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Prevalence of Intestinal Parasitic Infections among Patients Attending Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author KM, MKG and MY designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors THIS and OFA managed the analyses of the study. Author SUN, MKG, AUI and UM managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background: Intestinal parasitic infection is one of the major health issue in developing countries particularly in Sub -Saharan Africa. It has been estimated to affect about 3.5 billion people globally and 450 million people are thought to be ill as a result of such infections, the majority being children.
Aims: The study was aimed at determining the prevalence and associated risk factors of intestinal parasitic infections among patients attending Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria.

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Study Design: This was a cross-sectional, descriptive study.
Place and Duration of Study: This study was conducted among patients attending Usmanu Danfodiyo University, Teaching Hospital, Sokoto, Sokoto state, between May to November 2017.
Methodology: A total of 245 participants were enrolled in the study. Standard parasitological examination was carried out on stool samples using microscopic examination.
Results: Finding revealed that 29 (11.8%) were positive for intestinal parasitic infections. Males recorded higher prevalence than the females with 19 (11.9%) and 10 (11.7%), respectively.
Conclusion: Low level of education, occupational status, poor water supply were among the significant risk factors for these infections. Prevalence and intensity of parasitic infections among the study community could be reduce by Creating awareness, level of sanitation, water supply and deworming programme among school children.

Keywords: Prevalence study; intestinal parasitic infection; UDUTH; Sokoto State; Nigeria.

1. INTRODUCTION

Intestinal parasitic infection is one of the major public health burdens in developing countries particularly in Sub -Saharan Africa. It has been found to affect about 3.5 billion people globally and 450 million people are thought to be ill as a result of such infections, the majority being children [1]. In Nigeria, intestinal helminthes infections have continued to prevail because of poor standards of living, poor environmental sanitation and ignorance of simple health promoting behaviours [2,3]. Intestinal helminthes infections are most common in school age children and they tend to occur in high intensity in this age group [4,5,6].

These infections have been associated with an increased risk for nutritional anaemias, protein energy malnutrition, growth deficits in children, physical weakness and low educational performance of school children [7,8] and also causing high morbidity and mortality rate [9].

Parasitic infections are governed by behavioural factors, biological, environmental, socioeconomic and health systems factors. Local conditions such as quality of domestic and village infrastructure; economic factors such as monthly income, employment and occupation and social factors such as education influence the risk of infection, disease transmission and associated morbidity and mortality [10,11]. These infections are more prevalent among the poor segments of the population. They are closely associated with low household income, poor personal and environmental sanitation, and overcrowding, limited access to clean water, tropical climate and low altitude. Intestinal parasitic infections such as amoebiasis, ascariasis, hookworm infection and trichiuriasis are among the ten most common infections in the world [12].

There is dearth of information on the magnitude of intestinal parasitic infections and predictors among patients attending Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria. Information generated could be used for planning public health control programmes which is an important step for initiation of treatment and prevention strategies as well as reducing morbidity and mortality due to parasitic infections in the area.

2. MATERIALS AND METHODS

2.1 Study Area

The study area was Usmanu Danfodiyo University Teaching Hospital, a tertiary health facility located in Sokoto metropolis, the Sokoto State Capital. It serves as a referral centre for more than 10 million people of the Nigerian States of Sokoto, Zamfara and Kebbi; and neighbouring Niger and Benin Republic in the West African sub-region [13].

Sokoto State is located at the extreme part of North-Western Nigeria between longitude 3° and 7° east and between latitude 10° and 14° north of the equator. It shares borders with Niger-Republic to the North, Kebbi State to the South-West and Zamfara State to the East [13]. The state covers a total land area of about 32,000 square kilometres and a population of 4,602,298 million based on 2013 projection [14]. Sokoto State has semi-arid climate and vegetation is largely Sudan Savannah with an annual rainfall between 500 – 1300mm and temperature ranges between 150°C and over 400°C during warm days [13].

