GLOBAL JOURNAL OF PURE AND APPLIED SCIENCES VOL. 13, NO. 3, 2007: 415 - 419
 1SSN 1118-0579

GASTROINTESTINAL PARASITES ASSOCIATED WITH THE STOOLS OF BOTTLE- FED BABIES IN BENIN CITY, NIGERIA

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(Received 3 June 2004; Revision Accepted 6 November 2006)

ABSTRACT

A study was carried out to determine the gut parasites commonly associated with bottle-fed children in Benin City. Stool samples (n=840) were collected from bottle- fed babies aged 0- 2 years for a period of twelve months (January to December). A total of 593 (70.6%) of the subjects were symptomatic newly admitted children in two public hospitals. Macroscopic and microscopic examination of faecal samples by conventional methods revealed six parasites with varying prevalences. The parasites were *Ascaris lumbricoides (18%), Trichuris trichiura* (13.3%), *Ancylostoma duodenale* (4.8%), *Strongyloides stercoralis* (1.9%), *Entamoeba histolytica* (0.8%) and *Giardia lamblia* (0.6%). The highest prevalence (17.8%) was observed in babies aged 6-11 months, while the lowest (2.1%) was found in 0-5 months old. Some of the macroscopic appearances of the stool samples seemed to be related to the presence of certain parasites. Most of the stools had low egg counts (0-200 eggs/g stool) for *A. lumbricoides, T. trichiura* and *A. duodenale.* Four percent of the samples had high egg count (over 400 eggs/g stool) for *A. lumbricoides.* The infection rate in male babies was higher than in females (22.8% and 16.6%, respectively). Sex distribution of parasites in symptomatic versus asymptomatic babies did not follow a definite pattern. This study reveals a high prevalence of gastrointestinal parasites in bottle-fed children in Benin City. The 'Baby friendly' practice which encourages sole breast-feeding from 0-1 year is advocated as this will likely reduce the prevalence rates of these parasites.

KEYWORDS: Gastrointestinal parasites, bottle- feeding, babies, Nigeria.

INTRODUCTION

Infestation of the human gut by protozoa and helminthes with its socio-economic effects is a major problem the world over (Awogun, 1981, Aboh. 1990). Predisposing factors for gastrointestinal parasitosis in human such as unhygienic method of food preparation and malnutrition (Curtale *et al,* 1996; de Silver *et al.* 1998) abound in bottle- feeding.

Well-nourished children are more resistant to parasitic infections than malnourished children (Enweani and Igunbor, 1997; Ekhaise and Isikhuemhen 1997; Malaty *et al.* 2001). Relatively, bottle-fed children are more malnourished with a correspondingly lower disease resistance than the exclusively breast-fed (Mikiel-Kostyra, 2000; Dell and To, 2001).

This study was undertaken to determine the types and prevalence of gastrointestinal parasites associated with bottle-fed children in Benin City.

MATERIALS AND METHODS

Collection of stool samples

A total of 840 stool samples collected in sterile plastic universal bottles from partially bottle-fed babies aged 0-2 years, from January to December, 2000, in Benin City, Nigeria, were examined. Out of this number 593 (70.6%) were from symptomatic newly admitted babies in the University of Benin Teaching Hospital (UBTH) and the Central Hospital, while 29.4% were collected from randomly selected asymptomatic children of volunteer mothers, outside the hospital (which served as control). Age and sex of child were recorded at collection time.

Examination of stool samples

Samples were examined macroscopically (Garcia, 2001). Stool smears were then examined microscopically under the X10 and X40 powers of an optical microscope for the presence of motile protozoa, cysts, oocysts and ova (Sachs *et al,* 2000). Stool samples were examined within three hours after collection so as to allow detection of all forms of parasites. The sedimentation by Formol-Ether procedure (a concentration method that allows maximum detection of parasites in stool) was used according to the description of Blacklock and Southwell (1977). Briefly, 1g of stool sample was emulsified with a wooden applicator in 10ml of sterile distilled water and the mixture was passed through a wire mesh in a funnel. The filtrate was collected in a centrifuge tube. This filtrate was centrifuged at 2000 rpm for 3 minutes and the supernatant was added to residue and manually shaken vigorously. This was followed by centrifugation at 2000 rpm for 2 minutes. The fatty acid interface was loosened with a sterile swab stick and the supernatant was removed together with the fatty debris. The sediment was mixed with the little leftover fluid in the tube. Sample was examined with an optical microscope. Egg count (egg load per gram) was determined for egg positive samples containing helminth ova.

