

Original Research Article

The Prevalence of Intestinal Parasites among Students in Federal University of Technology Akure, Nigeria.

Abstract

Aims: The study is undertaken to determine the prevalence of intestinal parasites and the predisposing factors that make the students to be susceptible to intestinal parasitic infections in the study area.

Study design: Complete randomized design was used to sample the population of students who attended the University Health Centre during the period of the research.

Place and Duration of Study: The study was conducted in the Federal University of Technology Akure, Nigeria from February to September, 2015.

Methodology: Fresh faecal samples were collected into sterilized bottles from 300 students (204 male and 96 female, age range 10-50 years and mean age 25 years) who attended the university health centre from February to September 2015. Useful epidemiological information such as weight, eating habit, source of drinking water and toilet types were obtained from the subjects through administration of structured questionnaire. The eggs, cysts and larvae of the intestinal parasites were concentrated using flotation method and viewed with X10 and X40 magnifications of the binocular microscope. The prevalence of infection was calculated as the ratio of infected individuals in the population examined while significance of various parameters tested was established using Chi-square at 5% significance level.

Results: The results revealed prevalence of eight species of intestinal parasites among the study group. The parasites include: *Entamoeba histolytica* and *Giardia lamblia* (Protozoa), *Ascaris lumbricoides*, *Enterobius vermicularis*, *Trichuris trichiura*, *Strongyloides stercoralis* and hookworm (Nematodes). *Schistosoma mansoni* was the only trematode encountered in the study. Among these parasites, *A. lumbricoides* was the most prevalent (3.7%) while *G. lamblia*, *T. trichiura* and *S. stercoralis* were the

least prevalent (0.7%). All the intestinal parasites observed in this study were not significantly different between genders ($P > .05$, $\chi^2 = 0.928$, $n=300$). In contrast, the prevalence of intestinal parasites varied significantly among the age groups with age group 10-20years being the most susceptible age group in the study area ($P \text{ value} = .05$, $\chi^2 = 0.03$, $n=300$).

Conclusion: Feeding habit of the subject and toilet types are major factors that predisposed the subjects to gastrointestinal parasites in the study area. Therefore, personal hygiene and public enlightenment on proper cooking of meat and fish should be intensified in the study area to completely eradicate gastro intestinal infections in public schools.

Keywords: Intestinal parasites, prevalence, public schools, feeding habit.

1. Introduction

Intestinal parasites are parasites that live in the gastro intestinal tracts of humans, in humans, three types of these parasites live in the small and large intestines: tapeworms, roundworms (or nematodes), and protozoa . They are one of the most common infections in humans especially in tropical and sub-tropical countries [1]. Certain types remain in the intestines; others travel outside the intestines to invade other organs. Intestinal parasitic infections are among the most prevalent of human parasitic infections worldwide [2-4]. Among the most common helminthes that inhabit the intestines include *Ascaris lumbricoides* (roundworm), *Trichiuris trichiura* (whipworm), *Ancylostoma duodenale*, and *Necator americanus* (hookworms). While the protozoa include *Entamoeba histolytica*, *Giardia lamblia*, *Cyclospora cayetanensis*, and *Cryptosporidium* spp [5-7]. The prevalence of infections and degree of factors predisposing to infection vary from one region to another [8].

Intestinal parasites rarely cause death, instead the burden of disease is related to less mortality than to the chronic and insidious effects on health and nutritional status of the host (Arora and Arora, 2010). In addition to their health effects, intestinal parasitic infections also impair physical and mental growth of children, thwart educational achievement, and hinder economic development especially among Nigeria children [9-12]. Intestinal parasites exist throughout the world, the World Health Organization

(WHO) estimates that 3.5 billion people worldwide are infected with some type of intestinal parasite, and as many as 450 million of them are sick as a result [13]. Intestinal parasites spread rapidly in areas with poor sanitation and are most common in tropical developing countries on the African, Asia and South American continents.

