



Prevalence of Ascariasis among Children in Makurdi, Benue State, Nigeria

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Authors' contributions

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

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ABSTRACT

This study was conducted to assess the prevalence of ascariasis among children of 1-15 years old in Wadata, Wurukum, Northbank, Fiidi, and Modern market of Makurdi, Benue State, Nigeria. Prevalence of Ascariasis among children was conducted between January to march 2020. A total of 230 stool samples were randomly collected from children of both sexes and analyzed, using formol-ether concentration technique to determine the presence of eggs of *Ascaris lumbricoides*. Out of the samples analyzed, 64(27.83%) were positive for Ascariasis. Wadata had the highest prevalence of 23(35.92%). There was a direct relationship between the parasite load and the location ($P<0.05$). There was also a positive correlation ($P<0.05$) between the parasite load and the family size. Children that were provided with modern toilet facilities had the lowest prevalence 13(20%). Children of farmers recorded 23(35.94%). Hence ascariasis is endemic in Makurdi. There should be grassroots enlightenment on sanitation and hygiene. There is need for provision of screening materials and drugs at affordable rate to all patients. Communities should also embark on environmental sanitation and personal hygiene to curb the menace.

Keywords: Ascariasis; children; Makurdi and Nigeria.

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1. INTRODUCTION

Ascaris lumbricoides is a parasitic intestinal round worm that causes ascariasis in human. Children between 2 to 10 years are the most affected due to the heavy infections they harbour and because of their vulnerability to nutritional deficiencies [1]. Ascariasis is a perfect example of an environmental disease. Human and animal Ascariasis constitutes one of the most important global public health challenges. The disease is widespread and is found worldwide but particularly more common in Sub-Saharan Africa and Southeast Asia [2]. Transmission is through the faecal-oral route; eggs are ingested following contact with faecal or sludge contaminated food or soil, or the deliberate act of eating contaminated soil. It is estimated that more than 1.5 billion people are infected with Ascariasis, representing 25 percent of the world population. A number of features account for its high prevalence including ubiquitous distribution, the durability of eggs under a variety of environmental conditions, the high number of eggs Produced per parasite, and poor socioeconomic conditions that facilitate its spread. Transmission is enhanced by the fact that individuals can be asymptotically infected and can continue to shed eggs for years [3].

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in Makurdi, in Wadata, Wuruku, North bank, Fiidi, and Modern market between the period of January to March 2020. Makurdi is a cosmopolitan city, which is composed of urban population and is characterized by much higher densities of people, poor housing inadequate sanitation and solid waste removal and unsafe drinking water, which means many people are sharing small spaces and, therefore diseases like ascariasis are much more easily transmitted [4].

2.2 Determination of Sample Size

The number of children tested were determined using the formula,

$$n = N / (1+Ne^2)$$

as described by Ojunrogbe et al., (2014) for sample size selection. This formula is generally used to determine the least possible sample size for a particular study in a given population.

This formula $n = N / (1+Ne^2)$ defines;

n =desired sample size

N = general population from where the sampling is done

e = maximum acceptable margin error

1 = theoretical constant

However for the purpose of this study, the National Population Commission (NPC) reported in 2006 census that Makurdi has a human population of about 300, 377 with children population of 150,187 (NPC, 2006).

2.3 Sample Collection and Parasitological Examination

Stool samples were collected using student survey forms which include columns for each child's , location gender, age, size of the family, interval de-wormed, source of drinking water, toilet used and occupation of parents [5]. A plastic container marked with identification number was given to each child. Each of the children was instructed to supply the stool sample from their early morning stool the following day. Microscopic examination was carried out at Laboratory of the Department of Benue State University, Makurdi using formal-ether concentration technique as described by [6].

Approximately One (1) gram of stool was taken from the collected sample. 3ml of formal water was added to emulsify using applicator or rod. Additional 3ml of 10% formal water was added and mixed well by shaking. After shaking the emulsified stool was then sieved and collected in a beaker and supernatant discarded. The sieved suspension was transferred to centrifuge tube and 3ml of diethyl ether was added to the suspension shaken vigorously for one minute, and centrifuged at 3000rpm for 5minutes. The faecal debris layer was loosened using applicator stick in other to decant carefully, allowing only the sediment at the bottom of the tube. The sediment was carefully transferred into a sterilized glass slide, and covered gently with a glass cover slide to avoid air bubble. The slide was examined microscopically using x10 and then x40 power objective for *Ascaris lumbricoides* eggs.

2.4 Statistical Analysis

Data were evaluated by SPSS for windows (version 12.0) and the significant level was set at $\alpha = 0.05$.

