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Original Article

Microgeographical Patterns of Schistosomiasis and Anthropometric Indices of Children in Eko-Ende South West, Nigeria

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A R T I C L E I N F O

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A B S T R A C T

Urinary Schistosomiasis is a parasitic disease of public health importance in Africa affecting children. It relationship with malnutrition is well pronounced in Nigeria and impairs growth of the affected children or persons. This work investigates the nutritional status of children infected with urinary schistosomiasis. The Anthropometric indices of the studied children were determined according to standard procedures and related to intensity of *Schistosom. haematobium* infection. The weight, height and Age were Anthropometric indices used in this study. A total of 462 children were investigated which comprises of 252 of infected test group and 210 non infected control group. According to height for Age Z-scores 29 (22.7%) of the children with light infection and 60 (48.4%) with heavy infections were severely malnourished p, value= 0.1785 was statistically significant at p>0.05. The higher the intensity of infection, the more malnourished is the child in this study. Nutritional status of the children based on weight for Age Z-scores showed that p-value was not significant. These indicated that there is no significant difference between level of infectivity and weight for age indices of nutritional status. Height for Age Z (HAZ) and Weight for Height Z (WHZ)-scores were more sensitive indices in determining nutritional status in all indices used in this study. However, males were more malnourished and infected than their female counterparts. All stakeholders should intensify efforts through research and health policies at eradicating schistosomiasis schistosomiasis in Nigeria and Africa in general, more importantly among children.

1. Introduction

Urinary schistosomiasis caused by Schistosoma haematobium constitutes a major public health problem in many tropical and sub-tropical countries [1]. S. haematobium is reportedly endemic in 53 counties in the Middle East and most of the African continent [2]. Two hundred million people worldwide are estimated to be infected with S. haematobium of which 70% live in sub-Saharan Africa [3]. Although, many infections may be asymptomatic, infection with schistosomes may result in clinical disease, and S. haematobium infection however causes haematuria, dysuria, nutritional deficiencies, lesion of the bladder, kidney failure, an elevated risk of bladder cancer and-in children- growth retardation [4].

In Africa and the Middle East, where S. haematobium is common protein energy malnutrition, poor physical growth of children and underweight adults are highly prevalent concurently [5,6 and 7]. Studies have shown that S. heamatobium is associated with low weight for height in children and adults, that urinary schistosomiasis may inhibit child growth and that there will be improvement in growth after treatment [8]. Some cross-sectional studies that were carried out in Egypt, Liberia, Nigeria and Zimbabwe [9,10,11 and 12] gave contrary views in relationship between schistosomiasis and nutritional status.

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Associations between high weight for height and Urinary Schistosomiasis in children and adult males show that schistosomiasis may not cause growth stunting in adult males. In Tanzania, studies revealed that infected children grew less well than uninfected ones and that school children treated with anti-schistosomal drugs gained more weight and height than those not treated [13]. Studies demonstrate that treatment of S. haematobium with metrifonate was associated with weight gain few months after treatment in underweight adult males in Kenya, [14] and a general improve growth rates in school children three months after treatment (15). There is positive association between nutritional status and child growth in the Peoples Republic of China, Macgarvey et al., [16] , they found out that schistosomiasis and its intensity were significantly related to reduced stature in females, across the entire age group. The cross-sectional association between anthropometric reductions and in childhood and adolescence indicate a strong independent effect of infection on malnutrition and growth in the studied population. [11, 17, 18].

Micronutrient deficiency, parasitic infections and stunting remain significant problems among school aged children in Africa and Nigeria in particular [11]. The information about this is important concept of parasitic diseases is fragmental or absolutely lacking at microgeographical level in Nigeria. It is against this background that this study is designed to find out the effect of urinary schistosomiasis and anthropometric indices of children in Eko-Ende community Osun State, Nigeria

2. Materials and methods

2.1. The study area

The study area Eko-Ende lies between Latitude 7057' N and Longitude 4041 East of the Greenwich Meridian in Ifelodun Local government area of Osun State. Permission for the study was obtained from the Osun State Ministry of Health, Education and Ifelodun Local government authority as well as parents guardians of the children and the children themselves.

2.2.Ethical Clearance

Ethical clearance and approval was obtained from Osun state Ministry of Health and Ethical Committee of Ladoke Akintola University of Technology Teaching Hospital, Osogbo, Osun State. Informed consent was also sought and obtained from the community, subjects' parents or guidians and subjects themselves.

