

Prevalence of Urinary Schistosomiasis Among Primary School Pupils in Abuja Municipal Area Council Abuja, Nigeria

Okezie Gabriel Chidiebere¹, R.A.U. NWOB², Mgbowula Goodness Ifeoma³

¹Department of Medical Laboratory Science, Faculty of Health Sciences and Technology
College of Health Sciences, Nnamdi Azikiwe University, Nnewi Campus
Anambra, State, Nigeria.

²Professor of Medical Microbiology,
Department of Medical Laboratory Science, Faculty of Health Sciences and Technology
College of Health Sciences, Nnamdi Azikiwe University, Nnewi Campus
Anambra, State, Nigeria

³Digital Health Studies, Algonquin College, Canada.



Abstract – A study on the prevalence of urinary schistosomiasis was carried out among pupils in some selected primary school in Abuja Municipal Area Council Abuja, Nigeria. The study was carried out among 620 pupils comprised 264 males and 356 females age 5-16 years. Single urine samples were collected from the pupils between 10.00 hours and 13.00 hours and were examined for the presence of *Schistosoma haematobium* eggs using centrifugation techniques. Pupils examined 5 (0.8%) had the eggs of *S. haematobium* in their urine. The results show that males were more infected 3 (0.5%) than females 2 (0.3%). There was no statistically significant association between the sexes ($p > 0.05$). The infection rate varied according to age group, 13-16 years had the highest prevalence rate 3 (0.5%) and age group 9-12 years had the least prevalence 2 (0.3%). The age group 5-8 years had zero prevalence rate. The prevalence in relation to school shows that Azhata recorded the highest prevalence of 2 (0.3%) where as Gidamangoro, Orozo and Karshi recorded 1 (0.2%), 1 (0.2%) and 1 (0.2%) respectively, where as Karu and Jikwoyi had recorded zero prevalence. The distribution according to sources of drinking water shows that well water had high prevalence 3 (0.5%) and sachet water recorded the least prevalence 2 (0.3%), Tap water, borehole and rivers/stream had recorded zero prevalence. There was no statistically significant relationship between age, schools and sources of drinking water and prevalence of urinary schistosomiasis infection. This result of this study shows that urinary schistosomiasis was low prevalence in the study area. This study strongly suggests that provision of adequate clean water supply, health education on the modes of transmission, prevention and treatment should be provided and strengthened to achieve total eradication of the disease in the study area.

Keywords – Pupils, Primary, Abuja, Schools, Schistosomiasis, Urinary, Municipal.

I. INTRODUCTION

Schistosomiasis is a serious human disease in endemic regions of Asia, Africa and South America [23]. Schistosomiasis is considered by the World Health Organization as the second most socioeconomically

devastating parasitic disease, with hundreds of millions infected worldwide [48].

Schistosomiasis known as bilharziasis is a major disease of public health importance in tropic and the sub tropic as a source of human morbidity caused by parasitic agent ([33], [20]). Schistosomiasis is a parasitic disease produced by

the platyhelminthes worm of the class Trematode, genus *Schistosoma*. It is commonly known as Blood fluke or Flat worm which is common in developing countries [19]. According to the World Health Organization (WHO), Schistosomiasis is second to malaria alone amid the vector-borne diseases in terms of public health and remuneration importance in the tropic [49].

The World Health Organization (WHO) has estimated that 160-200 million cases of infections are acquired annually worldwide, with about 120 million with symptoms and 20 million with varying pathological presentation that is severe illness ([22], [29], [15]). The disease being endemic to some 74 countries and some 400 million more people are at risk of becoming infected and an estimated 80% of most severely affected individuals is now concentrated affecting at least 200 million people yearly in Africa ([50], [52], [45]). The infection is acquired through contact with cercaria-polluted water during washing clothes and utensils, swimming, wading (working or bathing) [5].

Schistosomiasis is still considered a neglected tropical disease. The disease mostly affects the health of school-age children [3].

Infection rates between men and women are the same and usually with women showing symptoms, while infections in men are usually asymptomatic [19]. Urinary Schistosomiasis is a risk factor for the second most common urologic malignancy (bladder cancer) and myriads of disorders that result in morbidity and mortality 8-10 ([46], [27]). In *S. haematobium* infection, the eggs are trapped in tissues and cause progressive damage to the bladder, ureters and kidneys. There is dysuria (painful urination) and haematuria (blood in urine) ([32], [11]).

