International Journal of Research and Review
www.ijrrjournal.com E-ISSN: 2349-9788; P-ISSN: 2454-2237

Original Research Article

Intestinal Helminthic Infection and Malnutrition among School Children (3 -12 Years): Case Study of 5 Schools in ODUFOR and EGWI Communities, Both in ETCHE L.G.A., Rivers State, Nigeria

Ihemanma CA, Amadi G, Okorie AC

Department of Biology/Microbiology, Abia State Polytechnic, Aba, Abia State, Nigeria.

Corresponding Author: Ihemanma CA

Received: 16/11/2015 *Revised: 18/11/2015* *Accepted: 21/11/2015*

ABSTRACT

Intestinal helminthic infections and malnutrition among school children in Etche L.G.A of Rivers State were studied between June - August, 2015. Anthropometric measurements consisting of weight, height and age were used as indicators to determine the nutritional status (malnutrition), examination of stool specimens was done using direct wet mount examination. The parasitosis and malnutrition were studied in 102 school children aged 3- 12 years. The result of stool examinations showed that 14 (13.7%) of the study subjects were infected by one or more parasites. The most frequent parasites were *Ascaris lumbricoides* (7.8%) and *Ancylostoma duodenale* (4.9%). The rate of intestinal helminthic infections was not significantly associated with sex, age and nutrition ($p < 0.05$). The overall prevalence of malnutrition was 43.1%. The study confirmed that malnutrition and parasitosis are important child health problems. Therefore, it is recommended that the local health sectors should make provision for regular examination of intestinal parasites. Counseling on nutrition should also be an important component of children health care services. This will go a long way to reduce the undesirable effects of intestinal parasitosis and malnutrition in children.

Keywords: *Intestinal Helminthic infection, malnutrition, Ascaris lumbricoides, Ancylostoma duodenale, Trichuris trichiura.*

INTRODUCTION

Malnutrition and intestinal helminthic infections are common among children in rural communities of Nigeria. Nutritional status is a key indicator of health assessment. The cause behind the childhood malnutrition has multiple reasons. Some causes are poor socioeconomic family level, poor childcare, poor diet, lack of basic healthcare services and various infections. Malnutrition is a condition that results from eating a diet in which nutrients are not enough such that the diet causes health problems. An estimated global infection rate for some helminthes has primarily been attributed to the appalling unhygienic and environmental conditions, poverty within the human communities (Goek, 2003).

The most common mode of spread of roundworms is from the contamination of food items e.g. uncooked vegetables, fruits, meat, dirty habits of playing or handling of infected soils, eating with soiled hands, unhygienic toilet practices,

drinking and eating of contaminated water and food. Helminthic infections in school children (3-12 years) are especially problematic because they have negative lifelong health consequences. *Amoebiasis, giardiasis, Ascariasis,* hookworm infection and *Trichuriasis* are among the most common intestinal helminthic infections worldwide, though there are others. These infections are associated with decreased child growth, low plasma vitamin A, loss of weight, chronic blood loss, iron deficiency, Anemia, diarrhoea and stunted growth. Alteration of the normal gastro intestinal flora by intestinal helminths has been found to be associated with diarrhoea, a major cause of childhood morbidity and mortality in developing countries. Apart from causing mortality and morbidity, infection with intestinal helminths has been associated with stunting of linear growth, physical weakness and low educational achievements in school children (Nokes, *et al.,* 1998).

In Nigeria, *schistosomiasis*, parasitic protozoan and soil transmitted helminth infections are important helminths diseases. The highest transmission levels of *schistosomiasis* occur in the Northern regions (Behnke, *et al.,* 2000). Abnormalities of intestinal mal-absorption contribute to nutritional deficiency (Tanner, *et al.,* 2009). Nutrition plays a major role in maintaining the health of children and infection of children with intestinal parasites can interfere with their growth and development (Latham, *et al.,* 2000).

MATERIALS AND METHODS

This study was performed in Odufor and Egwi, two communities located in Etche local government area of Rivers State, Nigeria.

