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Research Article

Survey of Human Intestinal Parasites in Communities within Ibadan, Southwestern, Nigeria

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Abstract

Intestinal Parasitic Infections (IPIs) including the soil transmitted helminthes reportedly affects more than two billion people globally causing significant morbidity and mortality mostly among resource poor people. The IPIs are prevalent among resource poor persons and communities as well as localities with low sanitary standards. Hence, a survey of IPI in two Local Government Areas in Ibadan was conducted to identify the presence and prevalence of parasite eggs, cysts and/or larva. A total of 228 participants were enrolled for the study between April and November 2016. Faecal samples were collected and examined microscopically using the sedimentation (Zinc sulphate solution and formol-ether) techniques. Data obtained were entered and analyzed using SPSS version 20 and Microsoft Excel Spread Sheet 2007. The association and significant variation between the prevalence of intestinal parasites in relation to the demographic and socio-economic variables were determined using ANOVA at $p < 0.05$. The total prevalence of intestinal parasites encountered was 19.3% prevalence ($p < 0.05$). Eight different species of parasites were encountered with the prevalence of 1.5%, 21.2%, 4.0%, 1.5%, 0.5%, 7.1% and 4.0% for *Capillaria hepatica, Ascais lumbricoides, Giardia intenstinalis, hookworm, Opistorchis viverrin, Entamoeba histolytica* and *Strongyloides stercoralis* respectively. Looking at the age groups, age group 11 - 20 was the most infected (46%). Students (50.4%) had the highest prevalence followed by Food vendors (34.5%). The prevalence status of intestinal parasites particularly *Ascaris* and hookworm confirms a serious public health concern for the Neglected Tropical Diseases (NTDs). The need for proper health education, personal hygiene and mass drug program in the elimination of infections is necessary even though the overall prevalence is less than 20% (WHO prevalence level for mass drug administration).

Keywords: Human; Intestinal Parasites; Ibadan; Prevalence; NTDs

Introduction

Intestinal Parasitic Infections (IPIs) are diseases caused by pathogenic helminths and protozoa species. They are among the most common infectious diseases affecting the poorest, most deprived people and communities worldwide with over 1.5 billion people or 24% of the world's population reportedly infected [1]. Over 270 million pre-School-Age Children (pre-SAC) and over 600 million School-Age Children (SAC) live in areas where these parasites are endemic and present mainly in tropical and subtropical regions [2]. Many factors such as reduced or no access to potable water, health care services, adequate sanitation as well as the prevailing climatic and environmental conditions are responsible for the endemicity of intestinal parasitic infections [3-6]. Mostly, young children are reported to be apparently infected by IPIs than adults [7].

Nematodes (roundworms), cestodes (tapeworms) and trematodes (flatworms) are among the most common helminths that inhabit the human gut. The soil transmitted nematodes particularly *Ascaris lumbricoides, Trichuris trichiura* and hookworms (*Ancylostoma duodenale* and *Necator americanus*) are the most prevalent and important helminths [8-10]. In Nigeria however, the major soil transmitted helminthes include *A. lumbricoides, T. trichiura, Hookworm, Strongyloides stercoralis, Enterobius vermicularis* and *Toxocara* species. Hookworm and *S. stercoralis* are transmitted by direct skin penetration while the rest gain entry by oral-route [7]. The oral-route transmission is facilitated by the use of contaminated household items, eating contaminated food or with infected dirty fingers. Housefly (*Musca domestica*) has also been suggested to facilitate the contamination of household items and foods [11]. Transmission is also facilitated by playing in a contami-

nated environment especially where there is lack of sanitation, illiteracy, poverty, poor environmental hygiene, impoverished health and overpopulation [12]. Intestinal helminths 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 [13]. In addition to their health effects, the physical and mental growth of children are impaired by intestinal helminth infections, thwart educational achievement and hinder economic development [14].

