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Prevalence of Intestinal Nematodes among Selected School Pupils in K-Vom Community Jos-South Local Government Area, Plateau State

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Abstract. The prevalence of intestinal nematodes was determined among 120 pupils aged 6-12 which consist of 57 males and 63 females in K-Vom community of Jos South L.G.A Plateau State. The fecal samples collected were examined microscopically using wet preparation (saline and iodine method) and concentration method using Formol ether concentration techniques for presence of intestinal nematodes and other intestinal parasites. The results obtained show zero prevalence of intestinal nematodes, with low prevalence of other intestinal parasites (14.17%), where *Entamoeba coli* consist of 12.5% while *Hymenolepis nana* consist of 0.83% and *Taenia saginata* 0.83% with 85.83% negative samples. Other intestinal parasites infection rates were highest among age group 10-12 years (9.17%) compared with (5.0%) in age group 6-9 years. Other intestinal parasites infection rates were higher in males 8.33% compared with 5.83% in females. There was zero percentage prevalence of intestinal nematodes across all classes but Class 4 and Class 6 have higher number of other intestinal parasites (3.33%) than Class 2 and 3 (2.5%), Class 5 (1.67%) and Class 1 (0.83%). A relatively low prevalence rate was obtained in this study showing improved personal hygiene among the pupils and proper sewage disposal in the area but more effort is needed to completely eradicate these parasites for a single infected individual can re-infect others.

Keywords: Prevalence, Intestinal nematodes, Intestinal parasites, Pupils, K-Vom community

Introduction

Nematodes are bilaterally symmetrical, elongated and usually tapered at both ends. The sexes are separate in most species, but some are hermaphroditic (i.e. have both male and female reproductive organs in the same specie). The intestinal nematodes include: *Necator americanus and Ancylostoma duodenale* (Hookworm), *Trichuris trichuria* (Whipworm), *Enterobius vermiculairs* (Pinworm), *Ascaris lumbricoides* (Roundworm), *Strongyloides stercoralis* (Threadworm) (Stepek, 2006).

Intestinal nematodes infection are globally endemic: affecting the health, growth and development of children worldwide. Day care and primary school are some of the environments where children are potentially exposed to infections.

Intestinal parasitic infections are widely distributed throughout the world. Mortality and mobility rates of these infections are significant in developing countries. Infections are mainly transmitted via ingestion of water, soil or food contaminated by faeces containing the eggs or larvae of helminths (Sarki *et al*., 2012). It has been revealed that more than three billion people are infected with intestinal parasites (Anvari, 2014), with children being more susceptible and constitute the greatest risk population and can contribute to malnutrition especially in children of primary schools.

Majority of them living in resource poor settings, 80% of these live in Sub Sahara Africa (Davis *et al*., 2003). However, recent report by WHO (2011) put the figure at 800 million infected children who are in need of treatment.

Intestinal nematodes infections are among the most common and neglected infection worldwide (Hotez *et al.*, 2008), they are among the most prevalent afflictions of human living

in areas of poverty in the developing world. According to Chan (1997), the prevalence of intestinal nematode infections has remained unchanged in over 50 years, with 39 million disability adjusted life years (DALYS) lost due to these parasites when compared with 35.7 million lost to malaria. Of the 342 helminth species that infect humans (Crompton, 1999), the species of greatest medical importance are *Ascaris lumbricoides* (Round worm), *Ancylostoma duodenale* and *Necator americanus* (Hookworms), *Trichuris trichiura* (Whipworms), *Enterobius vermicularis* (Pinworms), and *Strongyloides stercoralis* (Threadworm). For more than 50 years, the number of intestinal nematode infection has increased with the global population of over 50% of the world population being affected by the five major intestinal nematode species (Chan, 1997; Horton, 2003).

Epidemiological survey have revealed that poor sanitary condition such as open air defecation and fecal contamination of water bodies are the most important factors leading to intestinal worm infestation (Brooker *et al*., 2008).