Study Area:

The study area was Etche, in Rivers State. This study was carried out between June and August, 2015. Etche is a subsistent agrarian ethnic group in the Niger Delta of Nigeria and is located between longitude 4.9908^{o}N and Latitude 7.0544^{o}E. The climate is typical of the tropical rainforest zone and rainfall is between 160 - 236cm, with about 300 rain days especially during March - November periods. Temperature ranges between 24 and 38^{o}c and the predominant wind direction is northerly winds, although there is a significant influence from the southerly winds. Highest humidity of up to 90% are usually recorded during the wet season while values as low as 40% could be recorded at the peak of the dry season.

Some inhabitants of the area engage in Petty trading, palm wine tapping, palm oil processing, fishing, hunting and sand mining, while others are also graduates like medical doctors, lawyers, engineers, accountants and scientist to mention but a few (Di Ekine, 2008).

Ethical Consideration

A written note was obtained from the Head of Department (HOD), Biology/ Microbiology Department of Abia State Polytechnic, Aba and was taken to the village head, who granted the request for the samples to be collected.

Collection of Sample

A total of 102 school children from five different schools in the study area were enrolled, samples from both boys and girls with ages ranging from 3 – 12 years were collected in well labelled clean dry sterile screw capped containers. The procedure of introducing the stool into the container was explained and demonstrated to pupils with the help of their class teachers. They were given a day before collecting the sample from them. The stool samples collected were all transported to Biology/Microbiology Laboratory, Abia State Polytechnic, Aba for parasitological examination (WHO, 2000).

Macroscopic Examination

The stool samples were examined macroscopically to identity the presence of

blood, mucus, pus, worm, colour and the consistency of the stool (i.e. whether formed, semi-formed and unformed/ watery stool) (WHO, 2000).

Microscopic Examination

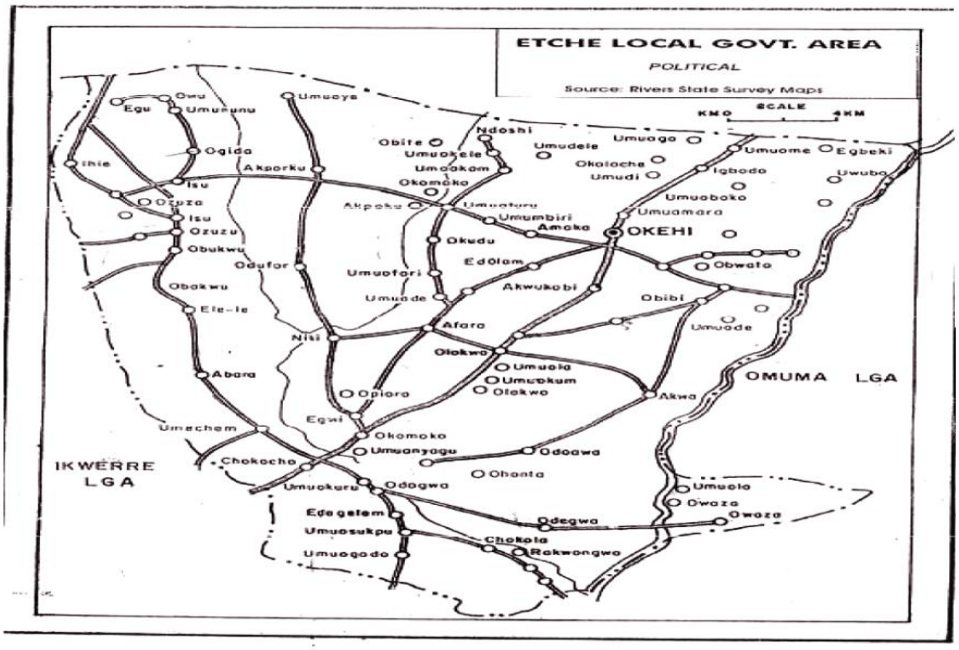
For each of the samples, a drop of normal saline was placed on a clean dry grease-free slide. Stool samples collected were placed on microscopic slides to make smooth thin smears and viewed under the microscope with X10 objective and X40 objective lens for parasites. The results were properly recorded (WHO, 2000).

