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Epidemiological Studies of Intestinal Helminthes and Malaria among Children in Lagos, Nigeria

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Abstract: Of the 1177 randomly surveyed children, 46.8% had parasitic infections, four types of helminthes, *Ascaris lumbricoides* (29.7%), *Trichuris trichiura* (18.4%), hookworm (0.7%), *Strongyloides stercoralis* (0.3%); and the malarial stages, trophozoites (34.3%) and gametocytes (2.0%). Highest prevalence of 58.25% was observed in the 0-2 years. Both *Ascaris* and *Plasmodium* had peak intensities in children aged 2-4 years; another peak for *Ascaris* in 8-10 years old. There was positive correlation between the age groups and the prevalence of *A. lumbricoides* and *T. trichiura* (both $p<0.05$), difference in other parasites were not significant. Males had higher prevalence of 52.8% than females 45.8%. Difference in prevalence between sexes was only significant in ascariasis ($p< 0.05$). Pit latrine users were the most infected (51.43%) while the water closet users were the least (33.28%). Children who drank well water regularly had the highest infection rate (43.5%). Intensity of malaria was highest in children whose families used nets only, lowest in those who combined insecticides, coils and nets. Sixty seven percent of infected cases were single infections while 29% were mixed infections.

Key words: Malaria, intestinal helminthes, habits, children, Nigeria

INTRODUCTION

Human intestinal helminthes and malaria are among the most common infections occurring throughout the developing world. These infections have been associated with low standard of sanitation, poor habits, low level of education or illiteracy and low socio-economic class. It is estimated that more than one billion people in the world are infected annually by Soil-Transmitted Helminthes (STH), mainly *Ascaris lumbricoides*, hookworms and *Trichuris trichiura* (Crompton, 1999). There have been several reports from various parts of Nigeria on human intestinal helminthes, including those of Adeyeba and Akinlabi (2002), Ogbe *et al.* (2002) and Ukpai and Ugwu (2003), which recognized them as important health problems especially among young children. Several epidemiological studies have indicated a high prevalence rate of intestinal infections among Nigerian children (Agbolade *et al.*, 2004). Parasitic diseases in association with nutritional imbalance was known to cause about 20.7% mortality in Lagos (Ejezie, 1983). At present, at least 300 million people are affected by malaria globally and there are between 1-1.5 million deaths by malaria per year. Malaria is endemic in tropical Africa, with an estimated 90% of the total malaria incidence and deaths occurring there, particularly amongst children aged under five and pregnant women, especially in areas where transmission is intense (Arrese, 2001). The World Health Organization (WHO) recommends a baseline survey in school children to determine the prevalence and intensity of infections (Montresor *et al.*, 1988) and develop effective treatment strategies and case management options (Andrade *et al.*, 2001). This study was carried out to determine the prevalence and intensity of intestinal parasites and malaria among children in Lagos and to correlate the findings to child's hygienic status, habits and environmental sanitation. The outcome of the study would help to provide basis for the development of control program that can improve the health status of Nigerian children, their home environment and personal hygiene.

MATERIALS AND METHODS

A total of 1177 randomly selected children from pupils of Nursery and Primary Schools in the Mainland and Lagos Island Local Government areas of Lagos State and outpatients of Massey Street Children Hospital,

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Lagos Island and Lagos University Teaching Hospital, Idi-Araba, Lagos, were examined for intestinal helminthes and malaria parasites. Informed consent was obtained from all human adult participants and from the parents. Plastic containers, appropriately labelled, were given to each child for collection of fecal sample. Each sample was first examined for its consistency, colour and presence of blood, mucous, adult worms and proglottides of tapeworms, with the aid of an applicator stick. Further examination was by the use of the Kato-Katz method. Eggs were recognized by their outstanding characteristics. The number of eggs per gram of faeces was calculated by multiplying the number of the eggs counted by 24. Questionnaires, aimed at obtaining personal data and information on habits and sanitary conditions, were administered to the mothers of the outpatient children. In order to screen for malaria parasite, *Plasmodium* species, thin and thick blood smears were prepared, stained with Giemsa stain and viewed under an oil immersion objective. Number of parasites per ul of blood was calculated as:

$$\frac{\text{Number of parasites}}{\text{Number of white blood cells}} * 6{,}000 \text{ leucocytes per } \mu L$$

Number of white blood cells: N.B: 6,000 is the standard WHO count used for children (WHO, 1988).

