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EPIDEMIOLOGICAL STUDY OF *SCHISTOSOMIASIS* AND ITS ASSOCIATED RISK FACTORS AMONG PRIMARY SCHOOL PUPILS IN JIBIA LOCAL GOVERNMENT AREA OF KATSINA STATE, NIGERIA

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ABSTRACT

Schistosomiasis is a chronic disease that is linked to poverty. Contact with fresh water infested with parasitic blood fluke (*Schistosomes spp*.) larvae (cercariae) can result in infection. The study aimed to determine the prevalence of Schistosomiasis among Jibia Local Government Area primary school pupils. Questions about risk factors, human water contact behaviour, and sociodemographic data were distributed to 300 randomly chosen pupils. Both stool and urine samples were examined under a microscope using sedimentation techniques, and the Medi-Test Combi-9 test strip was used for chemical analysis. *S. intercalatum* was present in just 1 out of 300 cases (0.3%) while *S. haematobium* in 83 cases (27.7%), haematuria in 85 cases (28.3%), and proteinuria in 33. Yet, Muhammad Rabiu Model Primary School has a much higher prevalence of *S. hematobium* 37 (44.6%) and just one *S. intercalatum* than Tukare Primary School, which has 20 (20.1%) *S. hematobium* and zero S. intercalatum, respectively, when compared to other schools. The school's closeness to a water body (Jibia Dam) may be the cause of this. Infection rates do not significantly differ by age group (P = <0.001) or gender (P = 5.621). However, compared to pupils without formal education, children whose parents are uneducated have an Odd Ratio (OR) of 36.7 higher infection rates (P = 0.01). In conclusion, the study area is endemic for *S. haematobium*, and in addition to personal hygiene, molecular detection of *S. intercalatum* is recommended.

Keywords: Jibia, Poverty, Water body, *Schistosoma haematobium, Schistosoma intercalatum,* Incidence, Pupils, Distribution

INTRODUCTION

Schistosomiasis is a poverty-related illness that causes long-term illness (Schuster *et al*., 2022). Contact with fresh water contaminated with parasitic blood fluke larvae (cercariae), also known as *Schistosomes*, can result in infection (Haseeb and Fried, 2024). The veins that drain the intestines and urinary system are home to the microscopic adult worms. Most of their eggs are stuck in the tissues, and the body's response to them can be quite harmful (WHO, 2023). Nevertheless, in addition to prophylactic chemotherapy, individual investigations using artemisinin or albendazole, as well as mass drug administration with praziquantel, have been documented in 11 of the 36 states, with cure rates ranging from 51.1% to 100%.

Schistosoma mansoni, Schistosoma japonicum, Schistosoma haematobium, Schistosoma intercalatum, and *Schistosoma mekongi* are the five species of *Schistosomes* that cause human schistosomiasis; the first three species are the most important from a clinical and socioeconomic standpoint. Except *S. haematobium*, which lives in the venous plexuses of the bladder and causes urogenital schistosomiasis, which has many complications, including bladder cancer, four of the five species cause intestinal schistosomiasis, in which the parasitic worms live in the mesenteric veins (WHO, 2023). And the study aimed to determine the prevalence of Schistosomiasis among Jibia Local Government Area primary school pupils.

The majority of African nations, including Kenya, Ethiopia, Egypt, and Nigeria, are affected by schistosomiasis (Muhsin *et al*., 2022). The widespread distribution of *Schistosoma spp*. has been the primary cause of the high prevalence of Schistosomiasis in Nigeria (Ojo *et al*., 2021). The high prevalence of schistosomiasis in developing nations like Nigeria is also explained by several variables, such as inadequate sanitation, poverty, ignorance, and restricted access to social amenities and medical services (Oyebamiji, 2023). Nigeria has the biggest schistosomiasis burden in the world, with 20 million individuals affected, primarily with *Schistosoma haematobium*. The distribution, prevalence, diagnosis, prevention, conventional therapies, and snail control methods of human schistosomiasis in Nigeria are reviewed (Ojo *et al*., 2021).

