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Original Article

Prevalence and Intensity of Intestinal Helminth Parasites and Their Response to Treatment with Albendazole in a Rural Community in Sierra Leone

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ABSTRACT

Helminth infections can be an important public health problem in most developing countries. Stool samples from five hundred and fourteen (514) participants in Gbondapi village were examined to determine the prevalence and intensity of intestinal helminths using the Kato-Katz method. The efficacy of a single dose of 200mg and 400mg albendazole in adults and subjects below and above 2 years respectively was also assessed. Seventy-nine (15.4%) of the 514 subjects were infected with at least one intestinal helminth. Data collected was analysed using Epi info statistical package. The most prevalent intestinal helminth was Hookworm (7.6%) followed by *Ascaris lumbricoides* (5.3%) and *Strongyloides stercoralis* (3.9%). The least prevalent helminth was *Schistosoma mansoni* (1.6%). The worm burden was generally light with mean egg counts ranging between 83 – 927eggs/gram of stool. Albendazole had an excellent safety record and found to be highly effective against *Ascaris lumbricoides*. In order to break the cycle of infection and re-infection in rural communities, programs embracing health education, mass treatment with albendazole, improved sanitation and the provision of protected water sources must be implemented.

Keywords: Albendazole, Intestinal Helminths, Kato-Katz method, Treatment

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INTRODUCTION

Worm infection is a common childhood condition in most developing countries and can be an important public health problem (Anah *et al*., 2008; Mwanthi *et al*., 2008; Uneke, 2010). Poor sanitation and lack of clean water supply have been recognized as the two major factors for the high prevalence of worm infection as residents in these areas are predisposed to persistent infection and re-infection (Stephenson, 1987). Although most people infected with these parasites are usually asymptomatic, those with heavy infections manifest symptoms including anaemia, anorexia and weight loss. A number of complications have also been recognised with heavy worm burdens in both children and adults (Crompton *et al*., 2003; Bowley *et al*., 2004; Govindasamy and Thompson, 2004). Intestinal and duct obstructions by *Ascaris lumbricoides* for example, may require surgery and have been reported to be serious and costly (Surendran and Paulose, 1988).

Reports from Sierra Leone indicate high prevalence rates, especially among children below 15 years (White *et al*., 1982; Webster *et al*., 1990; Gbakima and Sahr, 1995). Previous studies in Sierra Leone have reported *Ascaris lumbricoides* and *Trichuris trichura* as the most prevalent intestinal helminths in the country (MOHS, 1990; Gbakima and Sahr, 1995). We report here the first study to determine the prevalence of the various intestinal helminths among residents in Gbondapi village, and to assess the efficacy of a single dose of albendazole against these parasites.

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METHODOLOGY

Study Site and Subjects

The study was conducted in Gbondapi village which is an established fishing and swamp-land farming community located in the Mano Sakrim Chiefdom, Pujehun District in the Southern Province of Sierra Leone. The village is divided into three communities: Gbondapi, Mani and Sumbuya. The chiefdom is bordered in the east by Yakemo, Kpukumu, Krim and Kpaka chiefdoms; in the south by the Atlantic Ocean, northwest by Kwamebai chiefdom and on the north by Parga Krim chiefdom. Majority of the 5,000 residents speak mende, creole and a few speak English. There is a government-assisted health centre in the village supervised by a Community Health Officer, with referrals often made to the district Hospital in Pujehun town 80 kilometers away. The village depends on a few hand-pump wells, and poorly built pit latrines for adults, while children defaecate indiscriminately between houses.

Sample Collection and Examination

Appropriately labeled stool cups with tight-fitting lids were distributed at night to participants. Participants were requested to bring their stool cups containing the samples the following morning to the laboratory where the diagnosis of intestinal helminths was done using the Kato-Katz method. This method involves a single examination of about 41.7mg of stool that is given adequate time to clear to allow the morphologic characterisation of helminth eggs or larvae (Martin and Beaver, 1968). Hookworm eggs were not speciated into *Ancylostoma duodenale* and *Necator americanus* eggs as this involves coprocultural procedures.

Treatment with Albendazole

All participants positive for helminth eggs, except *Schitosoma mansoni*, in their stool were treated with a single dose of albendazole (Zentel). Each tablet of albendazole was in a blister pack and participants below two years were given one tablet (200mg) while those above 2 years were given two tablets (400mg) as a single dose. Children were asked to chew the tablets and swallowed with water while being observed by a member of the research team. Those infected with *S. mansoni* were treated with praziquantel, 40mg/kg body weight.

