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Prevalence and Socio-Demographic Determinants of Intestinal Parasitic Infections among *Obstetric Fistula* Patients in Kano, Nigeria

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Abstract

Background:
Intestinal parasitic infections (IPIs) remain a major public health challenge in developing countries, particularly among women of low socio-economic status. Obstetric fistula patients are especially vulnerable due to poor hygiene, malnutrition, and limited access to healthcare. This study aimed to determine the prevalence and socio-demographic determinants of intestinal parasitic infections among obstetric fistula patients in Kano, Nigeria.

Methods:
A descriptive cross-sectional study was conducted among 250 obstetric fistula patients attending the Murtala Muhammad Specialist Hospital, Kano. Structured questionnaires were administered to obtain socio-demographic data, and stool samples were examined using direct saline/iodine wet mount and formol-ether concentration techniques. Data were analyzed using IBM SPSS (version 29). Associations between infection and socio-demographic factors were tested using Chi-square at a 5% significance level.

Results:
Out of 250 samples examined, 41 (16.4%) were positive for at least one intestinal parasite. The most prevalent species were Ascaris lumbricoides (5.6%) and Entamoeba histolytica (4.4%). Infection prevalence was significantly associated with rural residence ($\chi^2 = 4.62$; $p = 0.032$), unemployment ($\chi^2 = 5.89$; $p = 0.015$), and open defecation ($\chi^2 = 6.74$; $p = 0.034$). Other factors such as age, water source, and refuse disposal were not statistically significant.

Conclusion:
The study revealed a moderate prevalence of intestinal parasitic infections among obstetric fistula patients, primarily influenced by poor sanitation and socio-economic disadvantage. Integrating parasitological screening into fistula care, improving sanitation, and ensuring access to safe water are essential to reduce infection burden and enhance patient recovery.

Keywords: *Intestinal parasites; Obstetric fistula; Socio-demographic factors; Kano State; Nigeria.*

1. Introduction

Intestinal parasitic infections (IPIs) continue to represent a major global health concern, particularly in developing regions where sanitation, hygiene, and healthcare access remain inadequate. These infections are primarily caused by protozoan and helminthic parasites that inhabit the human gastrointestinal tract and are transmitted through fecal-oral routes, contaminated food or water, and soil contact (Cheesbrough, 2006; Pullan *et al.*, 2014). The most common intestinal parasites of medical significance include *Ascaris lumbricoides*, *Trichuris trichiura*, *Hookworm*, *Entamoeba histolytica*, *Strongyloides stercoralis*, *Schistosoma mansoni*, and *Giardia lamblia*. Together, these parasites cause chronic infections that contribute substantially to malnutrition, anemia, growth retardation, and impaired cognitive function (Zaglool *et al.*, 2011; WHO, 2022).

Globally, it is estimated that more than 1.5 billion people are infected with soil-transmitted helminths, representing approximately 24% of the world's population (Pullan *et al.*, 2014; WHO, 2022). The burden is disproportionately higher in sub-Saharan Africa, where environmental and socio-economic conditions favor transmission. In these regions, factors such as poor sanitation, inadequate clean water supply, barefoot farming, and indiscriminate defecation play central roles in the persistence of infection (Hussein *et al.*, 2011; Gabbad & Elawad, 2014). Nigeria, being one of the most populous countries in Africa, bears a substantial share of this burden. Studies across various states have reported infection rates ranging between 20% and 70% among both rural and urban dwellers, depending on sanitation and environmental conditions (Ikeh *et al.*, 2011; Madobi, 2020).

Among women, especially those of reproductive age, intestinal parasitic infections are of particular concern due to their synergistic effects with anemia, malnutrition, and maternal morbidity (Chacon-Cruz & Mitchell, 2003). Infections such as *Hookworms* and *Schistosoma haematobium* have been associated with severe iron-deficiency anemia during pregnancy, while *Entamoeba histolytica* and *Giardia lamblia* can lead to gastrointestinal disturbances and nutrient malabsorption. These consequences not only endanger maternal health but also contribute to adverse pregnancy outcomes such as stillbirth, low birth weight, and poor fetal development (Hotez *et al.*, 2016).

