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# Prevalence of Intestinal Parasitic Infections among IDPs and their Associated Risk Factors in Jibia, LGA, Katsina, Nigeria

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*Abstract*

***Internally Displaced Persons (IDPs) often encounter poor living conditions that make them susceptible. This study assessed the Prevalence and Risk Factors of Intestinal Parasitic Infections (IPIs) among IDPs in Jibia, Katsina State, Nigeria. A cross-sectional study was performed among 300 IDPs who had lived in the camp for over a year. Demographic data, clinical symptoms, and hygiene practices were assessed using structured questionnaires. A clean, sterilized stool container and each specimen bottle were labelled with the IDP's serial number and date for correct identification. Stool samples were examined using Formalin-Ether Sedimentation technique to identify intestinal parasites. Females and individuals ≤19 years exhibited slightly higher infection rates, though demographic factors were not significantly linked with infection. A higher prevalence was observed in the 40–49 years age group (84.0%), while a lower prevalence was observed among individuals aged 30-39 years (71.1%). Abdominal pain (50.0%) was the most reported symptom. Key behavioral risk factors comprised poor hygiene practices, lack of knowledge about parasite transmission, and limited access to treated water and proper sanitation. Only 24.3% of participants demonstrated knowledge of parasite transmission, and just 12.0% practiced water treatment. Logistic regression analysis revealed that lack of transmission knowledge was an independent meansure predictor of infection (AOR: 1.91; 95% CI: 1.05-3.47; p = 0.03). Intestinal parasitic infections remain highly prevalent among IDPs in Jibia, largely driven by poor hygiene knowledge, inadequate sanitation, and unsafe water consumption. Comprehensive interventions, including health education, improved WASH (Water, Sanitation, and Hygiene) programs, and regular deworming, are urgently needed to reduce the burden of infection in this susceptible population.***

***Keywords: Prevalence, IDPs, Intestinal Parasites, Risk factors, Infection.***

## INTRODUCTION

Intestinal parasitic infections (IPIs) remain a major global public health burden, affecting billions of people, particularly in low- and middle-income countries. Globally, an estimated 3.5 billion individuals are infected with one or more intestinal parasites, including soil-transmitted helminths and protozoa (Mekonnen *et al.,* 2016; Gyang *et al.,* 2019). The World Health Organization reports that more than one billion people are affected by intestinal parasitic infections, soil-transmitted helminths, schistosomiasis, and related parasitic diseases, conditions strongly linked to poverty, inadequate sanitation, and limited access to healthcare services (WHO, 2014).

Among the most vulnerable populations to IPIs are IDPs, who are forced to flee their homes due to conflict, natural disasters, political instability, or terrorist activities (Owoaje *et al.,* 2016). Globally, approximately 5.2 million people are displaced annually due to armed conflict and violence perpetrated by groups such as Islamic State, the Taliban, Al-Shabaab, and Boko Haram, particularly in the Middle East and sub-Saharan Africa (Mohammed *et al.,* 2015; Abdullahi, 2019). In Nigeria alone, over 2.1 million people have been displaced due to insurgency, communal clashes, cattle rustling, and counter-insurgency operations, with more than 700,000 displaced in the northern region due to farmer-herder conflicts (Erismann *et al.,* 2017).

Socio-environmental conditions in IDP settlements significantly heighten the risk of intestinal parasite transmission. Overcrowding, inadequate sanitation, poor waste disposal, scarcity of clean water, and generally unhygienic living conditions create an environment conducive to the spread of helminths and protozoan infections. Studies have documented high prevalence rates of Ascaris infection, amebiasis, giardiasis, schistosomiasis, and other parasitic diseases among displaced populations, especially in camps located near contaminated water sources (Yauba *et al.,* 2018; Evbuomwan *et al.,* 2022).

The health consequences of these infections are profound. IPIs contribute to malnutrition, anemia, stunted growth, impaired cognitive development, and increased susceptibility to other diseases. Children and pregnant women are particularly at risk, and the burden of parasitic infections places additional strain on already limited healthcare systems within host communities (Teketelew *et al.,* 2023).

