Science World Journal Vol 5 (No 1) 2010
www.scienceworldjournal.org
ISSN 1597-6343

Schistosoma mansoni INFECTIONS AMONGST SCHOOL CHILDREN IN JOS, NIGERIA.

*GOSELLE, N. O.[1]; ANEGBE, D.[1]; IMANDEH, G. N.[1].; DAKUL, D. A.[1]; ONWULIRI, A. C. F.[2]; ABBA, O. J.[1]; UDEH, O. E[3] & ABELAU, A. M.[1].

[1]Applied Entomology and Parasitology Research Laboratory, Department of Zoology, University of Jos, Jos, Nigeria.
[2]Department of Plant Science and Technology, University of Jos, Nigeria.
[3]South South International Centre for AIDS Care and Treatment Programmes (ICAP), Mailman School of Public Health, USA.
*obeto247 @ yahoo.com

ABSTRACT
A parasitological study of intestinal schistosomiasis among public/private primary and secondary school pupils in Jos North Local Government Area of Plateau State, Nigeria was conducted. Out of the 280 stool samples examined, 13(4.6%) were positive for *S. mansoni* parasites. Single, dual and multiple parasitic infections were recovered. The study provided some data on infections with intestinal parasites among the pupils/students in Jos, Nigeria, recommending that control and treatment of these infections is of great importance.

Keywords: *S. mansoni*, pupils/students, survey, Jos, Nigeria

INTRODUCTION

Despite progress in control, *schistosomiasis* remains endemic in 76 countries, putting an estimated 600 million people at risk of acquiring this infection (Fallon *et al.,* 1995). Recent estimate shows that more than 200 million people are infected, out of which 120 million have symptoms and 20 million severe illnesses (Ross *et al.,* 2002). *Schistosomiasis* ranks second only to malaria in terms of parasite-associated human morbidity and mortality (Wilkins, 1987). It is the most prevalent of the water borne parasitic diseases and one of the greatest risks to health in rural areas of the developing world and also the most widespread of all human diseases but with low morbidity rate (WHO, 1990).

Schistosoma mansoni infection has been reported together with *Schistosoma haematobium* in various parts of Africa (Farid *et al.*, 2000; Stephenic & Daniel, 1995; Eric *et al.*, 1996; Kabatereine *et al.*, 2004), Nigeria (Ramsay, 1935; Cowper, 1963; Iarotski & Davies, 1981; Ofoezie *et al.,* 2002; Anosike *et al.,* 1992; Uneke *et al.*, 2007) and Plateau State (Anyanwu & Okoro, 2002).

According to a 2007 estimate by the Carter Centre (2007), 423 million drugs are needed yearly (globally) at a cost of US$76m. No company donate praziquantel on a large scale, unlike mectizan® used for treatment of river blindness, abendazole for lymphatic filariasis and zithromax® (for bacteria).

The aim of the study was to survey intestinal schistosomiasis among primary and secondary school children in some schools of Jos North Local Government Area of Plateau State, Nigeria to identify areas that are still endemic for the disease as well as the level of infection towards understanding the epidemiological factors that still predisposes people to infection.

MATERIALS AND METHODS

Study Area: Public and Private Primary and Secondary schools in Jos metropolis located in the northern city of Jos, Plateau State, Nigeria were surveyed. The area is located at latitude 9^0 55^1 and longitudes 8^0 54^1 and has an annual rainfall of about 1,410mm. Dry season which starts late in October last till March, while wet season is from April to October. The dry season in dominated by harmattan winds characterised by hot days and cool nights with relatively low humidity. Rainfall is high during the seven months (April to October) with an average annual of 1,410mm. The current (2006) human population of the area is 510,000.

Sample collection: 70 samples each were collected from from Faithful private primary school (FPPS) and Faithful private secondary school (FPSS) located at Nassarawa Gwong Jos, Plateau State; Local Government Education Area (LGEA) primary school located at Tudun Wada Jos and Government Secondary School, Kabong (GSSK) Jos.