The disease can present as chronic, which is most common or acute. Haematuria (blood in urine) and dysuria are the main early symptoms of the disease. Most individuals remain asymptomatic, although about 80% of the infected children show early symptoms and signs of disease ([32], [41]). Chronic Schistosomiasis may result in death. In sub-Saharan Africa, more than 200,000 deaths per year are caused by the disease ([50], [51], [52]).

The disease is endemic in the following African countries: Ethiopia, Kenya, Cameroon, Uganda, Malawi, Mozambique among others [15]. It is endemic in Tanzania (19%), Ghana and DR Congo 15% Abdulkadir et al., [1], Brouwer et al., [13] reported (60%), Same et al., [42] reported (32.1%) in Kumba Cameroun. The disease is normally endemic in rice and sugar cane producing areas as well as fishing communities and others [40].

Nigeria had the highest Schistosomiasis burden in Africa ([18], [43]). Urinary Schistosomiasis has been reported to be prevalent and widely distributed in all the geographical zones of Nigeria ([37], [38]). Urinary schistosomiasis has been reported in different parts of Abuja ([12], [14]). Akinwale et al., [6] using PCR technique reported 98.4% prevalence in a local community in South western Nigeria among age group 6-63 years. Amuta and Houmou, [9] reported prevalence rate of (55%) in Guma Benue State. Muhammed et al. [32] reported 48% among primary school pupils in Wamakko Sokoto, Nigeria. Ishaleku et al., [25] reported (30.5%), Akpan et al., [7] reported 1.5% in Ikom Cross River. Several studies in Benue State have reported urinary Schistosomiasis prevalence ranging from 15%-41% ([19], [24], [30], [45]).

Schistosomiasis principally affects people engaged in agriculture or fishing but in many areas a large population of children are infected by this age.

In children, schistosomiasis can cause anemia and physical weakness and consequently reduce their ability to learn, although these negative impacts can be reversed with appropriate treatment.

Minimizing morbidity can be effectively supported through parallel preventive measures by reducing the contamination of water with Schistosome eggs and preventing exposure of humans to Schistosome-infested water ([47], [48]). Health education, water supply and sanitation programmes and snail control are important preventive measures in an integrated approach to control Schistosomiasis transmission ([31], [32], [44]).

The most common method of diagnosis of Urinary Schistosomiasis in epidemiological surveys carried out in Africa is the identification of eggs in the urine from the infected individual. Drug treatment is still Praziquantel (40mg/kg) is effective in reducing prevalence and in curtailing the disease [51].

Epidemiological data often reveal the disease to be more prevalent in school-aged children and therefore this group is often targeted for control. It has been estimated that school-aged children experience a considerable burden of schistosomiasis which may have both immediate and long-term consequences on their health, growth and education.

Schistosomiasis is a neglected disease and no study has described its epidemiology in the study locality. Information on infection prevalence is useful to plan the prevention and control of urinary schistosomiasis and to assess progress in control programmes. This study was carried out to determine

the Urinary Schistosomiasis among primary school pupils in Abuja Municipal Area Council, Abuja, Nigeria.

II. MATERIALS AND METHOD

A. STUDY AREA

The study area include Karu, Jikwoyi, Azhata, Gidamangoro, Orozo and Karshi all in Abuja Municipal Area Council, Abuja Federal Capital Territory Abuja .Abuja Municipal Area Council is one of the six area Council that made up of Federal Capital Territory Abuja, Nigeria. The last demographic report by the National Population Commission indicated that the population of the area Council stood at 776298. Abuja geographical coordinate are 8° 49' 40" North, 7° 33' 0" East. Commission puts the population figure of Abuja at about 1.4million with annual growth rate of 13%. The indigenous inhabitants of Abuja are the Gbagyi (Gwari), with the Gbagyi language formerly the major of the region language ,and others in the area being Bassa, Gwadar, Gade, Dibo and Koro, Abuja is Nigeria Federal Capital, it covers an area of 800 square kilometres bounded to the north by Kaduna state, to the west by Niger state and on the east and south by Nassarawa and Kogi States respectively[36].

B. STUDY POPULATION

The study population was composed of 620 school children who were randomly selected using convenience sampling method. Two hundred and sixty four (264) males and 356 females. The ages were between 5 to 16 years. This study was a cross-sectional descriptive study.