Nutritional Assessment

Anthropometric measurements of height, weight and age were used to assess the nutritional status of the children. Body weight was determined to the nearest 0.1kg on an electronic digital scale and height was measured to the nearest 0.1cm. Body mass index (BMI), defined as the weight in kilogram of the individual divided by the square of the height in meter, was used to determine severe malnutrition (BMI = < 15.9kg/m^2), moderate malnutrition (BMI = 16 - 16.9kg/m^2) and normal (BMI = 18.5 - 25kg/m^2) as recommended by WHO (NCHS and CDC, 2012).

Statistics analysis

The data were analyzed using chi-square method. The association between intestinal helminthic infection and malnutrition was statistically tested using chi-square method at significance level of $P < 0.05$ (Gerstein, *et al.*, 1994).



RESULTS

Table 1: Distribution of Positive cases according to helminth species

Parasite	Number Observed	% Occurrence
Ascaris lumbricoides	8	7.8
Ancylostoma duodenale	5	4.9
Trichuris trichiura	1	1.0
Total	14	13.7

In total, 102 stool samples and Nutritional Assessment of 102 school children of age 3 - 12 years were conducted. 14 of them (13.7%) were positive for parasitic helminths. Three helminths species were identified. *Ascaris lumbricoides* 8 (7.8%), *Ancylostoma duodenale* 5 (4.9%) and *Trichuris trichiura* 1 (1.0%).

Out of the 14 positive cases, 6 (12.0%) and 8 (15.4%) were males and females respectively (table 2). Statistical analysis showed that there was no significant difference between helminths prevalence and gender ($X^2_{cal} = 0.188$, $X^2_{tab} = 3.841$, df = 1, $P < 0.05$).

Table 2: Positive cases according to gender

Sex	Number of Examined	Number of Infected with Parasites (%)
Male	50	6 (12.0%)
Female	52	8 (15.4%)
Total	102	14 (13.7%)

Age group 3-5yrs showed the highest prevalence rate of intestinal helminthic infection (17.2%). *A. lumbricoides* was highest at 3 - 5 years (13.79%), *A. duodenale* was highest at 9 - 1 2years (6.5%), while *T. trichiura* occurred once at 6 - 8 yrs (3.70%). Statistical analysis showed that there was no significant difference between intestinal helminthic infection and age (X^2cal = 1.02, X^2tab = 5.991, Df = 2, P < 0.05).

Table 3: Age-related prevalence of intestinal helminthic infection among the school children

Age Interval	3 – 5	6 – 8	9 – 12
No. of Children Investigated	29	27	46
No. Infected with			
Ascaris lumbricoides	13.79 % (4/29)	0.0% (0/27)	8.7% (4/46)
Ancylostoma duodenale	3.45% (1/29)	3.70% (1/27)	6.5% (3/46)
Trichuris trichiura	0.0% (0/29)	3.70% (1/2&)	0.0% (0/46)

The females showed a higher prevalence rate of 28 (54.0%) than the males 16 (32.0%) (Table 4). Statistical analysis showed that there was no significant difference between malnutrition and sex (X^2cal = 1.99, X^2tab 3.841, Df = 1, P = < 0.05).

Table 4: Sex related prevalence of malnutrition among the school children.

Sex	Number of Examined	Number of Infected with Malnutrition (%)
Male	50	16 (32.0%)
Female	52	28 (54.0%)
Total	102	44 (43.1%)

Prevalence of malnutrition (table 5) was higher between the age group 3 - 5 years (51.7%), followed by age group 6 - 8yrs (44.4%), while age group 9 - 12yrs showed the least (37.0%). Statistical analysis showed that there was no significant difference between malnutrition and age (X^2_{cal} = 0.631, X^2_{tab} = 5.991, Df = 2, P = < 0.05).

