African Journal of Biology and Medical Research
ISSN: 2689-534X
Volume 7, Issue 3, 2024 (pp. 119-128)
www.abjournals.org

INTESTINAL PROTOZOA AND *SCHISTOSOMA MANSONI* (SAMBON 1907) INFECTIONS AMONG SOME PUPILS IN AKKO LOCAL GOVERNMENT AREA OF GOMBE STATE, NIGERIA

M. S. Twan

Department of Biological Science, Federal University Wukari.

Email: kantomamatthew@gmail.com; Tel.: 07038353921

Cite this article:

M. S. Twan (2024), Intestinal Protozoa and Schistosoma Mansoni (Sambon 1907) Infections Among Some Pupils in Akko Local Government Area of Gombe State, Nigeria. African Journal of Biology and Medical Research 7(3), 119-128. DOI: 10.52589/AJBMR-IKSHDPNI

Manuscript History

Received: 11 Jun 2024

Accepted: 13 Aug 2024

Published: 2 Sep 2024

ABSTRACT: *The prevalence of intestinal protozoa and Schistosoma mansoni infections among primary school pupils in Akko Local Government Area of Gombe State, Nigeria was investigated. Stool samples were collected from 450 pupils aged 5–13 years in the three (3) districts of Akko Local Government Area. A structured questionnaire was used to collect relevant demographic and risk factor data associated with intestinal protozoa and S. mansoni infections. The stool samples were processed using the formol-ether concentration technique and microscopically examined for protozoan cysts and S. mansoni eggs; 12.4 % of the stool samples were positive for cysts and eggs. The prevalence of intestinal protozoa were: Entamoeba histolytica (4.9 %), Entamoeba coli (3.8 %) and Balantidium coli (2 %); Schistosoma mansoni eggs had a prevalence of 1.6 %. The prevalence of infection with protozoa and S. mansoni infections in individual schools was not uniform despite the similarity in the local topography and weather conditions. Source of drinking water and type of toilet used significantly associated with infection by intestinal protozoa and S. mansoni (Odd's Ratio value for Pit-latrine was 18.959). The prevalence of intestinal protozoa and Schistosoma mansoni infections among the primary school pupils was associated with poor personal hygiene habits at home and in school, and improper disposal of human and animal waste as implied by the responses to the questionnaire. It is therefore recommended that a concerted health education effort is necessary in order to curb the infections within the schools and the communities.*

KEYWORDS: *Schistosoma mansoni*, Schistosomiasis, Risk factors, Intestinal Protozoa, Prevalence, Kumo, Infection.

Article DOI: 10.52589/AJBMR-IKSHDPNI
DOI URL: https://doi.org/10.52589/AJBMR-IKSHDPNI

African Journal of Biology and Medical Research
ISSN: 2689-534X
Volume 7, Issue 3, 2024 (pp. 119-128)

www.abjournals.org

INTRODUCTION

Infections by intestinal parasites are of major public health importance worldwide, especially among children in developing countries. Approximately 3.5 billion people are infected by intestinal parasites and about 450 million children are ill due to these infections (WHO, 2000; Warunee *et al*., 2007). Infection with intestinal parasites may have important health consequences and are known to cause iron deficiency anemia, growth retardation in children and other physical problems (Scolari *et al*., 2000; Nasiri *et al*., 2009). Intestinal parasitic infections are linked to lack of sanitation, lack of access to safe water and poor hygiene and are therefore linked to poverty (Alhassan *et al*., 2013).

Protozoan parasites contribute immensely to the burden of intestinal parasitic infections among children (Harhay *et al*., 2010; Hotez *et al*., 2009). Poor hygiene coupled with children's voracious eating habits particularly puts them at greater risk of acquiring these infections (Schunk *et al*., 2001; Mohammed *et al*., 2015). Transmission is faeco-orally and most infections tend to be asymptomatic, but in a few cases, common symptoms include vomiting, abdominal discomfort and dysentery (Schunk *et al*., 2001). The consequences of intestinal parasites among children in particular include malnutrition, poor physical and mental development coupled with cognitive and behavioral deficiencies (Balci *et al*., 2009).