A total of 280 pupils/students were employed for the study. Specimen bottles labelled with the needed information were issued to the willing participants. Questionnaires were also issued which contain some demographic, social and environmental factors a pupil/student is exposed to. Stool samples were collected the following morning and immediately taken to the laboratory for analysis within 30 mins of collection and when this was not possible, the samples were preserved in 10% formalin.

Ethical clearance: Prior to the survey, the study team visited the various schools to discuss the objectives of the study. Written informed consent was obtained from the parents and teachers of the pupils before stool samples were collected from them.

Macroscopic Examination: The macroscopic analysis of stool samples was carried out by careful observation of the stool samples. Appearance (colour) which may be yellowish, brownish, greenish, black; consistency as to whether formed, semi – formed or unformed; and loose or watery stool. The presence of blood or mucus was also looked out for. Stool from healthy pupils is usually brown, while yellow, green, black or bloody stool with mucus is abnormal.

Microscopic examination of fresh stool sample by Direct Faecal Smear: A drop of normal saline was placed on a glass microscope slide, using an applicator stick, a small portion (1gm) of each stool sample was added to the drop of normal saline and mixed together. The mixture was covered with a glass cover slip.

Microscopic Examination: Where blood and mucus are present in a stool sample it was examined for *Schistosoma mansoni*; where it is loose without blood or mucus, it was examined for *trophozoites* of amoebae flagellates and their cyst and if stool is formed, it is examined for cyst. Each slide was viewed under the light microscope at x10 or x40 objective to identify the eggs and cyst.

A semi-structured questionnaire was used to obtain demographic data and information or risk factors.

RESULTS

Table 1 showed that out of the 280 stool samples collected and examined, 129 were from males and 151from females. A total of 13 (4.64%) were positive for *Schistosoma mansoni* infection. Of the 140 examined at the primary school level, 6(4.29%) were iinfected while 7(5.00%) of 140 examined at the secondary school category were infected. There were more infections among the secondary school students than their primary school counterparts, though the difference was not significant ($p>0.05$).

TABLE 1. DISTRIBUTION OF SCHISTOSOMIASIS IN SELECTED SCHOOLS IN JOS NORTH L.G.A

Names of Schools	No examined	No infected (%)
Primary school		
L.G.E.A	70	2 (2.9)
F.P.P.N	70	4 (5.7)
Sub-total	140	6(4.3)
Secondary school		
F.P.S.N		
G.S.S.K	70	1 (1.4)
Sub-total	70	6 (8.6)
	140	7(5.0)
Total	**280**	**13(4.6)**

The infection according to age and sex is shown in Table 2. Out of the 129 males examined, 10(7.8%) were infected while only 3(2.00%) of the 151 females examined were infected. The age group 10-14years had the highest prevalence with more males infected 8(22.2%) than females 2(3.7%). *S. mansoni* infection in the various schools is shown in Table 3. More boys were infected than girls in all the schools sampled.

Relationship between infection with *S. mansoni* and toilet facilities is shown in Table 4 while infection in relation to sources of drinking water is given in Table 5.

DISCUSSION

The public health significance of Schistosomiasis is often underestimated partly because like all helminthic infections, its distribution is usually widespread with few people having heavy infections and severe disease while majority are asymptomatic with lighter infections (De Vlas *et al.*, 1992; WHO, 1993).

TABLE 2. PREVALENCE OF *S. mansoni* INFECTION ACCORDING TO AGE AND SEX

Age group	Male		Female		Total	
	No examined	No infected (%)	No examined	No infected (%)	No. examined	No infected (%)
0 – 4	10	0 (0.0)	15	1 (6.7)	25	1 (4.0)
5 – 9	43	2 (0.0)	44	0 (0.0)	92	2 (2.2)
10 – 14	36	8 (22.2)	54	2 (3.7)	90	10(11.1)
15 – 19	25	0 (0.0)	28	0 (0.0)	53	0 (0.0)
< 20	10	0 (0.0)	10	0 (0.0)	20	0 (0.0)
Total	**129**	**10(7.8)**	**151**	**3(2.0)**	**280**	**13(4.6)**

TABLE 3. SCHISTOSOMA INFECTION ACCORDING TO SCHOOLS AND SEX.

