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Research Article

Intestinal Parasitic Infections and Associated Risk Factors in Primary School Children in Isuikwuato Local Government Area, Abia State, Nigeria

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ABSTRACT

Intestinal parasitic infections remain a significant public health concern, affecting over 450 million individuals globally, with children being disproportionately impacted due to their higher vulnerability. A total of 385 children from three primary schools in Isuikwuato Local Government Area, Abia State, were studied to determine the prevalence of intestinal parasitic infection. The faecal samples were collected and analyzed using the formol-ether sedimentation concentration technique. A well-structured questionnaire was designed and pre-tested to collect demographic, socio-economic, and behavioral data. The overall prevalence was 11.69%, and the highest prevalence was recorded in Amaba Central School. Four intestinal parasites (*Entamoeba histolytica*, *Ancylostoma duodenale*, *Ascaris lumbricoides,* and *Balantidium coli)* were recovered, with *E. histolytica* being the most prevalent. Low-prevalence mixed infection was also recorded. Female pupils and the age group (12-14 years) had higher prevalence rates. Some socio-demographic factors, like parents' marital status, occupation, source of water, and toilet type, wearing of footwear, washing of hands, disposing of household waste, and biting of fingernails, were highly significant, while picking food items from the floor, household size, household income, and educational background were not statistically significant in the study area. This study highlights the urgent need for public health intervention. Provision of water, sanitation, and health facilities (WASH), regular deworming, and public health education are needed in the area and schools to bring down the prevalence rate.

Keywords: Children; Intestinal; Mixed Infections; Parasites; Public Health

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INTRODUCTION

Intestinal parasitic infections are distributed virtually throughout the world, with a high prevalence rate in many regions (WHO, 2023a). Intestinal parasitic infections pose a major public health concern worldwide, particularly in developing countries, where they significantly contribute to high rates of morbidity and mortality (Ferreira *et al.,* 2020; Bisetegn *et al.,* 2023). Previous studies have shown that soil-transmitted helminth infection affects about 24% of the global population. More than 270 million preschool-aged children and about 600 million school-aged children live in regions with a high transmission rate of intestinal protozoa and helminths, making it necessary for public health interventions. The rate of intestinal parasitic infection in African countries, such as Nigeria, is estimated to be as high as 80% in some states (Meleko *et al.,* 2020). Previous studies by (Ukpai and Ugwu, 2003; Tappe *et al.,* 2011) consistently identified parasites like *Ascaris lumbricoides*, *Trichuris trichiura, Taenia species,* hookworm (including *Ancyclostoma duodenale* and *Necator americanus*)*, Strongyloides stercoralis,* and *Enterobius vermicularis* as the most prevalent across various Local Government Areas in Sub-Saharan Africa. Specifically, *Ascaris lumbricoides,* Hookworm, and *Trichuris trichiura* were found consistently in most areas sampled. *G. intestinalis* is very common in developing countries and has been recognized as the leading parasitic cause of diarrhoea in the developed world. These parasites can easily be found anywhere in the body, but they are commonly found in the intestinal wall. The different means of exposure and infection include the ingestion of undercooked meat, drinking infected water, faecal-oral transmission, and skin penetration. The impact of intestinal parasitic infections in developing countries, particularly among school-aged children, despite efforts by the government and individuals to reduce it to the barest minimum, cannot be overemphasized. Children at their cognitive and physical developmental stages are mostly vulnerable to intestinal parasitic infection because of their immature immune system and regular exposure to an unhygienic environment (Fauziah *et al.,* 2022). A lot of studies have been carried out on intestinal parasitic infections among primary school children in different parts of Nigeria. However, there is a lack of published data specifically on intestinal parasitic infections in Isuikwuato L.G.A, Abia State, in recent times. The study ascertained the prevalence of intestinal parasitic infections and the associated risk factors among selected primary school children in Isuikwuato Local Government Area, Abia State, Nigeria.