Intestinal schistosomiasis caused by *Schistosoma mansoni* is a serious public health problem in tropical and subtropical parts of the world (WHO, 1993). It is ranked next to malaria with respect to its impact on public health and socio-economic development in developing countries including those in Africa (WHO, 1993; Olveda *et al*., 2013). Factors contributing to the occurrence of *S. mansoni* infection include poor socioeconomic status, change in climate, human water contact behavior and ecological changes related to water resource development projects (WHO, 2004). Epidemiological investigations conducted in some communities in Nigeria have revealed that prevalence of intestinal protozoan and *S. mansoni* infestations ranges between 0.1-89.0% (Ekundayo *et al*., 2007). Globally, interventions are being put in place to control the morbidity and mortality due to these infections (WHO, 2006; Alum *et al*., 2010; Tengku *et al*., 2011). Some of these interventions target school age children in the context of school-based health intervention (Ekundayo *et al*., 2007). It is believed that school age children form the majority of the risk population and are therefore capable of maintaining the transmission of the infection in the community, particularly among their peers (WHO, 2006; Matthys *et al*., 2011; Speich *et al*., 2013). Knowing the prevalence and the associated risk factors in such a group will be critical to formulating policy interventions. The focus of this study was to investigate the prevalence of intestinal protozoan and *S. mansoni* infections among some primary school children in Akko local Government of Gombe State, Nigeria.

Article DOI: 10.52589/AJBMR-IKSHDPNI
DOI URL: https://doi.org/10.52589/AJBMR-IKSHDPNI

African Journal of Biology and Medical Research
ISSN: 2689-534X
Volume 7, Issue 3, 2024 (pp. 119-128)

www.abjournals.org

MATERIALS AND METHODS

Study Area

Stool samples used for the study were collected from Akko local Government Area (LGA) of Gombe State, in northeastern Nigeria. Akko LGA is one of the eleven (11) LGAs of Gombe State, which has its headquarters in the town of Kumo on the A345 highway south of the State Capital Gombe. Akko town for which the LGA is named, is located west of Gombe at10°17′N and 10°58′E. The LGA has an area of 2,627 km² and a population of 337,853 during the 2006 census. The inhabitants of Akko LGA are generally traders, farmers, tailors, cattle rearers, and civil servants. The sources of drinking water for household use are wells, streams and bore-holes.

Study Population

The study population included 450 male and female pupils aged 5-13 years, from six primary schools. The parents of the pupils in the selected schools were also included in the survey. The primary schools include: Central Primary School and All Saints Primary School, Kumo; Asas Primary School and Central Primary School, Kashere; Central Science Primary School, Bogo and Standard Academy Primary School, Tunfure.

Stool sample collection and microscopic examination

After obtaining ethical clearance and written consent, children who volunteered to participate in the study were given orientation on how to handle and submit their stool samples. Thereafter, pupils were given a sample bottle and an applicator stick for collecting their fresh stool samples (WHO, 2000). Stool samples were analyzed using formal ether concentration techniques described by Allen and Ridley (1970) and modified by Fayer and Xio (2008) was used to concentrate parasite cysts and eggs.

Data analysis

Prevalences of intestinal protozoa and *Schistosoma mansoni* were calculated and expressed as percentages with respect to school. Odd's Ratio (OR) was used to determine the level of association between risk factors and infection. Significance was determined at $P< 0.05$ at 95% confidence interval (C.I).

