South Asian Journal of Parasitology

5(2): 15-23, 2021; Article no.SAJP.64954

Prevalence of Gastrointestinal Parasites among off Campus and Hostel Students of the Federal University of Agriculture Makurdi, Benue State Nigeria

M. O. Iboyi[1*], C. O. Ali[1], B. O. David[1] and E. O. Otakpa[1]

[1]Department of Biological Sciences University of Agriculture Makurdi, P.M.B. 2373, Benue State, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. Author MOI designed the study, performed the statistical analysis, wrote the first draft of the manuscript. Authors COA and BOD managed the analysis of the study. Author EOO managed the literature searches and wrote the second draft of the manuscript. All authors read and approved the final manuscript.

Article Information

Editor(s):
(1) Dr. Somdet Srichairatanakool, Chiang Mai University, Thailand.
Reviewers:
(1) Yonairo Manuel Herrera Benavides, Universidad de Córdoba, Colombia.
(2) Jesús Carlos Ruvalcaba Ledezma , Universidad Autónoma del Estado de Hidalgo (UAEH) ,México.
Complete Peer review History: http://www.sdiarticle4.com/review-history/64954

Original Research Article

Received 20 November 2020
Accepted 25 January 2021
Published 19 March 2021

ABSTRACT

Aim: This study was conducted to determine the prevalence of gastrointestinal parasites among students of the Federal University of Agriculture Makurdi, Benue State.
Study Design: The study targeted a total of 200 (73 off campus and 127 hostel) students of the University of Agriculture Makurdi.
Place and Duration of the Study: University of Agriculture Makurdi, from March 2018 to August 2018.
Methodology: 200 stool samples were collected from students ranging in age from 15-35 years. Sample processing was done using formal ether sedimentation technique while structured questionnaire was used to gather other relevant data. Data was analyzed using Chi-square.
Results: An overall prevalence of 53(26.5%) was recorded. Five species of gastro intestinal parasites were identified of which three were helminthes: *Ascaris lumbricoides* 8.5%, *Trichuris trichuria* 5% and Hook worm 1.5% while the other two are protozoan: *Entamoeba histolytica* 6% and

**Corresponding author: E-mail: iboyimark@yahoo.com;*

Giardia lamblia 2%. *Ascaris lumbricoides* was the most predominant parasite although other parasites such as *strongloides stercolaris*, *Entamoeba coli*, C*hilomastix mesnili* and *Vampirolepis nana* were found aswell (P>0.05). Students in the age group 20-25 years were mostly infected while those from 31 years and above had no infection (P>0.05). High prevalence was recorded in students in hostel (28.3%) than those in off campus (23.3%) and among male students (29.2%) than in females (25.19%) (P>0.05). There was no significant difference between persons with single parasitism (32.6%) and poly-parasitism (20.5%) as well as in infection from different sources of drinking water (P>0.05). infection based on toilet type also showed no significant difference (P>0.05). 31.4% of infected subjects had symptoms of diarrhea while 25.3% had no diarrhea symptoms (P>0.05).

Conclusion: although the prevalence observed in this study is relatively low, students in the hostel account for most of the infection. Improved sanitation should be encouraged among students especially those in hostel.

Keywords: Prevalence; gastrointestinal-parasites; off campus; hostel; students.

1. INTRODUCTION

Gastrointestinal parasites are found inhabiting the intestinal tract of their hosts (animals) [1]. They are common among animals, such as cattle, goat, dog and man. They are classified into two major groups; protozoan parasites (which are single celled) and helminthes parasites [2].

Some gastrointestinal protozoan that are infectious to humans include *Giardia lamblia, Balantidium coli, Entamoeba histolytical* and *Cryptosporidium parvum.* While the helminths parasites which causes intestinal infections include *Ascaris lumbricoides* (roundworm), *Tricuris trichiura* (whipworm) and *Necator americanus* (hookworm) [1].

Gastrointestinal infections constitute a global health burden. It occurs mostly in developing countries mainly due to poor hygiene, fecal contamination of water and food, sympathetic climatic, environmental and Socio-economic factors [3]. Estimate suggests that there are 3.5 billion cases of gastrointestinal infections worldwide, of which 450 million are individuals who are seriously ill, majority however are children and 44million are pregnant women who are infected with hookworm, *Nacator americanus* and *Ascaris lumbricoides* [4].