The epidemiology of intestinal parasitic (nematode) infection shows that males and females of all age group are affected, but some age groups are more vulnerable than others. Various studies have shown that the socioeconomic situation of an individual is a very important factor that determines the chances of intestinal nematode infections, having a greater incidence in the children (Udonsi *et al.,* 1992). WHO (2002) reported that one or more species of intestinal nematodes infected 250 million people in sub-Saharan African alone. This is probably due to the poor housing, overcrowded living conditions, lack of adequate sanitation and hygiene and poor education and health care, in these areas (Conway *et al.,* 1995). Nevertheless, they are most common in crowded environments particularly in school children (i.e. children are at high risk of getting infected because they play in soil, walk around barefooted and eat food without washing of hands) and are spread easily between all family members, with frequent reinfection (Gonzales *et al*., 1987; Cook, 1994; Kucik *et al.,* 2004).

The African medical and research foundation in 2007 indicated that the young children that are particularly affected by intestinal helminths are from poor background, citing failure to use latrine as the major reason for the increase in the spread, as reported by Awoyeni *et al.* (2005).

In Nigeria, ascariasis is very prevalent especially among children (Holland *et al*., 1992). Ascaris-related abdominal complications are usually among major causes of hospitalization in pediatric surgery wards. In Nigeria, a survey of intestinal helminthiases conducted on 766 primary school children aged 5-16 years by Holland *et al.* (1989) found the prevalence of *A. lumbricoides*, *T. trichiura*, and Hookworm at 88.5%, 84.5% and 33.1% respectively, helminthiasis are the second leading cause of mortality in children. This was part of a larger study to identify risk factors for intestinal parasitism and to determine its relationship to the health and nutritional status of infected children.

Parasitic infections are a major medical problem throughout the world, especially in developing countries where they cause more morbidity and mortality than other infectious diseases and are the primary cause of death.

It is estimated that there are 3.5 billion cases worldwide, of which 450million are individuals who are seriously ill as a result, the majority of who are children and approximately 125000 deaths occur per year and these are mainly due to infections with *Ancylostoma duodenale* and *Necator americanus* (Hookworm) or *Ascaris lumbricoides* (Roundworm) (Stepek *et al.*, 2006).

The five (5) gastro intestinal nematode species of major importance are; *Ascaris lumbricoides, Trichuris trichiura, Enterobius vermicularis, Strongyloides stercoralis* and Hookworm. This five nematodes species are all highly specific to humans with no animal reservoirs of infection for any species. Although some animal species such as pigs, can

become infected with the human gastro intestinal nematodes, the life cycle cannot reach completion in these foreign host. The eggs or larvae of all the major nematodes, with the exception of *Enterobius vermicularis*, require a period of development in the soil to become infective before transmission to the human host. This requirement, combine with a similar geographical distribution, generate a high frequency of concurrent multiple species infection (usually *Ascaris lumbricoides* and *Trichuris trichiura*) (Booth & Bundy, 1992), especially in area where several species are sympatric.

Infection with *Ascaris lumbricoides* and *Trichuris trichiura* are more likely to be transmitted within the domestic situation where eggs may persist in household dust, whereas Hookworm infection are more often transmitted in the field where shoes are worn infrequently, whereas Ascaris and Trichuris can only infect via oral ingestion. Hookworms can only infect the host by skin penetration. This is why the wearing of shoes is a major factor in the prevention of Hookworm transmission (Killewo *et al.*, 1991).

The life cycle of *Enterobius vermicularis* differs from that of the other major human gastro intestinal nematode. The majority of the infective eggs are ingested or inhaled and swallowed after being coughed up and hatch in the small intestine where they release the first larvae stage. These first larvae stage undergo four molting to the adult stage usually in the large intestine and the appendix. Gravid females then migrate to the anus and deposit eggs on the peri-anal skin (Whitfield, 1993; Wakelin, 1996).

Literature Review and Discussion

Ascaris lumbricoides

Ascaris lumbricoides is the "large roundworm" of humans, growing to a length of up to 35cm (14ince). In 1758, Linnaeus named them *Ascaris lumbricoides*. In 1855, Ascaris eggs were found in human faeces by Henry Ransom in England then it was described in the literature two years later by Casimir Joseph (Grove, 1986). In 1886, Salvatore Calandruccio in Italy successfully infected a boy to whom he had given 150 eggs. Development was thought to occur directly within the bowel lumen (Grove, 2014).

