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Assessment of Intestinal Parasite and Nutritional Status of Children in Internally Displaced Persons (IDP) Camp in Guma and Makurdi, Nigeria

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Abstract

A cross-sectional study was carried out among 400 consented children 1-14 years old to determine the prevalence of intestinal parasitic infections and nutritional status of children under 5 years in Internally Displaced Persons (IDP) camps in Guma and Makurdi, Benue State, Nigeria. Stool samples were analyzed using formol ether concentration technique for presence of intestinal parasite. Anthropometric indices were taken and z scores were calculated using WHO growth standards in other to determine prevalence of wasting, stunting and underweight. Overall, prevalence of intestinal parasite infection in children 1 – 14 years was 28.8%. The intestinal parasites encountered were; *Entamoeba histolytica* (57.1%), *Hookworm* species (26.2%), *Taenia* species (15.0%), *Enterobius vermicularis* (0.8%) and *Schistosoma mansoni* (0.8%). Infection was significantly higher in children living in IDP camps (P = 0.048), children who were not dewormed (P< 0.001) and children observed without foot wear (P < 0.001). Wasting was recorded in 32.3% of children under 5 years, while prevalence of stunting and underweight was 9.0% and13.5% respectively. Wasting was more pronounced (P= 0.010) in children 3-5 years old (32.4%) than those of 1 – 2 years (9.1%) and was significantly different among the camps investigated (P = 0.003). Conversely, stunting was significantly higher (P = 0.006) in children 1 – 2 years of age (27.3%) than those within the ages of 3 – 5 (6.0%). The study could not associate very high malnutrition in this study with prevalence of intestinal parasite infections. Hence, there is need for Government to improve food security among these IDP camps and intensify efforts for IDP's return to their ancestral homes.

KEY WORDS: Intestinal parasite, Nutritional status, Children, IDP camps.

INTRODUCTION

Intestinal parasitic infections (IPIs) are reportedly one of the common infections causing health problems that impaired growth and physical development (Fauziah *et al*., 2022). Among these are infections caused by protozoans and helminthes, both of which live in the gastrointestinal tracts of humans and other animals. The common intestinal protozoan parasites of humans are *Entamoeba histolytica/dispar, Giardia intestinalis, Cryptosporidium* and *Cyclospora species* while helminthes parasites are *Ascaris lumbricoides, Trichuris trichiura,* hookworm, *Enterobius vermicularis*, and *Strongyloides* (Bisetegn *et al*., 2023). As a result of these parasites, humans, particularly children, suffer from diarrhea, malnutrition and anemia, which are generally associated with heavy parasitic burdens (Meurs *et al*., 2017).

About 270 million preschool children and over 600 million school children are reportedly living in areas where intestinal parasite infections are endemic (Sylla *et al*., 2022); and the developing world is disproportionately affected due to over-crowding, poor environmental sanitation such as uncontrolled feacal soiling activity and poor hygienic practices (Tyoalumun *et al*., 2016; Bisetegn *et al*., 2023). Intestinal parasite infections among children are found to be significantly associated with malnutrition and iron deficiency anemia, weight loss and stunted growth (Rajoo *et al*., 2017). Children who are stunted and wasted are negatively affected in terms of their cognitive functioning, academic achievement, motor skills, and psychological development (Coetzee *et al*., 2020).

Internally Displaced Persons (IDPs) camps are known to increase the risk of diarrhea diseases and intestinal parasitic infections due to their unhygienic and uninhabitable nature, poor sanitary conditions, overcrowding, and insufficient supply of drinking water (Evbuomwan *et al*., 2022). Approximately, 2.1 million Nigerians are reportedly displaced as a result of insurgences, herders-farmers clashes culminating in over 350 communities owned by the Tiv people in Guma, Gwer-West, Makurdi and other towns at the border with Taraba and Nasarawa State living in IDP camps (Duke and Agbaji, 2020). For example, as of 2018, 46,868 children under 15 years were recorded in the IDP camps in Makurdi and Guma alone (Korave *et al.*, 2021).