The symptoms associated with gastrointestinal parasitic infection includes abdominal pain, diarrhea, nausea or vomiting, gas and blotting, dysentery, rash or itching around the rectum or vulva, stomach pain or tenderness and tiredness [5]. Gastrointestinal parasites also burrow into organs such as liver, abdomen and gallbladder where they could induce physiological damage [4]. Chronic stage of helimenthiasis may lead to increase susceptibility to other infections such as tuberculosis, HIV and malaria [6]. The prevalence of intestinal parasites is more in the tropics because the parasites have a better chance of surviving in such environments due to the warm climate, and since such places lack access to clean water [7].

Amoebic dysentery and giardiasis are examples of protozoan infections that invade the digestive system. Intestinal parasites infect gastrointestinal tract of humans and other mammals, preferring the intestinal wall of their host. They invade their host through ingestion of uncooked meat, drinking infected water, skin penetration and consumption of vegetables and fruits not properly washed [8].

According to Odo et al. [9] some gastrointestinal parasites can live in the intestine for some time without causing any symptoms but become harmful in critical stage. Gastrointestinal parasitic infections have serious impact on human public health and development, affecting one third of the worlds population, causing high mortality and morbidity mostly among children [10]. Prevalence of parasitic infection in tropical and subtropical region is mainly due to poor hygiene and sanitation, which provide optimal environment for transmission of the disease [11]. Diagnosis of parasitic infection is in two common ways firstly, stool samples may be collected and viewed for the presence of intestinal parasites through microscopy. Secondly, adhesive or sticky tape could be applied to the anus then checked for the presence of helminthes ova after it is removed [12]. The most common practice that helps reduce the rate of infection, or prevent infection include proper washing of hands, the use of

constructed latrines and increased environmental sanitation since poor sanitation is one of the major causes of the infection [13].

Gastrointestinal parasites can be treated through mass drug administration with the use of drugs such as *albendazole, mebendazole* and *turpentine* [14]. The Aim of this study is therefore to ascertain the prevalence of gastrointestinal parasites among off campus and hostel students of the University of Agriculture, Makurdi.

2. MATERIALS AND METHODS

2.1 Study Area

Makurdi is the capital of Benue State, Nigeria. The city is located in central Nigeria along the Benue River with a minimum temperature of 18°C to 28°C and maximum of 30.10°C to 34.09°C with an altitude of 1200m above sea level. Its Location in Nigeria is 7°44'0"North, 8°32'0"East (the world Gazette). The practice around the riverine area is mainly arable farming with the relative humidity varying due to the season. The area is located in the heartland of the guinea savanna zone of central Nigeria, with a tropical vegetation. There are two-seasons; rainy season which last from April to October and dry season which last from November to March with an annual rainfall of 800mm-1500mm [15]. Makurdi town holds an estimated population of 500,797 people [16].

2.2 Study Design

The study design is cross-sectional and involves the use of structured questioners' administered to interested students for their personal bio-data (name sex, age, nutrition, health status, hygiene, toilet facilities and previous infection and treatment).

2.3 Study Population

A total number of 200 students were selected randomly using Roasoft calculator [17] for sampling. Samples were collected from students between the ages of 15-35 years living at off campus and hostel randomly, with their awareness and full consent for the study.

2.4 Collection and Preservation of Samples

Proper collection of sample is important for detection and identification of gastrointestinal parasites. Plastic bottles with scoop were given to participants, proper orientation was also given them on how to collect their stool without mixing it with urine and toilet water. Bio-data of students were obtained using questionnaire. Samples were collected from the age grade of 15-19yrs, 20-25yrs, 26-30yrs and 31-35yrs respectively with addition of formalin to preserve stool samples from deteriorating and to preserve the morphology of the cysts as well as to prevent the ova from hatching. Samples were then immediately transported to the Benue State University Parasitology Laboratory for immediate diagnosis.

2.5 Laboratory Diagnostic Method

Formal-Ether Sedimentation method was use according to Cheesbruough [18].