Nigeria is the most populous country in Africa, this huge population, coupled with the absence of basic social amenities, auspicious climatic environment and weak public health infrastructure favour the transmission and prevalence of intestinal parasites. The aim of this study is to determine the prevalence of intestinal parasites and the predisposing factors that make the students to be susceptible to intestinal parasitic infection in the study area.

2. Materials and Methods

2.1 Study Area

The study was carried out in the Federal University of Technology, located within latitude 7° 29N and longitude 5°14 E Akure, Ondo State. Akure where the institution is located is an urban settlement characterized with rainfall season from April to September with annual rainfall of 1524mm, temperature range of 28-31°C and mean annual relative humidity of 80%. The institution was established in the year 1981 having a mission which is to promote technological advancement by providing conducive environment for research, teaching and learning which engenders development of products that are technologically oriented, self-reliant and relevant to society. The university consists of six faculties and thirty seven departments consisting of both male and female students, teaching and non-teaching staff.

2.2 Samples and Data Collection

Fresh faecal samples were collected from 300 students of both genders who attended the university health centre from February to August 2015. The samples were collected into sterilized sample bottles from students of different departments across the university. Useful epidemiological information such

as weight, eating habit, source of drinking water and toilet types were obtained from the subjects through administration of structured questionnaire.

2.3 Ethical Consideration and Informed Consent

Prior to the study, ethical consideration and approval were obtained from the management of the University Health Centre. Similarly, informed consent of the respondent was obtained after a focus group discussion where the respondents were made to know the benefit of their participation in the study.

2.4 Examination of Faecal Samples

Samples collected from students were accurately labelled and taken to Biology laboratory, Federal University of Technology, Akure (FUTA) in tightly closed universal bottles. The diagnostic technique used is the floatation technique. 2g of faecal samples were mixed thoroughly (using a stirring device) with 20ml normal saline solution in a test tube, the test tube was placed in the test tube rack and gently top up with normal saline solution leaving a convex meniscus at the top of the tube, a cover slip was gently placed on the tube and allowed to stay for 30 minutes. After 30 minutes, the cover slip was gently lifted from the tube together with drop of faecal suspension adhering to it and was immediately placed on a clean glass slide. One drop of iodine was added to it and the slide was viewed under binocular microscope using X10 and X40 magnifications.

2.5 Data Analysis

The prevalence of infection among the examined students was calculated using the number of infected students divided by the number of students examined. The significance of the infection among the students was tested by Chi-square (X^2) analysis at 0.05% level of significance using statistical package for social sciences (SPSS) version 20.0.

3. Results

3.1 Groups of Intestinal Parasites Identified and Prevalence Between Gender

Eight species of intestinal parasites belonging to three major groups of parasites were identified in the study area. The parasites include: *Entamoeba histolytica* and *Giardia lamblia* (Protozoa), *Ascaris lumbricoides*, *Enterobius vermicularis*, *Trichuris trichiura*, *Strongyloides stercoralis*, Hookworm (Nematodes), and *Schistosoma mansoni* (Trematode). Among these parasites, *A. lumbricoides* was the most prevalent (3.7%) in the study area while *Giardia lamblia*, *Trichuris trichiura* and *Strongyloides stercoralis* were the least prevalent (0.7%) (Table 1). The result in Table 2 further showed that of the 300 students examined (204 males and 96 females), the prevalent of *E. histolytica* was significantly higher in female (2.5%) than the male gender (2.5%) while *S. mansoni* was not significantly different between genders. Similarly, all the parasitic nematodes observed among the study group were not significantly different between genders ($P > .05$, $n = 300$, $\chi^2 = 0.928$) (Table 3). Among the male students that were infected, 9.8% had single infection while 2.0% had mixed infection. Among the female students that were infected, 14.5% had single infection while 2.1% had mixed infection (Table 4).

Table 1: Prevalence of Intestinal Parasite Based on Type of Parasites Identified.

