

## Screening and Determination of the Effect of Intestinal, Vaginal and Malaria Parasites among Obstetric Fistula Patients, in Kano State, Nigeria

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### Abstract

*This study seeks to investigate the prevalence of intestinal, vaginal, and malaria parasites among obstetric fistula patients. A cross-sectional study was conducted with a sample of 250 obstetric fistula patients attending Murtala Muhammad Specialist Hospital, Kano State, Nigeria which happens to be the only Obstetric Fistula Center in the State. Fecal and high vaginal swabs were collected for stool and vaginal examination, respectively. Malaria was tested using the Rapid Diagnostic Test (RDTs) kit, and the diagnoses of the other parasites were made using direct microscopy. The results were analyzed using descriptive and inferential statistics. The results revealed the prevalence of intestinal parasites to be 41(16.4%). *Ascaris lumbricoides* were the most frequently isolated parasite with prevalence rate of 14(5.6%), followed by *E. histolytica* 11(4.4%), *T. trichiura* recorded 5(2.0%), *S. stercoralis* has a prevalence of 3(1.2%), *S. mansoni* was 3(1.2%), Hookworm and *H. nana* recorded a prevalence of 3(1.2%) and 2(0.8%) respectively. Of the participants examined for vaginal parasites, prevalence of *Trichomonas vaginalis* detected was 22(8.8%) among 250 obstetric fistula patients. Furthermore, 87(34.8 %) of the patients were tested positive for malaria. The results of this study show that intestinal, vaginal, and malaria parasites are highly prevalent among obstetric fistula patients in Kano Nigeria thereby increasing their severity and some complications such as anemia, weight loss and susceptible to sexually transmitted infections. It is therefore important to implement early screening and treatment to reduce morbidity and improve quality of life among this population.*

**Keywords:** Obstetrics Fistula, *Trichomonas vaginalis*, Malaria, Intestinal, Parasites, Co-infection, Congenital.

### 1. INTRODUCTION

Intestinal parasitic infections (IPIs) are among the major public health problems in developing countries and in many parts of the world. Globally, in 2010, an estimated

819.0 million, 438.9 million, and 467.6 million people were infected with *Ascaris lumbricoides*, hookworms, and *Trichuris trichiura*, respectively (Pullanet *al.*, 2014). Epidemiological research indicates that parasitic infections rank among the most widespread and significant health concerns globally. In sub-Saharan Africa, the prevalence of intestinal parasitic infections (IPIs) is consistently high, while in developed nations, the incidence stands at approximately 50%. However, in developing countries, this figure can soar to as high as 95%. These infections stem from various protozoa and helminthic parasites. Diarrhea emerges as one of the prominent clinical manifestations of these parasitic infections (Chacon-Cruz and Mitchell, 2003). As a result, Malaria, caused by the parasite Plasmodium and transmitted through the bite of infected mosquitoes, poses a significant global health threat. Among the five types of Plasmodium (*P. falciparum*, *P. ovale*, *P. malariae*, *P. vivax*, and *P. knowlesi*), *P. falciparum* is the most lethal, impacting nearly 40 percent of the world's population, with pregnant women and children under five bearing the brunt of its effects. Studies indicate that annually, ten thousand women and two hundred thousand infants succumb to malaria-related complications during pregnancy, particularly prevalent in sub-Saharan Africa at 85 percent. Alarmingly, half of pregnant women harbor *P. falciparum* in their placenta without exhibiting symptoms, contributing to twenty percent of stillbirths and eleven percent of maternal deaths.

In contrast, Trichomoniasis, caused by the parasitic protozoan *Trichomonas vaginalis*, is a prevalent sexually transmitted infection, with an estimated 170 million cases worldwide annually. However, the actual figures could be higher, given infection rates of up to 50 percent in women and even higher in men. Trichomoniasis has been linked to adverse pregnancy outcomes and an increased risk of HIV transmission. Standard treatment involves metronidazole, yet cases of metronidazole-resistant *T. vaginalis* are rising, necessitating alternative therapies and potentially a vaccine.

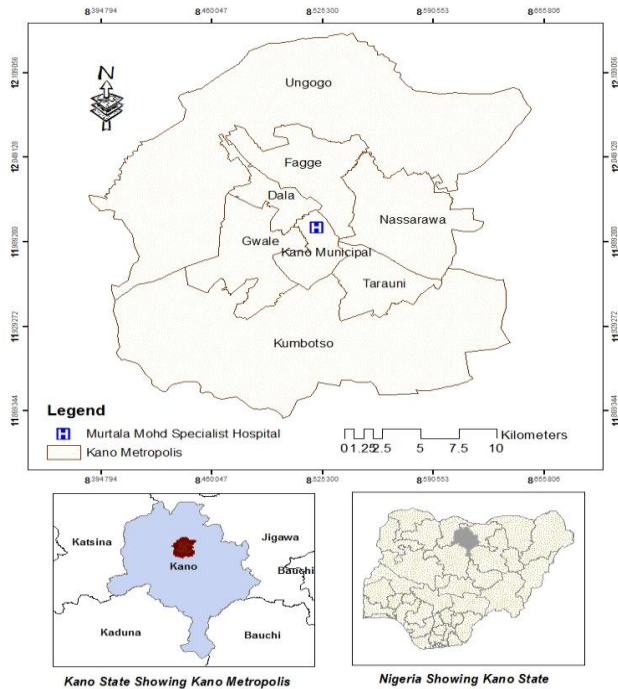
Limited literature explores the prevalence of intestinal parasites among vesicovaginal fistula patients, highlighting the need for research to assess the impact of intestinal, vaginal, and malaria parasites on obstetric fistula surgery patients. Obstetric fistula, a debilitating condition affecting millions of women in sub-Saharan Africa and Asia, primarily stems from prolonged and obstructed labor and is considered curable with appropriate interventions.