2.5.1 Procedures

4ml of formalin was added into sample bottle containing stool and shaken to mix well. The mixture was sieved to collect suspension in a beaker. 4ml of acetone was then added to the tube and mixed for 1 minute. The sample was then centrifuge immediately at 3000 G for 1 minute after which the supernatant was disposed leaving the sediment. The tube was then returned to its upright position to allow fluid from the side of the tube to drain to the bottom of the tube to re-suspend. This was mixed with the sediment, and transferred to a glass slide, and covered with a cover glass. The preparation was then examined microscopically using the X10 and X40 objective lens to identify ova or cyst and to count the number of each species of parasite in the entire population [18].

2.6 Data Analysis

Data analysis was done using Chi-square (x^2) test on SSPS for windows. Chi-square values were considered to be significant when P is less than 0.05 and not significant when P is greater than 0.05.

3. RESULTS

Out of the 200 faecal samples examined, a total of 53 (26.5%) were found to be infected with one or more parasites such as *Entamoeba histolytica* 6%, *Gardia lamblia* 2%, *Ascaris lumbricoides* 8%, *Trichuris trichuria*, 5.5% and Hookworm 1.5%. Other species of parasites identified which were not part of the study include *Strongyloides*

stercolaris 12%, *Entamoeba coli* 3.5%, *Chilomastix mesnili* 0.5 and *Vampirolepis nana* 0.5% (Table 1).

Fig. 1 shows the prevalence of gastrointestinal parasites in the different age groups selected. Infection was observed in students in all age groups except those from 31 years and above. Highest prevalence of infection was in the 20-25 years age group (29%) with the least infection being in the 26-30 years age group (20%). However, there is no significant difference in the level of infection observed in the different age groups (P>0.05).

Table 2 shows that out of the 200 participants, 65 were males and 136 females of which, 19(29.2%) and 34(25.1%) males and females respectively were infected (P>0.05). 32(32.65%) students were infected with single parasite and 21(20.58%) with poly parasites (P>0.05). Also, infection due to diarrhea was 20(15.38%) and infection without diarrhea was 33(47.14%) (P>0.05). As a whole, the differences observed were not statistically significant.

It can be concluded that infection without diarrhea was higher because the age grade in the study have stronger immunity than children, so most times symptoms such as diarrhea does not really occur when there is infection.

In Table 3, the prevalence of gastrointestinal parasite was found to be high among students in the hostel 36(28.4%) than those who are off campus 17(23.3%). This difference is however not significant (P>0.05) and could be as a result of high population in the hostel which cause a reduction in the level of hygiene among students.

Based on the demographic condition of respondents (Table 4), the study revealed that students who consume tap water were the most infected 25(28.09%) followed by those who consume borehole water 18(27.27%) (P>0.05).

Infection due to toilet type showed that students engaged in open defecation were the most infected 19(32.20%) followed by those who use pit toilet 6(27.27%). The differences observed in both cases however were not significant (P>0.05).

Table 1. Gastrointestinal parasites identified during the study

Parasites identified	No. of parasites observed	% of infection
Strongloides stercolaris	24	12.0
Ascaris lumbricoides	17	8.0
Trichuris trichuria	11	5.5
Entamoeba histolytical/dispar	12	6.0
Entamoeba coli	9	3.5
Giardia lamblia	4	2.0
Hookworm	3	1.5
Chilomastix mesnili	1	0.5
Vampirolepis nana	1	0.5
	82	39.5%

Table 2. Prevalence of gastrointestinal parasites in relation to sex, level of parasitism and diarrheal symptoms

Sex	No. examined	No. infected	% Prevalence	P value
Male	65	19	29.23	
Female	135	34	25.19	
Total	200	53	26.5	P>0.26
Parasitism				
Single parasitism	98	32	32.65	
Poly parasitism	102	21	20.58	
Total	200	53	26.5	P>0.38
Accompanying symptom				
Infection due to diarrhea	130	20	15.38	
Infection without diarrhea	70	33	47.14	
Total	200	53	26.5	P>0.38

Table 3. Prevalence of gastrointestinal parasite in relation to student's accommodation

Location	No. examined	No. infected	%Prevalence	P value
Off campus	73	17	23.3	
Hostel	127	36	28.4	
Total	200	53	26.5	P>0.26

Table 4. Prevalence of gastrointestinal parasites in relation to water sources and types of toilet used

