ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2017; 3(11): 174-178
www.allresearchjournal.com
Received: 29-09-2017
Accepted: 30-10-2017

Kiran Singh
Department of Biological Sciences, Usmanu Danfodiyo University, Sokoto, Nigeria

Ibrahim Sani Mandinka
Department of Biological Sciences, Usmanu Danfodiyo University, Sokoto, Nigeria

Jitendra Singh
Department of Family Medicine, Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria

Correspondence
Kiran Singh
Department of Biological Sciences, Usmanu Danfodiyo University, Sokoto, Nigeria

A surveillance on intestinal helminthiasis among pediatric age children in Dangulbi Town, Sokoto, Nigeria

Kiran Singh, Ibrahim Sani Mandinka and Jitendra Singh

Abstract
A study was conducted to determine the prevalence of Intestinal helminths among pediatric age children in Dangulbi Kwalkwalawa town of Sokoto State, Nigeria. A total of 100 faecal samples were analyzed using formal ether concentration technique and then examined microscopically for intestinal helminths infections. Out of 100 stool samples examined, 72.00% were found infected. However, the highest prevalence of 51.00% was recorded with nematodes (P<0.05) followed by cestodes 15.00% and trematodes 6.00 (P<0.05). Males had higher prevalence of 66.00% compared to the female 36.00% for nematodes, infection with cestodes in males 16.00% and females 14.00% and trematodes had equal infection (6.00%) among both males and females. In all parasites, male has highest prevalence among the gender. Likewise the prevalence of infection with respect to age; group of 5 – 7 years had the highest prevalence in all parasites (for nematodes 65.00%, for cestode 20.00% and trematodes 10.00%). followed by 2 – 4 years.

Keywords: Nematodes, Cestodes, Trematodes, poor development, unhygienic conditions, Nigeria etc.

Introduction
The intestinal helminthes are the major causes of parasitic disease responsible for morbidity, and mortality in many parts of the world (Behraman *et al*. 1996) [2]. Gastrointestinal helminthes flourish in settings characterized by warm temperature, humidity, poor sanitations, dirty water and substandard and crowded housing and infection rates are higher in children living in sub-Saharan Africa (De Silva *et al*. 2003; Brooker 2006) [8, 3]. The disease mainly affect under the age of 14 years; as a result children are primary sufferers, an essential vector for the reintroduction of the pathogens to the local environment and, consequently, the focus for control initiatives for GI parasitic diseases. Women of childbearing age are also have serious infection (Brooker *et al*. 2008) [4]. The disease is associated with soil and water contaminations (Made 1993) [17]. Such kind of diseases have very high occurrence in tropical and sub-tropical region of Africa where bout 90% of children are infected (WHO 2005) [27].

Helminths infections are mainly spread by faecal contamination in the environment and by inadequate food preparation due to lack of sanitary habits and contaminated/ unwashed food and unsafe water. Intestinal helminthes are responsible for a high rate of morbidity and mortality with high prevalence and intensity in rural areas (tropical and subtropical world) of sub-Saharan Africa where conditions of poor sanitation and poor hygiene co-exist with environmental factors favoring their survival (Vince *et al*. 2001) [23].

The pediatric age group (children between the age of 14 and below), are the most vulnerable to infection to intestinal parasites (Behraman *et al*. 1996) [2]. Polyparasitism or coinfection with either multiple GI helminthes in the young is wide spread (Kasssem *et al* 2007; Park *et al*. 2004; Sharma *et al*. 2004) [14, 19, 20]. In Nigeria parasitic infection among pediatric age group are endemic in many part of the country (WHO 1991) [25].

Nigeria is one of the countries where helminthes are dominantly found, especially in Sokoto State (Wamakko area) where majority of the people being affected are pre-school age children and tend to be at high intensity in this age group. Because most of them are not going to school due to poverty, and poor education of parents lead to unconcern about the

children and have the chance of playing with contaminated water in the river, lake and soil; where eggs of helminth parasites are available in the soil and contaminated water which can be directly or indirectly ingested/ inhaled.

