CHAPTER 2

REVIEW OF LITERATURE
Helminths have been infesting human beings since ages. Eggs of *Enterobius vermicularis* have been found in a 10,000 year old coprolith in USA making it the oldest demonstrated infection in humans (Liu, 1999). Details of anatomy and clinical manifestations of *Ascaris lumbricoides* have existed in Literature since 1683 when Tyson published his description in "Philosophical transactions". *Ascaris* was fully described by Linnaeus in (1758). Linnaeus is also associated with the discovery of *Trichuris trichiura* in 1771. Tapeworms have been known since the time of Hippocrates, although Goenze described them for the first time in 1782 (Jones, 1990).
Even at the present time, the burden of diseases associated with helminth infections is enormous, with at least 2 billion people affected worldwide. This is being increasingly recognized as a significant public health problem particularly in developing countries, where poverty, poor nutrition, inadequate sanitation, lack of clean drinking water and minimal health care prevail. The highest rates of infection are often in children between the ages of 3-15 years.

Although these helminths can infect all members of a population, the most vulnerable groups, those who are at most risk and who would benefit from preventive interventions are preschool (age 2-5 years) and school age children. Helminth infections have an adverse effect on cognitive development, and individuals in a period of intense physical and intellectual growths are extremely vulnerable. Despite increasing commitment to the health and learning of schoolchildren, progress on these fronts can be seriously threatened by helminth infections. Studies have shown clearly the detrimental effects of infection on educational performance and school attendance, as well as the significant improvements in language and memory development that can be realized following treatment.

Considering the magnitude of public health problem posed by intestinal parasitism and the resulting morbidity, any endeavour in a search of effective control is the need of the day.
For implementing an effective control measure, one should know about the prevalence and pattern of the parasitic infestations in a particular community. Over the past century, a lot of research work has been done and various factors such as personal hygiene, socio-economic status, maternal education, improper sanitation have been put forward as the reasons for this public health hazard.

Presented below is a review of some of the work done by various researchers at a global level in the past few decades to describe the pattern of prevalence of various intestinal parasites and the pathology caused by them.

Farid et al. (1969) described chronic helminth infections as an important cause of anaemia. The helminths associated with iron-deficiency anaemia as described by the authors include Hookworm, Trichuris trichiura and Schistosoma sps.

Kim et al. (1970) performed the gastro-intestinal parasitic survey in the Armed forces in South Vietnam. Stool samples were collected from 717 Vietnamese, 1933 U.S. Forces, 433 of Korean troops in South Vietnam and 114 of Korean Army patients in homeland, which were examined as a control. Incidence of parasites in general was 44.8%. Korean forces in South Vietnam showed 82.4% of infection rate, Vietnamese 64.6% and U.S. forces 26.1%. Korean home patients revealed 93.9%.

Choi (1971) while working on the Kyung-pook National University hospital found that 86.7% patients were positive for one or more species of helminths. Trichuris revealed the highest infection
rate (83.6%) while *Trichostrongylus orientalis* was next (61.6%) and *Ascaris lumbricoides* was unexpectedly low (40.9%).

Sivakumar and Reddy (1975) studied the Absorption of vitamin A in children with ascariasis. Absorption of the vitamin was significantly low in children with ascariasis. In two subjects, in whom the studies were repeated, absorption of vitamin A was significantly increased after anthelmintic treatment.

Ejezie (1981) studied the parasitic diseases of school children in Logas state, Nigeria and found that in 810 faecal samples, 74.2% demonstrated *Ascaris lumbricoides* with mean egg load of 2,544 eggs per gram of stool. He related this high prevalence to customs of indiscriminate defecation, eating contaminated produce and poor hand washing.

Croll *et al.* (1982) studied the population biology and control of *Ascaris lumbricoides* in a rural community in Iran. They studied the population dynamics of *Ascaris* with the help of simple mathematical model of transmission and attempted to ascertain the factors, which regulate parasite population within a human community.

Feachem *et al.* (1983) studied the relationships between intestinal parasitism and excreta disposal technologies in Gaborone (Botswana), Ndola (Zambia) and Kumasi (Ghana). Parasitic prevalence and intensity rates amongst groups of urban residents having similar socio-economic status and housing, but different excreta disposal technologies, were compared.
Martin et al. (1983) conducted a study on the prevalence and intensity of different parasites in children of northern Bangladesh. Age specific prevalence data indicated that about 90% of children were harbouring *Ascaris* infection by the time they were 4 years old. Some evidence was also present to suggest differences in pattern of age specific prevalence between male and female children.

Joo (1984) studied the patterns of intestinal helminth infections among the Residents of Taegu city, Korea. *Trichuris trichiura* was found most frequently (13.2%) among the residents followed by *Enterobius vermicularis* (7.0%) and *Ascaris lumbricoides* (6.4%). Hookworm was the least prevalent. *Taenia* species were detected from only 0.6% of the Residents. Females were a little more infected than males. *Enterobius vermicularis* showed the higher prevalence among the 0-9 age group in both sexes, but was uniformly high in all age groups over 10 years.

Singh et al. (1984) studied the prevalence and pattern of intestinal parasites in a rural community of Varanasi. 424 cases were chosen from 80 families by simple random sampling. The prevalence of intestinal infestation was 86.2% with males showing a higher prevalence than females. Open defecation, poor personal hygiene, dirty untrimmed nails and unsatisfactory method of storing drinking water were associated with high parasitic infestation rates.

Peters et al. (1986) studied the prevalence of enteric parasites in Homosexual patients at an out patient clinic. Of the 274 patients, 133 (48.5%) harboured one or more intestinal parasites.
Elkins et al. (1986) studied the epidemiology and control of intestinal helminths in the Pulicat Lake region of southern India. The study showed that the age intensity of infection profile was converse in form, where maximum worm burdens were attained in children in the age range 5-9 years. In their study wormy individual with heavy infections were shown to be predisposed to this state such that they reacquire heavier than average worm burdens following treatment. Elkins et al. (1989) studied the influence of individual, social group and household factors on the distribution of *Ascaris lumbricoides*. The distribution of *Ascaris lumbricoides* with in a community was examined at an initial mass anthelmintic treatment programme and following an 11 months period of re-infection. Similar pattern of the negative binomial parameter K (an inverse measure of parasite aggregation) and the proportion of parasites with in the most heavily infected quartile of the community were recorded at the two dates. Significant variation in the intensity of the infection was observed between households in the community. The number of family members being in the house strongly influenced the mean *Ascaris* burden and proportion of relatively heavy infections with in adults and children.