The curse granules of these conditions may be coupled with one or more parasitic infections. On several occasions, surgeons used to bring adult worms to the laboratory for identification, reports the cases of anemia, weight loss, and infections among obstetric fistula patients. Therefore we need to evaluate and study the effect of parasitic infection in these groups of patients so as to prevent the complications of intestinal, vaginal and malaria parasites in this group of patients during and after the surgery. However, it is difficult for one to estimate, lack of allegiance to provide better solution to this catastrophe, as well as a lack of apprehension in the healthcare system. Study revealed that each and every year, around 50,000 to 100,000 women globally are developing this obstetric fistula condition (Balaet *al.*, 2014). During the recent covid-19 pandemic and insecurity in some northern part of Nigeria, there was an increase in the cases of obstetric fistula as a result of shutdown of activities including healthcare systems, were millions delivery occurs at homes.

## 2. METHODOLOGY

### 2.1 STUDY AREA

The research was focused on the Kano metropolis in Nigeria, located within the geographic coordinates of latitude 11°45'N to 12°5'N and longitude 8°15'E to 8°35'E, with an elevation of 472 meters above sea level. It shares borders with Kaduna State to the Southwest, Bauchi to the Southeast, Jigawa to the East, and Katsina to the North. Covering an area of approximately 20,131 square kilometers (7,777 square miles), Kano has an estimated population of 13.4 million (NPC, 2014). The population consists predominantly of Hausa, Fulani, Kanuri and Nupe ethnic groups, engaged primarily in occupations such as farming, textile production, tanning, footwear manufacturing, cosmetics, ceramics, enamelware, plastics, pharmaceuticals, and furniture production, among others.



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

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

### 2.2 STUDY DESIGN

A total of two hundred and fifty (250) human subjects were used in which fecal, vaginal and blood sample each from obstetric fistula patients collected. These Samples (250) were collected using systematic random sampling from fistula patients having surgery

repairs at Murtala Muhammad Specialist Hospital Fistula Centre Kano, Kano state, Nigeria.

### 2.3 SAMPLE SIZE ESTIMATION

Data extracted from prior research indicate that the prevalence of intestinal parasite infection among individuals suspected of pulmonary tuberculosis in northwest Ethiopia stands at 19.6% (Yalew *et al.*, 2018).

Using the formula  $n = \frac{z^2pq}{d^2}$  (Araoye MO, 2004)

Where n= desired sample size

Z = standard normal deviation, and it is set at 1.96 to represent the 95% confidence interval.

p = percentage of the target population that is thought to have a particular characteristic (19.6% or 0.196).

q = 1.0 - 0.196 = 0.804

d = degree of freedom set at 0.05% = 0.0025

Substituting  $n = \frac{(1.96)^2 (0.196)(0.804)}{0.05^2} = \frac{3.8416 \times 0.196 \times 0.804}{0.0025} = 242.75$

Sample size was therefore been a minimum of 243 patients. Although 250 patients were recruited to increase the sensitivity of the study. A total of fifty apparently healthy obstetric fistula negative, age and sex matched patients were used as controls.

### 2.4 ETHICAL CONSIDERATION

Ethical clearance was obtained from Kano State Hospital Management Board, Kano State Nigeria, before the commencement of the work. At the same time consent of the patients was granted.

### 2.5 DATA COLLECTION

Data was collected using pre-tested structured questionnaire. The questionnaire included information on age, direct measurement of body weight, occupation, toilet facility, source of drinking water, method of refuse and sewage disposal, mode of acquiring obstetric fistula.

### 2.6 SAMPLE COLLECTION

#### 2.6.1 Stool Specimen Collection and Processing for Parasite Examination.

The process of collecting and preparing stool specimens for parasite examination among Obstetric Fistula patients involved providing them with a clean, dry, leak-proof stool cup labeled with a unique identification number. Patients were requested to provide approximately 5 grams of stool sample, which they complied with. Subsequently, these samples were transported to the laboratory. The examination for intestinal parasites was conducted using the direct saline/iodine wet and formal-ether concentration technique, as outlined by Cheesbrough (2006) and Allen and Ridley (1970).

**2.6.2** Smear (blood) for malaria parasites and Rapid diagnostic test (RDT), was carried out using blood samples (Cheesbrough, 2006)

**2.6.3** High Vaginal fluid was collected from each patient using Swab Stick, in which wet mount preparation microscopy of the vaginal fluid was conducted for *T. vaginalis* examination (Cheesbrough, 2006).

## 2.7 STATISTICAL ANALYSIS

The gathered information was categorized and identified intestinal, vaginal, and parasitic malaria. The occurrences of infection for each parasite were recorded. The SPSS program version number (29) was used for all statistical analysis and the Kolmogorov-Smirnov (KS) test were used and normality test was determined and found normally distributed. At a confidence level of 95%, the non-parametric Chi-square test was performed and examined the relationship between the employed variables (direct measurement of body weight, occupation, toilet facility, and source of drinking water, method of refuse and sewage disposal, and age groups)

## 3. RESULTS

### 3.1 Socio-demographic Characteristics of Obstetric Fistula Patients at MMSH, Kano State, Nigeria.

Socio-demographic characteristics with respect to weight in Table 1 shows that patient with weight 30–40 kg had an occurrence of 21.6% , 41–50 kg had 32.8% also, 51–60 kg of weight in Kano were 26.4% patient with weight 61–70 kg recorded were 12.0% in Kano. Consequently, weight among these patients above 70 kg represents 7.2%. In addition patients with an age range of 15–25 years were 40.8% in Kano, withal 26–35 years in Kano was 39.2%. Furthermore, 36–45-year-old patients in Kano were 14.8%. Patients with an age range above 45 years were 5.2% in Kano. Residential dwelling status of the patient revealed that in Kano 28.4% of the subjects were from urban communities. Similarly, 71.6% of the patients in Kano were from rural communities .The occupational status of the patient in Kano recorded was 24.0% employed. In addition, unemployment among these patients in Kano was 76.0%. In this research, the type of toilet facility the patients used was open defecation in Kano at 52.4%. Also, pit toilet facility usage in Kano was 38.4%. Moreover, the number of modern toilets discovered and used among these patients was 9.2% in Kano. In the foregoing, well water utilization among these patients in Kano was 44.0%. Similarly, stream/river water for drinking in Kano was 36.0%. Also, tap water utilization in Kano was 14.4%. In addition bottle/sachet water utilization for drinking in Kano was 5.6%.The result also recorded that 72.0% of the patients disposed of their refuse in an open farmland or outside the compound in Kano. Furthermore, refuse disposal in the dustbin in Kano was 26.0%. Incineration represents 2.0% in Kano. In this research, we also discovered different modes in which obstetric fistulas are being acquired. Childbirth or delivery in Kano accounted for 99.2%. Fistulas acquired through genital mutilation in Kano were 0.8% and no congenital fistula was recorded.