Name of Schools	Male		Female	
	No. Examined	No. infected (%)	No. examined	No. infected(%)
Primary school				
L.G.E.A	28	1(3.6)	42	1(2.4)
F.P.P.S	32	3(9.4)	38	1(2.6)
Secondary school				
F. P. S. S	37	1(2.7)	33	0(0.0)
G.S.S.K	32	5(15.6)	38	1(2.6)
Total	**129**	**10(7.8)**	**151**	**3(2.0)**

TABLE 4. PREVALENCE OF PARASITES IN SELECTED SCHOOLS OF JOS NORTH LGA BASED ON TOILET FACILITIES

Toilet facility	T/Wada		Nassarara		Kabong		Total examined	No infected (%)
	No examined	No Infected (%)	No examined	No Infected (%)	No examined	No Infected (%)		
Pit toilet	29	0(0)	69	2(2.9)	26	4(15.4)	124	6(4.8)
Water cistern	24	0(0)	42	3(7.1)	22	2(9.1)	88	5(5.7)
Bush	17	2(11.8)	11	0(0)	22	10(4.6)	50	2(4.0)
Others	0	0(0)	18	0(0)	0	0(0)	18	0(0)
Total	**70**	**2(2.9)**	**140**	**5(3.6)**	**70**	**6(8.6)**	**280**	**13(4.6)**

TABLE 5. DISTRIBUTION OF *S. mansoni* INFECTION IN RELATION TO SOURCE OF DRINKING WATER

Sources of drinking water	T/Wada		Nassarara		Kabong		Total examined	No infected (%)
	No examined	No Infected (%)	No examined	No Infected (%)	No examined	No Infected (%)		
Bore hole	14	0(0)	28	1(3.6)	21	1(4.8)	63	2(3.2)
Pipe borne	27	1(3.7)	92	4(4.4)	23	1(4.4)	142	6(4.2)
Well	29	1(3.5)	20	0(0)	26	4(15.4)	75	5(6.7)
Others	0	0(0)	0	0(0)	0	0(0)	0	0(0)
Total	**70**	**2(2.9)**	**140**	**5(3.6)**	**70**	**6(8.6)**	**280**	**13(4.6)**

Children from the 2 public schools surveyed were found to be more heavily infected with intestinal schistosomiasis than those from the private schools (FPPN and FPSN). Students from the secondary schools are generally older, aged between 10-14 years and found to be more infected than the younger pupils from primary schools. This agrees with studies carried out by Haza *et al.,* (1983) in Yemen who observed the age intervals of 9-13 years and 10-12years as the most affected groups. Similar findings were reported by Kabatereine *et al.,* (2004) in Uganda among the age group 10-12 years. Rubaihayo *et al.,* (2008) also reported high infections in 12-14 year age group in Uganda. A more wider age range of 10-20 years was reported by Farag (1985) and WHO (1985).

The results showed more males (7.8%) to be infected with Intestinal schistosomiasis than the females (2.0%), similar to the findings of Rubaihayo *et al.,* (2008) who observed lower prevalence of *S. mansoni* infection in girls (26%, 95CI:19.7-33.0%) than boys (29.6 %, 95% CI: 23.2-36.7%). In the present study, the mean intensity of infection was higher in boys (463 eggs/gm) compared to girls (290 eggs/gm) ($t=4.383$, $p<0.05$), similar to the study of Haza *et al.,* (1983) at Almahweet. Both Farag (1985), WHO (1985) and Nagi *et al.,* (1999) reported that schistosomiasis was most common in the age group 10-20 years and in males. This could be attributed to the nature of boys who are known to spend long hours playing in water. Raja'a *et al.,* (2000) gave a similar reason for higher infection in males than in females.

