/guardian of the pupils, study participants were given samples bottles each and a plastic cup for collection of urine and stool respectively. Urine samples were collected between the hours of 10:00 am to 2:00 pm and stool sample were collected in the morning since egg output from infected persons reaches peak value around this time of the day (Singh and Muddasiru, 2014). Where necessary, stool and urine samples were preserved with 10% formalin solution and 1% domestic bleach respectively. All samples collected were taken to the parasitology laboratory, Department of Zoology, Adamawa State University Mubi and examined for schistosoma ova.

Urine Analysis

Urine samples were analyzed using sedimentation technique (W.H.O. 2009). The urine was spun for 5 minutes at 1,000 rpm to sediment the Schistosome eggs. The supernatant fluid was discarded and the bottom of the tube was gently tapped to mix the sediment. A drop of the sediment was put on a clean grease free slide, covered with cover slip and examined using x10 and x40 objectives lens of the microscope (Balla *et al*., 2015). All the urine and stool samples were processed using sedimentation and stool microscopy techniques respectively. Results obtained showed a total prevalence of

Stool Analysis

A drop of normal saline was placed on a microscope glass slide and a small portion (1gm) of each stool sample was added to the drop of normal saline using an applicator stick, and mixed together. The mixture was covered with a glass cover slip and viewed under the light microscope at x10 or x40 objective to identify the eggs and cyst (Goselle *et al*., 2010)

Data Analysis

The data was analyzed by using analysis using simple percentage and Chi-Square to find out the similarities and differences between population and frequency.

Result

A total of 300 samples were collected from the study population and analyzed for *S. haematobium* and *S. mansoni*. Results obtained indicated a prevalence rate of 45(15.0%) for *Schistosoma haematobium* and 22(7.3%) for *Schistosoma mansoni*. The prevalence for urinary schistosomiasis in the 150 samples collected each from male and female pupils was 28(18.7%) and 17(11.3%) respectively (Table 1). However chi square analysis showed that there is no significant difference in infection rate among gender.

Table 1: Prevalence of *S. haematobium* and *S. mansoni* by sex

Sex	***S. haematobium***		***S. mansoni***	
	No. examine	No. positive (%)	No. examine	No. positive (%)
Male	150	28 (18.7)	150	12(8.0)
Female	150	17 (11.3)	150	10(6.7)
Total	300	45(15.0)	300	22(7.3)
	χ^2 = 0.130, df=2, P = 4.083		χ^2 = 0.750, df=3, P = 1.215	

Prevalence for *S. haematobium* was highest in age group 8-10 years and least in 14-16 years. The age group 8-10 years also recorded the highest prevalence for *S. mansoni* while the least was age group 11-16 years (Table 2). Chi square analysis showed that there is no significant difference in infection rates in the age groups.

Table 2: Prevalence of *S. haematobium* and *S. mansoni* by age

Age	***S. haematobium***		***S. mansoni***	
	No. examine	No. positive (%)	No. examine	No. positive (%)
5-7	86	12 (14.0)	86	6(7.0)
8-10	96	16 (16.7)	96	8(8.3)
11-13	74	12(16.2)	74	5(6.8)
14-16	44	5(11.4)	44	3(6.8)
Total	300	45(15.0)	300	22(7.3)
	χ^2 = 0.777, df=6, P = 3.252		χ^2 = 0.537, df=9, P = 7.975	

Pupils in Wurobarka primary school showed the highest 17(28.3%) infection rate for *S. haematobium* followed by Kelluje 10(16.7) while pupils in Digil

primary school had the least infection rate 5(15.0%). For *S. mansoni*, the highest and least infection rates were observed in Hurda and Wurobarka primary school respectively.