RESULTS

Pupils who provided consent and stool specimens were included in the study from the three districts of Akko LGA of Gombe state. Out of the total of 450 stool samples of school children examined in this study, 55 (12.2%) were positive for intestinal protozoa and *Schistosoma mansoni* infections (Table 1). The age group 8-10 years had the highest prevalence of infections. There were significant differences in prevalence of infections in the age groups ($P<0.05$). The age group 5-7 was more infected with *E. histolitical* (2.7 %) than the other age

Figure 2.1: eas; *S. mansoni* infection in the various age groups as also shown in table 1, appear to be more infested in age group 8-10 than the others groups in all the districts sampled. There were no significant differences ($P>0.05$) in the prevalence of infection with the protozoan parasite cysts (*E. histolytica, E. coli* and *B. coli*), among the three districts but there was a

Article DOI: 10.52589/AJBMR-IKSHDPNI
DOI URL: https://doi.org/10.52589/AJBMR-IKSHDPNI

African Journal of Biology and Medical Research
ISSN: 2689-534X
Volume 7, Issue 3, 2024 (pp. 119-128)
www.abjournals.org

significant difference (P<0.05) in the prevalence of *S. mansoni* infection among the districts. Figure 1 showed that there were more infections of protozoan parasites than the S. mansoni. The predominantly identified parasite species among the children were *E. histolitical* (4.9%) followed by *E. coli* (3.8%), *B. coli* (2%) and *S. mansoni* (1.6%). Pindiga district was more infected with *E. histolitical* and *E. coli* than the other two districts Kumo and Gona districts. Kumo districts had the highest with *S. mansoni* (0.8%) and *B. coli* (0.8%). There were no significant differences in prevalence of infection in all the districts (P>0.05).

The responses elicited by the questionnaire, and the statistical analysis showed an association between some risk factors with the epidemiological variables and the infections. The prevalence of infection with respect to source of water were 23.3%; 16.9%; and 9.0% for Stream, Well and Borehole respectively; the differences were statistically significant (P<0.05). An Odd's Ratio value of 2.522 was obtained for respondents that used Stream or Rivers water showed a strong association between water source and the infections. Among the 102 pupils that swam, 26.5% had intestinal protozoa and *S. mansoni* infections; an Odd's Ratio value of 3.96 showed a statistically significant association between water contact activities and the infections. Also there was a significant relationship between walking barefoot and the infections; the Odd's Ratio value obtained was 2.941 for walking barefoot occasionally. There was a highly significant relationship between the type of toilet used and prevalence of infections; Odd's Ratio of 18.959 was obtained for the use of pit-latrine. Non-washing of hands had a significant association with infection in all the districts. An Odd's Ratio value of 2.488 of washing hands without soap showed a relationship between non-washing of hands and infections (Table 2).

Table 1: Infection of Pupils with Protozoan Cysts According to Age

AGE	*E. histolytica*	*E. coli*	*B.coli*	*S. mansoni*	Total positive	χ^2	df	p-value
5-7	12	7	3	0	22	6.83	6	0.031
8-10	7	7	4	5	23			
11-13	3	3	2	2	10			
Total	22	17	9	7	55			

Article DOI: 10.52589/AJBMR-IKSHDPNI
DOI URL: https://doi.org/10.52589/AJBMR-IKSHDPNI

African Journal of Biology and Medical Research
ISSN: 2689-534X
Volume 7, Issue 3, 2024 (pp. 119-128)
www.abjournals.org

