PREVALENCE OF INTESTINAL PARASITIC INFECTIONS AMONG PATIENTS ATTENDING USMANU DANFODIYO UNIVERSITY TEACHING HOSPITAL, SOKOTO, NIGERIA

ABSTRACT

Background: Intestinal parasitic infection is one of the major health issues 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 aimed to determine the prevalence and associated risk factors of intestinal parasitic infections among patients attending Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria

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 243 participants were enrolled in the study. Standard parasitological examination was carried out on stool samples using microscopy followed by formal ether concentration methods

Results: Finding revealed that 29 (12%) were positive for intestinal parasitic infections. Males recorded higher prevalence than the females with 19 (11.9%) and 10 (11.8%), respectively. Intestinal parasites continue to remain a serious public health problem in North-western Nigeria.

Conclusion: Low level of education, occupational status, poor water supply were among the significant risk factors for these infections. Creating awareness, level of sanitation, water supply and deworming programme among school children will reduce prevalence and intensity of parasitic infections among the study community.

Keywords: Prevalence study, Intestinal parasitic infection, Patients, UDUTH, Sokoto State, Nigeria.

1.0 INTRODUCTION

Intestinal parasitic infection is one of the major public health burden 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].

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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 [9] and also causing high morbidity and mortality rate.

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].

In Nigeria 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 aim as an important step for initiation of treatment and prevention strategies as well as reducing morbidity and mortality due to parasitic infections in the area.

3.0 MATERIALS AND METHODS

3.1 STUDY AREA

The study area is 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].
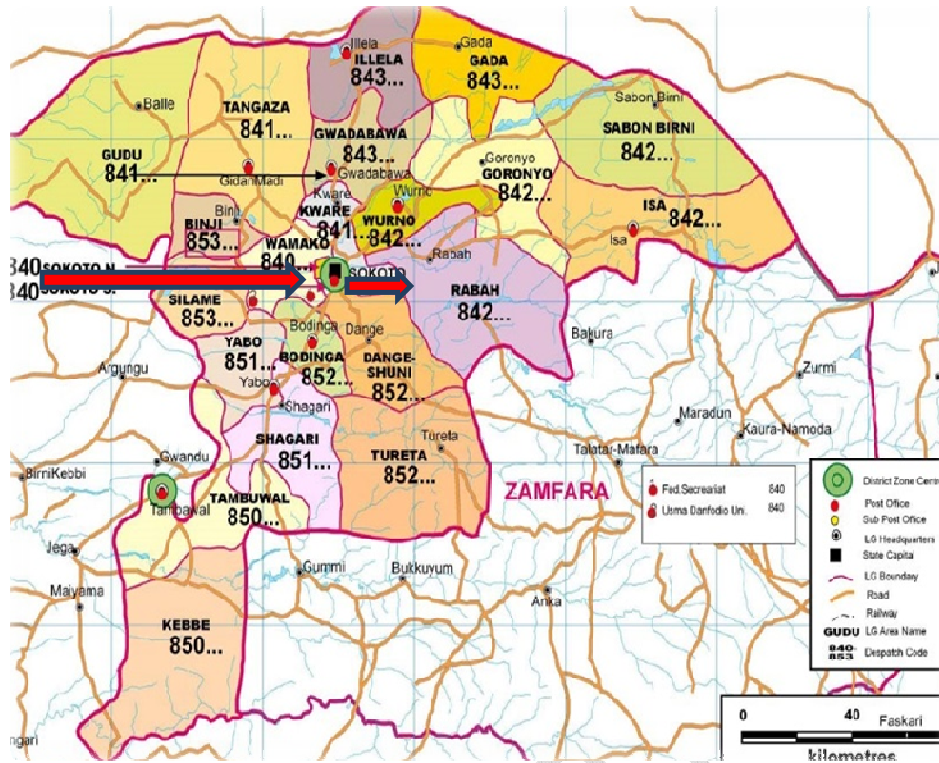
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74   Figure 11.Map of Sokoto State Showing Study Area [13].

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3.2 STUDY DESIGN

This is a cross-sectional descriptive study that was carried out on 243 samples collected from UDUTH Service laboratory, from May to November 2017.

3.3 SUBJECT AND SELECTION

The subjects were selected or recruited in UDUTH Service laboratory using systematic sampling method to recruit all patients that meet the inclusion criteria.

3.3.1 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.