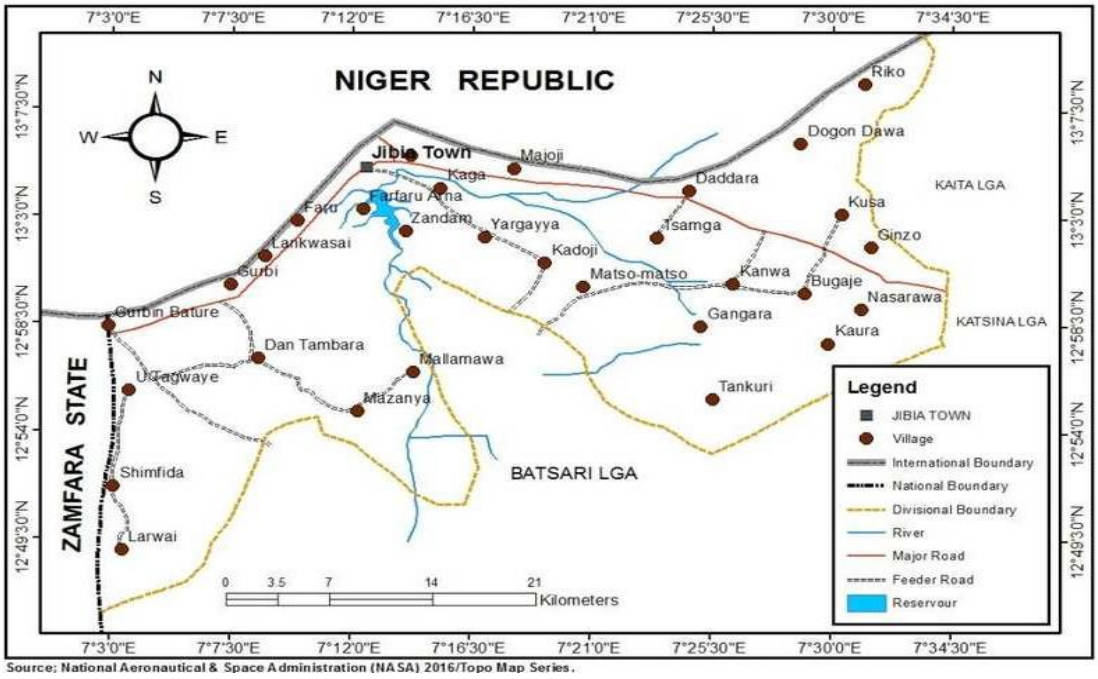
Its justify that, much has not been done in the study area as such, this research will help to highlight the problem of Schistosomiasis and also serve as literature for future studies. Poverty, poor health education, insufficient sanitation and lack of public awareness will probably result to high incidence of schistosomiasis in the study area. The effects of schistosomiasis on the productivity and intellectual performance of pupils in the study area is extremely high

MATERIALS AND METHODS

Study Area

Jibia Local Government Area lies approximately between latitudes 12°56' to 13°06' north of the equator and longitude 7°17'0'' to 7°45'20'' east of the Greenwich Meridian. The Local Government Area is one of the Thirty-four LGAs in Katsina State, which was created on May 1989 from the defunct Katsina LGA. Jibia LGA occupies a total land area of 1,032km^2 or 400 square miles in the most extreme north-western part of Katsina State. To the north, the LGA shares international boundary with Maradi State in Niger Republic, to the west with Zurmi LGA of Zamfara State, to the South Batsari LGA, to the east by Batagarawa, Katsina and Kaita LGAs of Katsina State. Jibia LGA is one of the six LGA that share international boundary with Niger Republic and the only LGA sharing international boundary among the eight most affected LGAs by banditry.

According to the 2006 census results released by the National Population Commission, the LGA has a total population of 210897 (Abdullahi, 2024).



Source; National Aeronautical & Space Administration (NASA) 2016/Topo Map Series.

Figure 1: Map of Jibia Local Government Area

Sample Size

For this study, 600 samples (300 urine and 300 stool) were calculated using Fisher's sample size method.

$$N = \frac{Z^2 P(1-P)}{d^2}$$

Ethical Approval and Informed Consent

The research ethics committee of the Katsina State Ministry of Health granted ethical authority to conduct this study (MOH/ADM/SUB/1152/1/917). Additionally, permission was obtained from the Ministry of Education in Katsina State. Parents and guardians of the sampled pupils, as well as the parent-teacher associations (PTAs) of the various individual schools, received the informed consent form and signed prior the sample collections.

Sampling Techniques

Systematic sampling techniques was used to select the participating pupils and all other pupils have an equal chance to participate.