Most of those who use Water cistern and Pit toilets were the most affected when other socio-demographic factors were considered. One would have anticipated that with such a confined pattern of defaecation, there would have been a reduction in the continued re-infection of parasitic infection. However, close examination of the soak away systems revealed very poor construction pattern resulting in leakages that flow into nearby streams and so encourages recirculation of parasites.

The study also revealed that those mostly affected with *S. mansoni* are those who drink pipe borne water 6(4.2%) and hand-dug well water 5(6.7%). This is because the quality of the pipe-borne water in Jos does not meet the minimum World Health Organization standard, while locally dug wells are mostly left uncovered most of the time, resulting in the inflow of contaminated water from nearby infected streams. A study carried out in Argentina shows that intestinal parasite frequencies detected in various socio-cultural areas were related to contaminated water sources as well as insufficient health conditions (Gamboa *et al.,* 2003). Report by Ostan *et al.,* (2007) in Demijohn revealed that students who drink tap water were found to have higher level of parasites than those who drink commercial drinking water. Rubaihayo *et al.,* (2008), in a study in Western Uganda reported that 36.7% of the pupils studied used crater lakes as their main source of domestic water, and that 61.5% of these lakes were infective with over 50% of the users infected. The same study also revealed that prevalence was generally higher in children who used crater water at low altitude than those at higher altitude. In a different study in Mexico, no correlation was observed between the reliable drinking water and parasitic infections (Quihui *et al.,* 2006). Many have also suggested that the domestic water network in Jos needed to be upgraded.

ACKNOWLEDGEMENTS
To the Department of Zoology, University of Jos for the use of their laboratory to analyze samples and to the various school authorities for the kind gesture extended to us at the course of the exercise.

REFERENCES

Anyanwu, G. I. & Okoro, O. C. (2002). Observation of urinary schistosomiasis in school children in Jos, Plateau State, Nigeria. *International. Journal of Environmental Health and Human Development,* 3(1): 31-34

Anosike, J. C., Okafor, F. C. & Onwuliri, C. O. E. (1992). Urinary schistosomiasis in Toro Local Government Area of Bauchi State, Nigeria. *Helminthologia*, 29: 177-179.

Brooker, S., Kabatereine, N. B., Tukahebwa, E. M., Kazibwe, F. (2004). Spatial analysis of the distribution of intestinal nematode infections in Uganda. *Epidemiology and Infection, 132(6):* 1065-71.

Cowper, S. G. (1963). Schistomaisis in Nigeria. *Annals of Tropical Medicine and Parasitology;* 57:302-322.

Carter Center (2007). The Carter Center Schistosomiasis Control Program, available at http://www.cartercenter.org/health/schistosomiasis/index.html. Accessed 20th March, 2009.

De Vlas, S. J. & Gryseels, B. (1992). Underestimation of *S. mansoni* prevalences. *Parasitology Today,* 8:274-7.

Eric, M. M., John, H. O. & Charles, H. K. (1996). Dynamics and control of *Schistosoma haematobium* transmission in Kenya: An overview of the Msambeni project. *American Journal of Tropical Medicine and Hygiene*, 55 (5):127-134.

Fallon, P. G., Sturrock, R. F., Capon, A., Niang, M. & Doenhoff, M. J. (1995). Short report: Diminished susceptibility to praziquantel in a Senegal isolate of Schistosoma mansoni. *American Journal of Tropical Medicine and Hygiene, 53*:61-62.

Farag, H. F. (1985). International parasitosis in Yemen Arab Republic. *Tropical and Geographical Medicine, 37*:29-31.

Farid, A. W., Gamal, E., Yoser, E. B., Imam, R., Eman, M. & Thomas, S. (2000). The epidemiology of schistsomaisis in Egypt: Methods, Training and quality control of Clinical and ultrasound examinations. *American Journal of Tropical Medicine and Hygiene, 62 (2)* 5:17-20.

Gamboa, M. I., Basualdo, J. A., Cordoba, M. A., Pezzani, B. C., Minvielle, M. C. & Lahitte, H. B. (2003). Distribution of intestinal parasitoses in relation to environmental and sociocultural parameters in La Plata, *Argentina. Journal of Helminthology, 77*:15-20.