MATERIALS AND METHODS

Study area and sample collection

The study was carried out in Isuikwuato Local Government Area (LGA), Abia State, Nigeria. Isuikwuato L.G.A. lies within the tropical rainforest zone of southeastern Nigeria, positioned between latitudes 5° 45′ 43′′ N and longitudes 7° 27′ 52′′ E. The climate in this area is typically humid and tropical, with two main seasons: the rainy season, which starts from May to October, and the dry season, which runs from November to April. Annual rainfall ranges between 2000mm and 2400mm, contributing to the area's agricultural productivity. The L.G.A. shares boundaries with Abiriba to the west, Bende to the north, Ohafia to the east, and Umunneochi to the south, with major towns including Ovim, Ahaba, and Amaba.

Study Population

The study population was drawn from school-aged children (6-14 years) in three randomly selected primary schools in Isuikwuato LGA. One public school was chosen from each of the three randomly selected towns of Ahaba, Amaba, and Ovim. The children were then randomly selected with assistance from the Head Teachers and classroom teachers.

A total of 400 sample bottles were distributed across the three selected schools. The pupils were recruited from each school using a simple random sampling method. Out of the distributed bottles, 138 samples were recovered from Ahaba Imenyi Central School, 127 samples were recovered from Spence Nursery and Primary School, and 120 samples were recovered from Amaba Central School, giving a total of 385 samples.

Ethical Clearance

The ethical clearance was obtained from the College of Natural Sciences Ethical Committee, Michael Okpara University of Agriculture, Umudike, and the Area Inspectorate of Education in Isuikwuato Local Government Area. Consents were also obtained from parents and guardians on behalf of all child participants before the study commenced. The parents and guardians were properly enlightened on the aim, objectives, importance, and procedures of the study. The samples and data from the participants were properly identified with numbers, and the confidentiality of the data collected was assured.

Data Collection

Administration of Questionnaires

A well-structured questionnaire was designed and pre-tested to collect demographic, socio-economic, and behavioural data. The questionnaires contained sections on age, gender, and class of the pupils, among other relevant details. Each questionnaire was numbered identically with the sample containers to ensure proper matching of responses with faecal samples. During the administration of the questionnaire, pupils were assisted in filling out the forms.

Faecal Collection

The children were guided on how to properly collect faecal samples, ensuring they were not contaminated with soil or urine. On the designated sample collection day, each child was provided with a dry, clean, leak-proof sample bottle labeled with their unique identification number, along with an applicator stick. faecal samples were preserved in an icebox and transported to the Laboratory of the Department of Zoology and Environmental Biology, Michael Okpara University of Agriculture, Umudike, for analysis.

Faecal Examination

The formol-ether sedimentation technique was used to concentrate the parasites in the faeces (Cheesbrough, 2010). One (1) g of the faeces was collected with an applicator stick and mixed with physiological saline and placed in a screw-cap bottle containing 4 ml of 10% formalin. The bottle was closed tightly and shaken for 20 seconds to ensure it was thoroughly mixed. The faecal mixture was filtered, and the suspension was transferred to a beaker. The content in the beaker was then poured into a centrifuge tube, with the addition of 3 ml of ether acetate. The tube was sealed and shaken for one minute to allow thorough mixing. Thereafter, the stopper was removed, and the tube was centrifuged at 3000 rpm for one minute. After that, four distinct layers became visible: the top ether layer, a thin layer of debris, the formalin layer, and the sediment containing the parasites at the bottom of the tube. An applicator stick was used to remove the debris layer from the side of the tube, after which the ether, debris, and formalin layers were carefully decanted, leaving only the sediment. The tube was then returned to an upright position, allowing any remaining liquid to drain to the bottom. The sediment was resuspended, and a drop was placed in the middle of a glass slide, covered with a cover slip, before viewing it under a light microscope using 10x and 40x objectives. The condenser iris was adjusted to enhance contrast and improve visualization of parasitic structures. At the end of the analysis, all materials used for sample collection were properly disposed of by burying.

Data Analysis

The data obtained were analyzed statistically using Chi-square (χ^2) to compare the differences in the prevalence of infection between the study variables. The statistical significance was set at a P-value of ≤ 0.05 with a 95% confidence interval**.** The results are presented in tables. PAST Statistical Version 4.03 was used for the analysis (Hammer *et al.,* 2001). The results are presented in tables.

RESULTS

The result showed that out of the 385 pupils examined, 45 were infected with different intestinal parasites. The overall prevalence of 11.69% was observed (Table 1).