Data Analysis

Data collected was analysed using Epi info statistical package.

RESULTS

Table I: Prevalence and Intensity of Intestinal Helminth Parasites in the Three Communities in Gbondapi Village, Pujehun District, Sierra Leone

Community	No Examined	Hookworm			*Trichuris trichura*			*Schistosoma mansoni*			*Strongyloides stercoralis*			*Ascaris lumbricoides*		
		No Pos	% Pos	XG	No Pos	% Pos	XG	No Pos	% Pos	XG	No Pos	% Pos	XG	No Pos	% Pos	XG
Gbondapi	314	27	8.6	892.1	6	1.9	348	7	2.2	372	10	3.2	85	14	4.5	927
Mani	88	4	4.6	216	1	1.1	48	1	1.1	192	9	10.2	213	8	9.1	829
Sumbuya	112	8	7.1	159	5	4.5	226	0	0.0	-	1	0.9	240	5	4.5	83
Total	514	39	7.6	437	12	2.3	197	8	1.6	278	20	3.9	161	27	5.3	534

XG – Geometric mean egg count (Intensity of Parasite); Pos= Positive

Prevalence of Intestinal Helminth Infection

Of the 514 faecal samples examined in the three communities in Gbondapi village, 79 (15.4%) were infected with at least one intestinal helminth. Hookworm was the most prevalent with 7.6% of the population examined infected. This was closely followed by *Ascaris lumbricoides* (5.3%), and *Strongyloides stercoralis* (3.9%). *Trichuris trichura* and *Schistosoma mansoni* accounted for only 2.3% and 1.6 % respectively (Table I).

The prevalence of the five different intestinal helminths varied from community to community. The highest prevalence of *Ascaris lumbricoides* and *Strongyloides stercoralis* were found in Mani (9.1% and 10.2% respectively), whilst Gbondapi had the highest prevalence of hookworm (8.6%). *Schistosoma mansoni* was not found in residents of Sumbuya (Table 1). The age specific intestinal helminth prevalence in the study population in Gbondapi village is represented in Table 2. Hookworm and *Ascaris lumbricoides* were the most prevalent in the 1 - 10 years age group with prevalence rates of 8.9% and 8.4% respectively. *Schistosoma mansoni* was the least prevalent helminth in this age group with only 1.1%

prevalence rates of hookworm were observed in the 11 – 20 and 21 – 30 years age groups (6.8% and 10.5% respectively), only one person in each of these age groups was infected with *Ascaris lumbricoides.* The distribution of multiple intestinal helminth parasites among the study population is summarised in Table 3. *Ascaris lumbricoides* and *Strongyloides stercoralis* was the most common intestinal helminth parasite combination in the study population, followed by *Ascaris lumbricoides* and hookworm combination. Only one subject has triple intestinal helminth parasite infection and that triad was *Ascaris lumbricoides*, hookworm and *Trichuris trichuria.*

Table 2: Age Specific Intestinal Helminth Parasite Prevalence in Gbondapi Village

Age group (yrs)	No Examined	Hookworm			*T. trichura*			*S. mansoni*			*S. stercoralis*			*A. lumbricoides*		
		No Pos	% Pos	XG	No Pos	% Pos	XG	No Pos	% Pos	XG	No Pos	% Pos	XG	No Pos	% Pos	XG
0 – 10	190	17	8.9	659	8	4.2	341	2	1.1	192	132	6.8	248	16	8.4	917
11 – 20	133	9	6.8	311	1	0.8	72	3	2.3	144	2	1.5	96	1	0.8	24
21 – 30	38	4	10.5	734	2	5.3	84	1	2.6	720	2	7.1	192	1	2.6	1320
31 – 40	51	2	3.9	204	0	0.0	-	2	3.9	144	2	3.9	84	4	7.8	470
≥ 41	102	10	9.8	443	1	1.0	72	0	0	-	1	1.0	48	5	4.9	592
Total	514	39	7.6	437	12	2.3	197	8	1.6	278	20	3.9	161	27	5.3	534

Table 3: Distribution of Multiple Intestinal Helminth Parasites among the study Population

Parasite combination	No Positive
Ascaris + Hookworm	3
Trichuris + Hookworm	-
Ascaris + Trichuris	2
Ascaris + Schistosoma	1
Ascaris + Strongyloides	6
Ascaris + Hookworm + *Schistosoma*	1
Total	13

