

Intestinal parasitic infection and body mass index among school children in oshodi lagos nigeria

Abstract

Background: Intestinal parasitic infections are still major public health problems in the world, particularly in developing countries. These parasitic infections have adverse effect on the health status of individuals particularly children.

Objective: The study is designed to determine the effect of nutritional status on the prevalence of intestinal parasites among the school children in Oshodi, Lagos State Nigeria between June and August 2014.

Methods: A total of consented 386 from seven public primary schools in Oshodi, 169 (43.8%) boys and 217 (56.2%) girls school children provided stool samples, their height and weight measured to calculate the body mass index (BMI) for the evaluation of the nutritional status of children and questionnaire were given to be completed. Their ages were between 3-14 years. Stool samples collected were examined using direct wet mount and the formal ether concentration technique. The BMI was classified based on children with normal weight and those that are under weight.

Results: Three species of intestinal parasitic infections were identified with overall prevalence of 58.3%. The predominant parasites were *Entamoeba histolytica* (35.8%), *Entamoeba coli* (22.0%) and *Ascaris lumbricoides* (5.1%). The prevalence among sex is 25.1% in males and 33.2% in females. The children with normal weight were 8.8%, while underweight were 91.2%. The relationship between infectivity and BMI was determined as normal weight 1.3%, $P=0.654$ and under weight 57% $P=0.845$, ($P>0.05$).

Conclusion and Recommendations: This study has shown that intestinal parasitic infections are prevalent and have adverse effect on nutritional status of children in Oshodi, and there is need for improved nutritional, personal and environmental hygiene of these children so as to reduce the infection rate.

Keywords: intestinal parasites, nutritional status, school children, oshodi, lagos state

Volume 2 Issue 2 - 2017

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Received: December 14, 2016 | **Published:** February 20, 2017

Introduction

Intestinal parasitic infection is a major problem affecting the health of children in Africa.¹ Approximately about 3.5 billion people are infected with intestinal parasites worldwide, the majority being primary school children.² The endemicity have been indicated as the greatest single cause of worldwide disease and illness in children.³⁻⁵ Due to poor sanitary and tropical climate conditions, illiteracy and lack of portable drinking water and poverty the parasites become a significant public health challenge in sub-Saharan Africa.^{3,6}

The nutritional status of a child is an important indicator of a child is overall health condition.⁷ Growth is the best global indicator of a child's well being.⁸ The most active phase of childhood is school age.⁹ Insufficient dietary intake, poor hygienic conditions and repeated parasitic infectious disease are the risk factors commonly known to give irregular growth pattern in children.⁸ Slower cognitive development, health complication and reduced quality of life have been linked to severe under nutrition in primary school children.¹⁰ Malnutrition is a common health problem of African school children due to inadequate food consumption and most importantly intestinal parasitic infections.¹¹

Malnutrition occurs when there is deficiency or imbalance of certain important nutrients in an individuals' diet.¹² Malnourished children are easily irritable, loose focus easily and fail to grow to

their required height as reported by WHO¹³ when it projected that 29% of malnourished children from developing countries will have stunted growth due to poor nutrition in 2015. Malnutrition in children however is the consequence of a range of factors that are often related to poor food quality, insufficient food intake, and severe and repeated infectious diseases, or frequently a combination of the three.¹³

A huge loss to the economy as about 39 million disability adjusted life years (DALY's) are attributed to intestinal parasitic infection.¹⁴ Intestinal parasitic infections have also been associated with poor educational performance, physical weakness and stunting apart from morbidity and mortality in primary school children.¹⁵

Developing countries account for fifty percent of children infected annually with soil transmitted nematode and orally acquired helminthes and protozoa.¹⁶ It was estimated that more than 1 billion people are chronically infected with soil-transmitted worms, including *Ascaris lumbricoides*, *Trichuris trichiuria*, and hookworm infections.¹⁷ The global prevalence of parasitic diseases is estimated to be 478 million children for *Ascaris lumbricoides*; 280 million for hookworms and 347 million children for.¹⁸⁻²⁰ Several epidemiological studies indicated high prevalence rate of intestinal parasitic infections among Nigerian children.^{1,21-23} A recent study in Ogun State South-west region of Nigeria indicates a prevalence of 25.8%.²⁴

Therefore, the use of anthropometric index to evaluate the

prevalence of under nutrition and the role of intestinal parasitic infection in the health condition of pupils in urban slum needs research attention. However, there is presently no effective and popular national or state school-based intestinal parasite control programme in Nigeria. There is also a dearth of information on the relationship between nutritional status and prevalence rate of intestinal parasitic infections amongst primary school pupils.