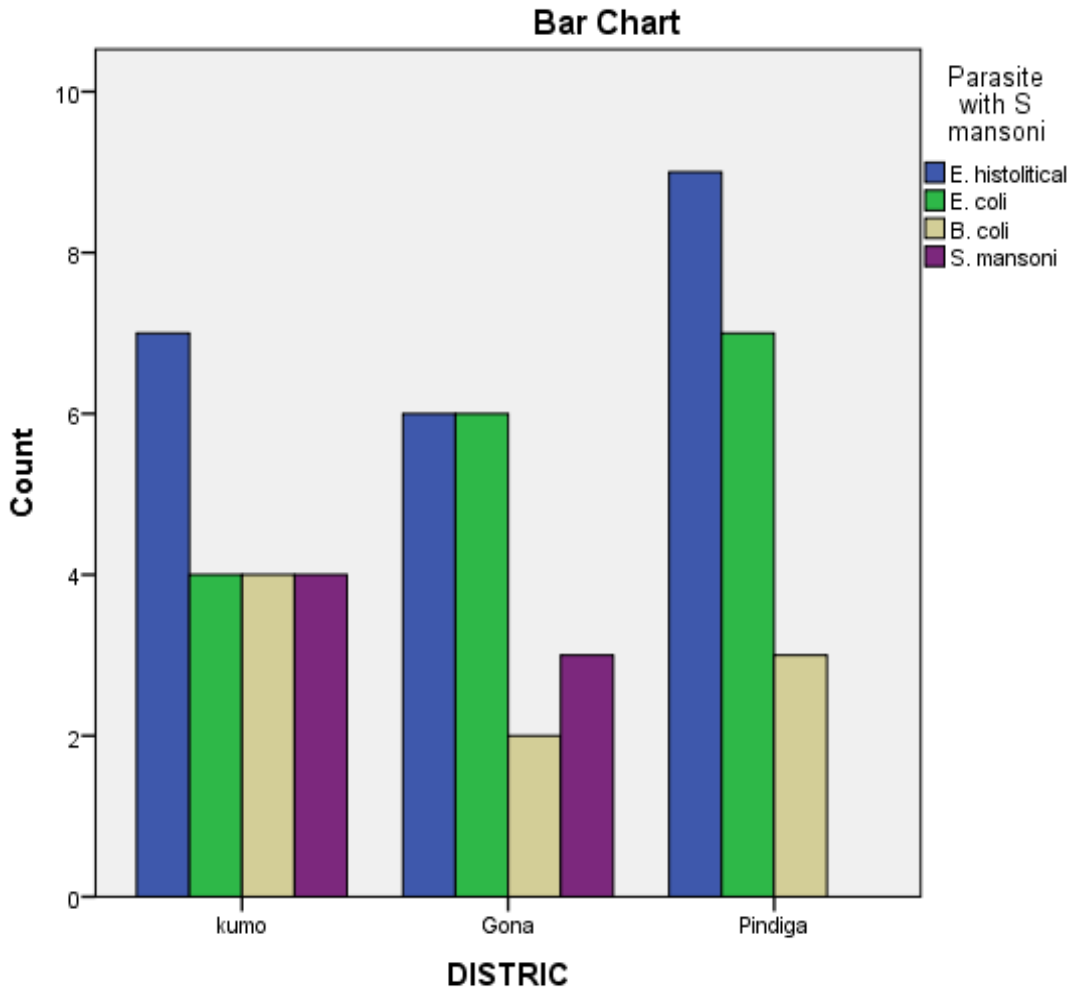

Fig 1: Intestinal Protozoa and *Schistosoma mansoni* Infections According to District

Table 2: Risk factors associated with intestinal Protozoa and *Schistosoma mansoni* infections

Risk Factors	No. Examined	No. Positive	%	χ^2	Df	P value	Odd Ratio	C.I
Source of Water								
Stream	60	14	23.3	11.452	2	0.003**	2.522	1.279 – 4.970
Well	89	15	16.9				1.582	0.832 – 3.010
Borehole	301	27	9.0				0.408	0.231 – 0.718
Do you swim								
Yes	102	27	26.5	23.815	1	0.000**	3.96	2.214 - 7.082
No	319	29	8.3					

Article DOI: 10.52589/AJBMR-IKSHDPNI
DOI URL: https://doi.org/10.52589/AJBMR-IKSHDPNI

Do you fish								
Yes	34	8	23.5	4.148	1	0.042*	2.359	1.011 - 5.506
No	416	48	11.5					
Bathing and Washing in Rivers/Streams								
Yes	143	28	19.6	9.796	1	0.002**	2.426	1.376 - 4.277
No	307	28	9.1					
Walking barefoot								
Always	4	0	0.0	1.296	2	0.523ns	-	-
Occasionally	429	55	12.8				2.941	0.387 – 22.354
Not at all	17	1	5.9				0.430	0.056 – 3.303
Trimming of fingernails								
Always	152	13	8.6	3.191	1	0.074ns	1.803	0.938 – 3.467
Occasionally	298	43	14.4					
Type of toilet used								
Pit Latrine	261	44	16.9	18.593	2	0.000**	18.959	4.535 – 9.260
Water Closet	175	8	4.6				0.299	0.136 – 0.657
Bush	13	4	30.8				3.752	1.128 – 12.488
Washing of hands before eating								
No	30	17	56.7	57.691	1	0.000**	0.010	0.004 – 0.023
Yes	420	39	9.3					
Washing of hands after using the toilet								
No	221	47	21.3	31.024	1	0.000**	6.603	3.149 – 13.844
Yes	229	9	3.9					
Use of soap in hand washing								
No	338	50	14.8	6.874	1	0.009**	2.488	1.032 – 6.002
Yes	112	6	5.4					