**Table 1. Socio-demographic Characteristics of the Patient and Mode of Acquiring Fistula in Murtala Muhammad Specialist Hospital, Kano State, Nigeria.**

Variable	No. Examined	Percentage (%)
<b>Weight</b>		
30 – 40	54	21.6
41 – 50	82	32.8
51 – 60	66	26.4
61 – 70	30	12.0
> 70	18	7.2
<b>Total</b>	<b>250</b>	<b>100</b>
<b>Age</b>		
15 – 25	102	40.8
26 – 35	98	39.2

36 – 45	37	14.8
> 45	13	5.2
<b>Total</b>	<b>250</b>	<b>100</b>
<b>Residence</b>		
Urban	71	28.4
Rural	179	71.6
<b>Total</b>	<b>250</b>	<b>100</b>
<b>Occupation</b>		
Employed	60	24.0
Unemployed	190	76.0
<b>Total</b>	<b>250</b>	<b>100</b>
<b>Toilet Facility</b>		
Open Defecation	131	52.4
Pit Toilet	96	38.4
Modern Toilet	23	9.2
<b>Total</b>	<b>250</b>	<b>100</b>
<b>Source of Drinking Water</b>		
Well Water	110	44.0
Stream/River	90	36.0
Tap	36	14.4
Bottle/Sachet	14	5.6
<b>Total</b>	<b>250</b>	<b>100</b>
<b>Refuse Disposal</b>		
Open on Farmland	180	72.0
Dustbin	65	26.0
Incineration	5	2.0
<b>Total</b>	<b>250</b>	<b>100</b>
<b>Mode of Acquiring Fistula</b>		
Child Birth	248	99.2
Genital Mutilation	2	0.8
Congenital	0	0
<b>Total</b>	<b>250</b>	<b>100</b>

### 3.2 Prevalence of intestinal, Vaginal and Malarial Parasites among Obstetric Fistula Patients Attending MMSH, Kano State, Nigeria.

In figure 2 Prevalence of intestinal parasites among 250 obstetric fistula patients Intestinal parasitic infection detected was 41(16.4%) where these groups of patients were infected by one or more intestinal parasitic infection. These studies also recorded the *Trichomonas vaginalis* infection among 22(8.8%) of the patients examined. While malaria parasitic infection among obstetric fistula patients recorded a prevalence of 87(34.8%) as presented in figure 2.

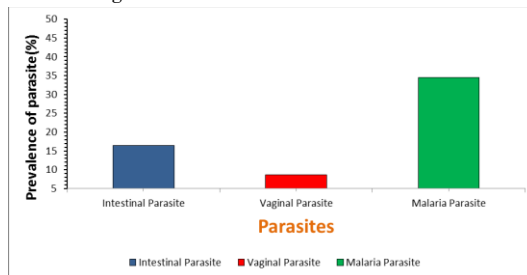


Figure 2. Prevalence of Intestinal, Vaginal and Malaria Parasites among Obstetric Fistula Patients Attending Murtala Muhammad Specialist Hospital, Surgery Repair Center.

### 3.3 Prevalence of Intestinal Parasites Encountered among Obstetric Fistula Patients Attending MMSH, Kano State, Nigeria.

*Ascaris lumbricoides* had the highest prevalence of 14(5.6%), followed by *E. histolytica* 11(4.4%), *T. trichiura* recorded 5(2.0%), *S. stercoralis* had a prevalence of 3(1.2%), *S. mansoni* 3(1.2%), while *Hookworm* and *H. nana* recorded a prevalence of 3(1.2%) and 2(0.8%) respectively as shown in figure 3.

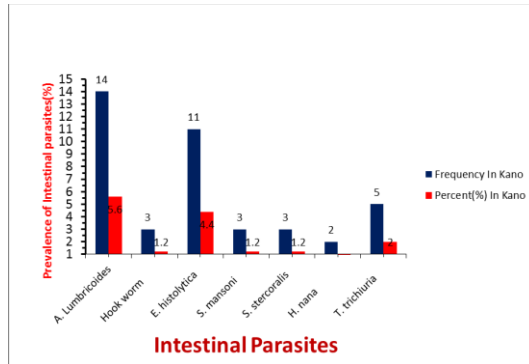


Figure 3. Prevalence of Intestinal Parasites among Obstetric Fistula Patients Attending Murtala Muhammad Specialist Hospital, Surgery Repair Center.

### 3.4 Prevalence of Co-Infection among Obstetric Fistula Patients Attending MMSH, Kano State, Nigeria.

In total, there were four types of co-infection observed in figure 4, a prevalence of 20(8.0%) for co-infection was recorded. The breakdown of co-infections were Malaria and *T. vaginalis* co-infection represented 4(1.6%), malaria and intestinal parasite co-infection accounted for 11(4.4%), and *T. vaginalis* and intestinal parasite co-infection recorded a prevalence of 3(1.2%). Additionally, co-infection involving malaria, *T. vaginalis*, and intestinal parasites found were 2(0.8%) in Kano.

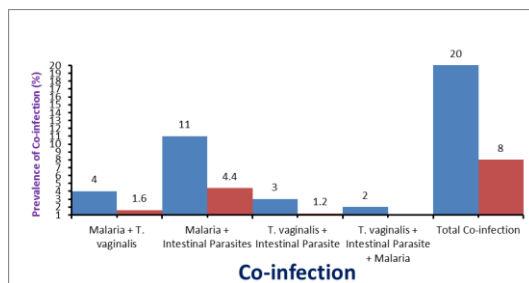


Figure 4. Prevalence of Intestinal, Vaginal and Malaria Parasites Co-infection among Obstetric Fistula Patients attending Murtala Muhammad Specialist Hospital, Surgery Repair Center.

