



Prevalence of Intestinal Parasitic Helminths from the Fingernails of Primary School Pupils in Makurdi Benue State

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Authors' contributions

This work was carried out in collaboration among all authors. Author ZYH designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors LK and OOP managed the analyses of the study. Author OOP managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Intestinal helminth infections are widely distributed throughout the world and children are the most affected population. The present study was carried out to assess the prevalence of intestinal helminths in children of primary schools in Makurdi, Benue State. Sterile cotton balls soaked in 10% formol saline were used to swab the underneath of the fingernails to collect 200 nail dirt samples from the school pupils of different ages and gender. The parasites were isolated from the dirt of both gender and prevalence was recorded. The direct mount method was used in the identification of parasites. The prevalence of parasites was presented as descriptive statistics, while the relationship between several variables (such as age and gender) and the presence of parasites were determined by Chi-square test. The level of significance used was $P < 0.05$. The highest prevalence was observed for *Ascaris lumbricoides* (35%) whereas the lowest prevalence was found for *Strongyloides stercoralis* (15%). The other parasite found was *Ancylostoma*

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duodenale (30%). Overall prevalence was found to be 10%. The prevalence of intestinal parasitic helminths was found to be higher in males with 13.19% than in females with 7.34%. There was no significant difference in the prevalence of the infection among gender. The distribution of intestinal parasitic helminths among the selected primary schools indicated that there was no significant difference in the occurrence of the helminths between the schools. The occurrence of fingernail parasites among children in primary schools can cause chronic infections which can negatively affect all aspects of children's health.

Keywords: *Intestinal helminthes; prevalence; fingernail; Makurdi; children.*

1. INTRODUCTION

Intestinal parasitic helminths are living organisms that are worm-like in morphology and receive nutrient and protection from their host thereby disrupting the inner activities of the host, inflicting diseases and weaknesses [1]. It has been estimated by the World Health Organization (WHO) that about 270 million pre-schools and over 600 million school children in the third world countries live in areas where the helminth parasites are endemic and are easily transmitted. Thus, such areas are in dire need of treatment and preventive interventions. Moreover, intestinal parasitic helminths have a cosmopolitan preponderance. However, their endemicity depends on parameters like socio-demographic factors, poverty, reduced access to adequate sanitation, lack of potable water, illiteracy, local customs such as the use of human and animal fertilizers, lack of access to modern healthcare facilities, and prevailing climatic as well as environmental conditions [1]. Prevalence of parasites amongst school-aged children occurs throughout the developing world. The prevalence in Nigeria has also been found to be high; the research survey among primary school children in Port Harcourt, Nigeria recorded 42.7%, with the prevalence of hookworm 16.0%, *Ascaris lumbricoides* 15.4%, *Strongyloides stercoralis* 3.0% [1]. This is not unconnected with the dirty habits of children by way of regular contact with fecal contaminated soil, the handling and eating of foods with unwashed hands that have been contaminated with the soil and faeces [2]. Thus, the presence of helminths in fingernails is an indication of one of the major routes of transmission of the parasites. Indeed, it is a clear indication of the presence of an active infection or a source of parasitic infection. All these tend to favour the transmission of parasites [3]. This study aimed to investigate the prevalence of intestinal parasitic helminths from the fingernails of primary school pupils in Benue State and determine the source of infection as an indicator of the overall hygienic standard of children from this area.

2. MATERIALS AND METHODS

2.1 Study Area

This study was carried out in Makurdi, the capital of Benue state, North Central of Nigeria which is located in the heart of Guinea Savannah zone. The town lies between latitude 7°15' and 7°45' N and longitude 8°15' and 8°42' East [10]. The major languages in Makurdi are the Tiv, Idoma and Iggede, other languages are the Etulo, Igbo, Jukun and Hausa. It also experiences typical tropical climate with two distinct seasons: the wet season which has duration from April to October and the dry season which also has duration from November to March.

2.2 Study Population

Dirt samples of fingernails were taken from pupils of the various schools on the appointed days in their schools; the samples were taken randomly from 50 pupils from four (4) selected schools located within the urban settlement to give a total of 200 samples. The condition of the pupils fingernails, whether trimmed or untrimmed were noted. Trimmed nails were those that had been cut and showing no visible hyponichium. Untrimmed nails were showing visible nail out growth.

