PREVALENCE OF SOME INTESTINAL PARASITIC INFECTIONS IN RELATION TO BODY MASS INDEX OF CHILDREN RESIDENT IN ORPHANAGES IN ANAMBRA STATE, NIGERIA

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Abstract

There is paucity of information on the prevalence of intestinal parasitic infections in orphanage homes in Anambra State, Nigeria. This study investigated the prevalence of some intestinal parasitic infections in relation to Body Mass Index (BMI) of children resident in orphanages situated in Anambra State. A total of 272 subjects comprising 172 orphans and 100 children in family setting (control) were investigated for intestinal parasites using formol-ether concentration method. Underweight, overweight and obesity were determined from BMI using the International Obesity Task Force cut-off points. Prevalence of 23.3%, 5.8%, 4.7% and 1.2% were observed for *Ascaris lumbricoides, Necator americanus/Ancylostoma duodenale, and Entamoeba histolytica/dispar* infections respectively. Prevalence of 12.8% and 9.0% were observed in children of orphanages and children living in their families respectively ($P = 0.045$, $P < 0.05$). The mean BMI of children living with their families was significantly higher than that of children in the orphanages ($P = 0.000$, $P < 0.05$). However, this was not related to parasitic infestation. It may be related to the level of care giving to the children in the orphanages. Underweight children were 8.1% and 0% in children of orphanages and families respectively while overweight children were 3.5% and 8.0% respectively. Children in family setting seem to thrive better than those in orphanages.

Keywords: Prevalence, Parasitic infections, Orphanage

INTRODUCTION

Orphanage homes form an organized setting which if proper attention is given may add value to the lives of the orphans and ensure proper management of communicable diseases. Communicable diseases spread rapidly in such settings if proper hygiene is compromised. The Centre for Disease Control and Prevention (CDC) and World Health Organization (WHO) wrote policy papers for the eradication of some communicable diseases through screening in shelters, prisons, and other congregate – living facilities (Francis *et al*., 2002). However, screening in institutional orphanages and motherless babies' homes were not specifically mentioned. Intestinal parasitic infections have been found to have significant consequences on nutritional and cognitive status especially among kindergarten and school aged children because of increased metabolic rate, chronic anaemia, anoxia and diarrhoea associated with heavy worm load (Ezeamama *et al.*, 2005; Okolo and John, 2006; Tamramat and Olowu, 2008). These helminthes cause decreased intake in the body's nutrient requirement by their interference with absorptive surfaces, obstruction of intestinal lumen, production of proteolytic substances, and consumption of nutrients intended for the body (Awasthi and Pande, 1997; Hotez 2004). These processes ultimately lead to loss of nutrients, fluid and electrolyte, direct depletion of red blood cells and growth failure (Awasthi and Pande, 1997; Hadidjaja *et al*., 1998 and Hotez 2004).

However, there is paucity of information on the prevalence of infections in orphanage and motherless babies' homes in Anambra State, Nigeria. Studies in sub-Saharan Africa have repeatedly demonstrated that growing up in a family environment is more beneficial to a child than institutional care, which should be considered a temporary option or a last resort (Albero, 2011). However other studies indicated that orphans and abandoned children in poor resource countries cared for in institutionalized settings had outcomes that are as good and as poor as their community-based counterparts (Whetten *et al.*, 2009). If these groups of people are neglected, infected orphans may be adopted by people in need of children or they may be released into the society after maturity and the spread of infectious organisms are sure to continue. Thus, this study investigated the prevalence of some intestinal parasitic infections in relation to Body Mass Index (BMI) of children resident in orphanages situated in Anambra State and compared the result with that of children resident in family setting.

