ASSESSMENT OF THE EFFICACY OF IVERMECTIN IN THE TREATMENT OF HUMAN INTESTINAL HELMINTHS AND URINARY TREMATODE INFECTIONS IN NORTH-EAST TANZANIA

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ABSTRACT: An open clinical trial was conducted in Amani, north-east Tanzania, to evaluate the efficacy of ivermectin in patients infected with either, intestinal helminths or urinary parasites. Stool specimens were examined by the McMaster's method, and urine was first centrifuged before the deposit was examined by the direct method. 103 patients with intestinal helminths and 22 with *Schistosoma haematobium* were treated with a single dose of oral ivermectin, given at a dosage of 150 μg/kg body weight. The drug was found to be very effective in clearing ascariasis and strongyloidiasis infections where by a 100% clearance rate was achieved. However, a mild to moderate activity was observed in *Schistosoma haematobium* and hookworm infections.

Introduction

Human geohelminthic and urinary trematode infestations remain a public health problem in the tropics and subtropics because of poor sanitary conditions in these regions. The poor sanitation predisposes people to repeated infestations and hence the need for repeated dose of anthelmintic agents (Rajasekariah et al., 1989). In addition, some of the parasites are less responsible to most of the available anthelminthic agents. On the other hand, a number of anthelminthic drugs have toxic adverse effects which in a way, reduce compliance (Grove, D.I., 1982; Franz et al., 1965; Most et al., 1965; Al-Ani and Al-Waili, 1987).

Ivermectin, a fractional mixture of 22-23 dihroavermectin B_{1a}/B_{1b} in a 80-20%, was found to be well-tolerated and highly efficacious in treating human onchocerciasis as a single dose (Azizi et al., 1982) and had comparatively fewer and milder adverse reactions than counterpart, diethylcarbamazine citrate (Awadzi et al., 1986). The drug was also found to have a significant effect on head

lice while treating onchocerciasis skin disease (Dunne et al., 1991). Adverse reactions experienced by these patients are similar to those observed in onchocerciasis patients receiving the drug for the first time (De Sole et al., 1990). This drug is a broad-spectrum antiparasitic agent, being active against a variety of nematodes and arthropods in domestic animals (Campbell et al., 1983). Ivermectin has also shown to be effective against human strongyloidiasis and other intestinal helminths. However, it was observed that, in patient with heavy infections repeated or higher doses were necessary in order to achieve higher cure rates (Naquira et al., 1989). Hookworm was noted to be less affected by the drug. Although the drug has been distributed for the treatment and control of onchocerciasis in the affected areas, there has not been a well planned trial evaluating the activity of this drug on geo-helminths infections in the country. This study, therefore, tries to demonstrate the activity of this chemical compound on the common intestinal parasitic infections and urinary schistosomiasis.

Materials and Methods

The study was carried out at Amani staff Clinic which is situated at an altitude of about 1000 meters above sea level. It is located within the East Usambara Mountains, in the northeastern part of Tanzania. Study population comprised of patients seeking for treatment at the dispensary. Patients who presented with clinical symptoms suggestive of either gastro-intestinal or urinary tract infections and who gave informed verbal consent were recruited for the study. Excluded from the study were children under the age of five years, pregnant and lactating women, those weighing below 15 kg, concurrent anthelminthic drug administration, and patients with serious or chronic illness. One gram of formed feacal material was collected from each stool specimen provided, and was mixed with 58 millilitres (mls) of saturated sodium chloride solution and thoroughly stirred. The mixture was then filtered through a gauze in a funnel. Finally, the filtrate was charged through McMaster slide, and examined under the low power objective of the microscope for parasite egg identification. 100mls of urine were collected from every urine specimen delivered, and then centrifuged at 2000 rpm for 5 minutes. The sediment was then examined likewise under the microscope for the presence and counting of eggs of *S.haematobium*. Ivermecin was administered orally in tablet formulation and given as single doses. The dosages were calculated according to body weight, equivalent to 150 μg/Kg. The doses were taken in empty stomachs, and patient were advised not take anything orally for at least two hours following drug administration. Follow up was done on days 7, 14 and 21. Stool and urine specimens were collected for laboratory examination for the presence of helminth eggs or larvae. A total number of 125 patients, 75 males and 50 females, from the age of 7 to 68 years old, completed the study after been identified positive for the infestation. One gram of faecal material was mixed with 58 mls of saturated sodium chloride solution. The mixture was then filtered through a gauze in a funnel. Finally, the filtrate was charged through McMaster slide for egg identification and quantification. Hundred mls of urine specimen from each patient with positive *Schistosoma haematobium* were collected and centrifuged at 2000 rpm for five minutes. The sediment was then put on a glass slide and examined under the low power objective for schistosome egg quantification.

Patients with positive stool for intestinal nematodes and urine for urinary trematodes were included in the study. Those individuals with severe hepatic, neurological diseases, concurrent drug therapy, pregnant and lactating women; children under five years of age, and those patients who received anthelmintic therapy within one month before reporting at the clinic form the beginning of the study were excluded from the study.

Ivermectin was administered orally in a form of tablets as a single oral dose at 3-12 mg in an empty stomach. Patients were their own control and were followed-up in order to monitor side effects on the first 3 consecutive days after ivermectin treatment. Stool and urine samples were collected and re-examined for helminths infestation at day 7, 14, and 21.

Results

One hundred and twenty five patients completed the study. Out of these, 103 (82.4%) had intestinal helminths and 22 (17.6%) had urinary schistosomiasis. All patients who had *s.haematobium* seen on day 7 of follow up remained positive for the infection. Only 4 out of 27 (14.8%) patients examined on day 14 had negative urine test for schistosomiasis; and no response recorded in 19 patients out of 22 (86.4%) with this trematode infection examined on day 21.

Ascaris lumbricoides and *strongyloides stercoralis* showed a complete response, and the patients who had these two parasitic infections remained negative throughout the follow up period. On the other hand, the responses for *trichuris trichiura* and the hookworms were rather disappointing. On day 7 follow treatment, 98.7% of the patients treated for hookworm were still positive for the infection, and 90% of those with *T.trichiura* were found positive. Up to day 21 of follow up there was no change in the response of were found positive. Up to day 21 of follow up there was no change in the response of these two parasites.

Discussion

Ivermectin administered as a single oral dose treatment was highly effective and tolerable in patients with ascariasis and strongyloidiasis. The efficacy-dose relationship demonstrated that a higher or repeated dose

of ivermectin is not required for the heavy infestation in both Ascaris lumbricoides and *Strongyloides stercolaris*. Nonetheless the cure rates after a single therapy with ivermectin was not sufficient to achieve reasonable cure rates in trichuriasis as the repeated doses observed by Naquira (1989). Moreover, there was no effect on hookworm, *T. trichiura* and *S. haematobium* after a single dose of ivermectin treatment.

It was therefore observed that, ivermectin could cure ascariasis and strongyloidiais but not trichuriasis, schistosomiasis or hookworm infestation in the study area.

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