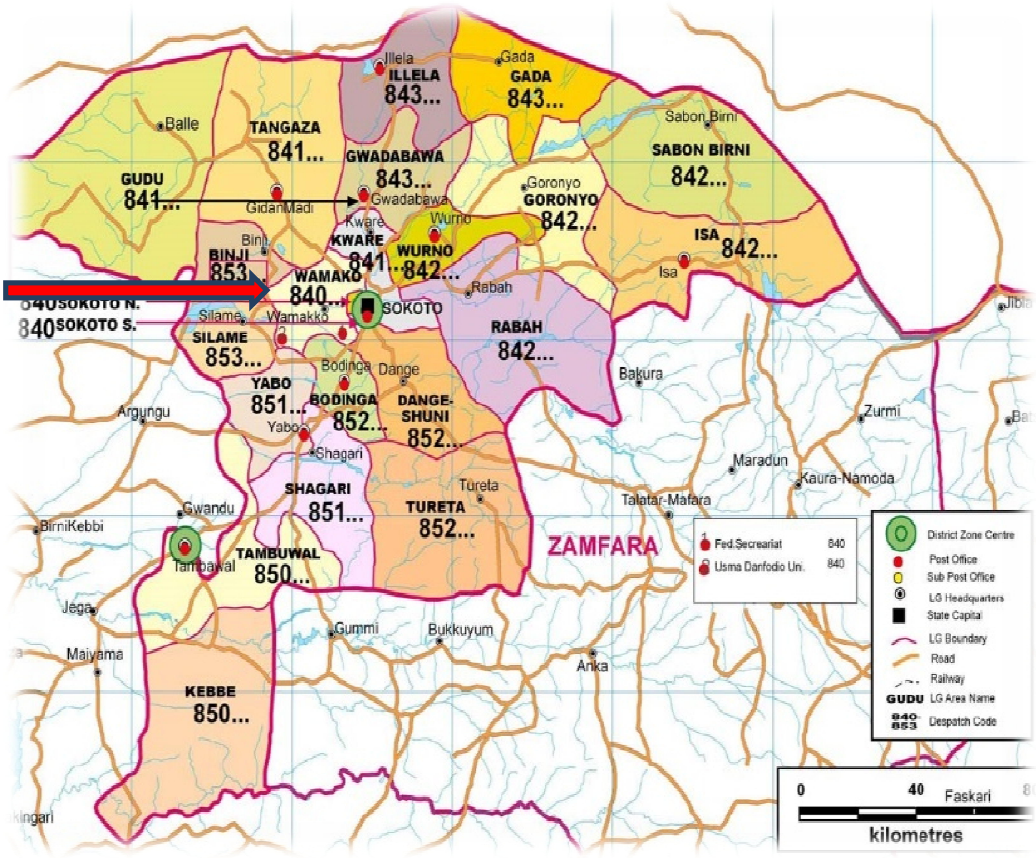

Fig. 1. Map of Sokoto state showing study area [13]

2.2 Study Design

This is a cross-sectional descriptive study that was carried out on 245 samples collected from UDUTH Service laboratory, from May to November 2017.

2.3 Subject and Selection

A systematic random sampling was used to select or recruit the subjects or respondents.

2.4 Inclusion Criteria

1. All patients with uncontaminated stool sample (formed, semi formed and unformed) were recruited for study and
2. Patients who give their consent to participate in the study.

2.5 Exclusion Criteria

1. Patients that did not meet inclusion criteria were excluded from the study and
2. Patients who refuse to give consent in the study.

2.6 Sample Size

The sample size was calculated using the formula outlined below [15]. Prevalence was set at 17.5% [16].

$$n = \frac{(z\text{-}a)^2 (p) (1\text{-}p)}{d^2}$$

$$n = 221$$

Using an attrition rate of 10%, a total of 243 patients were selected.

2.7 Sampling Method

A systematic sampling method was used to recruit all patients that meet the inclusion criteria.