Hookworm

Hookworm infection is an infection by the type of intestinal parasite known as a hookworm. Italian physician Angelo Dubini was the Modern-day discoverer of the worm in 1838 after an autopsy of a peasant woman. Dubini published details in 1843 and identified the species as *Ancylostoma duodenale* in an 1880 paper, physicians Camillo Bozzolo, Edoardo Perroncito and Luigi Pagliani correctly hypothesized that hookworm was linked to the fact that workers had to defecate inside the 15 km tunnel and many wore worn-out shoes (Peduzzi & Piffaretti, 1983).

The work environment often contains standing water sometimes knee deep, and the larvae was capable of surviving several weeks in the water, allowing them to infect many of the workers. In 1897, it was established that the skin was the principal avenue of infection and the biological life cycle of the hookworm was clarified.

Trichuris trichiura

Trichuris trichiura is a parasitic round worm (a type of helminth) that causes trichuriasis (a type of helminthiasis which is one of the neglected tropical diseases). When it infects a human large intestine, it is commonly known as the whipworm which refers to the shape of the worm; it looks like a whip with wider "handles" at the posterior end. The first written record of *Trichuris trichiura* was made by the Italian anatomist Giovanni Battista Morgagni, who identified the present of the parasite in a case of worms residing in the colon

in 1740. An exact morphological description and accurate drawings were first recorded in 1761 by Johann George Roaderer, a German physician.

Enterobius vermicularis

The earliest known instance of pinworm is evidenced by Pinworm egg found in coprolite; carbon dated to 7837 BC at Western Utah (Cook *et al.*, 1994). Pinworm infection is not classified as a neglected tropical disease unlike many other parasitic worm infections (WHO, 2014). Garlic has been used as a treatment in the ancient cultures of China, India, Egypt and Greece (Petrovska & Cekovska, 2010). *Enterobius vermicularis* is widely known as the human pinworm due to the female's long pointed tail.

Strongyliodes stercoralis

Strongyloides stercoralis is a human pathogenic parasitic roundworm causing the disease strongyloidiasis. Its common name in the United States is threadworm. In the United Kingdom and Australia however, the term threadworm can also be referred to nematode of the genus Enterobius, otherwise known as Pinworm (Vanderkoo, 2000).

Mortality and Morbidity

Intestinal nematodes infections are a major medical problem throughout the world, especially in developing countries where they cause more morbidity and mortality than other infectious diseases and are the primary cause of death. Nematodes infections of humans still occur in large number, over a billion people harbor one or several species of this long-lived parasite. Improved sanitation and vector control are important long-term solutions for elimination of human nematodes infections, but current strategies rely heavily on chemotherapy (Knopp *et al*., 2012). The deployment of nematodes chemotherapy varies with region and goals. Infections in the developed world are typically diagnosis-based and treatment is aimed at complete elimination of the parasites.

Epidemiology

Gastrointestinal nematodes epidemiology is driven by host, environmental conditions. Adverse effect from gastrointestinal nematodes on their host are caused by tissue damage, nutrient absorption, immuno-pathologic effect and reduced food intake induced by hormonal changes. Weather and micro-environmental factors influences the development and survival of free living parasitic stage. A holistic control approach entails the consideration of environmental, immunological and socio-economical aspect of nematodes epidemiology (Brooker, Clement, & Bundy, 2006).

Distribution across Sex and Age

Sex: Nematodes infections has no sex prediction.

Age: *Enterobius vermicularis*, *Ascaris lumbricoides* and hookworm are more common in children than adult (Guyatt *et al.*, 1990).

Symptoms

Common symptoms of intestinal worms are:

- Abdominal pain.
- Diarrhea, nausea or vomiting.
- Gas and bloating.
- Fatigue.
- Unexplained weight loss.
- Dysentery.

- Rash or itching around the rectum or vulva.

Complications

Several clinical signs and symptoms can occur in patients with nematode infections:

- Lung invasion syndrome (Ascariasis, Hookworm infections and Strongyloides).
- Fever.
- Cough.
- Blood-tinged sputum.
- Dyspnoea.
- Pulmonary consolidations.
- Asthma.
- Vomiting worms.
- Liver abscess.
- Bowel penetration.
- Anaemia, hypo-proteinemia.
- Intestinal obstruction, volvulus.
- Worms migration to common bile duct.
- Intussusception.
- Biliary colic.
- Peritonitis.
- Upper G.I bleeding.
- Acute Pancreatitis.
- Acute Cholangitis.
- Small bowel obstruction.
- Hepatic Abscess.
- Acute Cholecystitis (Marcos *et al.,* 2008).

