

Association of Anaemia and Intestinal Worm Infection among School going Children

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ABSTRACT

Intestinal worm infections are more prevalent throughout the tropics and subtropics. In many parts of the developing world, these parasitic worms and anemia are of considerable public health and social importance as they directly affect the performance of these children in their respective schools. Hence, this article relates the association of anemia and the parasitic worms, the methods of early diagnosis, and the ways to manage it.

Key words: Anaemia, Intestinal worms, School going children

AIM

The aim of the study was to establish the association between anemia and intestinal worm infections among school going children.

INTRODUCTION

In this systemic mini-review, we studied the association between the development of anemia and intestinal worm infections and various methods for early diagnosis. The research for the literature was carried out using online databases such as PubMed, ResearchGate, MEDLINE, and Google Scholar. The studies written in English and published in peer-reviewed journals were considered. The original research paper data were included in the study.

The keywords used were anemia, intestinal worms, school going children, helminths, prevalence, and parasites.

The titles and abstracts for each study were thoroughly read. The references from each article were further searched on to look for various other studies.

The studies were cross-sectional in nature. The studies had prospective design and included anemia as the outcome. Few studies also analyzed other risk factors associated with worm infections. Studies which dealt with

parasitic infections and the associated risk factors were searched on and included. One study which threw light on the management measures for parasitic infection-induced anemia was included in the study. No cadaver studies were included and no scoring system was done to evaluate any of these studies.

RESULTS AND DISCUSSION

In the literature search, many studies about worm infestation were found, but only few had data regarding the association between anemia and worm infestations. Of these, six were reviewed for our study.

In a study by Chami *et al.*,^[1] in the Ugandan villages, the intensity of *Schistosoma mansoni* infection was the heaviest in children (2.861 fold, $P < 0.001$) living in villages besides the beach. Apart from the association of anemia with worm infestations, other confounders such as malnutrition and malaria were noted. The eradication of *S. mansoni* in individuals with heavy infection intensity could reduce anemia by 32%. Further studies are required to include non-enrolled children with heavy intensity infection. Moreover, not to forget, the major mechanism of *S. mansoni* causing anemia is still unclear.

In a cross-sectional study carried out in Ethiopia by Degarege *et al.*,^[2] it was found that children with blood Group A are more susceptible to helminth infection and a reduction

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in the hemoglobin levels when compared to the other blood groups. The reason behind is that the helminth species such as hookworms, *S. mansoni* and *Ascaris lumbricoides* contain polysaccharides which are similar to the substances in blood Type A which might not be considered by the body as a foreign agent, thereby escaping the host immune response during infection. The other proposed mechanism for the infections in blood Type A is the presence of higher amounts of glycolipids which act as adhesion receptors for the helminths aiding in the rapid multiplication of the parasites in the body causing intestinal damage and blood loss. The study's limitation is that it did not explain the mechanism of anemia associated with *Trichuris trichiura*. The other limitation is that it did not study about the familial relationship, genetic factors, and household conditions related to the prevalence of anemia in the blood Type A.

Another surveillance study done in Kancheepuram District, Tamil Nadu,^[3] with stool samples from 335 children subjected to routine macroscopic and microscopic examination, was included in the study. The incidence of intestinal parasites among children of 6–12 years was found to be 68.05%, and the study revealed the association of anemia and intestinal worm infestation among 127 children. The overall incidence of anemia among the children was 167 and whereas the incidence of anemia in parasitized male children was found to be 57 and parasitized female children were found to be 70 making total number of 127. Chi-square test $\chi^2 = 9.775$ and $P = 0.002$ showed that there is a significant association between anemia and intestinal worm infestation. The limitation of this study is that there may be variations in the results compared to other similar studies due to heterogeneity in the sociodemographic characteristics of the study population and between various study location.

Another study, which was reviewed, was carried out by the Department of Microbiology, Patliputra Medical College and Hospital Dhanbad, Jharkhand.^[4] Blood samples and stool samples were collected from 480 children of 5–18 years of age from the rural and slum areas of Dhanbad. They found that 123 children were affected by the hookworm infection out of 480 children. In this study, they observed that number of hookworm associated anemic children was 29 out of 123 hookworm infected children. In Dhanbad large percentage of the population lived in rural and slum areas, they have very poor knowledge of personal hygiene. Hence, they are potentially exposed to hookworm infection.

In a cross-sectional study done among 550 children living in remote and rural areas in West Malaysia,^[5] 520 (94.5%) school children were among the age group of 7–12 years and 30 (5.5%) young children were among the age group of 1–6 years old. There were 254 (46.2%) boys and 296 (53.8%) girls. Out of 550 children, 26.2% had anemia, 54.9% had iron deficiency, and 16.9% had iron deficiency anemia (IDA). The overall prevalence of helminths was 76.5% comprising *T. trichiura* (71.5%), *A. lumbricoides* (41.6%), and hookworm infection (13.5%). They found that there was a significant association of anemia and IDA with the prevalence of *T. trichiura* and *A. lumbricoides* infections. The distribution of iron status indicator was also analyzed according to the intensity of STH infections. The Hb, SF, and SI levels declined from light infection to heavy infection for *T. trichiura*, *A. lumbricoides*, and hookworm infections. Although the prevalence of anemia, ID, and IDA increased with increasing worm burden, it was not statistically correlated with any of the worm burden thresholds.

This descriptive cross-sectional study was done among adolescent female schoolchildren in Anakaputhur area of Kancheepuram district.^[6] The prevalence of intestinal parasitic infection was found to be 36% with *Entamoeba histolytica* being the commonly isolated organism (23.2%) followed by *Giardia intestinalis* (5.2%), hookworm (4.4%), and *A. lumbricoides* (3.2%). The prevalence of anemia among them was found to be 84.8% with mild, moderate, and severe anemia being 12.8%, 46.8%, and 25.2%, respectively. Statistically significant association was found between intestinal parasitic infection and open field defecation, inadequate handwashing practices, and anemia.

The study was longitudinal and involved 403 children attending Tikur Wuha Elementary School, North Western Ethiopia,^[6] out of 403 which 15.4% were anemic and 58.3% were infected with intestinal helminths. The odds of anemia were higher among children infected with helminths (adjusted odds ratio = 3.83, 95 % CI = 1.92, 7.62). Children who were infected with STHs were treated with 400 mg albendazole while those who were infected with *H. nana*, *T. saginata*, and *S. mansoni* infection that were treated with praziquantel in appropriate doses (40 mg/kg body weight). Significant reduction in the prevalence of helminth infection (77.0%) and increment in mean hemoglobin level (+3.65 g/l) of children infected with helminths was observed 1 month after anthelmintic treatment.

CONCLUSION

Considerable amount of studies has reported the association of anemia among school going children. Various methods to confirm the prevalence of anemia have been studied, but studies are needed to establish the most efficient test to diagnose worm infections in school going children. As parasitic worms lodged in the gut for a long time can lead to persistent anemia, the need for preventive measures is highly stressed on. The authors recommend studies with well-defined risk assessment and outcome measures to formulate appropriate guidelines for preventive measures.

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