Original Research Article
Prevalence, Risk Factors, Knowledge and Hygiene Practices Regarding Intestinal Parasitic Infections among Orphanage Children in Awka, Anambra State, Nigeria

ABSTRACT

Children in poor nations are vulnerable to intestinal parasite infections due to deplorable socioeconomic factors and inadequate sanitation. This cross-sectional study was carried out between November 2023 and February 2024 with approval by the Ministry of Social Welfare, Children and Women Affairs (Ref: MW&SW/CD/077/VOL.2) and ethical approval (Ref: MH/PRSD/1401/27) granted by the Ministry of Health, Anambra State, Nigeria. The objectives were to determine the prevalence and risk factors of intestinal parasitic infections among the children. Stool samples were collected and questionnaires were administered. Stool samples were examined under a microscope using the formol-ether sedimentation technique and a direct wet smear in iodine and normal saline. Data collected were analysed with SPSS version 23. A total of 115 orphans between the ages of 1-20 years were selected. Intestinal parasite infections were 39.1% prevalent overall. *Entamoeba histolytica* (10.4%), *Balantidium coli* (7.8%), and *Ascaris lumbricoides* (20.9%) were the three parasite species identified. Prevalence was higher in males (44.3%) than in females (27.8%) (*P*=.092). Within the age groups, least prevalence (20%) was recorded in children 6-10 years (*P*=.001) and highest prevalence value (100%) was recorded in children 16–20years (*P*<.001). Within the orphanages, prevalence was higher (46.9%) in MCCH and lower (29.4%) in TLO (*P*=.057). Risk factors identified in this study were the source of water (*P*=.057), playing with sand (*P*=.135), keeping long fingernails (*P*< .001). Poor knowledge about intestinal parasite infections was observed. There was an 83.3% total hygiene level. The study revealed that intestinal parasite was prevalent among children in orphanages in Awka. Poor hygiene practices and inadequate knowledge were identified as major factors influencing this prevalence. Improving hygiene practices are recommended to mitigate the high prevalence of intestinal parasites among these vulnerable children.

Keywords: prevalence, risk factor, intestinal parasites, orphanages, Anambra State, Nigeria

1. INTRODUCTION

Intestinal parasitic infections (IPI) are infections affecting the gastrointestinal system of humans and other animals. Intestinal parasites are a significant public health concern, especially in sub-Saharan Africa (1). Of those afflicted, about 2 billion are children (2). Among other things, soil-transmitted helminths (STH), intestinal protozoan parasites, and *Schistosoma mansoni* are the causative agents of these diseases (3).

According to reports, 450 million people suffer from morbidity as a result of protozoan parasite infections, which are more common than helminth infections to cause gastrointestinal diseases (4). *Entamoeba histolytica, Giardia lamblia, Cryptosporidium*, and

Balantidium coli are the most frequent pathogenic intestinal protozoa that are known to sicken humans (4, 5). However, infections with *Strongyloides stercoralis*, *Trichuris trichiura* (whipworm), *Ascaris lumbricoides* (roundworm), and hookworms (*Ancylostoma duodenale* and *Necator americanus*) are the most common causes of intestinal helminth infections (6, 7). In Nigeria, intestinal parasite infections have been prevalent since the 1970s due to poor sanitation, hygiene, poverty, and environmental conditions (6, 7). In Anambra State, inadequate access to clean water and sanitation is a primary cause (6, 8).

Epidemiological research has shown that children between the ages of 4 and 15 have the highest prevalence and severity of intestinal parasite infections (9). Among these children are orphans, those who have lost either parent by death, abandoned by their parents or could not ascertain the where about of their parents (10). The Ministry of Women Affairs and Social Development estimated that there are 17.5 million orphans and vulnerable children (OVC) nationwide (11). These children in orphanages are equally at higher risk of infections by intestinal parasites due to habits of playing or handling infested soil, performing unhygienic toilet practices and eating or drinking with soiled hands (12, 13). Numerous investigations have been carried out over time by researchers to ascertain the prevalence of these parasites among children living in orphanages (13, 14, 15). In Anambra State of Nigeria, the most recent studies of intestinal parasite infections in orphanage homes were conducted by Anumba *et al.* (14). Between that period and now, a lot of intervention activities including health education must have been implemented in various orphanage homes. Thus there is need for updated information on the current state of IPI in orphanage homes.