Bundy et al. (1987) conducted a study on the population dynamics of *Ascaris* and *Trichuris* in a single Caribbean community using anthelmintic expulsion techniques. The same was reassessed in a similar manner after 17-month period of reinfection. The frequency distribution of intensity was similar for both species and
largely independent of host age. Bundy et al. (1987) studied the age-related prevalence and intensity of *Trichuris trichiura* infection in a St. Lucian community. Horizontal age-intensity profiles were convex in form with peak parasite loads occurring in the 2 to 15-year-old children. The parasites were highly aggregated within the study community, with most people harbouring low burdens while a few individuals harboured very heavy burdens. Of the total parasite populations in the study sample, 84% were harboured by the 2 to 15-year-old children. Of those individuals harbouring 100 worms or more, 87% were in the 2 to 10-year-old age range. Bundy et al. (1988) in their study conducted in a slum area of Kaulalumpur, Malaysia, analyzed stool samples of 1,574 children. Overall 71.8% children were infected with parasites. Almost 66% were infected with *Trichuris trichiura*, 49.6% with *Ascaris lumbricoides* and 5.3% with hookworm. The pattern was same for males and females, but differed markedly between different ethnic groups.

Northrop et al. (1987) studied the plasma albumin concentrations and intestinal permeability in Bangladeshi children infected with *Ascaris lumbricoides*. Children infected with *Ascaris lumbricoides* had lower plasma albumin concentrations than counterparts not harbouring this worm and values increased with successful treatment. Northrop et al. (2001) conducted a study on anthelmintic treatment of rural Bangladeshi children and to assess the effect of regular deworming on child growth, physiology and biochemical status. They found that Mebendazole reduced the
prevalence of *Ascaris lumbricoides* from 78% to 8%, *Trichuris trichiura* from 65% to 9% and hookworm from 4% to 0%. There was no significant difference in the growth of treated children compared with those given placebo Tablets. No changes in intestinal permeability of plasma albumin were observed after deworming. Significant decreases in total protein (p<0.001) and α1-antichymotrypsin (P<0.001) were observed in the treatment group, indicating possible reduction in inflammation and immunoglobulin concentration after deworming.

Forrester *et al.* (1988) conducted a study on clustering of *Ascaris lumbricoides* and *Trichuris trichiura* infections with in house holds. Heavily infected individuals were found together in house holds; fewer household units had a single heavily infected individual than would be expected by chance. They concluded that such a pattern could result either from genetic similarities among family members influencing their ability to mount an effective immunological response to infection or focal transmission near the home or both.

Sharma and Mahadik (1988) studied the prevalence of intestinal parasites in a rural area of Rajasthan. Stool examination of 114 school students of rural Rajasthan showed the overall prevalence of intestinal parasites as 62.3% during 1986, as compared to 60.7% and 50.7% during 1973 and 1979 respectively, showing that the total prevalence has not changed over the decade. However, hookworm infection was no longer observed to be a public
health problem in the schoolchildren of the area due to its dramatic fall from 11.5% in 1973 to 0% in 1979 and 1986.

Cooper and Bundy (1988) discussed the scale of disease caused by *Trichuris*, pointing to possible reasons for its neglect—under-recognition, under-reporting, and/or uncertainty of pathogenesis. They found its less clear clinical significance is largely because of the chronic insidious nature of the disease.

Tedla et al. (1988) conducted epidemiological studies in Ethiopia on Ascariasis in schoolchildren. The prevalence was highest in 9-10 years age group and lowest in the 15-18 years age group.

Kan et al. (1989) in their study in Malaysia found that 35.3% children harboured *Ascaris lumbricoides, Trichuris trichiura* or hookworm. *Trichuris* was the most prevalent nematode infecting 29.1% students followed by *Ascaris* and hookworm with prevalence of 21.2% and 5.9% respectively. The results suggested that urban slum children were at a greater risk of Ascariasis and Trichuriasis than their rural counterparts due to the current mass migration of rural poor into the urban areas.

Gupta (1990) studied the effect of ascariasis upon nutritional status of children. Children who had ascariasis were 2.1cm shorter in height, 0.06 cm thinner for mid-arm circumference and 0.38kg lighter in weight compared to children, who did not pass *Ascaris*.
Nokes et al. (1992) examined the effect of moderate to high worm burdens of *Trichuris trichiura* infection on the cognitive functions of 159 school children (age 9-12 years) in Jamaica, using a double-blind placebo controlled protocol. Results were evaluated by using a forward stepwise multiple linear regression. Removal of worms led to a significant improvement in tests of auditory short-term memory ($p < 0.017$; $p < 0.013$), and scanning and retrieval of long-term memory ($p < 0.001$).

Malla et al. (1992) in their study on the prevalence of *Taeniasis* in pig rearing and non-pig rearing slum dwellers in Chandigarh, found the presence of proglottids/ova of *Taenia* in 19.9% and 20.33% respectively.

Anderson et al. (1993) investigated the distribution of intestinal helminth infections in a rural village in Guatemala and reported the prevalence of 41% for *Ascaris lumbricoides*, *Trichuris trichiura* (60%) and *Necator americanus* (50%). Age/prevalence and age/intensity profiles were typical for both *Ascaris lumbricoides* and *Trichuris trichiura* with the highest worm burdens in the 5-10 year old children. Analysis of associations between parasites within hosts revealed strong correlations between *Ascaris lumbricoides* and *T. trichiura*.

Park et al. (1993) studied the intestinal parasite infection in the inhabitants along Hantan River, Choswongun Korea. Of 465 people observed, 2 *Ascaris lumbricoides*, 1 *Trichuris trichiura*, 39 *Clonorchis sinensis* and 16 *Metagonimus* egg positive cases were found.
Chan *et al.* (1994) examined the persistence of familial aggregation and familial predisposition to *Ascaris lumbricoides* and *Trichuris trichiura* infection over 2 periods of treatment and reinfection, in an urban community in Kuala Lumpur, Malaysia. Both parasite species were shown to be aggregated (assessed by the variance to mean ratio) within families at all 3 interventions, although no consistent trend in aggregation was observed over the period of the study. Associations between mean *Ascaris lumbricoides* and *Trichuris trichiura* infection levels of families, at all 3 interventions, were highly significant (*P* < 0.0001).

Herwaldt *et al.* (1994) studied the infections with intestinal parasites in Peace Corps volunteers in Guatemala to assess the role of parasites in causing diarrhoea. 115 stool specimens from a case control investigation (48 cases diarrhoea and 26 control episodes) were examined. The different helminths, which were found, were *Ascaris lumbricoides*, *Trichuris trichiura* and Hookworm.