Parasite	Number of examined	Number of infected	Prevalence (%)
Protozoans			
<i>Entamoeba histolytica</i>	300	8	2.7
<i>Giardia lamblia</i>	300	2	0.7
Total	300	10	3.3
Nematodes			
<i>Ascaris lumbricoides</i>	300	11	3.7
<i>Enterobius vermicularis</i>	300	5	1.7

<i>Hookworm</i>	300	7	2.3
<i>Trichuris trichiura</i>	300	2	0.7
<i>Strongyloides stercoralis</i>	300	2	0.7
Total	300	27	9.0
Trematode			
<i>Shistosoma mansoni</i>	300	3	1.0
Total	300	3	1.0

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114 Table 2: Prevalence of Protozoan and Trematode in Male and Female Students

Parasite and gender	Number of examined	Number of infected	Prevalence (%)
<i>E. histolytica</i>			
Male	204	5	2.5
Females	96	3	3.1
Total	300	8	2.7
<i>G.lamblia</i>			
Male	204	2	1.0
Female	96	0	0
Total	300	2	0.7
<i>S. mansoni</i>			
Male	204	2	1.0

Female	96	1	1.0
Total	300	3	1.0

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118 **Table 3: Prevalence of Parasitic Nematode in Male and Female Students**

Parasite and gender	Number examined	Number infected	Prevalence (%)
<i>E. vermicularis</i>			
Male	204	2	1.0
Female	96	3	3.1
Total	300	5	1.7
<i>A. lumbricoides</i>			
Male	204	7	3.4
Female	96	4	4.2
Total	300	11	3.7
<i>S. stercoralis</i>			
Male	204	1	0.5
Female	96	1	1.0
Total	300	2	0.7
<i>T. trichiura</i>			
Male	204	1	0.5
Female	96	1	1.0
Total	300	2	0.7
Hookworm			

Male	204	4	2.0
Female	96	3	3.2
Total	300	7	2.3

P value = 0.05 $\chi^2 = 0.928$

Table 4: Prevalence of Single and Mixed Infection of Parasites among Male and Female Students

Gender	Single infection			Mixed infection		
	No. Ex	No. single	Prev (%)	No. Ex	No. mixed	Prev (%)
Male	204	20	9.8	204	4	2.0
Female	96	14	14.5	96	2	2.1
Total	300	34	11.3	300	6	2

No. Inf =Number of infected **No. single** = Number of single infection **No. mixed** =Number of mixed infection **Prev** =Prevalence.

3.2 Prevalence of Intestinal Parasites Based on Age of the Students

The result in Table 5 showed that all the intestinal parasites with the exception of *E. vermicularis* were significantly higher in age group 10-20years. This suggests that age group 10-20years was the most susceptible age group in the study area. It was also observed that the prevalence of *E. vermicularis* was most prevalent in age group 40-50years (5.9%). Similarly, *A. lumbricoides* has the highest infection rate among age group 10-20yrs (5.6%) and 31- 40yrs (3.9%), while *E. histolytica*, *A. lumbricoides* and Hookworm have the highest infection rate among age group 21-30yrs (3.0%). Furthermore, *Ascaris lumbricoides* was found in all age groups except age group 41-50years but it was most prevalent in age group 10-20years (5.6%). Hookworm, *Giardia lamblia*, *Trichuris trichiura* and *Schistosoma mansoni* were found in age groups 10-20years and 21-30years but completely absent in age groups 31-40years

and 41-50years. *E. histolytica* and *E. vermicularis* were also common in all the age groups but most prevalent in age 21-30years (3%) and least prevalent in age group 31-40years and 41-50years (1.7%). The total sum of parasites found in each age group include: Age group 10-20years and 21-30years contained all the eight parasites observed in this study, age group 31-40years contained four parasites (*A. lumbricoides*, *E. vermicularis*, *E. histolytica* and *S. mansoni*), while two parasites (*E. vermicularis*, and *E. histolytica*) were observed in age group 41-50years. It was generally observed from Table 5 that age group 10-20years was the most susceptible to the intestinal parasites while age group 41-50years was the least susceptible group. This suggests that intestinal parasites are more prevalent among lower age groups than the older age groups.