3. RESULTS

The overall prevalence of Ascariasis in Makurdi based on this study was 67(27.8%) of the 230 children examined. Children living in Wadata gives the ridiculous number of infection 23(35.92%) followed by children living in Wurukum 14(21.88%). Modern market has the least prevalence of 6(9.38%).($\chi^2=17.62$ df = 4 P=0.01). (Fig. 1). Also by age, children between 6-10 years recorded the highest prevalence 24(43.75%), while least prevalence was recorded among children between 1-5 years 12(18.75%). The result showed that there was no positive correlation between the rate of infection and age ($\chi^2 = 2.613$. df = 2 P=0.27) (Table 1).

The male gender recorded the highest prevalence. Out of 126 samples examined, 41 were positive with prevalence of (64.06%) and the females recorded 23(35.94%). It was found that the rate of infection is not associated with gender.

($\chi^2 = 3.821$. df = 1 P=0.051). Children that have not been de-wormed recorded the highest prevalence 24(37.5%) while those that were de-wormed every three month recorded the least prevalence 11(17.19%). This result shows that there was a significance rate of infection and interval de-wormed. ($\chi^2 = 8.480$.df=3 P<0.05) (Fig. 2). Families with many children were more infected. Thus families of 13-15 members recorded the highest prevalence 21(32.81%). Also families with small sizes 4-6 recorded 10(15.63%) and 1-3, 8 (12.50%) respectively. The result showed that there was positive correlation between rate of infection and family size. ($\chi^2 = 9.951$ df = 4, P= 0.04). The result shows that children that drink borehole recorded the highest prevalence 26(40.63%) while least prevalence was recorded among children that drink rain water and sachet water with 5(7.81%) and 3(4.69%) respectively. The result showed that there was positive correlation between rate of infection and source of drinking water. ($\chi^2= 43.59$. df = 4 P = 0.00) (Fig. 3). The children that defecate openly recorded 22 (34.39), least prevalence was recorded among children that used water system 10(15.63%). There was no positive correlation between rate of infection and type of toilet used ($\chi^2 = 5.120$. df = 3 P = 0.16). Children whose parents are Famers recorded 23(35.94%), and drivers Drivers recorded 5(7.81%). This result showed no significant relationship between rate of infection and occupation of parent.

($\chi^2 = 5.643$. df = 4 P = 0.22) (Fig 2).

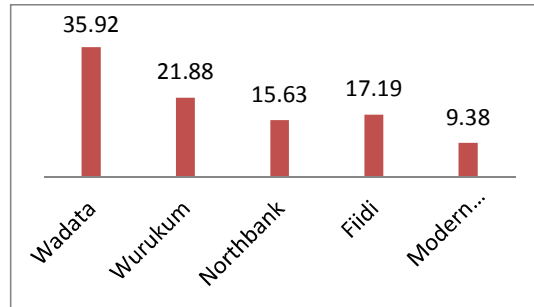


Fig. 1. Prevalence of ascariasis based on location
 $\chi^2 = 17.62$, df = 4, P = 0.01

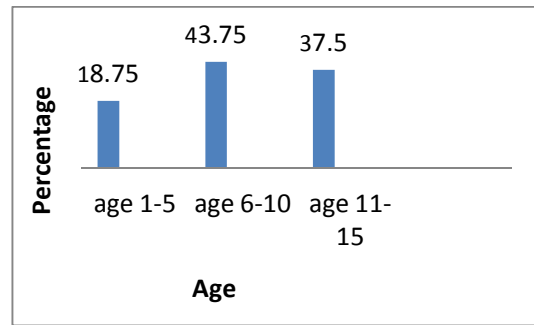


Fig. 2. Prevalence of ascariasis based on age
 $\chi^2 = 2.613$, df = 2, P = 0.27

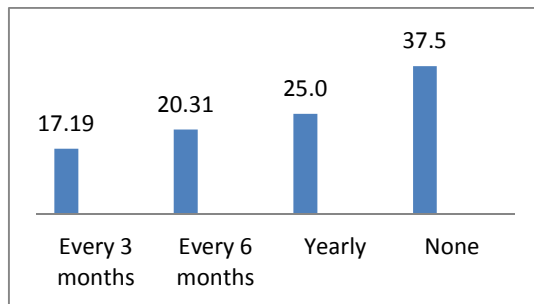


Fig. 3. Prevalence of ascariasis based on interval de-wormed
 $\chi^2 = 8.480$, df = 3, P - Value = 0.037

Table 1. Prevalence of ascariasis based on occupation of parents

Occupation	No. examined	Prevalence (%)
Civil servants	48	9 (14.06)
Famers	62	23(35.94)
Traders	51	15(23.44)
Students	43	12 (18.75)
Drivers	26	5 (7.81)
Total	230	64 (27.8)