C. QUESTIONNAIRES

The questionnaire was designed to obtain information on the children, demographic data like age and sex. The school name and source of drinking water supply such as well, pipe borne river/stream, tap water and sachet water. Immediately after the filled questionnaires from children parent were returned, the specimens were collected from the subject by a medical laboratory scientist..

D. ETHICAL APPROVAL

Ethical approval for the study was obtained from Abuja Municipal Area Council Local Education Authority. Written informed consents were given by parents/guardians of the children prior to the study.

E. SAMPLE COLLECTION AND ANALYSIS

A total of 620 urine samples were collected in a clean, dry sterile plastic, screw-capped 20ml universal urine bottles. Samples were collected between 10:00Am and 2:00pm and were examined. The samples were transported to the laboratory department of Decency Amana Medical Laboratory karshi Abuja for analysis. Ten millilitre of urine were transferred aseptically into centrifuge tube and centrifuged for 5 minutes at 5000rpm, after discarding the supernatant the entire sediment was transferred to a slide covered with cover glass and systematically examined using the 10x objective with the condenser iris closed sufficiently to give good contrast for red blood cells, pus cells and eggs of *S. haematobium* seen counted and reported per 10ml of urine.

F. STATISTICAL ANALYSIS

Chi square test was used to determine the level of significant between age, gender, schools and sources of drinking water. P value <0.05 was considered significant at 95% confidence interval.

III. RESULT

This study showed that out of the 620 pupils tested the overall prevalence of urinary schistosomiasis was 5(0.8%). The distribution among the pupils based on gender showed that male had the highest prevalence of 3(0.5%) and female 2(0.3%), although there was no statistical significant difference between the gender (Table.1).

The distribution of urinary schistosomiasis in relation to age showed that high prevalence of 3(0.5%) was recorded among the age group 13-16 years followed by 9-12 years 2(0.3%) and 5-8 years had zero prevalence 0(0.0%). The result shows that there is no statistically significant relationship between the prevalence and age group (Table.2).

The distribution of urinary schistosomiasis in relation to schools, showed that Azhata had the highest prevalence of 2(0.3%), followed by Gidamangoro, Orozo and Karshi had 1(0.2%) each respectively and Karu and Jikwoyi recorded zero prevalence, there is no statistically significant relationship between the prevalence and school (Table.3).

Distribution of urinary schistosomiasis in relation to sources of drinking water by the pupils sampled. Those that used well water had the highest prevalence rate 3(0.5%), followed by sachets water 2(0.3%). Tap water and river/stream recorded zero prevalent rate (Table. 4).

Table.1. Distribution of urinary schistosomiasis prevalence in relation to Gender

S. No	Gender	No. Examined	No. Positive	Positive (%)
1	Male	264	3	0.5
2	Female	356	2	0.3
3	Total	620	5	0.8

P -value<0.05 was considered as significant. P -value =0.735

Table.2. Distribution of urinary schistosomiasis prevalence based on Age

S. No	Age	No. Examined	No. Positive	Positive (%)
1	5-8	70	0	0.0
2	9-12	448	2	2.0
3	13-16	102	3	0.5
4	Total	620	5	0.8

P -value<0.05 was considered as significant, P -value=0.076

Table.3. Distribution of urinary schistosomiasis prevalence in relation to school/location

S. No	Name of School /Location	No. Examined	No. Positive	Positive (%)
1	Karu	100	0	0
2	Jikwoyi	120	0	0
3	Azhata	90	2	0.3
4	Gidamangoro	80	1	0.2
5	Orozo	130	1	0.2
6	Karshi	100	1	0.2
7	Total	620	5	0.8

P -value<0.05 was considered as significant, P -value=0.649

Table.4. Distribution of prevalence according to source of drinking water

S. No	Source of Drinking Water	No. Examined	No. Positive	Positive (%)
1	Tap(Pipe borne)	20	0	0
2	Borehole	130	0	0
3	Well	80	3	0.5
4	Sachet water	390	2	0.3
5	Rivers/Stream	0	0	0
6	Total	620	5	0.8

P -value<0.05 was considered as significant. P -value=0.000

IV. DISCUSSION

The findings revealed that out of 620 pupils tested 5(0.8%) were positive for urinary schistosomiasis infection. The prevalence of 0.8% in this study was relatively lower than the 10.1% reported by Biyaya and Adebawale [12] among school children in Gwagwalada, Abuja, Nigeria, 32% reported by Hassan et al., [21] among school age children in Aliero, Kebbi State, North-Western Nigeria, 24.3% reported by Kehinde et al., [26] among primary school children in