Schools Sampling

Homogeneous sampling method was used to select the participated schools close to water bodies Collection and Processing of Samples

Age, gender, and other sociodemographic data were gathered from the completed questionnaires. Three hundred urine and three hundred faecal samples were taken from pupils in the selected schools who were between the ages of five and thirteen. Two clean, labelled, screw-capped plastic containers with a wide mouth were given to the selected pupils. One container had an applicator attached for stool samples, and the other carried instructions to deposit urine midstream. To maintain the eggs' viability, the samples were delivered to the lab within two hours of collection and to ensure optimal egg passage (Hamlili *et al*., 2021).

Haematuria and Proteinuria Test

Fresh urine samples were tested for the presence of blood (hematuria) and protein (proteinuria) using the reagent strip method (Medi-test Combi-9 Macherey Negel D -5348 Duren, U.S.A.). The analysis was done before the urine was stored to prevent changing its chemical makeup. After the medi-test combi-9 test strip was completely stripped (submerged) in a fresh urine bottle with the urine sample for about a minute, the excess urine was removed. The test strip was placed on a clean, dry surface and its colors were compared to the reference chart on the strip container after a minute. Protein and blood levels were measured and recorded.

Parasitological Examination of Urine Sample

Ten milliliters of urine were taken out, put in a centrifuge tube, and then centrifuged for four minutes at 4,000 rpm. One drop of the sediment was placed on the microscope slide, covered with a cover slip, and viewed at x10 and x40 magnification after the supernatant was disposed of. The eggs with terminal spines marked positive for *S. haematobium* infection, they were counted and saved for molecular identification (Deribew *et al*., 2022).

Parasitological Examination of Stool Samples

One gram of fresh stool and ten milliliters of saline were put in a container and shaken briskly. The stool suspension was strained through gauze and put in a centrifuge tube to remove large particles. Without disturbing the sediment, the supernatant was carefully drained away. After adding a formalin-ether solution, the tube was centrifuged at 4000 rpm for four minutes. A glass slide with a drop of sediment on it was covered with a coverslip and examined under a microscope at 10x and 40x magnification. The Atlas of Medical Helminthology and Medical Parasitology were used to determine that the lateral-spine eggs were marked as positive for *S. intercalatum* (Tabios *et al*., 2022).

Data Analysis

The data was analyse using the SPSS software, version 22.0 . Microsoft Excel was used for data exploration and cleaning. The prevalence was determined using prevalence formula. Logistic regression was also used to predict the relationship between schistosomiasis and its associated risk factors.

RESULTS AND DISCUSSION

Haematuria and Proteinuria among the Selected Pupils in Jibia Local Government Area

Table 1 revealed that among the pupils of the Jibia Local Government, Muhammadu Rabi'u Model Primary School Rimi (MRPSJ) reported the highest incidence of haematuria (blood in urine) infections, with 37 positives out of 100 examined, reflecting an approximate 43.5 infection of all positive findings in Jibia. Among the 100 pupils tested for haematuri, 26 from Pilot Primary School Jibia (PPSJ) were positive, which makes a total of 30.6% in that area. Conversely, the least haematuria is 22 pupils from Tukare Primary School Jibia (TPSJ) were infected which corresponds to 25.9% of all pupils tested across the Local Government. Furthermore, 85(28.3%) out the pupils tested for haematuria are positives in Jibia Local Government. Tukare Primary School Jibia (TPSJ) had the least proteinuria (presence of protein in urine) with 6(18.2) while Muhammadu Rabi'u Model Primary School Rimi (MRPSJ) had the highest rate of proteinuria 18 out 100 samples tested which shows the percentage of the infection in the entire area as 54.4% and the overall proteinuria in the Local Government are 33(11%) out of 300 pupils participated in the research.

Table 1: Hematuria and Proteinuria among the Selected Pupils in Jibia Local Government Area

SN	Schools	Number of Urine Screened for Hematuria (Positive)	Percentage of the Haematuria (%)	Number of Urine Screened for Proteinuria (Positive)	Percentage of the Proteinuria (%)
1	PPSJ	100(26)	30.6	100(18)	54.5
2	MRMPSJ	100(37)	43.5	100(9)	27.3
3	TPSJ	100(22)	25.9	100(6)	18.2
4	Total	300(85)	28.3	300(33)	11

Prevalence of Schistosomiasis in Jibia Local Government

From Table 2 it shows that two species of Schistosomes that have been examined in three primary schools selected from Jibia Local Government are *Schistosoma hematobium* and *Schistosoma intercalatum*. The rate of infections in terms of *Schistosoma haematobium* are found in Muhammad Rabiu Model Primary School Jibia (MRMPSJ) with 37 out of 100 selected pupils which make 44.6% of the total infections in the area. Pilot Primary School Jibia (PPSJ) had also 26 positives out 100 (31.3% in the positive result at Jibia). The least prevalence among schools sampled in Jibia Local Government was Tukare Primary School Jibia with 20 pupils infected out of 100 tested in the school (20.1% of the entire positives in Jibia). Moreover, overall prevalence in the Local Government is 83 out of the total tested pupils in area (300), which defined to be 27.7% prevalence in the area.