For egg count, the quantitative method called Stoll's method was used. Three grams of each stool sample were added to 45ml of sterile distilled water in a stoppered bottle containing glass beads (for hard stool, 0.1N NaoH solution was substituted for water) and the bottle was shaken vigorously until the sample had completely disintegrated. The suspension was then stirred to ensure even suspension of eggs. Then 0.2ml of stool suspension was immediately transferred with a pipette onto a clean grease-free microscope slide and covered with a slip. All eggs under the cover slip (and sometimes those in any excess fluid on the slide but outside the cover slip) were counted. Three smears of each sample were examined and the mean calculated. Prevalence of parasites in symptomatic and asymptomatic children as well as sex specific distribution of parasitosis among the children were determined.

RESULTS

A total of 336 samples (39.4%) were positive for parasites. The infection rates were in the descending order – *Ascaris* >*Ancylostoma* >. *Strongyloides* > *Entamoeba* > *Giardia* (Fig. 1). This pattern of infection was consistent in both symptomatic and asymptomatic cases. The age group 6-11 months had the highest prevalence (28.9% for symptomatic and 10.1% for asymptomatic), while 0-5months had 4.6% for symptomatic and 1.4% for asymptomatic (Fig.2). Four macroscopic appearances of stools were distinguished,

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namely, Formed (1), Soft, with no blood or mucus (2), Soft with blood and mucus (3) and Watery (4) (Tab. I). Male children generally had higher prevalence rates in both symptomatic and asymptomatic cases but the sex specific distribution of the different parasites in these two groups of children was insignificant ($p \leq 0.05$) as shown in Tab. II . Most of the samples had low egg counts (0-200 eggs/g stool) while high counts (> 400 eggs/g stool) for *A. lumbricoides* were observed in 4% of the total samples (Tab.3).

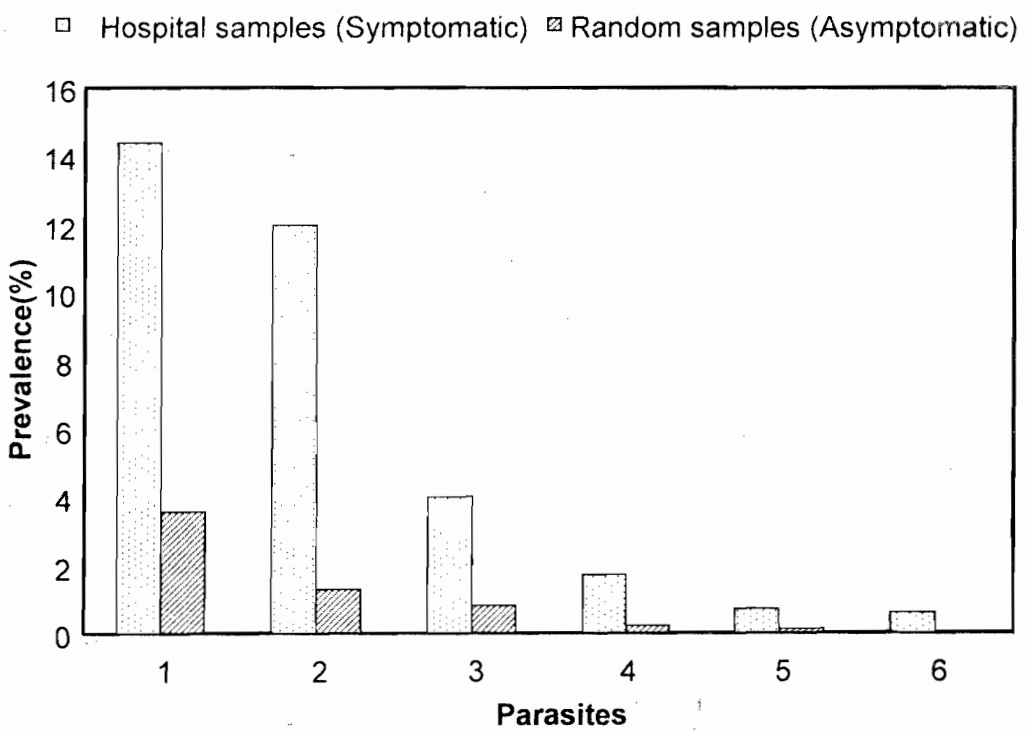

Figure 1: Prevalence rates of gastrointestinal parasites in 840 symptomatic and asymptomatic bottle-fed children. 1 = *A. lumbricoides*; 2 = *T. trichiura*; 3 = *A. duodenale*; 4 = *S. stercoralis*; 5 = *E. histolytica*; 6 = *G. lamblia*.

