Relationship of intestinal parasitic infections and malnutrition among school children in Makurdi, Benue State - Nigeria

E Amuta, T Olusi, R Houmsou

Citation

E Amuta, T Olusi, R Houmsou. *Relationship of intestinal parasitic infections and malnutrition among school children in Makurdi, Benue State - Nigeria*. The Internet Journal of Epidemiology. 2008 Volume 7 Number 1.

Abstract

Malnutrition and intestinal parasitic infections are common public health problems of children in developing countries. Malnutrition is typically caused by a combination of inadequate food intake and infection which impairs the body's ability to absorb or assimilate food. Anthropometric measurements with regards to W.H.O standard consisting of height and weight were taken using tape measure on a wooden stick and weighing scale respectively. The body mass index (B.M.I) was determined by dividing the weight in kilogram by the squared value of the height in metre. Examinations of stool specimens were done using direct smear examination and sedimentation and flotation techniques. The nutritional status and parasitosis was studied in 569 (272 male and 297 female) school children aged 10 to 18 years. 330 (57.99%) of the samples were found positive for various intestinal parasites with hookworm species accounting for the highest 173 (52.24%) and Schistosoma mansoni the lowest 3 (0.9%). The relationship between the prevalence and the nutritional status of the children showed that 247 (74.84%) of the infected children are malnourished ($P<0.05$) and there was no significant difference ($P>0.05$) of malnutrition between infected and non–infected children. The study confirmed that malnutrition and parasitosis were important child health problems. Therefore, it is recommended that the local health sectors should make provision for regular examination and treatment for intestinal parasitic infections among school children in Makurdi.

INTRODUCTION

Malnutrition and intestinal parasitic infections are common public health problems of children in developing countries [1]. Malnutrition is typically caused by a combination of inadequate food intake and infection which impairs the body's ability to absorb or assimilate food. An estimated global infection rate for some parasites has primarily been attributed to the appalling unhygienic and environmental conditions, poverty and over-dispersion of parasites. However, intestinal parasitic infections are especially problematic because they have negative life long health consequences; these infections can contribute to malnutrition which in turn can result in delayed growth as well as cognitive growth. It is well recognized worldwide that anthropometric measurements are indispensable in diagnosing malnutrition. It has now been well established that the body mass index (BMI) is the most appropriate variable for determining nutritional status among adolescents [2345]. However there is scanty information on the relationship of intestinal parasites and nutritional status of school children in Benue State. Thus, the present study was undertaken to find out the prevalence of intestinal parasites among school children, the relationship between intestinal parasites and malnutrition in school children and to be able to design a good programme that can improve the health status of Nigerian school children.

MATERIALS AND METHODS

STUDY AREA

This study was carried out in Makurdi, the capital of Benue State which is located in the heart land of guinea savanna zone in central Nigeria. Makurdi lies between 7° (30'- 43')N and 8º(30'- 35')E, It also experiences typical tropical climate with two distinct seasons: the wet season which lasts from April to October and the dry season which begins from November to March.

STUDY POPULATION

This study focused on children attending primary schools. They are the most suitable study group because schools are easily accessible; disease occurrence and malnutrition are usually highest among this age group. The study was carried

out between January and June 2006. A total of five hundred and sixty nine (569) school children were examined for intestinal parasites. Necessary approval was obtained from the school authorities prior to the commencement of the research.

Anthropometric measurements consisted of weighing children without shoes and with the least possible clothes, the measure precision was 0.1 Kg. Then a tape measure on a wooden stick was put vertically against the wall, the child stood up against the tape measure vertically without shoes, and height was measured with 0.5 centimetre precision. Height and weight were taken by one observer. Ages of the children were determined based on the questionnaire filled by their parents and body mass index (BMI in Kg/m²) is defined as the weight in kilogram divided by the square of height in meter.