3.3.2 Exclusion criteria:

1. Patients with stool sample contaminated with urine or mixed with soil were excluded from the study and

2. Patients who refuse to give consent in the study.

3.4 SAMPLE SIZE

The sample size was calculated using the formula outlined below

$$n = \frac{(z1-a)^2 (p) (1-p)}{d^2} [15].$$

And with the prevalence (p) estimated according to the study that was carried out in Sokoto that reveals that the intestinal parasitic infection has a prevalence of 17.5%. Hence, it was used to calculate the sample size. [16].

Where; n= Sample size

Z= standard normal deviate at 95% $(1.96)^2$

p = prevalence 17.5%, 17.5/100 = 0.175

q = complement of p (1-p)

d = precision 5% (0.05)

$n = (1.96)^2 \times 0.175 \times (1-0.175) / (0.05)^2$

n = 221

Using an attrition rate of 10%. Therefore; 221 + (0.1 x 221)

Actual sample size = 243 patients

3.5 SAMPLING METHOD

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

108 The laboratory register had about six hundred patients (600) that submitted their stool for evaluation
109 in the previous year (January 2016 to December 2017). This was used to determine the sampling
110 frame.

111 $K=N/n$: 600/243 = 2.5 ~ 3

112 A sampling interval of 3 was achieved.

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

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

3.6 SAMPLE COLLECTION

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

3.7 STUDY TOOL

121 The questionnaire was design as a structured questionnaire before it was administered to obtained
122 patient information. It was structured into the following subheadings; demographic information, socio-
123 economic data, clinical history and laboratory investigation. The questionnaire was pretested and
124 validated at a similar site to the study area in the state specialist hospital, Sokoto; corrections was
125 made thereafter where necessary.

3.8 SAMPLE PROCESSING

3.8.1 Macroscopy

128 The procedure for macroscopy was done as outlined below;

129 1. Presence of worms: The presence of adult helminthes or segments example: *Ascaris, Taenia*
130 *species, Enterobius vermicularis and gravid Taenia species* would be determined.

131 2. Consistency (degree of moisture): This varies with diet but certain clinical conditions associated
132 with parasite presence may be suggested by particular consistencies. It were described as hard,
133 formed, semi-formed and diarrhoeic (watery).

134 3. Colour: Any abnormal colour example, pale yellowish passed in steatorrhoeac conditions such as
135 Giardiasis, dark or black-stools occur when iron or bismuth is taken or when there is intestinal
136 haemorrhage were determined.

137 4. Pathologic odour: This can be offensive or non-offensive and it were determined.

138 5. Abnormal features seen (composition): This can be mucus, blood or fat globules. They were
139 determined and reported as appropriate.

3.8.2   DIRECT MICROSCOPIC EXAMINATION USING NORMAL SALINE AND IODINE PREPARATION

142 The procedure is outlined below;

143 About 1-2mg of stool were emulsified in 1-2 drops of normal saline (0.9%) or Lugol's iodine solution.
144 Then a cover-slip were placed and then the slide were scanned under the x10 and x40 objectives

145 lenses of a light microscope. Saline direct smear is used mainly for the detection of intestinal protozoa
146 trophozoites motility. Iodine direct smear allows the examination of the characteristics features of the
147 protozoa and the identification of the *Entamoeba histolytica/dispar* (*Entamoeba histolytica/dispar*) cyst
148 from the commensal Entamoeba coli. [17]

149 3.8.3 SEDIMENTATION METHOD

150 Formalin ethyl ether sedimentation method were used.

151 *3.8.3.1 PRINCIPLE*

152 Is a qualitative method that sediment various types of parasites by gravity or by centrifugal force [18].

153 *3.8.3.2 Formal ether concentration technique*

154 Procedure

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

164

3.9 DATA COLLECTION METHODS

Data was collected by the researcher himself. Data were entered independently at two separate occasions using Microsoft Excel 2016. Double data entry analysis was done to ensure data quality.

3.10 ETHICAL COSIDERATION

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

3.11 STATISTICAL ANALYSIS

Data was entered into the statistical package for social sciences (SPSS) version 20. Analysis for categorical variable was carried out using Chi-square test to determine the association. Simple and multiple logistic regression analysis was used to determine associated risk factors of the infections. Values were considered statistically significant at $p< 0.05$.

4.0 RESULT

A total of 243 participants in this study, an overall prevalence of 29 (12%) were found positive for intestinal parasitic infections.

Table 1, Shows the socio-demographic characteristics of variable with respect to marital status, gender, age group and tribe. Of the total study subjects 160 (65.3%) are males and 85 (34.7%) female among the subjects 38 (15.5%) were married and 207 (84.5%) single. The age ranges shows 21-25 years have the highest frequency of 83 (33.9%) followed by 16-20 years then 0- 5 years and 26-30 years 13 (5.3%) with the least.