De-silva *et al.* (1994) assessed the pattern of intestinal parasites among two diverse populations in Kandy area of Sri Lanka. Sample comprised of 354 preschool children from low cost housing area and 192 adults attending medical outpatient’s clinic at the teaching hospital Periandiya. Among the helminths, the prevalence in preschool children and adults for *Ascaris lumbricoides* was 21.7% and 11.9% respectively. For *Trichuris trichiura*, it was 6.5% and 4.7%, where as for mixed infections, it was 4.5% and 1.5%. The total prevalence was 4.5% and 21.3% for preschool children and adults respectively.
Virk et al. (1994) conducted a study on the prevalence of intestinal parasites in rural areas of district Shahjahan pur, Utter Pradesh. *Ascaris lumbricoides* was most prevalent parasite (17.85%) followed by *Trichuris trichiura*, Hook worm, *Hymenolepis nana*, Tape worm, and *Enterobius*. Parasitic load was higher in females (33.59%) than males (28.18%). The highest positivity was encountered in the age groups between 6 – 14 years.

Curtis et al. (1995) studied the stool disposal practices associated with childhood infections. Data from 2,793 household interviews with mothers of children from the town of Bobo-Dioulasso in Burkina Faso were analyzed to examine what differentiated mothers who reported using safer stool disposal practices from those who did not. Mothers with access to a tap in the yard reported using safe hygiene practices three times more often than mothers using wells outside the compound and twice as often as mothers who used public standpipes or wells within the yard.

Kightlinger et al. (1995) conducted a study on the epidemiology of *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworm in children in the Ranomafana rainforest, Madagascar. Faecal examinations revealed prevalence of 78% for *Ascaris lumbricoides*, 38% for *Trichuris trichiura*, 16% for hookworm, and 0.4% for *Schistosoma mansoni*. Infection intensity was measured indirectly by faecal egg counts and directly by *A. lumbricoides* expulsion following treatment with Pyrantel pamoate. The age
profiles showed a rapid acquisition of *A. lumbricoides* during infancy, increasing to 100% prevalence by age 10. There was evidence for age-dependent predisposition of the children to infection intensity for each of the 3 nematodes. Dual species intensity correlation was consistently strong for *A. lumbricoides* and *T. trichiura*. The significantly higher prevalence and intensity of ascariasis in girls were thought to be related to exposure.

Palmer and Bundy (1995) studied the epidemiology of human hookworm and *Ascaris lumbricoides* infestations in rural Gambia. *Necator americanus* and *Ascaris lumbricoides* were found to be the most prevalent helminths present at prevalence levels of 30% and 25% respectively. Other parasites present were *Trichuris trichiura* (2.4%) and *Schistosoma mansoni* (1.5%).

Palmer *et al.* (1995) studied the antibody isotype responses to antigens of *Ascaris lumbricoides* – one, which had been shown over a period of 12 months to be consistently lightly infected (controls) and other consistently heavily infected (cases). Children identified as cases were on average 4 times more heavily infected than the controls. Children with repeatedly heavy infections with *Ascaris lumbricoides* had higher concentrations of antibody isotopes to the antigens of *Ascaris lumbricoides* than children who are repeatedly lightly infected.

Huh *et al.* (1995) studied the intestinal parasitic infections in the residents of an emigration camp in Tijuana, Mexico. The different helminths observed included *Ascaris lumbricoides*, *Trichuris trichiura*, *Taenia* sp., and *Hymenolepis nana*. 
Tshikuka et al. (1995) conducted a study in Lubumbasi, Zaire, to identify features of the environment and living conditions that were significant predictors and to determine if the same predictors were important in populations living in the low socio-economic status (LSES) and high socio-economic status (HSES) areas. They considered maternal education, sanitary conditions as key determinants of infection intensity in both the lower and higher socio-economic status areas.

Khuroo (1996) gave a full detail of the classification, historical background, morphology, life cycle, pathogenic effects and the factors determining the prevalence of the *Ascaris lumbricoides*. The researcher concludes that Ascariasis control has remained a low priority because public health research workers have failed to demonstrate the magnitude of ascariasis as a disease, distinct from *Ascaris* as an infection.

Udonsi et al. (1996) analyzed the prevalence of infection and associations between human gastrointestinal nematodes among different age classes living in the urban and suburban communities of Port Harcourt, Nigeria. 85.3% were found to carry at least one of the four species of GI nematodes recognized during the study. The most common species was *Ascaris lumbricoides* (54%), followed by *Trichuris trichiura* (43.7%) and *Necator americanus* (42.7%) and lastly *Strongyloides stercoralis* (33%). Peak prevalence for *A. lumbricoides* was among the \( \leq 9 \) years age cohorts, whilst those for the remaining species all coincided among the 15-19 years age cohort.
Sugnam et al. (1996) conducted a study on the intestinal parasitic infestation among different population groups of Andaman and Nicobar islands. *Ascaris lumbricoides* was the commonest form of parasite encountered followed by *Trichuris trichiura* in all age groups.

Watkins et al. (1996) observed the effects of deworming on indicators of school performance in Guatemala. The children were randomly assigned to receive either Albendazole or placebo at 0 and 12 weeks in a 'double blind' study of the effects of deworming on the indicators of performance. Albendazole rid the children of *Ascaris* but it was less effective against *Trichuris*. Comparison of the treated and placebo groups showed no positive effects of deworming. The treated children were largely free of *Ascaris* for at least 6 months, but during that period, any improvement in reading, Vocabulary or attendance was not seen.

Marti et al. (1996) carried out a randomized trial in rural Zanzibar comparing a single dose of 200 micrograms/kg of Ivermectin and 400 mg/day for three days of albendazole for treatment of strongyloidiasis and other intestinal nematodes. In 301 children with *Strongyloides stercoralis* infection, treatment with Ivermectin or albendazole resulted in cure rates of 83% and 45%, respectively. While both drugs were very effective against *Ascaris lumbricoides*, *Trichuris trichiura* was cured only in 11% (Ivermectin) and 43% (albendazole) of the subjects, although the mean egg load was reduced by 59% and 92%, respectively.
Ananthakrishnan et al. (1997) reviewed the pathophysiology, chemical impact and control options of the most commonly prevalent geohelminths in the developing world. They noted 5-76% prevalence of intestinal worm infestation in India, similar to other developing countries.

Kang et al. (1998) studied the prevalence of intestinal parasites in rural southern Indians. They studied 78 members of 15 families from a village. Overall prevalence rate of various parasitic infections was 97.4% with only 2 of 78 subjects not excreting parasites in any of their 15 samples. 18 (23.1%) persons had only one type of parasites, while 58 (74.3%) had multiple parasites. Most common helminth infection was that of Hookworm, seen in 48/78 (61.5%).