2.3 Ethical Consideration

Before embarking on the study, permission was sought from the authorities of the schools after educating them on the significance of the study. Parents of participating pupils were also notified about the study for them to consent. Permission to undertake the study at the Baz Medical Laboratories, Makurdi was sought and granted by the laboratory management.

2.4 Questionnaire Administration

Each selected individual was properly briefed on the objectives of the investigation and once an informed consent was obtained, they were

administered structured questionnaire by participatory approach. Information obtained included name, age, school, class, gender, knowledge, attitude and risk factors to intestinal helminths.

2.5 Sample Collection

Prior to the day of specimen collection, dates were previously arranged with the headmasters and proprietors/proprietresses. Sterile cotton balls, soaked in 10% formol saline, were used to swab the underneath of the fingernails of both hands of each pupil. The balls for each pupil were placed in a labelled capped plastic container containing 5 ml 10% formol saline. The samples were thereafter taken to the laboratory for parasitological analysis. Samples of 200 pupils aged between 2 to 18 years were collected.

2.6 Laboratory Examination of Samples

In the laboratory, the cotton balls in each container were rotated using a pair of forceps and rinsed inside the capped bottles using 5ml formal saline to dislodge the swabbed content into the liquid medium. The used cotton balls were then disposed and the content of each bottle was poured into centrifuge tubes and the bottle rinsed with 3ml of ether which was further poured into the centrifuge tubes. The suspension was shaken vigorously for proper mixing inside the tube. Thereafter, the tubes were centrifuged at 2,000 revolutions per minute (rpm) for 2 minutes. The supernatant was discarded leaving the sediment in a small volume of liquid that drained back from the sides of the tubes to their bottoms [3]. The sediment was properly mixed using a pair of forceps, a drop placed on a slide and mixed with a drop of 2% aqueous iodine, a glass cover slide placed on it and examined microscopically at 400 magnification [4].

2.6.1 Dirt sample analysis

The diagnosis of intestinal helminths was confirmed by the recovery of helminths ova and larva from each dirt sample in Baz Medical laboratory. Direct wet mount method was used in the identification of parasites. With a marker, the study identification number was written at one end of the slide and the sediment at the bottom of the centrifuge tube was vigorously tapped on the working table to mix them well and then placed in the centre of the clean grease-free slide. The suspension was carefully covered with

a cover slip in a way as to avoid air bubbles. The slide was then placed on the stage, and the preparation was examined systematically in the dark field of the microscope under the low power (10x) objective so that the entire cover slip area is scanned for parasite ova and larvae. When organisms or suspicious objects were seen, the high dry (40x) objective was used to see more the detailed morphology of the object for confirmation. The method is useful for detecting organism motility, including motile larva forms of *Strongyloides stercoralis* [5].

2.6.2 Identification of parasites

The parasites were identified in respect to their morphology with the help of the laboratory scientists and technicians with special reference to manual guides in the laboratory.

2.6.3 Quality control (QC)

To ensure quality control, all the laboratory procedures including collection and handling of specimens were carried out in accordance with standard protocols. To ensure general safety, disposable gloves were worn and universal biosafety precautions. To ensure accurate identification of parasite species, bench aids for the diagnosis of intestinal parasites and diagrams of various parasites ova and larvae from parasitological texts were reviewed [5].

2.7 Data Analysis

All statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 21. Percentages were calculated in each case. The association between student's demographic variables and prevalence of parasitism was analyzed using Chi-square (χ^2). The differences were considered to be statistically significant when the P-value obtained was less than 0.05 ($P < 0.05$).

3. RESULTS

In the four schools sampled, the prevalence was observed as follows: School A, 2 (4%), School B, 4 (8%), School C, 8 (16%), and School D, 6 (12%). The results indicated that School C had the highest overall intestinal parasitic helminth infection of 16%, while School A had the least overall prevalence of intestinal parasitic helminths infections of 4%. However, there was no significant difference of infection among the schools studied.

The age of the participants ranged from 1-20 years. The proliferation and high rate of intestinal parasitic helminth infection observed within the age group 1-5 years could be attributable to the active nature of the age range. Children of this age bracket tend to be more exposed to contaminated sites and eating food with unwashed hands whereas the older age group tend to be more selective in their choice of food and outdoor activities thereby reducing infection risks through good health habits. The prevalence of intestinal helminths in these schools can be seen in Table 2. There was also no significant difference in the prevalence of the infection among the age groups.

The prevalence of intestinal parasitic helminths is higher in males with 13.19% than in females with 7.34% as presented in Table 3. There was also no significant difference in the prevalence of the infection among gender.