Despite the endemic nature of this problem, little is known (Nyinoh *et al*., 2023) about the impact of the congestion on the transmission of intestinal parasite infection and their effect on the nutritional status as well as other factors that could influence their transmission among these group of people. Hence, this study was designed to assess intestinal parasite infection of children 1 – 15 years and nutritional status of under 5 years children among internally displaced persons camps in Guma and Makurdi Local Government areas of Benue State, Nigeria

Material and Methods

Study Area

The study was conducted in Makurdi and Guma Local Government Areas of Benue State. Makurdi is located at latitude 7º 36´ 0´´ and 7º 55´ 0´´ North

and Longitude 8º 20´ 0´´ and 8º 40´ 0´´ East (Wikipedia) While Guma is situated between latitude 7º 33´ and 8º 22´ 0´´ North and longitude 8º 30´ 0´´ and 9º 00´ 0´´ East of Greenwich Meridian (wikipedia).

This study involved the (4) IDP camps officially recognized by Benue State Emergency Management Agency (Inyang and Effiong, 2022). The study targeted children aged 1-14 in Makurdi LGA (Abegena and Federal Housing Estate (FHE) camps) and Guma LGA (Daudu Camp I and Camp III), because intestinal parasite infections reach their maximum intensity at this age bracket (WHO, 2012). The population of IDPs officially recognized by Benue State Emergency Management Agency was 63,333 (Inyang and Effiong, 2022). This served as our population size from which our total sample size was chosen.

Sample size was determined using the formula:

$$n = Z^2 \frac{Pq}{d^2}$$

n = sample size

z = level of confidence according to the standard normal distribution (for a level of confidence of 95%, z = 1.96)

p = estimated proportion of the population that presents the characteristic (50%)

d = tolerated margin of error (0.05)

n= $(1.96)^2$ $\frac{0.5\ X0.5}{(0.05)2}$ =384 ≈ 400.

Ethical Issues

This study was approved by the Ethics Committee of Benue State Ministry of Health and Human services in Makurdi. Further permission was obtained from the State Emergency Management Agency (SEMA) that is in charge of the IDPs. At the IDP camps confirmation of the authenticity of permits was made by the various heads of the IDP camps, talks were organized in conjunction with the heads of the IDP camps to explain objectives of the study. Participation of any child in the study was voluntary and parents/guardians filled consent form for the participation of their ward.

Study Design and Selection of Participants

The design of the study was cross sectional and 400 participants were selected using a simple random procedure where each volunteered participant had equal chance of picking either a yes or no from a basket of folded papers.

Data and Sample Collection

A structured questionnaire was administered to each participating pupil with assistance of the parent /guardian. The questionnaire was designed to collect information on socio-demographic characteristics and risk factors associated with intestinal parasite infection.

A clean, labelled plastic container was given to each participating pupil/parent/guardian for the collection of early morning stool sample.

Appropriate instructions on how to collect uncontaminated stool samples were given to the children/parents. The stool samples were retrieved from the pupils and taken to Microbiology Laboratory, Benue State University Makurdi for parasitological examination.

Examination of Stool Samples for parasite

The collected stool samples were concentrated using formol-ether concentration technique (Cheesbrough, 2006). In this method, approximately 1g of stool sample was emulsified in 3mL of 10% formol-water in a 15mL centrifuge tube. Three to 4mLof formol water was added and sieved into a beaker. The filtrate was transferred into another 15mL test tube and 3mL of diethylether was added, mixed and centrifuge at 3000rpm for 10 minutes. The layers of ether, feacal debris and formol water was decanted. Deposit was examined microscopically using 10x and 40x objectives under low light illumination. For easy identification of cyst and eggs of parasite, wet preparations were stained with Dobell's iodine. The eggs in the samples were identified with the aid of parasitological atlas (Cheesbrough, 2006).