RESULTS

The results of this study showed the occurrence of 4 helminth parasites, namely, *Ascaris lumbricoides* (29.7%), *Trichuris trichiura* (18.4%), hookworm (0.7%) and *Strongyloides stercoralis* (0.3%); along with trophozoite (34.3%) and gametocyte stages (2.0%) of the malaria parasite, *Plasmodium falciparum*. Thus, malaria was the most prevalent infection and *Ascaris lumbricoides* was the most prevalent helminth. The overall prevalence of parasitic infection in the community was 46.8%.

The highest infection rate, 58.25%, was observed in the 0-2 years age group while the lowest was in 10-12 years old (17.65%) (Fig. 1). The prevalence of infection decreased from 0.1 to 8.0 years and then slightly increased in 8-10 years before decreasing in 10-12 years (Fig. 1). There was positive correlation between the age groups and the prevalence of *A. lumbricoides* and *T. trichiura* (both $p<0.05$), difference in other parasites were not significant.

Overall, prevalence of infection was higher in the males (52.81%) than in the females (45.80%), infection rate being highest in children between 0 and 2 years. This difference, however, was only significant in *A. lumbricoides* infection ($p<0.05$). Differences between males and females follow similar pattern to those of both sexes (Fig. 2). Ascariasis and trichuriasis were the only infections observed in children above 6 years, as shown in Fig. 2.

The highest mean intensity was found in infections with *Ascaris*, followed by trophozoites of the malaria parasite, *P. falciparum*. Intensity of ascariasis had two peaks, in children aged 2-4 and 8-10 years (Fig. 3). Malaria parasite (trophozoites) also had its peak in children aged 2-4 years while *Trichuris* peak infection occurred in age 6-8 years; no malaria parasite was recorded in children over 6 years of age, as shown in Fig. 3. Hookworm infection was recorded only in children below 4 years while *Strongyloides* infection was observed only in children less than 2 years of age (Fig. 3). The intensity of infection in males and females varies with different parasites, however, the pattern of the intensity is similar to that of both sexes as shown in Fig. 3.