Despite the high vulnerability of IDPs to parasitic infections, there is limited research assessing the prevalence, risk factors, and health impacts of IPIs within Nigerian displacement settings. This underscores the need for context-specific studies that can inform targeted interventions. Therefore, the present study aims to address this gap by investigating the burden of intestinal parasitic infections among IDPs, with the goal of generating evidence to support effective control strategies and improve health outcomes in these highly exposed populations.

## MATERIALS AND METHODS

### Study area

Jibia town (Figure 1) lies on latitude 13° 05' N and longitude 07° 13' E. The town is located about 20 km Northwest of Katsina, and the average altitude is 409 meters above sea level. It shares boundaries with Niger Republic to the North, Katsina and Kaita to the East, Batsari and Batagarawa to the South, and Zamfara State to the West. Jibia town is the headquarters of Jibia Local Government Area (LGA) of Katsina State, Nigeria. The study was conducted in Jibia IDPs, located at 13°.06'50.79'' N latitude and 7°.13'19.11'' E longitude. Northwest Nigeria, Katsina State.

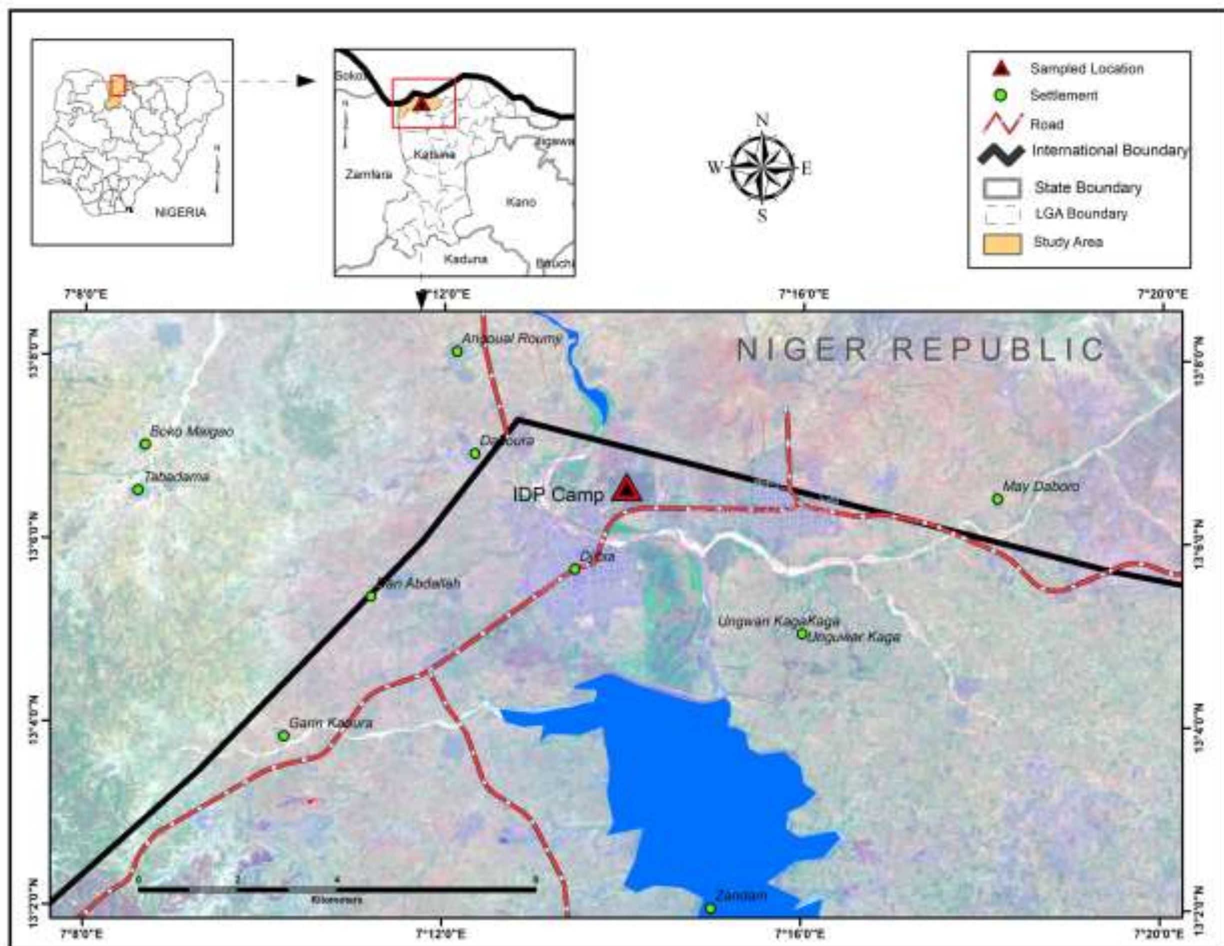


**Figure 1: Map of Jibia Local Government showing the study area (GIS Lab. UMYU, 2024).**

**Sampling**

The study utilized human stool samples collected from IDPs residing in the study area. Fresh stool specimens were obtained from each participant using clean, sterile, leak-proof specimen containers provided.

The sample size for the study was calculated according to WHO guidelines (Arya *et al.,* 2012). The following formula was used for the calculation of the sample size:

$N = Z^2P(1 - P)/(d^2)$

Where:

N = sample size

Z = Z statistic for a level of confidence (For 95% confidence level)

Z-value is 1.96.

P = expected prevalence or proportion (e.g. if 20%; P = 0.2), and

d = precision (e.g. if 5%, d = 0.05).

$n = (1.96)^2(0.2)(1-0.2)/[(0.05)^2]$

n = 246, which was approximated to 300.

The minimal sample size determined for the research was 246. Nevertheless, this figure was rounded up to 300 to account for potential non-response or invalid units, strengthen statistical power, and improve the representativeness and accuracy of the study outcomes.

**Study design and population**

A cross-sectional study design was employed, involving both field data collection and laboratory analysis of samples. The study population consisted of IDPs residing in designated IDP camps in Jibia town, Jibia Local Government Area, Katsina State.

