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PARENTS/CAREGIVERS OF CHILDREN'S AGED UNDER FIVE KNOWLEDGE, ATTITUDES AND PRACTICES TOWARDS SOIL TRANSMITTED HELMINTHS IN TARABA STATE, NIGERIA

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ABSTRACT

Soil-transmitted helminths (STHs) are included in the listof the world's neglected tropical diseases. The STHs include the roundworm *Ascaris* lumbricoides, the whipworm Trichuris trichiura, the hookworms, Ancylostoma duodenale and Necator americanus, and Strongyloides stercoralis. The study was aimed to determine parents/car-givers of under-five children's knowledge, attitudes and practices towards STHs in Taraba State, Nigeria. STHs infection is among the most chronic diseases globally. Because of its impact on human health, the WHO recommended the carrying out of robust approaches targeted at controlling or eliminating disease. The execution of this approach depends on the vivid understanding of the parent's/caregivers' knowledge, attitudes and practices in relation to this infection. A cross-sectional survey was conducted and data were assembled with the aid of a standardized questionnaires from 2,283 caregivers of under-five children. Extensive focus group discussions were carried out among parents/caregivers and the collected data were analysed thematically. Out of the six selected LGAs in Taraba State, highest albendazole coverage of 193(50.79%) was recorded in Bali LGA and least (47.89%) was recorded in Jalingo LGA. More so, a total STH prevalence of 3.29% was recorded among under-5 children who were dewormed six months ago before the survey period and 12.52% was also recorded among under-5 children who were not dewormed. Findings from this study also reflected adequate knowledge and attitudes with bad practices in connection to STHs among parents/caregivers while recognition of soil-transmitted helminths was high (94.2%). These reports are important in planning behavioural change approaches towards improving health results across community-based involvement to make certain successful control and elimination of STHs.

Keywords: Prevalence, Under-5 children, Parents/caregivers, Soil Transmitted Helminths, Taraba State

INTRODUCTION

Soil transmitted helminthiasis (STH) are are diseases caused mainly by *Ascaris lumbricoides* (common roundworms), *Trichuris trichiura* (whipworms), and the hookworms *Necator americanus* and *Ancylostoma duodenale* of the 1.5 billion infected, about 270 million and 600million are pre-school and school-aged children, respectively (Abdi *et al*., 2016). There are five species of STH (Soil-Transmitted helminths) which are roundworms (*Ascaris lumbricoides*), whipworm (*Trichuris trichiura*), hookworm (*Necator americanus* and *Ancylostoma duodenale*) and *Strongyloides stercoralis*.1,2 Four first mentioned species are endemic worms in Indonesia (Abdi, *et al*., 2021). The Americas, China, East Asia and sub-Saharan Africa account for over 56% of the STHs infection globally (Adams, Lombard, Dhansay, Markus, Fincham, 2020).

STH transmission is closely connected with penury and poor cleanliness. Infection is caused by the ingestion of parasite eggs from contaminated soil – in the case of *A. lumbricoides* and *T. trichiura* – or by active perforation of the skin by larvae in the soil – in the case of hookworms. People who are infected harbour parasite eggs in the feces, and in places where there is no toilet systems, the soil and water around the villages and communities become contaminated with feces carrying worm eggs. Although STH infections occur mostlyly in rural areas, the social and environmental situations in many unplanned slums and squatter settlements of low-income countries are good for their persistence (WHO, 2020). In endemic populations, STHs are combined: most infected individuals in a community will have infections of a mild or intermediate intensity, while a few will be heavily infected. Heavily infected peoples suffer most of the clinical repercusions of the infections and are the core source of infection for the rest of the community (WHO, 2020).