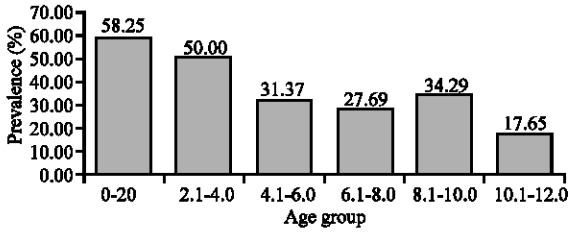

Fig. 1: Age group and frequency of infection

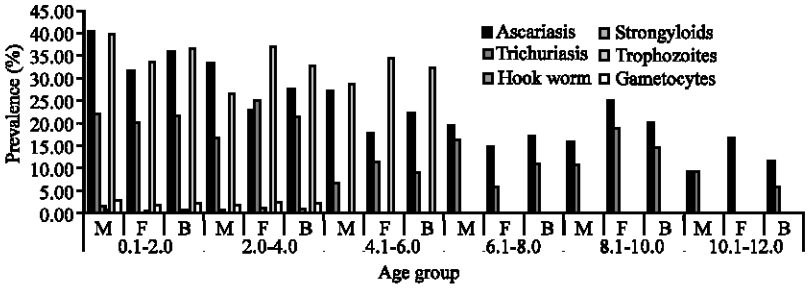

Fig. 2: Age and sex in relation to prevalence of infection

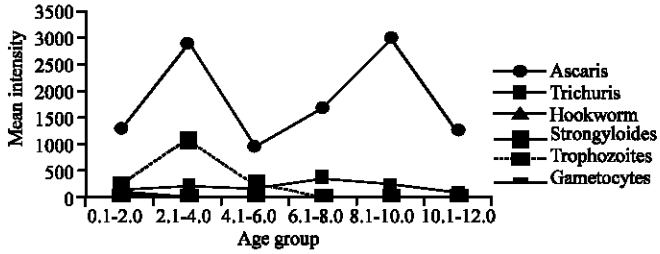

Fig. 3: Age and sex in relation to mean intensity of infection

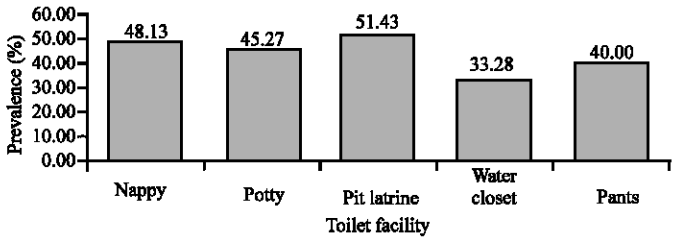

Fig. 4: Prevalence of helminth infection relative to type of toilet facility

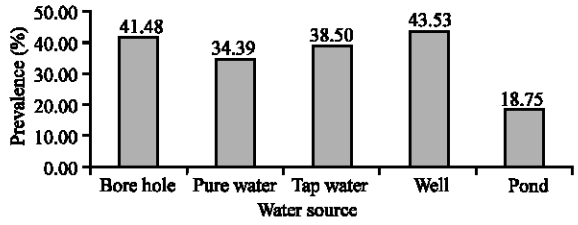

Fig. 5: Prevalence of helminth infection in relation to water source

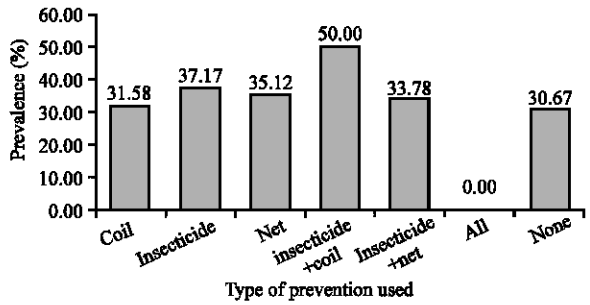

Fig. 6: Prevalence of malaria infections relative to type of prevention used

It was observed that in all the infections, children below four years generally had higher intensities of infections, compared to those above six years of age with fewer infections, except in ascariasis.

The relationship between the prevalence of helminth infection and the type of toilet facility was examined. Individuals who used the pit latrine were the most infected (51.43%); those who made use of the water closet had the lowest rate of infection (33.28%), as shown in Fig. 4. Children infected with *A. lumbricoides* and *T. trichiura* showed significant differences with type of toilet system used ($p<0.05$).

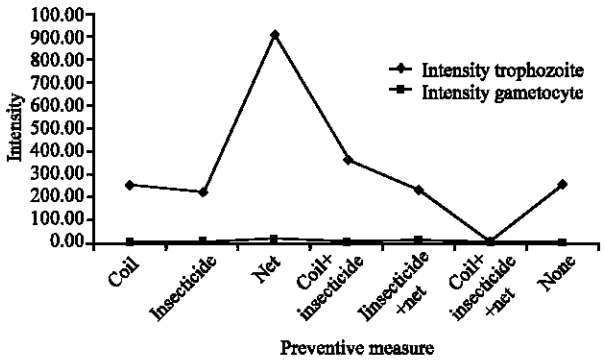

Fig. 7: Intensity of malaria relative to type of prevention used

Children, who used the well as their major source of drinking water, had the highest infection rate (43.5%), followed by those who drink from bore holes (41.5%), tap water (38.5%) and pure water (34.4%, Fig. 5). Children who drank from open water bodies, such as the pond, had the lowest infection rate (18.8%). No significant difference was observed between the level of infection and the different water sources ($p>0.05$).