Gender-Related Prevalence

The result showed that more females (12.84%) than males (10.18%) were infected (Table 2). There was no association between age and prevalence based on Chi-square analysis.

Age-Related Prevalence

Pupils within the age group (12-14 years) recorded the highest prevalence of (13.71%), followed by the age group (6-8 years) with a prevalence of (12.90%) (Table 3). There was no association between age and prevalence based on Chi-square analysis.

Class-Related Prevalence

Primary 3 pupils had the highest prevalence of (13.89%), followed by Primary 6 (12.31%). The least prevalence was observed in Primary 2 pupils (9.68%) (Table 4). There was no association in the class-related prevalence based on Chi-square analysis.

Table 1. Overall Prevalence of Intestinal Parasitic Infection among the Pupils

Number Examined	Number Infected	Overall Prevalence (%)
385	45	11.69

Table 2. Gender-Related Prevalence

Gender	No. Examined	No Infected	Prevalence Rate %	P-value
Male	167	17	10.18	0.47
Female	218	28	12.84	
Total	385	45	11.69	

X^2= 0.5159

Table 3. Age-Related Prevalence

Age Group (years)	No. Examined	No. Infected	Prevalence Rate	P-value
6-8	93	12	12.90	0.57
9-11	168	16	9.52	
12-14	124	17	13.71	
Total	385	45	11.69	

X^2 = 1.1001

Table 4. Class-Related Prevalence

Class	No Examined	No Infected	Prevalence Rate %	P-Value
Primary 1	58	7	12.07	0.99
Primary 2	62	6	9.68	
Primary 3	72	10	13.89	
Primary 4	71	8	11.27	
Primary 5	57	6	10.53	
Primary 6	65	8	12.31	
Total	385	45	11.69	

X^2= is 0.55214

School-Related Prevalence

The highest prevalence was recorded in Amaba Central School (14.17%), followed by Ahaba Imenyi Central School (11.59%). Spence Nursery & Primary School, Ovim had the least prevalence of infection (9.45%) (Table 5). There was no significant association in the community-related prevalence based on Chi-square analysis.

Parasite Isolated

Four (4) parasites were isolated and identified: *Entamoeba histolytica*, *Ascaris lumbricoides*, *Balantidium coli,* and *Ancylostoma duodenale*. *Entamoeba histolytica* was the most prevalent (5.71%), while *Balantidium coli* had the least (1.03%). Mixed infections also occurred in 2 pupils in the combinations of *Entamoeba histolytica* with *Ascaris lumbricoides* and *Ascaris lumbricoides* with *Ancyclostoma duodenale*, giving a prevalence of 0.26% each. (Table 6) There was a significant association between parasites isolated and prevalence ($p < 0.05$).

Associated Risk Factors

The associated risk factors for intestinal parasite infection in the study area are presented in (Table 7). Children whose parents were classified as others (traders, businessmen, artisans) had the highest prevalence (28.57%), followed by children of teachers (21.81%). The lowest prevalence was observed among children of farmers (7.08%). The difference in prevalence with respect to occupation was statistically significant ($P < 0.05$). Children of single parents recorded the highest prevalence (34.38%), followed by those from separated parents (30.00%) and divorced parents (29.63%). Children whose parents were married had the lowest prevalence (7.28%). The difference in prevalence in relation to marital status was statistically significant ($P < 0.05$).