LABORATORY INVESTIGATIONS

The stool specimens collected from the children were taken to the Advanced Biology Laboratory of the University of Agriculture, Makurdi for examination of intestinal parasites. The faeces were first examined by direct wet preparations which consisted of emulsifying small quantities of the faeces in normal saline with Lugol's iodine solution and examined microscopically under cover slip. Further examination of the faeces was done using the flotation egg technique. About one gram of faeces was placed in a tube of about 15ml, a few drops of saturated salt solution was stirred to make a fine solution, more salt solution was added until the tube nearly got full and the solution was stirred throughout and any coarse which floated up was removed. The tube was placed on a level surface. The final filling was done by a dropper until a convex meniscus was formed. A glass slide was carefully laid on the top of the container so that the centre was in contact with the fluid. The preparation was allowed to stand for 20 minutes after which the glass slide was quickly lifted, turned over smoothly as to avoid spilling of the fluid and examined under the microscope after putting a cover slip.

STATISTICAL ANALYSIS

Comparisons were made between the sex and age groups of children using chi-square test. Differences were shown to be statically significant where $P<0.05$. Correlation was used to assess the association between intestinal parasitic infections and malnutrition in children.

RESULTS

The prevalence of intestinal parasites is shown in Table I. A total of 330 (57.99%) children were infected, hookworm (52.24%) recorded the highest prevalence rate followed by Ascaris lumbricoides (19.39%) and Trichuris trichiura (11.81%), the least prevalence rate was recorded for Schistosoma mansoni (0.90%). 103 (31.21%) cases of multiple parasitism were also reported. The most common found was those of hookworm + Ascaris (53), hookworm + Trichuris (17), Ascaris + Trichuris (12). Triple infection were also encountered but with variable combinations of the different parasites.

Figure 1

Table 1: Percentage of intestinal parasites among infected school children in Makurdi

Parasites	Number Positive (%)
Helminths	
Hookworm	173 (52.42)
Ascaris lumbricoides	64 (19.39)
Trichuris trichiura	39 (11.81)
Taenia spp	7 (2.12
Strongyloides stercolaris	5 (1.5)
Schistosoma mansoni	3 (0.9)
Enterobius vermicularis	17(5.15)
Hymenolepis	9 (2.27)
Protozoa	
Giardia lamblia	6 (1.81)
Entamoeba histolytica	7 (2.1)

Table II shows the prevalence of intestinal parasites by age groups. It is observed that infection was recorded among all age groups but with high prevalence in the lower ages

(10-13) and (13-15) and the prevalence decreases in the age group (16-18). A difference was found to be non significant ($X^2= 6$, $P>0.05$) since parasites were recorded in all age groups.

Figure 2

Table 2: Prevalence of intestinal parasites by age groups

	Parasites (%)									
Age	Hookworm	*Ascaris*	*Trichuris*	*Taenia*	*Giardia*	*Entamoeba*	*Strongyloides*	*Schistosoma*	*Enterobius*	*Hymenolepis*
10-12	117(67.63)	45(70.31)	21(53.84)	3(42.85)	3(50.00)	4(57.14)	4(80.00)	2(66.66)	13(76.47)	6(66.66)
13-15	45(26.01)	14(21.87)	12(30.76)	2(28.57)	2(33.33)	1(14.28)	1(20.00)	0.00	2(11.76)	2(22.22)
16-18	11(6.35)	5(7.81)	6(15.38)	2(28.5)	1(16.66)	2(28.57)	0.00	1(33.33)	2(11.76)	1(11.11)
Total	173	64	39	7	6	7	5	3	17	9

The profile of anthropometric measurements in infected and non infected children is shown in Table III. The prevalence of malnutrition i.e. those with body mass index (BMI < 18.5) is found to be higher in infected than uninfected children and this difference was not significant among these children. ($X^2= 4$, $P>0.05$). Moreover the mean body mass index for

those infected was 17.44 kg/m² with a range of 11.97 – 26.71, while those uninfected had a mean of 22.73 Kg/m² with a range of 12.36 – 37.30. The mean weight of infected children was 34.35 kg while the corresponding figure for uninfected children is 47.25 kg.