Chai et al. (1998) undertook a survey on the residents along the Mekong river near Pakse, Laos, to know the status of helminth infections. The overall helminth positive rate was 75.9% and the different helminths observed included Opisthorehis viverrint (43.8%), Ascaris lumbricoides (26.2%) Taenia sp. (0.7%) and Schistosoma mekongi (1.5%).

Eve et al. (1998) in a survey of intestinal parasites among 827 rural villagers in the Brazilian Amazon revealed that the prevalence of infection with Necator americanus, Trichuris trichiura and/or Ascaris lumbricoides were high. However, the intensities of infection with the two parasites for which there were enough data on intensity for further analysis, Necator americanus and Trichuris
trichiura, were only low or moderate in each of the three districts studied. The possible reasons as concluded by the author for the unusual (but not unique) absence of high intensities include moderately good sanitation, low population densities, the way in which work activities were located geographically, the use of indigenous anthelmintics and the geographical isolation of the communities.

Needham et al. (1998) studied the epidemiology of soil-transmitted nematode infections in Ha Nam Province, Vietnam. Ascaris lumbricoides, Trichuris trichiura and hookworm infections were the only species detected. 83% of individuals were infected with Ascaris lumbricoides (mean EPG = 11971), 94% with Trichuris trichiura (mean EPG = 793) and 59% with hookworm (mean EPG = 302). Age-dependent patterns of infection prevalence and intensity were similar for Ascaris lumbricoides and Trichuris trichiura, but markedly different for hookworm infection.

Magambo et al. (1998) studied the prevalence of intestinal parasites among children in southern Sudan. 275 stool samples which were examined using formol-ether concentration techniques yielded different species of parasites. Children in the age group 6-10 years old were the most affected followed by the 11-15 year-old age group. The infection rate was slightly higher in males than females.

Kightlinger et al. (1998) examined the Ascaris lumbricoides intensity in relation to environmental, socioeconomic, and behavioural determinants of exposure to infection in children from
southeast Madagascar. 663 children, 4-10 yr old, revealed prevalence of 93% for *Ascaris lumbricoides*, 55% for *Trichuris trichiura*, and 27% for hookworm. Environmental, demographic, behavioural, and socioeconomic indicators assessed exposure to infection. *Ascaris lumbricoides* aggregations were associated with gender, housing style, ethnicity, and agricultural factors.

Oberhelman *et al.* (1998) correlated intestinal parasitosis, physical growth and psychomotor development among infants and children from rural Nicaragua. 961 children in two age strata (ages 0-24 months and ages 2-10 years) from one urban and three rural communities were screened for intestinal parasites, malnutrition and development delays. The prevalence of malnutrition was 14.6% (WTA), 8.4% (WFH) and 36.3% (HFA). *Ascaris* and *Trichuris* were more prevalent in malnourished children.

Norhayati *et al.* (1998) studied some risk factors of *Ascaris* and *Trichuris* infections in Malaysian aborigine (Orang Asli) children. 22.4% had single infection either by *Trichuris* or by *Ascaris*; 69.3% had mixed infection and most prevalent of mixed infection was a combination of *Ascaris* and *Trichuris*. They suggested that socio-behavioural (related to mothers education), demographic (children age) and environmental factors (usage of well water and non usage of toilets) are the elements to be considered in the design of long term soil transmitted helminth (STH) control in an endemic area.

Glickman *et al.* (1999) studied the intestinal nematode parasites of children in rural Guinea, Africa and its relationship to
geophagia. Geophagia was reported by parents to occur in 57%, 53%, and 43% of children between the age group 1-5, 6-10, 11-18 years respectively. The pattern of geophagia by age and gender of the children more closely resembled the infection pattern for the two orally acquired and soil transmitted nematodes (*Ascaris lumbricoides*, *Trichuris trichiura*) than it did the infection pattern for the two soil transmitted nematodes that infect by skin penetration (Hookworm, *Strongyloides stercoralis*).

Sebastian and Santi (1999) assessed the Health status of rural schoolchildren in the Amazon Basin of Ecuador of Naporuna ethnicity. They investigated the prevalence of protein-energy malnutrition, parasitic infections and pathology among 511 schoolchildren. 64% of the children surveyed were infected with one or more soil-transmitted helminths. Prevalence of stunting was 1.4% and wasting was 1.8%.

Toma et al. (1999) carried out a questionnaire survey with parasitological study on the inhabitants of 4 villages in Barru district, Sulawesi, Indonesia. The inhabitants with higher education background had significantly lower infection rates of *Ascaris* and *Trichuris*. The prevalence of hookworm infection was not significantly different between the inhabitants owning latrine and without it, but the prevalence of *Ascaris* and *Trichuris*, differed significantly.

Rochie and Benito (1999) studied the prevalence of intestinal parasite infections on the Island of Bioko. The average prevalence of
most common helminth was *Ascaris lumbricoides* and *Trichuris trichiura*. They established that parasitic infections in Equatorial Guinea represent a major health problem.

Lee *et al.* (1999) studied the helminth infections in the residents of rural areas near Ulaanbaatar, Mongolia. Out of 738 samples collected, *Enterobius vermicularis* eggs were detected in 138 cases. The other helminths observed include *Ascaris lumbricoides*, *Toxocara cati*, Hydate cyst etc. Lee *et al.* (2000) studied the status of infections caused by intestinal parasites among children and adolescents living in Legaspi city, the Philippines. They examined 64 subjects and observed the overall infection rate of 78.1%. Infection rates varied significantly in urban and rural areas as it was observed 56% in urban and 92.3% in rural areas. The different parasites observed were *Trichuris trichiura* 51%, *Ascaris lumbricoides* 40%, Hookworm 23.4%, *Iodamoeba butschlii* 15.6%, *Endolimax nana* 14.1%, *Entamoeba coli* 9.4% and *Giardia lamblia* 7.8%. Lee *et al.* (2000) studied the *Enterobius vermicularis* egg positive rate in a primary school in Chungchongnam-do (province) in Korea. Infection rates ranged from 4.2% to 26.1% among schoolchildren and the highest rate was observed in children attending Kindergarten. Lee *et al.* (2002) surveyed in the Kampongcham, Cambodia to find out the extent of intestinal parasite infection among primary school children. 251 faecal specimens were collected, out of which 54.2% were infected. It was shown that male children were more infected (57.3%) than female children (50.8%).
Raj (1999) studied the faecal occult blood testing of *Trichuris* infected primary school children in North-eastern peninsular Malaysia. All the specimens were examined for occult blood to investigate the possibility that trichuriasis causes occult intestinal bleeding in the absence of the overt *Trichuris* dysentery syndrome (TDS). They proposed that trichuriasis do not predispose to significant occult gastro-intestinal bleeding in children in the absence of the dysenteric syndrome. Stool specimens of 104 primary school children were examined. 61 children had *Trichuris* infection and 53 had *Ascaris* infections. No hookworm infection was detected.