METHODS

Children in 8 orphanage homes between 6 weeks and 18 years old were sampled. A total of 272 subjects consisting of 172 orphans and 100 children from family setting serving as control were investigated for intestinal parasitic infections using formol-ether concentration method (Cheesbrough, 2000). Of the 172 children in the orphanage homes, 79 were males while 93 were females. The children in the community setting, who served as control, consisted of 50 males and 50 females. The stool specimen were collected in a sterile universal bottle and taken to the laboratory within one hour of sample collection for microscopic examination (Cheesbrough, 2000). The children were grouped into 4 age groups of 5- year intervals (0-5, 6-10, 11-15 and 16-20 years). For anthropometric measurements, the children were weighed without shoes and in light clothes to a measured precision of 0.1 Kg. The height was measured vertically without the children wearing shoes (Amuta, 2008). The height was measured with 0.5 centimeter precision (converted to meter). Height and weight were taken by one observer. Children less than 2 years old were laid on a table on their backs and firmly immobilized with both legs fully extended (Amuta, 2008). The length was read off with a tape. Body mass index (BMI in Kg/m^2) was calculated by dividing the weight in kilogram by the square of height. The number of care givers in each orphanage home visited was recorded against the total number of children in the home. This was used to determine the child per care giver ratio.

Cysts and ova of intestinal parasites were identified in the wet preparation of the stool deposits after formol-ether concentration. In order to determining underweight, overweight and obesity in the children from Body Mass Index using the International Obesity Task Force (IOTF) cut-off points (Cole *et al*., 2000), the children were graded into five age ranges as infancy (< 2 years), early childhood (2 – 6 years), late childhood (7 – 10 years), early adolescent (11 – 14 years) and late adolescent (15 – 18 years) (Maruf *et al*., 2013). Ethical approval was given by the ethical committee of the Faculty of Health Sciences and Technology, College of Health Sciences, Nnamdi Azikiwe University, Nnewi Campus. Written approval was given by the Commissioner for Women Affairs, Anambra State, to collect samples from orphanages the State.

RESULTS

The total prevalence of intestinal parasites was 12.8% and 9.0% among children in orphanage homes and in family setting respectively (Table 1). The prevalence is significantly higher in Orphanage homes in relation to the control ($P = 0.047$, $P < 0.05$). A prevalence of 7.0%, 4.7% and 1.2% were observed in *Ascaris lumbricoides, Necator americanus/Ancylostoma*

duodenale, and Entamoeba histolytica/dispar infections respectively in orphanage homes (Table 2). In family based children, prevalence of the parasites was 2.0%, 2.0% and 5.0% respectively (Table 2). Of 79 male orphans, 12.7% children were infested with *Ascaris lumbricoides*, 2.5% with *Necator americanus/Ancylostoma duodenale*, and 1.3% were infested with *Entamoeba histolytica/dispar* (Table 2). Among the 50 male children in the family setting, prevalence of 4.0%, 4.0%, and 4.0% were recorded for the three parasites (Table 2). Of 93 female orphans prevalence of the three intestinal parasites was 2.2%, 6.5%, and 1.1% respectively (Table 2). Only a prevalence of 6.0% of *Entamoeba histolytica* was recorded among the 50 female children living in the family setting, the other parasites were not observed in these female controls.

Intestinal parasitic infection is significantly observed in all the age groups ($P = 0.00$, $P < 0.05$), both young and older children were susceptible to infection (Table 3). Out of 79 male orphans, 9 were found to be underweight, 3 were overweight. Of 93 female orphans, 5 were underweight and 3 were overweight given a total of 14 (8.1%) orphanage children that were underweight and 6 (3.5%) overweight children (Tables 4 & 5). Out of 100 control children, none was underweight while 3 males and 5 females were overweight, giving a total of zero underweight and 8 (8.0) overweight children. While the number of overweight children in orphanage homes was not significant in relation to the family based children (Male $P= 0.705$, Female $P = 0.739$; $P > 0.05$), the relationship between underweight children in both settings could not be computed as no underweight child was discovered among children in the family setting. However, no significant changes were recorded in the BMI of children who had parasitic infections in relation to children free of such infections ($P > 0.05$). No cases of obesity were recorded. The mean child per care giver ratio observed in the homes was 8:1.

Table 1: Prevalence of parasitic infections in children resident in orphanage homes in Anambra State in relation to results from children cared for in family setting.