2.3.Selection criteria

The test-group constituted the infected group and was selected through centrifugation microscopic ova detection method while the control group composed negative individuals by the same method. Those that refused to give consent were excluded from the study.

2.4. Microscopic examination of urine

Diagnosis of urinary Schistosoma haematobium eggs was done by microscopy, as described by Piekarski [19]. 10ml of urine was centrifuged at 2000rpm for 5minutes in order to concentrate eggs of schistosome. The deposit was examined microscopically using X10 and X40 objectives for the characteristics of eggs as described by [20].

2.5. Assesment of nutritional status

For assessment of the nutritional status of children, a test and a control group matched as much as possible for age and was constituted. Four hundred and sixty-two (462) children were recruited for the study. These test-groups constituted the infected-group and were detected through microscopic ova detection method while the control-group constituted negative individuals. The height (cm) and weight (kg) of each child were measured and recorded using standard method. The statistical package developed for use in large field trials was utilized for analysis. This package is approved by WHO and UNICEF and is acknowledged to be more than 90% accurate [7]. Anthropometric measurements are incorporated into the study to determine how much nutritional status explains and reflects an observed pattern of infection [7,21,22]. The basic anthropometric measurements age, sex, height and weight were used. These are compared with an international reference population (defined by the US, National Centre for Health Statistics (NCHS), and adopted by the Worldd Health Organization [22,23, 24]. To compute indices of weight for height (WHO, height for age (HA) and weight for age (WA) For ease of comparison the indices are converted to standard deviation scores (Z-scores) and/or percent of the median value (centile) of the reference population [24,25]. The epi-naut statistical package was used to assess nutritional status of children using anthropometric indices. A single set of measurement was available for screening so as to identify abnormal anthropometric indices

3. Results

A total of four hundred and six two respondents comprising 240 (51.9%) males and 222 (48.1%) females drawn from Eko-Ende participated in the study. (Table 1)The age range was 5 to 16 yr with the median being 12 year, standard deviation 2.9, mean 10.5 and mode 12. The weight and height range were .72m - 1.58m and 23-46kg with median of 1.22m and 25.00kg respectively.

Table 1. Age distribution by sex of the studied population in Eko-Ende community

Age Group Years	Males (%) N=252	Females (%) N=210
5-7	52 (19.8)	50 (23.8)
8-10	47 (17.9)	32 (15.2)
11-13	139 (53.1)	108 (51.4)
14-17	24 (9.2)	20 (9.5)
Total	252(54.5)	210(45.5)

Mean = 10.5 **Median = 12** **Mode =12**

The degree of infectivity by sex in the community of the study population is as shown (Table II). The control group had a total of 200 individuals out of which 59.0% were males and 41.0% were females. Seventy-five (54.3%) male children had a light infection of S. haematobium while 53 (46.5%) female children had a light infection rate. Among those with heavy infection, males recorded the highest infection rate of 68(26.3%).

Table 2. Degree of infectivity by sex of the studied population in the community.

Intensity of Infection	of Males n(%)	Females n (%)
Non-Infected	124(59.00)	86(41.0)
(Control)		
Light Infection	60(26.7)	63(30.0)
Heavy Infection	68(26.3)	61(23.3)
Total	252(56.7)	210(43.3)

Light infection 1-49 eggs in urine.
Heavy Infection 50-200 eggs.
v. Heavy Infection $\geq$300 eggs

The nutritional status of children and controls base on height for age Z-scores (stunting) is shown in Table III, p-value was significant at p.< 0.05. One hundred and twenty one (48.0%) of infected individuals were severely malnourished and only 76 (48.0) of the control were affected severely. There was a positive predictive value between rate of malnutrition of infected children and control as indicated by height for age. The more malnourished the child, the higher the chances of infectivity.

Table 3. Nutritional status of children studied and control based on height for Age Z-scores (stunting).

Height for age	n=210 Control	n=252 Infected
Normal	95(45.2)	60(23.8)
Mild	20 (9.5)	34 (13.5)
Moderate	19(9.1)	37(14.7)
Severe	76(36.2)	121(48.0)
Total	210(100.0)	252(100.0)

Classification used:
<-3 Severe,
<-2-<3 Moderate
<-1-<2 Mild x $\leq$-2
>-1 normal,
Chi-square – 8.27
Degree of freedom = 3
p-value = 0.03213244.
comment: p-value is significant at p<0.05.