Anthropometric Assessment

The height (cm) and weight (Kg) of the sampled children was recorded using a height scale and weighing balance respectively. The children were measured without shoes or any other material that could affect their actual heights and weights. Weight was measured to the nearest 0.1 kg, while the height was recorded to the nearest 0.1 cm. Data was entered using the World Health Organization (WHO,2006) software (WHOAnthro, version 3.2.2), anthropometric indices were calculated using reference medians recommended by WHO and classified according to standard deviation units (z scores). The Z score or standard deviation (SD) is defined as the difference between the value for an individual and median value of the reference population for the same age or height, divided by the standard deviation of the reference population (Abdulla, 2016). All anthropometric measurements were computed into z scores; weight for height z score (WHZ), height for age z score (HAZ) and weight for age z score (WAZ).

Statistical Analysis

The z scores were exported into Statistical package for Social Sciences (IBM SPSS version 20.0) and categorized. Malnourished children were reported when one of their anthropometric indices was abnormal (- 2 z scores below the average reference). Children were considered wasted if weight-for-height index was below -2 z score below the average reference. Similarly, children were considered to have growth retardation (stunting) if their height-for-age index was below -2 z score below the average reference and were considered underweight if their weight-for-age index was below -2 z score below the average reference.

Descriptive statistics was used to describe the demographic characteristics of the study. Chi square test was used to compare categorical variables. An association or difference was considered statistical significance if the probability value (P value) was less than or equal to 0.05.

RESULTS

In determining the prevalence of IPIs of all the 400 children that participated in the study, 115 (28.8%) were found to be infected with intestinal parasites. Infection was slightly higher ($\chi^2 = 2.351$, df = 1, p = 0.125) in females [63 (32.3%)], than their male counterpart [52 (25.4%)].

Intestinal parasite infection was significantly higher ($\chi^2 = 3.909$, df = 1, p = 0.048) in children living in the IDP camp [94 (31.3%)], than children living outside of the IDP camp [21(21.0%)]

Prevalence of Intestinal Parasite Infection with respect to age of children slightly increases ($\chi^2 = 0.297$, df = 2, P = 0.862) with increasing age (Table 1)

Of the parasite found among the studied participants, *Entamoeba histolytica* 72 (57.1%) was the parasite most frequently encountered. This was followed by Hookworm 33 (26.2%), *Teania* species 19(15.0%), *Enterobius vermicularis* 1(0.8%) and *Schistosoma mansonai* 1(0.8%) as shown in Table 2.

Table 1: Prevalence of Intestinal Parasite Infections according to Demographic Factors

Demographic factor	Number Examined	Infected (%)	P value
Sex			
Male	205	52 (25.4)	
Female	195	63 (32.3)	0.125
Residence			
In IDP	300	94 (31.3.0)	
Outside IDP	100	21 (21.0)	0.048*
Age Group			
1 – 5 years	166	40 (24.1)	
6 – 10 years	178	57 (32.0)	
11 – 15 years	56	18 (32.1)	0.223
Total	400	115 (28.8)	

Table 2: Frequency of Occurrence of Intestinal Parasites Infection among Children

Parasite	Frequency	Percentage
Entamoeba histolyiica	72	57.1
Enterobius vermicularis	1	0.8

Hookworm species	33	26.2
Schistosoma mansoni	1	0.8
Taenia species	19	15.0
Total	126	100

Questionnaire Responses to History of Risk factors and parasitic infection Status in this study shows 66.7% of the children lacked awareness to intestinal parasite infection. There was a corresponding slightly higher percentage infection of parasites in the uninformed (30.7%) than to those informed (28.8%) on knowledge of intestinal parasite infection.

Similarly, children with no previous history of intestinal parasitic infection had higher infection than those that had previous history of intestinal parasitic infection (χ^2 = 7.675, df =3, P= 0.022)

Infection was also significantly higher (χ^2=30.974, df=1, P <0.001) in children that were not dewormed in the last 4 months than those that were dewormed in the last 4 months.