Stephensen (1999) studied the effect of different infections on Growth failure. He proposed that high prevalence of infection including gut helminths among children living in poor areas of developing countries impairs linear growth in these populations. The reason as proposed by him was that infections might decrease food intake, impair nutrient absorption, cause direct nutrient loss, increase metabolic requirements or catabolic losses of nutrients and impair transport of nutrients to target tissues.

Tsuyuoka *et al.* (1999) conducted a study to describe the prevalence of anaemia, parasitic infections, and nutritional status of children attending public primary schools in Aracaju, Northeast Brazil. Of 360 students, 26.7% were anaemic, and prevalence was higher in children under 8 and over 15 years of age. Overall prevalence of intestinal parasites was 42%, with *Ascaris lumbricoides* (28.7%), *Trichuris trichiura* (15.6%), and hookworm
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(1.7%) most frequently found. There was an association between parasitic infections and poor sanitary conditions, but there was no association between anaemia and presence of intestinal parasites.

Sunethra and Lanerolle (1999) conducted a study on the soil transmitted helminth infection and its effect on Nutritional status of adolescent school girls (age 14-18 years) in both an urban area (N=383) and a rural area (N=231) of Sri Lanka. The prevalence of *Ascaris* and *Trichuris* infection was significantly higher (P<0.00001) in the urban area than in the rural area and this was associated with poor living conditions and personal hygiene. There was no significant difference in body mass index or haemoglobin concentration between infected and uninfected subjects.

Beach *et al.* (1999) assessed combined Ivermectin and Albendazole for treatment of intestinal helminth and *Wuchereria bancrofti* infections in Haitian schoolchildren. Children in the study were infected with *Ascaris* (29.2%), *Trichuris* (42.2%) and hookworm (6.9%) with 54.7% of children having one or more of these parasites. Children were randomly assigned to treatment with Placebo, Albendazole, Ivermectin or combined therapy. Combination treatment reduced the prevalence of *Trichuris* infections significantly more than either drug alone.

Chakma *et al.* (2000) conducted a study among school going children (6-14 years) of Baiga, Abuihmadia and Bharia tribes of Madhya Pradesh to assess the prevalence of anaemia and intestinal parasitic infestation among themselves. A total of 776-school going
children were included in the study of which blood samples of all and stool samples of 409 were collected. The results revealed that 30.3% of the children had severe anaemia (Hb < 7g/dl) and 50% children had intestinal parasites. The most common parasites were Hookworm (16.3%) and *A. lumbricoides* (18.5%). It was shown that though hookworm ova loads indicated mild to moderate infestation in most of the children, the continued presence of worms in marginally nourished children could contribute significantly to blood loss in the intestine with resultant anaemia.

Dickson *et al.* (2000) studied the Effects of treatment for intestinal helminth infection on growth and cognitive performance in children. There were some positive effects on mean weight change in the trials reporting this outcome: after a single dose (any anthelmintic), the pooled estimates were 0.24 kg (95% confidence interval 0.15 kg to 0.32 kg; fixed effects model assumed) and 0.38 kg (0.01 kg to 0.77 kg; random effects model assumed). Results from trials of multiple doses showed mean weight change in up to one year of follow up of 0.10 kg (0.04 kg to 0.17 kg; fixed effects) or 0.15 kg (0.00 to 0.30; random effects). At more than one year of follow up, mean weight change was 0.12 kg (-0.02 kg to 0.26 kg; fixed effects) and 0.43 (-0.61 to 1.47; random effects).

Narain *et al.* (2000) conducted a study on prevalence of *Trichuris trichiura* in relation to socio-economic and behavioural determinants of exposure to infection in rural Assam. In the overall multivariate model, open field defecation, large family size, and
three or more children in the household were found independently associated with *Trichuris* infection. Gender specific analysis revealed that in females the age was also independently associated with increased risk of infection whereas in males, earth flooring was the most significant risk factor independently associated with the risk of *Trichuris* infection.

Yong *et al.* (2000) conducted a small-scale survey on the status of intestinal parasite in rural villages in Nepal. Stool examination of 300 schoolchildren revealed incidence of intestinal parasites as 44%. The incidence of infection was more in females than in males.

Ortiz *et al.* (2000) investigated the influence of nutritional status, as determined from anthropometric measurement and of helminth infections on the immune response of children of low socioeconomic status in two rural communities in Venezuela: El Cardon in the state of Nueva Esparta and San Daniel in the state of Miranda. The results suggest that exposure level and individual susceptibility to the parasites are determining factors in parasitic infection and immune system behaviour.

Phiri *et al.* (2000) in their study on prevalence of intestinal parasites in urban-rural child populations aged 3-14 years in southern Malawi, analyzed stool samples from 553 children (273 urban, 280 rural) and found overall prevalence was higher in urban subjects than rural ones i.e. 16.5% vs. 3.6% with $p < 0.001$. 
Rodriguez et al. (2000) conducted study on schoolchildren at a public institution in Maracaibo municipality Venezuela. Faecal analysis was performed on 349 children of both sexes between 5 and 16 years of age. 83% of children presented enteroparasites with a high prevalence of polyparasitism (71.6%).

Simson et al. (2000) conducted a cross sectional study in Agnalem village, Tigray on 330 under five years of age of children. They reported an overall prevalence of 48.1% that was linearly associated with the age group of children. The positive prevalence of Ascaris lumbricoides was 5.8%. Few children harboured Strongyloides stercoralis (1.9%), Schistosoma mansoni (1%) and Enterobius vermicularis (1%).

Sebatian and Santi (2000) conducted a study on control of intestinal helminths in schoolchildren in low-Napo, Ecuador. They found that 48% children were infected at the first examination. The prevalence at the baseline was Ascaris 33.2% followed by hookworm 24.1% and Trichuris 6.5%. Sex was found to be a significant factor influencing the prevalence of hookworm and Trichuris. After 9 months, Ascaris and Trichuris prevalence had decreased but not hookworm. All of them increased after 18 months.