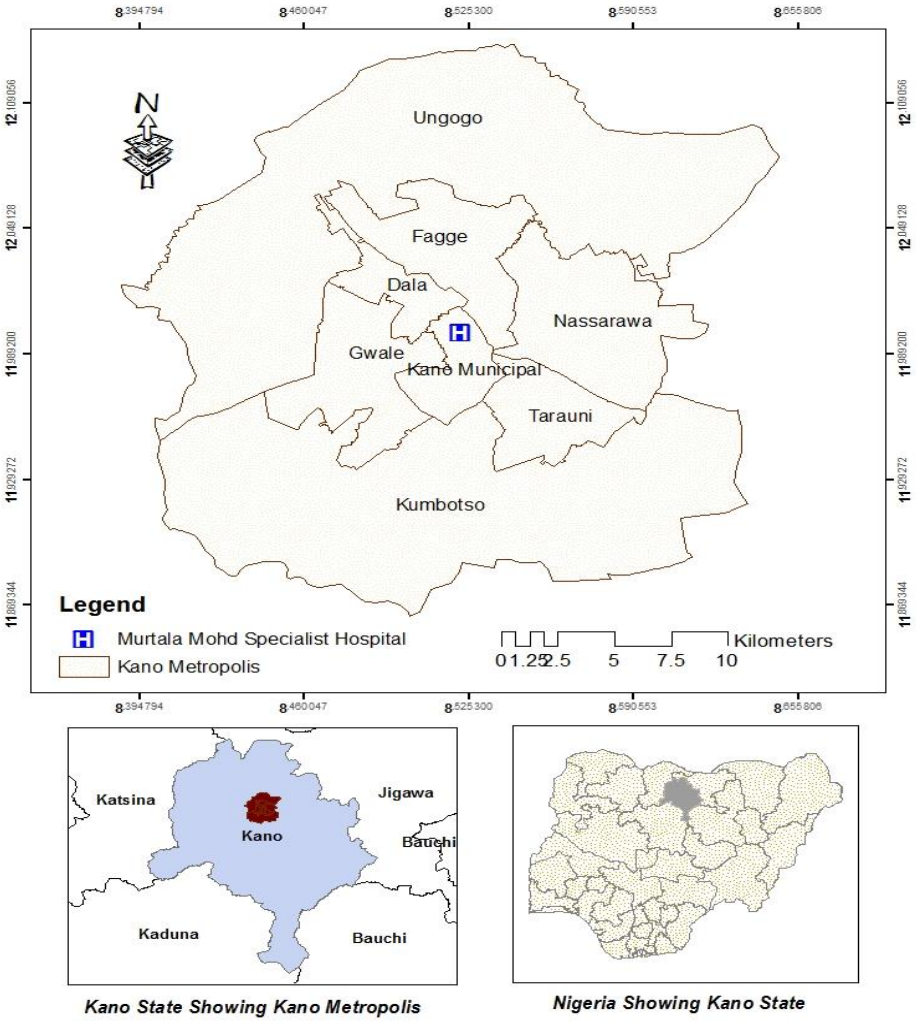
Obstetric fistula is a devastating maternal health condition characterized by an abnormal connection between the vagina and bladder (vesicovaginal fistula) or rectum (rectovaginal fistula), resulting from prolonged obstructed labor without timely medical intervention (Bala *et al.*, 2014). Women affected by this condition often live in poverty, social isolation, and poor hygiene due to continuous leakage of urine and/or feces (UNFPA, 2022). These circumstances, compounded by inadequate nutrition and chronic exposure to contaminated environments, may increase susceptibility to intestinal parasitic infections. The interplay between intestinal parasitism and obstetric fistula is multifaceted. The chronic weakness, anemia, and weight loss associated with parasitic infections may impair surgical recovery following fistula repair. Additionally, intestinal helminths can exacerbate malnutrition, reduce immune response, and complicate post-operative wound healing (Ikeh *et al.*, 2011; Amer *et al.*, 2016). Despite these clinical implications, very few studies have investigated the prevalence of intestinal parasites specifically among obstetric fistula patients in Nigeria or other parts of Africa. Therefore, the present study was aimed to determine the prevalence of intestinal parasitic infections among obstetric fistula patients in Kano, Nigeria, and to assess the relationship between infection rates and selected socio-demographic factors, including age, occupation, residence, sanitation practices, and water sources.