The most common intestinal protozoan parasites are *Giardia intestinalis, Entamoeba histolytica, Cyclospora cayetanenensis* and *Cryptosporidium* spp. causing giardiasis, amoebiasis, cyclosporiasis and cryptosporidiosis respectively and they are associated with diarrhoea [15]. *G. intestinalis* is the most prevalent parasitic cause of diarrhea in the developed world and it is also very common in developing countries. Amoebiasis is the third leading cause of death from parasitic diseases worldwide, with its greatest impact on the people of developing countries [16]. Not less than 50 million people worldwide have been estimated to suffer from invasive amoebic infection yearly, resulting in an annual death of 40 - 100 thousand people [16]. This study is geared towards the investigation of the presence of human intestinal parasites in the study areas and population given the paucity of information about such in the area, probably due to its non-endemicity or lack of diagnosis especially in resource poor settings. The epidemiology of human intestinal infection in this area is yet to be reported.

Materials and Methods

Study area

The study was carried out in Ido Local Government Area (Ido and Apete) and Ibadan North Local Government area of Ibadan Metropolitan Area (Adeoyo Maternity Center, Yemetu) (Figure 1).

Study design

A cross sectional study was carried out between April and November 2016 to determine the prevalence of intestinal parasites in the study area. The study populations were volunteers from age 5 and above; focus mainly on school-age children and food vendors.

Ethical approval

This research was approved by the Ethical Committee of the Ministry of Health, Department of Planning, Research and Statistics Division, Oyo State, Nigeria. Reference number: AD13/479/194.

Sample collection and examination

Faecal samples were collected from consented volunteers. Formol-ether sedimentation technique was used in the preparation of faecal samples for examination of parasite cyst, ova or egg. Prepared samples were microscopically examined under low power at 10 x 10 magnifications and under high power at 40 x 40 magnifications.

Statistical analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 20 and Microsoft Excel Spread Sheet 2007. Statistical analysis for the prevalence of intestinal parasites was calculated and expressed as a percentage. Using mean values, the association and significant variation between the prevalence of intestinal parasites in relation to the demographic and socio-economic variables were determined using one-way Analysis of Variance (ANOVA) at $p < 0.05$.

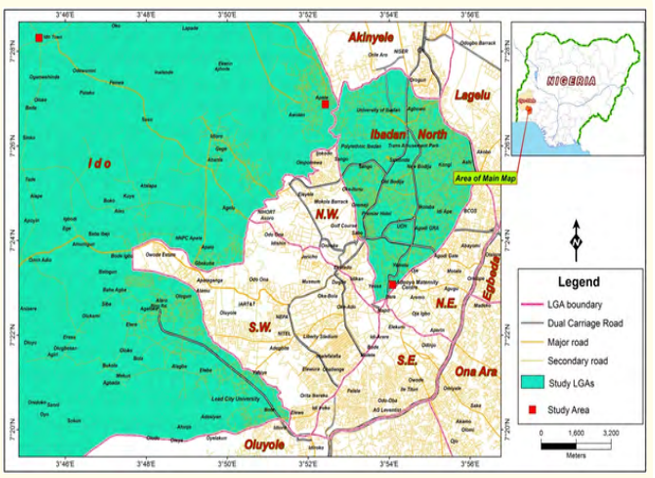

Figure 1: Map of Ido and Ibadan North Local Government Areas (Green) showing the study areas (Red square).

Results

Prevalence of Intestinal Parasitic Infections in the Study

A total of 228 participants were recruited for this study and their stool samples were collected for analysis from the three different locations of Yemetu (Adeoyo Maternity Hospital), Ido and Apete. The total prevalence of intestinal parasites encountered was 19.3% prevalence ($p < 0.05$) (Table 1). The prevalence in mixed infections is 1.75% and 17.54% for single infections.

The prevalence of parasitic infections in Yemetu, Ido and Apete was reported as 19.8%, 20% and 0% respectively. *Ascaris* was the most prevalent of all the parasites (21.2%), followed by *E. histolytica* (7.1%), *G. lamblia* (4%) and *S. stercoralis* (4%) respectively (Table 1).

Mean Intensity of Parasites Encountered

The analysis of mean values of parasites encountered in this study is presented in table 2. It shows that *Ascaris* is the most encountered parasite with mean intensity 0.02 ± 0.01 (Yemetu) compared to 0.0 ± 20.01 (Ido), followed by *E. histolytica* (0.28 ± 0.12), *G. lamblia* (0.04 ± 0.04), *S. stercoralis* (0.04 ± 0.04), *C. hepatica* (0.02 ± 0.01), Hookworm (0.02 ± 0.01) and *O. viverrin* (0.01 ± 0.01) respectively.