This study aims at determining the prevalence, risk factors, knowledge and hygiene practices of intestinal parasitic infections among children living in orphanages in Awka, Anambra State. This information will be used to measure improvement in health conditions in the orphanages, give directives on how health intervention programs and policies will be continued that would enhance the health of these children.

2. MATERIAL AND METHODS

2.1 Study Area

This study was conducted in orphanage homes in Awka, Anambra State, Nigeria. Awka is the capital city of Anambra State, Nigeria. The city is located along the Enugu-Onitsha Express way. It is located at latitude 6.22°N and longitude 7.07°E, and has a population of more than 1.7 million people. Awka is bordered by Nibo, Nise and Amawbia in the South West, Mgbakwu and Okpuno in the North West, Amansea in the North East and Umuawulu, Isiagu and Ezinato in the South East (16). Awka has a tropical climate with two seasons: dry and wet. The dry season normally lasts from early November to late March (4 months), while the wet season lasts from late March to early November (8 months). December to February is usually marked by dry, chilly conditions brought on by the northeast trade winds from the Sahara Desert, resulting in harmattan (16).

In Awka, there are certified orphanage homes that are overseen by the Ministry of Social Development, Children and Women Affairs. These orphanage homes are owned by missionaries, private investors, and the government (14). Refuse collection, disposal, and management is a serious environmental and health issue in Awka, where uncontrolled house clustering and the blocking of drainage systems due to improper waste disposal result in artificial erosions, persistent odours, and the spread of diseases such as intestinal parasite infections (17).

2.2 Study Design

This study has a cross-sectional design, and was conducted to investigate the prevalence, risk factors, knowledge and hygiene practices of intestinal parasite infections among

orphanage children in Awka, Anambra. The study covered a period of three months (between November 2023 and February 2024).

2.3 Study Population

This study involved children found in registered orphanage homes in Awka, Anambra State, Nigeria. Male and female children across all ages, regardless of the length of stay at the facilities make up the study population.

2.4 Selection of the Orphanages/Study Participants

This study used data from registered orphanages in Awka. Of the four registered orphanages in Awka, two were randomly selected. The participants were chosen using total population sample technique due to the small number of people discovered in them. The orphanages included MCCH, which housed 83 children and TLO with 68 children.

2.4.1 Inclusion/Exclusion Criteria

This study used orphanages in Awka that had been recognised and approved by the Ministry of Social Welfare, Children, and Women Affairs. The orphanages included in this study gave permission to collect specimens of faeces. However, orphanages that were not approved for this study by the Ministry of Social Welfare, Children, and Women Affairs were excluded. In addition, orphanages that refused to allow the collection of faeces were omitted from the study.

2.5 Sample Size Determination

Given the limited number of children in the orphanages, all the children present in the orphanages were included in the study. However, only children that provided faecal specimens for examination were eventually used as the optimum sample population. For this study, 115 samples were collected and evaluated from children living in orphanages who met the inclusion criteria.

2.6 Faecal Specimen Collection

The study involved the collection of fresh feces. A day before the specimen was collected; the children were given clean containers with tight lids that were labelled with their identification numbers, age, and gender. The caretakers at the orphanages, as well as the children, were taught how to collect faeces samples safely and without contamination by urine. Stool samples collected were promptly taken to the Department of Parasitology and Entomology Laboratory, Nnamdi Azikiwe University, Awka for testing. All samples were screened for intestinal parasites within 24 hours of collection.

2.7 Preparation and Examination of Faecal Samples

The faecal specimens were examined for adult worms. The diagnostic stages of intestinal parasites in stool specimens were diagnosed using direct smears (wet mounts) and Formol-ether sedimentation techniques defined by Cheesbrough (18). Parasite eggs, ova, and cysts were identified according to WHO (19) using established morphological standards.