2. Materials and Methods

2.1 Study Area

This research was carried out at the Murtala Muhammad Specialist Hospital (MMSH), Kano State, Nigeria, which serves as the primary referral center for obstetric fistula repair in the region. The hospital is located in Kano Metropolis, the capital of Kano State, situated in the Sudan Savannah ecological zone of northern Nigeria. Geographically, the area lies between latitude 11°45′N and 12°5′N and longitude 8°15′E and 8°35′E, with an average elevation of 472 meters above sea level**.**

Kano is bordered by Kaduna State to the southwest, Jigawa to the east, Katsina to the northwest, and Bauchi to the southeast. The metropolis covers approximately 20,131 km² with an estimated population of 13.4 million people (NPC, 2014). The population is ethnically diverse, consisting mainly of Hausa, Fulani, and Kanuri groups, and the predominant occupations include farming, trading, leatherwork, and textile production. The area experiences a tropical climate characterized by a rainy season (May–October) and a dry season (November–April), conditions that favor the persistence of intestinal parasites due to fluctuating water quality and inadequate sanitation infrastructure.



Source: Department of Geography Bayero University, Kano (2024)

Figure 1: Map of Kano Metropolis showing Murtala Muhammad Specialist Hospital, Kano State, Nigeria

2.2 Study Design

A descriptive cross-sectional study design was adopted to determine the prevalence and socio-demographic correlates of intestinal parasitic infections among obstetric fistula patients. The study was conducted between January and June 2019, a period covering both dry and early rainy seasons, to account for possible seasonal variations in parasitic infection patterns.

2.3 Study Population

The study population consisted of female obstetric fistula patients receiving treatment or awaiting surgery at the Obstetric Fistula Centre of MMSH. Inclusion criteria were: (i) Women diagnosed clinically with vesicovaginal or rectovaginal fistula. (ii) Those who provided informed consent to participate. (iii) Patients aged between 15 and 55 years. Exclusion criteria included: (i) Women currently undergoing anti-helminthic or antibiotic therapy. (ii) Those with severe co-morbid conditions unrelated to parasitic infection (e.g., advanced renal or hepatic disease). A control group of 50 apparently healthy women without fistula (age-matched) was also recruited from the same facility for comparative purposes.

2.4 Sample Size Determination

The minimum sample size was determined using the Araoye (2004) formula for prevalence studies:

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

Where:

- n = required sample size
- Z = 1.96 (standard normal deviation for 95% confidence interval)
- p = estimated prevalence from a previous study (19.6%) (Yalew et al., 2018)
- q = 1 – p = 0.804
- d = desired precision (0.05)

$$n = \frac{(1.96)^2(0.196)(0.804)}{(0.5)^2} = 243$$

Thus, a minimum of 243 participants was required. To enhance statistical power and account for non-response, 250 obstetric fistula patients were recruited for this study.

2.5 Ethical Considerations

Ethical approval was obtained from the Kano State Hospital Management Board. Permission was also granted by the management of MMSH (NHREC/17/03/2018), and informed consent was obtained from each participant prior to sample collection. All participants were informed about the study's purpose, the confidentiality of their information, and their right to withdraw at any stage without prejudice to their medical care.

2.6 Data Collection Instruments

Data were collected using a pre-tested, structured questionnaire, designed in both English and Hausa languages for easy comprehension. The questionnaire comprised two sections; section one involves Socio-demographic characteristics including age, marital status, occupation, residence (urban/rural), level of education, weight, type of toilet facility, source of drinking water, and refuse disposal method. Section two involves Clinical and behavioral factors including mode of fistula acquisition (childbirth, genital mutilation, or congenital), duration of illness, and prior deworming history. Trained research assistants, including nurses and laboratory technologists fluent in Hausa, administered the questionnaires through face-to-face interviews.