Children whose source of drinking water was sachet water recorded the highest prevalence (34.29%), followed by those whose source of drinking water was from surface water (stream, lake, and river) (14.52%). Children whose source of drinking water was from a private well/borehole had (7.38%) prevalence while the least prevalence was seen in children who used Municipal piped borne (5.77%). The difference in prevalence was statistically significant ($P < 0.05$). With respect to toilet facilities, children who practiced open defecation had the highest prevalence of infection (27.27%), followed by those who use pit toilet (16.67%). The least prevalence was recorded among the children who use a water cistern (6.05%). The difference in prevalence was statistically significant ($P < 0.05$). Children who do not wear footwear recorded the highest prevalence (40.00%), followed by children who rarely wear footwear (29.63%), and those who wear them sometimes had (15.00%), while those who wear them always had the least (5.15%). The difference in prevalence was statistically significant ($P < 0.05$). Children who wash their hands sometimes before eating recorded the highest prevalence (22.81%), followed closely by those who never wash their hands (21.43%), and those who wash their hands after eating had (9.09%), while those who wash their hands before eating had the lowest prevalence (8.33%). The difference in prevalence was statistically significant ($P < 0.05$). With respect to those who dispose household waste, those who use refuse dumps recorded the highest prevalence (36.36%), followed by those who dispose by burying (18.37%), and those who dispose in the bush had (8.05%), while those who burn their refuse recorded the least (2.56%). The prevalence was statistically significant ($P < 0.05$). Children who agreed to picking food items from the floor recorded (15.45%), while those who said they don't pick food items had the least (9.92%). The prevalence was not statistically significant ($P > 0.05$). Children who agreed to biting their fingernails had the highest prevalence of (18.62%), while those who said they don't bite their fingers had the least (7.50%). The difference in prevalence was statistically significant ($P < 0.05$).

On family income, children from low-income parents (< N50,000) recorded the highest prevalence (14.42%), followed by those earning between N100,000 to N150,000 (12.90%), and those earning between N200,000 and above had (12.50%), while those earning N50,000 to N100,000 had the least (4.44%). The prevalence was not statistically significant ($P > 0.05$). With respect to the educational status of parents, children of parents with secondary education recorded the highest prevalence (15.94%), followed by those with only primary education (13.19%), and those with tertiary education only had (11.49%). Those whose parents had no formal education had the lowest (6.49%). There was no significant difference in the prevalence ($P > 0.05$).

Table 5. Community-Related Prevalence

Community	No. Examined	No. Infected	Prevalence Rate %	P-Value
Ahaba Imenyi Central School	138	16	11.59	0.59
Spence Nursery & Primary School	127	12	9.45	
Amaba Central School	120	17	14.17	
Total	385	45	11.69	

X^2 = 1.0512

Table 6. Parasites Identified (N=385)

Parasites	Number Infected	Prevalence Rate (%)	P – value
Ascaris lumbricoides	8	2.08	0.00
Entamoeba histolytica	22	5.71	
Ancyclostoma duodenale	9	2.34	
Balantidium coli	4	1.03	
Mixed Infections			
Ancyclostoma duodenale + Ascaris lumbricoides	1	0.26	
Entamoeba histolytica + Ascaris lumbricoides	1	0.26	
Total	45	100	

X^2= 41.2666

Table 7. Associated Risk Factors of the Pupil Regarding Intestinal Parasitic Infections

Variables	No. Examined (N=385)	No. Infected	Infection Rate (%)	X^2	P-value
Parent's Occupation				14.48	0.00^S
Teacher	55	12	21.81		
Farmer	212	15	7.08		
Civil Servant	83	8	9.63		
Traders, Business Persons, & Artisans	35	10	28.57		
Marital Status				23.33	0.00^S
Single	32	11	34.38		
Married	316	23	7.28		
Divorced	27	8	29.63		
Separated	10	3	30.00		
Source of Water				16.88	0.00^S
Municipal/pipe-borne water	104	6	5.77		
Private Borehole	122	9	7.37		
Surface water (Stream, Lake, River)	124	18	14.52		
Packaged/Sachet water	35	12	34.29		
Type of Toilet				14.57	0.00^S
Water Cistern	215	13	6.05		
Pit toilet	102	17	16.67		
Bush (Open defecation)	44	12	27.27		
Squat toilet	24	3	12.50		
How often do you wear footwear?				26.9	0.00^S
Always	233	12	5.15		
Sometimes	100	15	15.00		
Rarely	27	8	29.63		
Not wearing footwear	25	10	40.00		
How often do you wash your hands?				8.97	0.02^S
Always before eating	168	14	8.33		
Always after eating	132	12	9.09		
Sometimes	57	13	22.81		
Never	28	6	21.43		