Usually, STH have a mild worm burden and usually have no discernible symptoms. Severe infections however cause a lot of health problems, including abdominal pain, diarrhea, blood and protein loss, rectal prolapse, physical and cognitive retardation. Severe ascariasis is typically a pneumonia, as the larvae invades lungs, producing fever, cough and dyspnea during early stage of infection. Hookworm infections intimate a skin reaction (dermatitis), increased white blood cells (eosinophils), a pulmonary reaction (pnemonitis), and skin rash (urticarial). Iron deficiency anemia due to blood is a common symptom (Loukas *et al.*, 2023). In 2001, the World Health Assembly called on endemic countries to control STH (CDC., 2011), targeting pre-school children (PSC) aged 12–59 months, school age children (SAC) aged 5–14years and at-risk adults including women of reproductive age. The World Health Organization (WHO) recommends mass drug administration (MDA) for STH twice yearly in high risk communities (prevalence over 50%) and annually in moderate risk communities (prevalence between 20 and 50%) (WHO, 2023). Longer-term control strategies include improved access to safe water and sanitation and behavior changes in personal and community hygiene, such as hand washing with soap and avoidance and safe disposal of human faeces (CDC, 2022). STHs majorly affects the world's deprived populations. The disease has major health and socio-economic consequences and constitutes an important public health problem in developing countries and the greatest numbers of infections occur in sub-Saharan Africa, the Americas, China and east-Asia (WHO , 2019; Hotez *et al.*, 2023).

Large-scale targeted preventive chemotherapy or deworming to at all risk-population is core intervention strategy to control morbidity and eliminate STHs as a public health problem. In 2015 the Rwandan national NTD program conducted pre-

intervention disease mapping. The baseline survey reported that STH and schistosomiasis infection was a significant public health problem in Rwanda, where more than 65% of children had intestinal worms with high levels of multiple parasite coinfection prevalence. NTD program has been implementing, school-based biannual deworming program with albendazole and an annual deworming for praziquantel in all areas with prevalence of STH and schistosomiasis infections (Moser *et al*., 2022). The global approximate of STH infection was 438.9 million, 819.0 million, and 464.6 million people for hookworm, *A. lumbricoides*, and *Ttrichiura*, respectively, in 2010. The highest prevalence of STH infections and vast majority of years lived with disability attributable to STH infections occur in Asia and Africa. In sub-Saharan Africa (SSA), there were 866 million people infected by STH as shown by the World Health Organization estimate 2012: the respective number (prevalence) of people infected by hookworm, *A. lumbricoides*, and *T. trichiura* was 117million (13.6%), 117million (13.6%), and 100.8million (11.6%), respectively (Mansur *et.al.*, 2020).

Infection with STHs is prevalent in the world especially in the rural low-income countries and more among under five children temprate climates and appropriate moisture, lack of personal or environmental hygiene, sanitation and education, walking barefoot and unhealth or nutritional status could inhance the risk of STH infections due to their recurrent playing habits and low level of recognition. Its main predisposing factors are; practice of open defecation, lack of hygiene such as hand washing and walking barefoot on contaminated soil (Misikir *et al*., 2020). Parental socio-economic status is influencial variable determining risk factor making pupils vulnerable to STHs infection. These predisosing factors differ with localities and could provide crucial information to help decision makers in planning a more focused preventive strategy to manage the disease (Sunish *et. al.*, 2021). Soil-transmitted helminth infections are among the most common of chronic human infections globally. STH spread in a country is intimately concerned with climate and soil characteristics. The most indigenous regions include south and south-west China, southern regions of India, south-east Asia, sub-Saharan Africa, and Central and South America (Hajare et al. 2022; Albonico, 2022). Higher prevalences are reportd in tropical and sub-tropical regions, especially in low-income earning countries where STH infections are connected to poverty, lack of good water, poor or non-existent sanitary facilities, unhygiene and inadquate health services (Brooker *et al*., 2016; WHO, 2023). In this study, priority was made on deworming coverage among under-5 children and knowledge, attitudes and practices of parents/caregive towards STHs in some selected Local Government Areas of Taraba State.

MATERIALS AND METHODS

Study Area

The survey was carried out in Taraba State, North-eastern Nigeria that lies approximately between latitude 6.494189°and 9.634663° North and between longitude 9.104619° and 11.914303° east with a total population of 2,294,800 (National Population Commission, (NPC), 2006]. It is bounded in the north by Bauchi State and Gombe State, Adamawa State in the Northeast, Republic of Cameroun to the south and south east, Benue State in the Southeast and, Nassarawa and Plateau States in the west. The state is mostly into agriculture, rearing of livestock, fishing and poultry. Agricultural produce such as, coffee tea, cotton, groundnuts, sorghum, millet, maize, rice, yam and cassava are produced in commercial quantity. Other activities include poultry farming, cotton-weaving, mat-making, dyeing, carving, blacksmithing and embroidery are carried out in the state. People that live in a community on the banks of river Benue, River Taraba, river Donga and Ibi engage in fishing all year round.