The nutritional status of children studied and intensity of infection with S. haematobium based on height for Age Z-scores (stunting) is as shown in Table IV. More children 29(22.7%) and 60(48.4%) with light and heavy infections were severely malnourished respectively. P value was significant at p<0.05. The higher the intensity of infection, the more malnourished is the child.

Table 4. Nutritional status of children and intensity of infection with S. haematobium infection based on height for Age Z-scores (stunting).

Weight for age (HAZ)	Light Intensity N%	Heavy intensity N%
Normal	50(39.0)	17(13.7)
Mild	38(29.7)	20(16.1)
Moderate	11(8.6)	27(21.8)
Severe	29 (22.7)	60(48.4)
Total	128(100.0)	124(100.0)

Chi-square = 2.85 p-value = 0.17859501.
Degree freedom = 3. Comment: p-value is not significant at p>0.05.

Nutritional status of infected children when compare to the control base on weight for Age –scores, (under-weight) showed that p-value was not significant at p>0.05 (Table V). None of the subjects were severely malnourished, 43(20.5%) and 49 (19.4%) revealed moderate malnourishment.

Table 5. Nutritional status of children studied and control based on weight for Age Zl-scores (under-weight).

Weight for age Z (WAZ)	n=210 Control N%	n=252 Infected N%
Normal	88(41.9)	123(48.8)
Mild	79(37.6)	80(31.8)
Moderate	43(20.5)	49(19.4)
Total	128(100.0)	252(100.0)

Chi-square = 0.424.
Degree of freedom =2.
Comment: p-value is not significant at p>0.05.

The nutritional status of children infected with S. haematobium based on weight for age Z-scores (under-weight) is shown in Table VI. The result show that p-value was not significant at p>0.05. Only 21(16.4%) and 11(8.9%) showed moderate malnourishment among control and test subjects respectively. There was no significant difference between level of infectivity and weight for age indices of nutritional status.

Table 6. Nutritional status of children and intensity of infection with S. haematobium infection based on weight for Age Zl-scores (under-weight)

Weight for age Z (WAZ)	n=128 Light Intensity N%	n=124 Heavy intensity N%
Normal	56(43.8)	68(54.8)
Mild	51(39.8)	45(36.3)
Moderate	21(16.4)	11(8.9)
Total	128(100.0)	124(100.0)

Chi-square = 2.64 p-value = 0.15749501.
Degree freedom = 2. Comment: p-value is not significant at p>0.05.

Nutritional status of children studied and control based on weight for Height –scores (wasting) is shown in Table VII, p-value was not significant, indicating that weight for height value is weakly and negatively relate to intensity of infection (correlation coefficient r=-0.02) while weight for age is positively and weakly correlated to intensify of infection (r=0.12), similarly is height for age (r=0.14)

Table 7. Nutritional status of children studied and control based on weight for Height Z-scores (wasting).

Weight for age Z (WAZ)	n=210 Control N%	n=252 Infected N%
Normal	168(80.0)	197(78.2)
Mild	32(15.2)	51(20.2)
Moderate	10(4.8.0)	4(1.6)
Total	210(100.0)	252(100.0)

Chi-square = 0.41.

Degree of freedom =2.

Comment: p-value is not significant at p>0.05.

The nutritional status of children and intensity of infection based on weight for Height Z-scores is shown in Table VIII, p-value was not significant. There was no weight for height indices of nutritional status.

The nutritional status of children studied and control based on weight for Height Z-scores (Table VIII). P-value is not significant Weight for Height was very weakly and negatively relate to intensity of infection (Correlation coefficient r = 0.04) while weight for age was positively and weakly correlated to intensity of infection (r = 0.13), as was height for age (r=0.16).

The nutritional status of children and intensity of infection based on Weight for Height Z-scores show that p-value is not significant i.e. there is no significant difference between level of infectivity and weight for height indices of nutritional status. Height for age was the most sensitive index in determining nutritional status. Weight is the most sensitive indicator used int eh determination of dosage of drug for the treatment of schistosomiasis and it is positively correlated (r=0.12)

Table 8. Nutritional status of children and intensity of selection based on weight for Height Z-score (washing).

Weight for age Z (WAZ)	n=128 Light Intensity N(%)	n=124 Heavy intensity N(%)
Normal	118(92.1)	116(93.6)
Mild	8(6.3)	6(4.8)
Moderate	2(1.6)	2(1.6)
Total	128(100.0)	124(100.0)

Chi-square = 1.94

Degree of freedom = 2

p-value = 0.2243891.

Comment: p-value is not significant at p>0.05.