The laboratory register had about six hundred patients (600) that submitted their stool for

evaluation in the previous year (January 2016 to December 2017). This was used to determine the sampling frame.

K=*N*/*n*: 600/245 = 2.4 ~ 3
A sampling interval of 3 was achieved.

Using simple random sampling; the first patient was chosen between number 1 and 3 for the first week of study.

For any randomly chosen numbered patient; thereafter a sampling interval of 3 would be used for the subsequent patients that present themselves at the facility until the sample size was achieved.

2.8 Sample Collection

An approximate amount of 100g faeces was collected into clean, dry and screw cap, leak proof containers.

2.9 Study Tool

A structured questionnaire was administered to obtain patient information. It was structured into the following subheadings; demographic information, socio-economic data, clinical history and laboratory investigation. The questionnaire was pretested and validated at a similar site to the study area in the state specialist hospital, Sokoto and corrections were made where necessary.

2.10 Sample Processing

The stool specimen was examined macroscopically for the presence of adult worms. The consistency, color and presence of abnormal structures were recorded. It was also examined microscopically using direct saline and wet iodine mount, and also formal-ether concentration method.

2.11 Direct Microscopic Examination Using Normal Saline and Iodine Preparation

For each sample, normal saline mount and iodine mount was prepared on a slide and examined microscopically at 10X and 40X for the presence of *Intestinal helminths*. Iodine preparation allows the examination of the characteristics features of the protozoa and the identification of the *Entamoeba histolytica/dispar* (*Entamoeba histolytica/dispar*) cyst from the commensal *Entamoeba coli* [17,18].

2.12 Formalin-Ether Sedimentation Method

0.5 g of faecal sample was added to a glass container containing 10 mls of 10% formalin and then mixed thoroughly. A Funnel was placed on a gauge and strain into a 15 mls centrifuge tube and centrifuged for 2 minutes at 1500 rpm. Then the supernatant was discarded and the sediment was re-suspended into 10 mls of physiological saline, and centrifuged for 2 minutes at 1500 rpm. The supernatant was discarded and the sediment re-suspended again in 7 mls of 10% formaldehyde, 3 mls of ether (diethyl) was also added. The tube was closed with a glass stopper and mixed vigorously, and then the stopper was removed and centrifuged for 2minutes at 1500 rpm. The supernatant was poured out and the sediment carefully placed on a clean glass slide and covered with cover slip and this was examined at x10 and x40 magnification on a light microscope [19].

2.13 Data Management

Data were entered independently at two separate occasions using Microsoft Excel 2016. Double data entry analysis was done to ensure data quality. Statistical package for social sciences (SPSS) version 20 was used for the analysis. Categorical variable was assessed using Chi-square test to determine the association. Simple and multiple logistic regression analysis were used to determine associated risk factors of the infections. Values were considered statistically significant at $p< 0.05$.

2.14 Ethical Consideration

Ethical clearance was obtained from the ethics and research committee of UDUTH, Sokoto and consent was sought from the participants prior to sample collection.

3. RESULTS

The prevalence of intestinal parasites among the overall population studied was 11.8%. The highest prevalence of 6.2% was noted for Hookworm and *Ascaris lumbricoides infection* while the lowest prevalence was seen with *H.*

nana (2.0%) as shown in Table 1. Of the total study subjects 160 (65.3%) were males and 85 (34.7%) were females. The males showed a higher prevalence of intestinal parasite infections of 11.9% (Table 2) than the females which showed a prevalence rate of (11.8%). However, this difference was not statistically significant (p>0.05). The age range (Table 3) of 11-15 had the highest prevalence of parasitic infection with 2.9% and none was recorded among the age group 31 and above. There was a statistically significant difference of worm of infestation among age groups (p=0.004).