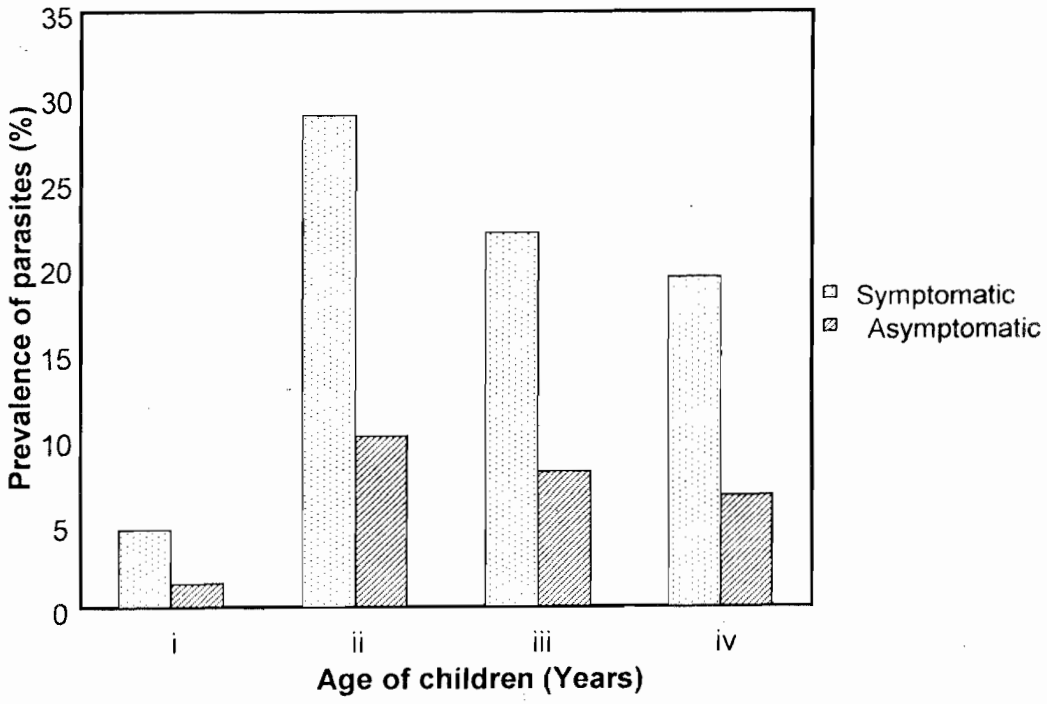

Figure 2: Prevalence of gastrointestinal parasites among 840 bottle-fed babies in different age groups (i = 0-5; ii = 6-11; iii = 12-17; iv = 18-24 years).

Table 1: Macroscopic appearances of parasite-positive samples

Percentage** of parasite positive samples in which were present							
Macroscopic appearance type * in total (336) samples	*A. lumbricoides*	*T. trichiura*	*A. duodenale*	*S. stercoralis*	*E. histolytica*	*G. lamblia*	**Total**
1 (n= 149)	9	4	0.8	Absent	Absent	Absent	**13.8**
2 (n= 105)	5	6	1	Absent	Absent	0.1	**12.1**
3 (n= 34)	4	3.3	3	1.1	Absent	0.4	**11.8**
4 (n= 48)	Absent	Absent	Absent	0.8	0.8	0.1	**1.7**
Total	**18.0**	**13.3**	**4.8**	**1.9**	**0.8**	**0.6**	**39.4**

*
1 = Formed stool
2 = Soft with no blood or mucus
3 = Soft with blood and mucus
4 = Watery
** Based on number of each type of parasite in total sample (336).

Table 2: Prevalence of gastrointestinal parasites in 840 male and female children

Parasite	Prevalence (%)				
	Symptomatic		Asymptomatic		**Total**
	Male n=301	Female n =292	Male n =119	Female n = 128	
A. lumbrico.	4.9	3.0	5.9	4.8	**18.0**
T. trichiura	3.8	4.5	3.3	1.7	**13.3**
A. duodenale	2.3	0.8	1.1	0.6	**4.8**
S. stercoralis	0.7	0.5	0.5	0.2	**1.9**
E. histolytica	0.3	0.2	0.2	0.1	**0.8**
G. lamblia	0.1	0.15	0.3	0.05	**0.6**
Total	**12.1**	**9.15**	**11.3**	**7.45**	**39.4**

Table 3: Egg Counts of parasite positive samples

Egg Count (Number of eggs/g faeces)	Number of egg positive samples		
	A. lumbricoides	*T. trichiura*	*A. duodenale*
Low (0-200) [n=38]	18	16	4
Moderate (201-400) [n=15]	15	None	None
High (over 400) [n=4]	4	None	None
Total samples	**37**	**16**	**4**