Figure 3

Table 3: Profile of anthropometric measurements in infected and non-infected children

Body mass index	No of infected children (%)	No of non-infected children (%)	Total
<16 (Severe malnutrition)	74 (22.42)	93 (38.91)	**167**
16-18.5 (Mild malnutrition)	173 (52.42)	73 (30.50)	**246**
>18.5 (Normal)	83(25.15)	73 (30.50)	**156**
Total	**330**	**239**	**569**

Table IV shows the pattern of infection and malnutrition between male and female children. Males recorded a high infection rate of 53.33% while female recorded a high malnutrition rate of 57.48%. However the association of intestinal parasitic infections and malnutrition (Fig 1) is found to be significant with a coefficient of correlation (r = 0.99, P<0.05).

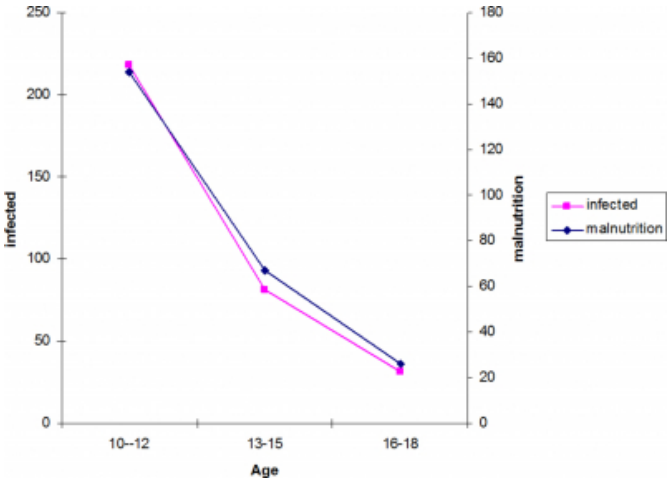
Figure 4

Table 4: Pattern of infection and malnutrition in male and female school children

Sex	Infection (%)	Malnutrition (%)
Male	176 (53.33)	105 (42.05)
Female	154 (46.66)	142 (57.48)
Total	**330**	**247**

Figure 5

Figure 1: Association between intestinal parasitosis and malnutrition



DISCUSSION

Intestinal parasitosis is global though endemic in the tropics and subtropics for reasons attributable mainly to environmental conditions and poor hygiene causing significant morbidity such as anaemia, diarrhoea and dysentery, malnutrition, mental deficits and poor growth. The results of this report shows that hookworm, Ascaris, Trichuris infections which tend to be high among the others in this study occur mostly in tropical and subtropical regions of the world involving school children associated with unsanitary conditions . The humid climate observed in the area provides favourable environmental conditions for the development of oval and larval stages of the parasites and their transmission to man. However, this result is consistent with the findings of [6] who reported an infection rate of 54.70 % in a study of soil transmitted helminthiasis among school children in Ethiope Local Government Area of Delta State, Nigeria. They also found that ascariasis (48.44%), hookworm infection (29.76%) and trichuriasis (17.5%) were the leading infection among the others. This result also agrees with the findings of [7] who reported high prevalence rate of Ascaris lumbricoides (39.0%), Trichuris trichiura (28.4%) and hookworm (26.5%) in a study carried out on intestinal parasites and nutritional status of Nigerian children in Ibadan. Thus, this may illustrate a common health problem among school children in Nigeria since the same environmental conditions abound everywhere.

Children below the age of 15 years appear to be more highly predisposed to intestinal parasitic infections than older ones. This indicates a coterminous behaviour and suscepbility for

these age groups. Children of these age groups often spend more of their leisure time outdoors, playing and or foraging in garbage dumps and eating discarded food remains on the street. They are also more often in contact with sand and eat indiscriminately with unwashed hand. The lower infection rate observed in the 16-18 years age group may be due to their hygiene concern about their looks as compared to the lower age group and hence are able to avoid as much as possible what would lead them to one being infected.