2.8 Determination of Risk Factors, Knowledge and Hygiene Practices of the Orphanages

This study used structured questionnaires to gather data on risk factors and knowledge of intestinal parasite infections among caregivers and orphanage children, focusing on water supply, personal health protection, hand washing procedures, and sanitary conditions in the orphanage homes. The hygiene and sanitation protocols of selected orphanages were assessed using a modified FMoH Recommended Checklist of Water Sanitation and Hygiene (WASH) indicators (20). This was achieved by carefully evaluating the facilities during field visits, interviews with children and caregivers, and assigning 1 or 0 points based on the information provided. The cumulative score was calculated.

2.9 Data Analysis

The SPSS version 23 was used to analyse data collected throughout the research project. For every case, the percentage prevalence (%) was computed. To determine whether there is a significant statistical association, a comparative analysis of the data using Pearson Chi square (χ^2) at the 5% level of significance was conducted. A P-value of less than 0.05 was considered statistically significant.

3. RESULTS

3.1 Prevalence of Intestinal Parasite Infections in the Study Area

No mucus, blood, worm segment or adult worm was observed when the stool specimens were examined macroscopically. The participants comprised of 79(68.7%) males and 36(31.3%) females within the age range of 1-20 years, with a mean age of nine (9) years. Using microscopic examination, an overall prevalence of 39.1% of intestinal parasites was recorded in the study. Table 1 shows the occurrence of intestinal parasites, categorised by the specific species of parasites, gender of participants, age groups, and orphanages where the participants reside, highlighting the prevalence of these parasites. Three species of parasite observed in this study were *Ascaris lumbricoides* with a prevalence of 20.9%, *Balantidium coli* with a prevalence of 7.8%, and *Entamoeba histolytica* with a prevalence of 10.4%. There was a significant difference in the prevalence of the parasite species causing intestinal parasite infections in orphanage homes in Awka (P<.001). Prevalence was higher in males (44.3%) than in females (27.8%), however, this association between gender and prevalence was of no significant consequence (P= .092). Within the age groups, children aged 1-5 years recorded a prevalence of 33.3% but the association of prevalence within this age group was not statistically significant (P= .480); children aged 6-10 years recorded a prevalence of 20% and this prevalence was statistically significant (P=.001); children aged 11-15 years recorded a prevalence of 46.7%, however, the association between prevalence of intestinal parasites within children in the age group 11-15 years was not statistically significant (P= .325); while children in the age group 16-20 years recorded a prevalence of 100% and there was a significant difference in the association of prevalence and children within the age group of 16-20 years (P< .001). With respect to the orphanage homes of the children, prevalence was higher (46.9%) in MCCH and lower (29.4%) in TLO. However, there was no significant difference in the prevalence of intestinal parasite infections in the orphanages (P= .057).

Table 1: Prevalence of Intestinal Parasite Infections among children in Orphanage Homes in Awka

Parameters	Categories	Number Examined (%) N= 115	Number infected (%) n= 45(39.1)
Species of intestinal parasite detected	*Ascaris lumbricoides*	115	24(20.9)
	Balantidium coli	115	9(7.8)
	Entamoeba	115	12(10.4)
Gender	Male	79(68.7)	35(44.3)
	Female	36(31.3)	10(27.8)
Age group (years)	1-5	27(23.5)	9(33.3)
	6-10	45(39.1)	9(20)
	11-15	30(26.1)	14(46.7)
	16-20	13(11.3)	13(100)
Orphanages	MCCH	64(55.7)	30(46.9)
	TLO	51(44.3)	15(29.4)

N=number examined, **n**= number of cases.

Figure 1 show that of the three intestinal parasite species (one helminth and two protozoa) identified in the children's faeces, *A. lumbricoides* was more prevalent (20.9%) while *B. coli* was least prevalent (7.8%).

