International Journal of
Innovation Sciences and Discoveries
Vol. 1, No, 01, pp.014-016, November- 2012

Available online at
http://www.wrpjournals.com

Research Article

IMPACT OF HELMINTH PARASITES ON PLASMA PROTEINS IN CHILDREN OF KASHMIR

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ABSTRACT

The aim of this study was to assess the impact of helminth infections on plasma proteins in children of Kashmir valley. Stool and Blood samples were collected from 573 school children both male and female in the age group of 2-15 years from the six districts of Kashmir valley. Blood samples were analyzed for estimation of plasma proteins, like albumin, globulin and total proteins by BIURET and BCG Methods and stool samples were processed by using both simple smear and zinc sulphate concentration methods. Of the 573 children surveyed, 381 (66.49%) were infected by either *Ascaris lumbricoides* or *Trichuris trichiura* or both. Children infected by helminths were found to have lower mean values of plasma albumin and total proteins but higher mean values of globulin than uninfected children. The present study reveals that Geohelminths are abundant among children of Kashmir valley which have a negative effect on the plasma protein value and suggests implementation of control measures to prevent geohelminthiasis.

Key Words: Helminths; plasma proteins; children; Kashmir valley.

INTRODUCTION

Intestinal parasitic infections remain an important cause of morbidity and mortality in developing countries especially among paediatrics (Okpala *et al.,* 1961, WHO 1981, Awogun 1984). They are frequently transmitted by unhygienic habit such as direct transfer of ova or cysts from anal region to mouth, eating with unwashed hands or eating and drinking of contaminated food and drink (Okpala *et al.,* 1961). Helminth infection is thought to contribute to child malnutrition through subtle reductions in digestion and absorption, chronic inflammation, and loss of nutrients (Thein-Hlaing, 1993). Intestinal helminths can cause injury to the mucosa of the small intestine, causing malabsorption and gastrointestinal losses of nutrients (Lunn *et al.,* 1993). Hypoalbunemia is reported frequently in Trichuriasis and in hookworm disease. Moreover, local inflammation at the site of infection appears to provoke a systemic inflammatory response with elevated plasma concentration of acute phase proteins and cytokines (Cooper *et al.,* 1992). Although several studies have been carried out on the prevalence of helminth infections in children of Kashmir valley (Bashir Ahmad, 2009; Khuroo, 1996; Ahmad *et al.,* 2002) but the impact of these helminths on plasma proteins has not been ascertained till now. Therefore the present study was undertaken to determine the relation-ship between soil-transmitted helminths (STH) and plasma proteins in children of Kashmir valley. `

MATERIAL AND METHODS

The study was carried out in six districts of Kashmir valley (Srinagar, Barramulla, Kupwara, Budgam, Pulwama and Anantnag) from July 2007 December 2008. In total 573 children which include 328 male and 245 female between the ages of 2-15 years (9.2±2.3) with no disabilities or those nor receiving antiparasitic treatment were included in the study. Official meetings with the personnel from health services, city councils and schools, as well as parents and school children from the study sites, were carried out in order to explain the protocol of the study. The children's age and demographic parameters were obtained through school records. Before taking a blood sample, the arm of each children was washed first with water and then with sprit. After the spot dried up, a distilled 5 ml. Syringe (Dispovan®) was used to take out the blood. Blood was stored in glass vials and added a pinch of anticoagulant i.e., EDTA. Also fresh morning stool samples were collected in nylon containers containing 10ml. of 10% formaldehyde. Both Blood and stool samples were labeled, and immediately transported to the parasitology laboratory, Department of Zoology, University of Kashmir, for further processing. For the estimation of proteins in the blood plasma, BIURET and BCG Method were employed. The stool specimens were processed using direct smear and zinc sulphate concentration techniques. A computer program (SPSS 10.05 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. 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 381 (66.49%) cases were infected with either *Ascaris lumbricoides* or *Trichuris trichiura* or both. Single and mixed type infection was observed almost in equal proportions. 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. Children having helminth infections had lower values of albumin protein in their plasma than uninfected children ($P<0.05$). Also albumin protein in children with mixed infection was comparatively lower than in children with single type of infection ($P<0.05$). As shown in Table 1, it is clear that *Ascaris* infection is involved in causing malabsorption of proteins in the intestinal tract, as children infected by *Ascaris lumbricoides* had lower mean values of albumin (3.42±0.15) in their plasma than in children infected by *Trichuris trichiura* (3.99±0.23).

Table 1. Mean value of Albumin in infected and uninfected children

Type	Mean±SD	Range	*P value*
Infected	3.52±0.28	3.2 – 4.5	
Not Infected	4.23±0.35	3.3 – 4.8	0.001
Single type Infection	3.64±0.33	3.2 – 4.5	
Multiple type Infection	3.59±0.31	3.2 – 4.5	0.001
Infection by *Ascaris*	3.42±0.15	3.2 – 3.8	
Infection by *Trichuris*	3.99±0.23	3.5 – 4.5	0.001

On analyzing the data it was observed that plasma globulin level, was higher in case of infected children than in uninfected children ($P<0.05$). In case of mixed infection, the mean plasma globulin was higher than in children infected with single type of helminth parasite as shown in Table 2. It was also observed that children infected by *Ascaris lumbricoides* were having slightly higher levels of globulin in their plasma, than in children infected by *Trichuris trichiura.*

