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A Knowledge-Based Survey of Intestinal Parasitic Infections among Students Attending Boarding Schools in Southeastern Nigeria

Faith Ebhodaghe and Clement Isaac*
Department of Zoology, Ambrose Alli University, Ekpoma
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Abstract

There is an apparent lack of information on the risk and clinical symptoms of Intestinal Parasitic Infections (IPIs) among students attending boarding secondary schools in Ebonyi State, Nigeria. This questionnaire-based survey attempts to assess some behavioural habits, possible risk factor (s) as well as clinical symptoms experienced by these students. 256 questionnaires were filled by (52.7% males and 47.3% females) from four boarding schools between June and July 2015. Results showed that on hand-washing practice after defecation, while there was much more students who washed their hands with soap and water (79.7%) than with water only (10.2%), only a few do not wash their hands (2.7%). Also, students washed (86.3%), do not wash (1.2%) or sometimes washed (11.3%) their hands before meals. There were students who do (16.4%), do not (53.5%) or sometimes do (22.3%) bite off on their fingernails using their teeth. Records were taken of those who walk (11.3%), do not walk (68.0%) or sometimes walk (18.0%) on bare feet. A greater number of students use water cisterns (41.0%) than pit toilets (36.7%); and pit toilets (36.7%) than bushes (19.5%). Borehole constituted the most ready source of drinking water for students (75.8%). Parents are predominantly farmers, traders, teachers and civil servants. Clinical symptoms were more occasional than frequent. The hygiene behavioural practices are commendable. Thus, there is possibly a low risk of IPIs among these students. However, promotion of healthy hygienic practices should be further encouraged.

Keywords: Intestinal parasitic infections, risk, clinical symptoms, boarding schools, Ebonyi State

1.0 Introduction

Intestinal parasitic infections (IPIs) are easily transmitted in an atmosphere of close human contacts. Students in boarding institutions, particularly those living under crowded conditions, are highly vulnerable to acquiring these infections (Gamboa *et al*., 2011; Al-Madani and Mahfouz, 1995; Sagnuankiat *et al., 2014*). The risk of infection is further compounded by the hygiene practices of some of these students. The habits of fingernail-biting, walking on bare foot, eating with unwashed hands and defecating without washing the hands are some of the bad habits that raise the risk of infection (Dambhare *et al.,*2014; Tamirat and Getye, 2014; Al-Delaimy, 2014).

IPIs are common in developing countries particularly in areas where basic facilities such as pipe-borne water, proper faecal waste disposal systems and adequate healthcare services are lacking (Al-Delaimy, 2014; Agi, 1995). Places with poor sanitary habits and improper personal and environmental hygiene are more often than not inhabited by low income earners and thus are worse hit by IPIs (Juarez and Rajal, 2013; Wordemann *et al.,* 2006). IPIs results in a wide-spectrum of clinical symptoms ranging from apparently symptomless to life-threatening conditions (Muennig *et al.,* 2015; Polimeno *et al.,* 2010; Ichhpujani and Bhatia, 2002). But common manifestations include abdominal pains, diarrhoea, anal itching and weight loss (Ichhpujani and Bhatia, 2002). These may occur occasionally or frequently depending on a number of factors such as infection burden, duration and risk of repeated exposures.

A number of studies conducted in different parts of Ebonyi, South Eastern Nigeria revealed a high prevalence of IPIs among school children (Anim and Akamnonu, 2009; Ugbogu and Asogu, 2013). This high prevalence among school-age children is largely

*Corresponding author's e-mail address: cle21200@gmail.com

a consequence of ignorance on the routes and risks of IPIs. We strongly believe that if school-age children are adequately informed about IPIs, habits that predispose them to acquiring IPIs will be easily dropped. Seeking information from the students as to their level of awareness on the causes and the clinical symptoms associated with IPIs is pivotal to the disease management (Workneh *et al.,* 2014) because it will show the ignorance level as well as bring to the fore the amount and areas where enlightenment needs to be strengthened so as to impact positively on behavioural habits and thereby reduce the incidence of infection. Thus, questionnaires were deployed as an information–gathering tool to achieve the aforementioned set objectives (Canete *et al.,* 2012; Idowu and Rowland, 2006).

