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Original Research Article

Human Enteric Helminthiasis in Children Aged 5 to 15 Years in Aro-Ndizuogu, Imo State, Nigeria

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Abstract

The public health and socio-economic consequences of enteric helminthiasis are of immense concerns in the rural communities of the developing countries. In this study, prevalence of enteric helminthiasis in children aged 5 to 15 years in Aro-Ndizuogu community, Imo State, Nigeria, was surveyed between July and October, 2016. Faecal specimens of 164 children (86 males, 78 females) were collected and analyzed using wet mount (normal saline) and concentrated saturated sodium chloride floatation techniques. Chi-square was used to determine if there was any relationship between sex, age and the prevalence of enteric helminthiasis. Of the 164 children examined, 130 (79.3%) had enteric helminthiasis. Prevalences of six forms of helminthiasis observed were ascariasis (48.2%), hookworm infection (21.3%), taeniasis (7.3%), enterobiasis (11.2%), trichuriasis (0.6%) and strongyloidiasis (0.6%), while the causative helminth species identified were *Ascaris lumbricoides,* hookworm sp., *Taenia sp*, *Enterobius vermicularis, Trichuris trichiura* and *Strongyloides stercoralis*, respectively. 114 (87.7%) had single helminthiasis while 16 (12.3%) suffered from double helminthiasis: ascariasis+hookworm infection (8.4%), trichuriasis+hookworm infection (2.3%), taeniasis+hookworm infection (0.8%), ascariasis+taeniasis (0.8). No significant association was observed among enteric helminthiasis prevalence, sex and age in the population studied. Results of this study revealed that enteric helminthiasis are still highly prevalent among children living in rural communities of Nigeria, where poor hygienic practices and unsanitary conditions are responsible for the high prevalence. Regular deworming of children and health education through primary health care could be used as control measure.

Keywords: *Enteric Helminthiasis*, Children, Prevalence, Aro-Ndizuogu, Nigeria.

INTRODUCTION

Parasitic helminth infections, also known as "helminthiasis" are common infection of humans and often recognized as serious public health problems in many developing countries (Jimenez-Gonzalez *et al*., 2009; Odu *et al*., 2011a; Odu *et al.,* 2013).

Causative agents (organisms) are helminthes, which mean "worms". Adults of some parasitic helminthes inhabit the subcutaneous tissues and lymphatic system of their animal hosts and are referred to as "tissue helminthes" while the adults of others are found in the lumen of the gut of their hosts and are called "enteric (or intestinal) helminthes". Human infections caused by intestinal parasitic helminthes are collectively referred to as "enteric helminthiasis"

The public health and socio-economic consequence of enteric helminthiasis are of considerable global concerns particularly in the rural communities of the developing countries (Azoro *et al*., 2015). In a world of 2,200 million

inhabitants; there exist over 2,000 million helminthiasis with 0ver 15million Nigerians suffering from various forms of enteric helminthiasis, such as ascariasis, trichuriasis, enterobiasis strongyloidiasis, taeniasis and hookworms infection (Anosike *et al*., 2006). This indicates that the prevalence of and morbidity from human enteric helminthiasis is enormous and of public health concern. Major morbidity associated with the infections is caused by intestinal blood loss, iron deficiency anaemia and protein malnutrition (Osasuwa *et al*., 2011). Although all human ages, irrespective of gender, are susceptible to enteric helminthiasis, the problem is predominant among children of school age and pregnant women.

Enteric helminthiasis is identified as a cause of morbidity and sometimes, morbidity throughout the world particularly in the underdeveloped countries (Odu *et al.,* 2011a; Odu *et al*., 2013). It is one of the most common infections in humans especially in tropical and sub-tropical countries (Awolaju and Morenikeji, 2009: Odu *et al*., 2011b; Odu *et al*., 2013). In the poorest countries of the world, children are likely to have enteric helminthiasis from the time they stop breast-feeding and to be continually infected and re-infected for the rest of their lives (Simon-Oke *et al*., 2014). The infection impairs nutritional status of the sufferer by causing loss of iron and protein, malnutrition of nutrients, inflammatory responses that adversely affect appetite, among others (WHO, 2012). It only rarely has acute consequences for children. Instead, the infection is long-term and chronic, and can negatively affect all aspects of child's development, health, nutrition, cognitive development, learning and educational access and achievement.