Prevention and Control

The best way to prevent people from getting infected include;

- Avoid ingesting of soil that has been contaminated with human faeces, including waste water.
- Wash your hand with soap and water before handling food.
- Teach children the importance of washing hands to prevent infection.
- Keeping finger nails short.
- Frequent washing of hands before meal and after defecation.
- Good personal hygiene.
- Treatment of infected cases and all others in the family or institution.
- Fingers should not be mouth sucked as habit.
- Washing bed liners and night dresses daily.
- Sanitary disposal of faeces.
- Food hygiene.
- Environmental sanitation.
- Avoid eating uncooked and unwashed vegetables.
- Avoid walking bare footed (Albonico *et al.,* 2006).
- There should be a public awareness to people by the government, T.V stations, radio stations, and social media and there should be a frequent medical outreach (Segarra-Newnham, 2007).

Treatment

The treatment of choice of intestinal nematodes are;

- Albendazole or Mebendazole: single dose or short course regimens with these oral agents: Albendazole 400mg once, Mebendazole 500mg once.
- Prednisolone: Once daily for the duration of treatment.
- Piperazine is currently preferred.
- Invermectin.
- Thiabendazole.
- Anthelminthic.
- Benzimidazole (Albonico *et al.*, 2003).

Materials and Methods

Study Area

The study was conducted in St. Mathew Primary School, NVRI Staff School, and St. Andrew's Primary School in K-Vom community, Jos-South Local Government Area Plateau State.

Study Subject

Pupils in the above named Primary schools in K-Vom community, Jos South L.G.A.

Study Period

The study was conducted throughout the period from April 2022 to July 2022.

Study Population

120 stool samples were collected in both male and female school children aged 6-12 years in K-Vom community Jos-South Local Government Area.

Study Design

It was a cross sectional school based study to estimate the distribution of intestinal nematodes among school children.

Sample Size

Stool samples were obtained from 120 school children, randomly selected.

Specimen Collection

Stool specimens were collected from 40 pupils each across three different schools in K-Vom community, Jos South L.G.A.

Methodology

Wet Preparation Using Saline Method

Procedure;

- Take a clean grease free slide
- Add one drop of physiological saline and add a pea size of the formed stool sample or a drop of watery stool
- Emulsify it properly using an applicator stick
- Remove coarse particles
- Place a cover slip avoiding air bubbles and over floating
- Examine under the microscope using x10 objective lens and confirm with x40 objective lens (Ochei & Kolhatkar, 2007).

Wet Preparation Using Iodine Method

Procedure;

- Take a clean grease free slide
- Using a Pasteur pipette, add one drop of iodine and add a pea size of the formed stool sample or a drop of watery stool
- Emulsify it properly using an applicator stick
- Remove coarse particles
- Place a cover slip avoiding air bubbles and over floating
- Examine under the microscope using x10 objective lens and confirm with x40 objective lens (Ochei & Kolhatkar, 2007).

Concentration Method Using Formol Ether Concentration Technique

Procedure;

- Unto a clean centrifuge tube, thoroughly mix 1g of stool specimen into 10ml of saline solution
- Filter the emulsion through fine mesh gauge into a conical centrifuge tube
- Centrifuge the suspension at 2000rpm for 10 minutes
- Decant the supernatant and wash the sediment with 10ml of saline solution. Centrifuge again and repeat washing until supernatant is clear
- Decant the supernatant and add 7ml of 10% Formol saline and 3ml of di-ethyl ether to the sediment
- Mix vigorously and allow to stand for 5minutes to effect fixation
- Centrifuge at 2000rpm for 10minutes
- Four layers should result as follows;
  - A top layer of ethyl
  - Plug of debris
  - Layer of formalin and
  - Sediment
- Free the plug of debris from the side of the tube by ringing with an applicator stick. Carefully decant the top three layers
- Unto a clean grease free slide, place a drop of the sediment and a drop of Lugol's iodine and emulsify
- Cover with cover slip avoiding air bubbles and over floating
- Examine under the microscope using x10 objective lens and confirm with x40 objective lens (Williams, 1998).