Prevalence of intestinal parasites			
Orphanage (N = 172) (%)	**Family (N = 100) (%)**	**χ^2**	**P-value**
22 (12.8)	9 (9.0)	7.972	0.047*

*Significant at $P < 0.05$

Table 2: Prevalence of intestinal parasitic infection in children resident in orphanage homes in relation to gender (N = 172)

Parasitic infections	Total no. positive		Gender			
			Male		Female	
	Orphanage N=172 n(%)	Family N=100 n(%)	Orphanage N=79 n (%)	Family N=50 n(%)	Orphanage N=93 n(%)	Family N=50 n(%)
Ascaris lumbricoides	12 (7.0)	2 (2.0)	10(12.7)	2 (4.0)	2 (2.2)	0 (0.0)
Necator americanus/*Ancylostoma duodenale*	8 (4.7)	2 (2.0)	2 (2.5)	2 (4.0)	6 (6.5)	0 (0.0)
Entamoeba histolytica/ dispar	2 (1.2)	5 (5.0)	1 (1.3)	2 (4.0)	1 (1.1)	3 (6.0)
Grand total	22 (12.8)	9 (9)	13 (16.5)	6 (12)	9 (9.7)	3 (6.0)

Table 3: Prevalence of intestinal parasites by age range in orphanage homes and community, Anambra State (N = 172).

Orphanage children (N = 172)						χ^2	P-value
	No. positive within age range (Years)						
Parasites	Total (%)	0–5 (%)	6–10 (%)	11–15 (%)	16–20 (%)		
Ascaris lumbricoides	12 (7.0)	5 (2.9)	2 (1.2)	3 (1.7)	2 (1.2)		
N. americanus/ *A. duodenale*	8 (4.7)	1 (0.6)	2 (1.2)	4 (2.3)	1 (0.6)		
E. histolytica/ dispar	2 (1.2)	0 (0.0)	1 (0.6)	0 (0.0)	1 (0.6)		
Total	**22(12.8)**	**6(3.5)**	**5(2.9)**	**7(4.1)**	**4(2.3)**	44.180	0.000*
Community (Control) children(N = 100)							
Ascaris lumbricoides	2 (2.0)	0 (0.0)	0 (0.0)	1 (1.0)	1 (1.0)		
N. americanus/ *A. duodenale*	2 (2.0)	0 (0.0)	0 (0.0)	1 (1.0)	1 (1.0)		
E. histolytica/ dispar	5 (5.0)	0 (0.0)	4 (4.0)	1 (1.0)	0 (0.0)		
Total	**9(9.0)**	**0(0.0)**	**4(4.0)**	**3(3.0)**	**2(2.0)**		

*Significant at $P < 0.05$

Table 4: BMI of male children in orphanage homes and community setting according to age

Orphanage Children

Age group (yrs)	No. examined	Mean BMI (Kg/m^2)	Number Underweight	Number Overweight	Number Obese
< 2	36	15.00 ±1.62	1	0	0
2-6	21	14.54 ± 2.31	5	3	0
7-10	13	16.17± 2.90	2	0	0

11-14	4	18.63 ± 0.65	0	0	0
15-18	5	19.40 ± 2.28	1	0	0
Total	79		9	3	0
Community					
< 2	17	14.56 ± 1.05	0	0	0
2-6	7	16.11 ± 1.29	0	2	0
7-10	9	16.71 ± 1.44	0	1	0
11-14	8	18.14 ± 2.38	0	0	0
15-18	9	20.70 ± 1.67	0	0	0
Total	50		0	3	0
χ^2			-	0.143	-
P value				0.705	

NB: Normal standard weight – Children who's BMI is 5 - < 85 percentile
Underweight – Children who's BMI is < 5 percentile
Overweight – Children who's BMI is ≥ 85 percentile
Obese – Children who's BMI is ≥ 95 percentile
(Cole *et al*., 2000)

Table 5: BMI of female children in orphanage homes and community setting according to age.