**Ethical consideration and consent**

Ethical consent was sought and obtained from the Research Ethics Review Committee of the Katsina State Ministry of Health, with the reference number MOH/ADM/SUB/1152/1/1069. All participants were informed of the study's purpose and procedures, and participation was voluntary. All information collected during the study, Prevalence of Intestinal Parasitic Infections among IDPs and its Associated Risk Factors in Jibia LGA, Katsina, Nigeria, was handled with strict confidentiality, and all data were anonymized to ensure that no participant could be identified, in accordance with standard ethical and data protection guidelines.

**Inclusion and exclusion criteria**

Internally Displaced Persons (IDPs) currently residing in Jibia Local Government Area, Katsina State, either registered in the camp/settlement or self-identified as IDPs. Individuals aged under 19 years and above who are eligible to participate. Individuals who refuse or are unable to provide informed consent/assent, and minors without an available legal guardian. Persons who are not IDPs, including members of the host community.

**Data collection**

A structured survey was conducted via in-person interviews by skilled research aides. This method was chosen to guarantee question understandability and to assist participants with low literacy. The survey gathered data regarding demographic traits and possible risk elements, such as age, sex, marital status, schooling level, job, length of stay in the settlement, medical background and record of parasitic disease, care for parasitic disease, antiparasitic drugs, cleanliness and hygiene habits, and primary source of drinking water.

**Sample collection and analysis**

Every IDP has received a clean, sanitized stool container. Each specimen bottle was correctly marked with the participant's serial identification number and the day of collection to ensure precise identification and traceability. Upon collection, each stool sample was immediately preserved by adding 1 mL of 10% formal saline to prevent further development of parasite eggs or cysts The samples were then transported to the Biological Science Laboratory of Umaru Musa Yar'adua University, Katsina, for analysis. Formalin-Ether Sedimentation Technique was employed. In a centrifuge tube, 10 mL of 10% formalin was combined with 2 g of the stool sample, filtered through gauze, and allowed to fix for 15 min. Followed by the addition of 3 mL of ether, the mixture was vigorously shaken and centrifuged for 3 mins at 2000 rpm. The readied transparencies were assessed by coached microscopists employing customary parasitological techniques. Two proficient microscopists independently examined each slide, and the findings were compared to ensure accuracy and reliability. After removing the uppermost three layers, the settling was placed on a clean microscope slide, covered with a coverslip, and observed at low (10×) and high (40×) magnification to identify intestinal parasites.