Remo Ogun State, Nigeria, 53.8% reported by amaechi [8] among school age children in abia state south eastern nigeria, 19.3% reported by

Uweh et al., [45] among school children in Igedeland, Benue State., Also, 48% reported by Muhammad et al., [32] among primary school pupils in Wamakko, Sokoto State, 32.7% reported by Adekola et al., [2] among school aged children in Saki, Oyo, State, Nigeria. Also, lower compare to studies carried out in other African

countries, Deribew et al., [17] reported 24.54% in the Afar region of Ethiopia, Dabab and El-Bingawi [16] reported 16% in Sudan and Liao et al., [28] reported 5.3% in Swaziland. The difference could be explained as a result of difference in environmental factors that can in turn lead to difference in transmission.

The prevalence of urinary schistosomiasis infection with respect to gender was found high in male (0.5%) than the female (0.3%). However, there was no statistical significant difference between the sexes. This finding is consistent with the finding of Muhammad et al., [32], Uweh et al., [45], Amaechi, [8], Kehinde et al., [26], Mohammed et al., [31], Hassan et al., [21], Bashir et al., [10] which reported a high prevalence among males and no significant association between gender and schistosomiasis infection ($p > 0.05$). But in contrast with the finding of Nwibari et al., [35] and studies carried out in Ghana and Osun showed higher prevalence of urinary schistosomiasis among females than males also, Olajumoke et al., [39] recorded higher prevalence among females (60.3%) than males (54.1%) in children in endemic rural community in Nigeria.

In relation to age high prevalence of (0.5%) was recorded among age group of 13-16 years while those between 9-12 years had the least of (0.3%). This finding agreed with report of Hassan et al. [21], who reported age group 10-14 years in Alero Kebbi State, Mohammed et al., [31] reported 11-14 years in Kwukwalawa Sokoto State, North-Western Nigeria and Amaechi, [8] who reported 10-14 years in Abia State South Eastern Nigeria. Although, no statistical significant difference was observed between age group $p > 0.05$.

The distribution of urinary schistosomiasis in relation to schools, showed that Azhata had the highest prevalence of 2(0.3%), followed by Gidamangoro, Orozo and Karshi had 1(0.2%) each respectively and Karu and Jikwoyi recorded zero prevalence, there is no statistically significant relationship between the prevalence and school.

The distribution of urinary schistosomiasis in relation to sources of drinking water shows that high infection rate recorded on well 3(0.5%), followed sachet water 2(0.2%) as sources of drinking water. This is disagreed with Amaechi, [8], Ofoezie, ([37], [38]), and Nwachukwu et al., [34] who reported high prevalence from stream more than those who use well.

This agreed with Muhammed et al., [32] who reported high prevalence among pupils whose sources of drinking water is from well water. World health organization has advocated

provision of safe drinking water from borehole and tap water for a successful control of schistosomiasis [49].

The study shows no pupils used stream/river as the source of drinking water. This can be attributed to the low prevalence of urinary schistosomiasis among the pupils examined. Since the infection is acquired through contact with cercaria polluted water body.

ACKNOWLEDGEMENT

The Authors wish to acknowledge the permission and assistance of the management and staff of Decency Amana Medical Laboratory, Karshi, Abuja, Nigeria. We are grateful to the entire staff of Abuja Municipal area council education Authority, especially Head of Department schools service Mr. Ahmed Gwegua for the approval and Head Masters/Mistress and teachers of the various approved schools for the studies especially Karu, Jikwoyi, Azhata, Gidamangoro, Orozo and Karshi for mobilizing their pupils.