### 3.5 Prevalence of Intestinal Parasites in Relation to Socio-demographic Factors and Mode of Acquiring Fistula among Obstetric Fistula Patients at MMSH, Kano State, Nigeria.

The prevalence of intestinal parasitic infection in relation to age among obstetric fistula patients is shown in Table 2. that patients who were between the age 15-25 years which represented 7.2% were infected, which represent the highest number of infected individuals. Moreover, people between the age of 26-35, 36-45 and > 45 representing 6.0%, 2.0% and 1.2% respectively, Moreover according to the Urban and Rural settlements people living in rural areas has the highest number of infected individuals representing 11.6% while those living in Urban Areas take 4.8%. In terms of occupation this research has indicated that 12.8% of the total populations of the infected individuals were unemployed while 3.6% were unemployed. In terms of toilet facilities out of 131 infected individuals examined representing 8.4% were using open Defecation means of which 6.0% and 2.0% uses Pit Toilet and Modern Toilet, respectively were infected. The source of drinking water was another issue discussed in this research out of the total infected population, 13(5.2%) were said to have been using well water, 19(7.6%) were using Stream/River water, 6(2.4%) using tap water and 3(1.2%) were using Bottle/Sachet Water. Moreover, mode of refuse disposal among patients with intestinal parasites had indicated that 10.0% dispose refuse on open farmland and immediate surroundings while 6.4% used dustbin as mean of refuse disposal. In relation to mode of acquiring fistula 16.4% of the examined groups with intestinal parasites acquired fistula through child birth delivery, whereas no intestinal infection discovered with patients that had fistula by genital mutilation, also no congenital parasitic transmission recorded as per during this research in respect to congenital fistula.

**Table 2. Prevalence of Intestinal Parasites in Relation to Demographic Factors and Mode of Acquiring Fistula among Obstetric Fistula Patients at MMSH, Kano State, Nigeria.**

Variable	No. Examined	No. Infected	Percentage Infected (%)	Chi-Square ( $X^2$ )
<b>Age</b>				3.15 p>0.05
15 – 25	102	18	7.2	
26 – 35	98	15	6.0	
36 – 45	37	5	2.0	
> 45	13	3	1.2	
<b>Total</b>	<b>250</b>	<b>41</b>	<b>16.4</b>	
<b>Residence</b>				1.6 p<0.05
Urban	71	12	4.8	
Rural	179	29	11.6	
<b>Total</b>	<b>250</b>	<b>41</b>	<b>16.4</b>	
<b>Occupation</b>				1.95 p<0.05
Employed	60	9	3.6	
Unemployed	190	32	12.8	
<b>Total</b>	<b>250</b>	<b>41</b>	<b>16.4</b>	
<b>Toilet Facility</b>				4.5 p<0.05
Open Defecation	131	21	8.4	
Pit Toilet	96	15	6.0	
Modern Toilet	23	5	2.0	
<b>Total</b>	<b>250</b>	<b>41</b>	<b>16.4</b>	
<b>Source of Drinking Water</b>				2.8 p>0.05
Well Water	110	13	5.2	
Stream/River	90	19	7.2	
Tap	36	6	2.4	
Bottle/Sachet	14	3	1.2	
<b>Total</b>	<b>250</b>	<b>41</b>	<b>16.4</b>	



<b>Refuse Disposal</b>				
Open on Farmland	180	25	10.0	3.3 p>0.05
Dustbin	65	16	6.4	
Incineration	5	0.0	0.0	
<b>Total</b>	<b>250</b>	<b>41</b>	<b>16.4</b>	
<b>Mode of Acquiring Fistula</b>				
Child Birth	248	41	16.4	7.2 p>0.05
Genital Mutilation	2	0	0.0	
Congenital	0	0	0.0	
<b>Total</b>	<b>250</b>	<b>41</b>	<b>16.4</b>	

### 3.6 Prevalence of *Trichomonas vaginalis* in Relation to Socio-demographic Factors and Mode of Acquiring Fistula among Obstetric Fistula Patients at MMSH, Kano State, Nigeria.

The prevalence of *Trichomonas vaginalis* in relation to age among obstetric fistula patients shown in table 3. that patients who are between age 15-25 which represent 4.8% were infected, which is representing the highest number of infected individuals. Moreover, people between the age of 26-35, 36-45 and > 45 representing 2.8%, 0.8% and 0.4% respectively. Moreover, according to settlements, patients living in rural areas had the highest number of infected individuals with trichomoniasis (6.8%) while those living in Urban Areas took 2.0%. In terms of occupation this research has indicated that 6.0% of the total populations of the infected individuals were unemployed while 2.8% were employed. In terms of toilet facilities, infected individuals examined represented 5.2% were using open defecation means, 2.8% and 0.8% were using Pit Toilet and Modern Toilet respectively. Furthermore, source of drinking water was another issue discussed in this research out of the total infected population, 8 patients representing 3.2% were said to have been using well water, 11(4.4%) were using Stream/River water, 2 patients representing 0.8% and 1(0.4%) were using Bottle/Sachet Water. Result of mode of refuse disposal among those with *Trichomonas vaginalis* had indicated that 7.2% dispose refuse on open farmland and immediate surroundings while 1.6% used dustbin as mean of refuse disposal. In relation to mode of acquiring fistula 8.4% of the examined groups with *Trichomonas vaginalis* acquired fistula through child birth delivery, whereas 1(0.4%) had fistula by genital mutilation, no congenital in relation to *T. vaginalis* infection were recorded.