Also, inorganic fertilizers are not affordable to poor farmers there fore, people use unprocessed human faeces as fertilizer without using any special equipment for its application. By doing so these people are in direct contact with eggs of such parasites, which ensures infection and constant reinfection among inhabitants; after getting fertilized by such fertilizer, some edible vegetables and fruits which contain eggs of helminths due to its long life and resistance in soil, these eggs can survive for long and can infest the people consuming such fruits and vegetables. People consuming vegetables in this area are at risk of having helminthiasis as well as farmers and their family members that apply this kind of fertilizers using their hands are exposed to the helminths infection.

Materials and Methods

Study Area

The study area is Dangulbi village located at Kwalkwalawa in Wamakko local government area of Sokoto State, Nigeria.

In terms of religions, the inhabitant peoples are about 99% Muslims, thus Islam is the major religion of people living in the area.

The occupational activities of the people living in the area include: farming, fishing, business, rearing of animals while few are civil servants; majority of them are below poverty level.

Sample Collection

One hundred (100) stool samples were collected from school age children between the month of July and October. Clean (universal) screw caped bottles were given to the children for stool collection, each bottle was labeled to correspond with the number of the sampled person, age and gender.

The specimens were collected in the morning between 7:30 – 11:30am and were transported to the parasitology laboratory of Usmanu Danfodiyo University, Sokoto for further analysis.

Stool Analysis

The stool samples were analyzed using the formal ether concentration techniques as described by (WHO 1998). 1.0 gram of the stool was picked using a clean clinical stick, and emulsified in a screw-caped universal bottle containing 4 ml of 10% formaline. Another 3 ml of 10% formaline was further added. The bottle was then capped and the contents mixed well by gentle shaking. The emulsified sample was then sieved using sieve of 2.5 mm. The sieved filtrate was collected in a beaker (250 ml) then transferred in to a centrifuge tube. Three milliliters (3 ml) of diethyl ether was added to it and mixed well by gentle shaking. This was then centrifuged immediately at approximately 3000 r.p.m. for 5 minutes. The ether, faecal debris, supernatant and formal water were discarded and the sediment was then allowed to settle to the bottom. A drop or two of sediment was then transferred onto a clean slide (using a sterilized wire loop). After making a thin smear, it was then covered with a coverslip and examined microscopically using x 10 and x 40 objective. Parasite eggs were identified based on external morphology and anatomy of eggs and confirmed by chart provided by (Cheesbrough 1998) [6] and recorded.

The result obtained were statistically analyzed by simple percentage and using chi-square (X^2). To show out similarities and differences between parameters.

Results

Out of one hundred (100) stools samples examined, a total of 72 (72.00%) was found infected. However, the prevalence of these parasites varied among the children examined. Those infected with nematodes had the highest prevalence of 51.00% followed by cestodes 15.00% and least prevalence of 6.00% was found infected with trematodes. A significant variation was observed by chi-square analysis ($x^2 = 35.787$; df = 2; $p>0.05$).

Table 1: Prevalence of Intestinal helminthes among children in Dangulbi town

Parasites	Samples Examined	No. Positive	Prevalence (%)
Nematodes	100	51	51.00
Cestodes	100	15	15.00
Trematodes	100	6	6.00
Total	100	72	72.00

$x^2 = 35.787$; df = 2; $p > 0.05$.

Prevalence of Nematodes with Respect to Gender of children

In a total of 100 stool samples examined for helminthes parasites, 50 for male and 50 for female, it was observed that males had the highest prevalence of 33 (66.00%) than females with 18 (36.00%). However, a chi-square analysis showed ($x^2 = 2.951$; df = 1; $p > 0.05$).

Table 2: Prevalence of nematode with respect to gender of children

Sex	Samples examined	No. Positive	Prevalence (%)
Male	50	33	66.00
Female	50	18	36.00
Total	100	51	51.00

$x^2 = 2.951$, df = 1; $p<0.05$.

Prevalence of Cestodes with Respect to Gender of children

In a total of 100 stool samples examined for helminth parasites, 50 for male and 50 for female, it was observed that males had the highest prevalence of 8 (16.00%) than females with 7 (14.00%). However, a chi-square analysis showed ($x^2 = 0.058$; df = 1; $p<0.05$).