The mean intensity of parasites encountered in this study as distributed by age, gender, occupation and educational background differences are as shown in Figures 2, 3, 4 and 5 respectively. Mean intensity of parasites differs by age and parasite types. *Ascaris* have the highest mean intensity as shown in Figure 2 which is evident in age group 11 - 20 years; while *Capillaria, Opistorchis, Giardia* and *Strongyloides* have the least mean intensities evident in age groups 31 - 40 and 41 - 50 years.

Males than females have the highest mean intensities for *Ascaris*, while the other encountered parasites are more intense in females than males (Figure 3). Intensity is zero in civil servants considering occupation predisposition but highest in students followed food vendors (Figure 4).

Primary School Certificate holders also have the highest intensities compared to others, while those without certificate have the least intensities of *Capillaria, Opistorchis, Giardia* and *Strongyloides* (Figure 5) considering educational background.

Age, Gender, Occupation and Educational Background Differences in Relation to Parasites Encountered

The age group 11 - 20 years reportedly have the highest prevalence of intestinal parasitic infection at 37.1%, followed by age group 41 - 50 years at 28.6% and the least is 2.9% amongst the age group 51 - 60 years; showing no significant difference (p > 0.01).

Gender differences in the distribution of infection were shown to influence the outcome of parasitic infection amongst the study population. Prevalence of infection was highest in females (77.1%) than in males (22.9%). This gender differences in distribution of parasitic infection was significantly different (p > 0.05).

Result of this study also indicates that occupation influences the prevalence of parasitic infections among participants. Students have the highest level of infection (45.7%), followed by food vendors (33.9%) and the least amongst civil servants (0%).

Considering educational background in parasite prevalence; Primary School Certificate holders are most infected (54.3%), followed by Secondary School Certificate holders (22.9%), National Diploma/National Certificate of Education holders are least infected (5.7% respectively); significant difference (p > 0.05).

Parasites encountered	Sampling Locations			
	Yemetu (n = 196)	Ido (n = 32)	Apete (n = 7)	Total (n = 228)
	No Infected (%)	No Infected (%)	No Infected (%)	Infected (%)
Capillaria	3(1.5)	0(0.0)	0(0.0)	3(1.5)
Ascaris lumbricoides	18(9.2)	3(12.0)	0(0.0)	21(21.2)
Giardia lamblia	0(0.0)	1(4.0)	0(0.0)	1(4.0)
Hookworm	3(1.5)	0(0.0)	0(0.0)	3(1.5)
Opistorchis viverrin	1(0.5)	0(0.0)	0(0.0)	1(0.5)
Entamoeba histolytica	14(7.1)	0(0.0)	0(0.0)	14(7.1)
Strongyloides stercoralis	0(0.0)	1(4.0)	0(0.0)	1(4.0)
Total	39(19.8)	5(20)	0(0.0)	44(39.8)

Table 1: Prevalence of Intestinal Parasites by Location.

n = number examined by location.

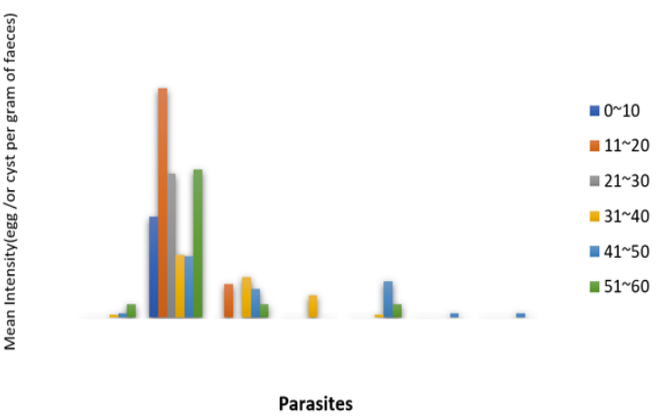

Figure 2: Mean Intensity of Parasites Encountered in Relation to Host Age.