Similarly, samples from children observed without foot wear recorded significantly higher intestinal parasite compared with those that put-on foot wears (χ^2= 52.903, df = 1, P < 0,001)

However, there was no association between intestinal parasitic infection and type of toilet facility used by the children in this study (Table 3)

Table 3: Questionnaire Responses to History of Risk factors and parasitic infection Status for each Response Group

History of Risk factor	Responses Sought	Number of Responders (%)	No. Infected with IP (%)	P value
Awareness of Intestinal Parasite Infections?				
	Yes	133 (33.3)	33 (24.8)	
	No	267 (66.7)	82 (30.7)	0.219
History of previous intestinal parasite infection				
	Yes	44 (11.0)	12 (27.3)	
	No	198 (49.5)	69 (34.8)	
	I don't know	158 (39.5)	34 (21.5)	0.022*
Dewormed in the last 4 months				
	Yes	226 (56.5)	40 (17.7)	
	No	174 (43.5)	75 (43.1)	< 0.001**

Observation of Foot Wear			
Without foot wear	239 (59.8)	101 (42.3)	
With foot wear	161 (40.2)	14 (8.7)	< 0.001**
Type of Toilet facility frequently used			
Pit toilet	371 (92.7)	108 (29.1)	
Open defecation	10 (2.5)	2 (20.0)	
Pit and open defecation	19 (4.8)	5 (26.3)	0.798

A total of 32.5% children under 5 years of age had a Weight for height z score (WHZ) below -2 SD and were classified as been wasted, 9.0% of children under 5years had their z score (HAZ) below -2SD and were classified as been stunted while 13.5% had their weight for age (WAZ) z score below -2SD and were classified as underweight children (Table 4).

Table 4: Prevalence of Wasting, Stunting and Underweight among Children 0 – 5 years in and Outside IDP Camps in Makurdi and Guma LGAs.

Variable	Classification	Z score	Frequency	Percent
WHZ	Wasted	< -2	50	32.3
	Normal	-2 to 2	90	58.1
	Obese	>2	15	9.7
HAZ	Stunted	< -2	14	9.0
	Normal	-2 to 2	107	69.0
	Abnormal	>2	34	21.9
WAZ	Underweight	< -2	21	13.5
	Normal	-2 to 2	131	84.5
	Obese	>2	3	1.9

The levels of malnutrition among children under five in this study were not different between males and females (Table 5). Wasting was recorded in 32.4% of females as well as 32.1% in males (χ^2 =0.231, df=2, P = 0.891). Similarly, 14.9% of females were underweight compared with 12.3% of the males (χ^2 =0.440, df= 2, P = 0.803). Conversely, stunting was slightly higher in males (9.9%) than the females (8.1%), (χ^2 =1.040, df = 2, P = 0.595). These values were all not significantly different between males and females.

Table 5: Prevalence of Wasted, Stunted and Underweight among Children 5 years and below in Relation to Sex of children IDP camp in Makurdi and Guma LGAs

Sex	Number Examined	Z Score Classification			P value
		< -2	-2 to 2	> 2	
			WHZ		
Males	81	26 (32.1)	48(59.3)	7(8.6)	
Females	74	24(32.4)	42(56.8)	8(10.8)	0.891
			HAZ		
Males	81	8(9.9)	53(65.4)	20(24.7)	
Females	74	6(8.1)	54(73.0)	14(18.9)	0.595
			WAZ		
Males	81	10(12.3)	69(85.2)	2(2.5)	
Females	74	11(14.9)	62(83.8)	1(1.4)	0.803

The rates of malnutrition among children under five in this study indicates that older children (3 – 5 years old) were significantly (χ^2 =9.230, df = 2, P = 0.010) more wasted (36.1%) than those under 1 – 2 years (9.1%). Conversely, children under 1 -2 years category (27.3%) were significantly (χ^2= 10.389, df = 2, P = 0.006) more stunted than those that were under 3 – 5 years category (6.0%). On the other hand, there was no difference (χ^2 = 0.507, df = 2, P = 0.776) between the underweight status of children 1 – 2 years (13.6%) and 3 – 5 years (13.5%) as seen in Table 6.