Table 3: Prevalence of Cestodes with respect to Gender of children

Sex	samples examined	No. Positive	Prevalence (%)
Male	50	8	16.00
Female	50	7	14.00
Total	100	15	(15.00%)

$x^2 = 0.058$, df = 1; $p<0.05$.

Prevalence of Trematodes with respect to Gender of children

In a total of 100 stool sample examined for helminthes parasites, 50 for male and 50 for female, it was observed that the male had 3 (6.00%) which is the same prevalence with female 3(6.00%). However, a chi-square analysis ($x^2 = 0.17$, df = 1, $p<0.05$).

Table 4: Prevalence of Trematode with respect to Gender of children

Sex	samples examined	No. Positive	Prevalence (%)
Male	50	3	6.00
Female	50	3	6.00
Total	100	6	(6.00%)

$x^2 = 0.17$, df = 1; $p<0.05$.

Prevalence of Nematodes with Respect to Age of children

The age related prevalence of nematode showed that children within the age range 5 – 7 had the highest prevalence of 65.00%, followed by children within 2 – 4 had 55.00%, children within 8 – 10 had 50.00%, children within 14 – 16 had 45.00%, and children within 11 – 13 had the least prevalence of 40. 00%. The results showed a highly significantly difference ($P<0.05$) between the infection and age.

Table 5: Prevalence of Nematodes with respect to Age of children

Age	No. of Nematodes examined	No. Positive	Prevalence (%)
2 – 4	20	11	55
5 – 7	20	13	65
8 – 10	20	10	50
11 – 13	20	8	40
14 – 16	20	9	45
Total	100	51	(51.00%)

$x^2 = 0.945$, df = 4; $p<0.05$.

Prevalence of Cestodes with respect to Age of children

The age related prevalence showed that, children within the age range 5 – 7 and 11 – 13 had the highest prevalence of 20.00%, followed by children within 8 – 10 and 14 – 16 had 15.00% and children between 2 – 4, had the least prevalence of 5.00%. The result showed a highly significant difference ($P<0.05$) between infection and age ($x^2 = 1.825$, df = 4, $p<0.05$).

Table 6: Prevalence of Cestodes with respect to Age of studied children

Age	No. of samples examined	No. Positive	Prevalence (%)
2 – 4	20	1	5
5 – 7	20	4	20
8 – 10	20	3	15
11 – 13	20	4	20
14 – 16	20	3	15
Total	100	15	(15.00%)

$x^2 = 1.825$, df = 4; $p<0.05$.

Prevalence of Treamatode with respect to Age of children

The age related prevalence showed that, children within the age of 5 – 7 and 11 – 13 had the highest prevalence of 10.00%, followed by children within 2 – 4 and 8 – 10 had 15.00% and children between 14 – 16 had not found to be infected 0.00%. The results show a highly significant difference ($P<0.05$) between infection and age ($x^2 = 2.233$, df = 4, $p<0.05$).

Table 7: Prevalence of Trematodes with respect to Age of children

Age	No. of samples examined	No. Positive	Prevalence (%)
2 – 4	20	1	5
5 – 7	20	2	10
8 – 10	20	1	5
11 – 13	20	2	10
14 – 16	20	0	0
Total	100	6	(6.00%)

$x^2 = 2.233$, df = 4; $p<0.05$.

Table 8: Differential prevalence of parasites recovered from studied children

Species of parasites	Class of parasites	Prevalence (%)
Ascaris lumbricoides	Nematode	29
Strongyloides stercorcilis	Nematode	7
Ancyclostoma duodinale	Nematode	6
Trichuris trichura	Nematode	5
Enterobius vermicolus	Nematode	2
Necator americanus	Nematode	2
Schistosoma mansoni	Cestode	5
Fasciola buski	Cestode	4
Schistosoma hematobium	Cestode	3
Schistosoma japanicum	Cestode	1
Fascioliasis nana	Cestode	1
Fasciola hepatica	Cestode	1
Taenea saginata	Trematode	3
Hymanolepsis nana	Trematode	2
Taenea solium	Trematode	1

Species of parasites recovered from children

The differential prevalence of nematodes recovered from this study were *Ascaris lumbricoides* 29%, *Strongyloides stercorcilis* 7.00%, *Ancyclostoma duodinale* 6.00%, *Trichuris trichura* 5.00%, *Enterobius vermicolus* 2.00% and *Necator americanus* 2.00%.