Key:

ns =n not significant;

n= Number Examined

Article DOI: 10.52589/AJBMR-IKSHDPNI
DOI URL: https://doi.org/10.52589/AJBMR-IKSHDPNI

African Journal of Biology and Medical Research
ISSN: 2689-534X
Volume 7, Issue 3, 2024 (pp. 119-128)

www.abjournals.org

DISCUSSION

The results of the present study established the occurrence of three species of intestinal protozoa (*E. histolitiica, E. coli, B. coli*) and *Schistosoma mansoni* infections among pupils of primary schools in the three districts of Akko Local Government Area, Gombe State. 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). The prevalence of infection obtained (12.2%) was lower than what has been reported in studies conducted in other parts of north-eastern Nigeria. In similar studies conducted by Biu and Dauda (2008) and Biu *et al*. (2012) in Maiduguri, Borno State, prevalence of 72% and 60% of enteric protozoans and gastrointestinal helminth eggs respectively, were reported. The possible explanation for the discrepancy between the result of the present and those of previous such studies in Borno State might be due to the differences in sampling technique, quality of drinking water, sample size, and variation in the environmental and climatic conditions of the different study localities. These observations, with which we concur, were made by Aina (2002).

Pupils from Pindiga districts examined were found to be more heavily infected with intestinal parasites, cysts and eggs than those from the other districts. *Schistosoma mansoni* is higher in Kumo districts than those from the Gona district. Surprisingly, Pindiga districts had no prevalence of *S. mansoni*. *Schistosoma mansoni* eggs in this study had a lower prevalence (1.6%) than the intestinal protozoa cysts (10.7%). This might probably be due to the fact that there are very few water contact activities in surrounding streams, which may harbor the snail intermediate host of *S. mansoni*. Okpala *et al*. (2004) obtained a higher prevalence of *S. mansoni* (3.33%) in Plateau State, when they surveyed primary school pupils.

Among the cysts of protozoan parasites found in this study, *E. histolytica* had the highest prevalence (4.9%) which might be due to the fact that primary school children eat food and would drink water indiscriminately while in school, and which could be contaminated with the cyst. The prevalence of intestinal protozoa infestation observed in the present study may be attributed to unhealthy environmental conditions, lack of safe drinking water and indiscriminate defecation in the open, which were all noted in the course of this study. Mohammed *et al*. (2015) noted that such infections were also common among primary school children in Boso Local Government Area, Niger State.

The data obtained in this study confirmed that hand-washing before eating and after going to the toilet significantly reduced the risk of infection, in all the districts of acquiring surveyed. This agrees with the findings of Curtis (1978) and Obadiah *et al.* (2011), who remarked that the hands of pupils were contaminated with dirt, especially with fecal matter and that such hands could potentially be a vehicle in the transmission of parasitic infections. The contamination of hands by parasite cysts/eggs reflects the poor hygiene habits of the pupils, which is often associated with indiscriminate disposal of human feces and poor animal husbandry, most especially in the environs. These observations were also made by Aina (2002) and Michael *et al*. (2012).