How do you dispose your household waste?				31.71	0.00[S]
Burning	156	4	2.56		
Bush	87	7	8.05		
Burying	98	18	18.37		
Refuse dump	44	16	36.36		
Do you pick items from the floor?				1.92	0.16[NS]
Yes	123	19	15.45		
No	262	26	9.92		
Do you bite your fingernails?				8.37	0.00[S]
Yes	145	27	18.62		
No	240	18	7.50		
Household Income				3.53	0.47[NS]
Less Than N50,000	201	29	14.42		
N50,000-N100,000	95	6	6.31		
N100,000-N150,000	31	4	12.90		
N150,000-N200,000	42	4	9.52		
N200,000 and Above	16	2	12.50		
Educational Status				2.75	0.43[NS]
Non-Formal	77	5	6.49		
Primary	91	12	13.19		
Secondary	69	11	15.94		
Tertiary	148	17	11.49		

Key: S = Significant; NS = Not Significant

DISCUSSION

Intestinal parasitic infection has significantly contributed to high mortality and morbidity rates, raising major public health concerns (Bisetegn *et al.,* 2023). The overall prevalence recorded was 11.69%. This prevalence was low compared to values recorded in related studies in this region. A study by Maduagwu *et al.* (2025) indicated prevalence rates of 68% in Ebonyi State, 44% in Abia State, and 37% in Imo State among school children in southeastern Nigeria. In other related studies, Okeke *et al.* (2023) reported a prevalence of 47.2% among school-aged children in Nnarambia, Imo State; Ihejirika *et al.* (2023) reported an overall prevalence of 19.3% among school-aged children also in Imo State, Chukwu *et al.* (2023) recorded a prevalence of 49.5% among school-aged children in Rumuodogo, Rivers State, Nigeria, and Isma'L *et al.* (2024) recorded a prevalence of 33.6% among school-aged children in Katsina metropolis, Katsina State, Nigeria. However, a lower prevalence of 3.25% was reported by Ngwamah *et al.* (2024) among primary school pupils in Lokoja, Kogi State, Nigeria. The variations in the prevalence rates may be attributed to factors like environmental conditions, geographical location, socio-economic status, sanitation facilities, and hygiene practices.

Gender-related prevalence showed that more females were infected (12.84%) than the males (10.18%), though not significant different (P > 0.05). This is in agreement with the findings of Akande *et al.* (2024) that reported a higher prevalence (81.8%) among females in their study in Ife Central L.G.A, Osun State, Nigeria. Onyeka and Maina (2025) also reported a higher prevalence of 49.2% among female school-aged children in primary schools in Pankshin L.G.A, Plateau State. The higher prevalence reported in this study could be a result of socio-behavioural and environmental factors relating to roles of girl-child in the family, especially in the rural areas, which could expose them to parasitic infections. Females are more likely to get involved with household chores like fetching water from the stream, house cleaning that could bring them in contact with the ground, and assisting in food preparations from a tender age than their male counterparts (Ages and Agesa, 2019; WHO, 2023b).

Age-related infection prevalence was highest among children aged 12-14 years, while the age group (9-11 years) was the least. No significant difference (P > 0.05) was observed. This finding is similar to Akande *et al.* (2024), who reported a higher prevalence of (81.8%) among children above 10 years old in their study in Ife Central L.G.A, Osun State, Nigeria. The higher prevalence recorded among the age group could be that, as the children are getting older, they become more independent in carrying out their daily activities, such as farming, fetching water, household chores, and other outdoor activities, increasing their chances of exposure to contaminated soil and water (Nadia *et al.,* 2023). The older ones may also engage more frequently in school sports activities that involve direct contact with a contaminated environment, such as playing barefoot or swimming. They can easily purchase street food, eat unwashed fruits, or eat with dirty hands, increasing the chances of ingesting eggs and larvae (Ngwamah *et al.,* 2024).

Class-related prevalence showed that Primary 3 pupils had the highest prevalence of (13.88%), followed closely by Primary 6 (12.31%) and Primary 1(12.07%). The difference was however, not statistically significant (P > 0.05). This is in agreement with the findings from Amisu *et al.* (2023) that recorded a higher prevalence (41.2%) among children in primary 3 in their study in Elemere, Kwara State, Nigeria. This outcome is tied to age when children become active in life, thereby predisposing them to intestinal parasites. Primary 3 usually starts from 8 years, but sometimes up to 10 – 11 years in rural areas. In rural areas, children in the pre-teen and teenage groups usually get involved in household activities that may increase their exposure (Gambo *et al.,* 2024). The prevalence reduced with higher classes as the pupils get older.