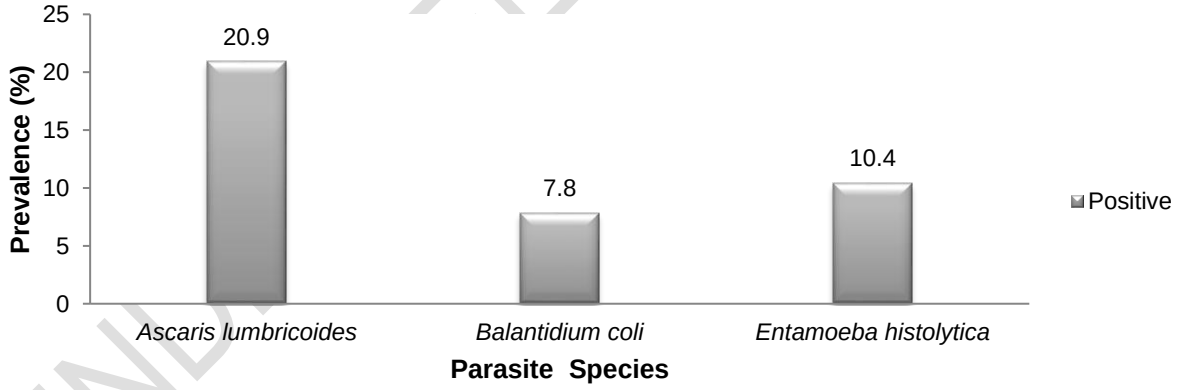

Figure 1: Prevalence of Intestinal Parasite Infections among orphanage children in Awka

3.2 Assessment of Risk Factors of Intestinal Parasite Infections in Selected Orphanages in Awka

The study found that risk factors were the source of water, playing with soil, and cutting fingernails. The investigation revealed two significant water sources: commercial tankers and boreholes. The source of water supply was found to be a risk factor, with a higher prevalence (46.9%) among children who drank from commercial tankers and a lower prevalence (29.4%) among children who drank from boreholes. There was no significant difference in the association between the water source and the prevalence of intestinal parasite infections (P = .057). Majority (96.5%) of the children evaluated does not play with sand, but there was no significant difference in the association between the prevalence of IPI

among children who play with sand and those who do not (P > .135). Results show that most of the participants (57.4%) had short fingernails whereas 42.6% of the participants had uncut fingernails. Prevalence was higher (76.9%) in children with uncut fingernails than children with short and tidy nails (9.1%). Fingernail cutting was found to have a significant correlation with prevalence (P<.001). The children evaluated reported having been given deworming medicine and the last time of deworming was identified as a possible risk factor. More children (55.7%) reported being dewormed three months before sample collection than those who were dewormed one month prior to sample collection (44.3%).The prevalence of IPI was higher (46.9%) in children who received deworming medications three months before the faecal samples were obtained and lower (29.4%) in children who were dewormed one month prior. However, there was no significant difference in the correlations of IPI prevalence with time since the last medication was administered (P = .057).

Table 2: Risk Factors of Intestinal Parasite Infections among Orphanage Children in Awka

Variable	**Category**	**Responses (%)**	**No. infected (%)**
Source of water	Borehole	51(44.3)	15(29.4)
	Tanker	64(55.7)	30(46.9)
Playing with soil	Yes	4(3.5)	3(75)
	No	111(96.5)	42(37.3)
Cutting fingernail	Yes	66(57.4)	6(9.1)
	No	49(42.6)	39(79.6)
Last medicine taken	1 month ago	51(44.3)	15(29.4)
	3 months ago	64(55.7)	30(46.9)
	6 months ago	0(0)	0(0)