The parasites isolated from the fingernails of primary school pupils in Makurdi were; *Ascaris lumbricoides*, *Ancylostoma duodenale* and *Strongyloides stercoralis*, with prevalence rates of 35%, 30% and 15% respectively. There were no mixed infections. However, there was a significant difference between the occurrence of various intestinal helminths (P value= 0.000) as presented in Table 4, also the results indicated that *Ascaris lumbricoides* infection had the highest occurrence of 35.0% while *Strongyloides stercoralis* infection had the lowest occurrence of 15.0%.

The distribution of intestinal parasitic helminths among the selected primary schools indicated that there was no significant difference in the variables involved i.e. the P -value is greater than 0.05 in each case.

Table 1. General prevalence of intestinal parasitic helminths in pupils from each school

School	No. examined	No. infected	Prevalence (%)	χ^2	p-value
School A	50	2	4.00		0.217
School B	50	4	8.00		
School C	50	8	16.00		
School D	50	6	12.00		
Total	200	20	10.00	4.00	

Table 2. Age related prevalence of intestinal helminths in pupils at study sites

Age bound	No. examined	No. infected	Prevalence (%)	χ^2	p-value
1 – 5	90	10	11.11		0.692
6 – 10	50	6	12.00		
11 – 15	40	2	5.00		
16 – 20	20	2	10.00		
Total	200	20	10.00	1.13	

Table 3. Sex related prevalence of intestinal helminths in pupils at study sites

Sex	No. examined	No. infected	Prevalence (%)	χ^2	p-value
Male	91	12	13.19		0.170
Female	109	8	7.34		
Total	200	20	10.00	1.70	

No significant difference ($P > 0.05$)

Table 4. Occurrence of helminths among the pupils

Helminths	Occurrence	Prevalence (%)	F	p-value
<i>Ascaris lumbricoides</i>	7	35	-213.61	0.000
<i>Ancylostoma duodenale</i>	6	30		
<i>Strongyloides stercoralis</i>	3	15		
Total	16	100		

* There is a significant difference ($p < 0.05$)

Table 5. Distribution of intestinal helminths among primary school pupils in some selected schools in Oju based on helminths observed

School	No. examined	Helminths			Total
		<i>Ascaris lumbricoides</i>	<i>Ancylostoma duodenale</i>	<i>Strongyloides stercoralis</i>	
School A	50	1 ^a	0 ^a	1 ^a	2 ^a
School B	50	3 ^b	0 ^b	0 ^b	3 ^b
School C	50	3 ^c	3 ^c	2 ^c	8 ^c
School D	50	0 ^d	3 ^d	0 ^d	3 ^d
Total	200	7	6	3	16

Same alphabet across a row shows no significant difference with p -value = 0.385 ($p > 0.05$)
 Different alphabets down a row shows no significant difference with p -value = 0.769 ($p < 0.05$)

4. DISCUSSION

In this study, the overall prevalence of intestinal parasitic helminths was 10% (20 out of 200). This finding is lower when compared with Alo et al. [6] who reported a prevalence of 57.2% in Ohaozara, Ebonyi, Nigeria and with Yahaya et al. [7] who reported a prevalence of 54.8% in Birnin Kudu, Jigawa, Nigeria. However, it is in agreement to some extent with Dyek et al. [8], who reported a prevalence of 7% in Pankshin, Plateau State, Nigeria and also with the findings of Okpala et al. [9] who reported a prevalence of 13.8% in Esan West L.G.A. Edo state, Nigeria.

The low prevalence of intestinal parasitism in this study could be attributed to the level of hygiene and clean environment among the primary schools. The primary schools in this study were located in urban areas where there was portable water, proper system of refuse and human waste disposal. However, few primary schools lack these facilities which have led to infection among these pupils when they come in contact with contaminated playing ground [1]. Children of the age group 1-5 years were most infected while the age group 16-20 was least infected. This relationship between the age and intestinal parasites might be due to the increased exposure of children (1-5 years) to soil environment as they like to spend most of their time playing on the floors than their older counterparts [2].

The males were more infected (13.19%) than the females (7.34) though the difference was not significant ($P > 0.05$). About the fingernail, a value of 12.2% of prevalence was found among pupils with untrimmed fingernails, this is also in agreement with Dyek et al. [8] who reported 9.65% of prevalence among pupils with untrimmed nails. In addition, the distribution of intestinal parasitic helminths among the selected

schools revealed that school C had the highest occurrence of helminths infection which is attributed to the condition of their sanitary environment at the time during which the study was conducted. The school was located at a swampy area. When rain falls, it sweeps debris from nearby residents into the school compound making it unfit for the pupils to cope.

