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HEALTH OF SCHOOL CHILDREN
TREATMENT OF INTESTINAL HELMINTHS AND SCHISTOSOMIASIS[1]

SUMMARY

School children harbour some of the most intense helminth infections with adverse effects on health, growth and school performance. Treatment of this group achieves the maximum return in terms of reduction of morbidity. School children are also one of the most accessible groups for treatment, and health care can be efficiently integrated with education programmes. Mixed infections of intestinal helminths and schistosomiasis justify integrated control programmes based on chemotherapy. Safe and highly effective single dose drugs such as the benzimidazoles (albendazole and mebendazole) and praziquantel are now available permitting integrated interventions. The frequency, intensity and reinfection pattern of multiple infections may vary considerably requiring careful monitoring to determine the value and methodology of integrated programmes based on chemotherapy. Joint administration of drugs may offer improvement of logistics, may reduce costs and improve patient compliance. Studies in progress will determine the safety and efficacy of the joint administration of praziquantel with albendazole or mebendazole. Until these studies are completed, in routine programmes WHO recommends a one week interval between the administration of these drugs. Where careful surveillance of potential adverse effects can be assured, however, shorter intervals may be explored, recognizing that praziquantel is completely eliminated in healthy subjects after 24 hours.

[1]This document has been prepared in collaboration by CTD/SCH, TDR/PDU, and CDS/IPI

Introduction

The success of global programmes to reduce infant morbidity and mortality has created new opportunities and a new challenge for WHO. The opportunities are in the increasing size of the school age group. The challenge is how to improve their health status. Keeping this age group healthy to bring children into a productive adulthood is an added guarantee on the long term educational investment of developing countries. Progressive urbanization of the developing world has increased the proportion of school enrolled children but also created conditions for a more favourable transmission of helminths due to overcrowding, contamination of the soil of shanty towns by human excreta and environmental degradation.

Policy Goal

Improvement of health and development of school age children through control of morbidity due to intestinal helminths and schistosomiasis.

Policy Objectives

1. Provide treatment for the major helminthic infections (intestinal helminths and schistosomiasis);

2. incorporate health education on helminthic infections into the school curriculum;

3. encourage collaboration between the education and health sectors in programmes to promote health of school age children;

4. improve the capacity of the health care system for management and delivery of chemotherapy;

5. improve the capacity of the health care system for organization and management of control of communicable and tropical diseases.

The situation

School age children: Among the 1.2 billion school age children, 700 million are registered in a school and each day it is estimated that 400 million are present. However school enrolment is presently increasing.

Helminthic infections negatively effect school performance, cognitive processes and nutritional status and justify programmes to improve the health of school age children by control of helminthic infections.

A first initiative in this direction was recently taken by a United Nations Administrative Committee on Nutrition recommending treatment of intestinal parasites integrated with food and vitamin A supplementation.

Intestinal helminths: About 400 million school-age children are infected with intestinal helminths. Ascaris lumbricoides and Trichuris trichiura infect one quarter of the world's population. School-age children harbour both the highest prevalence and intensity of these helminthic infections. Small hookworm loads may precipitate severe anaemia in children and in women of childbearing age.

Infection with Ascaris lumbricoides can be responsible for a decrease in growth rate, nitrogen absorption and retention, fat absorption, D-xylose absorption, and mucosal lactate activity and can also cause structural abnormalities of the mucosa of the small intestine in malnourished children. Deworming of children can lead to increased growth rates and in physical and mental improvements.

Hookworms (Necator americanus and Ancylostoma duodenale) are responsible for decreased physical fitness and activity, work capacity and productivity by loss of blood, even without overt anaemia, and a decrease of appetite.

Infection with Trichuris trichiura may be responsible of loss of blood, growth retardation and impairment of school performance: treatment may reverse these effects with a very fast return to normality.

Schistosomiasis: Over 200 million persons residing in 74 countries are infected, of which approximately 88 million are under fifteen years of age.

In heavily infected children, growth may be dramatically retarded. This effect is completely reversed by treatment of schistosomiasis. In Sudan, severe disease (hepatosplenic enlargement with portal hypertension) is frequent in children under fifteen years of age. Blood loss in urinary schistosomiasis contributes substantially to anaemia caused by hookworm infection.

Epidemiological characteristics

The interaction between these helminthic diseases is determined by their focal distribution and clustering at all levels. If both schistosomiasis and intestinal helminths are present, the prevalence and intensity of each may be different even in localities in close geographical proximity. The pattern of reinfection after treatment is different and may not be constant. These epidemiological differences necessitate prior surveys or investigations in the field in which the presence of both infections can be determined to decide if intervention for both schistosomiasis and intestinal helminths is warranted.

Drugs of choice

Intestinal helminths: Albendazole (400 mg single dose), levamisole (2.5 mg/kg single dose), mebendazole (500 mg single dose), and pyrantel (10 mg/kg single dose) are all effective in producing cures in nearly 100% of cases of Ascaris lumbricoides infection.

Against Necator americanus, and Ancylostoma duodenale single doses of albendazole and mebendazole may have a variable cure rate but normally have a significant effect in reducing intensity of infection. Levamisole may have some effect mostly on egg reduction.