4. Discussion

The results showed that males were more infected than the females. This is most likely due to the fact that boys are more explorative and inquisitive to take adventure than their female counterparts [25]. The level of infectivity of the studied children showed that males recorded the highest level of infection when compare with the females. This corresponds to the findings of other workers for instance, some studies have shown that S. haematobium is associated with low weight for height in children and adults, that urinary schistosomiasis may inhibit child growth and that there will be improvement in growth after treatment (6,8,). Some cross sectional studies that have been carried out in African countries that reported similar associations between high weight for height and S. haematobium infection in children as reviewed by [11]. Sulyman and Colleague also revealed that studies carried out in Tanzania showed that infected children grow less well than uninfected ones and that school children treated with anti-schistosoma drugs gained more weight and height than those not treated [27, 28, 29]. This could be attributed to various reasons such as predisposing environmental and behavioural features [11].

There was a high significant figure of anthropometric indices among the infected individuals when compared with the control-group. More children with heavy intensity of infection showed severe stunting (malnutrition) when compared with those with light intensity of infections. This result is similar to the observations contributed to growth deficits; also heights for age (HFA) indices of nutrition give a picture of past nutritional history [11, 30]. Low height for age (stunting) signifies a slowing of skeletal growth, this condition is associated with poor overall economic situations, chronic or repeated infections as well as inadequate nutrient intake [30, 31]. However, it was noted that there was no significant difference between the level of infection and anthropometric indices of weight for Age Z-scores in both control and infected children.

This remark is contrary to the findings of Delima et al., [32] who found that of all the children surveyed, 69% were undernourished (less than 80% of expected weight for age). Also, [33] found no association between low anthropometric measures and schistosmiasis.

There was also no significant difference between nutritional status of infected children and the controls based on weight for Height Z-scores (wasting), this is same for level of infectivity and weight for height indices of nutritional status. According to [11] weight for height (WFH) is an index of current nutritional status. Low weight for height (wasting) indicates a deficit in tissue and fat mass compared with the amount expected for a child of the same height or length and may result either from failure to gain weight or from actual weight loss.

5. Conclusion

This work has generated some useful information for the planning of sustainable and effective intervention against the transmission of urinary schistosomiasis and the need for improved health of school children in Eko-Ende and other rural communities. Therefore, there is the need for control measures, particularly in the area of high-quality nutrition and dietary education.

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6. References

[1] Michaud CM, Gorden WS, Reich M R. The global burden of diseases due to schistosomiasis. D C P P Working Paper 19, Cambridge. 2003, pp 1-40. Available at: www hsph. harvard.edu/schisto. Assessed May 5, 2005.

[2] Chitsulo L, Engels D, Montresor A, Savioli L.The global status of schistosomiasis and its control. Acta Trop. 2000; 77: 41-51.

[3] Jukes MCH, Nokes CA, Alcock KJ, et al. Heavy schistosomiasis associated with poor short-term memory and slower reaction times in Tanzanian schoolchildren. Trop Med Int Health. 2002; 7(2): 104-117.

[4] Mostafa MH, Sheweita SA, O'connor PJ. Relationship between schistosomiasis and bladder cancer. Clin Microbiol Rev .1999; 12: 97-111.

[5] World Health Organization. Prevention and Control of schistosomiasis and soil Transmitted Helminthiasis. WHO Technical Report services, Geneva, 2002; 912 (i-vi):1-57.

[6] Stephensen LS. The impact of helminth Infections on human nutrition. Schistosmes and soil transmitted helminthes. New York. Taylor and Francis Co 233; 1987.

[7] World Health Organization. Epidermiology and control of schistosomiasis. Report of a WHO Expect committee. WHOa Tech, Rep. Ser.,1980; 643:5-62.

[8] Stephensen LS, Latham MC, Kurz KM, Kinoti SN, Oumori MC, Crompoton DW. Relationship of Schistosoma haematobium , hookworm and Malaria infections and metrifonate treatment to growth of Kenya school children. Am. Jour. Trop. Med. Hgy.1985; 34:1109-1118.

[9] Abdel-Salam E, Abdel Fattah W. Prevalence and morbidity of Schistosoma haematobium in Egyptian children. Am Jour Trop Med Hyg.1977; 26(3); 463-471.

[10] Hozer B, Saladin K, Salain B, Ennis E, Demont A. The impact of schistosomiasis among rural populations in Liberia. Acta Trop.1983; 40: 232-259.