REFERENCES

- [1] Abdulkadir, A., Ahmed, M., Abubakar, B.M., Suleimana, I.E. et al. Prevalence of urinary schistosomiasis in Nigeria, 1994–2015: Systematic review and meta-analysis. *African Journal of Urology*, 2017, 23:228-239.
- [2] Adekola Saheed Salawu, Salawu Ore Asaolu and Oluyomi Abayomi Sowemimo. Co-infections with *Schistosoma haematobium* among school-age children in Saki, Oyo State, Nigeria. *Journal of Public Health and Epidemiology*, 2014, 6(12):417-423.
- [3] Adeyaba, O. A., and Ojeaga, S. G. T. Urinary schistosomiasis and concomitant urinary tract pathogen among school children in metropolitan Ibadan, Nigeria. *African Journal of Biomedical Research*, 2002, 5, 103–107.
- [4] Adulugba, C and Omudu, E.A. Epidemiological studies of Schistosomiasis in Agatu LGA, Benue State, Nigeria. *Nigerian Journal of Parasitology*, 2013, 34:12-18.
- [5] Akinboye, D.O., Ajisebutu, J. U., Fawole, O. M., Agbolade, O. M., Akinboye, D. O., Amosu, A. M. and Emem, O. Urinary schistosomiasis. Water contact frequency and infertility among secondary school students in Ibadan, Nigeria. *Nigerian Journal of Parasitology*, 2011. 32, 129–134.
- [6] Akinwale, O., Ajayi, M., Akande, D., Adeleke, M., Gyang, P., Adeneye, A., et al. Prevalence of *Schistosoma*

- haematobium infection in a neglected community, south western Nigeria. *International Journal of Health Research*, 2009, 2(2):148.
- [7] Akpan, S. S., Dike, P.C and Mbah, M. The Prevalence of Urinary Schistosomiasis among School Children in Nkarasi and Ekor Communities in Ikom Local Government Area of Cross River State, Nigeria. *Pyrex Journal of Medicine and Medical Sciences*, 2017, 4 (1) 1-4.
- [8] Amaechi, Ebube Charles. Urinary Schistosomiasis among school age children in some rural communities of Abia State, South Eastern Nigeria. *Animal Research International*, 2014, 11(2):1953-1957
- [9] Amuta, E.U. and Houmsou, R.S. Prevalence, intensity of infection and risk factors of urinary schistosomiasis in preschool and school aged children in Guma Local Government Area, Nigeria. *Asian Pacific Journal of Tropical Medicine*, 2014. 34-39.
- [10] Bashir, S.F., Usman, U., Sani, N.M. and Kawo, A.H. Prevalence of Schistosoma Haematobium among Population Aged 1- 25 Years Attending Rasheed Shekoni Specialist Hospital, Dutse, Jigawa State-Nigeria. *Journal of Pharmacy and Biological Sciences*, 2016 Volume 11, Issue 6 Ver. I. PP 20-24
- [11] Bello, A., Jimoh, O. A., Shiitu, S. B., and Hudu, S. A. Prevalence of urinary schistosomiasis and associated haemato-proteinuria in Wurko Rural Area of Sokoto State, Nigeria. *Orient Journal of Medicine*, 2014, 26(3-40), 114-121.
- [12] Biyaya, Beatrice Nwankwo, and Adebowe, Ernest Onifade .Prevalence and intensity of Urinary Schistosomiasis among school children of Anguwan dodo a semi-urban community in Gwagwalada, Abuja. *Journal of Microbiology and Biochemical Research*, 2019, 4(3):33.
- [13] Brouwer, K.C., Munatsi, A., Ndhlovu, P.D., Wagatsuma, Y. and Shiff, C.J. Urinary schistosomiasis in Zimbabwean school children: predictors of morbidity. *African Health Sciences*. 2004, 4(2): 115-118. 20. 58.
- [14] Casmir I.C. Ifeanyi, Benard M. Matur and Nkiruka F. Ikeneche. Urinary Schistosomiasis and Concomitant Bacteriuria in the Federal Capital Territory Abuja Nigeria. *New York Science Journal*. 2009, 2(2); 1-8.
- [15] Chitsulo, L. D., Engles, A; Montreson and Savioli, L. The global state of Schistosomiasis and its Control. *Acta Tropica*, 2000, 77: 41-51.
- [16] Dahab TO, El-Bingawi HM. Epidemiological survey: *Schistosoma haematobium* in schoolchildren of White Nile areas, Khartoum. Sudan Medical Journal. 2012; 48(2):1-6.
- [17] Deribew, K., Tekeste, Z. and Petros, B. Urinary schistosomiasis and malaria associated anemia in Ethiopia. *Asian Pacific Journal of Tropical Biomedicine*, 2013, 3(4):307-310. DOI: 10.1016/S2221- 1691(13)60068-4.
- [18] DeSilva, N.R., Brooker, S., Hotez, P.J., Montresor, A., Engels, D. and Savioli, L. Soil-transmitted helminthes infections: updating the global picture. *Trends Parasitology*, 2003, 19(12):547-551..
- [19] Gberikon, G.M., Aguru, C.U. and Yandev, D. Incidence of Schistosoma Haematobium and Trichomonas Vaginalis among Occupational status of Patients Attending some selected Hospitals in Gboko, Benue State of Nigeria. *International Journal of Sciences*. 2015, 4(06):38-43.
- [20] Goselle, N.O., Anegbe, D., Imande, G.N., Dakul, D.A., Onwuliri, C.O.E., Abba, O.J., Udeh, O.E. and Abela, A.M. *Schistosoma mansoni* infections amongst school children in Jos, Nigeria. *Science World Journal*, 2010, 5(1): 23-30.
- [21] Hassan, J., Mohammed, K., Opaluwa, S.A., Adamu, T., N. ataala, S.U., Garba, M.K., Bello, M., and Bunza, N.M. Diagnostic Potentials of Haematuria and Proteinuria in Urinary Schistosomiasis among School-Age Children in Aliero Local Government Area, Kebbi State, North-Western Nigeria. *Asian Journal of Research Medical and Pharmaceutical Sciences*. 2017, 2(4): 1-9.
- [22] Harp, D.F. and Chowdhury, I. Trichomoniasis: Evaluation to Execution. *European Journal of Obstetrics and Gynecology and Reproductive Biology*, 2011, 157 (1): 3-9. <http://dx.doi.org/10.1016/j.ejogrb.2011.02.024>
- [23] Herbert, O.K. Epidemiological study of schistosomiasis in Jos, South local government area, Plateau State. *The Nigerian Journal of Parasitology*, 2012, 13: 26-30.
- [24] Houmsou, R.S., Amuta, E.U., and Sar, T.T. Profile of an epidemiological study of urinary Schistosomiasis in two local government areas of Benue state, Nigeria. *International Journal of Biomedical Research*, 2012, 1(1):39-48.
- [25] Ishaleku, D., Yako, A.B., Usman, D., and Azamu,