Results

Table 1: Number of school children according to age group and gender

	No of Pupils	**Percentage (%)**
Age Group (Years)		
6 – 7	30	25
8 – 9	40	33.3
10 – 11	39	32.5
12 and above	11	9.2
Total	**120**	**100**
Gender		
Male	57	47.5
Female	63	52.5
Total	**120**	**100**

The total number of stool samples collected based on age group and gender from our study Centre.

Table 2: Number of school children according to classes

	No of Pupils	Percentage (%)
Classes		
1	18	15
2	23	19.2
3	25	20.8
4	23	19.2
5	20	16.7
6	11	9.1
Total	**120**	**100**

The total number of stool samples collected based on their classes from our study Centre.

Table 3: Distribution of intestinal nematodes and other intestinal parasites according to age group and sex

	Intestinal Nematodes (%)	Other Intestinal Parasites (%)	No Intestinal Parasites seen (%)
Age Group (Years)			
6 – 7	0 (0)	2 (1.67)	28 (23.3)
8 – 9	0 (0)	4 (3.33)	36 (30)
10 – 11	0 (0)	6 (5.00)	33 (27.5)
12 and Above	0 (0)	5 (4.17)	6 (5.0)
Total	**0 (0)**	**17 (14.17)**	**103 (85.83)**
Gender			
Male	0 (0)	10 (8.33)	46 (38.33)
Female	0 (0)	7 (5.83)	57 (47.50)
Total	**0 (0)**	**17 (14.17)**	**103 (85.83)**

The total number of intestinal nematodes and other intestinal parasites compared with no intestinal parasites seen in different age group and gender.

Table 4: Distribution of intestinal nematodes and other intestinal parasites according to classes

	Intestinal Nematodes (%)	Other Intestinal Parasites (%)	No Intestinal Parasites seen (%)
Classes			
1	0 (0)	1 (0.83)	17 (14.17)
2	0 (0)	3 (2.5)	20 (16.67)
3	0 (0)	3 (2.5)	22 (18.33)
4	0 (0)	4 (3.33)	19 (15.83)
5	0 (0)	2 (1.67)	18 (15.00)
6	0 (0)	4 (3.33)	7 (5.83)
Total	**0 (0)**	**17 (14.17)**	**103 (85.83)**

The total number of intestinal nematodes and other intestinal parasites compared with no intestinal parasites seen in different classes.

Table 5: Distribution of intestinal nematodes according to species and other intestinal parasites with no parasites seen

Parasites	Number seen (%)
Nematodes (Round Worm)	
Ascaris lumbricoides	0 (0)
Hookworm	0 (0)
Trichiuris trichiura	0 (0)
Enterobius vermicularis	0 (0)
Strongyloides stercoralis	0 (0)
Total	0 (0)
Protozoa	
Entamoeba coli	
Cestodes (tapeworm)	15 (12.50)
Hymenolepis nana	1 (0.83)
Taenia saginata	1(0.83)
Total	2 (1.67)
No Intestinal Parasites	103 (85.83)

The total number of intestinal nematodes and other intestinal parasites with no intestinal parasites seen.