Table 2, Shows the socio-demographic characteristics of variable with respect to educational status, occupation, monthly income, and water source. Based on the source of water participants consumed, those that drink sachet water had 74 (31.4%) followed by those that consume tap water 62 (25.3%) then followed by those that consumed river/stream 49 (20%) and well water 37 (15.1%) and lastly those that consumed other source of water with 23 (9.4%). With regards to occupation, higher frequency was recorded among 116 (47.3%) students, likewise highest among those that are civil servant 47 (19.2%) then unemployed with 41 (16.7%), then those that are business men with 26 (10.6%), while the least was found among those that are farming 15 (6.1%).

Table 3, Shows the socio-demographic characteristics of variable with respect to frequency of eating vegetables, type toilet facility, diarrhoea, dysentery, abdominal pain, fever and do you walk bare foot. Out of 243 participants about 126 (51.4%) have high frequency of diarrhoea and 119 (48.6%) had not.

Table 4, Shows the socio-demographic characteristics of variable with respect to intensity parasite, headache, do you wash your hand before eating, vomiting and habit of eating hawk food. In regards to washing of hand before eating about 195 (79.6%) do not wash their hand before eating while 50 (20.4%) wash their before eating.

Likewise, highest among age group ranges 11-15 years of (36.8%) and the least among 31 and above years. There was a statiscally significant difference by aged group ($p<0.004$). The males showed a higher prevalence of intestinal parasite infections of 11.9% than the females that shows a prevalence rate of (11.8%). However, this is not statistically significant ($p>0.05$).(Table 5).

Prevalence of intestinal parasitic infection among study population based on characteristic of the variable(s) shows that those that consumed river/stream water 13 (26.5%) have highest risk of

intestinal parasitic infection, followed by those that drink other source of water with prevalence of 8 (24.8%) then followed by those that drink well water with 4 (10.8%) and lastly those that consumed sachet water have the lowest prevalence of 1 (1.4%). Comparing the different prevalence rates in relation to intestinal parasites by water source is statistically significant ($p<0.001$)(Table 6).

The distribution of intestinal parasitic infection among study population base on frequency of eating vegetables, walking bare footed, type of toilet facility, diarrhoea, dysentery, abdominal pain and fever. Out of 243 participants about 20 (16.8%) are recorded with diarrhoea and 9 (7.1%) had not. There was a statiscally significant difference of ($p<0.019$) by diarrhoea.(Table 7).

The distribution of intestinal parasitic infection among study population base on the characteristic variable (s) as shown in table 8. It was observed that those who eat less hawked food had the highest risk of parasitic infection with 97 (65.5%) followed by those that do not eat hawked food at all with 69 (27.6%); while those who engage more often in eating hawked food with 97 (65.5%) were the least infected with intestinal parasite. Comparing the difference in mode of eating hawked food has no statistically significant difference ($p<0.060$) (Table 8).

241   **I would strongly suggest to remove Table 1-4 to avoid repetition from Table 5-8**

242   **Table 1: Socio-demographic characteristics of variable with respect to marital status, gender,**
243   **age group, and tribe.**

Variable(s)	Frequency (F)	Percentage (%)
Marital status		
Married	38	15.5
Single	205	84.5
Gender		
Male	160	65.3
Female	83	34.7
Age group (years)		
0-5	33	13.5
6-10	19	7.8
11-15	19	7.8
16-20	55	23.3
21-25	83	33.9
26-30	13	5.3
31 and above	21	8.6
Tribe		
Hausa	200	82
Igbo	9	3.7
Yoruba	6	2.4
Fulani	20	8.6
Others	8	3.3

244   **Table 2: Socio-demographic characteristics of variable with respect to educational status,**
245   **occupation, monthly income, and water source.**

Variables (s)	Frequency (F)	Percentage (%)
Educational status		
None	84	34.3
Informal	16	6.5
Primary	30	12.2
Secondary	40	16.3
Tertiary	73	30.6
Occupation		
Business	26	10.6
Farming	15	6.1
Civil servant	47	19.2
Unemployed	41	16.7
Student	114	47.3
Monthly income		

Variable	Frequency	Percentage
High	31	12.7
Average	108	44.9
Low	104	42.4
Water source		
Tap water	62	25.3
Well water	37	15.1
River/stream	49	20
Sachet water	72	31.4
Others	23	9.4