Merid et al. (2001) conducted a cross sectional copro-parasitologic study on 150 children under the age of 15 years engaged in fishing and fish processing. The overall prevalence of at least one-helminth infections was 92.7%.
Brooks and Grace (2001) compared the single dose oral Ivermectin with topical benzyl benzoate for the treatment of paediatric scabies. 110 children aged from 6 months to 14 years were randomized to receive either Ivermectin 200 μg/kg orally or 10% benzyl benzoate topically. Follow up was at 3 weeks post-treatment. There was no significant difference between the two treatments; both produced a significant decrease in the number of scabies lesions seen at follow up. Ivermectin cured 24 out of 43 patients (56%) and benzyl benzoate 19 out of 37 patients (51%) at 3 weeks post-treatment.

Thiong et al. (2001) conducted a study among schoolchildren in a rural district of Kenya to determine the extent of intestinal helminths and Schistosomiasis. Overall prevalence of Schistosoma mansoni was 31.6%, Hookworm was 36.8%, Trichuris trichiura 21.8% and Ascaris lumbricoides was 16.5%. The infestation of Schistosoma mansoni was more in girls (34.9% vs. 28.6%). More males than females were infected with Hookworms (39% vs. 34.5%).

Kabatereine et al. (2001) conducted a study among schoolchildren in southern Uganda on 2004 schoolchildren aged 2-20 years using a randomly selected sample. Overall 55.9% were infected with either Hookworm or Trichuris trichiura. The prevalence of Ascaris was 17.5%, Trichuris (7.3%) and Hookworm was 44.5%. The prevalence of Ascaris and Trichuris was highest in western districts, while Hookworm infection was more evenly distributed across the country.
Kim *et al.* (2001) conducted a study in Hamyang-gun, Gyeongsangnam-do (province), Korea on infection rates of *Enterobius vermicularis* and *Clonorchis sinensis* of primary school children. The egg positive rate of *Enterobius vermicularis* was 12.6% in two schools- Balkjeon and Wiseong. Pinworm infection was more in lower grade 17.6% than in higher grades 7.7%.

Smith *et al.* (2001) conducted a cross-sectional survey to examine the prevalence and intensity of *Ascaris lumbricoides* and *Trichuris trichiura* infections among 240 faecal specimens and the association between selected socio-demographic variables and infection for 62 households. The overall prevalence of *Ascaris lumbricoides* and *Trichuris trichiura* was 45% and 38% respectively. By univariate analysis, variables associated with infections of *Ascaris lumbricoides* were: number of children 2-5 years old ($P=0.001$), level of formal education of respondents ($P=0.01$), reported site of defecation of children in households ($p=0.03$), households with children who had a recent history of diarrhoea (0.002) and the location of households ($p=0.03$).

Rai *et al.* (2002) conducted a study on the infectious diseases and Malnutrition status in Nepal. They observed that intestinal parasitic infection was the major cause of Malnutrition and observed that Malnutrition associated with child mortality was more common among children aged less age of 5 years.

Crompton and Nesheim (2002) conducted a study on Nutritional impact of intestinal helminthiasis during the human life
cycle. During their study, they found that infections by gastrointestinal helminths are accompanied mainly by Nutritional disturbance with different infections having their deleterious effects at different stages during human life cycle. They observed, the severity of disease caused by soil-transmitted nematodes depends on the number of worms present per person.

Fallah et al. (2002) evaluated the mass treatment of Ascariasis in rural areas of Hamadan province, Islamic republic of Iran. They administered all persons involved, a single dose of 400mg of Albendazole at intervals of three months. The average rate of infection with Ascaris before treatment was 53.3%, ranging from 40% in Hamadan district to 75% in Toysercan. After two years of mass treatment, the infection rate had decreased to 6%.

Savioli et al. (2002) in their study established the fact that about 2 billion people are affected by schistosomiasis and soil transmitted helminths worldwide. According to them personal hygiene and play habits of children, make them more vulnerable to these infections.

Lindo et al. (2002) conducted a study on intestinal parasites among young children in the interior of Guyana. 85 children were examined and at least one intestinal parasite was detected in 43.5% (37/85) of the children studied and multiple parasitic infections were recorded in 21.2% (18/85).

Albonico et al. (2002) conducted a study on soil transmitted nematode infections and Mebendazole treatment in Mafia Island
schoolchildren. They observed that Hookworm infection was widespread 72.5% where as *Trichuris trichiura* was 39.7% and *Ascaris lumbricoides* was present at a low prevalence 4.2% mainly in urban areas. Their study was followed by a parasitological evaluation of Mebendazole treatment using a single 500 mg dose. They used their results to compare with results from recent studies of similar treatment regimens in the neighbouring Island of Pemba, Zanzibar. Mebendazole had higher efficacy against Hookworm in Mafia Island than that observed in Pemba Island. It was concluded that hookworms may be developing Mebendazole resistance on Pemba Island because of intense exposure to the drug there.

Ibrahim (2002) conducted a cross sectional study in schoolchildren aged 6-11 years from Deir-EL-Balah town in Gaza strip Palestine. 650 stool samples were analyzed, 230 samples were found positive for parasitosis showing an overall prevalence of 36.3%. A significantly higher prevalence of infection was observed among males 48.5% as compared to 27.8% in females. Most cases were clustered in 6-7 year age group 55%.

Waikagul et al. (2002) conducted a cross-sectional study of the prevalence of intestinal parasitic infection at eight schools in Bo-klau district and four schools in Chalerm prakiet district, Nan province in January and February 2001. 1,010 faecal samples examined, revealed the rate of helminth infection as 60%.

Kim et al. (2003) carried out a small-scale survey to investigate the status of intestinal protozoa and helminth infection
of inhabitants in Roxas city, Mindoro, the Philippines. They collected 301 stool samples, observed that overall positive rate was 64.5% and that of male, and female were 56.6% and 72.5% respectively. In their study, the highest infecting helminth was *Ascaris lumbricoides* (51.2%), followed by *Trichuris trichiura* (27.6%), Hookworm (8.0%) and *Enterobius vermicularis* (0.3%). The multiple infection more than two parasites was 29.6% and double infection with *Ascaris lumbricoides* and *Trichuris trichiura* was most common.

Kim *et al.* (2003) conducted a study on the status of pinworm (*Enterobius vermicularis*) egg positive rate of primary school children in Geoje Island. 754 children were examined and total egg positive rates of *Enterobius vermicularis* were 9.8% and those of male and female were 10.8% and 8.7% respectively. They showed that 2nd grade children had highest egg positive rate (15.3%) where as the 5th grade showed the lowest egg positive rate (2.6%).

