Impact of Soil-Transmitted Helminth Infections on Haematobiochemical Profile in Children

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Abstract: The present study was a cross-sectional community-based study carried out amongst rural children of district Ganderbal aged between 2-16 years old. The aim of the study was to characterize demographic and clinical presentations of children with intestinal helminthiasis and also assess the effects of ascariasis on some plasma biochemical parameters. One stool and blood sample per child was collected and examined by direct smear and zinc sulphate floatation technique for parasites. Stool smear positive children were studied and evaluated for clinical signs and symptoms. Blood samples were analyzed for the determination of total protein, serum albumin, packed cell volume and Vitamin E. Of the 573 children surveyed, 381 (66.49%) were infected by either *Ascaris lumbricoides* or *Trichuris trichiura* or both. Biochemically, the plasma total protein, albumin, Vitamin E as well as the packed cell volume (PCV) were significantly reduced in children with moderate and heavy *Ascaris* infection than controls but higher mean values of globulin than uninfected children. Heavy and moderate ascariasis were associated with various morbidities evident by both clinical and biochemical findings. Our findings should re-emphasize the need for all stakeholders to support and implement community-based control programmes of intestinal helminthiasis in Kashmir valley.

Key words: Intestinal Helminthiasis • Worm Burden • Demography • Biochemical

INTRODUCTION

It is estimated that more than 1 billion people in the world are infected by soil-transmitted helminthes (STH) (*Ascaris lumbricoides*, *Trichuris trichiura* and hookworm) [1]. These infections affect most frequently children in developing countries and are associated with poor growth, reduced physical activity and impaired learning ability [2].

The highest rates of soil transmitted helminth infections worldwide occur in the tropical regions and the distribution of these infections depend on conditions such as suitable climate and human activities, population movements and poor sanitations [1,3]. Diarrhea, including that of parasitic origin remains one of the most common illnesses in children and one of the major causes of infant and childhood mortality in developing countries [4]. Many epidemiological data on the distribution and prevalence of intestinal parasites as well as the effect of these parasites on host nutrition are well documented in the literatures [5-7]. However the extent of morbidity of intestinal parasites in children of rural dwelling has not been well studied in our environment.

The objective of this study was to fully characterize the demographic and clinical presentations of children with intestinal helminthiasis as influenced by socio economic factors and also assess the effects of ascariasis on some biochemical parameters. It is hoped that the results of this study will help to reawaken the need to support and implement programmes aimed at the control of intestinal parasites in children living in the tropics.

MATERIALS AND METHODS

This epidemiologic cross-sectional study was conducted among children between September 2007 and August 2008 in mostly rural communities of district Ganderbal which is located in the northern of Kashmir valley and is about 20 kms away from Srinagar. In total 573 children including 328 male and 245 female between the ages of 2-16 years, 9.5±2.3% without receiving antiparasitic treatment were included in the study. Preliminary meetings were held with the principals of the schools and representatives of the parents: the outline of the programme was explained and verbal consent was obtained from the families and a detailed questionnaire...
was filled for each case. The importance of the study was explained to all the children in the study population and the method of collecting the stool specimen was thoroughly made clear to all the children. They were provided with labeled clean stool containers, containing 10ml of 10% formalin with a proper lid. Every child was instructed to bring his/her own stool sample to avoid mixing of samples. The stool samples were quickly processed and examined for detection of adult worms or eggs by simple smear and zinc sulphate floatation techniques. The worm load was estimated by Stoll’s egg counting technique [8] and was categorized as light, moderate and heavy according to WHO [9] guidelines. All parasite positive children were further screened to document symptoms, clinical features and their blood samples obtained for biochemical investigations.

The biochemical tests conducted on the study and control participants included total serum protein, serum albumin, vitamin E and packed cell volume (PCV) by digital analyzer (Photometer 5010, Robert Riele GmbH and Co KG, Germany) [10].

A computer program (SPSS 11.5 for windows) was used for data analysis. The descriptive data was given as a mean ± standard deviation (SD). Student's t-test was used for the analytic assessment while categorical variables were compared using Chi square test. The differences were considered to be significant when the p-value obtained was less than 0.05.

RESULTS

Among 573 children subjected to stool examination, data revealed that 224 (39.0%) children were infected by single type of helminth, in which *Ascaris lumbricoides* was found in 137 (23.90%) and *Trichuris trichiura* in 87 (15.18%) children. Mixed type infection by *Ascaris lumbricoides* and *Trichuris trichiura* was observed in 225 (39.26%) children. Single and mixed type infection was observed almost in equal proportions.