With respect to school/community-related prevalence, Amaba Central School had the highest prevalence of 14.17%. The difference was however, not statistically significant (P > 0.05). The higher prevalence could be as a result of poor sanitation, hygiene, and access to clean water in the school (Wada *et al.,* 2022; Victor *et al.,* 2025). Onyido *et al.* (2017) reported a higher prevalence of (16.39%) in Regina Caeli Primary School in Ekwulumili community, Nnewi South L.G.A, Anambra State, attributed to the same factors.

Four intestinal parasites were observed in this work, namely: *Entamoeba histolytica* (5.71%), *Ascaris lumbricoides* (2.08%), *Balantidium coli* (1.03%), and *Ancylostoma duodenale* (2.35%). The difference was however statistically significant (P < 0.05). This was higher than the 3 parasites reported by Akande *et al.* (2024). Okeke *et al.* (2023) reported 4 parasites, while Ihejirika *et al.* (2023) and Usip *et al.* (2023) both reported 8 parasites each. However, Gbonihibor *et al.* (2022) and Chukwu et al. (2023) reported 9 and 11 parasites, respectively, in their studies. *E. histolytica* had the highest prevalence (5.17%) among the isolated parasites. A similar report was made by Tyoalumun *et al.* (2016) in Benue State, Nigeria. Evbuomwan *et al.* (2022) also reported the prevalence of *E. histolytica* (64.3%) in pupils living in an internally displaced persons (IDPs) camp. The higher prevalence of *E. histolytica* could be attributed to poor sanitation and hygiene practices, as was also reported by Mohammed *et al.* (2020) and Roro *et al.* (2022). The result of this study was however, at variance with the findings of some other authors (Gbonhibor *et al.,* 2022; Chukwu *et al.,* 2023; Okeke *et al.,* 2023; Ihejirika *et al.,* 2023; Usip *et al.,* 2023; Akande *et al.,* 2024) that reported *Ascaris lumbricoides* as the most prevalent in their studies.

Mixed infections involving *E. histolytica, Ascaris lumbricoides,* and *Ancylostoma duodenale* were also observed. Imalele *et al.* (2023) also reported that *Ascaris lumbricoides* is common in mixed infections. Poor sanitation and hygiene practices, ingestion of contaminated food and water, and poverty can increase the likelihood of acquiring single or mixed infections.

The associated risk factors for acquiring intestinal parasitic infections revealed that children whose parents were traders, business persons, and artisans had the highest prevalence (28.57%). The difference was however, statistically significant (P < 0.05). This trend agreed with the findings of Gyang *et al.* (2019), who reported a higher prevalence among children whose parents were engaged in business in urban slums in Nigeria. This could be attributed to their increased exposure to poor hygiene, unsafe environments, and limited supervision, which could increase their risk of getting infected with intestinal parasites.

Children who usually drank packaged water, popularly known as sachet or pure water, recorded the highest prevalence (34.29%). The difference was however statistically significant (P < 0.05). This is in agreement with the report of Umeaneto *et al.* (2022) in Enugu State, Nigeria. Storage could also affect the sachet of water. In rural areas, pure or sachet water bags are sometimes kept in open and dusty environments, which could expose them to contamination with parasites. Some sachet water may not have gone through proper quality control checks before being pushed out to the public for consumption.

With respect to toilet facilities, the highest prevalence was recorded among pupils who are engaged in open defecation (27.27%). The difference was statistically significant (P < 0.05). This agreed with the report of Ngwamah *et al.* (2024) in Lokoja, Kogi State, Nigeria, who reported a higher prevalence (52.40%) of intestinal parasitic infections among families who defecate in the bush (open defecation). Jayaram *et al.* (2021) also reported a higher prevalence (27.8%) among children who engaged in open-air defecation in India. Open-air defecation contaminates the environment and can serve as a reservoir for parasites. Children stand a higher risk of being infected through the soil, contaminated water, and by direct contact.

There was a higher prevalence of parasitic infection among children who do not wear footwear. The difference was statistically significant (P < 0.05). This agrees with Usip *et al.* (2023) in Akwa Ibom State, who recorded a higher prevalence (58.08%) among children who play barefoot. Parasites like *Ancyclostoma duodenale, Strongyloides stercoralis,* and *Trichuris trichuria* are easily transmitted through soil contaminated with human feaces. Walking or playing barefoot can easily expose the skin to these parasites.