$\chi^2 = 5.643$, df = 4, P = 0.22

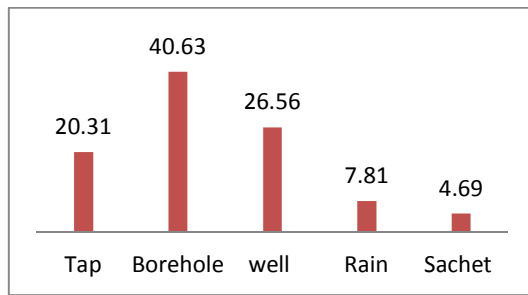


Fig. 4. Prevalence of ascariasis based on source of drinking water
 $\chi^2 = 43.59$, $df = 4$, $P - Value = 0.00$

4. DISCUSSION

The results of this study showed that Ascariasis infection is relatively high in Makurdi with overall prevalence 230(27.8%). This result is lower when compared to those of Ojurogbe et al., (2014) in Osun state who recorded 36.40%, and Takerada [7] who recorded 40(33.89) in Vandeikya, but higher when compared to those of Houmsou et al., [4] in Makurdi, Benue State who recorded 17.2%. This could be poor environmental and personal hygiene, shortage of good water supply and indiscriminate defaecation and poor sewage systems. Wadata and Wurukum recorded the high prevalence 23(35.92% and 14(21.88%) of Ascariasis. This result is significant (p -value < 0.05) because these are density areas populated by mainly farmers, fishermen and Traders. These areas did not provide enough toilet system and there are surrounded by garbage dumps where children use to defecate and sometimes play. In contrast is the low prevalence recorded among children in Modern market 6(9.38%). This is a low density affluent residency area. Sanitary conditions around the area are adequate and well-equipped with modern toilet facilities. It is also believed that these children are provided with modern water system toilet facilities because most of the parents are educated and of middle class, the children have access to modern water system toilet facilities at home.

The age between 6-10 years recorded the highest prevalence, 28(43.75%). This result is closely related to (32.8%) Azamu [8], in Jos, however it is not statistically significant. (P -value > 0.05). High prevalence recorded may be due to Poor cleaning habits, playing with leaves, sand or papers which exposed them to be contaminated by *Ascaris lumbricoides* eggs.

Also the results show high prevalence of Ascariasis among the male gender 41(64.06)

which agree with Takerada [7] who recorded 22(41.51%) prevalence but contrast Azamu whose result showed high prevalence among the female gender Azamu [8] 35.3% and Benke [9] 12.62%. This could be as a result of their potency to play with sand, eat with dirty hands or even drink water that is contaminated with *Ascaris lumbricoides* eggs. Water contact activities among the male children, swimming and fishing habits tend to increase the prevalence of the infection. Wadata, Wurukum and North Bank are bordered on one edge by the River Benue and a lot of playing takes place on the river bank.

The family size of 13-15 members recorded the highest prevalence 21(32.81%). This result is statistically significant (p -value < 0.05) which proves that, Infections tend to cluster in families, and worm burden correlates with the number of people living in a home.

With regards to water sources used, a good number of the respondents made use of well, borehole and tap water, with a fewer number using rain water. In this study those that use borehole water are more infected 26(40.63%). This contrast Takerada [7] in Vandeikya where children using well water were more likely to come up with the infections. It may be possible that the long trek to reach the borehole exposes the children to infection. The high rate of infection observed may be due to other possible sources of contamination such as unwashed contaminated hands of the children after playing with the soil. They may in the process of fetching water contaminate the water containers, the mouth or handle of the tap and the water itself.

A comparison of the toilet systems used by the children showed that those who defecate openly had the highest prevalence 22(34.38%) of Ascariasis infection and this may be due to the exposure of these children to contaminated soil where they defecate.

The relationship between socio-economic status or occupation of parents and prevalence of infection showed that children of farmers and traders recorded a high prevalence 23 (35.94%), and 15(23.44%). This finding disagrees with those of Azamu's (2018) who recorded higher infections for trader's children (41.8%).The high rate of infection in the former category of children may be attributable to the constant contact with contaminated soil and water either through farming or fishing and swimming when they are taken along with their parents. They are also

fond of eating indiscriminately with unwashed hand after their work.

The eggs of *Ascaris lumbricoides* are resilient helminth eggs that can remain in the infective stage for years embedded in the soil. Therefore, soil pollution with *Ascaris* eggs is a major risk factor for the development of infection. As the eggs are very sticky, they readily adhere to raw fruits and vegetables, which are washed with contaminated water or fertilized with contaminated soil. They may also circulate in household dust and air where they are inhaled or swallowed. This also agree with works done by WHO [10].

5. CONCLUSION

It is well known that Ascariasis infections are common in children in Makurdi metropolis. The factors that favour the rate of infection include; location, interval of de-worming, family size, and source of drinking water.

Children with intestinal parasites become an infection focus for the community.

If left untreated serious complications and even death may occur due to Ascariasis infection.

CONSENT

At the beginning of the study, Consent was first taken from the school authorities and parents; the reasons for the surveys and procedure for stool sample collection were explained to the teachers, children and their parent.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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