While the trematodes recovered were- *Schistosoma mansoni* 5.00%, *Fasciola buski* 4.00%, *Schistosoma hematobium* 3.00%, *Schistosoma japanicum* 1.00%, *Fascioliasis nana* 1.00% and *Fasciola hepatica* 1.00%.

The cestodes recoverd were *Taenea saginata* 3.00%, *Hymanolepsis nana* 2.00% and *Taenea solium* 1.00%.

Discussion

The results of this study showed high occurrence of intestinal helminthiasis among children examined, which indicate that, out of 100, a total of 72 (72.00%) children were infected with various species of helminths.

The higher prevalence of the infection in the area is attributed to the higher level of unhygienic habits, poor sanitary conditions, illiteracy and absence of basic social amenities among the respondents which ensures and enhance transmission. The area generally lacks basic social amenities as potable/clean drinking water, health facilities and schools. People defecate indiscriminately in open areas and near the natural water bodies like river and ponds. All these factors contribute and promote the spread such kind of parasite infections (WHO 1980) [24].

The high prevalence of nematode infection 51.00% was followed by those infected with cestodes 15.00% and least prevalence 6.00% was found in those affected with trematodes.

The high prevalence of nematodes infection among studied children (specially males) may be due to the fact that the respondents were mainly from village or other poor settlements, their parents can't afford public schools so, they attained Quranic school which open only for two hours in morning (8-10) and two hours in the evening (4-6). After school these children play football in their streets; mainly in sand and from there they get such kind of infections. After playing they continue with their study in the evening time and without taking bath or even washing their hands they eat food when provided. Many of the nematodes reported in this study are ported to the new hosts either through contaminated food and water (*A. lumbricoides, T. tricura* and *E. vermicolus*) or through penetration through skin (*S. stercoralis, A. deodenale* and *N. americanus*). These habits are very common in the studied children, due to poverty they walk bare footed and some of them are also involved in farming as they help their father in farming field; due to insufficient availability of food; when ever the food is available, they just rush to it without thinking of washing their hands; here use of night soil (untreated human faeces) as fertilizer is also very common (as poor farmers can not afford buying synthetic or organic fertilizer) which serves another foci of infection. This alarming prevalence of nematode infection can impair over all physical (Jardim-Botelho *et al*. 2008) [13], and mental growth, (Jardim-Botelho *et al*. 2008; Hadidjaja *et al*. 1998) [14, 10], and affect nutritional status and general development of children (Crompton and Nesheim 2002) [7]. High prevalence rate of *A. lumbricoides* can lead to Ascaris pneumonia and disturb normal function of brain, spinal cord, heart and kidneys; while infection caused by *S. stercoralis* can lead to haemorrhages in lung alveoli and bronchopneumonia, anal and intestinal lesions with blood and mucus in stool (Chatterjee, 2009) [5]; *A. deodenale* can cause dermatitis, pneumonia and anaemia (Chatterjee, 2009) [5]. In case of heavy infection, Trichuriasis can cause acute appendicitis, diarrhea and prolapse of rectum, while American hookworm can lead to inflammation of the vermiform appendix (Chatterjee, 2009) [5].

This result is consistent with the report of (Mafiana 1995; Owhoeli and Wink 2011) [16, 18]. Although the highest recorded nematode infection was in case of *A. lumbricoides* which can be due to the fact that a fertile, mature female *Ascaris lumbricoides* lay more than 200,000 eggs per day (Chatterjee 2009) [5]; and hence the maximum output of excreated eggs in faeces of infected person. *A lumbricoides* together with *Ancylostoma duodenale*, *Necator americanus*, *Ascaris lumbricoides* and *Trichuris trichiura* are among the most prevalent organisms on the planet, estimated to infect almost one-sixth of the global population (Hotez 2009) [12].

The higher prevalence of nematode infection based on children gender was observed among males 66.00% compared to the females 36.00%.

