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Prevalence Of Intestinal Parasitic Infections Among Malnourished Children Under Five Years In Community Management Of Acute Malnutrition Centres, Adamawa State, North East Nigeria

Aisha Rita Nicholas,[1] Micah Saleh Pukuma,[2] Abubakar Musa,[3] Usman Abba,[4] Abdullahi Aliyu Jibo.[5]

[1]Adamawa State Primary Health Care Development Agency, Adamawa State – Nigeria

[2]Department of Zoology, Modibbo Adama University Yola, Adamawa State – Nigeria

[3]Department of Community Medicine,
Abubakar Tafawa Balewa University/Abubakar Tafawa Balewa University Teaching Hospital, Bauchi – Nigeria

[4]Department of Obstetrics and Gynaecology,
Yobe State University Damaturu, Yobe State – Nigeria

[5]Department of Microbiology, Sa'adu Zungur University Bauchi-Nigeria
Correspondence: Aisha Rita Nicholas, Adamawa State Primary Health Care Development Agency, Adamawa State – Nigeria.
abdulahiaisha989@gmail.com, +234(0)8141315438

ABSTRACT
Intestinal parasitic infections (IPIs) remain a significant public health challenge, particularly in low- and middle-income countries. Malnourished children under five years are especially vulnerable, with infections exacerbating malnutrition and impairing physical and cognitive development. Limited data exist on the prevalence of IPIs among malnourished children in Yola North, Adamawa State, Nigeria. This study aimed to determine the prevalence and types of intestinal parasites among malnourished children under five attending Community Management of Acute Malnutrition (CMAM) centres in Yola North. A cross-sectional study was conducted between November 2021 and February 2022. Stool samples were collected from 380 children (179 males, 201 females) across five CMAM centres. Parasitological analysis was performed using direct wet mount and formol-ether concentration techniques. Data were analyzed using SPSS version 24. The overall prevalence of IPIs was 23.4%. Hookworm was the most common parasite (52.8%), followed by *Ascaris lumbricoides* (25.9%), *Trichuris trichiura* (7.9%), *Entamoeba coli* (6.7%), and low frequencies of *Giardia lamblia*, *Strongyloides stercoralis*, and *Enterobius vermicularis* (each 2.2%). Prevalence varied significantly by age, gender, and CMAM centre ($p<0.05$). Older children (48–59 months) and females showed higher infection rates and intensities. Intestinal parasitic infections are prevalent among malnourished children in Yola North, with hookworm being the most common. Poor sanitation, open defecation, and low socioeconomic status are key risk factors. Integrated interventions focusing on hygiene, sanitation, and health education are urgently needed.

Keywords: Prevalence, Intestinal Parasites, Malnutrition, Children Under-Five, CMAM, Adamawa State, Nigeria.

INTRODUCTION

Intestinal parasitic infections constitute a major public health challenge in developing nations.[1] Globally, hundreds of millions are infected with soil-transmitted helminths like *Ascaris lumbricoides*, hookworms, and *Trichuris trichiura*.[2] These parasites cause diseases such as ascariasis, trichuriasis, and strongyloidiasis, leading to symptoms ranging from abdominal discomfort and diarrhoea to severe anaemia, cognitive deficits, and growth stunting, particularly in children.[3,4]

Transmission is fueled by inadequate sanitation, contaminated water, and poor hygiene practices.[5] In Nigeria, while some studies have documented IPIs, data from specific regions like Adamawa State, particularly among vulnerable groups such as malnourished children, remain sparse.[6] This study aimed to establish baseline data on the prevalence and associated factors of IPIs among malnourished children under five in Yola North LGA, Adamawa State, Nigeria.

METHODOLOGY

Study Area & Design: The study was conducted in Yola North LGA, Adamawa State, using a descriptive cross-sectional design.

Study Population: The population comprised children under five years attending CMAM centres. Critically ill children or those on recent anthelmintic/antibiotic therapy were excluded.

Sample Size & Sampling: A sample size of 380 was calculated using the formula from the previous study,[7] with a 52% prevalence assumption,[8] 95% confidence level, and 5% margin of error. Participants were proportionally allocated from five CMAM centres and selected via systematic random sampling.

Data & Sample Collection: A checklist was administered to mothers/caregivers to collect socio-demographic and clinical data. Each child provided a single stool sample collected in a pre-labeled container. Samples were preserved in 10% formalin and transported to the laboratory.

Parasitological Examination: Macroscopic examination was followed by saline/iodine wet mounts and formal-ether concentration technique.[9] Identification was based on morphological characteristics of eggs, cysts, and larvae.

Data Analysis: Data were analyzed using SPSS v24.0 and Microsoft Excel. Associations were tested using Chi-square and ANOVA. Statistical significance was set at $p<0.05$.

Ethical Consideration: Ethical clearance was obtained from the Adamawa State Ministry of Health. Informed consent was sought from caregivers, and the principles of the Declaration of Helsinki were adhered to.

RESULTS

The overall prevalence of intestinal parasitic infections was 23.4% (89/380). Hookworm was the most frequent parasite (52.8% of positives), followed by *A. lumbricoides* (25.8%). Prevalence varied significantly across CMAM centres ($p<0.05$), with Jambutu centre recording the highest prevalence (32.1%) and Ajiya the lowest (6.5%) (Table 1).