2.7 Sample Collection and Laboratory Analysis

2.7.1 Stool Sample Collection

Each participant was provided with a sterile, leak-proof, wide-mouthed stool container labeled with a unique identification code. Participants were instructed to collect approximately 5 grams of freshly passed stool free from urine or other contaminants. The samples were immediately transported in cold boxes to the Laboratory for analysis within 2 hours of collection.

2.7.2 Laboratory Examination for Intestinal Parasites

1. Direct Saline/Iodine Wet Mount Technique

A small portion of the stool sample was emulsified on a clean glass slide using normal saline (0.85%) and Lugol's iodine solution. The preparation was covered with a cover slip and examined under the 10× and 40× objective lenses of a light microscope for the presence of cysts, ova, or larvae (Cheesbrough, 2006).

2. Formol-Ether Concentration Technique

Approximately 1 g of stool was emulsified in 10 ml of 10% formalin and strained through gauze into a centrifuge tube. After adding 3 ml of diethyl ether, the tube was centrifuged at 3000 rpm for 3 minutes**.** The sediment was examined microscopically for parasite eggs, cysts, and larvae following the method described by Allen and Ridley (1970). Parasite identification was performed based on morphological features as outlined in standard parasitology manuals (Cheesbrough, 2006). Each positive finding was verified by two independent microscopists to ensure accuracy.

2.9 Data Analysis

Collected data were coded and entered into IBM SPSS Statistics version 29 for analysis. Descriptive statistics (frequency, mean, and standard deviation) were used to summarize data. The Kolmogorov–Smirnov test was performed to assess normality of continuous variables. Associations between infection status and categorical socio-demographic variables (e.g., residence, occupation, toilet type, and water source) were evaluated using the Chi-square (χ^2) test, with significance set at $p < 0.05$. Results were presented in tables and graphs.

3. Results

3.1 Socio-Demographic Characteristics of the Study Population

A total of 250 obstetric fistula patients participated in the study. Their ages ranged from 15 to 55 years, with a mean age of 27.4 ± 6.2 years. The majority of the participants (40.8%) were aged 15–25 years, while those above 45 years constituted 5.2%. Most respondents (71.6%) resided in rural areas, and a large proportion (76.0%) were unemployed. Regarding sanitation, 52.4% practiced open defecation, 38.4% used pit toilets, and only 9.2% had access to modern toilets. The main sources of drinking water were well water (44.0%) and stream/river (36.0%). Almost all participants (99.2%) acquired obstetric fistula following childbirth (Table 1).

Table 1. Socio-Demographic Characteristics of Obstetric Fistula Patients (n = 250)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	15–25	102	40.8
	26–35	98	39.2
	36–45	37	14.8
	>45	13	5.2

Residence	Urban	71	28.4
	Rural	179	71.6
Occupation	Employed	60	24.0
	Unemployed	190	76.0
Toilet Facility	Open defecation	131	52.4
	Pit toilet	96	38.4
	Modern toilet	23	9.2
Water Source	Well	110	44.0
	Stream/River	90	36.0
	Tap	36	14.4
	Bottle/Sachet	14	5.6
Refuse Disposal	Open farmland	180	72.0
	Dustbin	65	26.0
	Incineration	5	2.0
Mode of Fistula Acquisition	Childbirth	248	99.2
	Genital mutilation	2	0.8

3.2 Prevalence of Intestinal Parasitic Infections

Out of the 250 fecal samples examined, 41 patients (16.4%) were infected with at least one intestinal parasite. *Ascaris lumbricoides* was the most frequently detected parasite (5.6%), followed by *Entamoeba histolytica* (4.4%), *Trichuris trichiura* (2.0%), *Strongyloides stercoralis* (1.2%), *Schistosoma mansoni* (1.2%), *Hookworm* (1.2%), and *Hymenolepis nana* (0.8%). No multiple intestinal infections were recorded within a single individual.