Table 6: Prevalence of Wasted, Stunted and Underweight among Children 5 years and below in Relation to Age of IDP children in Makurdi and Guma LGAs

Age (years)	Number Examined	Z Score Classification			P value
		< -2	-2 to 2	> 2	
			WHZ		
1 – 2	22	2 (9.1)	15(68.2)	5(22.7)	
3 – 5	133	24(32.4)	42(56.8)	8(10.8)	0.010*
			HAZ		
1 – 2	22	6(27.3)	12(54.5)	4(18.2)	
3 – 5	133	8(6.0)	95(71.4)	30(22.6)	0.006*
			WAZ		
1 – 2	22	3(13.5)	19(86.4)	0(0.0)	
3 – 5	133	18(14.9)	112(84.2)	3(1.9)	0.776

*significant

Regarding the nutritional status of children under five according to IDP Camps studied, wasting was significantly different (χ^2 =19.480, df = 2, P= 0.003) , among the 4 camps with highest rate (59.1%) reported in FHE camp followed by IDP Camp 1 (46.4%) while Abagena camp was recorded with the least wasting of 18.9% . Though stunting was recorded higher in IDP camp 3 (13.2%) when compared with Abagena (10.8%) and IDP camp 1 (3.6%) and FHE camp (0.0%), the difference was not statistically significant (χ^2 =10.551, df = 6, P = 0.103). On the other hand, underweight was slightly higher (χ^2 =6.966,

df = 6, P = 0.324) in IDP camp1 (21.4%), followed by FHE camp (18.2%), IDP camp3 and Abagena camp with 2.7% (Table 7).

Table 7: Prevalence of Wasted, Stunted and Underweight among Children 5 years and below in Relation to IDP Camp of children in Makurdi and Guma LGAs

IDP camp	Number Examined	Z Score Classification			P value
		< -2	-2 to 2	> 2	
			WHZ		
Abagena	37	7 (18.9)	27(73.0)	3(8.1)	
IDP Camp 3	68	17(25.0)	40(58.8)	11(16.2)	
IDP Camp 1	28	13(46.4)	15(53.6)	0(0.0)	
FHE Camp	22	13(59.1)	8(36.4)	1(4.5)	0.003*
			HAZ		
Abagena	37	4(10.8)	27(73.0)	6(16.2)	
IDP Camp 3	68	9(13.2)	48(70.6)	11(16.2)	
IDP Camp 1	28	1(3.6)	19(67.9)	8(28.6)	
FHE Camp	22	0(0.0)	13(59.1)	9(40.9)	0.103
			WAZ		
Abagena	37	1(2.7)	35(94.6)	1(2.7)	
IDP Camp 3	68	10(14.7)	56(82.4)	2(2.9)	
IDP Camp 1	28	6(21.4)	22(78.6)	0(0.0)	
FHE Camp	22	21(13.6)	18(81.8)	0(0.0)	0.324

*significant

Prevalence of intestinal parasite infection in relation to the nutritional status of children under five in the IDP camps is shown in Table 8. Children with z score below – 2 SD (wasted) had higher (χ^2 =0.911, df = 2, P = 0.634) intestinal parasite infection (28.0%) compared with those that had z score -2 to 2 (21.1%) and children that were Obese (26.7%). In terms of stunting, children under normal z score (-2 to 2) were significantly (χ^2 = 6.647, df = 2, P = 0.036) more infected with intestinal parasite than the obese (17.6%) and stunted children (0.0%).