LOCATION	PARASITES (mean ± S.E)						
	Capillaria	*Ascaris*	*E. histolytica*	*Hookworm*	*O. viverrin*	*Giardia*	*Strongyloides*
Yemetu	0.02 ± 0.01	1.28 ± 0.62a	0.28 ± 0.12a	0.02 ± 0.01a	0.01 ± 0.01a	0.00 ± 0.00a	0.00 ± 0.00a
Apete	0.00 ± 0.00a	0.00 ± 0.00a	0.00 ± 0.00a	0.00 ± 0.00a	0.00 ± 0.00a	0.00 ± 0.00a	0.00 ± 0.00a
Ido	0.00 ± 0.00a	0.32 ± 0.24	0.00 ± 0.00a	0.00 ± 0.00a	0.00 ± 0.00a	0.04 ± 0.04	0.04 ± 0.04

Table 2: Mean Intensity of Parasites Encountered by Location (mean ± S.E).
Mean numbers followed by same letters within a row are not significantly different (LSD). Duncan Multiple Range Test ($p > 0.05$).

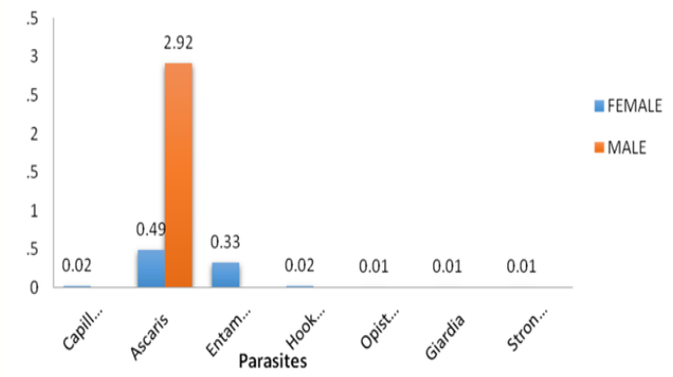

Figure 3: Gender Related Mean Intensity of Parasites Encountered.

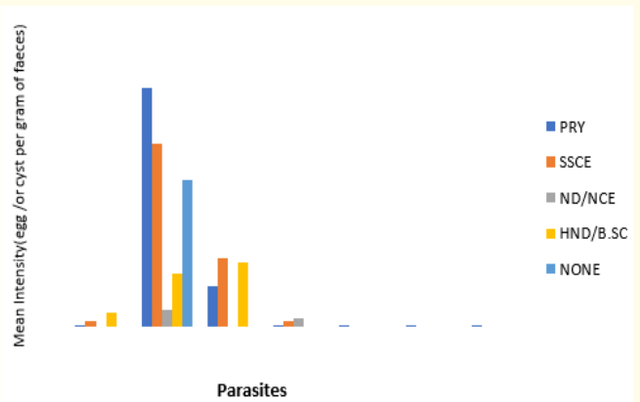

Figure 5: Educational background Related Mean Intensity of Parasites Encountered.

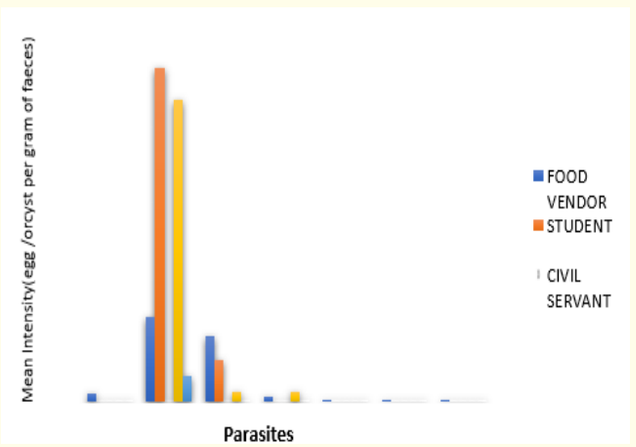

Figure 4: Occupation Related Mean Intensity of Parasites Encountered.

Associated Risk Factors (Knowledge, Attitude and Practices) to the Prevalence of Intestinal

Parasitic Infections

(Tables 3) shows that 156 (68.4%) of the participants drink tap (including borehole and pure water) water as against 70 (30.7%), 1 (0.4%) and 1 (0.4%) that resort to drinking well, river and rain water respectively in the absence of portable water. Encouraging is the 220 (96.49%) as opposed to just 8 (3.51%) who claimed to wash hands before eating and after defecating.