Table 2. Mean value of Globulin in infected and uninfected children

Type	Mean±SD	Range	*P value*
Infected	2.52±0.45	1.2 - 3.6	
Not Infected	2.27±0.41	1.2 – 3.2	0.001
Single type Infection	2.47±0.43	1.8 – 3.5	
Multiple type Infection	2.63±0.46	1.2 – 3.6	0.000
Infection by *Ascaris*	2.48±0.40	1.8 – 3.5	
Infection by *Trichuris*	2.46±0.42	1.8 – 3.4	0.06

As shown in Table 3, the mean values of total Protein was significantly higher in uninfected children than in infected children [$P<0.05$]. Total protein values were slightly higher in children infected with multiple infections than in children infected by single type helminths. It was also observed that children infected with *Ascaris lumbricoides* were having lower mean values of total protein than children infected by *Trichuris trichiura*. The results reveal the role of *Ascaris* infection in causing 'Protein Energy Malnutrition by interfering with protein absorption in the intestinal tract.

Table 3. Mean value of Total proteins in infected and uninfected children

Type	Mean±SD	Range	*P value*
Infected	6.08±0.6	4.1 –7.9	
Not Infected	6.72±0.8	5.0 – 8.3	0.001
Single type Infection	6.01±0.7	4.1 – 7.9	
Multiple type Infection	6.15±0.6	4.1 – 7.6	0.02
Infection by *Ascaris*	5.60±0.3	4.1 – 6.4	
Infection by *Trichuris*	6.64±0.6	5.5 – 7.9	0.00

DISCUSSION

Biochemical abnormalities are considered a hallmark of helminthiasis, especially in Ascariasis and Trichuriasis (Rai *et al.* 2004). 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 show that Kashmir valley is 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*. (1988) showed a high overall prevalence of 62% among the urban slum children of Malaysia. Rodriguez *et al.,* (2000) reported a high prevalence of 72% among the school children studying in a public institution in Maracaibo, Venezuela. Legesse *et al.,* (2004) also noted the high prevalence of 88.2% among the school children in rural Ethopia, while Kabatereine *et al.,* (2001) reported an over all prevalence of 56% among the school children of south Uganda. Ibrahim (2002) conducted a study among school children in Gaza strip and found an overall prevalence of 36%. The high prevalence of Soil-transmitted helminth infections is probably a consequence of a low standard of living, poor sanitation and lack of personal hygiene, traditional methods of agriculture, indiscriminate defecation, the use of night soil as fertilizers and other occupational work. Similar factors have also been found responsible for high prevalence of infection by Okyay *et al.,* 2004 and Ulukanligil and Seyrek, 2003.

Children with helminth infection were found having lower mean values of Albumin, higher Globulin and low mean value of total proteins in the blood plasma. Studies conducted by Northop (1987); Rai *et al.* (2004); Annanthakrishnan *et al.* (1997); Northrop *et al.* (2001) and Ortiz *et al.* (2000) are in conformity to present results. Northop, (1987) showed that albumin concentrations increase significantly after anthelmintic treatment in Bangladeshi children infected with *Ascaris lumbricoides*. Rai *et al.* (2004) found significant differences in Albumin concentrations between infected and uninfected children in Nepal. Intestinal helminths cause malabsorption of proteins in intestines, which leads to decreased Albumin and protein energy malnutrition (Annanthakrishnan *et al.,* 1997). Protein absorption has been shown to be better in children after deworming (Annanthakrishnan *et al.,* 1997). It has been estimated that in children with worm load of 13-40 worms, approximately, 4 grams of protein are lost per day from a diet containing 35-50g of protein (Gupta, 1990). Higher concentrations of globulins in infected children are due to the increased titre of immunoglobulin against helminth infections. Northrop *et al.* (2001) showed significant decrease in globulin titre in children treated with anthelmintics, indicating the possible reductions in inflammation and immunoglobulin concentrations after deworming. Ortiz *et al.* (2000) showed that the intensity of parasitic burden plays an important role in stimulating polyclonal IgE, which diminishes the effectiveness of the specific response to these infections.

On the other hand, nutritional deficiencies could change the immune mechanisms of the mucous membrane, negatively influence the synthesis of secretary IgA and stimulate the production of polyclonal IgE; thus increase in the globulin level in blood plasma. In treated children, after deworming,

total protein concentration becomes low as globulin level decreases (Northop *et al.* 2001). The low mean values of total protein in infected children are due to low levels of albumin in blood plasma. In infected children presence of worm in intestine causes less absorption of proteins, which leads to low protein levels in blood plasma (Annanthakrishnan *et al.,* 1997). Hypoalbuminemia is reported frequently in Trichuriasis (Cooper *et al.,* 1992). So it is clear that indeed globulin levels increase during infection, but over all protein levels decrease, which is the reason behind the lower levels of total protein in the plasma of infected children.

Conclusion

Soil-transmitted is highly abundant among the children of Kashmir valley and obviously contribute to Protein energy malnutrition (PEM) and low nutritional status, these conditions are more pronounced in individuals concurrently infected with Ascaris and other soil-transmitted helminths. This situation strongly alarms for the control measures, including treatment of infected individuals, improvement of sanitation practices, and provision of clean water. The impact of each measure would be maximized through a health education program directed at school children, and their mothers in particular, and to communities in general.

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