

INTESTINAL HELMINTHIASES AND THEIR CONTROL WITH ALBENDAZOLE AMONG PRIMARY SCHOOLCHILDREN IN RIVERINE COMMUNITIES OF ONDO STATE, NIGERIA

F Oyewole¹, F Ariyo¹, A Sanyaolu¹, WA Oyibo², T Faweya³, P Monye¹, M Ukpong¹ and C Okoro⁴

¹Central Public Health Laboraroy, Yaba, Lagos; ²Medcare Program for Afica, Lagos; ³Chevron Clinic, Lekki, Lagos; ⁴Smithkline Beecham, Lagos, Nigeria

Abstract. A study to establish the prevalence of intestinal helminthiases among schoolchildren of riverine communities in the Ilaje-Ese Odo Local Government Area of Ondo State, Nigeria was conducted. Ninety-four percent of the children studied were infected with intestinal helminths. *Trichuris trichiura* infection was the commonest (84%), followed by *Ascaris lumbricoides* (75.3 %) and hookworm (7.6 %). Dual helminthic infections were recorded, with *Ascaris-Trichuris* having the highest prevalence among the children. Poor environmental sanitation and personal hygiene combined with the absence of potable water and a lack of awareness of the effects of nematode infection were identified as the possible reasons for the high rate of infection. Treatment with albendazole (200 mg) brought about reductions in the level of *Trichuris trichiura* (to 41.7%), *Ascaris lumbricoides* (to 4.2%) and Hookworm (to 0.7%). The estimated rates of reduction were 94.4%, 49.7%, and 90.2% for *Ascaris lumbricoides*, *Trichuris trichiura* and hookworm respectively. Post-treatment helminthic reduction, as found in this study, is expected to enhance the mental and physical development of the children. Community mobilization with health education messages aimed at improving personal and community hygiene was initiated with an emphasis on creating a sustained reduction in the burden of helminthic infection.

INTRODUCTION

Intestinal helminths such as *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworm are among the most common infections of school-age children in developing countries. It is estimated that there are between one and one and a half thousand million of these worms in the world (Watkins *et al*, 1996).

Though the prevalence and intensity of infection in many countries reach a peak in the school-age group, helminthic infections are also known to have devastating effects on older children: nutritional deficiency, intestinal obstruction, prostrating anemia, chronic dysentery, rectal prolapse, respiratory complications, poor

weight gain, retarded growth and mental retardation (Bundy, 1994). Indeed ascariasis was the cause of pediatric intestinal obstruction in 5% to 35% of all cases in a comparison of studies conducted in the tropics (Pawlowski and Davies, 1989); moreover, rectal prolapse due to trichuriasis occurred in nearly 4% of children studied in the West Indies (Bundy and Cooper, 1989). In fact, World Health Organization (1987) estimates suggest that there are about 3.5 million cases annually of clinical disease associated with nematodes.

Studies in developing countries have shown that de-worming benefits the physical growth and fitness of children by partially reversing stunted growth (Thein-Hlaing *et al*, 1991; Cooper *et al*, 1992; Adams *et al*, 1994), improves appetite (Stephenson *et al*, 1993a,b), and enhances cognitive performance (Nokes *et al*, 1992). In addition, the treatment of children could lead to the reduction of infection in untreated adults simply by reducing the num-

Correspondence: Dr Wellington A Oyibo, Medcare Program for Africa, 203 Igbosere Road, Lagos, Nigeria.
E-mail: wellao@yahoo.com; wellao@theglobe.com

ber of transmission stages: this effect has been observed in the field (Bundy, 1990).

Riverine communities, often remote and inaccessible, may fail to attract the attention of researchers seeking to conduct intervention studies; in addition, few health personnel are willing to accept community health assignments in these areas. The communities may depend on a single source of drinking: this single source may also be used for washing and, unfortunately, as a latrine. For these reasons, this study was conducted; the study aimed to document the profile and the level of intestinal helminths among schoolchildren in the riverine communities of the Ilaje-Ese Odo Local Government Area of Ondo State, Nigeria, before and after chemotherapy with albendazole.

MATERIALS AND METHODS

This study was carried out among primary schoolchildren living in riverine communities of the Ilaje-Ese Odo Local Government Area of Ondo State, Nigeria. The communities situated adjacent to 1,076 schoolchildren of between 4 and 16 years of age were randomly selected from 24 primary schools in three major zones, namely Igbokoda, Ugbonla, and Arugbo. With the cooperation of the local authority and headmasters, the children, whose parents had given consent, were given pre-labeled plastic universal containers for stool collection. Health characteristics and personal hygiene and socio-economic information were obtained from the

pupils. This was done directly with the children or indirectly through their teachers. Focus group discussions and in-depth interviews were conducted with key informants: primary school teachers, community leaders, and a Public Health Officer.