Age group (yrs)	No. examined	Mean BMI (Kg/m^2)	Number underweight	Number overweight	Number obese
< 2	52	14.59 ±1.48	1	0	0
2-6	21	14.00 ±1.44	1	2	0
7-10	10	15.42 ± 2.99	3	0	0
11-14	5	18.68 ± 2.98	0	1	0
15-18	5	18.58 ± 0.90	0	0	0
Total	93		5	3	0
Community					
< 2	14	14.73 ± 1.37	0	2	0
2-6	12	16.13 ± 0.94	0	0	0
7-10	10	16.80 ± 2.41	0	1	0
11-14	7	18.77 ± 2.36	0	2	0
15-18	7	21.16 ± 2.31	0	0	0
Total	50		0	5	0
χ^2			-	0.111	-
P value				0.739	

Key: *Significant at P < 0.05
- χ^2 not computed
NB: Normal standard weight – Children who's BMI is 5 - < 85 percentile
Underweight – Children who's BMI is < 5 percentile
Overweight – Children who's BMI is ≥ 85 percentile
Obese – Children who's BMI is ≥ 95 percentile
(Cole *et al*., 2000)

DISCUSSION

The prevalence of intestinal parasites recorded in the orphanage homes in Anambra State was 12.8% contrary to the report of 20.7% by Nwaneri and Omuemu (2013) in orphanages in Benin City, 63.6% by Ogbe and Ado (1990) in orphanages in Lagos and 62.7% by Al-Shibani *et al.*, (2009) 3 orphanages in Sana'a City, Yemeni.

Enekwechi and Azubike (1994) reported *Entamoeba histolytica* prevalence of 6.8% in children of primary school age in Nimo, Anambra State. This was higher than the prevalence recorded in this study (1.2%). Association between the intestinal parasites and age grades of children sampled in the orphanage homes was significant ($P = 0.00$, $P < 0.05$). Intestinal parasites were isolated from children of all the ages between 0 and 18 years. However, while *Ascaris lumbricoides* was highest in children of 0-5 years, *Necator americanus/Ancylostoma duodenale* was highest in children of 11-15 years. The reason may be that the younger children are in the habit of eating whatever they come across while crawling. The older children may be playing barefooted in the field even in the rain and are more liable to infection by the filariform lavae of hookworm. This may explain why more of older children were infected with hookworm. High prevalence of intestinal parasites in a community is a reflection of the level of personal hygiene and fecal contamination of the living environment.

The recommended child to caregiver ratio in orphanages was set at 3-4:1 (UNICEF, 2008) as against the average of 8:1 observed in this study. Orphanages with higher child to caregiver ratio also recorded higher proportion of intestinal helminthiasis in a study (UNICEF, 2008). Chronic intestinal parasitic infection in a vulnerable population (such as orphanage homes) will not only jeopardize the health of the children, but will also make them susceptible to other diseases (Adeyeba and Tijani, 2002; Hotez, 2004).

Parasitic helminthes are endemic in Nigeria, possibly owing to poor environmental sanitation, and contamination of water. Malnutrition and intestinal parasitic infections are common public health problems of children in developing countries (Amuta *et al.,* 2013). It is typically caused by a combination of inadequate food intake and infection which impairs the body's ability to absorb or assimilate food. This may become more complicated in parasitic co-infections among the children. Also, infections can contribute to malnutrition which in turn can result in delayed growth. However, low BMI in orphanage homes is not associated with parasitic infections in this study. It may rather be linked to nutritional status of the children.

However, when the children were grouped into different age ranges and their BMI were analyzed, 14 (8.1%) of the children were found to be underweight. As there were no underweight children in the community based

children, low BMI might be pointing to the level of care giving to the orphanage children.

The assertion by some authors that children in orphanages could be at higher risk of both intestinal helminthiasis and under-nutrition due to the poor level of care offered to the children in the orphanages (Borekci and Uzel, 2009) is upheld by the findings of this study.

CONCLUSION

The prevalence of intestinal parasitic infection was significantly higher in orphanage homes in Anambra State than in children cared for in family setting. Children in family setting may be healthier and thrive better than those in orphanage homes.

References:

Adeyeba, O. A. and Tijani, B. D. (2002). Intestinal helminthiasis among malnourished school age children in peri-urban area of Ibadan, Nigeria. *African Journal of Clinical and Experimental Microbiology* **3**:24-28.

Albeiro, R. (2011). Empty the orphanages. Retrieved 14th April, 2012 from: emptytheorphanages.org/2011/orphanages-should-be-a-last-resort.

Al-Shibani, L. A., Azazi, A. A. and El-Taweel, H. A (2009). Cryptosporidiosis and other intestinal parasites in 3 Yemeni orphanages: prevalence, risk, and morbidity. *Journal of Egyptian Society of Parasitology*. **39**(1): 327-337.