Ethical Consideration

Approval was sought and obtained from the Taraba State Ministry of Health. The Local Government Management/Executives of the respective LGAs were notified prior to the commencement of the survey, also traditional leaders of the respective LGAs as well as villages heads of the selected communities also, to seek for consent and approval. They were informed of their right to take part or decline from the study at any moment without any consequence and were guaranteed on the confidentiality of the research outcome.

Determination of sample size

Sample size of 384 was employed for the study which was obtained by using formula suggest by Araoye (2020).

Stool sample collection

Well labelled sterile plastic containers were used to collect stool samples of all under-5 children in the selected households. The mother/child were reminder on the procedure for collecting stool samples into the container. The samples were collected at the appointed time and preserved immediately using 10% formalin. Preserved samples were conveyed to the laboratory for investigations. All samples collected were analyzed using formal-ether concentration technique (Cheesbrough, 2021). The eggs were distinguished according to morphological details (Chiodini *et al*., 2022).

Data collection and analysis

Data was collected through well structures questionnaires on the characteristics of the under-5 children and the parent's/caregiver's knowledge, attitudes and practices towards soil transmitted helminths. All data collected were analyzed using Statistical Package for Social Sciences (SPSS) version 23.0. and statistical values were considered significant at $p<0.05$.

RESULTS AND DISCUSSION

Table 1: Prevalence of STHs among Under-5 children based on albendazole usage six months ago before the study

LGA	No examined	STHs found (%)	No dewormed (%)	STHs found (%)	No not dewormed (%)	STHs found (%)
Bali	380	34(8.94)	193(50.79)	8(4.14)	187(49.21)	26(13.90)
Jalingo	380	23(6.05)	182(47.89)	5(2.75)	198(52.11)	18(9.09)
Zing	380	24(6.31)	190(50.00)	5(2.63)	190(50.00)	29(15.26)
Sardauna	380	23(6.05)	188(49.47)	3(1.60)	194(51.05)	20(10.31)
Lau	380	45(11.84)	183((48.16)	10(5.46)	199(52.37)	35(17.59)
Gashaka	380	23(6.05)	189(49.73)	6(3.17)	190(50.00)	17(8.95)
Total	2,280	173(45.52)	1,125(49.34)	37(3.29)	1,158((50.79)	145((12.52)

Data in Table 1 revealed the prevalence of STHs based on Albendazole usage among under-5
children in six selected LGAs in Taraba State. A total albendazole coverage of 1,125(49.34%) from a cumulative of 2,280 under-5 children recruited in the study was reported. Highest albendazole coverage of 193(50.79%) was recorded in Bali LGA and least (47.89%) was recorded in Jalingo LGA. Other prevalence of albendazole coverages across the selected LGAs includes; 50.00%, 49.49%, 48.16%, 49.73% and 49.73% for Zing, Sardauna, Lau and Gashaka LGAs respectively. The distribution coverage of albendazole was relatively similar across all the six LGAs sampled for the study. More so, a total STHs prevalence of 3.29% was recorded among under-5 children who were dewormed in the last six months prior to the study period and 12.52% was also recorded among under-5 children who were not dewormed.

Table 2: Assessment of the Relationship Between Parent's/caregiver's Knowledge with Regards to Prevention and Treatment of STHs Infections Among Under-five Children in the Study Area

Variables	Yes (%)	No (%)	pValue
Knowledge			
Awareness of STHs	2109(92.4)	174(7.6)	0.053
Positive for STHs	161(7.6)	20(11.5)	
Affect Adult Only	201(8.8)	2082 (91.2)	0.237
Positive for STHs	162(7.8)	18(2.0)	
Infected with consumption of poorly cooked food	1393(61.0)	890(39.0)	0.432
Positive for STHs	163(7.8)	18(2.0)	
Faecal Material Serve as source of STHs	2108(92.3)	175(7.7)	0.312
Positive for STHs	173(8.2)	8(4.6)	
Had Treatment for STHs	2097 (91.9)	186(8.1)	0.345
Positive for STHs	112(5.3)	69(37.1)	
Informed of albendazole Drug	1837(80.5)	446(19.5)	0.840
Positive for STHs	138(7.5)	43(9.6)	
Obtained Albendazole from health facility	1068(46.8)	1215(53.2)	0.259
Positive for STHs	80(7.5)	101(8.3)	
Dewormed Your Child for the Past 6 months	1158(50.7)	1125(49.3)	0.164
Positive for STHs	96(8.5)	85(7.3)	
Knowledge about Parasitic worms'	1322(57.9)	961(42.1)	0.357
Positive for STHs	102(7.7)	79(8.2)	