2.0 Materials and Methods

2.1 Study Area

The survey was carried out in Ebonyi Central and South, two of the three senatorial zones of Ebonyi State. Ebonyi State is located in the South Eastern part of Nigeria. It lies between longitude $7^{0}35^{'}$N and latitude $6^{0}45^{'}$E. The State shares boundaries with Enugu, Cross River, Benue and Abia states on the West, East, North and South respectively. There are two distinct seasons; rainy season from April to October and dry season from November to March. A good number of Ebonyians are civil servants, students, drivers, manual labourers and artisans, but are predominantly traders and farmers. They produce crops such as rice, yam, potatoes, maize and cassava in large quantities. The rural dwellers especially, rely on rivers and streams for water (Nworie *et al.,* 2014). Several of the people make use of pit toilets and bushes as means of faecal waste disposal, a practice which inadvertently promote IPIs transmission. The State has a rich presence of academic institutions which include universities, Colleges of Education and Agriculture, and boarding secondary schools.

2.2 Study Population and Sample Estimation

The present questionnaire-based survey was conducted among students attending boarding secondary schools between June and July, 2015. Four boarding schools were selected for this survey; an exclusively boys' and an exclusively girls' boarding secondary schools from each of the two [Ebonyi Central (Ezza High School and Ezza Girld) and South (Eghugbo Technical College and Sir Francis Ibiam Grammar School)] senatorial zones. These schools are well known and the enrolment of children by their parents is relatively encouraging. Using the Creative Research Systems Survey Software (Version 11.0) with a Confidence Limit (CL) and Confidence Interval (CI) of 95% and 5.5 respectively, a population estimate of 2,800 students resulted in a sample size of 285 students out of which only 256 respondents were processed. The other 29 were voided due to a range of errors.

2.3 Ethical Clearance and Data Collection

Verbal consents were granted by the schools' heads. Data were gathered by the use of questionnaires. The questionnaires were designed to address four major aspects: environmental; socio-economic and sanitary behavioural risk factors of IPIs and some of their clinical symptoms. The socio-economic factors were age, sex and parents' (father and mother) occupations. The sanitary behavioural aspect covered questions on hand washing after defecation (yes/no, and if yes, with soap and water, or with water only), and before meals (yes/no/sometimes), walking on barefoot (no/yes/sometimes) and biting of fingernails (no/yes/sometimes). Environmental risks were on the type of faecal waste disposal system (pit toilet, water cistern, bush) and source of drinking water (borehole, stream, well, river, storage tank, any other source). The students were to give a 'frequently' or 'occasionally' answer to each of the clinical symptoms (diarrhoea, anal itch, flatulence, abdominal pains, foul-smelling stools) presented in the questionnaires.

2.4 Statistical Analysis

The odd Ratio (OR) analysis was performed using Medcalc Statistical Software (version 15.6) to assess the relative exposure of students in the use of the different faecal waste disposal systems (pit toilet, water cistern and bush). ORs were statistically significant if $P<0.001$ at 95% confidence interval. The Social Science Statistical Software (Jeremy Stangroom, 2015) was used in chi-square analysis of sanitary behavioural data and between occasional and frequent occurrences of clinical symptoms. Chi-square analysis was significant if $P<0.01$. Frequency distributions of the responses of subjects on various

aspects of the survey were carried out. Categorical variables were expressed as number (percentage, %).

3.0 Results

A total of 256 students [males135 (52.7%); females (121 (47.3%)] responded to the questionnaires. These respondents were within the age bracket of 11-19 years. Data on personal hygiene of the students, according to their age groups are presented in Tables 1, 2, 3, and 4. Significant differences between students (males and females) who washed their hands after defecation with water only, and with water and soap (χ^2= 11.7. P = 0.000615. P < 0.01) and students who walked, did not walk and sometimes walked on bare foot (χ^2= 13.2. P=0.001395. P <0.01) were observed. There were no significant differences between students who washed, failed to wash and sometimes washed their hands before meals (χ^2 = 4.3. P =0.116745 P>0.01) and those who used, did not use and sometimes used their teeth to bite off their fingernails (χ^2 = 4.0 P = 0.136924. P>0.01).

Table 1: Hand washing behaviour after defecation.

Age Group (Years)	Wash hands after defecation		
	Yes (%)		No (%)
	Water	Soap and Water	
11-12	4(1.6)	21(8.2)	0(0.0)
13-14	7(2.7)	62(24.2)	2(0.8)
15-16	10(3.9)	87(34.0)	4(1.6)
17>	5(2.0)	34(13.3)	1(0.4)
Total	26(10.2)	204(79.7)	7(2.7)

Table 2: Hand washing behaviour before meals.