Table 5: Age-related prevalence of malnutrition among the school children

Age Group	Number of Examined (%)	Number of Malnourished (%)
3 – 5	29 (28.4%)	15 (51.7%)
6 – 8	27 (26.5%)	12 (44.4%)
9 – 12	46 (45.1%)	17 (37.0%)
Total	102	44 (43.1%)

Table 6 shows Body Mass Index (BMI) related prevalence of intestinal helminthic infection among the school children. Statistical analysis showed that there was no significant difference between body mass index and prevalence of intestinal helminthic infection among the school children (X^2_{cal} = 0.401, X^2_{tab} = 5.991, Df = 2, P = <0.05).

Table 6: Body mass index (BMI) related prevalence of intestinal helminthic infection among the school children.

WHO Category of Malnutrition	BMI Range (kg/m^2)	No of Examined	No. infected with Parasites (%)
Severe (< 15.9kg/m^2)	10 – 13	34	5 (14.7%)
Moderate (16 – 16.9kg/m^2)	14 - 17	46	7 (15.2%)
Normal (18.5 - 25kg/m^2)	18 – 21	22	2 (9.1%)
Total		102	14 (13.7%)

DISCUSSION

As shown by different investigators, parasitic infections are a major health problem in various parts of Nigeria. The types of parasites in various parts of the country depend on climate, soil, geographic and environmental conditions. The study confirmed that 13.7% of the children were infected with intestinal helminths. The prevalence of these infections in this study is lower than that reported by Kabatereine *et al.*, (2005). The fact that the studies by Kabatereine *et al.*, were undertaken only 2 - 3 years after starting a counting wide deworming policy as compared to this done after 7 years might explain the lower prevalence of helminth infections revealed by this study.

Table 1 show that intestinal parasitic infection was more prevalent in the females (15.4%) than in males (12.0%) though there was no significant difference

between intestinal parasitosis and gender (sex). This is comparable to what has been previously reported by other investigators. Pawlos *et al.,* (2011) reported a high prevalence of intestinal parasitic infection in females (39%) than in males (30%) and independence of intestinal parasitic infection on gender. Okonko *et al.,* (2009) in Abeokuta reported a higher prevalence of intestinal parasitic infection in males than in the females. Thus, this was not in line with the findings of this study. The difference recorded among the study population can be attributed to result of the climate and soil, geographic and environmental conditions (Ghorbani, 1990).

Table 2 shows an overall prevalence of age-related of intestinal parasitic infection by 13.7% differing from that of Pawlos, *et al.,* (2011), who recorded an overall prevalence of 35.5% and Unachukwu and Nwakanma (2014), who recorded an overall prevalence of 38.8% but slightly harmonizing with the report of Gimba and Dawam, (2015) who reported a prevalence rate of 28%. The highest prevalence of intestinal parasitic infection was found in the age interval of 3 – 5 years. A similar trend was reported by Jombo *et al.,* (2007) in Northern Nigeria. It can be recalled that some of these intestinal parasites are soil transmitted helminthes (STH) and children in their day life come in contact with the soil. And as a result, the prevalence rate was high among the young children.

Table 3 shows the percentage occurrence of the intestinal helminthic infections. These percentage incidences during the study are as follows: *Ascaris lumbricoides* 8 (7.8%), *Ancylostoma duodenale* 5 (4.9%) and *Trichuris trichiura* 1 (1.0%). These findings agreed with the report of Hurtado, *et al.* (2005) that a high prevalence of intestinal parasites is consistent with what is found throughout indigenous population in the suburban tropical areas. In some suburban areas of Africa like (Etche L.G.A), ignorance, lack of basic public amenities, poor sanitation, poverty and inadequate access to healthcare are major predisposing factors to intestinal parasitic infections. The suburban schools used in the present study lack adequate toilet facility. There is completely absence of potable water, pupil obtain their water from borehole, the risk is that the tank has not been washed since decades, and some obtain their water from nearby stream and may have been contaminated with fecal matter. Evidently, pupils daeficate indiscriminately in the bushes (bush method) around the school premises as observed. These faecal litterings, are likely to contain ova and cysts of parasites.