Data in Table 2 revealed that majority of study participants (92.4%) were aware of the cause of STHs while 7.6% claimed not to be aware of the parasite. The infection of the STHs was observed higher among those unaware (11.5%) compare to those that are aware (7.6%). Parents/caregivers who responded that STHs affect children the most were 91.2% with the infection prevalence of 9.5% higher than the 8.8% who responded that adults are mostly affected with STHs which recorded a prevalence of 7.8% among the children. Other predisposing factors revealed by the caregivers included; consumption of raw vegetables and fruits (61.0%), with STHs pevalence of 7.8%, eating poorly cooked food (39%) with STHs prevalence of 2.0%, while those that agreed that faeces are source of STHs infection (92.3%) recorded highest STHs infection prevalence of 8.2%. Similarly, those that had treatment for STHs (91.9%), informed of albendazole drugs (80.5%), obtained albendazole from health facility (46.8%) recorded STHs prevalence of 5.3%, 7.5% and 7.5% respectively. About 50.7% parents of the respondents had given albendazole to their children pills last six months despite that the rate of infection by STHs (8.5%) is higher than those that did not give any treatment to their children last six months. According to the results, the majority of the parents/guardians of the under-5 children had good knowledge about the STHs with no significant association ($p>0.05$).

Table 3: Assessment of the Relationship Between Parent's/caregiver's Atitude with Regards to Prevention and Treatment of STHs Infections among Under-five Children in the Study Area

Attitudes	Yes (%)	No (%)	*p* Value
STHs infection Cand be prevented	1871(82.0)	412(18.0)	0.218
Positive for STHs	144(7.7)	37(9.0)	
Consumption of Vegetables & fruits cause transmission of STHs	1699(74.4)	584(25.6)	0.379
Positive for STHs	137(8.1)	44(7.5)	
Treatment/Cure for STHs is Possible	2283(100.0)		0.214
Positive for STHs	181(7.9)		
Affected by STHs is Attended at Health facility.	2103(92.1)	180(7.9)	0.175
Positive for STHs	163(7.8)	18(10.0)	
Severity of STHs among Children	654(28.6)	1629(71.4)	0.347
Positive for STHs	49(7.5)	132(8.1)	
Worrisomeness of STHs	1777(77.8)	506(22.2)	0.317
Positive for STHs	144(8.1)	37(7.3)	
Reason for Concern About Affecting by STHs	1730(75.8)	553(24.2)	0.340
Positive for STHs	140(8.1)	41(7.4)	

Data in Table 3 revealed that the attitudes of the participant towards STHs were positive, as majority (82.0%) and (74.4%) of the study participants believe that the infection can be prevented if proper precaution is taken in to consideration and that would even help in preventing their children from consuming raw vegetables respectively, but all those that parents that responded not to take precaution had higher STHs infection of 9.0%. All the respondents (100%) think STHs infection can be cured. Caregivers who responded that if they observed any known symptoms of STHs in their children they visit a nearby health facility for treatment had least infection rate of 7.8% than those that responded no with STHs prevalence of 10.0%. About 77.8%% believed that STHs is a very worrisome disease affecting their children in the community and 75.8% stated the disease (STHs) is of concern to them. However, there is no significant different between the rate of infection and attitudes of the parents/care givers ($p>0.05$). The majority of study participants show some level of commitment on STHs prevention practices, these includes washing of hands with soap before feeding their children (98.9%), avoid touching the mouth of their children after visiting the toilet(95.7%), avoided wide open field defecation (100%) and wore shoes to prevent STHs infection (54.2%)

Table 4: Assessment of the Relationship Between Parent's/caregiver's Practice with Regards to Prevention and Treatment of STHs Infections Among Under-five Children in the Study Area