Children in families who used insecticides with coils as a preventive measure against malaria had the highest infection rate (50.0%), followed by those using insecticides alone (37.2%), nets (35.1%), insecticides with nets (33.8%) and coils (31.6%), as shown in Fig. 6. Those who used none had an infection rate of 30.7%, while no malaria infection was recorded in those who used all the types of preventive measures examined. Interaction between the protective measure used and prevalence of infection was not significant ($p>0.05$). Intensity of

infection was highest in children whose families used nets alone, lowest in those who combined all types of preventive measures-insecticides, coils and nets (Fig. 7). Sixety seven percent of all infected cases were single infections, while 29% were mixed infections. *A. lumbricoides* was mostly associated with other parasites.

DISCUSSION

This study showed that *Plasmodium falciparum* and *Ascaris lumbricoides* infections were the most widespread in the study area. The overall prevalence of infection recorded (46.8%) was high because *Plasmodium falciparum* morbid and fatal risks are considerably higher in areas supporting parasite prevalence≥25%, when compared with low transmission areas supporting parasite prevalence below 25% (Omumbo *et al*., 2004). The higher prevalence of *A. lumbricoides* (29.74%) compared to that of hookworm (0.68%) agreed with some previous reports (Adeyeba and Akinlabi, 2002; Agbolade *et al*., 2004), but different from others (Nwaorgu *et al*., 1998). The highest infection rate recorded in 0-2 years old children was not surprising as children of this age are well-exposed to parasitic infections. Both *Ascaris* and malaria parasite had peak intensities in children aged 2-4 years, although *Ascaris* had another peak in children of 8-10 years. Children less than 4 years old may contact infections during intense activities and adventure such as crawling or walking on bear ground, sand or grass. Transmission of infection can also be during outdoor play with no slippers or shoes on soil contaminated with feaces. Some of the children might have contacted infection through ingestion of helminth eggs in contaminated food or drinking water and eating with or licking unwashed contaminated hands/fingers, clothing or air, especially during outdoor play in the soil. Combination of defaecating in open spaces, playing in soil and the geophagus habit of the children could be a good source of high helminth infections (Etim and Akpan, 1999).

In addition, inadequate toilet facilities and unhygienic behaviour all work together to enhance disease transmission, as those drinking well water and using pit latrines had the highest prevalence of helminthic infections. The presence of *Trichuris trichiura* infection is predictable, however low, since such unhealthy environmental conditions generally influence its endemicity (Ukoli, 1984). The low prevalence of *Strongyloides stercoralis* larvae in faeces agreed with previous study (Wariso and Ibe, 1994). All infections recorded were not sex-dependent in conformity with previous reports (Agbolade *et al*., 2004; Egwunyenga and Ataikiru, 2005), except for that of ascariasis which was statistically significant. Generally, prevalence of infection decreased as age increased suggesting improved level of personal hygiene as the child matures. It is apparent that good toilet facilities and drinking water help reduce prevalence and intensity of helminthic infection. Actions designed to bring about interruptions of transmission will lead to long-term success in the control of intestinal parasitic infections (WHO, 1987). Level of malaria was observed to be high despite the use of mosquito nets by 50% of subjects, insecticides (39%) and coils (12%). In this study, combination of all types of malaria preventive measures proved best in reducing the prevalence of malaria to zero. This shows that only integration of malaria control methods can eradicate malaria, especially in tropical Africa. Almost one-third of all the infections recorded in this study were mixed infections, mostly with *Ascaris lumbricoides*. This level of multiple infections will justify the use of broad spectrum anthelminthics in the management of helminthiasis among children in Lagos State in particular and Nigeria in general. 49.1% multiple infections was recorded among the infected population in Ibadan, Nigeria (Dada-Adegbola *et al*., 2005). Therefore, mass chemotherapy and integrated measures of parasitic control would be of utmost importance in reducing the level of infections among children.