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Table 5: Prevalence of Intestinal Parasite Based on Age Group

Age Group	<i>A. lumbricoides</i>			<i>Hookworm</i>			<i>E. vermicularis</i>			<i>E. histolytica</i>			<i>G. lamblia</i>			<i>S. stercoralis</i>			<i>T. trichiura</i>			<i>S. mansoni</i>		
	E.	I.	P.(%)	E.	I.	P(%)	E.	I.	P(%)	E.	I.	P(%)	E.	I.	P(%)	E.	I.	P(%)	E.	I.	P(%)	E.	I.	P(%)
10-20	89	5	5.6	89	3	3.8	89	2	2.2	89	2	2.2	89	1	1.1	89	1	1.1	89	1	1.1	89	1	1.1
21-30	135	4	3.0	135	4	3.0	135	1	0.7	135	4	3.0	135	1	0.7	135	1	0.7	135	1	0.7	135	1	0.7
31-40	59	2	3.4	59	0	0	59	1	1.8	59	1	1.7	59	0	0	59	0	0	59	0	0	59	1	1.7
41-50	17	0	0	17	0	0	17	1	5.9	59	1	1.7	59	0	0	59	0	0	59	0	0	59	0	0
Total	300	11	3.7	300	7	2.3	300	5	1.7	300	8	2.7	300	2	0.7	300	2	0.7	300	2	0.7	300	3	1.0

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I. =Number of Infected E. =Number of Examined P. = Prevalence P value = 0.05 $\chi^2 = 0.03$

3.3 Prevalence of Intestinal Parasite based on Feeding Habit of and Toilet Types Used by the Students

Epidemiological information obtained through the questionnaire showed that feeding habit of the students were based on 2 different feeding variations, which are meat and fish. Table 6 showed that out of 300 students that were examined, 16 (5.3%) students fed exclusively on meat, 10 (3.3%) fed exclusively on fish while 294 (91.3%) fed on both fish and meat. 11 (68.8%) of students that fed on meat were infected, 02 (20.0%) of the students that fed on fish were infected and 27 (9.9%) students that fed on both meat and fish were infected. The result further shows that infection rate was highest (68.8%) among students that fed exclusively on meat and lowest among students that fed on both fish and meat. Meanwhile, meat was noted to be the feeding habit that most predisposed the students in the study area to intestinal parasites.

The toilet type used by students were classified according to public (Latrine, Bush, public water closet) and private (water closet) toilet types. From the evaluation of prevalence based on toilet types as shown in Table 7, 13 (13.8%) out of 94 students that used public toilets were infected, 27 (13.1) were infected among 206 student that used private toilets. *A. lumbricoides* has the highest infection rate among the students that used private toilet (3.4%) and public toilet (4.3%). *S. mansoni* and *G. lamblia* were absent among students that used public toilet and private toilet respectively. The results revealed that infection rate is higher among students that used public toilet (13.8%) than private toilet (13.1%).

173 **Table 6: Prevalence of Intestinal Parasite Based on Feeding Habit of the Students**

Feeding Habit	Number of examined	Number of infected	Prevalence (%)
Meat	16	11	68.8
Fish	10	02	20.0
Both	274	27	9.9
Total	300	40	13.3

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175 **Table 7: Prevalence of Intestinal Parasite Based on Toilet Type used by the Students**

Parasite	Private toilet			Public toilet		
	No. Ex	No. Inf	Prev (%)	No. Ex	No. inf	Prev (%)
<i>A. lumbricoides</i>	206	7	3.4	94	4	4.3
<i>Hookworm</i>	206	5	2.4	94	2	2.1
<i>E. vermicularis</i>	206	4	1.9	94	1	1.1
<i>E. histolytica</i>	206	6	2.9	94	2	2.1
<i>S. stercoralis</i>	206	1	0.5	94	1	1.1
<i>G. lamblia</i>	206	0	0	94	2	2.1
<i>T. trichiura</i>	206	1	0.5	94	1	1.1
<i>S. mansoni</i>	206	3	1.5	94	0	0
Total	206	27	13.1	94	13	13.8