Variables	Yes (%)	No (%)	p Value
Washing Hands after zcoming out from toilet	2258(98.9)	25(1.1)	0.318
Positive for STHs	178(7.9)	3(12.0)	
Avoidance of touching mouth with unwashed Hands	2183(95.7)	100(4.3)	0.309
Positive for STHs	151(6.9)	30(30.0)	
Use Shoes or Not	1237(54.2)	1046(45.6)	0.238
Positive for STHs	93(7.5)	88(8.4)	
Frequency of children Playing with Soil	1189(52.1)	1094(47.9)	0.131
Positive for STHs	102(8.6)	79(7.2)	
Practice of Open Defaecation	2283(100.0)		0.214
Positive for STHs	181(7.9)		
Visit of Health Facility	1245(54.5)	1046(45.6)	0.494
Positive for STHs	40(3.2)	141(13.5)	

Table 4 revealed that most of the paricipants had good practices towards the prevention and treatrment of STHs. 98% practice handwashing before and after feeding their children, 95.7% aviod touching the mouth of their baby with unwashed hand, 54.2% of their children wear shoe, 100% avoid open defaecation and 54% of the parents/caregivers visit health facilities when they suspect infection by STHs. Chi-square test showed no significant difference between those that responded yes to all the practice variables compare to those that responded no ($p>0.05$). All parents/caregivers that responded no to the practices had higher rate of STHs except those that responded that they would restrain their children from playing in the soil.

The percentage coverage of Albendazole administration (deworming) with respect to the prevalence of STHs in the survey revealed that as coverage keeps increasing the diseases prevalence of STHs decreases. Therefore, apart from diminishing the prevalence, albendazole is also able to reduce the severity of infection which has a contribution in spreading the infection in the thick of soil contamination. Positive participants will continue to contaminate the environment; thus, if not retreated immediately, the prevalence will increase rapidly. This corresponds to the study by Appleton *et al*. (2022) and Jia *et al*. (2023) stated that treatment with albendazole and mebendazole due to failure of behavioral changes, such indiscriminate excretion and refuse washing hands at five significant times (before eating, after passing stool, before handling babies, after changing diapers, and before preparing food) increseases STHs infection. However, Saleha *et al*. (2023) stated that deworming decreased the infections with intermediate to heavy severity, as well as the pooledl prevalence of STH infection. The overall rate of albendazole usage (deworming) amidst children aged under five years in six selected LGAs in Taraba State was 1125(49.34%). This finding is widespread than those of schistosomiasis and soil-transmitted helminthiases progress report, 2020, which has 9.21% exploration in 13 African countries, but related to surveys carried out in 39 countries UNICEF offices (49.1%) (Kumapley et al 2022), reports from SSA 45.03% (Belay et al., 2022), and global deworming programs that target to reach 75% pre-SAC (Kumapley et al 2015). In variance, this figure is lower than the national deworming exploration of Myanmar, Philippines, and the Burundi where 93.6%, 75.7% and 80.1%, of children, respectively, served deworming enhancement (Lo et al., 2020). These differences could be as a result of changes in sociocultural factors amidst the surveyed participants, information collection season, and variances in sensitivity and awareness to the need for deworming to control STH infections in children aged under five yeras (Eze et al., 2020).

Most of study respondents knew the source of STHs are parasitic worms while others claimed not to be aware of the parasite, the infection of the STHs was observed to higher among those unaware compare to those that are aware. This agrees with the study by Lu *et al*. (2018) who reported that this inadequate understanding among care givers about STH infection, prevents them from demanding theirb children to be dewormed. However, it contradicts low level of STHs knowledge reported among caregivers adespite high awareness levels reported widely by KAP studies conducted in Bangladesh (Sacolo-Gwebu et al., 2019), Kenya (Masaku, 2023) South Africa (Sibiya and Gumbo, 2023) and Ethiopia (Vivas, 2024).