Amuta, E., Olusi, T. and Houmsou, R. (2008). Relationship of intestinal parasitic infections and malnutrition among school children in Makurdi, Benue State, Nigeria. *The Internet Journal of Epidemiology*. **7** (1). Retrieved from http://ispub.com/IJE/7/1/7618.

Awasthi, P. and Pande, V. K. (1997). Prevalence of malnutrition and intestinal parasites in pre- school children in Lucknow. *Indian Journal of Paediatrics*. **34**:7-12.

Borekci, G, and Uzel, A. (2009). The determination of intestinal parasites, physical growth and hygiene behaviours of children in the Mersin City Social Service Child Care Centre. *Turkiye Parazitoloji Dergisi*. **33** (1): 63-72.

Cheesbrough, M. (2000). District laboratory practice in Tropical countries (Part 2). Doddington, Cambridgeshire, United Kingdom: Tropical Health Technology.

Cole, T. J., Bellizzi, M. C., Flegel, M. and Dietz, W. (2000). Establishing a standard definition for child overweight and obesity worldwide: international survey. *British Medical Journal*. **320**: 1-6.

Enekwechi, L. C. and Azubike, C. N. (1994). Survey of the prevalence of intestinal parasites in children of primary school age. *West African Journal*

of Medicine. **13** (4): 227-230.
Ezeamama, A. E., Friedman, J. F., Acousta, L., Bellinger, D. C., Langdon, G. C., Manalo, D. L… and McGarvey, S. T. (2005) Helminthes infection and cognitive impairment among Filipino children. *American Journal of Tropical Medicine and Hygiene*. **72** (5): 540-548.
Francis, J., Reed, A., Yahannes, F., Donard, M. and Fournier, M. (2002). Screening for tuberculosis among orphans in a developing country 2 3. *American Journal of Preventive Medicine*. **22** (2): 117-119.
Hadidjaja, P., Bonang, E., Suyardi, M. A., Abidin, S. A., Ismid, I. S. and Margano, S. S. (1998). The effect of intervention on nutritional status and cognitive function of primary school children infected with *Ascaris lumbricoides*. *American Journal of Tropical Medicine and Hygiene.* **59**: 791-795.
Hotez, P. J. (2004). Hookworms (Ancylstoma and *Necator americanus*). In: Behrman R. E, Kliegman R. M, Jenson H. B (eds). Nelson textbook of paediatrics, (17th ed), (Pp 1156-1158) Philadelphia, Pennsylvania: Saunders the Curtis centre.
Maruf, F. A., Aronu, U., Chukwuegbu, K. and Aronu, A. E. (2013). Influence of gender on prevalence of overweight and obesity in Nigerian school children and adolescents. *Tanzanian Journal of Hearth Research*. **15** (4): 1-5.
Nwaneri, D. U. and Omuemu, V. O. (2013). Intestinal helminthiasis and nutritional status of children living in orphanages in Benin City, Nigeria. *Nigerian Journal of Clinical Practice*. **16**: 243-248.
Ogbe, M. G. and Ado, O. O. (1990). Intestinal helminthiasis in an orphanage in Nigeria. *Biosience Research Communication* 2: 105-118.
Okolo, S. N, and John, C. (2006). Nutritional status and intestinal parasitic infestation among rural Fulani children in Vom, Plateau State. *Nigerian Journal of Paediatrics* **33**: 47-55.
Tamramat, I. R. and Olowu, A. O. (2008). Study on prevalence and nutritional effect of helminthic infection in pre-school rural children in Nigeria. *Nigerian Journal of Medical Practice* **54**:16-20.
UNICEF (2008). State of the world children 2008- Child survival. UNICEF. Retrieved 10th September, 2012 from http://www.unicef/org/sowc08.
Whetten, K., Ostermann, J., Whetten, R. A., Pence, B. W., O'Donnell, K., Messer, L. C… and the Positive Outcomes for Orphans (POFO) Research Team, (2009). A comparism of the wellbeing of orphans and abandoned children ages 6-12 in institutional and community-based care setting in 5 less wealthy nations. Ho, J. (edr). Retrieved from: doi: 10.1371/journal.pone.0008169.