Albendazole and mebendazole are only partially effective at a single dose against Trichuris trichiura, although generally good egg reduction rates may be achieved.

Side effects: most side effects with all these drugs are mild and transient. The benzimidazole derivatives (albendazole and mebendazole) are teratogenic and embryotoxic in some species of experimental animals, and caution must be observed in pregnancy.

Schistosomiasis: Praziquantel has broad spectrum effectiveness against all forms of schistosomiasis and cestode infections in a single dose of 40mg/kg. When only urinary schistosomiasis is present, metrifonate is also effective in three doses, at two week intervals, thus requiring an efficient primary health care system or full collaboration of the school system. The low cost of metrifonate may favour its use in these areas.

Side effects: Thirty percent of children treated with praziquantel have transient abdominal pain 1-2 hours after treatment. Generalized allergic reactions have been reported from West Africa and Madagascar. Blood in the stool has occurred occasionally after treatment. In areas of cysticercosis fatal side effects may occur due to effects on cerebral cysts.

Drugs with multiple anthelminthic effects. Metrifonate has a significant effect on urinary schistosomiasis as well as Ascaris and hookworm infections. Long term single dose treatment at short intervals - monthly or bimonthly - has not been tested.

Combination of drugs and joint drug delivery: The formulation of praziquantel and one or more anthelminthic drugs into a single preparation is not recommended. Differences in recommended doses and regulatory requirements make this approach unpractical. What is under consideration is the joint delivery of anthelminthic drugs for multidisease therapy. The potential advantages for combined drug delivery include,

- lower cost of drug delivery
- simplification of therapy resulting in improved patient compliance
- improvement by potentiation of therapeutic effect.

Potential disadvantages may include the accumulation of adverse reactions resulting in diminished safety or decreased patient compliance.

Studies on joint drug delivery. It is prudent to consider the interactions if praziquantel and intestinal anthelminthics are coadministered, especially in endemic countries where poor levels of nutrition and general health might be expected to exacerbate any untoward drug interactions.

The WHO Special Program for Tropical Diseases (TDR) is presently undertaking a series of studies on the concomitant administration of the benzimidazoles and praziquantel.

No differences in acute toxicity have been observed in animal studies where combinations of albendazole or mebendazole have been compared to single drug administration.

Phase I clinical studies have revealed a four-fold increase in the bioavailability of albendazole in the presence of praziquantel but the significance of this is not known. The bioavailability of praziquantel was unaffected by the administration of albendazole.

Phase II studies on the safety and efficacy of combined treatment with praziquantel and albendazole have been planned and should be completed early in 1993.

Pending the results of these studies and, from knowledge of the pharmacokinetics of praziquantel and albendazole, the interval between drug administrations at which little or no interaction might occur can be calculated. The half life of praziquantel is 2.1 hours and all the drug is eliminated in 24 hours. For albendazole the figures are 10.1 and 48 hours, respectively. Thus albendazole could be administered 24 hours after praziquantel. An alternative schedule might consider administration of albendazole after praziquantel at a time when only 50% of praziquantel has been eliminated. In this case the interval between administration could be as short as four hours.

At present the WHO will continue to follow the recommendation of the WHO Informal Consultation on Intestinal Helminth Infections (1990) that for the time being if combined chemotherapy is desirable and justifiable on epidemiological reasons the two drugs should be spaced by one week in community control activities.

Individual control programmes might wish to pursue a shorter time interval between the administration of praziquantel and albendazole with initial close monitoring to ensure that there are no side effects, including nausea and vomiting which might adversely effect community and patient compliance.

Control approaches

Intestinal helminths: WHO emphasizes the importance of targeting treatment to the school-age children since they harbour the most intense infections with Ascaris, Trichuris and other helminth infections. Treatment of this group achieves the maximum return in terms of reduction of morbidity. In addition, children in school are one of the most accessible groups for treatment.

Schistosomiasis: WHO also emphasizes the importance of treatment of school-age children with oral antischistosomal drugs. Programmes to reduce morbidity should orient their operations to achieve complete coverage of the section of the population of school age. These can be integrated with other operational programmes of high priority such as control of intestinal parasitic infections, immunization, nutritional programmes, maternal and child health activities, tuberculosis, leprosy and sleeping sickness surveys as well as the control of diarrhoeal diseases.

Integrated approaches: Community based chemotherapy integrated into the primary health care system will improve coverage and achieve optimal retreatment schedules. Experience in this area is growing and in line with the commitment of the member states to promote the capacity peripheral health services to control communicable diseases. The major potential benefit of integrated helminth control is the strengthening of the health services by training of the peripheral health care personnel, and developing activities based on disease-specific (reduction in prevalence of infection and morbidity) and operational (coverage of schools and localities) objectives.

Field quantitative parasitological screening techniques are simple to perform and low cost, but are time consuming and need an experienced microscopist. Treatment without prior individual screening of the whole population is recommended where surveys of school-age children indicate the prevalence of intestinal helminths or schistosome infection exceeds 50%. Periodic monitoring of appropriate samples of the treated population will ensure effective evaluation of the of the programme. On the other hand indirect screening techniques for haematuria are highly reliable to identify children for treatment against S.haematobium.

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