Table 2: Prevalence Schistosomiasis in Jibia Local Government

SN	Schools	No. of Samples Screened for *S. hematobium* (positive)	Infection of *S. hematobium* (%)	No. of Samples Screened for *S.intaclatum* (positive)	Infection of *S.intaclatum* (%)
1	PPSJ	100(26)	31.3	100(0)	0
2	MRMPSJ	100(37)	44.6	100(1)	100
3	TPSJ	100(20)	20.1	100(0)	0
4	Total	300(83)	27.7	300(1)	0.3

In contrast to *Schistosoma intercalatum* only one pupils are infected in the whole Local Government among the tested pupils, making it only 0.3% infections in Jibia Local Government which also implies that the *Schistosoma intercalatum* is very rear in the selected area and among the participated group.

Prevalence of *Schistosoma haematobium* in Relation to Respondents on Clinical Sign and Symptoms among the Pupils in Jibia Local Government

Table 3 shows that out of 176 pupils respondent with hematuria 50(60.2%) are positive with schistosomiasis with Odd Ratio(OR) of 15, which statistically shows the rate of infection is 15 times higher than those that had no hematuria. The results of the urinary schistosomiasis infection from Jibia Local Government in relation to clinical symptoms responded by the participants also indicated that there is strong predictor between *Schistosoma haematobium* and dysuria, with 48 out of 182 pupils who reported having dysuria testing positive (58%) and 120 not reporting it and 35 testing positive (42%) with OR = 10. The clinical symptoms of respondents in Jibia Local Government who have a haematuria infection are 10 times more likely to have the infection than those who do not.

Table 3: Prevalence of *Schistosoma haematobium* in Relation to Respond on Clinical Sign and Symptoms among the Pupils in Jibia Local Government

SN	Clinical Sign and Symptoms	Number of Samples Screened (Positive)	Percentage of Positives (%)	Odd Ratio
1	Do you experience Hematuria?			
	Yes	176(50)	60.2	15
	No	124(33)	39.8	
2	Do you experience Dysuria?			
	Yes	182(48)	58	10
	No	118(35)	42	
3	Do you experience Nocturia?			
	Yes	199(54)	65	7
	No	101(29)	35	
4	Do you experience Abdominal Pain?			
	Yes	190(51)	61.4	8
	No	110(32)	38.6	

Odds Ratios >1 indicate a strong relationship between symptoms and infection, but the magnitude varies

There is a significant prediction between nocturia and urinary schistosomiasis, as evidenced by the fact that 199 respondents with nocturia had 54 tested positive (65%) and 101 respondents without nocturia had 29 positives (35%). This indicates that the risk of urinary schistosomiasis is 7 times higher for those with nocturia than for those without. Of the respondents who reported abdominal pain, 190 reported 51 positives (61.4%) and 129 did not report any abdominal pain, with OR = 5.

Prevalence of *Schistosoma haematobium* in Relation to Demographical Response of the Pupils in Jibia Local Government

The demographical information of the respondents obtained in Table 4, males are more affected 51(61.4%) with *Schistosoma haematobium* than females 32(38.6%) which shows that, statistically, *Schistosoma haematobium* infections are not determined by gender (OR= 0.98), so as ages of the respondents (OR= 1.66). However, those pupils whose parents have formal education are more likely to be free from *Schistosoma haematobium* with 37(68.5%) infections than those whose parents have no formal education with 17(31.5%) even though statistically parent formal education can play a role in the transmission of urinary schistosomiasis with Odd Ration 36.70 and P= 0.01

Table 4: Prevalence of *Schistosoma haematobium* in Relation to Demographical Response of the Pupils in Jibia Local Government

SN	Demographical Characteristics of the Respondents	Number of Samples Screened (Positive)	Percentage of Positives (%)	Odd Ratio	P. Value
1	Gender				
	Male	150(51)	61.4	0.98	5.67
	Female	150(32)	38.6		
2	Age (Years)				
	5-7Years	100(19)	22.9	1.66	<0.001
	8-10Years	101(32)	38.6		
	11-13Years	100(32)	38.6		
3	Parent Formal Education?				
	Yes	113(24)	28.9	36.70	0.01
	No	187(59)	71.1		