Table 4: Efficacy of a single dose of Albendazole on the Treatment of intestinal helminth parasites in Gbondapi Village, Sierra Leone

Intestinal Helminth	No Pos	No with Mono-infection	No (%) Response to Albendazole
Hookworm	39	35	13 (37.1)
Trichuris	12	10	5 (50)
Strongyloides	20	13	10 (76.9)
Ascaris	27	21	20 (95.2)

Intensity of Intestinal Helminth Infection

The worm egg density expressed as the geometric mean egg count and which reflects the worm burden varied within communities. Gbondapi community had the highest geometric mean egg count for all the intestinal helminths encountered. Only one person each was infected with *Trichuris trichura* and *Schistosoma mansoni* in Mani community. In Sumbuya community, only one person was infected with *Strongyloides stercoralis*. *Trichuris trichura* eggs were absent in the 31 – 40 years age group. In subjects ≥ 41 years, on the other hand, no *Schistosoma mansoni* eggs were identified, with only two persons infected, one having eggs of *Trichuris trichura* and the other having larvae of *Strongyloides stercoralis.*

Treatment with Albendazole

No adverse drug-related effects were reported or observed in our study population with the administration of albendazole. From the data summarised in Table 4, it was observed that single dose of 200mg for subjects below 2 years and 400mg of albendazole for subjects above 2 years had a superior cure rate only on *Ascaris lumbricoides* (95.2%), and a moderate cure rate on *Strongyloides stercoralis* (76.9%). Low cure rates were observed with Hookworm (37.1%) and *Trichuris trichura* (50%). Low cure rates ranging from 0 – 33% were observed with the single dose of albendazole on all the various combinations of multiple intestinal helminth parasite infections.

DISCUSSION

Results from this study show that five different intestinal helminth parasites occurred among the 514 residents examined in the three communities in Gbondapi village with low prevalence rates. Unlike the overall infection rate (42.4%) reported

in Kotto Barombi and Marumba II villages, South-West Cameroon (Nkengazong *et al*., 2010), the worm burden for all five intestinal helminth parasites documented in this study was generally of low intensity with average egg count per gram of stool ranging from 83 – 927. Similar low intensities was also reported by Anah *et al*. (2008) among pre-school children in Calabar, Nigeria.

Hookworm was however the most prevalent intestinal helminth parasite encountered, unlike previous studies in the country (Wilson *et al*., 1991; Gbakima and Sahr, 1995) and studies elsewhere in Africa in which *Ascaris lumbricoides* was the most prevalent parasite (Anah *et al*., 2008; Mwanthi *et al*., 2008; Wagbatsoma and Aimiuwu, 2008). *Ascaris lumbricoides* had the highest prevalence in the 1 – 10 years age group. This high prevalence of hookworm in our study population is not surprising as most inhabitants in these communities walk about barefooted and as such prone to infection and re-infection with hookworm larvae. In addition, the ten year rebel crisis accompanied by the complete destruction of the general infrastructure in these communities enhanced the transmission of hookworm and other intestinal helminth parasites. There is however observed differences in prevalence among the various age groups for the other helminth parasites present.

Results also indicated that a single dose of 200mg and 400mg of albendazole had a significant effect on *Ascaris lumbricoides* and *Strongyloides stercoralis* infections in children below 2 years and those above 2 years respectively. Adams *et al*. (2004) similarly reported that a dose of 400mg of albendazole was completely effective against *Ascaris lumbricoides* in pre-school children. The 50% cure rate of *Trichuris trichura* with a single dose of albendazole is similar to the 25.8% and 46.2% cure rates reported by Adams *et al*. (2004). A meta-analysis of seventeen trials that reported on single dose treatment with 400mg of albendazole in tropical countries found a median of 0 – 90.5% (Arendse, 2001). Furthermore, the 0 – 33 % cure rate of the multiple intestinal parasites in the study population suggests that a single dose of albendazole might not be adequate for the treatment of multiple intestinal helminth infection. It may be therefore be necessary to evaluate in subsequent studies the efficacy of albendazole in repeated doses against *Ascaris* and other intestinal helminths as certain reports have authorized the administration of albendazole 400mg start and 400mg repeated daily for up to three days (Gibbon, 2003).