Table 8: Prevalence of Intestinal Parasite Infection According Wasted, Stunted and Underweight among Children 5 years of IDP Camp in Makurdi and Guma LGAs

Z Score	Number Examined	Number Infected (%)	P value
		WHZ	
< 2	50	14(28.0)	
-2 to 2	90	19(21.1)	
>2	15	4(26.7)	0.634
		HAZ	
< 2	14	0(0.0)	
-2 to 2	107	31(29.0)	

>2	34	6(17.6)	0.036*
		WAZ	
< 2	21	4(19.0)	
-2 to 2	131	32(24.4)	
>2	3	1(33.3)	0.803

*significant

DISCUSSION

Prevalence of intestinal parasitic infections of 28.8% recorded in the study is moderate and could be due to efforts of the Benue State Government and other donor agencies to reduce intestinal parasitic infections through construction of toilets, sinking of boreholes and free mass drug administration at the various IDP camps. This is corroborated by the study of Ihejirika *et al*. (2019) who associated prevalence of intestinal parasitic infection of 16.6% to efforts of Imo State government and free mass drug administration. Conversely, Tyolumun *et al*. (2016) linked higher prevalence of intestinal parasite infections (51.4%) among pre-school in Gboko Local Government area to poor environmental hygiene, shortages of clean portable water and indiscriminate defecation. Another report among preschool children in Eke, Okpokwu Local Government Area also in Benue State (Ogbeyi *et al*., 2020) recorded higher intestinal parasite infections of 58.0%, implicating inadequate sanitation and hygiene behaviour among the children studied as risk factors. Similar findings of prevalence of intestinal parasite infections (58.8%) were earlier reported by Houmsou *et al*. (2010) among primary school children in Makurdi, Benue State.

Prevalence of 28.8% reported among the IDPs in this study is also lower than other studies among children in other parts of Nigeria. For example, Gyang *et al.,* (2019) reported prevalence of 86.2% among school-aged children in an archetypal African urban slum in Nigeria; Opara *et al.,* (2012) reported a prevalence of 67.4% (273/405) among rural and urban school-aged children in Nigeria while Ubachukwu *et al.* (2016) found prevalence of 52.5% among school children in Uzo-Uwani Local Government Area of Enugu State.

In comparison with works done in IDP camps, prevalence of intestinal parasite infections of 28.8% reported in this study corroborates 21.8% reported by Hamidu *et al*. (2016) among children in an Internally Displaced Persons' (IDPs) camp in Maiduguri, Borno State but is at variance with prevalence 89.6% reported among schoolchildren in an internally displaced person's camp in Benin City, Nigeria (Evbuomwan *et al*., 2022). Victims of displacement are reportedly faced with shortage of basic amenities such as essential food material and nutrients, clothing, shelter, poor sanitation, poor hygiene among other necessities (Oluwatosin *et al*., 2019). But the impact of these confounding factors vary from one IDP camp to another and from region to region. For example high IPI prevalence reported in Benin city IDP camp

(Evbuomwan *et al*., 2022) was associated with poor personal hygiene, environmental hygiene and genetic make-up of the studied children. Nzitakera *et al*., (2022) linked 48.0% prevalence of intestinal parasite infection among primary school children at Kegeme refugee camp in Rwanda to parental literacy and poor personal hygiene. In this study, prevalence of intestinal parasite infection was strongly associated ($p < 0.001$) with children's basic needs like foot wear as well as history of previous intestinal parasite infection ($p = 0.022$) that may not have been well treated or which could have persisted due to drug resistance. Notwithstanding, deworming of these IDP children had a highly ($p < 0.001$) positive predictive value in reducing infections due to intestinal parasite.