Discussion

In Jibia Local Government, 85 out of 300 pupils (28.3%) had positive which consistent with new research from Nigeria (Ezechukwu, 2019). There is a considerable burden of these urine abnormalities in the area, as evidenced by a study conducted in Abuja that found that among healthy elementary school pupils, the prevalence of haematuria was 10.6% and that of proteinuria was 7.0% (Ezechukwu, 2019). Similarly, research in Enugu found that 19% of primary school children exhibited urinary abnormalities, including isolated proteinuria and hematuria, with a higher prevalence among females and early adolescents aged 9 to 12 years (Anigilaje *et al.*, 2023) However, a significant degree of endemicity was indicated by the overall incidence of *S. haematobium* in Jibia Local Government, which was 27.7% (83/300). The World Health Organization (WHO) states that periodic mass drug administration (MDA) with praziquantel is necessary to limit transmission when the prevalence is higher than 10% (WHO, 2022). This prevalence is consistent with studies from other parts of Nigeria where Schistosomiasis is widespread, and similar rates of *S. haematobium* infections in schoolchildren have been documented (Nwosu *et al*., 2020).

Furthermore, a major factor in the spread of schistosomiasis is human water contact behavior. *S. intercalatum* low incidence could be a sign of little exposure to tainted water sources that harbor the parasite. On the other hand, because of its effective transmission cycle and wider ecological adaptability, *S. haematobium* is more common in Nigeria and West Africa (Onyekwere, 2022).

The results are consistent with other research demonstrating that *Schistosoma mansoni* and *S. haematobium* are more prevalent in Nigeria than *S. intercalatum* (Mogaji *et al*., 2023). This trend is supported by the fact that *S. intercalatum* is rare in Jibia, suggesting that the spread of the disease is not a major public health issue there. These findings also highlight how clinical signs, particularly haematuria and dysuria, can be used to predict schistosomiasis infection. Targeted interventions, including mass drug administration (MDA) with praziquantel, better water cleanliness, and health education are essential in reducing transmission because of the high disease burden (Chanhanga *et al*., 2023).

The results also show that among pupils in Jibia Local Government, there are noteworthy correlations between urinary schistosomiasis infection and important clinical symptoms. Apart from haematuria and dysuria, nocturia was found to be a powerful indicator of schistosomiasis. Only 29 (35%) of the 101 respondents without nocturia tested positive, compared to 54 (65%) of the 199 respondents who did. Urinary schistosomiasis is seven times more common in people who experience nocturia than in people who do not, according to the odds ratio (OR = 7). These findings are consistent with other research linking nocturnal urination to inflammation and irritation of the bladder brought on by *Schistosoma haematobium* egg deposition (Costain, 2023). These findings also support the high predictive value of several clinical symptoms—dysuria, nocturia, hematuria, and abdominal pain in the examination of schistosomiasis (Gerstenberg, 2024).

CONCLUSION

Due to the high prevalence of urinary schistosomiasis among school-age children in Jibia, targeted management strategies are necessary. Health officials should prioritize school-based deworming programs, promote behavioral changes, and expand access to clean water in order to decrease contact with contaminated water sources. In the absence of these treatments, schistosomiasis may result in chronic complications such as kidney damage, bladder fibrosis, and heightened vulnerability to other infections.

RECOMMENDATIONS

Ongoing illness surveillance, targeted praziquantel therapy, comprehensive health education, improved water sources, expanded research to include out-of-school children exposed to water bodies, and treatment of affected pupils are all essential strategies to reduce disease burden, enhance understanding of risk factors, and improve the cognitive

development and quality of life of pupils in affected communities.

REFERENCES

Abdullahi, S. (2024). Physiochemical Soil Properties assessment for sustainable agriculture in Katsina North Senatorial Zone Katsina State, Nigeria

Adenowo, A. F., *et al*. (2015). *Impact of human schistosomiasis in sub-Saharan Africa*. Infectious Diseases of Poverty, 4(1), 1-12.

Akinwale, O.P., *et al*. (2010). "Prevalence of Urinary Schistosomiasis in Nigeria: A Review." *African Journal of Health Sciences*, 17(1-2), 23-30.

Anigilaje, E. A., & Elike, C. M. (2023). Childhood acute post-infectious glomerulonephritis: a study of clinical profile and outcomes at the University of Abuja Teaching Hospital, Abuja, Nigeria, 2016 to 2021. *Tropical Journal of Nephrology*, *17*(1), 7-19.