Factors	No. examined	No. infected	% prevalence	P-value
Water source				
Bore hole	66	18	27.27	
Sachet water	35	8	22.86	
Tap	89	25	28.09	
Bottle	10	2	20.0	
Total	200	53	26.5	P>0.33
Type of toilet				
Open field	59	19	32.20	
Waters closest	119	28	23.53	
Pit	22	6	27.27	
Total	200	53	26.5	P>0.28

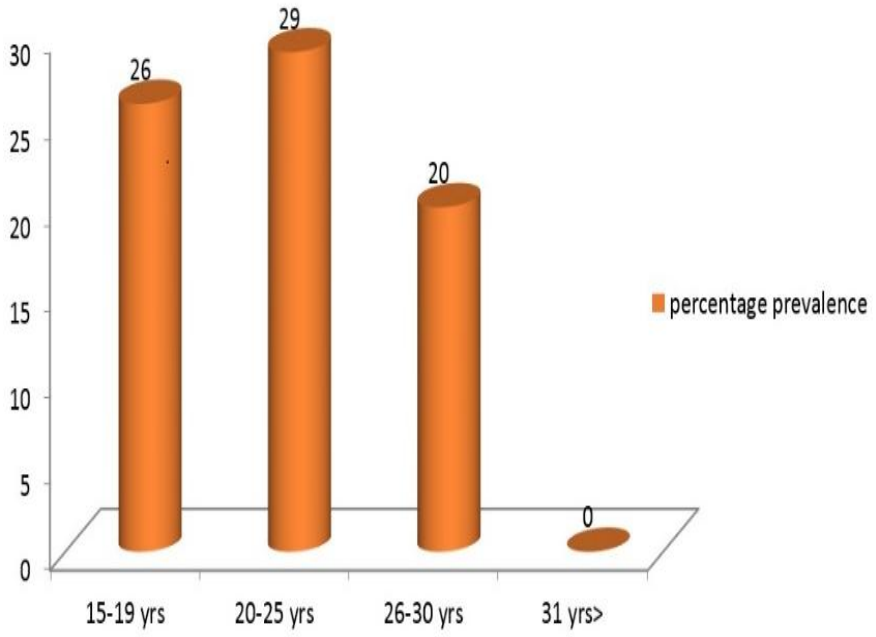

Fig. 1. Prevalence of gastrointestinal parasites among the different age groups in the study area

4. DISCUSSION

The study reveals that out of the 200 samples examined, 53(26.5%) were positive for protozoa and helminthes infection which is lower compared to similar studies conducted in different parts of Nigeria. Abah and Arene [19] in Rivers State reported a 42.7% prevalence, Awi-waadu [20] reported a 72% prevalence in Awka etiti Anambara State while Houmsou et al. [21] reported 58.5% prevalence in Benue State. In contrast with the present study however, lower prevalence of gastrointestinal parasites were observed in Ambala city in India by Beena et al.

[22] and in Saudi Arabia by Patel and Khandekar [23] who recorded an overall prevalence of 7.8% and 10.9% respectively. The difference in prevalence could be attributed to the living standards of subjects and geographical condition of the study areas. The low prevalence of gastrointestinal parasites in this study is based on the fact that the subjects being university students have a high level of personal hygiene and awareness of the disease.

The parasites identified in this study were *Giardia lamblia*, *Entamoeba histolytical*, *Ascaris lumbricoides, Tricuris trichuria* and Hookworm in addition to other parasites that are not within the scope of the study. Poor hygiene and socio-economic factors are among the factors that aid the survival and transmission of these parasite [15]. Hookworm has the lowest prevalence while *Ascaris lumbricoides* had the highest prevalence. The lower prevalence of Hookworm reported in this study is similar to study conducted by Gelwa et al. [24] in Gondar when compared and in contrast with Mengistu [25] who reported a high prevalence of hookworm in Ethiopia. Similarly, the prevalence of *Ascaris lumbricoides* observed in this study is similar to that reported in Southeast of Lake Langano and Gondar by Gelwa et al. [24] and Legesse and Erko [26] who reported lower prevalence in both cases. In contrast to this study however, Amuta et al. [27] reported 43.6% prevalence of *Ascaris lumbricoides* which is higher than the result of this study. Similarly, the prevalence of *Ascaris lumbricoids* in this study is lower compared to the results of other studies conducted by Legesse and Erko [28] in wondo Gene and Ayalew et al. [29] in Ethopia and in other parts of countries such as Guinea and Nigeria by Agbolade et al. [30] and Chandrasekhar and Nagesha [31] respectively.