This study is intended to provide information on the basis for development of control programme at national, state and local government levels on the need for an effective primary school-based intestinal parasite eradication programme to be implemented as a school-based intervention.

Materials and methods

Study area

Oshodi Local Government Areas of Lagos State Nigeria covers land area of about 9.0sqk (9km²) and is located on latitude 06°25'N and longitude 03°27'E. It shares border with the following Local Governments; Ikeja Local Government on the North, Onigbobo Local Government on the North-East and Mushin Ajina Local Government in South-South East. It has two distinct seasons in the year, rainy (April to October) and dry season (November to March) with an average monthly temperature ranges between 34°C and 37°C. It has a growing population of over 1,000,000 people/inhabitants with poor sanitary facilities, poor water management practices and indiscriminate disposal of waste materials. There are forty three public primary schools in the area with 28,400 pupils.

Ethical consideration

Ethical approval for the research work was given by Nigerian Institute of Medical Research (N.I.M.R) Ethical Committee. Permission to have access to schools was given by Lagos State Ministry of Education (State Universal Basic Education Board). Informed consent from parents/guardians was gotten using parents/teachers forum. Students enrolled for this study were duly informed and consented before sample collection.

Sample collection

A total of 249 samples were collected using Akingbade et al.²⁴ method from students in Mafoluku, Oshodi and Shogunle public primary schools.²⁴

Table 1 Prevalence of intestinal parasites and sex distributions among primary school children

	Boys	Girls	Both sex
Parasite species	N=169	N=217	N=386
	Number (%)	Number (%)	Number (%)
<i>E. histolytica</i>	59 (34.9)	79 (36.4)	138 (35.8)
<i>E. coli</i>	38 (22.5)	47 (21.7)	85 (22.0)
<i>A. lumbricoides</i>	0 (0)	2 (0.9)	2 (0.5)
Overall prevalence	97 (57.4)	128 (58.9)	225 (58.3)

$$\chi^2 = 1.03, DF=3, P=0.598 .P>0.05.$$

Sample examination

The stool was examined macroscopically for consistency, color, odour, presence of blood, mucus and presence of adult intestinal parasites (worms). Microscopic examination of the stool samples were carried out using saline and iodine mount method, Formalin ethyl acetate stool concentration technique (MINI PARASEP kit) was used to further identify cyst, egg or larvae of intestinal parasites.

Nutritional status determination

The body weight and height measurement to the nearest 0.1kg and 0.1cm respectively were taken for each pupil using an electronic weighing balance and a measuring tape to calculate anthropometric indicators (BMI).

Statistical analysis

The analysis was done using SPSS (Statistical Package for Social Sciences) version 17.0 to determine the differences in the prevalence of infection between ages and sexes and the relationship of infectivity of intestinal parasites and the BMI.

Results

A total of 386 students participated in this study 169 (43.8%) are males with infection rate of 57.4% and 217 (56.2%) females with infection rate of 58.3%. *E. histolytica* had the highest prevalence of 35.8% from both sexes and *E. coli* having 22% while *A. lumbricoides* had a prevalence of 0.5% in female population. Table 1. Table 2 shows the Prevalence of Intestinal Parasitic Infections among zones in Oshodi, Lagos, Nigeria, with the overall prevalence of intestinal parasitic infection of 58.3%. The prevalence from Oshodi zone are 57.1% for Oshodi Primary School while 41.7% and 56% were from Afolabi and Local Government Primary Schools respectively. In Shogunle zone, Temidire Primary School had prevalence of 45%. In Mafoluku zone, Aregbe Primary School presented a prevalence of 60.5% St. Paul Primary School had 64.3% while Mafoluku Primary School had 65.8%. Table 3 showed the age distribution and prevalence of intestinal parasitic infections among the student. Ages 7-10 presented the highest prevalence of 24.9% while the lowest was observed 3-6 years (8.0%) (P>0.05). Table 4 shows the normal body mass index (BMI) and underweight BMI in relation to age groups and infectivity status of the students. (p<0.05). Age groups 7-10 and 11-14 were more of underweight as compared to Age group 3-6.