**Table 3. Prevalence of *TrichomonasVaginalis* in Relation To Demographic Factors and Mode of Acquiring Fistula among Obstetric Fistula Patients at MMSH, Kano State, Nigeria.**

Variable	No. Examined	No. Infected	Percentage Infected (%)	P-Value (X <sup>2</sup> )
<b>Age</b>				
15 – 25	106	13	4.8	2.16 p<0.05
26 – 35	96	7	2.8	
36 – 45	37	2	0.8	
> 45	11	1	0.4	
<b>Total</b>	<b>250</b>	<b>22</b>	<b>8.8</b>	
<b>Residence</b>				
Urban	71	5	2.0	8.67 p>0.05
Rural	179	17	6.8	
<b>Total</b>	<b>250</b>	<b>22</b>	<b>8.8</b>	
<b>Occupation</b>				
Employed	60	7	2.8	8.32 p<0.05

Unemployed	190	15	6.0	
<b>Total</b>	<b>250</b>	<b>22</b>	<b>8.8</b>	
<b>Toilet Facility</b>				
Open Defecation	131	13	5.2	9.26>0.05
Pit Toilet	96	7	2.8	
Modern Toilet	23	2	0.8	
<b>Total</b>	<b>250</b>	<b>22</b>	<b>8.8</b>	
<b>Source of Drinking Water</b>				
Well Water	110	8	3.2	4.5 p>0.05
Stream/River	90	11	4.4	
Tap	36	2	0.8	
Bottle/Sachet	14	1	0.4	
<b>Total</b>	<b>250</b>	<b>22</b>	<b>8.8</b>	
<b>Refuse Disposal</b>				
Open on Farmland	180	18	7.2	12.21 p>0.05
Dustbin	65	4	1.6	
Incineration	5	0	0.0	
<b>Total</b>	<b>250</b>	<b>22</b>	<b>8.8</b>	
<b>Mode of Acquiring Fistula</b>				
Child Birth	248	21	8.4	7.15 p>0.05
Genital Mutilation	2	1	0.4	
Congenital	0	0	0.0	
<b>Total</b>	<b>250</b>	<b>22</b>	<b>8.8</b>	

### 3.7 Prevalence of Malaria Parasites in Relation to Socio-demographic Factors and Mode of Acquiring Fistula among Obstetric Fistula Patients at MMSH, Kano State, Nigeria.

Prevalence of malaria in relation to socio-demographic information of the studied obstetric fistula patients in table 4. showed that 13.2% were at the age of 15-25 years, 14.0% at age range of 26-35, followed by 36-45 years which had a prevalence of 6.4%, patients with age above 45 years had a malaria prevalence of 1.2%. Residential dwellings of the studied population revealed that 9.6% came from urban communities whereas, 25.2% were from rural communities. Occupational status in relation to malaria indicated that most of the patient 26.8% had malaria which were unemployed, employed infected patients with malaria recoded 8.0%. Additionally in relation of malaria prevalence with toilet facility, revealed that 20.0% defecates openly on land and bushes, pit toilet recorded 12.4% while modern toilet facility recorded 2.4%. The prevalence of malaria with regards to sources of drinking water reported 12.4% drinks water from hand dug well, 15.6% from stream or river and 4.8% from tap while 2.0% drinks from Bottle and or sachet water. Refuse disposal in relation to malaria had 26.8% for open disposal of refuse, 7.2% for dustbin and 0.8% for incineration. Mode of acquiring fistula through child birth had the highest prevalence (34.0%) in relation to malaria most prevalence in relation to malaria. Genital mutilation or female circumcision had (0.8%) and no congenital fistula recorded in relation to malaria.

**Table 4. Prevalence of Malaria in Relation to Socio-demographic Factors and Mode of Acquiring Fistula among Obstetric Fistula Patients attending MMSH, Kano State, Nigeria.**

Variable	No. Examined	No. Infected	Percentage Infected (%)	P-Value (X <sup>2</sup> )
<b>Age</b>				
15 – 25	106	33	13.2	12.3p>0.05
26 – 35	96	35	14.0	
36 – 45	37	16	6.4	
> 45	11	3	1.2	
<b>Total</b>	<b>250</b>	<b>87</b>	<b>34.8</b>	
<b>Residence</b>				
Urban	71	24	9.6	16.3 p<0.05
Rural	179	63	25.2	
<b>Total</b>	<b>250</b>	<b>87</b>	<b>34.8</b>	
<b>Occupation</b>				
Employed	60	20	8.0	8.3 p<0.05
Unemployed	190	67	26.8	
<b>Total</b>	<b>250</b>	<b>87</b>	<b>34.8</b>	
<b>Toilet Facility</b>				
Open Defecation	131	50	20.0	16.5 p<0.05
Pit Toilet	96	31	12.4	
Modern Toilet	23	6	2.4	
<b>Total</b>	<b>250</b>	<b>87</b>	<b>34.8</b>	
<b>Source of Drinking Water</b>				
Well Water	110	31	12.4	17.3 p<0.05
Stream/River	90	39	15.6	
Tap	36	12	4.8	
Bottle/Sachet	14	5	2.0	
<b>Total</b>	<b>250</b>	<b>87</b>	<b>34.8</b>	
<b>Refuse Disposal</b>				
Open	180	67	26.8	3.2 p>0.05
Dustbin	65	18	7.2	
Incineration	5	2	0.8	
<b>Total</b>	<b>250</b>	<b>87</b>	<b>34.8</b>	
<b>Mode of Acquiring Fistula</b>				
Child Birth	248	85	34.0	5.6 p>0.05
Genital Mutilation	2	2	0.8	
Congenital	0	0	0.0	
<b>Total</b>	<b>250</b>	<b>87</b>	<b>34.8</b>	

### 3.8 Most Vulnerable Groups Infected with intestinal, Vaginal and Malaria Parasites among Obstetric Fistula Patients Attending MMSH, Kano State, Nigeria.