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REFERENCES

Adeyeba, O.A. and A. Akinlabi, 2002. Intestinal parasitic infections among school children in a rural community, southwest Nigeria. Nigerian J. Parasitol., 23: 11-18.

Agbolade, O.M., D. Akinboye and A. Awolaja, 2004. Intestinal helminthiasis and urinary schistosomiasis in some villages of Ijebu North, Ogun State, Nigeria. African J. Biotechnol., 3: 206-209.

Andrade, C., T. Alava, I. Palacio, P. Del Poggio, C. Jamoletti, M. Gulletta and A. Montresor, 2001. Prevalence and intensity of soil-transmitted Helminthiasis in the city of Portoviejo (Ecuador). Mem. Inst. Oswaldo Cruz., 96: 1075-1079.

Arrese, C., 2001. Malaria: Its human impact, challenges and control strategies in Nigeria. Harvard Health Policy Review, 2: 2.

Crompton, D.W.T., 1999. How much human helminthiasis is there in the world. J. Parasitol., 85: 397-403.

Dada-Adegbola, H.O., A.O. Oluwatoba and C.O. Falade, 2005. Prevalence of multiple intestinal helminths among children in a rural community. Afr. J. Med. Sci., 34: 263-267.

Egwunyenga, O.A. and D.P. Ataikiru, 2005. Soil-transmitted helminthiasis among school age children in Ethiope East Local Government Area, Delta State, Nigeria. African J. Biotechnol., 4: 938-941.

Ejezie, G.C., 1983. The Nigerian environment and parasitic infections. Folia Parasitol., 30: 89-95.

Etim, S.T. and P.A. Akpan, 1999. Studies on geography as risk factors for geohelminthiases in Calabar, Cross-River, Nigeria J. Parasitol., 20: 91-98.

Montresor, A., D. Crompton, A. Hall, D. Bundy and L. Savioli, 1988. Guidelines for the evaluation of soil-transmitted helminthiasis and schistosomiasis and community level. A guide for managers of control programmes. World Health Org. Geneva, pp: 1-45.

Nwaorgu, O.C., J. Okeibunor, E. Madu, U. Amazigo, N. Onyegegbu and D. Evans, 1998. A school-based schistosomiasis and intestinal helminthiasis control programme in Nigeria: Acceptability to community members. Trop. Med. Int. Hlth., 3: 842-849.

Ogbe, M.G., Edet and M. Isichei, 2002. Intestinal helminth infection in primary school children in areas of operation of Shell Petroleum Development Company of Nigeria (SPDC), Western Division in Delta State. Nig. J. Parasitol., 23: 3-10.

Omumbo, J.A., S.I. Hay, C.A. Guerra and R.W. Snow, 2004. The relationship between the *Plasmodium falciparum* parasite ratio in childhood and climate estimates of malaria transmission in Kenya. Malaria J., 3: 17.

Ukoli, F.M.A., 1984. Introduction to parasitology in Tropical Africa. John Wiley and Sons Ltd., Chichester.

Ukpai, O.M. and C. Ugwu, 2003. The prevalence of gastro-intestinal tract parasites in primary school children Ikwuano Local Government Area of Abia State, Nigeria. Nig. J. Parasitol., 24: 129-136.

Wariso, B.A. and S. Ibe, 1994. Prevalence of some intestinal helminths in Port Harcourt, University of Port Harcourt Teaching Hospital, Nigeria. West Afr. J. Med., 13: 218-22.

WHO., 1987. Prevention and control of intestinal parasitic infections. WHO Technical Report Series, 749: 7-83.

WHO., 1988. Malaria Diagnosis: Memorandum from the World Health Organization meeting Bulletin of the World Health Organization, 66: 575-594.