In most rural communities in Nigeria, low standard of sanitation and poor socio-economic conditions are predisposing factors to high prevalence of human enteric helminthiasis (Anosike *et al*., 2006). Children of primary school age are often used to obtain information of parasitic prevalence in any community. The reason is that children are vulnerable and easy to reach (Mordi *et al.,* 2011). Thus studies on parasitic prevalence involving school aged children provide reliable information for the planning of any dependable public health programme. This survey was carried out to assess the status of enteric helminthiasis in a rural community located in South-eastern Nigeria.

MATERIALS AND METHODS

Study Area

The study area is a rural community called Aro-Ndizuogu. The community is situated in Idiato North Local Government Area of Imo State in south-eastern part of Nigeria. Aro-Ndizuogu is characterized by tropical climate with rainy season lasting from April to November. The inhabitants are predominantly farmers. Some are traders whereas others are artisans. Basic social amenities are inadequate. Sewage disposal system is lacking in the study area while sanitary conditions are poor generally.

Ethical clearance and informed consent

The researchers met with Aro-Ndizuogu Development Union (home branch) executives to explain the aims and benefits of the survey and request for permission to carry it out. Verbal permission was thereafter granted. A town-hall meeting was later scheduled by the union during which the aims and benefits of the research work were also explained to the inhabitants who then gave their oral mutual consent to the participation of their children and maids.

Collection and Examination of Faecal Specimens

Wide mouthed specimen bottles were given to randomly selected children using the lottery method from four collection centres established for this survey in the community. The subjects were asked to collect their morning faeces with bottles and return them the same morning of collection. On collection of faecal specimens from the children, each child was interviewed on some information on age, parent's occupation, foot wear habit; domestic animals reared by parents, type of meat consumed, last day of deworming, and type of toilet facility. Name, sex and age of each child were labeled on the respective bottle containing the faecal specimen. 164 faecal specimens were collected from subjects aged 5 to 15 years (86 males, 78 females) between July and October, 2016. The bottles containing the faecal specimens were taken to the laboratory immediately they were retrieved for examination of ova and larvae of helminthes. All were examined on the same day of collection.

Wet mount (normal saline) and concentrated saturated sodium chloride floatation techniques according to Cheesbrough (2009) were used for the analysis of the faecal specimens. The specimens were examined for ova and larvae of enteric helminthiasis causative helminth species with light microscope using x10 and x40 objectives.

Results were analyzed by means of descriptive statistics (simple percentage and chi-square) to determine if a significant relationship existed between the gender and age of the subjects. The level of significance was set at $p< 0.05$.

RESULTS

The results of the present study showed that faecal specimens from 164 children comprising 86 males

Table 1. Prevalence of forms of enteric helminthiasis and their causative helminth species among participants

Helminthiasis	Causative Helminth Species	No. Examined	No. Infected	Prevalence
Asariasis	*Ascaris lumbricoides*	164	79	48.2
Hookworm infection	Hookworm spp.	164	35	21.3
Taeniasis	*Taenia spp.*	164	12	7.3
Enterobiasis	*Trichuris trichiura*	164	1	0.6
Strongyloidiasis	*Strongyloides stercoralis*	164	1	0.6
		Total	**130**	**79.3**

Hookworm and tapeworm were not identified into species.