Article DOI: 10.52589/AJBMR-IKSHDPNI
DOI URL: https://doi.org/10.52589/AJBMR-IKSHDPNI

Source of drinking water, and water contact activities such as swimming, fishing, bathing and washing in rivers/streams, trimming of fingernails and washing of hands without soap were also found to be significantly associated with infection by intestinal protozoa and *S. mansoni*. This is an indication that children who lived near water bodies had a higher prevalence of infestation with *S. mansoni* than those who lived further away. Tadesse and Mulat (2014) in Ethiopia and Okpala *et al*. (2004) in Jos also made a similar observation that swimming and fishing were significant risk factors of *Schistosoma mansoni* infection.

CONCLUSION

The study revealed that hand washing before eating and after going to the toilet, and swimming are significantly associated with intestinal protozoa and *Schistosoma mansoni* infections. Appropriate intervention and health education are required for the control and prevention of protozoa and *S. mansoni* infections in Akko Local Government Area of Gombe State.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the assistance rendered by Mal. Saleh Usman with respect to laboratory analysis of samples and to the various school authorities for the kind gesture extended to us in the course of sample and data collection.

REFERENCES

Aina, O. E. (2002). *Solid water management in Zaria*. Unpublished B.Sc. Project, Department of Geography, Ahmadu Bello University, Zaria. Pp. 2-7.

Alhassan, A., Luka, S. A., Balarabe, M. L. and Kogi, E. (2013). Prevalence and selected risk factors of intestinal schistosomiasis among primary school children in Birnin-Gwari Local Government Area, Kaduna State, Nigeria. *International Journal of Applied Biological Research*, **5**(1): 72-81.

Alum, A., Rubino, J. R and Khalid, I. M. (2010). The global war against intestinal parasites. *International Journal of Infectious Diseases,* **14**: 732-738.

Balci, Y. I., Turk, M., Polat, Y. and Erbil, N. (2009). The distribution of intestinal parasites among children in Denizli. *Turkish Journal* of *Pathology,* **33**(4): 298–300.

Biu, A. A. and Dauda, M. (2008). Prevalence study on enteric protozoans responsible for diarrhea in patients attending local health centers in Maiduguri, Nigeria. *International Journal of Biomedical and Health Science*, **4**(1): 29-32.

Biu, A. A., Aitiya, G., Paul, B. T. and Konto, M. (2012). Incidence of gastrointestinal helminths ova of Nigerian local dogs (*Caniis familiaris*) resident on University of Maiduguri campus, Maiduguri, Nigeria. *Journal of Agriculture and Veterinary Science.* **4**: 63-68.

Curtis, D. (1978). Values of latrines users and Administrators. In: Pacey, A. (Ed.). *Sanitation in developing countries*, John Wiley and sons, Chichester. 238P.

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

Article DOI: 10.52589/AJBMR-IKSHDPNI
DOI URL: https://doi.org/10.52589/AJBMR-IKSHDPNI

Ekundayo, O. J., Aliyu, M. H. and Jolly, P. E. (2007). A review of intestinal helminthiasis in Nigeria and the need for school-based intervention. *Journal of Rural and Tropical Public Health*, **6**: 33-39.

Harhay, M. O., Horton, J. and Olliaro, P. L. (2010). Epidemiology and control of human gastrointestinal parasites in children. *Expert Review* of *Anti Infectious Therapy*, **8**(2): 219-234.

Hotez, P. J. and Kamath, A. (2011). Neglected tropical diseases in sub-saharan Africa: review of their prevalence, distribution, and disease burden. *PLoS Neglected Tropical Disease*. **3**(8): 412.

Matthys, B.**,** Bobieva, M.**,** Karimova, G.**,** Mengliboeva, Z.**,** Jean-Richard, V. **and** Malika, H. (2011). Prevalence and risk factors of helminths and intestinal protozoa infections among children from primary schools in western Tajikistan, *Parasites and Vectors,* **4**(195): 194-195. doi:10.1186/1756-3305-4-195.

Michael, O. E., Ukpai, A. E., Amos, N. and Akpotomi, O. I. (2012). Prevalence of helminths on edible fruits and vegetables cultivated in rural villages of Ebonyi State, South East Nigeria. *American Journal of Food and Nutrition*, **2**(3): 58-64.