The parents/caregivers who responded that the parasites affect children the most had the higher STHs infection than those that responded that adults are mostly affected. Other predisposing factors i.e consumption of raw vegetables and fruits are ways of transmission of STHs revealed those that said eating poorly cooked food do not play any role in the infection, while for those that agree that faeces as source of STHs still shows higher parasitic infections which correlate with the study document by Beckker *et al*. (2020). On albendazole utilization, agree to have heard about the use of albendazole drug, but those who said they never heard had the

higher infection of STHs, most of the respondents said it is not free had the highest presence of STHs and not given free at the health care centres also had higher infection rate of STHs.

About half parents of the respondents had given albendazole to their children pills last six months despite that the rate of infection by STHs is higher than those that didn't give any treatment to their children last six months. According to the results, the majority of the parents/guardians of the under-5 children had good knowledge about the STHs. There is no significant different between the rate of infection and knowledge of the parents/care givers $p>0.05$. The attitudes of the participant towards STHs are positive, as most of the examined respondents believe that the infection is preventable if proper precaution is taken in to consideration and that would even help in preventing their children from consuming raw vegetables respectively, but all those that parents that responded not to take precaution had higer infection of STHs. The parents of the under-5 children in all the study location had adequate knowledge of STHs infection and believed it can be cured, they visit health facility for treatment and they had least infection rate.

The study participants show some level of commitment on STHs prevention practices, this includes hand washing with detergent prior to feeding their children, avoid touching the mouth of their children and after using toilet, facilities stopped unlatched field excretion, and wearing shoes for prevention of STHs infection. In addition, they practice of visiting health facilities when they suspect infection by STHs. All parents/caregivers that responded no to the practices had higher rate of STHs except those that responded that they would restrain their children from playing in the soil. The probable justification as reported by Gitore *et al*. (2020) might be due to the correspondences of some attributes of children and communities in the present study. These factors include: level of knowledge, attitudes and practices about the STHs, habits of handwashing before eating and cleaning toilet. Again, it could be due to comparative study participants in these suyveys attributed to the exixting disease.

Despite the fact that those who participated in the study had adequate knowledge on the treatment regimen and most preventable measures, most (77.0%) were worrisome about the infection which corroborates with a similar study in Côte d'Ivoire, (Schmidlin *et al*., 2013) where 88.7% of the participants were also woorisome about STHs infection with a bad attitude towards its control. Very few subjects agreed to seeking treatment while most did not see it as a challenge.

CONCLUSION

In spite of many rounds of mass drug administration (MDA) with albendazole in Taraba State, however, the prevalence of STH is still moderate in the selected LGAs studied. The finding illustrated good knowledge and attitudes with bad practices towards STH among parents/caregivers. On the other hand, inadequate knowledge on MDA and lack of health enlightenment still pause hindrances to STH control. Therefore, educational programs should be intensified to create more awareness of good practices toward STH not only to parents/caregivers but to the community members as well.

REFERENCES

Abdi, M., Nibret, E. & Munshea, A. (2016). Prevalence of Intestinal Helminthic Infections and Malnutrition Among School Children of the Zegie Peninsula, Northwestern Ethiopia. *Journal of Infection and Public Health, 10*: 234-245. https://doi.org/10.1016/j.jiph.2016.02.009

Adams, V.J., Lombard, C.J., Dhansay, M.A., Markus, M.B., Fincham, J.E., (2021). Efficacy of Albendazole Against the whipworm *Trichuris Trichiura: a Randomized, Controlled Trial. South African Medical Journal 94: 972–976.* https://doi.org/10.1007/s12639-022-01495-1

Albonico, M., Smith, P.G., Ercole, E., Hall, A., Chwaya, H.M., Alawi, K.S., Savioli, L., (2021). Rate of Reinfection with Intestinal Nematodes After Treatment of Children with Mebendazole or Albendazole in a highly endemic area. Trans. R. Soc. *Tropical Medical Hygiene 89*: 538–541.

Appleton, C.C., Gouws, E., (2023). The Distribution of Common Intestinal Nematodes Along an Altitudinal Transect in KwaZulu-Natal, South Africa. Ann. *Tropical Medical Parasitology 90:* 181–188.

Araoye, M.O. (2019) Research Methodology with Statistics for Health and Social Sciences. In: Subject Selection, Nathadex Publishers, Ilorin, 115-120.

