A survey of the prevalence of intestinal parasites among school-aged children: a case study of Nnarambia, Ahiazu Mbaise Local Government Area of Imo State, Nigeria

Abstract

Aims: The aim was to determine the prevalence of intestinal parasites among children in Nnarambia community, Imo State, Nigeria.

Study design: This study is a cross-sectional, community-based, descriptive study.

Place and Duration of Study: The study was carried out in Umunnachi and Amaokwe Nnarambia, Ahiazu Mbaise L.G.A of Imo State, Nigeria. The laboratory investigations and analysis were done in the Zoology Laboratory, Department of Zoology, Nnamdi Azikiwe University, Awka, between April and September 2021.

Methodology: A total of two hundred and fifty (250) children from the two villages were randomly sampled for the study with an age range from 4-13 years. Stool samplings were collected and analyzed microscopically using standard procedures.

Results: From the 250 pupils examined, 118(47.20%) were males and 132(52.80%) were females. The result revealed an overall prevalence of 19(7.60), faecal samples of 11 males (9.32%) and 8 females (6.06) were positive for intestinal parasites. Intestinal parasites detected include: *Ascaris lumbricoides* 6(2.40%), *Entamoeba histolytica* 5(2.00%), Hookworms 6(2.40%) and *Trichiuris trichiura* 2(0.80%). The infection rate was higher among children aged 2-7yrs 11(13.92%) and least among children aged 10-14yrs 2(3.03%).

Conclusion: There is a need for organized and routine deworming among children to sustain the low infection rate observed.

Comment [U1]: This is suggestion not conclusion. Conclusion is the answer of the aim of the study.

1. introduction

Intestinal parasites are parasites that populate the gastrointestinal tract. Typically, protozoa and helminths are among the major types of intestinal parasites in humans [1]. Children are an important risk group for intestinal helminthiasis, [2] this is due to the common practices found among children or due to the heavy infections they harbour and their vulnerability to nutritional deficiencies [3, 4, 5].

Intestinal parasite affects the overall growth, development and academic performance of children [6, 7, 8, 9 & 10]. Children especially those below 10 years are prone to infections because they may not be properly clothed or covered and also their behavioural activities like walking barefoot [5, 11]. Some of the children in Nnarambia are from poor family backgrounds lacking necessary sanitation and toilet facilities. Therefore, a study such as this must be carried out to investigate the prevalence of IPs among children below the age of 14 years.

The range of infections caused by soil-transmitted Helminths (STHs) constitutes a major health problem among children in developing countries, especially in Nigeria [12]. This helminths infection often presents with anaemia, malnutrition, diarrhoea, mal-absorption, physical and mental impairment, delayed growth in children, weight loss and fatigue [7, 13]. Infected children are nutritionally and physically impaired [14].

Soil-transmitted helminths impair the nutritional status of the people they infect in multiple ways such as feeding on host tissues, including blood, which leads to a loss of iron and protein, hookworms in addition cause chronic intestinal blood loss that can result in anaemia, especially in adolescent girls and women of reproductive age, worms increase mal-absorption of nutrients; roundworm may compete for vitamin A in the intestine and some soil-transmitted helminths also cause loss of appetite and, therefore, a reduction of nutritional intake and physical fitness. In particular, *T. trichiura* can cause diarrhoea and dysentery [5].

It is important to note that morbidity in helminth infection is related to the number of worms harboured. People with infections of light intensity (few worms) usually do not suffer from the infection. Heavier infections can cause a range of symptoms including intestinal manifestations (diarrhoea and abdominal pain), malnutrition, general malaise and weakness, and impaired growth and physical development. Infections of very high intensity can cause intestinal obstruction that should be treated surgically [5].

Some studies have reported that helminthiasis causes more harm by stunting the growth of children both mentally and physically and thus robbing them of a proper healthy life [15]. However, some have not established any relationship between helminth infection and stunting but agreed that stunting itself may affect the pathogenesis of STH infection [10, 16].