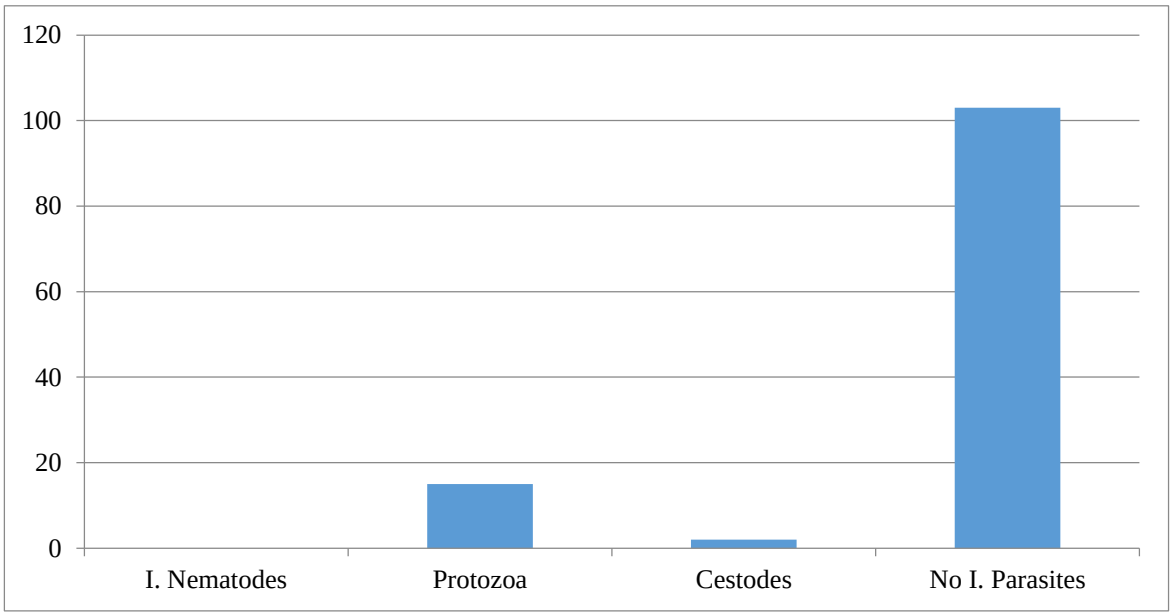

Figure 1: Bar chart displaying total intestinal nematodes and other intestinal parasites with no intestinal parasite seen

Key: I. Nematodes – Intestinal Nematodes; Protozoa – (*Entamoeba. coli*); Cestodes – (*Taenia. saginata*, *Hymenolepsis. nana*); No I. Parasites – No Intestinal Parasites

Discussion

The present study was aimed at establishing the prevalence of intestinal nematodes among selected school pupils in K-Vom community. The results of this study indicated a low prevalence rate of intestinal nematodes and other intestinal parasites. The overall prevalence of intestinal nematodes was 0 (0%) out of one hundred and twenty (120) stool samples collected from the pupils studied. Other intestinal parasites prevalence indicates that Protozoa (*E. coli*) had 15 (12.5%), Cestodes (*H. nana* and *T. saginata*) had 2 (1.67%) combined

together while intestinal parasites was not seen in one hundred and three (103) samples out of one hundred and twenty (120) stool samples, collected. Samples without any intestinal parasites made up of 85.83% out of the total number studied. This study was conducted during rainy season (April-July) of the year which favors the hatching of parasitic eggs or the survival of infective larvae. In this study, the overall prevalence of intestinal nematodes was 0/120 (0%) which was lower than a previous study conducted by Holland *et al.* (1989) among 766 primary school children aged 5-16 years who had prevalence of *A. lumbricoides* 88.5%, *T. trichuria* 84.5% and Hookworm 33.1 %. These differences in prevalence may be attributed to the total number of samples studied (120) as compared to 766 samples studied by Holland, et al and to the living standard of the population and the geographical location of the study area. Improved sanitary conditions might have also accounted for the low incidence rate of intestinal nematodes among the children studied which agree with Sarki *et al.* (2012) who stated that infections are mainly transmitted via ingestion of water, soil or food contaminated by faeces containing the eggs or larvae of helminths.

In this study, intestinal nematodes were zero percentage but other intestinal parasite such as *Entamoeba coli*, *Hymenolepis nana* and *Taenia saginata* was found. The more prevalence of *H. nana* compare to nematodes may be due to that children from the area studied normally eat rodents which are the primary definitive host of *H. nana*. *H. nana* is more prevalence in populations particularly children living in conditions of poverty and poor hygiene. Infections are often asymptomatic but heavy infection may cause crampy abdominal pain, diarrhea, anorexia and non-specific systemic symptoms. The more prevalence of *T. saginata* compared to other intestinal nematodes may be due to high ingestion of beef and pork meat in the area studied. Humans contact Taenia specie from eating raw or undercooked beef and pork meat containing cysticerus (larvae) of the parasite.