246

247 **Table 3: Socio-demographic characteristics of variable with respect to frequency of eating**
248 **vegetables, do you walk bare foot, type of toilet facility, diarrhoea, dysentery, abdominal pain**
249 **and fever.**

Variable(s)	Frequency (F)	Percentage (%)
<mark>Frequency of eating vegetables</mark>		
Frequent	68	27.8
Not frequent	161	66.5
Not at all	14	5.7
Do you walk bare foot		
Yes	180	73.5
No	63	26.5
Type of toilet facility		
Pit latrine	55	23.3
Bucket latrine	45	18.4
Open space	43	17.6
Flush	100	40.8
Diarrhoea		
Yes	119	48.6
No	124	51.4
Dysentery		
Yes	61	24.9
No	181	74.7
Abdominal pain		
Yes	85	34.7
No	155	64.1
Fever		
Yes	30	12.2
No	210	86.5

250

251 **Table 4: Socio-demographic characteristics of variable with respect to population**
252 **characteristic of the variable**

Variables (V)	Frequency (F)	Percentage (%)
Headache		
Yes	44	18.0
No	197	81.2
Washing hand before eating		
Yes	50	20.4
No	193	79.6
Vomiting		
Yes	25	10.2
No	218	89.0
Frequency of eating hawk food		
Often	50	6.9
Less	97	65.5
Not at all	67	27.6
Intensity of parasitic infection		
No infection	214	88.2
Light infection	29	11.8

253

254 **Combined Tables 5 and 6**

255 **Table 5: Distribution of intestinal parasitic infection among study population according to**
256 **baseline data** ~~with respect to the characteristics variable(s) listed below.~~

Variables	Intestinal parasites				p-value [a]
	Infection		No infection		
	N	%	n	%	
Marital status					
Married	3	(7.90)	35	(92.1)	0.905
Single	26	(12.6)	181	(87.4)	
Gender					
Male	19	(11.9)	141	(88.1)	0.413
Female	10	(11.8)	75	(88.1)	
Age group (years)					
0-5	5	(15.2)	28	(84.8)	0.004 *
6-10	4	(21.1)	15	(78.9)	
11-15	7	(36.8)	12	(63.2)	
16-20	6	(10.5)	51	(89.5)	
21-25	5	(6.00)	78	(94.0)	
26-30	2	(15.4)	11	(84.6)	
31 and above	0	(0.00)	21	(100.0)	
Tribe					

	N	%	n	%	
Hausa	24	(11.9)	177	(88.1)	0.569
Igbo	8	(3.70)	1	(3.4)	
Yoruba	0	(0.00)	6	(100)	
Fulani	4	(19.0)	17	(81.0)	
Others	0	(0.00)	8	(100)	

257 Key:

258 a = Pearson chi-square test

259 n = Number of parasites

260 * = Statistically significant

261

262 **Table 6: Distribution of intestinal parasitic infection among study population base on**
263 **Educational status, occupation, monthly income and water source.**

Variable(s)	Intestinal parasite				p-value [a]
	Infection		No infection		
	N	%	n	%	
Educational status					
None	7	(8.3)	77	(91.7)	0.021 *
Informal	2	(6.5)	14	(87.9)	
Primary	3	(10.0)	27	(90.0)	
Secondary	29	(72.5)	11	(27.5)	
Tertiary	6	(8.0)	69	(92.0)	
Occupation					
Business	3	(11.5)	23	(88.5)	0.905
Farming	1	(6.7)	14	(93.3)	
Civil servant	7	(14.9)	40	(85.1)	
Unemployed	4	(9.8)	37	(90.2)	
Student	14	(12.1)	102	(87.9)	
Monthly income					
High	2	(6.5)	29	(93.5)	0.408
Average	16	(14.5)	94	(85.5)	
Low	11	(10.6)	93	(89.4)	

264

265 Key:

266 a = Pearson chi-square test

267 n = Number of parasites

268 * = Statistically significant

269   Others = dam water

270   **Combined Tables 7 and 8**

271   **Table 7: Distribution of intestinal parasitic infection among study population base on risk**
272   **factors and clinical symptoms** ~~Characteristic variable(s) as shown in the table.~~