3.3 Assessment of Knowledge on Prevalence of Intestinal Parasite Infections in Selected Orphanages in Awka

Results recorded showed that more children in the orphanage homes in Awka had poor knowledge about intestinal parasite infections (Table 3). More children (74.8%) assessed had never heard of these parasites. There was a significant difference in the prevalence results between those who had heard about these parasites and those who had not heard about them (P<.001). All participants (100%) reported that they have never seen these parasites which could have influenced the 39.1% prevalence recorded. However, there was no significant difference in the association of prevalence of intestinal parasites between children who have seen or have not seen these parasites (P= .057). More children (74.8%) reported to not know if these parasites cause sicknesses than those who reported to know (25.2%). There was significant difference in the association between prevalence and knowing if these parasites can cause sickness to the body (P<.001). More children (97.4%) reported that they do not know how infection occurred than those who know (2.6%). However, there was no significant difference to the prevalence results of children who knew how infection occurred and children who did not know how intestinal parasite infections occurred (P= .159). Results also showed that more children (98.3%) do not know how to prevent infection than those who know how infection can be prevented (1.7%). However there was no significant difference in the association of prevalence of intestinal parasites among children who knew how to prevent IPI and those who do not know how infection can be prevented (P= .253).

Table 3: Impact of Knowledge on the Prevalence of Intestinal Parasites among the Children

Knowledge	Category	Responses (%)	No. infected (%)
Heard of intestinal parasites	Yes	29(25.2)	21(72.4)
	No	86(74.8)	24(27.9)
Seen them	Yes	0(0.0)	0(0.0)
	No	115(100)	45(39.1)
If they cause sickness	Yes	29(25.2)	21(72.4)
	No	86(74.8)	24(27.9)
How one may be infected	Yes	3(2.6)	0(0.0)
	No	112(97.4)	45(40.1)
How to prevent infection	Yes	2(1.7)	0(0.0)
	No	113(98.3)	45(39.8)

3.4 Assessment of Hygiene Practices in Selected Orphanages in Awka

Table 4 shows the hygiene ratings of the chosen. The orphanages both had an overall score of 10 out of 12 available points (83.3%). In the chosen orphanage residences, garbage cans were seen. Water, soap, and hand wash stations were available in the facilities. In the orphanages, not a single bush was seen. The children wash their hands after using the toilet, before eating, and after eating. They also wore shoes and shared cups, fruits, and candy. The hygiene level was recorded at 83.3% at Model Community Children's Home and 83.3% at Tender Love Orphanage.

Table 4: Hygiene Practices in Selected Orphanages in Awka

Variable		MCCH	TLO
A.	Hygiene facilities		
i.	Garbage can	1	1
ii.	Hand wash basin	1	1
iii.	Soap	1	1
iv.	Water	1	1
B.	Cleanliness of compound**:**		
i.	Bushes around the orphanage	0	0
C.	Use of common cups and storage cans	1	1
D.	Hand washing habits of the children:		
i.	Before toilet	0	0
ii.	After toilet	1	1
iii.	Before eating	1	1
iv.	After eating	1	1
i.	Shares fruits and candies	1	1
ii.	Use of footwear	1	1
Total (%)		10(83.3%)	10(83.3%)

Key: 1**=** present or yes; 0= absent or no

3.5 Impact of Hygiene Practices on Prevalence of Intestinal Parasite Infections in Selected Orphanages in Awka

Figure 2 demonstrates the correlation between cleanliness behaviours and the prevalence of intestinal parasite infections in the chosen orphanages in Awka. Both orphanages had equal

hygiene levels (83.3%), however, MCCH recorded higher prevalence (46.9%) than TLO (29.4%).