DISCUSSION

The high rate 39.4% of infection may be attributed to the fact that the studied area, Benin City, is inhabited by mostly low-income people. Also, many parts of this city are slums with poor drainage and refuse disposal systems both of which favour the propagation of these helminthes and protozoa and serve as breeding sites for cockroaches, rats and flies serve as vectors for eggs of *A. lumbricoides, A. duodenale, T. trichiura*, and cysts of *E. histolytica* and *G. lamblia*. A total prevalence of 35% for gastrointestinal worms was reported for children 0-16 years (Garcia, 2001). The prevalence rate (18%) for *A. lumbricoides* is close to the figure (15.2%) reported by Oyerinde (1989) in his work carried out at the University of Lagos Teaching Hospital. Also, Lee *et al* (1999) reported that *Ascaris* was the commonest intestinal helminth in children. The prevalence of *T. trichiura* is in agreement with the 11.7% reported by Alakija (1986). Although Onadeko and Ladipo (1989) reported a prevalence of 1.0% as against 1.9% recorded in this work for *S. stercoralis*, the prevalence (3.0%) reported by Holland *et al* (1989) is significantly higher.

The prevalence of *Ancylostoma* is also in consonance with the 4.2% reported by Sridhar *et al* (1999). Relatively low prevalence rates than reported earlier were observed for *Entamoeba* and *Giardia*. These are 4.9% and 7.9% (Oyerinde, 1989) for *E. histolytica* and *G. intestinalis*, respectively. These discrepancies might have arisen as a result of regional differences. Lagos is a more populous and congested city with poorer refuse disposal systems in some many areas, and poor accessibility to safe drinking water, than Benin City. Poor environmental and food hygiene and lack of regular antihelminthic therapy might have contributed to the prevalences of these parasites. Also, feeding bottles can drop off children's mouths or get in contact with flies as the children move about with them. The main mode of infestation by *Ancylostoma* is by penetration of unbroken skin by infective larvae in the soil. Since the sampled children were 0-2 years, majority of them could not have been exposed to contaminated soil for, at this age range, they are kept under the surveillance of adults or older children who check their movement.

The highest prevalence of gastrointestinal parasites was found in the age group 6-11months (37.8%) while 0-5 months had 6.0% prevalence rate. A prevalence of 11.1% reported by Aksoy *et al* (2003) in children aged 0-2 years is quite low. Geographical location and environmental hygiene might have played a role in the higher prevalence found in Benin City. Also, the 35% prevalence rate of gastrointestinal parasitosis reported by Agbere *et al* (1995) is low though close to the figure in our study since the authors surveyed a larger age group (0-16 years). Again, environmental hygiene might have contributed to this difference. Moreover, the population sampled by these authors was not specifically breast- fed or bottled –fed children. The age 6-17 months is the peak period for bottle feeding. At 6 months of age, the baby was already being offered the feeding bottle, and it could hold on to the bottle. As the age increased the child could walk and move about with the bottle, with the risk of easy contamination. At age 0-5 months the baby was fed (mainly breast–feeding) with more care and attention, hence the low prevalence.

Garcia (2001) had used the macroscopic methods employed here and also noted the appearances as observed in this present study. Stools positive for *S. stercoralis, E. histolytica* and *G. lamblia* were soft (with or without mucus and blood) or watery, while those positive for *A. lumbricoides, T. trichiura* and *A. duodenale* were not watery at all. This specificity in stool appearance agrees with what is commonly observed in clinical practice.

Egg counts were generally low (0-200 eggs/g stool). *A lumbricoides* had the highest egg- positive samples (37), which was significantly higher than those of *T trichiura* (16) and *A. duodenale* (4). For *A. lumbricoides*, 18 samples had low egg count, 15 with moderate (201-400 eggs/g stool) and 4 with high (>400 eggs/g stool) counts. Eggs of *A. lumbricoides* abound in soil contaminated with stool of infested persons and could have been transmitted to the children through food handling and preparation, unhygienic water source and by vectors such as houseflies and cockroaches.

In this part of the world there is the general practice of giving male children more medical attention than females due to gender bias. More males than females were probably brought to the hospital. Although the prevalence of infection in male and female children did not follow a definite pattern among the symptomatic, the prevalence in male children was consistently, though insignificantly, higher in the asymptomatic.

There is a high prevalence rate of gastrointestinal parasites among bottle- fed children in Benin City. Adoption of the 'Baby-friendly' practice, which encourages sole breast-feeding for babies from 0-1 year, may reduce the prevalence of these parasites because feeding bottle is prone to contamination during food preparation and feeding. Regular antihelminthic therapy in this age group and general enlightenment of the public on factors, which promote infestation by these parasites in Benin City, are recommended.

ACKNOWLEDGEMENT

We are grateful to staff of the hospitals in which samples were collected. We also thank the volunteer mothers.

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