Discussion

Intestinal parasitic infections are diseases caused by pathogenic helminths and protozoa species and are among the most common infectious diseases reportedly affecting over 1.5 billion people mostly from the poorest and most deprived communities worldwide. The purpose of studying epidemiological characteristics of parasitic infections in different localities is for the identification of high risk communities and formulation of preventive and curative measures and to prevent wide spread of such infection.

Parameters	Frequency	Percentage (%)
Handwashing before eating and After defecation		
Always	220	96.49
Once in while	8	3.51
Not at all	0	0
Method of cooking vegetable		
Undercooked	37	16.23
Thoroughly cooked	191	83.77
Toilet facility		
Yes	172	75.44
No	56	24.56
Examination of faeces before now		
Yes	44	19.3
No	184	80.7
Source of drinking water		
Tap	156	68.42
River	1	0.44
Well	70	30.7
Rain	1	0.44
Usage of antihelminths drug inthe last 3 months		
Yes	27	11.84
No	201	88.16
Accessibility to health facility		
Yes	224	98.25
No	4	1.75
Feeling of symptoms like headache, stomach disorder, diarrhea etc.		
Yes	201	88.16
No	27	11.84

Table 3: Attitude and Practices of Participants that Enhances Transmission or Predisposes to Intestinal Parasitic Infections.

The most predominant parasite in this study is *A. lumbricoides* (21.2%) which correlates with the study of Salawu and Ughele (2015). The relatively high prevalence of other parasites reported in this study is in tandem with previous studies. The total prevalence of intestinal parasites reported in this study 19.3% is higher than 16.9% reported in South-Eastern Nigeria [17] and 15.6% in Thailand [18], but apparently lower than in some other studies. Mohammed., *et al*. (2015) reported 54.2% total prevalence of intestinal parasites in Sokoto State, Adeomi., *et al.* [11] reported prevalence of 30.6% in Osun State, 52% reported by Adefioye., *et al*. [7] and 41.9% in Kwara State [19] and 48.48% intestinal parasite eggs or cysts found on consumable fruits and vegetables [10].

However, there are some potential limitations to be considered while considering the results of this study. Such limitations include the fact that the microscopic examination is faced with lots of challenges most especially of sensitivity and specificity compared to serological and molecular examinations; and a single faecal examination is unreliable as optimal laboratory examination requires not less than three faecal samples examination [20].

Giving the high prevalence of parasitic infections and its associated high morbidity, there is need for health care providers and government to embark on a massive health education program. The higher level of infection recorded in students and food vendors could probably be due to the attitude of this group of people as to their eating habit and sanitary practices because students are fond of eating anything not minding if it is hygienic or not and most food vendors do not practice the ideal sanitary and hygiene practices, thus, could account for the higher prevalence in these groups. The educational status, sanitary and hygiene level of civil servants could be a determining factor of the zero-prevalence recorded, though the number examined from this group was relatively small.

Participants obviously maintained a reasonably high level of hygiene with 200 (96.5%) of the participants who claimed to wash hands after defecating and before eating; 191 (83.8%) cooks their vegetable before consumption and a good proportion 172 (75.4%) have toilet facility at home which could have buttressed the low intensity of some of the intestinal parasites and absence of others like *T. trichiura* which is one of the major STHs and recognized Neglected Tropical Diseases (NTDs). The high percentage (88.16%) of respondents that do not use antihelminthic drugs could possibly explain the presence of intestinal parasites especially *Ascaris* which was widely distributed with highest prevalence (21.2%).

Conclusion

In conclusion, the prevalence (19.3%) of other intestinal helminthes amongst the study population of Ibadan has been able to reaffirm its presentation as a serious public health concern, although WHO does not recommend large-scale preventive chemotherapy in areas where prevalence is below 20% [6,21,22]. This study was limited to single sample observation. Perhaps, larger sample size and longitudinal studies with more parameters will be necessary for the continuation of this surveillance study to obtain an accurate understanding and cause of the parasitic burden of this area. Health education on exhibiting good sanitary habit and personal hygiene and the need for regular deworming are paramount factors in combating the menace of infection. Government should also endeavor to provide basic amenities like provision of safe, portable drinking water.

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