The result in table 5 revealed that the most vulnerable group are between age 15-25 and 26-35 where intestinal parasitic infection, Malaria and *T. vaginalis* for the former was 7.2%, 13.2% and 4.8% respectively. The later recorded 6.2%, 14.0% and 2.8% for intestinal parasites, malaria parasite and *T. vaginalis* respectively. The most exposed patients were those from rural communities who represented a total 11.6% for Intestinal parasites, 25.2% for Malaria at same time *T. vaginalis* were common among this group with a total prevalence of 6.8%. Additionally, occupational status of these patients' showed that unemployed groups were more exposed to parasitic infection with a prevalence rate of 12.8% for intestinal parasites, 26.8% had malaria infection and 6.0% had *T. vaginalis*. Socio-demographic information of toilet facility, patients who

defecate on open farmland or backyards were more exposed 8.4% had intestinal parasites, 20.0% with Malaria and 5.2% had *T. vaginalis*, then patients who utilizes pit toilets facility with 6.0% having Intestinal Parasites, 12.4% with Malaria parasites and 2.8% had *T. vaginalis* infection. Patients that uses Well water for drinking as well as those who took water from the stream or river were more exposed, the former recorded 5.2% for intestinal parasites, 12.4% Malaria and 3.2% *T. vaginalis*, whereas, the later had 7.6%, 15.6% and 4.4% for Intestinal, Malarial and Vaginal parasites respectively. Patients who suffered most in relation to disposal of refuse were those who disposed on open environment such as compound and on farmlands with a prevalence of 10.0% for intestinal parasites, 26.8% malaria and 7.2% for *T. vaginalis*. In respect to mode of acquiring fistula, 16.4% of the studied population had intestinal parasitic infection while, Malaria and *T. vaginalis* recorded 34.0% and 8.4% in these groups of patients respectively.

**Table 5. Socio-demographic Result in Relation to Parasites and More Vulnerable Groups among Obstetric Fistula Patients Attending MMSH, Kano State, Nigeria.**

	<b>Intestinal Parasites</b>	<b>Malaria Parasite</b>	<b><i>T. vaginalis</i></b>
Variable	Percentage (%)	Percentage (%)	Percentage (%)
<b>Age</b>			
15-25	7.2	13.2	4.8
26-35	6.2	14.0	2.8
Total	13.4	27.2	7.6
<b>Residence</b>			
Rural	11.6	25.2	6.8
<b>Occupation</b>			
Unemployed	12.8	26.8	6.0
<b>Toilet Facility</b>			
Open Defecation	8.4	20.0	5.2
Pit Toilet	6.0	12.4	2.8
Total	14.4	32.4	8.0
<b>Source of drinking water</b>			
Hand Dug well	5.2	12.4	3.2
Stream/River	7.6	15.6	4.4
Total	12.8	28.0	7.6
<b>Refuse Disposal</b>			
Open	10.0	26.8	7.2
<b>Mode of Acquiring Fistula</b>			
Child Birth	16.4	34.0	8.4

#### 4. 1 DISCUSSION

The prevalence of intestinal parasites among obstetric fistula surgery patients, amounting to 41 cases (16.4%), where these groups of patients were infected by one or more intestinal parasitic infection. *Ascaris lumbricoids* were the most frequently isolated parasite observed in this study, with a prevalence of 14(5.6%), followed by *E. histolytica* 11(4.4%), *T. trichuria* recorded 5(2.0%), *S. stercoralis* had a prevalence of 3(1.2%), *S. mansoni* was 3(1.2%), *Hookworm* and *H. nana* recorded a prevalence of 3(1.2%) and 2(0.8%) respectively. However, this finding indicates a lower prevalence

compared to studies conducted in Plateau State, Nigeria (Ikeh *et al.*, 2011), which reported an overall prevalence of 31.5%. Among these, helminthes accounted for 30.8%, while protozoans comprised 1.5%. Notably, *Hookworms* exhibited the highest distribution at 17.7%, followed by *Ascaris lumbricoides* at 10.8%, and *Schistosoma mansoni* and *Strongyloides stercoralis* each at 2.3%. Additionally, *Entamoeba histolytica/dispar* and *Trichuris trichiura* were each observed at 0.8%. Comparatively, earlier stool analysis surveys conducted in Saudi Arabia and various other countries displayed a considerable range of prevalence rates for intestinal parasites. This finding is consistent with recent research by Suraj *et al.*(2023), which reported a prevalence of soil-transmitted helminths (STHs) at 19.6%, with *Hookworms* being the most prevalent at 14.3%, followed by *Ascaris* is 4.6%. The prevalence of 13.3% in india is somewhat less compared to the present studies (Assudani *et al.*, 2015), 7.9% in Iraq (Hussein *et al.*, 2011) which is a little bit higher compared to the present studies, additionally prevalence of 64.4% was reported in Sudan (Gabbad and Elawad, 2010) and 58.7% in Yemen (Al-Haddad and Baswaid, 2010). The study also agreed with previous study by Eugene *et al.*,(2011) in Jos, Nigeria on screening for intestinal parasites in elective surgery patients in endemic areas, where 41 (31.5%) of the 130 patients had intestinal parasitism. Hookworm had the highest prevalence of 17.7%, closely followed by *Ascarislumbricoides* (10.8%). Others were *Schistosomamansoni* (2.3%), *Strongyloidesstercoralis* (2.3%), *Trichuristrichiura*(0.8%), *Entamoeba coli* (0.8%), and *E.histolytica/dispar* 0.8%. (Yalewayker *et al.*, 2018) studies of intestinal parasitic infection among *PTBSuspected Patients*, among 256 pulmonary tuberculosis suspected patients, intestinal parasites were detected in 19.6% (50/256) this was a very close to the present study. Nevertheless, lower prevalence was recorded (Omar *et al.*, 2018), reported 0.96% in Saudi Arabia, a high prevalence (32-41.5%) in Palastine (Bdir and Adwan, 2010), 64.4% in Sudan (Gabbad and Elawad, 2014).

Prevalence of malaria among 250 obstetric fistula patients studied was 87(34.8%) while the remaining patients were malaria negative. This studies conform to the study carried out by Etifia, (2020)which revealed that malaria prevalence was 41.6% in North Western Nigeria and 88.0% in North Central Nigeria. Additionally, Surajet *al.*(20203) discovered a prevalence of 92.7% of malaria among patients attending some hospitals in Kano metropolis which is higher compared to the current studies on obstetrics fistula patients. In addition (Oladele *et al.*, 2019) reported a prevalence of 64.9% of malaria infection among patients attending MurtalaMuhammed specialist hospital Kano, Nigeria. Moreover, Ibrahim *et al.*(2023) recorded a prevalence of 71.1% in Southwestern Nigeria, comparatively, Madobi (2019) reported 87% in Kano, while a lower prevalence of 23.3% in southeastern Nigeria (Nwaneli, *et al.*, 2020).