Age Group	Wash hands before meals		
(Years)	Yes (%)	No (%)	Sometimes (%)
11-12	20(7.8)	1(0.4)	4(1.6)
13-14	71(27.7)	1(0.4)	4(1.6)
15-16	95(37.1)	0(0.0)	14(5.5)
17>	35(13.7)	1(0.4)	7(2.7)
Total	221(86.3)	3(1.2)	29(11.3)

Table 3: Behavioural practice of walking on bare feet

Age Group	Walk on bare feet		
(Years)	Yes (%)	No (%)	Sometimes (%)
11-12	4(1.6)	17(6.6)	4(1.6)
13-14	11(4.3)	53(20.7)	8(3.1)
15-16	8(3.1)	80(31.3)	20(7.8)
17>	6(2.3)	24(9.4)	14(5.5)
Total	29(11.3)	174(68.0)	46(18.0)

Table 4: Fingernails-biting behaviour

Age Group	Biting of fingernails		
(Years)	Yes (%)	No (%)	Sometimes (%)
11-12	3(1.2)	16(6.3)	5(2.0)
13-14	12(4.7)	41(16.0)	14(5.5)
15-16	17(6.6)	60(23.4)	25(9.8)
17>	10(3.9)	20(7.8)	13(5.1)
Total	42(16.4)	137(53.5)	57(22.3)

Water cistern (WC) are used by 105(41.0%) students, pit latrine by 94(36.7%) and bush by 50(19.5%). Some others used a combination of these faecal waste disposal methods. The number of students using WCs were higher than those using pit latrines (OR = 3.56. CI (95%) = 1.98 to 6.39. P<0.001); and pit latrines than bushes (OR = 3.44, CI (95%) = 1.68 to 7.06. (P<0.001) (Table 5).

Table 5: Feacal disposal method

Age/method	Pit latrine	Water cistern	Bush
11-12	12	6	6
13-14	28	34	12
15-16	43	49	14
17>	11	16	18
Total	94	105	50

Borehole constituted the most ready source of drinking water for a majority (194, 75.8%) of students. This was distantly followed by storage tanks (19, 7.4%), streams (17, 6.6%), wells (3, 1.2%), river (2, 0.8%), rainfall (1, 0.4%) and tap (1, 0.4%). There were other students who listed a combination of some of these water sources.

Parents are predominantly traders (22.7% fathers, 48.0% mothers), farmers (12.5% fathers, 8.6% mothers), teachers (9.0% fathers, 10.2% mothers), civil servants (16.0% fathers, 10.9% mothers), artisans (9.0% fathers, 3.5% mothers) and health workers (3.1% fathers, 9.4% mothers).

Data on the clinical symptoms of IPIs among students are presented in Table 6. It revealed that more students are occasionally down with the symptoms of IPIs than frequently (χ^2=4.5 P = 0.340138. P>0.01).

4.0 Discussion

The present questionnaire-survey assessed a number of risk factors and clinical symptoms of IPIs among

Table 6: Rates of clinical symptoms

Clinical symptoms	Males (%)		Females (%)		Total (%)	
	Occasionally	Frequently	Occasionally	Frequently	Occasionally	Frequently
Diarrhoea	34(13.3)	9(3.5)	39(15.2)	1(0.4)	73(28.5)	10(3.9)
Anal itch	43(16.8)	3(1.2)	37(14.5)	5(2.0)	80(31.3)	8(3.1)
Flatulence	56(21.9)	16(6.3)	46(18.0)	3(1.2)	102(39.8)	19(7.4)
Abdominal pain	72(28.1)	9(3.5)	72(28.1)	5(2.0)	144(56.3)	14(5.5)
Foul-smelling stool	53(20.7)	9(3.5)	46(18.0)	8(3.1)	99(38.7)	17(6.6)

students attending boarding secondary schools in Ebonyi State, Nigeria. The hygienic behaviour of any individual has a significant correlation with the risk of infection (Dambhare *et al.,* 2010; Tamirat and Getye, 2014; Al-Delaimy *et al.,* 2014). The route of transmission of IPIs is largely faeca-oral. The majority of students in this study washes their hands after defecation (89.9%) and before meals (86.3%). This could be a result of good education on hand washing, presence of washing facilities around points of defecation and food service. Additionally, a greater number of these students after defecation wash their hands with soap and water (79.7%) and consequently they are at much lesser risk of IPIs than those who used only water (10.2%). A study carried out among school children in the Eastern Region of Nepal reportedly showed that children who washed their hands after defecation using soap and water had a significantly lower prevalence of infection (24%) when compared to those who used only water (63.2%) (Sah *et al*., 2013). Students who failed to wash their hands are very much vulnerable to the disease. Failure to wash hands after defecation may result from an eagerness to play with friends, laziness, lack or distance of washing facilities from defecation points among other reasons.