Becker, S.L., Liwanag, H.J., Snyder, J.S., Akogun, O, Belizario V. J., Freeman, M.C. et al. (2018) Toward the 2020 goal of soil-transmitted helminthiasis control and elimination. PLoS Negl Trop Dis 12(8): e0006606. https://doi.org/10.1371/journal.pntd.0006606

Belay, D.G., Kibret, A.A, Diress, M., Gela, Y.Y., Sinamaw, D., Simegn, W. (2022). Deworming among preschool age children in sub-Saharan Africa: pooled prevalence and multi-level analysis. Tropical Medicine and Health. 50(1):74. https://doi.org/10.1186/s41182-022-00465-w

Brooker, S., Clements, A.C. & Bundy, D.A. (2022). Global epidemiol ogy, ecology and control of soil-transmitted helminth infec tions. Advances in Parasitology 62, 221–261.

Brooker, S., Clements, A.C.A., Bundy, D.A.P., (2020). Global Epidemiology, Ecology and Control of Soil-Transmitted Helminth Infections. *Advance Parasitology, 62*: 221–261.

Center for Infectious Disease Control Rwanda (2021). National Prevalence Survey on Soil-Transmitted Helminths and Schisto somiasis. Kigali, Rwanda: Center for Infectious Disease Con trol Rwanda, Access Project and National Reference Laboratory. Available from: http://tap.pmhclients.com/images/uploads/z-media/SCHISTO-REPORT-Rwanda.pdf [Accessed 25 July, 2024].

Cheesbrough, M. (2022). District Laboratory Practice in Tropical Countries. Cambridge University Press. Pp. 62.

Chiodini, P. L., Moody, A. H. & Manser, D. W. (2021). Atlas of Medical Helminthology and Protozology, Harcourt Publishers Limited.

Eze, P., Agu, U.J., Aniebo, C.L., Agu, S.A., Lawani, L.O. (2020). Perception and attitudinal factors contributing to periodic deworming of preschool children in an urban slum, Nigeria. BMC Public Health. 20:1–12.

Gitore, W.A., Ali, M.M., Yoseph, A., Mangesha, A.E., Debiso, A.T. (2020). Prevalence of soil-transmitted helminthes and its association with water, sanitation, hygiene among schoolchildren and barriers for school's level

prevention in technology villages of Hawassa University: Mixed design. PLoS ONE 15(9): e0239557. https://doi.org/10.1371/journal.pone.0239557

Hajare, S. T., Mulu, T., Upadhye, V. J., Chauhan, N. M., & Eriso, F. (2022). Prevalence of Ascaris lumbricoides infections among elementary school children and associated risk factors from Southern Ethiopia. Journal of parasitic diseases : official organ of the Indian Society for Parasitology, 46(3), 643–652. https://doi.org/10.1007/s12639-022-01475-5

Hotez, P., Ottesen, E., Fenwick, A. (2023). The neglected tropical diseases: the ancient a ictions of stigma and poverty and the prospects for their control and elimination. Adv Exp Med Biol 582: 23–33. 22.

Hotez, P.J., Molyneux, D.H., Fenwick, A., Kumaresan, J., Ehrlich Sachs, S., Sachs, J.D., *et al*.,--- (2017). Control of Neglected Tropical Diseases. *North England Journal of Medicine* 357: 1018–1027.

Jia, T.W., Melville, S., Utzinger, J., King, C.H., Zhou, X.N. (2022). Soil-transmitted helminth reinfection after drug treatment: a systematic review and meta-analysis. PLoS Negl Trop Dis 6(5): e1621. https://doi.org/10.1371/journal.pntd.0001621.24 .

Kumapley, R. S., Kupka, R., & Dalmiya, N. (2023). The Role of Child Health Days in the Attainment of Global Deworming Coverage Targets among Preschool-Age Children. PLoS neglected tropical diseases, 9(11). https://doi.org/10.1371/journal.pntd.0004206

Lo, N.C., Gupta, R., Addiss, D.G., Bendavid, E., Heft-Neal, S., Mikhailov, A. (2020). Comparison of World Health Organization and Demographic and Health Surveys data to estimate sub-national deworming coverage in pre-school aged children. PLOS Neglected Tropical Diseases. 14(8):. https://doi.org/10.1371/e0008551