With respect to washing of hands, children who washed their hands sometimes before eating had a higher prevalence of infection (22.81%). The difference in infection rate was statistically significant (P < 0.05). This agreed with the findings of Saleh *et al.* (2024) that reported a higher prevalence (44.38%) among primary school pupils in Kogi State whose responses were negative to washing of hands before eating. Regular hand washing before meals helps in reducing the risk of parasitic infection among school-aged children.

Children who bite their fingernails had the highest prevalence (18.62%). The difference in infection rate was statistically significant (P < 0.05). Shrestha *et al.* (2021) also recorded a higher prevalence among children who bite their fingers in Dhuran Submetropolitan City, Nepal. Finger nails can harbour a lot of germs and parasites. Biting their fingernails invariably exposed them to getting parasitic infections.

Improper household waste disposal can contribute to the growing rate of infection with intestinal parasites. Those who disposed their waste at the refuse dumps recorded the highest prevalence (36.36%), while those who burnt the refuse had the lowest prevalence of (2.56%). The difference between infection rates as a result of waste disposal methods was statistically significant (P < 0.05). Chege *et al.* (2020) recorded a higher prevalence of infection among those who dispose their wastes in public spaces in Nakuru town, Kenya. Children can pick up eggs of parasites from refuse dumps when they go to dispose refuse. Some may not wash their hands, and this makes it easy for them to ingest ova of parasites.

Children who responded positively to picking food items from the ground recorded the highest prevalence in this work (13.0%). The difference was however, not statistically significant (P > 0.05). This contrasted with the findings of Ukpai *et al.* (2024), who reported a higher prevalence among children who responded 'No' to picking of food from the ground. Children can easily ingest soil-transmitted parasitic eggs from food items picked from the floor (geophagy), such as *Ascaris lumbricoides.*

Intestinal parasitic infections are often considered diseases of the poor and marginalized (Evbuomwan *et al.,* 2022; Hakizimana *et al.,* 2023; Štrkolcová *et al.,* 2024). A higher prevalence (14.43%) was recorded among children whose parents earn less than N50,000 a month. This suggested that poor economic conditions can influence infection rates. The difference was however not statistically significant (P > 0.05). Ajayi *et al.* (2024) also reported a higher prevalence of infection (90.9%) among pupils from low-income families. Singer *et al.* (2020) observed that the burden of intestinal parasites is more among pre-school and school-aged children, with the underprivileged children having a greater risk of recurring infections. Severe poverty, deficits in water, sanitation, and hygiene (WASH) have been reported among the major risk factors for parasitic infections (Strunz *et al.,* 2014).

In terms of parents' education, children of parents with a secondary level of education had the highest prevalence (15.94%), followed by children whose parents had a primary level of education (13.19%). This differed from the results of Ogbondah and Owhonda (2021), who reported a higher prevalence (67.9%) among children whose mothers had no formal education. The difference was however, not statistically significant (P > 0.05). Parental education level did not play a major role in influencing infection rates in this study. However, better parental education can help reduce the risk of infection because it is generally associated with improved hygiene practices, sanitation, and access to good-quality water as well as knowledge about health matters (Gupta, 2024).

CONCLUSION

The prevalence of intestinal parasitic infections among primary school children in Isuikwuato Local Government Area, Abia State, Nigeria, indicated a significant burden. The prevalence rate and dominance of *Entamoeba histolytica* is an indication of poor sanitary conditions, unsafe water sources, and inadequate hygiene practices in the schools and among the pupils. The gender and age-specific variations in infection rates reflected shared environmental and socioeconomic factors. The outcome of this study calls for improved water, sanitation, and hygiene (WASH) practices alongside regular deworming programmes in the schools and similar communities. This study provided baseline data to inform public health policy-makers of the need to reduce intestinal parasitic infections in Isuikwuato and nearby communities.

Conflict of Interest

The authors do not have any conflicts of interest.

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Authors Contributions
Authors were jointly involved in the conception of the study, through the methodology to the writing and final approval of the manuscript for publication.

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