Table 1. Prevalence of intestinal parasitic Infection

Parasites	Frequency (n=245)	Prevalence (%)
Hook worm and *Ascaris Lumbricoides*	15	6.1
G. lamblia and *Entamoeba*. histolytica	9	3.7
H. nana	5	2.0
Total	29	11.8

Prevalence of intestinal parasitic infection among study population based on water source shows that those that consume river/stream water 13 (5.3%) have highest risk of intestinal parasitic infection, followed by those that drink other source of water with prevalence of 8 (3.3%) then followed by those that drink well water with 4 (1.6%), Tap water 3 (1.2) and lastly those that consumed sachet water have the lowest prevalence of 1 (0.4%). Comparing the different prevalence rates in relation to intestinal parasites by water source is statistically significant (p=0.001).

The distribution of intestinal parasitic infection among study population based on frequency of eating vegetables, walking bare footed, type of toilet facility, occupation, educational level etc. are shown in Table 4.

4. DISCUSSION

This study reveals a parasitic prevalence rate of 11.8% among 245 patients attending the Usmanu Danfodiyo University Sokoto Teaching Hospital, which were selected at random from May to November, 2017.

The low prevalence of intestinal parasites in this study is in line with the study observed in North western Nigeria of 15.67% by Garba et al. [19] and 12% in South India by Baragundi et al. [20]. However, the results are considerably lower than studies reported in North western Nigeria by Kabiru et al. [21], North central Nigeria by et al. [22], western Tajikistan by Matthys et al. [23] and North eastern Ethiopia by Missaye et al. [24]. The lower prevalence might be due to improved environmental sanitation, better knowledge of personnel health and hygiene, and educational status of the subjects found in the study area [25].

Table 2. Showing prevalence in relation to gender

Gender	No examined (%)	Intestinal parasites		p-value
		Infected (%)	Not Infected (%)	
Male	160 (65.3)	19 (11.9)	141(57.6)	**0.413**
Female	85 (34.7)	10(11.7)	75 (30.6)	
Total	245	29	216	

Table 3. Showing prevalence in relation to age distribution

Ages	No examined (%)	Intestinal parasites		p-value
		Infected (%)	Not infected (%)	
0-5	33(13.5)	5(15.2)	28(11.4)	**0.004***
6-10	19(7.8)	4(21.0)	15(6.1)	
11-15	19(7.8)	7(36.8)	12(4.9)	
16-20	57(23.3)	6(10.5)	51(20.8)	
21-25	83(33.9)	5(6.0)	78(31.8)	
26-30	13(5.3)	2(15.4)	11(4.5)	
≥ 31	21(8.6)	0(0.0)	21(8.6)	
Total	245	29	216	

Table 4. Showing Distribution of intestinal parasitic infection among study population with respect to some sociodemographic characteristics

Variables	Intestinal parasites				Total	*p*-value[a]
	Infected		Not infected			
	n	%	n	%	N	
Educational status						
None	7	(2.9)	77	(11.0)	84	0.021 *
Informal	2	(0.8)	14	(7.0)	16	
Primary	3	(1.2)	27	(9.0)	30	
Secondary	11	(4.5)	29	(2.64)	40	
Tertiary	6	(2.4)	69	(11.5)	75	
Occupation						
Business	3	(1.2)	23	(7.6)	26	0.905
Farming	1	(0.4)	14	(14.0)	15	
Civil servant	7	(2.9)	40	(5.7)	47	
Unemployed	4	(1.6)	37	(9.3)	41	
Student	14	(5.7)	102	(7.3)	116	
Water source						
Tap water	3	(1.2)	59	(19.6)	62	0.001*
Well water	4	(1.6)	33	(8.3)	37	
River/stream	13	(5.3)	36	(14.7)	49	
Sachet water	1	(0.4)	73	(2.7)	74	
Others	8	(3.3)	15	(1.8)	23	
Frequency of eating vegetables						
Frequent	11	(4.5)	57	(5.2)	68	0.201
Not frequent	18	(7.3)	145	(8.1)	163	
Not at all	0	(0.00)	14	(5.7)	14	
Do you walk bare foot						
Yes	25	(10.2)	155	(6.2)	180	0.098
No	4	(1.6)	61	(15.3)	65	
Do you wash your hand						
Yes	8	(3.3)	42	(5.3)	50	0.307
NO	21	(8.6)	174	(8.3)	195	
Type of toilet facility						
Pit latrine	9	(3.7)	48	(5.3)	57	0.379
Bucket latrine	6	(2.4)	39	(6.5)	45	
Open space	2	(0.8)	41	(20.5)	43	
Water System	12	(4.9)	88	(7.3)	100	