**Data analysis and result presentation**

The data generated where analyzed using SPSS version 20. Summary statistics, including frequencies and proportions, were used to assess the prevalence of enteric parasitic infections.

Associations between discrete variables and enteric parasitic infections were evaluated using a t-test and Chi-square ($x^2$) test. Relative risks (odds ratios, ORs) along with matching 95% confidence intervals (CIs) were computed to gauge the strength of the association between detected risk factors and the infection condition. A p-value of less than 0.05 ($p < 0.05$) was considered statistically significant for all analyses.

## RESULTS

An overall prevalence of 77.7% (233/300) was recorded among the examined stool samples, as presented in Table 1. The analysis of result based on age group is shown in Table 1. the higher prevalence was recorded among the 40–49 years' age group (84.0%) while the lower prevalence was observed in the 30–39 years' age group (71.1%) with no statistical significant difference observed between the age groups.

**Table 1: Prevalence of Intestinal Parasites among Internally displaced persons based on age groups in the study area**

| Age | Male | | | Female | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | Number Examined | Number Positive (%) | P-value | Number Examined | Number positive (%) | P-value | Number Examined | Number positive (%) | P-value |
| ≤ 19 | 20 | 17 (85.0) | 0.80 | 71 | 54 (76.1) | 0.50 | 91 | 71 (78.0) | 0.65 |
| 20 - 29 | 43 | 32 (74.4) | | 58 | 49 (84.5) | | 101 | 81 (80.2) | |
| 30 - 39 | 15 | 11 (73.3) | | 37 | 26 (70.3) | | 52 | 37 (71.1) | |
| 40 - 49 | 2 | 2 (100) | | 23 | 19 (82.6) | | 25 | 21 (84.0) | |
| ≥ 50 | 8 | 6 (75.0) | | 23 | 17 (73.9) | | 31 | 23 (74.2) | |
| **Total** | **88** | **68 (77.3)** | | **212** | **165 (77.8)** | | **300** | **233 (77.7)** | |

P-value obtained using chi-square test

Several elements were discovered to influence the incidence of infection, encompassing socio- demographic traits, schooling, job, cleanliness routines, water source, sanitation, and lifestyle actions, males (77.3%) and females (77.8%). The greatest prevalence happened in the 40-49 years' age bracket (84.0%), follow by 30-39 years' group (71.1%). Singles had (79.8%), married (76.2%). No formal education had (79.5%) with formal education (71.2%). Farmers (77.8%) and traders (77.2%) skin rashes recorded 82.0%, while abdominal pain presented 77.0%. Past infection was 78.6% among those with treated records, and 76.2% among those without treated records, with 77.3% and 80.0% respectively. Those who had taken deworming drugs had (72.5%) who had not (78.5%). Lacking knowledge recording 80.6%, compared to 68.5% among the informed, regular hand washers (78.1%) and non-regular (76.9%). Tanker-supplied water users had 79.4% compared to borehole users (75.7%). Treated water had (80.6%) without (77.3%). Open disposal users had 78.2% compared to 75.0% among those utilizing waste bins. Open defecation 79.1%, 72.9% among pit latrine users. Infrequent cleaners had (83.7%) frequent cleaners (76.5%). Environment contributed (74.7%) compared to those who did not (79.1%). Health education sessions had an effect, as participants who attended recorded 71.8% compared to 80.7% among those who did not. Barefoot walkers had 79.1%, 75.6% among non-barefoot walkers. Contact with infected groups was recorded at 76.3%, compared with 79.5% among those with no contact. Intake of raw or undercooked food was linked to 76.8% compared to 79.4% among those who did not.