Females were found more infected 189(77.14%) than males 192(58.53%). On analyzing the data age was found important risk factor for helminth infection as shown in Table 1. Both males and females were found heavy and moderate infection in lower age groups as compared to higher age groups. The least intensity of infection was seen among children aged between 12-16 years, as only 32(55.17%) in females and 62 (50.0%) had moderate/light intensity of infection, no heavy load of ascariasis was recorded in this age group. Diarrhea was the commonest complain (27.2%), rectal prolapse was seen in (6.8%) of the children.

Children of lower social class were more infected 83(56.5%) compared to the middle social class children 64(43.5%). More children in the low social class had moderate infection (41.0%) compared to those in the middle class with (30.5%) while for heavy infections 15.2% and 13.3% were recorded among children of low and middle class respectively.

Plasma vitamin E, total serum protein, albumin and PCV were significantly lower in children that were heavily and moderately worm burdened, as compared to control group. As shown in Table 2, it was clear that *Ascaris* infection was involved in causing malabsorption of proteins in the intestinal tract.

DISCUSSION

This study showed that a high proportion of our rural children are still burdened by intestinal parasitoses and *Ascaris lumbricoides* was the most prevalent amongst the children. Biochemical abnormalities are considered a hallmark of helminthiasis, especially in ascariasis and trichuriasis [11]. The present study indicated a prevalence of helminthiasis in children of Kashmir valley (66.49%). These figures when compared with studies conducted in other parts of the world showed that Kashmir valley was one of the most hyper endemic regions for intestinal helminthiasis. For example studies conducted on the frequency distribution of gastrointestinal helminths by Bundy et al. [12] showed a high overall prevalence of 62% among the urban slum children of Malaysia. Rodriguez et al. [13] reported a high prevalence of 72% among the school children studying in a public institution in Maracaibo, Venezuela. Legesse and Erko [14] also noted the high prevalence of 88.2% among the school children in rural Ethiopia, while Kabatereine et al. [15] reported an overall prevalence of 56% among the school children of south Uganda. Ibrahim [16] conducted a study among school children in Gaza strip and found an overall prevalence of 36%. Children aged 2-6 years were most infected with *Ascaris lumbricoides* compared to the other age groups for both sexes. It was likely that children within this age group were most exposed to infection with *Ascaris* especially when at play in contaminated environments and less aware of these helminth infections [17].

Poverty and ignorance might have been important predisposition of the children to frequent intestinal infections. Our finding was similar to that reported by Lui et al. [18] that employment status and education of mothers were important factors in the prevalence of intestinal parasitic infections. Diarrhea in children with
intestinal helminthiasis might have multiple origin; apart from the direct physical effects by the parasites, in the GIT, intestinal parasites might cause malabsorption, malnutrition as well as avitaminoses [6], which could worsen the diarrhea. These multiple causes and effect relationship might explain why diarrhea was a common presentation in children with intestinal helminthiasis.

The mean plasma total protein and albumin were lower in our children moderately and severely infected with ascariasis, these findings were supported by other studies [19,20] which reported intestinal loss of 7%-9% of dietary fat as well as abnormal carbohydrate (d-xylose absorption) in subjects infected with ascariasis. This study also showed that children infected with ascariasis had low vitamin E compared to uninfected controls. This finding correlated an earlier report by Dodin [21] who demonstrated abnormally low vitamin E excretion in his subjects infected with ascariasis and other parasites but the present results were against the findings of [22,23]. The reason for the low vitamin E levels might be traceable to the malabsorption syndrome in hosts infected with ascariasis, because of the parasites interference with duodenal and jejunal function [24,25].

The mean packed cell volume was also lower in children with ascariasis compared to controls, probably because of the malabsorption, malnutrition and protein losses as supported by other studies [7,19,20] and exemplified by low total plasma protein, albumin and vitamin E in this study. The low PCV, might explain why weakness was a common complaint in the children.

**CONCLUSION**

Intestinal helminthiasis moderate and severe infections are associated with various morbidities exemplified by clinical and laboratory findings. Findings of this study should serve to re-emphasize the need to support and implement programmes that are aimed at the control of intestinal parasites especially among the rural populace and possibly elsewhere.

**REFERENCES**