Variable(s)	Intestinal parasite				p-value [a]
	Infection		**No infection**		
	N	**%**	**N**	**%**	
Eating raw vegetables					
Frequent	11	(16.2)	57	(83.8)	0.201
Not frequent	18	(11.0)	145	(89.0)	
Not at all	0	(0.00)	14	(100)	
Walking barefoot					
Yes	25	(13.9)	155	(86.1)	0.098
No	4	(6.20)	61	(93.8)	
Type of Water (moved from Table 6 for consistency of Variables)					
Type of toilet facility					
Pit latrine	9	(15.8)	48	(84.2)	0.379
Bucket latrine	39	(18.1)	6	(20.7)	
Open space	41	(19.0)	2	(6.90)	
Flush	12	(12.0)	88	(88.0)	
Diarrhoea					
Yes	20	(16.8)	99	(83.2)	0.019 *
No	9	(7.10)	117	(92.9)	
Dysentery					
Yes	5	(8.20)	56	(91.8)	0.500
No	24	(13.1)	159	(86.9)	
Abdominal pain					
Yes	5	(5.90)	80	(94.1)	0.530
No	24	(15.3)	133	(84.7)	

273

274   ~~**Table 8: Distribution of intestinal parasitic infection among study population base on fever,**~~
275   ~~**headache, do you wash your hand before eating, vomiting and habit of eating hawk food.**~~

Variable(s)	Intestinal parasite				Total		p-value [a]
	Infection		**No infection**				
	N	**%**	**n**	**%**	**N**	**%**	

Fever							
Yes	4	(13.3)	26	(86.7)	30	(100.0)	0.808
No	25	(11.8)	187	(88.2)	212	(100.0)	
Headache							
Yes	4	(9.1)	40	(90.9)	44	(100.0)	0.364
No	25	(23.7)	174	(87.4)	199	(100.0)	
Washing hand before eating							
Yes	8	(16.0)	42	(84.0)	50	(100.0)	0.307
NO	21	(10.8)	174	(89.2)	195	(100.0)	
Vomiting							
Yes	3	(12.0)	22	(88.0)	25	(100.0)	0.979
No	26	(11.8)	194	(88.2)	220	(100.0)	
Habit of eating hawk food							
Often	2	(3.8)	50	(96.2)	52	(100.0)	0.060
Less	19	(16.4)	97	(83.6)	116	(100.0)	
Not at all	8	(10.4)	69	(89.6)	77	(100.0)	

276

277 Key:

278 a = Pearson chi-square test

279 0 = No infection

5.1 DISCUSSION

281 This study reveals a parasitic prevalence rate of 12% among 243 patients attending the Usmanu
282 Danfodiyo University Sokoto Teaching Hospital, which were selected at random from May to
283 November, 2017.

284 The low prevalence of this study is in line with the study observed in North western Nigeria of 15.67%
285 by [19] and 12% in South India by [20]. However, the results are considerably lower than studies
286 reported in North western Nigeria by [21], North central Nigeria by [22], western Tajikistan by [23] and
287 North eastern Ethiopia by [24]. The lower prevalence might be due to improved environmental
288 sanitation, better knowledge of personnel health and hygiene, economic and educational status of the
289 subjects found in the study area.

290 The present study revealed that males gender are little more susceptible to infection (11.9%) than the
291 females (11.8%), this finding was found to be similar with that reported by [26]. This might be due to
292 the common feeding pattern in which a great number of men eat outside their homes while on daily
293 activities to earn a living. And also due to the contamination of soil by human faeces, use of raw
294 sewage for agricultural purposes; use of waste water irrigated vegetables and contaminated imported
295 vegetables [27].

296   Prevalence is not dependent on sex among the sampled population which disagrees with the work of
297 [26] who observed a higher prevalence of intestinal parasite in females than in males. And the work
298 contrast with that of [28], who reported that male was found to have higher prevalence rate in his
299 study carried out in North western Ethiopia.

However, 11-15 years aged group and 6-10 years had a highest prevalence of 36.8% and 21.1% respectively. This finding was found to be similar with that reported by [21, 29]. This study contradicts the work of [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 the 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 (51%) followed by *G. lamblia* and *E. histolytica* 9 (31%) and *H. nana* recorded the least prevalence of 5 (17.2%). This finding was similar to those reported in Ethiopia [28], and in contrast with the study in Nigeria [33].

In this study, occupation, monthly income eating of hawked food, presence of latrine and frequency eating of vegetables were not significantly associated with intestinal parasitic infections. However, according to the study conducted by [34] and [35] 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].

5.2 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 were strongly associated with intestinal parasitic infection. However, the low prevalence might be attributed to proper management of organic refuse, public health Enlightment about the risk of intestinal parasitic infections, adequate supply of clean water, proper drainage and use of sites for defaecation.

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

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