Table 2 Prevalence of intestinal parasitic infections among the zones in oshodi, lagos, nigeria

	Primary schools examined	Number examined	Number of entamoeba histolytica (%)	Number of entamoeba coli (%)	Number of ascaris	Total number infected %
Oshodi Zone	Oshodi primary school	21	7(33.1)	4(19.0)	1(4.8)	12(57.1)
	Afolabi primary school	36	8(22.2)	7(19.4)	0(0)	15(41.7)
	Local government primary school	25	7(28.0)	7(28.0)	0(0)	14(56.0)
Shogunle Zone	Temidire primary school	60	17(28.3)	10(16.7)	0(0)	27(45.0)
	St. Paul primary school	84	35(41.7)	19(22.6)	0(0)	54(64.3)
Mafoloku Zone	Mafoloku primary school	117	44(37.6)	32(27.4)	1(0.9)	77(65.8)
	Aregbe primary school	43	20(46.5)	6(13.9)	0(0)	26(60.5)
	Total	386	138(35.8)	85(22.02)	2(5.1)	225(58.3)

$$\chi^2 = 13.48, DF=12, P=0.34 .P>0.05.$$

Table 3 Age distribution and prevalence of intestinal parasitic infections among school pupils in oshodi, lagos

Age group (years)	Number examined	Number of E. Histolytica %	Number of E.Coli (%)	Number of A. Lumbricoides (%)	Number of mixed infection (E. Histolytica & E.Coli) (%)	Total number infected %
6-Mar	44	22(50.0)	9(20.5)	0(0)	1(2.3)	31(8.0%)
10-Jul	206	63(30.6)	32(15.5)	1(0.5)	25(12.1)	96(24.9%)
11-14	136	42(30.9)	13(9.6)	1(0.9)	16(11.5)	56(47.4%)
Total	386					225(58.3)

$$\chi^2 = 9.021, DF=9, P=0.42 .P>0.05$$

Table 4 Relationship between BMI and infectivity status

Age (years)	Normal BMI>18.5 – 24.9 N (%)	Infectivity status		P-value
		Non-infected	Infected	
		N (%)	N (%)	
3-6	5(14.7)	4(13.8)	1(20.0)	0.654
7-10	17(50.0)	13(44.8)	4(80.0)	
14-Nov	12(35.3)	12(41.4)	0(0.0)	
Total	34(100)	29(100)	5(100)	
Age (years)	Under weight BMI<18.5 N (%)	Infectivity status		P-value
		Non-infected	Infected	
		N (%)	N (%)	
6-Mar	39(11.1)	9(6.8)	30(13.6)	0.845
10-Jul	207(58.8)	88(66.7)	119(54.1)	
14-Nov	106(30.1)	35(26.5)	71(32.3)	
Total	352(100)	132(100)	220(100)	

Not significant i.e. P>0.05 for both sides.

Discussion

This study revealed that the prevalence of intestinal parasitic infections from the different schools in Oshodi, Lagos Nigeria is high (58.3%) compared to the work of Akingbade et al.²⁴ in Ogun State, South-West Nigeria.²⁴ This high prevalence could be related to lack of hand washing after the use of toilet, before and after eating and non washing of fruits before eating it. Poor sanitary condition, ill constructed drainages and unplanned urbanization are also factors that could have influenced the high prevalence in this urban setting. The Local government is divided into three zones (Mafoluku, Oshodi and Shogunle). Oshodi Primary School had a prevalence of 57.1%, while Afolabi Primary School was 41.7% from the Oshodi zone. Local Government Primary School had a prevalence of 56% and Temidire Primary School was 45% from the Shogunle zone. A higher prevalence was recorded from Mafoluku zone with Aregbe Primary School having a prevalence of 60.5%, St. Paul Primary School with a prevalence of 64.3% and Mafoluku Primary School 65.8%.

This high prevalence of intestinal parasitic infection observed was in line with Chukwuma et al.²¹ in their study with primary school pupils in Anambra state, Nigeria and reported Obuno primary school 75%, Umuji primary school 87.5% and Umuoghehi primary school, 95.5%. Studies in India have also shown high prevalence ranging from 60% - 70% in Gurajat²² Contrary to this high prevalence of intestinal parasitic infection, Akingbade et al.²⁴ had a lower prevalence of 25.8% in Abeokuta Ogun state, Nigeria while Mordi et al.²⁵ reported 0.7% prevalence in Edo state. This low prevalence was also seen in the study conducted by Alison et al.²⁶ in Uganda.