Table 1: Prevalence of Intestinal Parasitic Infections by CMAM Centre

CMAM Centre	No. Examined	No. Positive (%)	*A. lumbricoides*	Hookworm	*E. coli*	*T. trichiura*	*E. vermicularis*	*G. lamblia*	*S. stercoralis*
Ajiya	31	2 (6.5)	1	1	0	0	0	0	0
Yelwa	48	6 (12.5)	1	4	1	0	0	0	0
Bachure	130	33 (25.4)	13	12	2	3	0	2	1
Nassarawo	37	5 (13.5)	1	2	1	1	0	0	0
Jambutu	134	43 (32.1)	7	28	2	3	2	0	1
Total	**380**	**89 (23.4)**	**23 (25.8%)**	**47 (52.8%)**	**6 (6.7%)**	**7 (7.9%)**	**2 (2.2%)**	**2 (2.2%)**	**2 (2.2%)**

Infection prevalence were significantly higher in females (29.4%) than males (16.8%), particularly for *A. lumbricoides* ($p<0.05$). The 48-59 months age group had the highest prevalence (34.3%), while the 1-11 months group had the lowest (9.7%) (Table 2).

Table 2: Prevalence of IPIs by Age and Gender

Variable	No. Examined	No. Positive (%)	*A. lumbricoides*	*E. coli*	*E. vermicularis*	*G. lamblia*	Hookworm	*S. stercoralis*	*T. trichiura*
Age (months)									
1–11	72	7 (9.7)	2 (28.6)	–	–	–	5 (71.4)	–	–
12–23	60	10 (16.7)	3 (30.0)	–	–	–	6 (60.0)	–	1 (10.0)
24–35	83	13 (15.7)	3 (23.1)	–	–	–	9 (69.2)	–	1 (7.7)
36–47	66	15 (22.7)	4 (26.7)	1 (6.7)	–	–	9 (60.0)	–	1 (6.7)
48–59	99	34 (34.3)	11 (32.4)	5 (14.7)	2 (5.9)	2 (5.9)	18 (52.9)	2 (5.9)	4 (11.8)
Gender									
Male	179	30 (16.8)	6 (20.0)	2 (6.7)	–	–	20 (66.7)	–	2 (6.7)
Female	201	59 (29.4)	17 (28.8)	4 (6.8)	2 (3.4)	2 (3.4)	27 (45.8)	2 (3.4)	5 (8.5)
Total	**380**	**89 (23.4)**	**23 (25.8)**	**6 (6.7)**	**2 (2.2)**	**2 (2.2)**	**47 (52.8)**	**2 (2.2)**	**7 (7.9)**

Significant associations were found for *E. coli* by age (ANOVA $p<0.05$) and for *A. lumbricoides* by gender (χ^2 $p<0.05$).

Infection prevalence and mean intensity were significantly higher in females (29.4%) than males (16.8%), particularly for *A. lumbricoides* ($p<0.05$). The 48-59 months age group had the highest prevalence (34.3%) and mean intensity, while the 1-11 months group had the lowest (9.2%) (Table 3).

Table 3: Prevalence and Mean Intensity of Infections by Age and Gender

Variable	No. Examined	No. Positive (%)	Hookworm Mean Intensity (epg)	*A. lumbricoides* Mean Intensity (epg)
Age (months)				
1-11	72	7 (9.2)	0.086	0.029
12-23	60	10 (16.7)	0.148	0.082
24-35	83	13 (15.7)	0.107	0.036
36-47	66	15 (22.7)	0.152	0.061
48-59	99	34 (34.3)	0.200	0.150
Gender				
Male	179	30 (16.8)	0.123	0.045
Female	201	59 (29.4)	0.142	0.076

DISCUSSION

The overall prevalence of 23.4% aligns with studies from Ethiopia (23.4-25.4%)[10] but is lower than rates reported in some Ethiopian communities (59.4%).[11] It is higher than prevalence found in southwestern Iran (5.8-6.1%).[12] These disparities may be attributed to differences in socio-economic status, sanitation, climate, and study populations. The predominance of hookworm (52.8%) contrasts with studies from India where *Giardia lamblia* was most common,[13] highlighting geographical variations in parasite distribution.

The higher prevalence in older children (48-59 months) is consistent with increased environmental exposure through play and poor self-latrine practices.[14] The significantly higher prevalence and intensity in females, particularly for ascariasis, warrants further investigation but may relate to gendered roles in caregiving and domestic activities that influence exposure.[15]

The variation between CMAM centres, with Jambutu having the highest prevalence, is strongly associated with reported open defecation practices (94.3% in bush), emphasizing the role of sanitation.[16] This finding is consistent with national and international evidence linking open defecation to soil-transmitted helminth infections.[17]

The persistent burden of IPIs among malnourished children underscores a vicious cycle where parasites exacerbate nutrient loss and growth faltering, while malnutrition increases susceptibility to infection.[18]

This calls for the integration of routine deworming into CMAM protocols, alongside targeted Water, Sanitation, and Hygiene (WASH) interventions.[19]

Limitations

The study was limited to CMAM centres, which may not represent the broader community of non-malnourished children and the use of a single stool sample per child may underestimate the prevalence of intermittent or low-burden infections. The cross-sectional design limits causal inference between risk factors and infections.

CONCLUSION

This study reveals a moderately high prevalence of intestinal parasites, particularly hookworm, among malnourished children in Yola North. Key risk factors include open defecation, low maternal education, low socioeconomic status, and use of unprotected water sources. Addressing IPIs requires multisectoral strategies integrating health, WASH (Water, Sanitation, and Hygiene), and community education initiatives.

RECOMMENDATIONS

1. Government and NGOs should improve access to sanitary toilet facilities to eliminate open defecation.
2. Implement and enforce safe water management and treatment practices, including boiling.
3. Promote thorough washing of vegetables and fruits before consumption.
4. Integrate sustained health education for mothers on hygiene, parasite transmission, and prevention into CMAM programmes. and regular deworming campaigns targeting malnourished children.
5. Further research should explore the socio-behavioural determinants of infection and the cost-effectiveness of integrated intervention models.

Conflict of interest: Nil

Funding source: Nil

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