Intestinal helminths are often neglected possibly because of their low mortality rate; however, it accounts for the highest disability-adjusted life years (DALYs) among parasitic diseases in the world[17].New estimates from the Global Burden of Disease Study 2015 indicate that together helminth infections resulted in more than 6 million disability-adjusted life-years (DALYs) **[**18**].** Also, in a study to determine the Reduction in DALYs lost due to soil-transmitted helminthiases and schistosomiasis from 2000 to 2019, Antonio *et al*. (2022), reported that the cumulative gain during the 19 years was estimated at over 26 million DALYs.

Various studies [19, 20 & 21] carried out in Nigeria have reported that STH infections involving *Ascaris lumbricoides*, *Strongyloides stercoralis*, *Trichuris trichiura* and hookworms are highly prevalent across Nigeria which escalates and persist in communities without better housing, sanitation, water supplies, health care, education and low income. Other studies further stressed that children between the age group of 4-10 years are the highest risk group and most infected [17, 22 & 23].

Contrastingly, [24] reported that the individual prevalence of intestinal helminths infection was highest among the age group 7- 9 years (37.2%) followed by the age group 3- 6 years (36.8%) and then age group 11-14 years (31.6%) This study shows that age brackets studied are equally exposed to infection with helminths. This is unexpected as studies conducted among primary school children have reported them to be the highest risk group as far as helminth transmission is concerned [24].

WHO recommends periodic medicinal treatment (de-worming or preventive chemotherapy) without a previous individual diagnosis to all at-risk people living in endemic areas because the intervention reduces morbidity by reducing the worm burden. De-worming can be easily integrated with child health days or vitamin A supplementation programmes for preschool children [25,5). Regions with a prevalence ≥ 50% require de-worming 2to 3 times a year [14]. School children are one of the main target groups for this type of intervention, the health benefit

of de-worming has been conspicuous but the awareness and enlightenment on the need to de-worm frequently have not been greatly publicized especially in rural areas [26]. De-worming substantially improves health and school participation for both treated and untreated children, in treatment schools and neighbouring schools. As a result, treating only school-age children can reduce the total burden of disease due to intestinal worm infections by 70% in the community [27]. However, some studies reported that public health programmes to regularly treat all children with de-worming drugs do not appear to improve height, haemoglobin, cognition, school performance, or mortality [28].

The main objective of the study is to determine the prevalence of intestinal parasites among children 0 – 14 years in Umunnachi Nnarambia in Ahiazu Mbaise L.G.A of Imo State.

2. **Materials and methods**

2.1 Study Area

The study was carried out in Umunnachi and Amaokwe Nnarambia, Ahiazu Mbaise L.G.A of Imo State, Nigeria, between April and June 2021. Umunnachi and Amaokwe Nnarambia, Ahiazu Mbaise L.G.A have an annual rainfall range from 2500 mm to 3000 mm and an annual temperature range of 26- 32 C. The area falls within the tropical zone, latitude 5° 32’ 44” N and longitude 7° 18’ 10” E with a climate characterized by a rainy season (February/March-November) and dry season (November- February/March). Ahiazu-Mbaise LGA, created in 1976, derived its name from two ancestral clans, Ahiara and Ekwerazu. The area has a fairly levelled landscape covering 107 square kilometres with a population of about 170,902 thousand people according to the 2006 population census count. The majority of them are farmers, artisans, craftsmen, civil servants and traders. The LGA is made up of 27 autonomous communities. The sanitary condition of this area is on average with the pit toilet and water system as their method of faecal deposition; their sources of drinking water include the river but mainly boreholes.

2.2 Experimental design

This study is a cross-sectional, community-based household descriptive study involving two hundred and fifty (250) children of age ranging from 0-15 years. The participants for the study were selected using a systematic sampling technique.

2.3 Ethical consent

Chukwuemeka Odumegwu Ojukwu Teaching Hospital, Amaku, Awka gave the ethical clearance for this work(COOUTH/CMAC/ETH.C/VOL.1/FN:04/0108 (2021). Consent was sort from the parents/guardian of the children after a clear explanation of the study have been given to them. They were equally informed that the data generated from the study will be kept confidential and used for academic purposes and their identity will not be disclosed for any reason.