Loukas, A., Hotez, P. J., Diemert, D., Yazdanbakhsh, M., McCarthy, J. S., Correa-Oliveira, R.et al.,…..(2021). Hookworm infection. Nature reviews. Disease primers, 2, 16088. https://doi.org/10.1038/nrdp.2016.88

Lu, L., Liu, C., Zhang, L., Medina, A., Smith, S., Rozell,e S. (2015) Gut Instincts: Knowledge, Attitudes, and Practices regarding Soil-Transmitted Helminths in Rural China. PLoS Negl Trop Dis 9(3): e0003643. https://doi.org/10.1371/journal.pntd.0003643

Mansur, S., Abubakar, B. & Hassan, I. (2020). Prevalence of Soil-Transmitted Helminths Among Primary School Children in Yana, Bauchi State, Nigeria. *Journal of Parasitology, 12:* 432-443.

Masaku, J. (2023). High prevalence of helminths infection and associated risk factors among adults living in a rural setting, Central Kenya: a cross-sectional study. Trop Med Health. 45(1):15.

Misikir, S. W., Wobie, M., Tariku, M. K., & Bante, S. A. (2020). Prevalence of hookworm infection and associated factors among pregnant women attending antenatal care at governmental health centers in DEMBECHA district, north West Ethiopia, 2017. BMC pregnancy and childbirth, 20(1), 457. https://doi.org/10.1186/s12884-020-03134-0

Moser, W., Batil, A. A., Ott, R., Abderamane, M., Clements, R., Wampfler, R., Poppert, S., Steinmann, P., Allan, F., & Greter, H. (2022). High prevalence of urinary schistosomiasis in a desert population: results from an exploratory study around the Ounianga lakes in Chad. Infectious diseases of poverty, 11(1), 5. https://doi.org/10.1186/s40249-021-00930-4

Nath, T.C. (2018). Elimination of soil-transmitted helminthiasis infection in Bangladesh: knowledge, attitudes, and practices regarding mass drug administration. J Glob Health Rep. 2.

National Population Commission (2023). Nigeria population census Report. pp 62 – 65. 30.

Sacolo-Gwebu, H., Kabuyaya, M. & Chimbari, M. (2019). Knowledge, attitudes and practices on schistosomiasis and soil-transmitted helminths among caregivers in Ingwavuma area in uMkhanyakude district, South Africa. BMC Infect Dis 19:734. https://doi.org/10.1186/s12879-019-4253-3

Saleha, S., Asri, S. R. and Gladys K. (2022). The Effect of Deworming Using Triple-Dose Albendazole on Nutritional Status of Children in Perobatang Village, Southwest Sumba, Indonesia. Journal of Parasitology Research, (2):1-5 https://doi.org/10.1155/2017/5476739

Schmidlin, T., Hürlimann, E., Silué, K. D., Yapi, R. B., Houngbedji, C., Kouadio, B. A. et al…. (2022). Effects of hygiene and defecation behavior on helminths and intestinal protozoa infections in Taabo, Côte d'Ivoire, PLoS One. 8:6

Sibiya, J.E. & Gumbo, J.R. (2020). Knowledge, attitude and practices (KAP) survey on water, sanitation and hygiene in selected schools in Vhembe District, Limpopo, South Africa. Int J Environ Res Public Health. 10(6):2282–95.

Sunish, I. P., Rajendran, R., Munirathinam, A., Kalimuthu, M., Kumar, V. A., Nagaraj, J., *et al*., --- (2022). Impact on Prevalence of Intestinal Helminth Infection in School Children Administered with Seven Annual Rounds of diethyl Carbamazine (DEC) with Albendazole. *The Indian Journal of Medical Research, 141:* (3), 330-339.

Vivas, A. (2020). Knowledge, attitudes, and practices (KAP) of hygiene among school children in Angolela, Ethiopia. J Prev Med Hyg. 51(2):73.

World Health Organization, (2022). Schistosomiasis and soil-transmitted helminth infections- preliminary estimates of the number of children treated with albendazole or mebendazole, Soil-transmitted helminth infections: updating the global picture. Wkly. Epidemiol. Rec. 81, pp.

World Health Organization, (2020). Preventive Chemotherapy in Human Helminthiasis: Coordinated Use of Anthelminthic Drugs in Control Interventions: A Manual for Health Professionals and Programme Managers. World Health Organization Press, Geneva