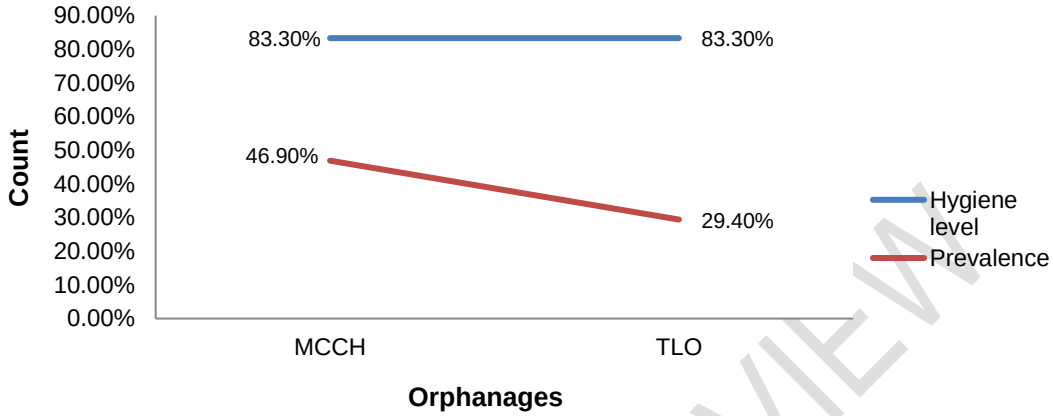

Figure 2: Impact of hygiene practices on prevalence of intestinal parasite infections

4. DISCUSSIONS

Intestinal parasite infections is a public health problem in orphanage homes in Awka, Anambra State, Nigeria as evident in the presence of infected children in this study with an overall prevalence of 39.1%. Compared to previous studies in orphanage homes in Anambra State which recorded a prevalence of 63.16% (14), this study recorded lower prevalence. This decrease in prevalence could be attributed to the improved hygiene practices and health intervention measures imbibed in the various facilities over the years. However, the prevalence recorded in this study was higher than similar studies in orphanage homes in other parts of the country: in Kaduna, Northern Nigeria, an overall prevalence of 9.2% was reported (15) while in Benin City, 20.7% prevalence of intestinal helminths was reported (13). The prevalence recorded in this study implies that children in these orphanages are still being exposed to predisposing factors aiding infection and reinfection. Therefore, places the demand for greater intervention measures to be put in place to further reduce prevalence in these orphanages in Awka.

Three parasite species were observed: *Ascaris lumbricoides, Balantidium coli,* and *Entamoeba histolytica*. *A. lumbricoides* had the highest prevalence (20.9%), which was consistent with the findings of many authors reporting *A. lumbricoides* as the parasite with highest prevalence in their researches (2, 4, 6, 14, 21, 22). The results for the prevalence of *A. lumbricoides* among orphanage children in this study was statistically significant which suggests that this prevalence was not by chance as children may have come into contact with soil, food, and water contaminated with infective stages (23). The infective stage of *A. lumbricoides* have the capacity to withstand extreme environmental temperatures and are coated with a mucopolysaccharide that renders them adhesive to a variety of surfaces like vegetables, fruits, door handles, and money (3,6). Consequently, poor hygiene practices of improper washing of hands without soap, eating unwashed fruits and vegetables, playing with sand as well as not cutting their fingernails might have exposed the children to the risk of contaminating their hands with infective stages of *Ascaris* eggs (21). Findings from this research showed that *E. histolytica* was more prevalent (10.4%) than *B. coli* (7.8%). Anumba *et al.,* (14), in a similar study in orphanage homes in this Anambra State reported lower prevalence of *E. histolytica* (3.23%). This study bears similarities to that conducted in Benue State by Utume et al. (24), who reported a prevalence of 8.3% though higher compared to this research finding and may be attributed to drinking tainted water with infective stages of

B. coli which could be a significant mechanism of cyst transmission. The prevalence results for these protozoan parasites were statistically significant and this may be attributed to the fact that transmission occurred through faeco-oral route, suggesting that these children may have consumed contaminated water due inadequate water supply and poor environmental hygiene practices in these orphanage (13).
Although there was a higher prevalence of IPI among male children in this study than female children, there was no statistically significant correlation between prevalence and gender. One possible explanation for this could be that the orphanage facilities exposed both male and female children to the same upkeep culture. This result is consistent with previous research conducted in orphanages (13, 15). However, other authors (6, 14) in similar study, reported higher prevalence in female children than in males. According to the findings of this study, the risk of intestinal parasitic infections was similar in male and female children.