**Table 2: Prevalence of Intestinal Parasites among IDPs based on Socio-demographic Factors in the study area**

| Factor | Number Examined | Number Positive (%) | P-value | Odds Ratio |
|---|---|---|---|---|
| Sex | | | | |
| Male | 88 | 68 (77.3 | | |
| Female | 212 | 165 (77.8) | 0.92 | 1.03 |
| Marital Status | | | | |
| Married | 181 | 138 (76.2) | | |
| Single | 119 | 95 (79.8) | 0.47 | 1.23 |
| Educational Level | | | | |
| No Formal | 234 | 186 (79.5) | | |
| Formal | 66 | 47 (71.2) | 1.04 | 1.52 |
| Occupation | | | | |
| Trader | 57 | 44 (77.2) | | |
| Farmer | 243 | 189 (77.8) | 0.92 | 1.03 |
| | | | | |
| No Formal | 234 | 186 (79.5) | | |
| Formal | 66 | 47 (71.2) | 1.04 | 1.52 |
| Occupation | | | | |
| Trader | 57 | 44 (77.2) | | |
| Farmer | 243 | 189 (77.8) | 0.92 | 1.03 |

**Table 3: Prevalence of Intestinal Parasites among IDPs based on risk factors in the study area**

| Factor | Number Examined | Number Positive (%) | P-value | Odds Ratio |
|---|---|---|---|---|
| Symptoms | | | | |
| Abdominal Pain | 261 | 201 (77.0) | | |
| Skin Rashes | 39 | 32 (82.0) | 0.48 | 1.36 |
| Past Parasitic Infection | | | | |
| No | 122 | 93 (76.2) | | |
| Yes | 178 | 140 (78.6) | 0.62 | 1.15 |
| Treated for Parasitic Infection | | | | |
| No | 40 | 32 (80.0) | | |
| Yes | 260 | 201 (77.3) | 0.70 | 0.85 |
| Takes Deworming Medication | | | | |
| No | 260 | 204 (78.5) | | |
| Yes | 40 | 29 (72.5) | 0.40 | 0.72 |
| Knowledge of Transmission | | | | |
| No | 227 | 183 (80.6) | | |
| Yes | 73 | 50 (68.5) | 0.03 | 0.52 |
| Wash Hands Regularly | | | | |
| No | 117 | 90 (76.9) | | |
| Yes | 183 | 143 (78.1) | 0.80 | 1.07 |
| Source of Drinking Water | | | | |
| Borehole | 140 | 106 (75.7) | | |
| Tanker Supply | 160 | 127 (79.4) | 0.45 | 1.23 |

| | | | | |
|---|---|---|---|---|
| Boil or Treat Drinking Water | | | | |
| No | 264 | 204 (77.3) | | |
| Yes | 36 | 29 (80.6) | 0.66 | 1.22 |
| Waste Disposal Method | | | | |
| Waste Bins | 48 | 36 (75.0) | | |
| Open Spaces | 252 | 197 (78.2) | 0.63 | 1.19 |
| Toilet Facility | | | | |
| Pit Latrine | 70 | 51 (72.9) | | |
| Open Defecation | 230 | 182 (79.1) | 0.27 | 1.41 |
| Frequency of Cleaning Surroundings | | | | |
| Frequent | 251 | 192 (76.5) | | |
| Infrequent | 49 | 41 (83.7) | 0.27 | 1.57 |
| Environment Contributes to Health Problems? | | | | |
| No | 201 | 159 (79.1) | | |
| Yes | 99 | 74 (74.7) | 0.39 | 0.78 |
| Attended Health Sessions in Camp | | | | |
| No | 197 | 159 (80.7) | | |
| Yes | 103 | 74 (71.8) | 0.08 | 0.61 |
| Walk Barefoot Regularly | | | | |
| No | 123 | 93 (75.6) | | |
| Yes | 177 | 140 (79.1) | 0.48 | 1.22 |
| Close Contact with Infected Individuals | | | | |
| No | 127 | 101 (79.5) | | |
| Yes | 173 | 132 (76.3) | 0.51 | 0.83 |
| Eat Raw or Undercooked Food | | | | |
| No | 102 | 81 (79.4) | | |
| Yes | 198 | 152 (76.8) | 0.60 | 0.86 |