Mohammed, Y., Aliyu, M., Dabo, N. T., Adabara, N. U., Otone, B. and Ige, A. O. (2015). Prevalence of intestinal protozoan parasites infection among primary school pupils in Boso, Niger state, Nigeria. *African Journal of Clinical and Experimental Microbiology*, **16**(1): 42-46.

Nasiri, V., Esmailian, K., Karim, G., Nasir, M. and Akhavan, O. (2009). Intestinal parasitic infections among inhabitants of Karaj city, Tehran province, Iran. *Korean Journal of Parasitology*, **47**: 265-268.

Obadiah, H. I., Nock, I. H., Ndams, I. S., Kogi, E. and Bugaje, M. A. (2011). Prevalence of *Entamoeba histolytica* Infection in Pre-school children in Zaria, Nigeria. *Nigerian Journal of Scientific Research*, **9**(10): 21-29.

Okpala, O., Herbert, E., Agwu, A. I., Mathias, C. R., Onyirioha, N. O. and Gilbert, O. A. (2004). A survey of the prevalence of schistosomiasis among pupils in Apata and Laranto areas in Jos, Plateau State. *Journal of Health and Applied Sciences*, **1**: 1-4.

Olveda, D. U., Li, Y., Olveda, R. M., Lam, A. K., Chau, T. N. and Harn, D. A. (2013). Bilharzia: Pathology, Diagnosis, Management and Control. *Tropical Medical Surgery*, **1**: 135.

Pedersen, F. K. and Møller, N. E. (2000). Diseases among refugee and immigrant children. Ugesk Laege, **162**: 6207–6209.

Schunk, M., Jelinek, T., Wetzek, K. and Nothdurff, H. D. (2001). Detection of *Giardia lamblia* and *Entamoeba histolytica* in Stool Samples by Two Enzyme Immunoassay. *European Journal of Clinical Microbial. Infectious Disease,* **20***:* 389-391.

Scolari, C., Torti, C., Beltrame, A., Matteelli, A. and Castelli, F. (2000). Prevalence and distribution of Soil-Transmitted Helminth (STH) infections in urban and indigenous school children in Ortigueira, State of Parana, Brasil: Implications for control. *Tropical Medicine of International Health*, **5**: 302-307.

Speich, B., Marti, H., S. M., Ali, S. M., Bogoch, I. I. and Utzinger, J. (2013). Prevalence of intestinal protozoa infection among school-aged children on Pemba Island, Tanzania, and effect of single-dose albendazole, nitazoxanide and albendazole-nitazoxanide. *Parasites and Vectors*, 2013; **6**(3): doi:10.1186/1756-3305-6-3.

Tadesse, H. J. and Mulat, H. (2014). Challenges of shistosomiasis prevention and control in Ethiopia: literature review and current status. *Journal of Parasitology and Vector Biology*, **6** (6): 80-86.

Article DOI: 10.52589/AJBMR-IKSHDPNI
DOI URL: https://doi.org/10.52589/AJBMR-IKSHDPNI

Tengku, S. A. and Norhayati, M. (2011). Public health and clinical importance of amoebiasis in Malaysia: A review. *Tropical Biomedicine*, **28**(2): 194-222.

Warunee, N., Choomanee, L., Sataporn, P., Rapeeporn, Y. and Nuttapong, W. (2007). Intestinal parasitic infection among school children in Thailand. *Tropical Biomedical Journal*, **24**: 83-88.

World Health Organisation (1993). The control of schistosomiasis: 2nd report of the WHO expert committee on schistosomiasis, Geneva, Switzerland.

World Health Organisation (2006). Preventive chemotherapy in human helminthiasis. Coordinated use of anthelmintic drugs in control interventions. A manual for professionals and programme managers. Geneva, Switzerland.

World Health Organisation (2000). Overcoming Antimicrobial Resistance. *World Health Report on Infectious Diseases*, Geneva, Switzerland.

Article DOI: 10.52589/AJBMR-IKSHDPNI
DOI URL: https://doi.org/10.52589/AJBMR-IKSHDPNI