Prevalence of 57.0% of *Entameba histolytica* reported in this study in the mist of frequent deworming exercise of the IDP children points to the fact that Albendazole, methyl [5-(propylthio)-1H-benzimidazol-2-yl] carbamate, use for mass deworming of children is reportedly effective against nematode, trematode and cestode infections but needs further evaluation in terms of protozoan infections (Chai *et al*.,2021). High prevalence of *E. histolytica* reported in an area of frequent deworming have also been reported by Ihejerika *et al*. (2019) among primary school children in Imo State, Nigeria. Similarly, high prevalence of *E. histolytica* infections (64.3%) have been reported by Evbuamwan *et al*. (2022) among children in internally displaced persons camp in Benin city while 68.9% have been reported by Hassan and Mero (2020) among displaced persons living in displacement camps in Duok Province in Iraq. Hence there is need to further investigate deworm children of protozoan infections after a mass deworming exercise.

IPIs and under-nutrition are reportedly a major public health problem, especially among children (Bisetegn *et al*., 2023). In this study malnourished children were reported when any of the anthropometric indices (WHZ, HAZ or WAZ) were abnormal (-2 z score below the average reference), (Abdulla, 2016). Prevalence of wasting of 32.3% recorded in this study could be classify as critical or very high (WHO, 2019) but the result agrees with the findings of pilot study in Abagena IDP camp in Makurdi which reported prevalence of underweight of 42.5% (Nyinoh *et al*., 2023). Relatedly, Idowu *et al*. (2020) also reported prevalence of underweight, stunting and wasting of 42%, 41% and 29.3%, respectively among under-five children in internally displaced persons ´camps in Abuja municipal area council, Abuja, Nigeria. This study also agrees with the findings of an earlier study among urban school children in Makurdi, Benue State that reported prevalence of underweight 43.4%, stunting 52.7%, and thinness 77.3% (Goon *et al*., 2011). The study attributed the high prevalence of under-nutrition among the children to poverty due to low socio-economic background of their parents. In another study among preschool-aged children in the sub-urban communities of Abeokuta, Southwest, Nigeria, prevalence of stunting (39.5%), underweight (22.8%), and wasting/thinness of 11.4% was reported (Adeniran *et al*., 2017).

Wasting in children is reportedly a symptom of acute under-nutrition, usually as a consequence of insufficient food intake or a high incidence of infectious diseases, especially diarrhea (WHO, 2019). In this study, high prevalence of wasting could not be associated with prevalence of intestinal parasitic infections. However, it was difficult to rule out the impact of other infectious diseases on the prevalence of wasting reported since our pilot study reported higher prevalence of gut bacteria; *Salmonella* spp., *Shigella* spp., and *Escherichia coli* (Nyinoh *et al*., 2023). Similar findings have been reported by Ihejirika *et al*. (2019) where prevalence of stunting, underweight and wasting were higher in intestinal parasitic uninfected children (86.1%, 90.0% and 10.0%) respectively than in intestinal parasitic infected children (13.9%, 10.0% and 0.0%) respectively. Conversely, Opara *et al*. (2012) associated high prevalence of under-nutrition of rural and urban school-aged children of two schools in Akwa-Ibom to high prevalence of intestinal parasitic infections. Similar findings have also been reported in Benue State where high prevalence of wasting of 30.3% and 24.3% among children from rural and urban settlements respectively was associated with infected children (Tyolumun *et al*., 2016).

Significant higher prevalence of wasting ($p = 0.003$) recorded in FHE IDP camp as against other studied camps is not unexpected because the IDP camp is situated beside Federal Housing Estate away from the reach of herdsmen. As a result displaced persons are more attracted to it resulting in over population culminating in shortages of intervention material such as food and clothing.

Conclusion

Children living in IDP camps in Makurdi and Guma were moderately infected (28.8%) with intestinal parasites especially *Entamoeba histolytica* in the mist of free deworming exercises by government, donor agencies and philanthropic organizations. The study also reported critical level (32.3%) of malnutrition among the studied children in the IDP camps. The study appreciate the impact of free deworming exercise on prevalence of IPIs but recommend further investigation to reduce prevalence of protozoan parasitic infections. Furthermore, there is need for Government to improve food security among these IDP camps and intensify efforts for IDP's return to their ancestral homes.

Competing Interest

The authors declare no competing interest

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