[11] Sulyman MA, Fagbenro-Beyioku AF, Mafe MA, Omotola BD, Adedoyin JA, Akande OD. Schistosomiasis and anthropometric indices of children in Abeokuta North Local Governmen. Area, Ogun State,Nigeria. Nig J Of Parasitol.2009; 30 (2) pp 96 -101.

[12] Chandiwana SK. Human bilharziasis in a periurban area in Zimbabwe with special reference to its relationship to malnutrition in school children. Cent Afr J Med.1983; 29:23-26.

[13] Jordan P, Webbe G. Schistosomiasis, epidemiology, treatment and control. William sHeineman Medical Books Ltd, London , 1982; pp. 1-239.

[14] Lutham MC, Stephenson LS, Hall A, wolgemuh JC, Ellcot IC, Crompton DWT. Parasitic infections, anaemia and nutritional status: A study of their interrelationships and the effect of prophylaxis and treatment on workers in Kwale District, Kenya. Trans. Roy Soc Trop Med Hyg. 1983; 77:41-48.

[15] Stephenson LS, Latham MC, Kurz KM, Miller DM, Kinote SN. Relationship of Schistosoma haematobium hookworm, and malaria infections and metrigonate treatment to nutritional status of Kenya coastal school children a 16 month follow up. Stephenson W., e. Schistosomiasis and malnutrition international Nutrition monograph. Ithahaca, N.Y: Cornell International Nutrition Program, 1986.

[16] Macgarvey ST, Wu G, Zhang S, Wang X, Peters P, Olds GR, West PM. Child growth, nutritional status and Schistosma japonicum in jiagx, People's Republic of China. Am J Trop Med Hyg. 1996; 48(4): 547-553.

[17] Paraga IM, Assis AM, Prado MS, Barreto ML, Reis MG, King CH, Blanton RE. Gender differences in growth of school-aged children with schistosomiasis and geohelminth infection. Am J Trop Med Hyg. 1996;55(2): 150-156

.[18] Jinabhai CC, Taylor M, Coustsouidis A, Cookadia H, Tomkins AM, Sullivan KR. A health and nutritional profile of rural school children in Kwazalu Natal, South Africa. Ann Trop Pracd. 2001; 21(1): 50-58.

[19] Pekarski E. Medical parasitology. Springer Verlag Berlin Heidelberg.1989; pp.168-169.

[20] Pugh RNH, Gilles HM. Malumfashi Endemic Diseases research project III. Urinary schistosomiasis: a longitudinal study. Ann Trop Med Parasit. 1978;72:471-482.

[21] WHO. Global Distribution of Schistosomiasis: GEGET/WHO Atlas. World Health Statist. Quart. 1985a;37: 186-199.

[22] WHO. The Control of Schistosomiasis. Report of a WHO Expert Committee. Who Technical Rep. Series, Geneva.1985b; 728.

[23] World Health Organization. The control of Schistosomiasis: In report of the WHO expert committee, technical report Series No728, Geneva, 1997a; pp113.

[24] WHO. Schistosomiasis in Tropical Disease Research, 13th programme report WHO, Geneva 1997b; 62-73.

[25] Adeyeba OA, Ojeaga SGT. Urinary Schistosomiasis and concomitant Urinary Tract Pathogens among School Children in Metropolitan Ibadan, Nigeria. Afric J Biomed Res.2002; 5: 103-107.

[26] World Health Organisation. The control of schistosomiasis. Second report of the WHO Expert Committee to a series. Tech Rep Sen. 1993; 82: pp. 1-86.

[27] Ekejindu IM, Ekejindu GO, Andy A. Schistosmia haematobium infection and nutritional status of residents in Ezi – anam, a riverine area of Anambra state, south-eastern Nigeria. Nig Jour of Parasitology.2002; 23:131-138.

[28] Waterlow JC. Classification and definition of protein calorie malnutrition. Brit.Med.Jour. 1997;4 506-569.

[29] World Health Organisation. Use and inter protection of anthropometric indicator of nutritional status. Bull, of WHO .1964;(6); 929-941.

[30] Carswell P, Hughes AO, Palmer RI, Higginson J, Harland PS, Meakins RH. Nutritional status, globulin titers an parasitic infections of two populations of Tanzania school children. Am Jour Clin Nutr.1981; 34(7): 1292-1299.

[31] Waterlow JC. Classification and definition of protein calorie malnutrition.Brit.Med. Jour.1977; 4 506-569.

[32] Delima MF, Rocha RS, Katz N. Schistosomiasis. Rev Inst Med Med Trop Saw Paulo.1985; 27:66-75.