The more prevalence of *Entamoeba coli* compared to intestinal nematodes studied may be due to the endemic nature of *E. coli*. *Entamoeba coli* is global in its distribution with the highest prevalence in regions with inadequate sanitation typically in rural areas. *E. coli* is transmitted through fecal-oral route. Typically mature cysts are ingested from contaminated water and food sources. Also, children from the area studied live on high vegetable diet which they consume fresh or half cooked to preserve the taste which predisposes them from contacting this parasite. These findings agree with the study of Brooker *et al.* (2008) who stated that poor sanitary conditions such as open air defecation and fecal contamination of water bodies in our farmland are the most important factors leading to intestinal worm infestation. The data presented in Table 1 shows that age group 8-9 have the highest number of population studied 33.3% while female gender 52.5% were more than males.

The data presented in Table 2 shows that Class 3 have the highest number of pupils studied with 20.8% though there was no much difference in the population of Class 1 to Class 5 with the exception of Class 6 which had fewer population.

The prevalence of intestinal nematodes in different age group was same 0% as well as in male and female but other intestinal parasites seen cut across all age group and gender. Other intestinal parasites were more in males 8.33% than in females 5.83% though there is no much difference existing between them. These observations may be due to the exposure of these pupils to the same school environments.

The prevalence of other intestinal parasites was more from age 10 and above and less from age 6-9 years. This increase in prevalence from age 10 and above might be that this age group attends to their personal care without much contribution from their parents; they are also more involved in outdoor activities where they will be more exposed to soil and water that is feacally contaminated. This is in consonance with the findings of Ozumba and Ozumba (2002) who reported that age 12-17 teenagers had the highest rate of intestinal parasite infection.

The low incidence of intestinal parasite from age 6-9 years as found in this study was contrary to the findings of Ekpenyong and Eyo (2008) who reported from their study that children between the age 4 and 6 years had the highest incidence of *A. lumbricoides* infection and explained this to be due to an underdeveloped immunity to parasitic infections among the children, it would be expected that children aged 6-9 years are being assisted in carrying out their personal care by their parents and as well are restricted to some outdoor activities like farming thus not exposed to soil and water contaminated faeces as well as eating with unwashed hands.

There is no incident of intestinal nematodes across all classes (0%) but there was low incident of other intestinal parasites across all classes. This low incident of other intestinal parasites may be due to improved environmental sanitation and personal hygiene, portal drinking water that exist in the school environments of the pupils studied. This finding is in consonance with the report of Udonsi *et al*. (1992), who opined that improved socioeconomic situation of an individual is a very important factor that diminishes the chances of intestinal parasites in any population.

Table 5 of this study shows no prevalence of intestinal nematodes but low prevalence of other intestinal parasites: *Entamoeba coli* accounting for 12.5% while *Hymenolepis nana* and *Taenia saginata* accounted for 1.67% combined together. The low incident of these intestinal parasites may be due to improved hygiene among the studied population or due to their geographical location (semi-urban region).

Conclusion

This study had documented a no prevalence of intestinal nematodes with low prevalence of other parasites among the pupils studied who were not diarrhea patient and do not manifest any symptoms of parasitic intestinal infection. Out of one hundred and twenty (120) samples collected from the pupils, no sample was positive for intestinal nematodes but seventeen (17) samples were positive for other intestinal parasites with one hundred and three (103) samples being negative. The low prevalence of intestinal parasites and nematodes may be due to moderate personal hygiene, environmental sanitation and regular deworming among the pupils studied. Males were more infected than females and all age groups have at least one intestinal parasite infections with *Entamoeba coli* (protozoa) being the most prevalent.

Recommendation

Despite the low prevalence rate recorded in this study, efforts should be made to inculcate in children the importance of proper personal hygiene such as washing of hands before and after eating and washing of hands after visiting a toilet. This effort may further help in reducing the prevalence rate of intestinal parasite infection among the pupils studied. Drug treatment should be given to those already infected to alleviate their suffering and prevent the parasite they harbor from passing into the environment to infect others.

Hygienic food preparations, and health education to encourage individuals to adopt proper personal hygiene. Also, more samples, say 500 should be studied to confirm no prevalence of intestinal nematodes and low prevalence of other intestinal parasites as obtained from this study.

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