- S.A.Schistosoma haematobium Infections among school children in Keffi Town, Nasarawa State, Nigeria. *Scholarly Journal of Medicine*, 2012, 2(7). 104-107
- [26] Kehinde, J., Amoo· Oladipupo A.J. Amoo., Adewale, A. Oke , and Tope, T. Adegboyega. Prevalence of Urinary Tract Infection (UTI) and Concomitant Urinary Schistosomiasis among Primary School Children in Remo North Local Government, Ogun State, Nigeria. *Journal of Dental and Medical Sciences (IOSR-JDMS)*, 2017, Volume 16, Issue 11 Ver. II (Nov. 2017), PP 68-73
- [27] Khalaf, Ismail., Shokeir, Ahmed., and Shalaby, Mohammed. Urologic complications of Genitourinary Schistosomiasis. *World Journal of Urology*, 2012, 30(1): 31-38.
- [28] Liao, C.W., Sukati, H., Nara, T., Tsubouchi, A., Chou, C.M., Jian, J.Y., and et al. Prevalence of *Schistosoma haematobium* infection among schoolchildren in remote areas devoid of sanitation in Northwestern Swaziland, Southern Africa. *Japanese Journal of Infectious Diseases*, 2011, 64(4): 322-326.
- [29] Mafiana, C.F., Ekpo, U.F. and Ojo, D.A. Urinary Schistosomiasis in Pre- school children in settlements around Oyan Reservoir in Ogun State, Nigeria: Implications for Control. *Tropical Medicine and International Health*, 2003, 8 (1): 78 – 82
- [30] Mbata, T., Orgi, M. and Oguoma, V. The prevalence of urinary schistosomiasis in Ogbadibo Local Government Area of Benue State, Nigeria. *Journal of Infectious Diseases*, 2009, 7(1): 3 – 7
- [31] Mohammed, K., Suwaiba, M., Spencer, T.H.I., Nataala, S.U., Ashcroft, O.F., Nuhu, A. and Asiya, U.I. Prevalence of Urinary Schistosomiasis among Primary School Children in Kwankwalawa Area, Sokoto State, North-Western Nigeria. *Asia Journal of Research in Medical and Pharmaceutical Sciences*, 2018, 3(1): 1-10.
- [32] Muhammad, Imrana. Arzika., Kabiru, Abdullahi., Aminu, Yabo. Bala. and Sa'adatu, Aliyu. Shinkafi. Prevalence of urinary schistosomiasis among primary school pupils in Wamakko Local Government, Sokoto State, Nigeria. *The Journal of Basic and Applied Zoology*, 2019, 80: 22
- [33] Nanvya, T.N., Dakul, D.A. and Mwansat, G.S. Schistosomiasis in Ndinjor District of Langtang North Local Government Area of Plateau State, Nigeria, *Nigerian Journal of Parasitology*, 2011, 32 (2): 209–213.
- [34] Nwachukwu, P. C., Ohaeri, C. C., Ukpai, O. M., Irole-Eze, O. P., and Amaechi, E. C. Prevalence of *Schistosoma haematobium* infection among school-aged children in Afikpo North Local Government Area, Ebonyi State, Nigeria. *Sri Lankan Journal Biology*, 2018, 3(2), 1–8..
- [35] Nwibari, A.M.W., Johnson, C.T., Yohanna, J.A. and Dakul D.A. (2016). Prevalence of Urinary Schistosomiasis Among Human Immuno- deficiency Virus
- [36] /s Patients Attending Faith Alive Medical Centre in Jos North, Plateau State, Nigeria. *International Journal of Biomedical and Health Science Vol. 12, No.1; 33.*
- [37] National Population Census (2015). Projected population, 2015–2020. Abuja: National Population Commission Office.
- [38] OFOEZIE, I. E. and OLADEJO, S. O. (2006). Unabated schistosomiasis transmission in Erinle River Dam, Osun State, Nigeria: evidence of neglect of environmental effects of developmental projects. *Tropical Medicine and International Health*, 11(6): 843 – 850.
- [39] Ofoezie, I.E., Bolton, P., Imevbore, A.M.A. and Christensen, N.O. (2013). Schistosomiasis and other helminth infections in Irrigation Schemes in Sokoto, Katsina and Kebbi States of Nigeria. *Nigerian Journal of Parasitology*, 17: 31-37.
- [40] Olajumoke M, Junaid Q, Claire O, et al. A cross-sectional study on urogenital schistosomiasis in children; haematuria and proteinuria as diagnostic indicators in an endemic rural area of Nigeria. *Africa Health Science*. 2014, 14,(2): 390–396.
- [41] Okechukwu, P.O. Bacteria in primary school children with urinary schistosomiasis in rural communities in Enugu State, Nigeria. *Bulletin of the World Health Organization*, 2012, 45(4): 494–695.
- [42] Olds, G.R. and Srinivasan, D. Schistosomiasis. *Current Treatment Options in Infectious Diseases*. 2000, 2: 88–99
- [43] Sama, M.T., Oyono, E. and Ratard, R.C. High risk behaviours and schistosomiasis infection in Kumba,