The mean body mass index and mean weight showed a remarkable difference of nutritional status between infected and uninfected children. Children infected with intestinal parasites tend to be thinner than uninfected ones. Thus, there is no doubt that intestinal parasites may produce a remarkably and significant adverse effects on the weight gain inducing a significant contribution to the development of nutritional deficiencies in the group of children studied. The synergism observed between intestinal parasites and malnutrition in this study may be attributed to the fact that hookworm, Ascaris lumbricoides and Trichuris trichiura which are the prevalent in this study are the three main nematode infections implicated in growth retardation of children in tropical countries.[$_{8}$]. Hookworm causes systemic secondary effects related to iron deficiency, anaemia and therefore inducing malnutrition. Ascariasis causes vitamin A and carotenes deficiencies and possibly malnutrition as secondary effect. Trichuriasis in the same way causes iron deficiencies, anaemia which may also lead to malnutrition. Thus, the considerable malnutrition rate observed among the infected children may be due to the adverse effects of these parasites on the children since they recorded high prevalences among the other parasites in this study. The presence of parasites observed in normal children may be due to the fact that these children tend to be careless about their hygiene since some of them live in suburbs such as Wadata and Wurukum where unsanitary conditions and hazardous environmental factors prevail both at home and in school and these may lead them to infections. However the malnutrition observed among uninfected children may be due to inadequate food intake that leads to poor appetite and metabolic and clinical disturbances. Poverty is perhaps the most insidious basic determinant.

The prevalence of infections was higher among male than female this may be attributed to the fact that males are more often engaged in predisposing activities like playing football. The reasons of high rate of malnutrition recorded among females are far beyond the limits of this study and need more studies to be answered.

CONCLUSION

The study shows that a synergism exists between intestinal parasitic infections and malnutrition in school children in Makurdi. But it is important to stress that ‘association” does not equal ‘cause’. An example of this is the uncertainty about some other factors in the development of malnutrition. Therefore investment in education that it is not accompanied by investment in the health and nutrition of school children is a net loss for a country. If an improved health and amelioration of nutritional status in school children can be done, it will obviously contribute to high enrolments, better school attendance, lower rate of dropout, improved performance in academic work and to social equity and economic growth as healthy persons have the energy to work. However, to ameliorate the state of public health problem in school children in the nation, it is recommended that facilities for the physical maintenance of school health and nutrition and minimum health (first aid, etc) need to be in place where possible, regular medical check-ups could be undertaken. All schools must have adequate and clean toilets, clean drinking water. Future school designs should also take account of kitchen and minimum health facilities while school nutrition and health committees and food production units should be part of a new school environment.

ACKNOWLEDGEMENT

The headmasters and teachers are thankfully acknowledged for their assistance and support during data collection. Thanks are also due to the pupils that participated in the study.

References

1. Ajayi, E.O.S. and Akinyinka, O.O. Evaluation of the nutritional status of first year
school children in Ibadan South. West. Afr. J. Med. Sciences 1999: 59-63.
2. World Health Organisation. Physical status : the use and interpretation of Anthropo-
metry. Technical Report Series No.854. World Health Organisation, Geneva 1995.
3. Himes, J.H. and Bouchard, C. Validity of anthropometry in classifying youths as obese.
Int. J. Obes. 1989; 13:183-193.
4. Must, A., Dallal, G. E. and Dietz, W. H. Reference data for obesity: 85th and 95th
percentiles of body mass index (Wt/ht²) and triceps skinfold thickness. Am. J. Clin. Nutr.
1991, 53: 839-846.
5. Rolland-Cachera, M.F. Body composition during

adolescence: methods, limitations and
determinants. Hormone Research.1993; 53: 839-846.
6. Bano, L and Begum, Y. Observation on incidence with intestinal paraites in tshe school
children of Peshavar (Pakistan). Pak. J. Med. Res. 1981; 20: 49-50.
7. Egwunyenga, .A. and Ataikiru, D.P. Soil – transmitted helminthiasis among school age
Children in Ethiope East Local Government Area of Delta State, Nigeria. Afr. J. Biotech.
2005; 4(9): 938-941.
8. Adekunle, L. Intestinal parasites and nutritional status of Nigerian children. Afr. J.
Biomed. Res. 2002; 5: 115-119.
9. Cheesebrough, M. Medical Laboratory Practice in Tropical Countries. Part 1 Cambridge
University press, 1998.

Author Information

E.U. Amuta, PhD
Department of Biological Sciences, University of Agriculture

T.A. Olusi, Ph.D.
Department of Biological Sciences, University of Agriculture

R.S. Houmsou, M.Sc.
Department of Biological Sciences, University of Mkar