Espinoza *et al.* (2003) studied the prevalence of intestinal parasites in children in highly deprived areas in the border region of Chiapas, Mexico and its possible association with demographic and socioeconomic indicators. They selected 32 communities of the border region of Chiapas and examined the children (1,478) randomly. The total prevalence of intestinal parasitosis was 67%. They presumed that lack of refrigerator and electricity was associated with the presence of *Ascaris lumbricoides*.

Margono (2003) studied some important human helminthiasis in Indonesia and found that many species of helminths are
prevalent in humans in Indonesia; however some of these species are highly prevalent and widely distributed. Of the nematode infections, both soil transmitted helminths and lymphatic filariasis are public health problems in the country.

Bordignon and Shakya (2003) observed the impact of deworming programme in Nepal supported by the World food programme. The survey conducted in the areas covered by deworming in 2000 revealed a dramatic reduction in infection. The prevalence of worm infection was reduced from 74% to 51% and of high intensity infection from 9.3% to 1.9%. Significant nutritional improvements were achieved because of the control of soil-transmitted helminths.

Quinell (2003) in a review article entitled ‘Genetics of susceptibility to human helminth infection’ establishes that the intensity of infection by many helminths is a heritable phenotype. He concluded that identification of the genetic loci involved might be important in the understanding of helminth epidemiology and the mechanism of resistance and pathology.

Kwena et al. (2003) conducted a study on the prevalence and severity of malnutrition in pre-school children in an area in rural western Kenya with intense malaria transmission, a high prevalence of severe anaemia and human immunodeficiency virus and high infant and under five mortality. Anthropometric indices were presented for 2130 children collected prior to and during intervention. The prevalence of stunting, wasting and being under weight was 30%, 4% and 20% respectively.
Ulukanligil et al. (2003) studied the demographic and parasitic infection status of schoolchildren and sanitary conditions of schools in Sanliurfa, Turkey. Of 1,820 children, more than 50% of the children were infected by single or multiple helminths. Ascaris lumbricoides, was the most prevalent species followed by Trichuris trichiura, Hymenolepis nana and Taenia sp. Sanitation survey indicate that the tap water was limited in three schools. These results indicated that burden of parasitic infections and poor sanitation conditions constituted public health importance among schoolchildren.

Legesse and Erko (2004) conducted a study on the prevalence of intestinal parasitic infections in a rural area close to the southeast of lake Langana, Ethiopia. Of the 259 students surveyed 217 (83.8%) had one or more parasites. Prevalence of Hookworm was the highest followed by Schistosoma mansoni, Trichuris trichiura, Taenia spp., Entamoeba histolytica, Ascaris lumbricoides, and Strongyloides stercoralis.

Adedayo and Nasiiro (2004) studied the incidence of intestinal parasites in Dominica (New York). In their study, parasites were found in 393 out of 3,752 stool samples (10.47%). The main parasites were Entamoeba coli, Hookworm, Giardia lamblia, Strongyloides stercoralis, Ascaris lumbricoides and Trichuris trichiura.

Kucik et al. (2004) studied the common intestinal parasites in United States and confirmed the presence of Enterobius
vermicularis, Giardia lamblia, Ancylostoma duodenale, Necator americana and Entamoeba histolytica. They also confirmed the accuracy of the Cellophane tape test for Enterobius vermicularis.

Heukelbach et al. (2004) studied the selective mass treatment with Ivermectin to control intestinal helminthiasis and parasitic skin diseases in a severely affected population. They observed that Ivermectin was an effective and safe means of reducing the prevalence of most of the parasitic disease prevalent in poor community in North-east Brazil.

Zani et al. (2004) studied the impact of Anthelmintic treatment on infection by Ascaris lumbricoides, Trichuris trichiura and Hookworms in Covas, Brazil. They carried four parasitological surveys from March 2001 to March 2002. Infected subjects were assigned to two groups for treatment with either albendazole (n=62) or mebendazole (n=57). They concluded that prevalence of infection fell significantly (p < 0.05) one month after treatment.

Okyay et al. (2004) studied the intestinal parasite prevalence and related factors in schoolchildren, in a western city sample, Turkey. In their study, they found that 145 (31.8%) students out of 456 were infected with one or more intestinal parasites. Rural children were more infected than urban children were. Rural residence, mother education less than primary school, sometimes or never usage of toilet paper and washing anal area by hands after defecation were significant associations.
Al-Nakkas et al. (2004) in their study in primary care centres on parasitic infections in Kuwait found at least 25% subjects positive for different types of parasitic infections. Parasitic infections were significantly higher in children than in adults ($P < 0.001$).

Agbolade et al. (2004) studied the intestinal helminthiasis and urinary schistosomiasis in some villages of Ijebu North, Ogun state, Nigeria between April and December 2002. Faecal Samples and urine samples from 199 subjects confirmed the presence of various types of helminths prevalent there. The most common type of helminths included *Ascaris lumbricoides* (62.8%), Hookworm (16.6%) and *Schistosoma haematobium* (2.5%).

Culha (2004) investigated the prevalence of *Enterobius vermicularis* in children in the 0-7 yrs in the Hatey society for the protection of children and teenagers in the 7-17 age groups in the Hatey orphanage for girls. The cellophane tape technique was used for the diagnosis and it was found that 71.4% were infected in Hatey society for the protection of children and 0.14% in Hatey orphanage for girls.

El-Ammari et al. (2004) studied the intestinal parasites among Libyans, Non Libyan Arabs and Non-Arabs living in Benghazi, Libya. Examinations of stool samples revealed that 14.1% Libyans, 18.5% Non-Libyan Arabs and 16.7% Non-Arabs were infected with one or more of seven species of helminth parasites.

Kaminsky et al. (2004) studied the occurrence of the intestinal parasites in 133 HIV positive individuals from Honduras. Of them
67% were co-infected with pathogenic and non-pathogenic parasites. Overall occurrence of nematodes was 44.3%.

Rai et al. (2004) examined the effect of enteric parasitosis on nutritional status of schoolchildren in remote hilly areas in Nepal. 325 schoolchildren aged 6 to 19 years (boys: 214; girls: 111) who provided both blood and stool samples were included. The blood haemoglobin (Hb) was estimated by Sahli’s method. Of the total, 201 (61.8%) had enteric parasites, predominantly the soil transmitted helminths. Rai et al. (2007) reported a case of seven-year-old, migrant from Bihar state, infested with *Fasciolopsis buski* *Strongyloides stercoralis* *Ascaris lumbricoides*, *Trichuris trichiura* and *Ancylostoma duodenale* in faeces. Patient responded to treatment with piperazine, thiabendazole and albendazole.