Table 2. Prevalence of helminthiasis in relation to sex of participants

Sex	No. Examined	No. Infection	% Prevalence
Male	86 (52.4%)	70 (53.9%)	42.7
Female	78 (47.6%)	60 (46.1%)	36.6
Total	**164**	**130 (100.0)**	**79.3**

Table 3. Prevalence of enteric helminthiasis in relation to age of participants.

Age-group (years)	Sex	Number Examined	Number Infected	% Prevalence
5 – 9	Male	56	50(38.5%)	30.5
	Female	51	38 (29.2%)	23.2
10 – 15	Male	30	22(16.9%)	13.4
	Female	27	20(15.4%)	12.2
	Total	**164**	**130 (100.0)**	**79.3**

Both single and double infections were observed.

Table 4. Frequency of prevalence of enteric helminthiasis and causative helminth species among participants

Helminthiasis	Number Infected	Prevalence percentage
Single helminthiasis	114	87.7
Ascariasis	68	52.3
Hookworm infection	32	24.6
Taeniasis	11	8.4
Enterobiasis	1	0.8
Trichuriasis	1	0.8
Strongyloidiasis	1	0.8
Double helminthiasis	16	12.3
Ascariasis + Hookworm infection	11	8.4
Trichuriasis + Hookworm infection	3	2.3
Taeniasis + Hookworm infection	1	0.8
Ascariasis + Taeniasis	1	0.8
Total	**130**	**100.0%**

and 78 females, age between 5 and 15 years, were examined for enteric helminthiasis, ascariasis, hookworm infection, taeniasis, enterobiasis, trichuriasis and strongyloidiasis and their causative helminth species were identified. Of the 164 children examined, 130 (79.3%) were infected with ascariasis caused by *Ascaris lumbricoides* having the highest prevalence rate (48.2%), followed by hookworm infection caused by hookworm spp. (21.3%), taeniasis caused by *Taenia spp* (7.3%) and enterobiasis caused by *Enterobius vermicularis* (1.2%)

respectively, whereas trichuriasis caused by *Trichuris trichiura*and strongyloidiasis caused by *Strongyloides stercoralis* had the rate of prevalence (0.6% each). The results are shown in tables 1-4. There were significant differences in the prevalence of helminthiasis and their causative agents ($p<0.05$).
Hookworm and tapeworm were not identified into species.

Table 2 shows the prevalence of enteric helminthiasis in relation to sex of the children. It showed that prevalence of helminthiasis was higher in males (42.7%) than females (36.6%). However, the difference was not statistically significant ($P>0.05$). There was no association between enteric helminthiasis prevalence and sex of participants.
Table 3 shows the prevalence of enteric helminthiasis in relation to age of the subjects. It showed that the prevalence of enteric helminthiasis was 30.5% in males of age-corhort 5 to 9 years and 23.2% in females in age-group 10-15 years, males had 13.4% prevalence while females recorded 12.2%. There was no relationship between prevalence of helminthiasis and age of the participants ($P>0.05$)

Table 4 shows frequency of prevalence of single and concurrent enteric helminthiasis among the infected participants. A greater number of the participants suffered from only one form of enteric helminthiasis [114(87.7%)] while a few had two forms concurrently [16(12.3%)] (Table 4). Hookworm infection was predominant in concurrent helminthiasis were observed in the study: ascaris+hookworm infection (8.4%) trichuriasis+hookworm infection (2.3%) taeniasis +hookworm infection (0.8%) and ascariasis+taeniasis (0.8%)

DISCUSSION

The high prevalence (79.3%) of human enteric helminthiasis recorded in the present study community could be attributed to exposure of children age 5 – 15 years to enteric helminthiasis predisposing factors, such as, poor sanitary and hygienic conditions, unsafe sources of water and lack of awareness on the part of children and parents (Simon-Oke *et al*., 2014; Mordi *et al*., 2011). This result when compared with findings of some previous studies in other parts of Nigeria (Azoro *et al*., 2015; Wasu and Onyeabor, 2014; Alli *et al*., 2011 ab) agrees with them, but is high when compared with the findings of Okpara (2007); Egwunyenga and Ataikiru (2005); Odu *et al*., (2013).