Furthermore, the occurrence of the isolated intestinal helminths revealed their prevalence to be: *Ascaris lumbricoides* (35%), *Ancylostoma duodenale* (30%), *Necator americanus* (20%) and *Strongyloides stercoralis* (15%) which were quite in line with the report of Michael et al. [1] who revealed prevalence of *Ascaris lumbricoides* (36.2%), *Necator Americanus* (17.6%) and *Strongyloides stercoralis* (9.0%). Intestinal parasitic helminth infections can cause vomiting, diarrhoea, anorexia, abdominal pain and nausea which may lead to reduced food intake, causing reduced nutrient availability hence contributing to undernutrition in children [10].

5. CONCLUSION

The results of this study have revealed the presence of *Ascaris lumbricoides*, *Ancylostoma duodenale* and *Strongyloides stercoralis* in pupils from selected schools in Oju, Benue state. The occurrence of fingernail parasites among children in primary schools can cause chronic infections which can negatively affect all aspects of children's health, nutrition, cognitive development, learning and educational access and achievement. Therefore, an intervention strategy should be designed and implemented including provision of adequate and safe water supply, regular deworming and health education on personal hygiene to the pupils and to the parents in the study area.

5.1 Limitation and Way Forward for the Study

This study focused on the prevalence of intestinal parasitic helminths from the fingernails of primary school pupils. Treatment of the pupils by deworming was not carried out. The way forward for the study include:

1. Providing education about helminths in the study area as an effective way to reduce the transmission rate.
2. Periodic deworming of pupils in the study area for intestinal parasites.
3. Educating pupils in the study area on the importance of maintaining environmental personal hygiene

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Michael E, Abah A, Marcus P. Intestinal parasite infection among primary school children in Port-Harcourt City Local Government Area of Nigeria: A review for school-based intervention. *Adv.-Tech Clin Microbiol.* 2017;1(4):19.
2. Jonathan W, Abdullah AA, Kumar S. Prevalence and association of parasitic helminths among the cross section of male and female gender groups at University of Guyana, Georgetown, Guyana. *Research Journal of Parasitology.* 2015;10:50-57.
3. Neva AF, Brown WH. *Basic chemical parasitology* (sixth Edition). United States of America: Appleton and Lange Paramount Publishing Business and Professional Group; 1994.
4. Cheesbrough M. Techniques used to identify parasites. In *Medical Laboratory Manual for Tropical Countries*, 2nd edition. Cambridge University Press, Cambridge, UK. 1992;178–193.
5. Osei-Atweneboana MY, Lustigman S, Prichard RK, Boatman BA, Basa'n̄ez MG. A research agenda for Helminth diseases of humans: Health research and capacity building in disease-endemic countries for Helminthiasis control. *PLoS Negl Trop Dis.* 2012;6(4):1-5. DOI: 10.1371/journal.pntd.0001602
6. Alo M, Ugah U, Elom M. Prevalence of intestinal parasites from fingers of school children in Ohaoraza, Ebonyi state, Nigeria. *American Journal of Biological, Chemical and Pharmaceutical Science.* 2013;1(5): 22-27.
7. Yahaya A, Yakubu B, Aisha IT. Prevalence of Intestinal parasitic helminths from fingernails of "Almajiosis" in Birnin Kudu Local Government Area, Jigawa State, Nigeria. *Int. J. Trop. Dis. Health.* 2015;8: 66-74.
8. Dyek ND, Kaga BI, Daduwak MC, Daduwak CC. Prevalence of intestinal parasites under the fingernails of pupils in Pankshin Plateau State, Nigeria. *International Journal of Innovative Research in Technology, Basic and Applied Sciences;* 2016.
9. Okpala HO, Josiah SJ, Oranekwulu MU, Ovie EG. Prevalence of intestinal parasites among children in day care Centres in Esan-West Local Government Area, Edo State, Nigeria. *Asian Journal of Medical Sciences.* 2013;6(4):34-39.
10. Kpurkpur J, Sani A, Nongu C. Prevalence of intestinal parasite infections and their association with nutritional status of rural and urban pre-school children in Benue State, Nigeria. *Int. J. MCH and AIDS.* 2016; 5(2):146-152.

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