176 **No. Ex – Number of examined No. Inf – Number of Infected Prev – Prevalence**

177 **P = 0.05 $\chi^2 = 0.446$**

4. Discussion

Low prevalence of intestinal parasites (13.3%) as generally observed among the students in this study area might be because of the student's level of education, standard of personal and environmental hygiene as well as social habit, since the distribution of the parasites are favoured by poverty, poor hygiene and poor sewage disposal. The low prevalence can also be due to the age group of the students, in which students would have developed stronger and protective immunity after several exposures to these parasites when younger. The low prevalence (13.3%) observed is similar to the report of [14] Benin City (11.1%) and [15] in Ilorin (21.1%). The result is also supported by the report of [16-17], the authors in their separate studies reported that average prevalence of intestinal parasites in Africa countries was between 5 to 60%. Contrary to the report of this study was the report of [18] in Owerri (43.0%), [19] in Oba-ile, Osun State (95.7%) and [20] in Uturu, Abia State (34.67%), this suggests that prevalence of intestinal parasite is high in rural areas where there are more likelihood of poor hygiene, poverty, ignorance, lack of toilet facilities and lack of proper health care services compared to urban area where the study was carried out.

This study has revealed the existence of 8 different intestinal parasites among the students, in which *Ascaris lumbricoides* (3.7%), Hookworms (2.3%) and *Entamoeba histolytica* (2.7%) were the most prevalent, this agrees with the report of [21-23] who reported that these parasites, particularly hookworms and *Ascaris lumbricoides* are common throughout Nigeria.

Evaluation of prevalence of intestinal parasites based on the gender of the students shows that there is no significant difference between the male and female students ($P > 0.05$). This report agrees with [21, 24] both authors reported that there was no significant different in the sex – related prevalence, this was also supported by [25-27] which showed from their results that helminthic infections were not sex dependent. The sex- independence reported in this study might be due to the fact that both male and female in the study group were exposed to the same or

similar sources of infection at the same rate, they both take part in similar activities in the same area that could predispose them to the intestinal parasitic infections.

This study further revealed that prevalence of parasites was high among student within age range 10 -20yrs. This is supported by [15, 20, 28, 29] that revealed in their studies that age-related prevalence showed that infection rate is high among children due to exposure to parasites and lack of acquired immunity. The intensity of prevalence of intestinal parasite has been established to be high among school age children ranging from age 5–20yrs [30-33].

Evaluation of parasitic infection based on the toilet type used by the students' shows that prevalence is slightly higher among students using public toilet (13.82%) than students using private toilets (13.10%). It has earlier been reported that improper sewage disposal, defecating in bushes and pit latrines, and sharing of toilets are conditions that favoured transmission of intestinal parasites and expose the students to risk of gastrointestinal diseases in endemic areas [18, 29].

Furthermore, the study showed a very high prevalence (66.7%) among students that fed exclusively on meat, this is supported by the fact that students that feed exclusively on meat are at risk of consuming under cooked meat, in which most of the animals slaughtered as meat are intermediate hosts of these intestinal parasites. Mixed infection of parasites observed in the study is not peculiar to this study area alone as it has been reported by [34] in Oba-Ile Community, Osun State, [35] in Aba, Abia State and [36] in Ikuano Local government area of Abia State.

5. Conclusion

Despite the low prevalence of intestinal parasites found in the study area, the public health concern should be considered; this is because intestinal parasitic infections hamper physical, economic and mental developments, and lead to poor academic performance in school children. Hence, there is need for public enlightenment to be intensified in the study area to further educate the students on the need for regular medical check up, personal hygiene and proper cooking of

228 meat and fish before eating. This will help to completely eradicate intestinal parasitic infections in
229 public schools.

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234 **Conflict of Interest**

235 There is no conflict of interest among the authors. All authors read and approved of the
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