## DISCUSSION

Intestinal parasitic infections remain prominent in certain tropical and subtropical areas globally and are often prevalent in developing nations, though the prevalence of intestinal diseases across diverse areas and countries can indirectly mirror local sanitation and living standards (Virgolino *et al.*, 2020). IPIs remain a significant health concern globally in emerging areas, and Sudan's situation is consistent; the frequency of IPIs within a locale indicates the health, hygiene, lifestyle, and public well-being of residents (Charani *et al.*, 2019). The results of this research showed a high incidence of intestinal parasitic infestations (IPIs) in internally displaced individuals (IDPs) in Jibia, Katsina State. This outcome aligns with international reports and domestic studies indicating that displaced populations are disproportionately affected by parasitic infections due to inadequate sanitation, overcrowding, and restricted access to potable water and healthcare (Trasia, 2023).

The frequency observed in this research was slightly higher than that reported by Evbuomwan *et al.* (2022) in Benin City, Nigeria. It was also significantly greater than findings from earlier research in Sana'a City (Garg *et al.*, 2005), Southern China (Shang *et al.*, 2010), and Adamawa State, Nigeria (Pukuma *et al.*, 2023). Nonetheless, it corresponds with results from Guma and Makurdi, Nigeria. Environmental influences like a warm environment, deficient sanitation, insufficient use of anthelmintic drugs, and subpar nutritional condition probably add to the continuous spread and substantial impact of parasitic infections seen in this area. Similarly, national statistics from Nigeria also validate high prevalence rates of IPIs in displaced and rural groups. A study by Anuar *et al.* (2013) documented comparable trends in parasite spread within IDP camps in Borno State and pinpointed similar risk factors, including insufficient sanitation and a lack of health education.

The spread of infections was affected by multiple socio-demographic and environmental risk elements. Variables including age, poor handwashing habits, walking barefoot, open defecation, and consumption of unwashed fruits or impure water were significantly associated with higher infection levels. These risk factors agree with those identified in worldwide literature, especially in IDP camps in nations like South Sudan, Yemen, and Syria, where insufficient WASH (Water, Sanitation, and Hygiene) circumstances are common (WHO, 2012).

Ayuba *et al.,* 2019, Pukuma *et al.,* 2023 and Ezeogu Okoro, 2023 maintain that gender difference has no impact on infection rate of intestinal parasites on IDPs. Furthermore, Ezeogu and Okoro (2023) maintained that young females have a higher infection rate than male children, which is in line with the findings of this research. In general, children and adults (41 years and above) have a high infection rate (Ezeogu and Okoro, 2023). This may be due to prolonged exposure to environmental risks without proper treatment. According to this study, farmers have high risk of being infected with intestinal parasites in IDPs compared to traders. This is in line with the findings of Ezeogu Okoro, 2023 who found that farmers have high rate of infection in comparison with artisans. It is also in line with the findings of Hay *et al.,* 2014 and Mogaji *et al.,* 2017 who noted that agricultural workers are more exposed to contaminated soil and water. People with formal education have the lowest infection rate compared to those without formal education. This contradicts the findings of Ezeogu Okoro, 2023 noted that poor sanitation and limited access to social amenities in IDP camps may likely contributed to the high prevalence of intestinal parasite infection. They further noted that factors such as age, gender, occupation, and formal education have an impact on intestinal parasitic infection.

## CONCLUSION

This research confirms that Intestinal Parasitic Infections (IPIs) are common among Internally Displaced Persons (IDPs) in Jibia, Katsina State, Nigeria. Females had higher infection rates, possibly due to closer contact with young children and more exposure to contaminated environments. The highest infection rates were in those aged 19 and under, likely because of greater outdoor activity. Several socio-economic and behavioral factors were linked to infection, including low education, occupational risks, unsafe water, eating unwashed fruits and vegetables, walking barefoot, and poor deworming habits. To reduce infections, comprehensive control measures are needed, including regular deworming, improved access to clean water, better sanitation, and ongoing health education for IDPs, children, and the wider community.

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