*Key: a = Pearson chi-square test, n = Number of parasites, * = statistically significant*

The present study revealed that males were a little more susceptible to infection (11.9%) than the females (11.7%). This finding was found to be similar with that reported by Brooker et al. [26]. This might be due to the common feeding pattern in which a great number of men eat outside their homes while on daily activities to earn a living. And also due to the contamination of soil by human faeces, use of raw sewage for agricultural purposes; use of waste water irrigated vegetables and contaminated imported vegetables [27].

Prevalence is not dependent on sex among the sampled population which disagrees with the work of Brooker et al. [26] who observed a higher prevalence of intestinal parasite in females than in males. And the work is in contrast with that of Gelaw and Belay [28], who reported that male was found to have higher prevalence rate in a study carried out in North western Ethiopia.

However, 11-15 years aged group and 16-20 years had a highest prevalence of 36.8% and 10.5% respectively. This finding was found to be similar with that reported by Kabiru et al. [21], Abou-El et al. [29]. This study is also similar to the work of Oguoma et al. [30], who reported highest prevalence in the ages 9-10 years among children [30]. Even though WHO confirmed that intestinal protozoan parasite (IPP) are dependent on age and greater severity of the

infection is found in the younger children [31]. This could be attributed to the different host responses and other related factors such as nutritional status [32].

The most common intestinal parasitic infection identified in the community include amongst others *H. nana*, *Ascaris lumbricoides, G. lamblia, E. histolytica* and Hookworm specie. However Hookworm and *A. lumbricoides* recorded the highest prevalence of 15 (6.1%) followed by *G. lamblia* and *E. histolytica* 9 (3.7%) and *H. nana* recorded the least prevalence of 5 (2.0%). This finding was similar to those reported in Ethiopia [28], and in contrast with the study in Nigeria [33].

In this study, occupation, type of toilet facility and frequency eating of vegetables were not significantly associated with intestinal parasitic infections. However, according to the study conducted by Erko and Medhin [34] and Asrat et al. [35], they were strongly associated with infections. This is more likely due to high level of education, better sanitation condition, better knowledge about the faeco-oral transmission of intestinal parasite through their unwashed hands and the contamination of vegetables with faecal materials in the farm. Season could be another important predictor of intestinal parasitic infections especially during rainy season where agricultural activities is said to be highest. This finding is in agreement with the findings of other researchers that indicated seasonal variations contributed to the higher prevalence of the disease [36,37].

5. CONCLUSION

This present study revealed that there is low prevalence of intestinal parasitic infection among patients attending Usmanu Danfodiyo University Teaching Hospital, Sokoto.

The different potential risk factors assessed in the study include occupation, educational status, water source, and type of toilet facility. Water source and educational status were strongly associated with intestinal parasitic infection. However, the low prevalence of infection might be attributed to proper management of organic refuse, public health enlightenment about the risk of intestinal parasitic infections, adequate supply of clean water and proper drainage among the study participants.

Therefore, all stakeholders should give attention to raising awareness about control of intestinal parasitic infection, personal and environmental hygiene, and improving the quality of drinking water source.

CONSENT AND ETHICAL APPROVAL

Ethical clearance was obtained from the ethics and research committee of UDUTH, Sokoto and consent was sought from the participants prior to sample collection.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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