Hughes et al. (2004) studied the environmental influences on helmininasis and nutritional status among pacific schoolchildren. Of 1996 children, 32.81% were found infected by one or more intestinal helminths. Children were found to be 8.7 times more likely to be stunted and 4.3 times more likely to be underweight than non-anaemic and non-infected children.

Tashima and Simoes (2004) studied enteroparasitic occurrence in faecal samples analyzed at University of western Sao-paulo-unoeste clinical laboratory, Brazil. Children in the age group of 0-12 years were analyzed and out of 1000 children, 21.3% presented some kind of parasite.
Saathoff et al. (2004) studied the patterns of geohelmenth infection, impact of albendazole treatment and re-infection after treatment in school children from rural KwaZulu-Natal South African. In their study Grade 3 school children from Maputaland in Northern KZN were examined for infections with Hookworm, Ascaris lumbricoides and Trichuris trichiura, treated twice with 400mg albendazole and re-examined several times over one year. After the first treatment in order to assess the impact of treatment and patterns of infections and re-infections in their study, they found that single dose treatment with albendazole was very effective against Hookworm and Ascaris lumbricoides. Albendazole was found less effective against Trichuriasis.

Astal (2005) conducted and epidemiological survey of the prevalence of parasites among children in Khan Younis Governmente, Palestine. In the study, 1,370 children in the age group of 6-11 years were surveyed and 20.9% prevalence of infection was found.

Wanachiwanawin et al. (2005) correlated the Trichuris trichiura infection and faecal occult blood in primary school children in Narthiwat province, Thailand. Their study suggested that Trichuris trichiura infection with an intensity of 500 epg or greater may be associated with intestinal bleeding.

Kozan et al. (2005) conducted a study on the prevalence of helminth eggs on raw vegetables used for salads. 203 unwashed and 406 washed samples were analyzed by light microscopy.
Helminth eggs were detected in 12 (5.9%) of 203 unwashed samples and not in any washed samples (p<0.05).

Gabrielli et al. (2005) conducted a study on soil-transmitted helminth and Haemoglobin status among Afghan children in world food programme assisted schools. Under this study, a cross-sectional examination revealed that about 47.2% were infected with at least one soil-transmitted helminth. The study revealed that infections with *Ascaris lumbricoides* were most wide spread (40.9%), followed by *Trichuris trichiura* (9.9%) and Hookworms (0.7%) previously unknown from Afghanistan. During this study, the blood Haemoglobin concentration of surveyed children was also assessed and the results showed that 4% children are anaemic (Hb < 11gdl⁻¹) and 0.4% severely anaemic (Hb < 7gdl⁻¹).

Dada-Adegbola et al. (2005) conducted a study on the prevalence of multiple intestinal helminth infections among children in a farming community with no tarred access road, electricity or pipe-borne water. 170 stool samples from 88 male and 82 female children were examined. (68.2%) of the study, volunteers had one intestinal helminth infection or the other. Co-infection by more than one helminth was not uncommon. *Ascaris lumbricoides* and hookworm were the most common combinations observed in the study 52.6%, followed by the combination of *A. lumbricoides* and *T. trichiura* 17.5%.

Uga et al. (2005) conducted an epidemiological study on the intestinal parasites among school going children in a sub urban
area of Hanoi, Vietnam. Out of 217 children, 76% were positive at least for one intestinal parasite, with highest prevalence of 67% for *Trichuris trichiura* followed by *Ascaris lumbricoides* and Hookworm.

Poudyal *et al.* (2006) conducted a study aimed to identify the effective intervention group for the control of the intestinal helminth infections among school age children in rural Nepal. 1,677 stool samples of school age children from 25 schools and 1,014 samples from 25 communities were examined. They found a significant difference in the prevalence rates between the school age children in schools, who were widely infected than those in communities.

Quihui *et al.* (2006) investigated whether a variety of socio-economic factors, including maternal education and employment levels, were associated with intestinal parasite infection in rural schoolchildren. Children from lower-income families and with unemployed and less educated mothers showed higher risk of intestinal parasitism. Defecation in open areas was also a high risk factor for infection.

Celik *et al.* (2006) determined the incidence of intestinal parasites among primary school children in the central region of Malatya. Parasitic infection was observed in 415 (22.5%) out of 1,838 students and the highest rate of 10.6% was that of *Enterobius vermicularis*.

Alver and Tore (2006) studied the prevalence and distribution of intestinal parasites in Uludag University Medical School. The
overall prevalence of intestinal parasitic infection rate was 42.7%. Of these, 40.4% were female and 59.6%, male. The rate of intestinal parasites in the 0-9 age group was higher than that of other groups. Nguyen et al. (2006) determined Intestinal helminth infections among reproductive age women in Vietnam. A. lumbricoides and T. trichiura were more likely to be concurrent than expected by chance. There was significant interaction between prevalence and intensity of infection in all three species. All three helminth species were more common in certain ecologic zones than others. Hookworm infection was associated with farming and lack of a closed latrine, A. lumbricoides with use of untreated faeces as fertilizer (OR = 1.2) and co-infection with T. trichiura and T. trichiura with A. lumbricoides co-infection.

Karanikas et al. (2007) reported one case of small bowel obstruction leading to necrosis and another case of large bowel obstruction and volvulus due to an impacted tapeworm.

Zhou et al. (2007) studied the impacts of dietary intake and helminth infection on diversity in growth among schoolchildren in rural south China. Comparisons among tertiles classified by the extents of change in weight-for-age Z score from the first to the last survey revealed significant effects of dietary intakes and parasite infections.

Somers et al. (2007) collected Sixty-five Taenia samples from patients in a referral hospital in Hanoi, North Vietnam, for species identification by morphological and molecular techniques. Taenia
saginata asiatica was the most common species (55.4%) followed by T. saginata (38.5%) and T. solium (6.2%).

The above review provides a complete picture of the work done on different aspects of gastro-intestinal helminth infections. It is also clear that vast literature is available on the prevalence of helminth infections in human populations, but little attention has been paid towards the haematological and biochemical effects of helminthiasis.

Comprehensive field studies on prevalence and those revealing the factors influencing the helminth infections in children of Kashmir valley are wanting as is evident from non availability of the references on these aspects. Although, some hospital based research work has been carried out on different aspects of helminth infections in Kashmir valley, but that does not reflect the true picture of the status of helminthiasis in the children in community. Above review clearly indicates that a lot of work has been done on these aspects out side the state and the country, but scanty efforts have been put on finding the relationship between gastro-intestinal helminth infections and their effects on haemoglobin value, plasma proteins and nutritional status, so, it was felt necessary to carry out the study on these aspects and the present endeavour is a step in the same direction.