Pre-treatment stool samples were obtained from the pupils and sent to the laboratory for parasitological examination. Following this, the children were de-wormed with a 200 mg dose of albendazole (tablets) and repeat stool samples were obtained two weeks post-treatment. Albendazole administration was supervised to ensure compliance. The pre- and post-treatment stool samples were prepared and examined microscopically using the Kato-Katz quantitative technique for the estimation of worm burden (Martin and Beaver, 1968). In addition, the WHO (1987) method of estimating the intensity of worm burden by establishing the number of eggs per gram (epg) was applied in the calculation of the intensity of infection. Data were analyzed using the EPI-INFO statistical package, Version 6.0. P-values less than 0.05 were regarded as significant.

RESULTS

One thousand and nine (94%) of the children examined were infected with intestinal helminths. In general, the worm burden was significantly reduced by the time of post-treatment evaluation (Table 1). The estimated reduction rate was 94.4% for *Ascaris*, 90.2 % for hook-

Table 1
Intestinal nematodes infections among primary school children in the Ilaje-Ese Odo Local Government Area of Ondo State, Nigeria: pre- and post-chemotherapy with albendazole.

Period	<i>Ascaris</i> No. (%)	<i>Trichuris</i> No. (%)	Hookworm No.(%)	Mixed Asc-Tri No. (%)	Mixed Asc-Hkw No. (%)
Pre-treatment	810 (75.3)	904 (84.0)	82 (7.6)	480 (65.0)	26 (0.4)
Post-treatment	45 (4.2)	449 (41.7)	8 (0.7)	8 (0.9)	0 (0)

Asc-Tri = *Ascaris* + *Trichuris* infection; Asc-Hkw = *Ascaris* + Hookworm infection.

worm and 49.7% for *Trichuris*.

Dual infections were different at pre- and post-treatment evaluation (Table 1): at pre-treatment evaluation, *Ascaris-Trichuris* infection was commonest (65%), while dual infection with *Ascaris*-hookworm (0.4%) was the least common. Furthermore, the estimation of worm intensity using the WHO (1987) criteria for egg count per gram (epg) showed that the children had light to moderate infection. The calculated pre-treatment epg were 4,790.6, 692.6, and 205.6 for *Ascaris*, *Trichuris*, and hookworm respectively while the epg at the post-treatment assessment were 1,817.9, 355.7 and 58.7 respectively.

Responses from questionnaires and interviews revealed that the main source of household drinking water in the communities was the river. This same source of water and the bushland that forms the banks of the river also serve as sites for waste disposal. Mass community de-worming has never been conducted before and fewer than 5% of the people had de-wormed themselves during the previous four years. The community members were familiar with worms but could not recognize the types or their clinical effects.

DISCUSSION

The Ilaje-Ese Odo Local Government Area of Ondo State consists mostly of riverine communities that are accessible only by boat or canoe. The importance of this study in these remote riverine communities, where the primary healthcare infrastructure is inadequate or non-existent, is obvious.

The 94% rate of infection with intestinal helminths among the schoolchildren in this study was high; this underscores the need for the institution of measures such as mass community mobilization with health education about disease prevention and general hygiene. The high prevalence of infection recorded in this study reflects the standard of hygiene in the communities. Previous studies have reported *Ascaris* as having a higher prevalence compared

with *Trichuris* (Holland *et al*, 1989; Akogun, 1989). The perception among community members that nematode infections are common and therefore pose an unimportant problem is unfortunate. Inadequate food intake and repeated infections have been recognized as two crucial factors that contribute to the poor health and impaired nutritional status of children in communities that cannot meet the basic needs for food, housing, clean water supplies, adequate sanitation, and good environmental and health care. It is, moreover, generally assumed that the nutritional status of children reflects indirectly the overall quality of life of the whole community (Shetty *et al*, 1994).

Though this study did not investigate the effect of helminths on mental and physical development, the schoolchildren studied were at risk of suffering from the other consequences of helminthic infection. Nematode infection, particularly hookworm infection, is associated with stunting of growth (Schad and Nawalinski, 1991) and anthelmintic therapy can partially reverse the effect (Stephenson *et al*, 1990; Thein-Hlaing *et al*, 1991). Chemotherapeutic intervention with albendazole in these communities would be of benefit to the schoolchildren because their worm burden, especially the highly prevalent *Ascaris* and *Trichuris*, decreased significantly with albendazole treatment. Nokes *et al* (1992), in their intervention studies, indicated that anthelmintic therapy results in significant improvement in the performance of some cognitive tests by children with moderate *T. trichiura* infection. It is possible, therefore, that the schoolchildren would have unhindered development if they continued with regular de-worming.