In this study, the prevalence of *Trichomonas vaginalis* infection was observed to be 8.8% among 250 obstetric fistula patients. In comparison, Husen *et al.* (2023) reported an overall prevalence of *T. vaginalis* at 7.7% among pregnant women attending antenatal care in Bule Hora, Ethiopia, with the highest prevalence observed among patients aged 35-39 years (18.2%). However, the prevalence was lower compared to the present study. Moreover, it was lower than the prevalence reported by Obiora *et al.* (2021), who recorded a prevalence rate of *Trichomonas vaginalis* at 10.0% among adults. Additionally, our findings align with those of Nas *et al.* (2020), who reported a prevalence of *T. vaginalis* at 12.5% among pregnant women attending antenatal care in Kano, Nigeria. However, the prevalence is lower when compared to Nwibari and Nanvayat (2013) in Jos North Plateau State, where a prevalence of 23.3% was reported.

This difference could be attributed to variations in sample areas or research methods. The study indicated that the highest prevalence of Trichomoniasis occurred among females, this is consistent with Burgess (2006), who suggested that the infection affects females more than males. Trichomoniasis was also most prevalent within the age group of 18-30 years, with a prevalence rate of 8.0% in urine samples and 16.7% in high vaginal swab samples, followed by the age group of 31-40 years, with a prevalence rate of 4.0% in urine samples and 6.7% in high vaginal swabs. Lower infection rates were recorded within the age groups of 41-50 and 51-60 years, with a prevalence rate of 3.3% in high vaginal swab samples. Among males, the infection occurred most frequently within the age groups of 31-40 and 41-50 years, with a prevalence rate of 4.0% in both cases. This trend could be ascribed to the heightened sexual activity observed within these age brackets, leading to an increased likelihood of infection transmission. This observation aligns with the findings of the UNFPA (2022), which indicated that 25% of women aged between 18 and 49 years were married or in union before their 18th birthday. Moreover, this study corresponds with the research conducted by Olayeni and Adebol (2006), who found that out of 300 high vaginal swab samples collected from randomly selected pregnant women and screened, 56 (18.66%) tested positive for trichomoniasis using culture techniques. Notably, direct microscopic examination of wet mount preparations detected only 20 (6.66%) positive cases.

As observed in this studies patients with weight 30–40 kg had an occurrence of 21.6% , 41–50 kg had 32.8% in Kano, also 51–60 kg of weight in Kano were 26.4%, patients weighing 61–70 kg recorded were 12.0%. Consequently, weight in kg among these patients above 70kg represents 7.2% in Kano state. This indicated that 80.8% of the studied population were within underweight category (UNCSO, 2012), and may be attributed to low water intake and high prevalence of intestinal, malaria and vaginal infections. In addition to that, socio-demographic characteristics of residential dwellings of obstetric fistula surgery patients 179(71.6%) were from rural communities while the remaining 71(28.4%) came from urban communities. More so, the current studies does not tally compared with Adulugbaet *al.* (2020) who recorded urban (42.2%) and rural (23.8%). In addition, Oladele *et al.* (2018) reported urban (65.6%) and rural (34.4%). Residential dwelling status of the patient revealed that in Kano 28.4% of the subjects were from urban communities. Furthermore, the current investigation disagrees with Naset *al.* (2020) who recorded prevalence for urban residential dwelling (69.6%) whereas rural had (30.4%). In addition this research was low in urban but high in rural setting in contrast to the report of Husenet *al.* (2023) who revealed (63.3%) and (36.7%) in urban and rural dwellers, respectively. Furthermore, (Ikehet *al.*, 2011) revealed that the age group of 61 years and above had the highest prevalence of 45.5% of intestinal parasites, followed by the 41-50 year age group with 36.4%. This studies conform with (Adulugbaet *al.*, 2020) who recorded a comparatively (22.0%) for ages ranging 15-20 years which is low with regard to the current research, also (39.5%) was recorded for 26-30 years. This agreed with the study conducted by (UNFPA, 2022) that 25% of the women (aged 18-49) were married or in union before their 18<sup>th</sup> birthday. Similarly, Husenet *al.* (2023) reported high prevalence of trichomoniasis among pregnant women mostly during their active sexual life, age 15-19 years (9.7%), 20-24 years (26.0%), also 25-29 years (36.7%) and 30-34 years had (21.9%). Furthermore, (Naset *al.*, 2020) recorded high prevalence of *T.vaginalis*, less than 20 years of age (15.2%), 21-25 years had (22.30%), 26-30 years had (27.2%) and 31-35 years had a prevalence of

Trichomoniasis(19.6%) among pregnant women attending antenatal care in Kano, Nigeria.