In conclusion, since the presence of intestinal helminth parasites is closely linked with climate and poverty, the occurence of these intestinal helminths in our study population is an indication of their low socio-economic status and poor sewage disposal. Also a single 400mg dose of albendazole in adults was found to have an excellent safety record and highly effective against *Ascaris lumbricoides*. It is recommended that the government institutes a programme that would embrace health education, mass treatment with albendazole, improved sanitation and the provision of protected water sources, so that the cycle of infection and re-infection can be broken.

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REFERENCES

Anderson RM (1986). The Population Dynamics and Epidemiology of Intestinal Nematode Infections. *Trans R Soc Tro Med Hyg*. **80**: 686-692

Anah Mu, Ikpeme OE, Etuk IS, Yong KE, Ibanga I and Asuquo BE (2008). Worm Infestation and Anaemia among Pre-school Children of Peasant Farmers in Calabar, Nigeria. *Niger J Clin Pract*.**11**:220-4

Arendse VJ (2001). Treatment and Prevention of Trichuriasis: Efficacy of Albendazole in Disadvantaged Children at Rawsonville Primary School, Western Cape Province, South Africa MSc Med Sc thesis, University of Stellenbosch

Bowley DMG, Parmar NK and Boffard KD (2004). Burdens of Disease in Southern Africa. *Lancet*. **363**:1508

Bundy DAP, Wong MS, Lewis LL and Horton J (1990). Control of Geohelminths by Delivery of Targeted Chemotherapy through Schools. *Trans R Soc Trop Med Hyg*. **84**:125-130

Crompton DWT, Montresor A, Nesheim MC and Savioli L (2003). Controlling Disease due to Helminth Infections. Geneva: World Health Organization, Pp: 75-99

Gbakima AA and Sahr F (1995). Intestinal Parasitic Infections among Rural Farming Communities in Eastern Sierra Leone. *Afr J Med Med Sci*. **24**:195 – 200

Gibbon CJ (2003). South African Medicines Formulary. 6th Ed. Cape Town: South African Medical and Dental Association, Health and Medical Publishing Group. Pp: 31-40

Govindasamy V and Thomson SR (2004). Worms Wanted, Dead or Alive. *S Afr Med J.* **94**: 524 – 525

Kan SP (1989). Soil-transmitted Helminthiasis among Inhabitants of an Oil palm Plantation in West Malaysia. *J Trop Med Hyg.* **92**:263-269

Martin LK and Beaver PC (1968). Evaluation of Kato Thick-smear Technique for Quantitative Diagnosis of Helminth Infections. *Am J Trop Med Hyg*.**17**: 382-389

Mwanthi MA, Kinoti MK, Wamae AW, Ndonga M and Migiro PS (2008). Prevalence of Intestinal Worm Infections among Primary School Children in Nairobi City, Kenya. *East Afr J Public Health*. **5**:86-9

Nkengazong L, Njiokou F, Wanji S, Teukeng F, Enyong P and Asonganyi T (2010). Prevalence of Soil Transmitted Helminths and Impact of Albendazole on Parasitic Indices in Kotto Barombi and Marumba II Villages (South-West Cameroon). *Afr J Environ Sci Technol*. **4**:115-121

Sierra Leone National Nutrition Survey (PMISU) (1990). Ministry of Health. Pp: 1 – 33

Stephenson LS (1987). The impact of Helminth Infections on Human Nutrition. Schistosomes and Soil-Transmitted Helminth. London: Taylor and Francis.

Uneke CJ (2010). Soil Transmitted Helminth Infections and Schistosomiasis in School Age Children in Sub-Saharan Africa: Efficacy of Chemotherapeutic Intervention Since World Health Assembly Resolution 2001. *Tanzania J Health Res*. **12**: *ajol.info/index.php/thrb/article/view/56366/44801*

Wagbatsoma VA and Aimiuwu U (2008). Sanitary Provision and Helminthiasis among School Children in Benin City, Nigeria. *Nig Postgrad Med J*. **15**: 105 – 11

Webster J, Hodges M, Crompton DWT and Walters DE (1990). Intestinal Parasitic Infections in Children from Freetown, Sierra Leone. *J SL Med Dent Assoc.* **5**: 144-155

White PT, Coleman M and Jupp BP (1982). Swamp Rice Development Schistosomiasis, and Onchocerciasis in Southeast Sierra leone. *Am J Trop Med Hyg*. **31**: 490-498

World Health Organization (1987). Prevention and Control of Intestinal Parasitic Infections. WHO Technical Report Series No: 749:7-85