In this study, *Entamoeba histolytica*, *Entamoeba coli* and *Ascaris lumbricoides* were the intestinal parasites detected. Mixed infections also observed. *Entamoeba histolytica* was more prevalent parasite detected and it is known to be the most medically significant amoeba species of man. Infection from species of amoeba occurs when there is ingestion of contaminated foods containing cyst of the parasite.²⁷ This study shows that *E. histolytica* (35.8%) is the predominant intestinal parasites and this finding is in agreement with previous studies done by Okonko et al.²⁸ where a prevalence of 51.7% was reported. Mordi et al.²⁵ reported a higher value of 94%. Some findings in Nigeria are in disagreement with these high prevalences. Akingbade et al.²⁴ reported prevalence of 19.4% for *E. histolytica*, Omudu et al.²⁹ reported 20.3%, in Imo state Okolie et al.²⁰ reported a prevalence of 19.1%. In this study, *Entamoeba coli* and *Ascaris lumbricoides* presented a prevalence of 22.8% and 0.5% respectively. *Entamoeba coli* being the second predominant intestinal parasite in this study agreed with the study of Akingbade et al.²⁴ having (25.8%) but completely in contrast with the findings of Egwari et al.³⁰ where there was no report of *Entamoeba coli* in their study.

The low prevalence of *Entamoeba coli* and *Ascaris lumbricoides* compared with *Entamoeba histolytica* is in disagreement with the studies of Akingbade et al.²⁴ that reported a higher prevalence of 54.8% of *Ascaris lumbricoides*, Odu et al.³¹ also reported 57.4% prevalence in their study. The present of *E. histolytica* and *E. coli* are clear indications of poor environmental sanitation, poor personal hygiene, lack of hand washing culture and nail sucking among the students used for this study.

Infections were more common in girls (58.9%) than boys (57.4%), previous studies done by Ekpenyong EA et al.³² in Enugu agrees with this finding and this implies that the prevalence was sex determinant

in conformity with Akingbade et al.²⁴ in Abeokuta Ogun state, but the finding disagrees with the studies of Okonko et al.,²³ Chukwuma et al.²¹ who reported that intestinal parasitic infections were more common in boys than girls. Many other reports such as those of Baldo et al.,³³ Adeyeba et al.³⁴ also showed report of higher rate of infections in boys than girls. Tiedaece in Ethiopia reported higher prevalence in boys (28.1%) and (24.3%) in girls, other studies conducted among school children in Nepal indicated that both sexes were equally exposed.^{35,36} In Nigeria, Awolaju et al.¹ reported no significant difference between intestinal parasitic infection and sex in Osun state. This is in agreement with Nkengazong et al.³⁷ in Cameroon who reported that there was no significant difference in the prevalence of parasite to the sexes in Kotto Barombi and in Marumba.

In our study, we found out that those children between 3-6 years had higher prevalence (72.7%) compared to other age groups; 7-10 years and 11- 14 years which had 58.7% and 52.9% respectively. Previous study done in Nigeria by Ekpenyong et al.³² in Enugu agrees with this finding. Also, Akingbade et al.²⁴ in Ogun state agrees with the high prevalence in this group. This may be due to the fact that their immunity to parasite has not been fully developed for this age group. In the contrary, Odu et al.³¹ reported that intestinal parasitic infections are not age dependent. Low body immune system, lack of potable drinking water, poor sanitary condition and habits like nail biting and sucking might be attributed to the high prevalence in this study and others.³⁸

Anthropometry has become a practical tool for evaluating the nutritional status of populations, particularly of children in developing countries³⁹ and nutritional status is the best indicator of the global well-being of children.⁴⁰ This study revealed that intestinal parasitic infection have been linked to malnutrition which compromise the nutritional status of children ($P > 0.05$). The high prevalence rate of children from malnutrition and anthropometric measurement from this study shows children with normal weight were 34(8.8%) while children that are underweight were 352(91.2%). Previous reports had showed a close association between intestinal parasitism and malnutrition.⁴¹⁻⁴³

A possible interpretation is that both intestinal parasitism and malnutrition are of public health importance. This present study recorded a high degree of malnutrition among the children in the study those with normal BMI >18.5-24.9 had lower infectivity rate compared to abnormal BMI (underweight) <18.5 children having higher infectivity rate. The P value for normal weight was 0.654 ($P > 0.05$) and that of underweight children was 0.845 ($P > 0.05$). This findings agreed with the studies of other investigators such as Adekunle,⁴⁴ Croptom & Nesheim,⁴² Chandrasena et al.,⁴⁵ Carvalho-costa et al.,⁴⁶ Nematian et al.⁴⁷

Conclusion and recommendations

This study has shown that intestinal parasites are still highly prevalent among children in Oshodi an urban setting in Lagos. The data obtained from this study provides base line information on the adverse effect of intestinal parasite on the nutritional status of children which is alarming. The need to take serious personal, communal and environmental hygiene would contribute to the reduction of this high prevalence and this will in no small measure increase the physical development and well-being of children. Government at all levels must have an effective regular school based deforming programme as an intervention for Controlling neglected tropical diseases.

Acknowledgements

None.

Conflict of interest

The author declares no conflict of interest.

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