According to table 4, the overall prevalence of malnutrition is 43.1% and the gender that is mostly malnourished is the females 28 (54.0%) than the males 16 (32.0%). The report established a statistical independence between malnutrition and gender in line with the report of Miquel, *et al.,* (2015). Table 5 shows that the school children aged 3 – 5 years had the highest prevalence of malnutrition at 15 (51.7%) where as the overall prevalence of the malnutrition is 43.1%. This shows that there is no significant difference between malnutrition and age ($P = < 0.05$), which was in agreement with a finding from the study conducted in Babile town. (Tadesse, 2005). In agreement with other studies (Phiri, *et al.,* 2009).

Table 6 shows that BMI range 14 - 17 (kg/m^2) had the highest prevalence of intestinal parasitic infection of 7 (15.2%) whereas the overall prevalence is 13.7% but there was no significant difference between BMI and IPI or IHI.

This study does not really show a significant association between nutritional indicators and intestinal parasitic infection especially the protozoan parasites (*G. lamblia*), (similar studies in Tehran and Brazil by (Carvalho-costa, *et al.,* 2002),

recorded a significant association between *G. lamblia* and nutritional status. There are several mechanisms by which intestinal parasites may cause or aggravate malnutrition including impaired nutrient absorption resulting from infection and reduced appetite (Crompton, *et al.,* 2002).

Adult helminthes worms residing in the small intestine are in an excellent position to interfere with their hosts' nutrition and can induce damage to the intestinal mucosa that may reduce a person's ability to extract and absorb nutrients from food (Opara, *et al.,* 2003). These factors collectively or singly might have contributed to the malnutrition observed in this study. *Ascaris lumbricoides* was the most occurred among the five species of human intestinal parasites in children. Nursery, primary and secondary school children, teachers and nursing mothers should be sensitized on the importance of good hygiene, appropriate sanitation and proper way of feeding children.

Finally, state government should provide basic amenities, more child health care facilities which would contribute to the elimination of infection and malnutrition among school children especially in villages where there is poor environmental and personal hygiene, shortage of clean potable water and indiscriminate defecation (bush method). Reducing the intestinal helminthic infections and malnutrition in school children, may be of tremendous benefit on child growth, development and education outcome.

CONCLUSION AND RECOMMENDATION

The study confirmed that malnutrition and parasitosis were important child health problem and the prevalence of 13.7% of parasitic infection showed a light intensity infection. It is possible that the de-worming campaign that has been running in this country since 2003 could have reduced the prevalence of intensity of the helminth infections. Since intestinal parasitic infections are associated with malnutrition, controlling these parasites would increase the physical development and well-being of the affected children. The predisposing factors of these conditions include poor sanitation condition, unhygienic practices, absence of potable water, poverty, prolonged shortage of balanced diet, lack of adequate and proper awareness of the transmission mechanisms and life cycle patterns of these parasites amidst others. Therefore, prevention and control measures can focus on regular school health education programmes on the prevention of intestinal parasitic infections, school health programmes for the assessment of malnutrition and health education for parents and/or guardians on how to prevent intestinal parasitic infection and malnutrition, as well as the provision of one subsidized school meal per child per day.

The study therefore recommends that selective periodic de-worming of school children irrespective of the intensity of the infection for those with high risk of developing parasitism should be considered in other to eradicate parasitism and the risk of malnutrition in Etche L.G.A of Rivers State, Nigeria.

REFERENCES

1. Assis, A. M. O., Prado, M. S., Barreto, M. L., Reis, M. G., Pinheiro, S. M. C., Parraga, I. M. and Blanton, R. E. (2004). Childhood stunting in northeast Brazil: the role of *Schistosoma mansoni* infection and inadequate dietary intake. *European Journal of Clinical Nutrition, 58:*1022 – 1029.
2. Behnke, J. M., De Clercq, D., Sacko, M., Gilbert, F. S. and Quattara, D. B. (2000). The epidemiology of human hookworm infections in the southern region of mail. *Trop. Med. Int Health 5(5):* 343 – 354.
3. Crompton, D. W. and Nesheim, M. C. (2002). Nutritional impact of intestinal helminthiasis during the human life