It has been recorded that cestode infection is not frequent in children living in tropical poverty as they have limited access to meats that serve as sources of infection (Hall *et al*. 2008) [11], but in this study we found a different figure because in this environment vegetables are much more expensive than meat and poor population can't afford vegetables. A part from this poor population also prefer bush meat and meat from other sources. Prevalence rete of cestodes can be as a result of eating undercooked food or even in some communities people eat raw meet dried in sun. Infection with cestodes can lead to stomach discomfort, chronic indigestion and anaemia (Chatterjee, 2009) [5].

Infection with trematodes, male and female both had similar prevalence of 6.00% in the study area, which might be attributed to their frequent exposure to infective places such as the faecally polluted soil which, most of the time serve as their play grounds, and infected water bodies where they usually swim, bath and wash their cloth can serve as source of infection (Akogun and Badaki, 1998) [1]; whether females generally are restricted to their houses and do not frequently go for all above stated purpose, so they are less exposed to the sources of infection. In case of similar infection rate among males and females it can be concluded that females are getting similar infections even when they are restricted to their houses because they help in cooking in their houses and while cooking they use to taste the uncooked/undercooked food, which can be a source of infection for them. In general highly prevalent trematode in this part of world is *S. haematobium* (Singh *et al*., 2016) [21], but may be due to the limitation of diagnostic mode (stool microscopy) few eggs were recorded. *S. mansoni* which was most prevalent among trematodes cause peripheral cirrhosis; *S. japanicum* is characterizes by palpable spleen and tenderness of liver, stomach discomfort, and S. haematobium can cause local dermatitis, painful terminal haematuria, irreversible fibrosis and bladder cancer (Chatterjee, 2009) [5].

The prevalence rate with respect to age showed that children within the age of 5 – 7 had the highest prevalence of nematodes 65.00%, cestodes 20.00% and trematodes 10.00%. The increase in the prevalence of the infection within this age group (5 – 7 years) might be attributed to the fact that those children, most of the time engaged themselves in the activities that exposed them to the sources of infection such as playing in faecally polluted soils, indiscriminately defecating around houses, eating unwashed fruits and vegetables as reported by (Akogun and Badaki 1998) [1]. Also at this age their immune system is not strong

enough and low immunity cause rapid growth and reproduction of parasites in their body. This is in line with the work conducted by (Akogun and Badaki 1998) [1] in Port Harcourt, River State, Nigeria and Kasssem *et al* 2007 [14]; Park *et al*. 2004 [19]. Such a high level of infection specially with nematodes and other treamatodes like *S. japonicum* or *T. trichiura* can cause higher levels of anemia than would be expected with single infections (Ezeamama *et al*., 2008) [9].

In summary, GI parasitic infection will remain responsible for untold childhood morbidity as long as poverty exists. Yet efforts to reduce GI parasites in communities have shown potential to be highly effective when they focus on reducing exposure and increased drug delivery in the local context. Additional research on recent global demographic shifts and these parasites will need to be actively pursued to guide control endeavors. Improvement in domestic water supplies with the introduction of piped and closed sewerage systems is likely to have the most marked impact in decreasing overall infection rates. Investment in public works at large would also go a long way (Utzinger 2008; Knopp *et al*., 2009) [22, 15].