Table 2. Distribution of Intestinal Parasites among Obstetric Fistula Patients (n = 250)

Parasite Species	Number Infected	Prevalence (%)
Ascaris lumbricoides	14	5.6
Entamoeba histolytica	11	4.4
Trichuris trichiura	5	2.0
Strongyloides stercoralis	3	1.2
Schistosoma mansoni	3	1.2
Hookworm	3	1.2
Hymenolepis nana	2	0.8
Total	**41**	**16.4**

3.3 Association between Intestinal Parasitic Infections and Socio-Demographic Factors

The relationship between intestinal parasitic infections and socio-demographic characteristics is shown in Table 3. Significant associations were observed between infection prevalence and residence ($\chi^2 = 4.62$; $p = 0.032$), occupation ($\chi^2 = 5.89$; $p = 0.015$), and toilet facility ($\chi^2 = 6.74$; $p = 0.034$). Patients residing in rural areas (11.6%) were more likely to be infected compared to urban dwellers (4.8%). Similarly, unemployed women showed higher infection rates (12.8%) than employed women (3.6%). Participants practicing open defecation (8.4%) had significantly higher infection prevalence compared to those using pit toilets (6.0%) or modern toilets (2.0%). Although infection was higher among those using stream/river water (7.6%) and well water (5.2%) compared to treated water users, this difference was not statistically significant ($\chi^2 = 2.84$; $p = 0.092$).

Table 3. Association between Intestinal Parasitic Infections and Socio-Demographic Variables (n = 250)

Variable	Category	No. Examined	No. Infected	Prevalence (%)	χ^2	p-value	Significance
Age (years)	15–25	102	18	7.2	3.15	0.084	NS
	26–35	98	15	6.0			
	36–45	37	5	2.0			
	>45	13	3	1.2			
Residence	Urban	71	12	4.8	4.62	0.032	*Significant*
	Rural	179	29	11.6			

Occupation	Employed	60	9	3.6	5.89	0.015	*Significant*
	Unemployed	190	32	12.8			
Toilet Facility	Open Defecation	131	21	8.4	6.74	0.034	*Significant*
	Pit Toilet	96	15	6.0			
	Modern Toilet	23	5	2.0			
Water Source	Well	110	13	5.2	2.84	0.092	NS
	Stream/River	90	19	7.6			
	Tap	36	6	2.4			
	Bottle/Sachet	14	3	1.2			
Refuse Disposal	Open/Farmland	180	25	10.0	3.31	0.072	NS
	Dustbin	65	16	6.4			
	Incineration	5	0	0.0			
Mode of Fistula Acquisition	Childbirth	248	41	16.4	1.05	0.307	NS
	Genital Mutilation	2	0	0.0			

Chi-square analysis confirmed that rural dwelling ($p = 0.032$), unemployment ($p = 0.015$), and open defecation ($p = 0.034$) were statistically significant predictors of intestinal parasitic infection among obstetric fistula patients. The results indicate that socio-economic and environmental factors remain critical determinants of parasitic disease burden within this population. Improved sanitation and targeted health education interventions would substantially reduce infection risk.

4. Discussion

This study assessed the prevalence and socio-demographic determinants of intestinal parasitic infections (IPIs) among obstetric fistula patients attending Murtala Muhammad Specialist Hospital (MMSH), Kano, Nigeria. The overall prevalence of intestinal parasites observed was 16.4%, indicating that intestinal parasitism constitutes a significant co-morbidity among women suffering from obstetric fistula in this region. The finding underscores the interplay between poor hygiene, low socio-economic status, and parasitic infections within this vulnerable population. The overall prevalence of 16.4% observed in this study is consistent with findings from similar studies conducted in Nigeria and other developing countries. For instance, Ikeh *et al.* (2011) reported an intestinal parasite prevalence of 31.5% among elective surgical patients in Jos, Plateau State, while Suraj *et al.* (2023) recorded 19.6% of soil-transmitted helminths among hospital attendees in Kano metropolis. However, the prevalence recorded in this study is lower than that reported in Yemen (Al-Haddad & Baswaid, 2010) and Sudan (Gabbad & Elawad, 2014) with prevalence rates of.58.7% and 64.4%, respectively; but higher than the 0.96% recorded in Saudi Arabia (Omar *et al.*, 2018). These variations may be attributed to differences in sanitation, diagnostic methods, and population groups studied.