Table 3: Prevalence of *S. haematobium* and *S. mansoni* by location of school

School	*S. haematobium*		*S. mansoni*	
	No. examine	No. positive (%)	No. examine	No. positive (%)
Wurobarka	60	17 (28.3)	60	0(0.0)
Kelluje	60	10 (16.7)	60	5(8.3)
Hurda	60	6(10.0)	60	7(11.7)
Didif	60	7(11.7)	60	5(8.3)
Digil	60	5(8.3)	60	5(8.3)
Total	300	45(15.0)	300	22(7.3)
	$\chi^2 = 0.777$, df=6, P = 3.252		$\chi^2 = 0.537$, df=9, P = 7.975	

Discussion

Nigeria is considered as the most endemic country for schistosomiasis, with approximately 29 million infected people and 101 million people at risk of infection (Dawaki *et al*., 2016). In this study a prevalence of 15.0% and 7.3% was recorded for *Schistosoma haematobium* and *Schistosoma mansoni*. This implies that there is active transmission of schistosomiasis in the study area. The presence of two forms of human schistosomiasis, caused either by *Schistosoma haematobium* or *Schistosoma mansoni*, in Nigeria has been known since 1881 (Dawaki *et al.,* 2016). A report by the W.H.O. in 1987 indicated that the urinary form of the disease caused by *S. haematobium* is widespread throughout Nigeria and more prevalent than intestinal schistosomiasis caused by *S. mansoni* (Dawaki *et al.,* 2016). The high prevalence of urinary schistosomiasis observed in this study corroborated the W.H.O. report. In the same vein, a similar study conducted in Northeastern Nigeria revealed prevalence rate of 10% and 2% for *S. haematobium* and *S. mansoni* respectively (Bassey and Umar, 2004). Another study from Anambra state revealed 15% and 0.0% prevalence rate for *S. haematobium* and *S. mansoni* respectively (Ugochukwu *et al*., 2013). Contrary to our finding, a study in Kano and Ogun states reported higher prevalence of *S. mansoni* than *S. haematobium* (Dawaki *et al*., 2016; Agbolade *et al*., 2014,). While the distribution and prevalence of schistosomiasis vary across different communities in Nigeria, the geographic distribution of each *Schistosoma* species is dependent on presence of appropriate freshwater snails. Both *Bulinus* and *Biomphalaria*; the genus that serve as the Molluscan intermediate host for *S. haematobium* and *S. mansoni* respectively are found in Nigeria, with *Bulinus* having wider distribution and more species, such as *B. globosus*, *B. truncates* and *B. senegalensis*, than *Biomphalaria* (Dawaki *et al*., 2016). This could account for the higher prevalence of *S. haematobium* observed in this study.

The higher prevalence of infection in male than female for both urinary and intestinal schistosomiasis observed in this study agrees with the reports of Dawaki *et al*. (2016), Ivoke *et al*. (2014) and Dunah *et al*. (2000). This may be attributed to the high water contact activity by the male child and the social restriction placed on the female child. Contrary to our

observation, a significantly higher prevalence of schistosomiasis was reported among females in comparison to males in Ghana (Nkegbe, 2010).

An increasing trend in the infection rate among pupils from 5-13 year and then a decline at 14-16 year was observed in this study. This finding is keeping in line with an earlier study that reported children aged 5-15 year as most likely to be infected, and the decline in age 15 and above (Babatunde *et al*., 2013). The drop in infection rate in the older groups may be due to either reduced water contact activities or decrease in survival and fecundity of worms already in the human host which is consistent with the slowly acquired immunity to infection (Babatunde *et al*., 2013).

Prevalence rate for the primary schools studied showed that transmission of *S. haematobium* was highest at Wurobarka followed by Kelluje and Didif. This variation may be a function of the degree of exposure of pupils to infected water in their community. The differences in the transmission of *S. haematobium* and *S. mansoni* in the schools could be attributed to the distribution of the obligatory snail host within the community (Dawaki *et al*., 2016).

Some limitation of the methodology employed in this study include the reliance on small sample size and single faecal and urine sample collected from subject may have underestimated the prevalence of schistosomiasis due to temporal variation in eggs excretion over hours and days. However, the fact that positive cases were observed in the study indicates active transmission of the disease and the need to implement control measure to curb the spread.

Conclusion

The present study shows that schistosomiasis is still prevalent within the communities in Digil. Prevalence study at a wide scale targeting children and adults within the communities, and treatment of the infected population as well as health education should be adopted by public health authorities as a way of controlling the spread and morbidity of schistosomiasis within the community.

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