Intestinal parasites like hookworms and *Strongyloides* are capable of penetrating intact human skin like the soles of the feet which are in constant contact with soil (Ichhpujani and Bhatia, 2002). Hence, the need to always put on foot wares. About 86.0% of students admittedly use shoes regularly. The good practice by a majority of students to always be on foot wares would help in reducing the risk of infection. The comparatively low prevalence of *Ascaris lumbricoides,* hookworm and *Schistosoma mansoni* recorded in some school children have been presumably attributed, among other factors, to the regular wearing of shoes (Gelaw *et al.,* 2013).

Although many of the students have formed the habit of biting (16.4%) or sometimes biting (22.3%) their fingernails, those who do not bite off on their fingernails (53.5%) were much more. The biting of infected fingernails, undoubtedly, results in auto-infection of individuals. We are of the opinion that the provision of nail clippers, for the students will greatly discourage the use of the teeth in biting off fingernails, thus reducing possible incidences of re-infection (Mahmud *et al.,* 2015).

The choice of faecal waste disposal method is critical in assessing the risk of IPIs (Al-Delaimy *et al.,* 2014; Agi, 1995). Our survey revealed that WCs is most used than other means. The steady decline in the number of students using WC (105, 41.0%), pit toilet (94, 36.7%) and bush (50, 19.5%) portends a reduction trend in the risk of acquiring IPIs in relation to the use of these faecal waste disposal systems. The use of bush for faecal disposal, chiefly exposes people to risk of infection. Communities where individuals use bushes, following lack of or refusal to use toilet facilities, rank high in IPIs (Agi, 1995; Abate *et al.,* 2013). Similarly, in a cross-sectional study on primary school children in Addis Ababa, children who used traditional type of toilet had the highest prevalence of IPIs as well as those whose toilets were farther from their vicinity (Ashenafi and Mohammed, 2014). To this end, while advocating for a total elimination of the practice of defecating in bushes, we encourage that a good number of water closet toilets which are easily accessible and having adequate washing facilities, be constructed instead of pit latrines in each of the boarding schools. If this is done, the risk of IPIs would be significantly reduced.

Choice and source of drinking water has strong correlation with risk of IPIs (Al-Delaimy *et al.,* 2014; Agi, 1995; Ashenafi and Mohammed, 2014). The intermittent visits of some of the students to their

homes after each day's academic work by some students in one of the boarding schools may account for some of the various responses recorded (stream, well and river) as these may be the sources of water available to them at home.

The occupational engagements of parents is an index to the economic status which may constitute a risk of acquiring these infections (Juarez and Rajal, 2013; Wordemann *et al.,* 2006; Sah *et al.,* 2013). Parents of students were mostly traders, farmers, teachers and civil servants. Some are artisans and health workers. In a study among children in Jos, Nigeria, significantly higher infection rates were recorded among children whose female parents or care givers were petty traders, artisans and farmers than those that were civil servants and health workers (Jombo *et al.,* 2011). In another study, infection rate was highest in farmers (60.94%) and was least in civil servants (30.17%) (Ogbuagu *et al,* 2009).

The use of questionnaires in assessing the clinical symptoms of IPIs, as done in this study, is a rapid assessment technique (RAT) in evaluating the prevalence, magnitude and burden of the disease in a population. Questionnaires have been used in collecting information on symptoms of IPIs in previous studies (Niyyati *et al.,* 2009; Escobedo *et al.,* 2008). There is no gainsaying that populations where IPIs are markedly present will experience frequent manifestations of the disease symptoms than other populations where the infections are barely recorded. For all five clinical symptoms assessed from the students' experiences, it shows that more students go down with the symtoms of IPIs occasionally rather than frequently. This result suggests a possible low prevalence of the disease among boarding students in contrast to previous parasitological survey of the general population across age groups (Anim and Akamnonu, 2009; Ugbogu and Asogu, 2013). We advise that a screening exercise be conducted among these students in order to ascertain the prevalence of IPIs. Also, enlightenment campaigns on personal and environmental hygiene should be a regular phenomenon.

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