In this studies the highest occurrence of 190(76.0%) was among unemployed patients, while 24% were employed, mostly self-employed. This conforms to Adulugba *et al.*(2020)recorded employed subjects as (27.7%) and (72.3%) for unemployed subject. Similarly, Nas, *et al.*, 2020) reported that unemployed pregnant women in kano were (82.1%) and employed pregnant women represented (17.9%). In contrast, Ikeh *et al.* (2011) also found that individuals who defecate in pit toilets exhibited a prevalence of 35.5%, closely followed by those defecating in bushes and cultivated farmlands, with rates of 34.0%. Conversely, subjects using water-closet toilet systems had a notably lower prevalence of 6.7%. Additionally, Husen *et al.* (2023) reported a high prevalence of unemployment among patients at 89.3%, while only 0.7% of employed patients were observed to have obstetric fistula. Furthermore, Ikeh *et al.* (2011) noted that farmers had a prevalence of 35.3%, whereas civil servants had the lowest prevalence at 7.1%. Moreover, this study revealed that open defecation in bushes and farmlands was most prevalent among patients, with 131 (52.4%) and 96 (38.4%) respectively, while patients using pit toilets or water closets had a lower occurrence of 23 (9.2%). Regarding sources of drinking water, Ikeh *et al.* (2011) reported the highest prevalence among those using water from streams and rivers at 35.1%, while those using tap water recorded 27.0%, contrasting with the findings of the present research. Well water consumption was reported by 110 (44.0%) individuals, followed by stream/river water at 90 (36.0%), while 36 (14.4%) and 14 (5.6%) drank tap water and bottled/sachet water respectively. In this study, well water utilization had the highest prevalence at 44.0%, followed by stream/river water. Furthermore, this research identified various modes, through which obstetric fistulas are acquired, with 99.2% attributed to childbirth delivery and only 0.8% resulting from female circumcision, with no congenital fistulas recorded in Kano. The prevalence of female genital mutilation was found to be 0.8% in Kano, reflecting a lower rate compared to studies by Adebayo *et al.* (2018), where a prevalence of 13% and 34% was reported in Kano and Kaduna respectively, both in North-West Nigeria, as documented by Garba *et al.* (2012) and Mandara (2004).

The effects of a high prevalence of intestinal, vaginal, and malaria infections can vary depending on various factors, such as the severity of the infections, access to healthcare, and the overall health infrastructure of the affected region. However, intestinal infections often lead to symptoms such as diarrhea, abdominal cramps, and vomiting, which can result in dehydration, particularly in vulnerable populations such as children and the elderly (Barhanet *al.*, 2020). More so, chronic intestinal infections can impair nutrient absorption, leading to malnutrition and stunted growth, especially in children. Persistent or severe intestinal infections in children can lead to cognitive impairment and developmental delays (Ahmed and Jasim, 2023).

Furthermore, prevalence of *Trichomonas vaginalis* as 8.8% may impart vaginal infections such as bacterial vaginosis, yeast infections, or sexually transmitted infections (STIs) causing symptoms like itching, burning, abnormal discharge, and pain during intercourse (CDC, 2022). Certain vaginal infections, if left untreated, can lead to complications during pregnancy, including preterm birth, low birth weight, and neonatal infections (Darvinet *al.*, 2022).Vaginal infections can increase susceptibility to sexually transmitted infections such as HIV, gonorrhea, and Chlamydia (Jessica *et al.*, 2023).

Consequently, in the forgoing malaria prevalence of 34.8% would typically presents with symptoms such as fever, chills, sweats, headaches, and muscle aches (Buck *et al.*, 2023). Malaria parasites destroy red blood cells, leading to anemia, which can cause fatigue, weakness, and other complications. Severe malaria can lead to complications such as cerebral malaria (affecting the brain), severe anemia, respiratory distress, and organ failure, which can be fatal if not promptly treated (Conroy *et al.*, 2019). Malaria can have a significant socioeconomic impact on affected communities due to loss of productivity, healthcare costs, and investments in prevention and control measures. Overall, a high prevalence of these infections can impose a substantial burden on healthcare systems, impede economic development, and contribute to morbidity and mortality, particularly in resource-limited settings. Effective prevention strategies, timely diagnosis, and access to appropriate treatment are essential for reducing the impact of these infections on affected populations (WHO, 2022).

## 5. CONCLUSION

In summary, this research offers valuable insights into the prevalence of intestinal parasites, malaria, and *Trichomonas vaginalis* among obstetric fistula surgery patients, along with the associated factors within Kano State. The study highlights a relatively elevated prevalence of intestinal parasites (30.8%) among these patients, with *Ascaris lumbricoides* being the most commonly identified parasite (9.2%), followed by *E. histolytica* (8.0%) and *T. trichuria* (4.0%). The prevalence observed aligns with findings from previous studies conducted in different regions, underscoring regional variations in parasite prevalence. The prevalence of malaria among obstetric fistula patients was 49.2%, indicating a significant burden of malaria in this population. The prevalence of malaria in this study aligns with studies in different regions of Nigeria, suggesting relatively high malaria prevalence in the country. The prevalence of *Trichomonas vaginalis* among obstetric fistula patients was 14.8%, which is lower than some previous studies conducted in different regions of Nigeria. The prevalence of trichomoniasis was higher among females and in the age group of 18–30 years, which is in line with existing knowledge about this infection. Four types of co-infections were identified, including malaria + *T. vaginalis*, malaria + intestinal parasites, *T. vaginalis* + intestinal parasites, and malaria + *T. vaginalis* + intestinal parasites. Co-infections can have compounding health effects and should be a focus for further research and medical intervention.

Various sociodemographic factors such as age, weight, residence, occupation, source of drinking water, toilet facility, refuse disposal, and mode of acquiring fistula were considered in this study. Age and occupation seem to be associated with the prevalence of these infections, with younger age groups and unemployment having higher rates of infection. Factors related to sanitation and water sources, such as open defecation, toilet facilities, and sources of drinking water, are associated with the prevalence of intestinal parasites and other infections. This suggests that improving sanitation and access to clean water may help reduce the prevalence of these infections. The majority of patients acquired obstetric fistulas through childbirth delivery, highlighting the importance of maternal health care and the prevention of obstetric complications. Female genital mutilation is also mentioned as a potential cause of obstetric fistula in a small percentage of cases.



## 6. RECOMMENDATIONS

From the forgoing, the findings underscore the need for targeted healthcare interventions, especially in improving sanitation, access to clean water, and maternal healthcare services in the study area.

- i. A comprehensive epidemiological study is needed to assess the prevalence and risk factors of parasitic infections and obstetric fistulas in Kano state and Nigeria at large. The study will include a diverse sample of obstetric fistula patients, focusing on sanitation, hygiene, maternal healthcare services, socio-demographic factors, and co-infections.
- ii. Comparative analysis should be conducted to understand National and global patterns and regional variations.
- iii. Targeted intervention strategies should be developed to improve sanitation, access to clean water, maternal healthcare, and raise awareness about risks associated with certain practices. The long-term impact of these strategies should also be assessed.

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