Haza, Y. A., Arfaa, F., Haggar, M. (1983). Studies on Schistosomiasis in Taiz province, Yemen Arab Republic. *American Journal of Tropical Medicine and Hygiene, 32*:1023-8.

Iarotski, I. A. & Davis, A. (1981). The schistosomiasis problem in the world: A result of WHO questionnaire. *Bulletine of the World Health Organization, 59:* 115-128.

Kabatereine, N. B., Brooker, S., Tukahebwa, E. M., Kazibwe, F. & Onapa, A. W. (2004). Epidemiology and geography of Schistosoma mansoni in Uganda: implications for planning control. *Tropical Medicine and International Health, 9(3):*372-80(Abstract)

Nagi, M. A. M., Kumar, A., Mubarak, J. S. & Bamashmoos, S. A. (1999). Epidemiological, clinical and haematological profile of Schistosomiasis in Yemen. *Eastern Mediterranean Health Journal, 5(1):*177-181.

Ofoezie, I. E., Bolton, P., Imevbore, A. M. A. & Christensen, N. O. (2002). Schistosomiasis and other helminth infections in irrigation schemes in Sokoto, Katsina and Kebbi states of Nigeria. *The Nigerian Journal of Parasitology, 17*:31-37.

Ostan, I., Kilimcioglu, A. A., Girginkardesler, N., Ozyurt, B. C., Limoncu, M. E. & OK, U. Z. (2007). Health inequities: lower socio-economic conditions and higher incidences of intestinal parasites. *BMC Public Health, 7*: 342.

Quihui, L., Valencia, M. E., Crompton, D. W. T., Philips, S., Hagan, P., Morales, G., Diaz- Camacho, S. P. (2006). Role of the employment status and education of mothers in the prevalence of intestinal parasitic infections in Mexican rural school children. *BMC Public Health, 6*:225-232.

Raja'a, Y., Assiraji, M. H., Luhom, A. A. A., Mohammed, A. B. S., Albahr, M. H., Ashaddadi, M. A. A., & AlMuflihi, N. A. (2000). Schistosomes infection rate in relation to environmental factors in school children. *Saudi Medical Journal, 21(7)*:635-638.

Ramsay, G. W. (1935). A study of schistosomiasis and certain helminthes infections in Northern Nigeria. *British Medical Journal, 8:* 20-10.

Ross, A. G. P., Bartley, P. B., Sleigh, A. C., Olds, G. R., Li, Y., Williams, G. M. & McManus, D. P. (2002). *Schistosomiasis*. The *New England Journal of Medicine*, *346*(16): 1212-20.

Rubaihayo, J., Moghusu, E., Clouds, P. & Abaasa, A. (2008). Schistosomiasis transmission at high altitude crater lakes in Western Uganda. *BMC Infectious Diseases, 8*:110.

Stephenic, J. & Daniel, C. (1995). *Current opinion in infection disease*. Rapid Science Publishers, 8:351-355.

Uneke, C. J., Oyibo, P.G., Ugwuoru, C. D. C., Arinzechukwu, P. N. & Iloegbunam, R. O. (2007). Urinary schistosomiasis among school age children in Ebonyi state, Nigeria. *The Internet Journal of Laboratory Medicine, 2(1):* 1-14.

WHO (1993). The control of schistosomiasis: 2nd report of the WHO expert committee on schistosomiasis (WHO Technical report series No. 830). WHO Geneva, 1993.

WHO (1985). The control of Schistosomiasis. Report of a WHO Expert Committee Geneva, World Health Organization (Technical Report Series, No. 728).

WHO (1990). Health Education and control of schistosomiasis. World Health Organization manual. Geneva 280pp.

Wilkins, H. A. (1987). The epidemiology of schistosoma infections in man. In: Rollinsop, A.J.G., Editors. *The biology of schistosomes from genes to latrines*. London: Academic Press.