References

1. Akogun OB, Badaki J. Intestinal Helminthes infection in two communities along the Benue River valley, Adamawa State. African Journal of Parasitology. 1998; 19:67-72.
2. Behraman RE, Kliegman RM, Nelson WE, Vaughan VC. Textbook of Pediatrics. W.B. Sanders Publishers Company Ltd. 1996, 964.
3. Brooker S, Clement AC, Bundy DA. Global epidemiology, ecology and control of soil transmitted helminth infections. Advances in parasitology. 2006; 62:221-261.
4. Brooker S, Hotez PJ, Bundy DA. Hookworm related anaemia among pregnant women: a systemic review. PLoS neglected tropical diseases. 2008; 2(9):291.
5. Chatterjee KD. Parasitology: Protozoology and Helminthology, Thirteenth Edition, Thompson press, India, 2009.
6. Cheesbrough M. District Practice in Tropical Countries, Part I. London: Cambridge University Press. 1998, 194-235.
7. Crompton DW, Nesheim MC. Nutritional impact of intestinal helminthiasis during the human life cycle Annual Review of Nutrition. 2002; 22:35-59.
8. De Silva NR, Brooker S, Hotez PJ, Montresor A, Engles D, Savioli L. Soil transmitted helminth infections: updating the global picture. Trends in parasitology. 2003; 19(12):547-551.
9. Ezeamama AE, McGarvey ST, Acosta LP *et al*. The synergistic effect of concomitant schistosomiasis, hookworm, and trichuris infections on children's anemia burden. PLoS Neglected Tropical Diseases. 2008; 2(6):e245.
10. Hadidjaja P, Bonang E, Suyardi MA, Abidin SA, Ismid IS, Margono SS. The effect of intervention methods on nutritional status and cognitive function of primary school children infected with *Ascaris lumbricoides* American Journal of Tropical Medicine and Hygeine. 1998; 59(5):791-795.
11. Hall A, Hewitt G, Tuffrey V, de Silva N A review and meta-analysis of the impact of intestinal worms on child growth and nutrition. Maternal and Child Nutrition. 2008; 1:118-236.
12. Hotez PJ, Fenwick A, Savioli L, Molyneux DH. Rescuing the bottom billion through control of neglected tropical diseases. Lancet. 2009; 373(9674):1570-1575.
13. Jardim-Botelho A, Brooker S, Geiger SM *et al*. Age patterns in undernutrition and helminth infection in a rural area of Brazil: associations with ascariasis and hookworm. Tropical Medicine and International Health. 2008; 13(4):458-467.
14. Jardim-Botelho A, Raff S, Rodrigues Rde A *et al*. Hookworm, *Ascaris lumbricoides* infection and polyparasitism associated with poor cognitive performance in Brazilian schoolchildren. Tropical Medicine and International Health. 2008; 13(8):994-1004. Kasssem HH, Zaed HA, Sadaga GA. Intestinal parasitic infection among children and neonates admitted in Ibn-Sina Hospital, Sirt, Libya. Journal of Egypt society of parasitology. 2007; 37(2):371-380.
15. Knopp S, Glinz D, Rinaldi L *et al*. FLOTAC: A promising technique for detecting helminth eggs in human faeces. Trans. Royal Society of Tropical Medicine and Hygiene. 2009; 103(12):1190-1194.
16. Mafiana CF. Intestinal helminthiasis (with particular reference to *Ascariasis* among children in Ilewo-Orile, Ogun State Nigeria. Nigerian Journal of Parasitology 16:47-55.
17. Made AB. Nigeria, A People United a Future Assured. Survey of States 1995; 2:547-550.
18. Owhoeli LT, Wink M. The pin worm *Enterobius vermicularis* in primary care. 2011; 18:13-23.
19. Park SK, Kim DH, Deung YK *et al*. Status of intestinal parasite infection among children in Bat Dambang, Cambodia. Korean journal of parasitology. 2004; 42(4): 201-203.
20. Sharma BK, Rai SK, Rai SK, Choudhury DR. Prevalence of intestinal parasitic infestation in school children in the northeastern part of Kathmandu Valley, Nepal. Southeast Asian journal of tropical medicine and public health. 2004; 35(3): 501-505.
21. Singh K. Muddasiru D, singh J. Current Status of Schistosomiasis in Sokoto, Nigeria. Parasite Epidemiology and Control. 2016; 1:239-244.
22. Utzinger J, Rinaldi L, Lohourignon LK *et al*. FLOTAC: a new sensitive technique for the diagnosis of hookworm infections in humans. Trans. Royal Society of Tropical Medicine and Hygiene. 2008; 102(1):84-90.
23. Vince JD, Ashford RW, Gratten MJ. Strongyloids species infection in oedema. Papua New Guinea Medical Journal. 2001; 22:12-127.
24. WHO. Epidemiology and control of Schistosomiasis, Public Health Significance of Intestinal parasitic infections. Technical Report Series. 1980; 643;18-23.
25. WHO. Laboratory Methods in Medical Parasitology, WHO. 1991, 1-31.
26. WHO. Health Education and Control of Schistosomiasis. WHO Manual, Geneva, 1998.
27. WHO. The control of schistosomiasis. Second Report of WHO Expert Committee, WHO/TSR. 2005; 830:1-26.