Southwest Province, Cameroon. *International Journal of Environmental Research and Public Health*, 2007, 4: 101-105.

- [44] Steinmann, P., Keiser, J., Bos, T., Tanner, M. and Utzinger, J. Schistosomiasis and water resources development: systematic review, meta-analysis, and estimates of people at risk. *Lancet Infectious Diseases*, 2006, 6: 411-425.
- [45] Sturrock, R. F. Schistosomiasis epidemiology and control: How did we get here and where should we go? *Memórias do Instituto Oswaldo Cruz*, (2001), 96 (suppl), 17–27.
- [46] Uweh, P.O., Omudu, E. A. and Onah, I. E. (2015). Current status of Schistosomiasis amongst school children in Igede land in Benue State Nigeria. *Journal of pure and applied sciences*, 2015, 5; 33.
- [47] Vennervald, Birgitte, Jyding. Epidemiology and mechanism of car-cinogenesis of schistosomiasis. *Tropical hemato-oncology*, Springer International Publisher: 2015, 9(10): 165-70.
- [48] World Health Organisation. (2013). Schistosomiasis: World Health Organization
- [49] World Health Organization. Research priorities for helminth infections: Technical report of the TDR disease reference group on helminthes infections. (Technical report series; no. 972), 2012, (pp. 60–62)
- [50] World Health Organization. Water-related diseases—schistosomiasis view at [www.who.int/water sanitation health/diseases/ schisto /en](http://www.who.int/water_sanitation_health/diseases/schisto/en). 2016.
- [51] World Health Organisation, Geneva. Schistosomiasis Fact Sheet. Retrieved from www.who.org/infections, 2015.
- [52] WHO. Schistosomiasis (online) Cited 5 February. Available at [http:](http://) , 2013.
- [53] WHO (2015): Tropical Disease Research Progress.