Intestinal helminthiasis will continue to be a public health concern in developing countries, especially in communities with poor personal hygiene, as long as people remain ignorant of the effects of the infection. A combination of improved environmental sanitation, personal hygiene, water supply and chemotherapy is recommended as a measure to control helminthiasis in these communities. Based on our findings, our study group initiated a community mobilization program to

educate parents and pupils about the direct and indirect benefits of regular de-worming.

ACKNOWLEDGEMENTS

Chevron Nigeria Limited and SmithKline Beecham Plc (Nigeria) jointly sponsored this study as part of a oil-producing-community development program. We are grateful for the efforts of the following staff of the Public Affairs Department, Chevron Nigeria Limited: S Omole, D Haastrup, Y Emiko and A Olukanni.

REFERENCES

- Adams EJ, Stephenson LS, Latham MC, Kinoti SN. Physical activity of growth of Kenyan Schoolchildren with hookworm, *Trichuris trichiura* and *Ascaris lumbricoides* infections are improved after treatment with albendazole. *J Nutr* 1994; 124: 1199-206.
- Akogun OB. Some social aspect of helminthiasis among the people of Gamau district, Bauchi State. *Nigeria J Trop Med Hyg* 1989; 92: 193-6.
- Bundy DAP, Cooper ES. *Trichuris* and trichuriasis in humans. *Adv Parasitol* 1989; 28: 107-73.
- Bundy DAP. New initiatives in helminth control. *Trans R Soc Trop Med Hyg* 1990; 84: 467-8.
- Bundy DAP. The global burden of intestinal nematode disease. *Trans R Soc Trop Med Hyg* 1994; 88: 259-61.
- Cooper ES, Whyte-Alleng CAM, Finzi-Smith JS, MacDonald TT. Intestinal nematode infections in children: the pathophysiological price paid. *Parasitology* 1992; 104: S91-S103.
- Holland CU, Asaolu SO, Crompton DWT, Stoddart RC, MacDonald R, Torimiro SEA. The epidemiology of *Ascaris lumbricoides* and other soil transmitted helminthes in primary schoolchildren from Ile-Ife, Nigeria. *Parasitology* 1989; 99: 75-85.
- Martin LK, Beaver PC. Evaluation of Kato thick-smear technique for quantitative diagnosis of helminth infection. *Am J Trop Hyg* 1986; 17: 382-91.
- Nokes C, Grantham-McGregor SM, Sawyer AW. Moderate to heavy infections of *Trichuris trichiura* affect cognitive function in Jamaican schoolchildren. *Parasitology* 1992; 104: 539-47.
- Pawlowski ZS, Davies A. Morbidity and mortality in ascariasis. In: Crompton DWT, Nesheim MC, Pawlowski ZS, eds. Ascariasis and its prevention and control. London: Taylor and Francis. 1989.
- Schad GA, Nawalinski TA. Historical introduction. In: Gilles HM, Ball PAJ, eds. Human Parasitic Diseases, Vol 4. Amsterdam: Elsevier. 1991.
- Shetty PS, James WPT, Farro-Luzzi A. Malnutrition in the community: recent concepts. *Trans R Soc Trop Med Hyg* 1994; 88: 612-4.
- Stephenson LS, Latham MC, Kinoti SN, Kurz KM, Brigham H. Improvements in physical fitness of Kenyan schoolboys infected with hookworm, *Trichuris trichiura* and *Ascaris lumbricoides* following a single dose of albendazole. *Trans R Soc Trop Med Hyg* 1990; 84: 277-82.
- Stephenson LS, Latham MC, Adams EJ, Kinoti SN, Pertet A. Weight gain of Kenyan schoolboys infected with hookworm, *Trichuris trichiura* and *Ascaris lumbricoides* is improved following once- or twice- yearly treatment with albendazole. *J Nutr* 1993a; 123: 656-65.
- Stephenson LS, Latham MC, Adams EJ, Kinoti SN, Pertet A. Physical fitness, growth and appetite of Kenyan schoolboys infected with hookworm, *Trichuris trichiura* and *Ascaris lumbricoides* are improved four months after a single dose of albendazole. *J Nutr* 1993b; 123: 1036-46.
- Thein-Hlaing, Thane-Toe, Than-Saw, Myat-Lay-Kyn, Myin-Lwin. A controlled chemotherapeutic intervention trial on the relationship between *Ascaris lumbricoides* infection and malnutrition in children. *Trans R Soc Trop Med Hyg* 1991; 85: 523-8.
- Watkins WE, Cruz JR, Pollit E. The effects of de-worming on indicators of school performance in Guatemala. *Trans R Soc Trop Med Hyg* 1960; 90: 156-61.
- WHO. Prevention and control of intestinal parasitic infections. *WHO Tech Rep Ser* 1987; 749.