The study found a correlation between age and the prevalence of intestinal parasitic infections, where children in the age group 16-20 years had the highest prevalence, while those in the age group 6-10 years had the lowest. This is consistent with similar studies in orphanage homes in Benin City (13) that reported more prevalence in older children, but was in contrast to studies in orphanage homes in Kaduna Metropolis (15) that reported more prevalence in younger children. This could be attributed to the hygiene practices of older children. This statistically significant finding highlights the importance of age in the prevalence of intestinal parasite infections in children. Orphanage-based prevalence of IPI was not significant although MCCH reported more prevalence than TLO (14).

This study revealed some risk factors for IPI in the orphanages: access to water, nail cutting, and playing with soil. Nwaneri and Omuemu (2012) noted that a borehole facility was located in the orphanages under research, serving as a source of drinking water for the children and for hand washing. This was also available in the orphanages in Awka. Despite the fact that the study found no significant difference between the prevalence of IPI and the source of water supply, orphanages with functional boreholes that served as a source of water for the children had a lower prevalence in this study, whereas those without functional boreholes that relied on external sources such as commercial tankers had a higher prevalence making it a significant risk factor because it was impossible to determine the cleanliness of the water and where appropriate precautions are not taken, such as boiling or chlorinating the water before drinking, children are more likely to contract intestinal parasites (13, 14). Intestinal parasite was more prevalent in children who played with sand as well as in children with long fingernails. This could be explained by the fact that when children play with contaminated soil, infectious stages of parasites in the soil may attach to their hands and cleave to long fingernails, which can then be consumed when contaminated hands come into contact with the mouth and proper hand washing with soap and clean water is neglected. Another factor that was shown to influence prevalence was the regularity with which the orphanages performed deworming exercises. Children who took antihelminthic medication three (3) months prior to sample collection recorded more prevalence compared to children who were dewormed one month before sample collection. However, the prevalence of IPI did not significantly correlate with the period since the last medicine was taken. This could be attributed to the fact that in any closed community, including orphanages, similar deworming exercises have been shown to reduce the prevalence and intensity of intestinal parasite (25), highlighting the importance of community mobilisation programmes as a means of informing the children and caregivers about the general advantages of routine deworming procedures (13). WHO has advised that all at-risk individuals residing in endemic areas are to receive periodic medical treatment (deworming or preventative chemotherapy) without first receiving a personalised diagnosis (26).
The study revealed inadequate knowledge of the children regarding IPI which could have influenced the prevalence among children in the orphanages. However, there was no

significant difference between the associations. This finding is consistent with those of Idowu *et al*. (22) in Lagos and Omitola *et al.* (21) in Ogun State, despite the fact that the subjects were not orphans. This knowledge gap informs the need for awareness and sensitization campaign to be carried out in the orphanage facilities where both children and caregivers would be educated about intestinal parasites.
This study also considered the hygiene practices of the orphanages and an overall hygiene level of 83.3% was recorded. This affirms the need for a boost in hygiene practices in the orphanages to further reduce prevalence of IPI in the orphanages.

5. CONCLUSION

In conclusion, this study reports a low prevalence of intestinal parasite infections compared to previous studies in Anambra State. Poor hygiene practices and inadequate knowledge on intestinal parasites were identified as risk factors. Therefore, this study shows that intestinal parasite infections is public health problem that requires attention and places the demand for sensitization campaigns, improved hygienic habits, environmental sanitation, and strategic deworming in the various orphanage homes. Hygiene practices such as regular cutting of fingernails, washing of hands properly especially after using the toilet, and use of foot-wears should be encouraged to curb potential health threats from infections and re-infections among orphanage children in Awka, Anambra State, Nigeria.

CONSENT

Advocacy visits were made to the orphanages in Awka in order to obtain the support and approval of orphanage homes towards the study. All authors declare that informed consent was obtained from the orphanage administrators.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. The approval to embark on this research was obtained from the Federal Ministry of Health, Anambra State, Nigeria with reference number: Ref: MH/PRSD/1401/27. Ethical approval to conduct this research in orphanage homes was obtained from the Ministry of Social Welfare, Children and Women Affairs with reference number: Ref: MW&SW/CD/077/VOL.2.

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