The high prevalence recorded in the study area indicates that indiscriminate defecation, unhygienic food and feeding habits, lack of awareness of the mode of transmission of enteric helminthiasis as well as low level of sanitation of the study community are among the principal factors enhancing transmission in the community. This situation calls for effective control measures in the study area, which can be achieved through community health education campaign aimed at influencing the poor hygienic attitudes and behaviours of the population at risk. In addition, regular deworming of children in the study area is advocated.

Prevalence of enteric helminthiasis between sex and age of the sampled children did not differ significantly. There was, therefore, no evidence to suggest that there was sex or age relationship and prevalence of helminthiasis among the study population. This is because children aged 5 – 15 years living in poor hygienic environments are generally susceptible and equally exposed to enteric parasitic helminth infection, irrespective of sex and age, due to their unhygienic practices.

The “no association” between and prevalence of enteric helminthiasis recorded in this study (Table 2) conforms with findings of Simon-Oke *et al*., (2014); Ekpenyong and Eyo (2008) but contradicts the findings of some previous studies in some parts of Nigeria (Eze and Nzeako, 2011; Egwunyenga and Ataikiru, 2005; Azoro *et al*., 2015).

Prevalence of enteric helminthiasis seemed to be higher in the age cohort 5-9 years where males recorded 30.5% and females 23.3% than in age-group 10 – 15 years where males recorded 13.4% and female 12.2% (Table 3). This may be due to the fact that children in 5 – 9 years age-group are known to exhibit higher level of unhygienic practices than their counterparts in 10 – 15 years age-cohort. They regularly often get in contact with sources which have been contaminated with eggs of parasitic helminthes, such as, soil, food and drinks. The lower prevalence rate recorded in 10 – 15 years age-group could be due to build up immunity as age increased. However, there was no relationship between prevalence of enteric helminthiasis and age of the subjects in this study.

The prevalence of six forms of enteric helminthiasis (Table 1); ascariasis (52.3), hookworms infection (2.4.6%) taeniasis (8.4%), and 0.8% for enterobiasis, trichuriasis and strongyloidiasis, respectively, suggests that the studied population lived in poor hygienic environments as well as exhibited high level of unsanitary habits especially in handling of foods and drinks, playing with soil and walking bare-footed. Higher prevalence of ascariasis in this study agrees with findings of some previous studies in parts of Nigeria (Okoli *et al*., 2008; Okonko *et al*., 2009; Alli *et al*., 201a) and can be attributed to high level of unhygienic practices, which enhances transmission among children. However, this finding disagrees with that of Odu *et al*., (2011 a) who reported predominance of trichuriasis over ascariasis and hookworm infection. Prevalence of ascariasis, trichuriasis and hookworm infection have been reported in many parts of Nigeria (Ajero *et al*., 2008; Okolie *et al*., 2008; Chukwuma *et al*., 2009; Odu *et al*., 2010; Odu *et al*.,

2013).

Concurrent helminthiasis varied with ascariasis and hookworm infection (8.4%), trichuriasis and hookworm infection (2.3%) taeninasis and hookworm infection (0.8%) and ascariasis and taeniasis (0.8%). Ascariasis and hookworm infection was predominant. This is consonant with the findings of Okpara *et al.*, (2007). Prevalence of ascariasis and hookworm infection, was highest, in contrast to other forms of enteric helminthiasis. This is probably because the eggs of their causative helminthes species can survive in the soil for years and are resistant to environmental pressures.

CONCLUSION

Findings of this study revealed a high human enteric helminthiasis burden, a situation which is not good for physical, mental and cognitive development of children. Government and non-governmental organizations should embark on measures to control further spread of enteric helminthiasis among children in Aro-Ndizuogu, Imo State particularly and Nigeria in general.

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