cycle. *Annual Review of Nutrition. 22*:35 – 59.
4. Carvalho-Costa, F. A., Goncalves, A. Q., Lassance, S. L., Silva Neto, L. M., Salmazo, C. A. A. and Boi, M. N. (2002). *Giardia lamblia* and other intestinal parasitic infections and their relationships with nutritional status in children in Brazilian Amazon. *Revista do instituto de Medicina. Tropical de Sao Paulo. 49(3):* 147 – 153.9
5. DI Ekine and ME Onu (2008). "Economics of small-scale palm oil processing in Ikwerre and Etche Local Government Areas of Rivers State, Nigeria". *Journal of Agricultural and Social Research (JASR),* 8, Vol. 2.
6. Gerstein, J., Sullivan, K., Yip, R., Onis, M., Trowbridge, F. and Fajans, P. (1994). Issues in the assessment of nutritional status anthropometry. *WHO Bull, 72:*273 – 283.
7. Ghorbani, G. (1990). Association between intestinal parasitoses and nutritional status in 14 – 60 month-old children in the urban Area of Kerman Province. *Tehran: School of Public Health,* Tehran University of Medical Science.
8. Goek, L. K. (2003). Update on the prevalence of malnutrition among children in Asia. *J. Nepal Med. College,* 113 – 22.
9. Kabaterein, E. M. Tukahebwa Kazibwe, F., Twa-Twa, J., Barenzi, M., Zaramba, F.Z.S. Stothard, J.R., Fenwick, A. and Brooker, S. (2005). Soil-Transmitted Helminthiasis in Uganda: Epidemiology and Cost of Control. *In Tropical Medicine and International Health, Black-well Publishing Ltd*: London, UK, pp. 1187-118.
10. Latham, M. C. and Ottesen, E. A. (2000). Malnutrition and parasitic helminthes infections. *Parasitol, 121: 23* – 38.4.
11. Mahmud, A. M., Mark, S., Afework, M. B., Ignacio, L. P., Geert, J. D. and Roman, B. V. (2013). "Risk factors for intestinal parasitosis, anaemia and malnutrition among school children in Ethiopia". *Pathogens and Global Health; 107(2):* 58 – 65.
12. NCHS, CDC Growth Charts (2012). U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics. http://www.cdc.gov/nchs.
13. Nokes, C. and Bundy, D. A. P. (1998). Compliance and absenteeism in school children: Implication for helminthes control. *Trans. R Soc. Trop. Med. Hyg, 87:*148 – 152.
14. Opera, K. N. and Udoidung, N. I. (2003). Parasitic contamination of leafy vegetable. A function of leaf area index. *Global Journal of Pure and Applied Science, 9*:25-29.
15. Phiri, K., Whitty, C., Graham, S. and Ssembatya-Lule, G. (2000). Urban/rural difference in prevalence and risk factors for intestinal helminthes infection in Southern Malawi. *Ann. Trop. Med. Parasitol, 94:*381 – 387.
16. Pawlow, R., Belay, G., Erko, B., Legesse, M. and Belay, M. (2011). "Intestinal parasitic infections and malnutrition amongst first-cycle primary school children in Adama, Ethiopia." *African Journal of Primary Health Care Family Medicine, 3(1*): 198, 5.
17. Tanner, S., Leonard, W. R., McDade, T. W., Reyes-Garcia, V., Godoy, R. and Huanca, T. (2009). Influence of helminthes infections on childhood nutritional status in lowland Bolivia. *Am. J. Hum Biol. 21 (5):* 651 – 6.
18. Tadesse, G. 92005). The prevalence of intestinal helminthes infections and associated risk factors among school children in Babile town, Eastern Ethiopia. *Ethiopia I of Health Dev. 19*:140 – 147.
19. Unachukwu, M. N. and Nwakanma, C. (2014). Prevalence of parasitic infection and malnutrition in Enugu Urban and Suburban Area. *International Journal of Medical Research Review; 2 (6):* 565 – 572

How to cite this article: Ihemanma CA, Amadi G, Okorie AC. Intestinal helminthic infection and malnutrition among school children (3-12 years): case study of 5 schools in ODUFOR and EGWI communities, both in ETCHE l. G. A., Rivers State, Nigeria. Int J Res Rev. 2015; 2(11):646-652.

****