Chanhanga, N., Mindu, T., Mogaka, J., & Chimbari, M. (2023). The impact of targeted treatment and mass drug administration delivery strategies on the prevalence and intensity of schistosomiasis in school aged children in Africa: a systematic review. *Infection and Drug Resistance*, 2453-2466.

Costain, A. H. (2021). *Exploring host-immune-microbial interactions during intestinal schistosomiasis* (Doctoral dissertation, The University of Manchester (United Kingdom)).

Deribew, K., Yewhalaw, D., Erko, B. and Mekonnen, Z. (2022). Urogenital schistosomiasis prevalence and diagnostic performance of urine filtration and urinalysis reagent strip in schoolchildren, Ethiopia. *PLoS One*, *17*(7), e0271569.

Ezechukwu, C. (2019). Abstracts of Proceedings: 50th Annual General and Scientific Conference of the Paediatrics Association of Nigeria (PANCONF), 24th-26th January, 2019. *Nigerian Journal of Paediatrics*, *46*(2), 73-121.

Gerstenberg, J. M. (2024). *Safety and efficacy of praziquantel in pregnant women infected with schistosoma haematobium in Lambaréné, Gabon* (Doctoral dissertation, Universität Tübingen).

Hamlili, F. Z., Thiam, F., Laroche, M., Diarra, A. Z., Doucouré, S., Gaye, P. M. and Parola, P. (2021). MALDI-TOF mass spectrometry for the identification of freshwater snails from Senegal, including intermediate hosts of schistosomes. *PLoS neglected tropical diseases*, *15*(9), e0009725.

Haseeb, M. A. and Fried, B. (2024). Modes of transmission of trematode infections and their control. In *Advances in trematode biology* (pp. 31-56). CRC Press.

Mogaji, H. O., Omitola, O. O., Bayegun, A. A., Ekpo, U. F., & Taylor-Robinson, A. W. (2023). Livestock reservoir hosts: an obscured threat to control of human schistosomiasis in Nigeria. *Zoonotic Diseases*, *3*(1), 52-67.

Muhsin, M. A., Wang, X., Kabole, F. M., Zilabumba, J. and Yang, K. (2022). The indispensability of snail control for accelerating schistosomiasis elimination: evidence from Zanzibar. *Tropical Medicine and Infectious Disease*, *7*(11), 347.

Nwosu, A.B., *et al*. (2020). "Prevalence and Risk Factors of Urinary Schistosomiasis in Rural Nigerian Communities." *Parasites & Vectors*, 13(1), 78.

Ojo, J. A., Adedokun, S. A., Akindele, A. A., Olorunfemi, A. B., Otutu, O. A., Ojurongbe, T. A. and Ojurongbe, O. (2021). Prevalence of urogenital and intestinal schistosomiasis among school children in South-west Nigeria. *PLoS neglected tropical diseases*, *15*(7), e0009628.

Onyekwere, A. (2022). *Population genetic structure and hybridization of urogenital schistosomiasis among primary school-age pupils in Nigeria* (Doctoral dissertation, Université de Perpignan).

Oyebamiji, D. A. (2023). *Environmental Factors and Cultural Practices Influencing the Epidemiology of Soil Transmitted Helminths in Ibadan, Nigeria* (Doctoral dissertation).

Schuster, A., Randrianasolo, B. S., Rabozakandraina, O. O., Ramarokoto, C. E., Brønnum, D.and Feldmeier, H. (2022). Knowledge, experiences, and practices of women affected by female genital schistosomiasis in rural Madagascar: A qualitative study on disease perception, health impairment and social impact. *PLOS Neglected Tropical Diseases*, *16*(11), e0010901.

Tabios, I. K. B., Sato, M. O., Tantengco, O. A. G., Fornillos, R. J. C., Kirinoki, M., Sato, M. and Leonardo, L. R. (2022). Diagnostic performance of parasitological, immunological, molecular, and Ultrasonographic tests in diagnosing intestinal schistosomiasis in fieldworkers from endemic municipalities in the Philippines. *Frontiers in immunology*, *13*, 899311.

World Health Organisation (WHO). *Schistosomiasis: Key Facts and Prevention Strategies*. Geneva: WHO Press (2022).

World Health Organization (WHO). (2022). *Schistosomiasis fact sheet*. Retrieved from WHO website.

World Health Organization. (2023). *WHO guideline on control and elimination of human schistosomiasis*. World Health Organization.