2.4 Population study

The population of the study is all the children in the three villages in the community. The community have an estimated number of 25,000 peoples according to the 2006 population census. The age of the children was gotten from parents/guardians.

2.5 Determination of sample size

The sample size was calculated according toYamane [29]. A total of two hundred and fifty (250) children from the three villages were randomly sampled for the study, their ages ranged from 0-15 years.

2.6 Stool sampling collection

The children and their parents were educated on sample collection and were given a clean container for the collection of stool samples with their ages and sex labelled on them. The children were interviewed orally to sort for information on their economic background, the type of sanitary facilities at home, personal hygiene such as the washing of hands before eating and after visiting the toilet, and also the source of their drinking water.

2.7 Parasitological analysis

The laboratory investigations were done using standard procedures [30,31]. The macroscopic parameters checked include the colour of the stool sample, consistency (formed, unformed or watery), presence of blood, mucus and pus and presence of motile worms. The parasitological atlas in cheesbrough [30] was used as a guide for the identification of the different eggs. Smears made for microscopic examination were viewed using the X10 objectives lens of the light microscope

2.8 Statistical Analysis

Chi-square test ($\chi 2$) and Minitab statistical package version 17 were used to test for statistically significant differences between the prevalence of infection among the age group, sexes, source of drinking water and toilet facilities

3. Results

Comment [U2]: information about economic background and santation as mentioned in the method should be reported in the result, And the most important thing is to make correlation or releinship with the infected chlidern.

From the 250 pupils examined, 118(47.20%) were males and 132(52.80%) were females. Faecal samples of children examined from the three villages revealed that 19(12.67%) faecal samples were positive for intestinal parasites (11 males and 8 females). The intestinal parasites identified are *Ascaris. lumbricoides, Trichuris. Trichiura,* Hookworms and *Entamoeba histolytica.*Intestinal parasites were more prevalent in males (9.32%) than in females (6.06%). The differences in the prevalence are not significant ($p>0.05$) (Table 1).

Table 1: Prevalence of Intestinal Parasites among children in Nnarambia, Ahiazu Mbaise Imo State by Sex

Sex	Number examined	Number Infected	Prevalence (%)
Males	118	11	9.32
Females	132	8	6.06
Total	250	19	7.60

$\chi^2 = 0.944$, df = 1: p=0.331

The prevalence of intestinal parasites varied among different age groups (Table 2). Children within the 2-7 years age group had the highest prevalence (13.92%) while those in age groups 10-15 years had the least prevalence (3.03%). The difference in prevalence is not statistically significant ($p>0.05$).

Table 2: Prevalence of Intestinal Parasites Species among school children in Nnarambia, Imo State in relation to age

Age	Number examined	*A. lumbricoides* (%)	*T. trichiuria* (%)	Hookworm (%)	*E. histolytica* (%)	Total (%)
2-7	79	3(3.80)	1(1.27)	3(3.80)	4(5.06)	11(13.92)

8-11	105	2(1.90)	1(0.95)	2(1.90)	1(0.95)	6(5.71)
10-15	66	1(1.52)	0(0.00)	1(1.52)	0(0.00)	2(3.03)
Total	250	6(2.40)	2(0.80)	6(2.40)	5(2.00)	19(7.60)

$\chi^2 = 2.178$, df = 6; p=0.903

Also, the prevalence of intestinal parasites varied among different toilet facilities (Table 3). Children who use buckets had the highest prevalence (16.00%) while those who use the bush had the least prevalence (6.06%). The difference is not statistically significant (p>0.05).

Table 3: Prevalence in relation to Toilet facilities

Toilet facilities	**Number Examined**	***A. lumbricoides* (%)**	***T. trichiuria* (%)**	**Hookworm (%)**	***E. histolytica* (%)**	**Total (%)**
Water Cistern	115	2(1.74)	1(0.87)	2(1.74)	2(1.74)	7(6.09)
Pit	77	2(2.60)	1(1.30)	2(2.60)	1(1.30)	6(7.79)
Bush	33	1(3.03)	0(0.00)	1(3.03)	0(0.00)	2(6.06)
Bucket	25	1(4.00)	0(0.00)	1(4.00)	2(8.00)	4(16.00)
Total	**250**	**6(2.40)**	**2(0.80)**	**6(2.40)**	**5(2.00)**	**19(7.60)**

$\chi^2 = 3.137$, df = 9; p=0.959

Furthermore, the result of the study shows that the prevalence of intestinal parasites varied among different villages (Table 4). Children from Amaokwe had the highest prevalence (10.67%) while those from Umuezereugwu had the least prevalence (6.25%) however, the difference in prevalence is also not statistically significant (p>0.05).