The second most prevalent gastrointestinal parasite in this study was *Entamoeba histolytica* which is slightly low than the study conducted in Etulo by Atu et al. [32] The prevalence recorded is also low compared with studies carried out in Benue by Iboyi et al. [15] and Amuta et al.[27] who reported 10.9% and 8.3% respectively. This difference could be due to the fact that most studies conducted in Benue on prevalnce of intestinal parasite involves mainly infants, primary and secondary school children and since children are more susceptible to intestinal parasitic infection than adults, [33] it accounted for the lower prevalence observed in this study. This might also be the reason why there was no significant difference in infection between the age groups as the current study did not involve children however, this does not exclude the fact that adults cannot be infected with such parasites as evident in the result of this finding.

In this study the male students happened to be more infected than the female subjects. From the questionnaire it was gathered that most male students do not wash their hands after visiting the toilet and they eat fruits that are not properly washed which could be the cause of the high rate of infection among them as also observed by Termirate et al. [8] This finding is in contrast with that by Oriji et al. [34] who observed a high prevalence among females than males. However, this result is also in conformity with that of Aribodor et al. [35] who reported the prevalence of male infecion to be 16.1% and that of females to be 9.3%. Also similar to this is Amoke et al. [36] who reported 16.6% prevalence in male and 6.9% in females.

Poly parasitisms were frequently encountered in this studybut single parasitism was most prevalent with the most frequent infection occuring with *Ascaris lumbricoid*, *Entamoeba histolytical* and *Trichuris trichuria* which is in contrast when compared to the study conducted by Atu et al. [32] and Begna et al. [37]

Comparatively, the study shows high prevalence of gastrointestinal infection at the hostel than in off campus. This prevalence can be attributed to the residential condition of the students. Other factors that might have caused this include: poor personal hygiene practice as a result of increased population of students in the hostel, the use of public toilet by hostel students and poor drainage system.

Water source is a factor responsible for gastrointestinal infection, several breakdown in human health has been reported by drinking contaminated water, which could be because of improper treatment of water with chlorine [38]. The main sources of drinking water in Federal University of Agriculture Makurdi are boreholes, tap, sachet and bottle water, although students change water source from time to time. The prevalence of infection caused by water from the different source is higher in students who drink tap water followed by those who drink water from borehole. This is in contrast to the study conducted by Iboyi et al. [15] The high prevalence could be because of improper treatment of water in tanks and reservoirs for the

tap and borehole water. Although, the source of drinking water has no significant influence over the prevalence of gastrointestinal parasite from the study.

The absence of latrine in any given environment greatly determines the prevalence of intestinal parasites [15]. In this study hostel students that defecate in open fields because of insufficient supply of water in the hostel at the time of this study have high prevalence of infection than those who defecate in water system and pit toilet and this conforms to the study conducted by Amuta et al. [27] Students who defecate in open field shed alongside ova of the parasites which can easily infect others through absorption or penetration into the skin when in larva form especially in Hookworm (*Necator Americanus)* [8].

5. CONCLUSION

The study reveals that gastrointestinal parasitic infection in the study area has low prevalence which might be due to a high level of personal hygiene among students and because students rarely are exposed to contaminated soil and water. Also, being university students, it is probably that they are well informed about such infections, mode of transmission and practices that helps prevent the infections.

Awareness should be carried out to inform students on the health implications relating to open field defecation and the effects on the environment and improved sanitation should be encouraged among students especially in the hostel. Also, management should ensure proper treatment of drinking water and regular cleaning of the reservoirs.

CONSENT

Verbal consent was sought from each student after explaining the aim of the study to them before sample collection. Those who refused to give their consent or provide their faecal samples as well as to answer the questionnaire were simply excluded from the study.

ETHICAL APPROVAL

Ethical approval was sought and obtained from the Benue State Health Management Board before the commencement of the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/64954