The predominance of *Ascaris lumbricoides* (5.6%) in this study agrees with previous research showing that *Ascaris* is among the most common soil-transmitted helminths in sub-Saharan Africa (Pullan *et al.*, 2014; Amer *et al.*, 2016). Similarly, *Entamoeba histolytica* (4.4%) ranked second in prevalence, a pattern consistent with findings by Hussein et al. (2011) and Nas *et al.* (2020), who observed that protozoan infections remain a persistent challenge due to fecal contamination of water sources and poor hand hygiene. The relatively low prevalence of *Hookworm* (1.2%) and *Trichuris trichiura* (2.0%) may reflect improved awareness of footwear use and ongoing deworming programs, though open defecation practices still sustain environmental transmission.

The present study also revealed that infection rates were significantly higher among rural dwellers, unemployed women, and those practicing open defecation, confirming the strong link between poverty, environmental sanitation, and parasitic transmission. Rural residents accounted for 71.6% of the study population and exhibited an infection prevalence of 11.6%, which was significantly greater than that of urban dwellers ($p = 0.032$). This finding is consistent with reports by Adulugba *et al.* (2020) and Suraj et al. (2023), which attributed the higher rural prevalence to inadequate sanitation facilities, reliance on unprotected water sources, and poor waste disposal systems. Similarly, unemployment emerged as a significant risk factor ($p = 0.015$). Most unemployed patients in this study lived in rural areas with limited access to healthcare and clean water, supporting the hypothesis that socio-economic deprivation enhances vulnerability to parasitic infections (Hotez *et al.*, 2016). The association between toilet type and infection prevalence was also statistically significant ($p = 0.034$), with open defecation being the most common practice (52.4%). This is in agreement with findings from Ethiopia

(Yalew *et al.*, 2018) and Palestine (Bdir & Adwan, 2010), where high infection rates were reported in communities practicing open defecation. However, although not statistically significant, the use of untreated water sources such as wells and streams was associated with higher infection rates. This pattern supports previous findings by Amer *et al.* (2016) and Al-Haddad & Baswaid (2010), who emphasized the role of contaminated water in the persistence of *E. histolytica* and *Giardia lamblia*. The continued reliance on these sources in rural Kano reflects broader infrastructural and environmental health challenges.

Globally, the observed prevalence in this study (16.4%) falls within the moderate endemicity range reported by WHO (2022). While industrialized countries have largely controlled intestinal parasitism through improved sanitation and mass drug administration (MDA), the infection persists in tropical regions due to infrastructural and behavioral challenges. The infection pattern observed among obstetric fistula patients mirrors that of other high-risk groups, such as pregnant women and rural farmers, confirming that socio-economic status remains the strongest determinant of intestinal parasitic infection worldwide (Hotez *et al.*, 2016; Pullan *et al.*, 2014). However, despite the robustness of the findings, this study had some limitations. The use of microscopy-based diagnostic methods, although practical, may have underestimated protozoan infections that require molecular confirmation (e.g., *E. histolytica* vs. *E. dispar*). Additionally, the cross-sectional design precludes causal inference between infection and socio-demographic factors. Nonetheless, the study provides valuable baseline data for future longitudinal and intervention-based research among obstetric fistula patients.

5. Conclusion and Recommendations

Conclusion

This study revealed a 16.4% prevalence of intestinal parasitic infections among obstetric fistula patients in Kano, Nigeria, with *Ascaris lumbricoides* and *Entamoeba histolytica* being the most prevalent species. Infection was significantly associated with rural residence, unemployment, and open defecation, emphasizing the influence of socio-economic and environmental factors on parasite transmission.

Recommendations

i. Parasitological screening and deworming should be incorporated into the routine management of obstetric fistula patients before and after surgical repair to reduce co-morbidity and improve recovery outcomes.

ii. Adequate sanitation facilities and hygiene education should be provided for women in rural areas to discourage open defecation and promote safe waste disposal practices that limit parasite transmission.

iii. Provision of safe and potable water sources should be prioritized in fistula-prone rural communities to minimize the risk of water-borne parasitic infections and enhance overall community health.

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