Table 4: Prevalence across villages

Villages	**Number Examined**	***A. lumbricoides* (%)**	***T. trichiuria* (%)**	**Hookworm (%)**	***E. histolytica* (%)**	**Total (%)**
Umunnachi	111	3(2.70)	2(1.80)	1(0.90)	1(0.90)	7(6.31)
Umuezereugwu	64	1(1.56)	0(0.00)	2(3.13)	1(1.56)	4(6.25)

Amaokwe	75	2(2.67)	0(0.00)	3(4.00)	3(4.00)	8(10.67)
Total	**250**	**6(2.40)**	**2(0.80)**	**6(2.40)**	**5(2.00)**	**19(7.60)**

$\chi^2 = 5.824$, df = 6; p=0.443

4. Discussion

Comment [U3]: isthereany standard ofprevalency survey? Theauthorshouldrefer tothis standardtoevaluatethedata. thediscusion should focus onanswering why there moreuninfected childernin comparasonwiththeinfectedgroup.

This study was carried out among children of Nnarambia to determine the prevalence of intestinal parasites showed a low prevalence of 12.67%.

The prevalence of different intestinal parasites revealed that only four (4) parasites were found. *Ascaris lumbricoides* and Hookworm were the most common parasites observed followed by *E. histolytica* and *Trichiuris trichiura*. Several studies have identified *A. lumbricoides* as the most common STHs infection [32, 9, 33, 34, 35, 36, 37, 38 & 39] and the major route of transmission is ingestion of contaminated food, water and vegetables.

There was an overall lower percentage of infections among the study participants compared to 23.95% and 86.2% in school children reported in Makoko, an urban slum located in the heart of Lagos, Nigeria [40, 41]. This may be attributed to the fact that the stool samples were collected from households while other studies collected samples from schools. Also, the children confessed to being de-wormed by their parents on regular bases.

Male has more intestinal parasites than females which contradicts the study of [20] concerning gender. Age ranges between 2-7 and 8-11 had a higher prevalence. This is similar to some studies [17, 22]. High infection in the lower age group may be because of their poor application of good hygiene practices in association with other risk factors.

The prevalence of helminth parasite infection in children using varying toilet facilities was determined in this study. Children that made use of flushed toilets had the highest infection followed by those who use a pit toilet. The lowest infection was found among those children who defecated in the open or bush. However, Pukuma *et al*. [42] reported that children, who used the water closet system, had the least prevalence of 18(5.00 %), while those who used the pit toilet recorded the highest prevalence of 51(14.17 %). The differences may come from the type or source of water used in flushing the toilet or poor or lack of hand washing after defecation. The prevalence of helminth parasites and the source of drinking water were also investigated. Their major source of water is the rainwater and borehole water. The safety of drinking water [43, 44,

45 & 46] concerning parasitic infection has been emphasized. This result is similar to that of [47] in South-Eastern Nigeria where significant difference between the water source and the prevalence of *A. lumbricoides* infection ($p< 0.05$), no significant difference between the water source and the prevalence of hookworm infection ($p>0.05$) and *T. trichiura* infection ($p> 0.05$ was reported.

Generally, the availability of sanitation facilities has been a risk factor in the transmission of helminth parasites therefore, hence their availability is associated with significant protection against infection with soil-transmitted helminths (OR = 0.46 to 0.58) [48]. Also, intestinal parasitosis was statistically significant with family income, hand-washing habits, type of drinking water, and availability of a toilet facility at home [49].

Conclusion and recommendation

This study has revealed a relatively low prevalence of intestinal helminth infestations among school-aged in Nnarambia, however, an improved and sustainable sanitary environment is recommended.

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