

## A Study on Iron Deficiency Anemia among the Hook Worm Infected Children

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Conflict of interest: Nil

### Abstract

**Introduction:** Hookworm, *Ancylostoma duodenale* infection and iron deficiency anemia (IDA) are prevalent in many developing regions. With this a study was undertaken to find the prevalence of IDA among the hook worm infection (HI) individuals.

**Methods:** It was a prospective research conducted in GSL Medical College, Rajahmundry. Study was conducted for a period of 6 months, protocol was approved by Institutional ethical committee. School going children of both gender those attended on outpatient basis to this institution were included in the research. After recruiting the participant, detailed clinical history was collected. Blood sample was collected by venue puncture by following the universal safety precautions in heparin anticoagulant tube. Simultaneously stool specimen was collected. Blood iron was estimated by automated analyser as per the manufacturer instructions as well as by using standard guidelines. Stool microscopy for the diagnosis of HI was also carried as per the guidelines. Anemia classification adhered to the guidelines. Chisquare test was used for statistical analysis and  $P < 0.05$  were considered to be statistically significant.

**Results:** Total 115 (100%) members were included, in this the prevalence of IDA was 38 (33%) and HI was 28 (24.4%). In HI cases, the prevalence of IDA was 21.8%. Statistically there was significant difference. Gender wise, statistically there was no significant difference respectively between HI and IDA.

**Conclusion:** In this study there is high incidence of IDA among the HI children. Consideration should be given to implementing school health program for HI prevention, incorporating behaviour change communication to promote dietary modification, along with universal iron supplementation. However small sample size, short duration of the research are the limitations.

**Keywords:** Anemia, Gender, Hookworm, research

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### Introduction

Hookworm, *Ancylostoma duodenale* infection and iron deficiency anemia (IDA) are prevalent in many developing regions. [1] The mechanism involves hookworms actively consuming blood from lacerated capillaries in the intestinal mucosa, leading to substantial gastrointestinal hemorrhage, loss of serum proteins, and intestinal inflammation. [2] The cumulative impact of chronic hookworm infection (HI) and iron deficiency in children and women of reproductive age can be severe [3], negatively affecting growth, as well as physical and cognitive development. Consequently, strategies to mitigate the impact of HI on childhood nutrition often include combined therapy with anthelmintics and iron supplements.

As per World Health Organization (WHO) assessments, approximately 870 million children

reside in regions characterized by high prevalence of helminthic infection. [4] India, on its own, accounts for nearly a quarter of the global cases, with approximately 220.6 million children requiring preventive chemotherapy. The strategy recommended by the WHO emphasizes the control of morbidity through the mass drug administration (MDA) of anthelmintic drugs, specifically albendazole or mebendazole. This approach targets preschool-age children, school-age children (SAC), women of reproductive age (WRA), and other populations at risk. The goal is to achieve a coverage rate of 75% in these populations by the year 2020. [5]

With this a study was undertaken to find the prevalence of IDA among the HI children.

**Methods:**

It was a prospective research conducted in GSL Medical College, Rajahmundry. Study was conducted for a period of 6 months, from January to June 2021. Study protocol was approved by Institutional ethical committee. An informed written consent was taken from the parents of the study participant's.

School going children of both gender those attended on outpatient basis to this institution were included in the research. Children with known anaemia status, those on oral iron folic acid supplementation, non cooperative children and known HI were not considered in this research.

After recruiting the participant in the study, detailed clinical history was collected. All the findings were recorded in the study proforma. The study was clearly explained in the local language and the use of IFA was explained in local language. The participants were allowed to ask doubts. After clarifying all the doubts beyond the knowledge attempted for blood sample collection. Simultaneously all were asked to submit stool specimen for Microscopy.

Blood sample was collected by venue puncture by following the universal safety precautions in heparin

anticoagulant tube. It was centrifuged at 3000rpm for 10 mnts. The serum was used for iron estimation. Blood parameters were estimated by automated analyser as per the manufacturer instructions as well as by using standard guidelines. [6] Stool microscopy for the diagnosis of HI was also carried as per the guidelines. [7] Anemia classification adhered to the guidelines. [8]

**Statistical Analysis:** The data were analysed using SPSS version 21, presented in mean and percentage. Chisquare test was used for statistical analysis and  $P < 0.05$  were considered to be statistically significant.

**Results**

Total 115 (100%) members were included, in this the prevalence of IDA was 38 (33%) and HI was 28 (24.4%). In HI cases, the prevalence of IDA was 21.8%. Statistically there was significant difference (Table 1). In this study, gender wise 41% (47) were boys and 59% (68) were girl children. Among the boys the prevalence of IDA was 9.6% (11) and it was 23.5% (27) in girls. Statistically there was no significant difference (Table 2). Whereas, gender wise, the prevalence of HI was 15 (13%) and 13 (11.3%), respectively among the boys' and girls'; statistically there was no significant difference (Table 3).

**Table 1: Distribution of IDA and HI among the study participants; n (%)**

HI	IDA	Non IDA	Total
Present	25 (21.8)	3 (2.6)	28 (24.4)
Absent	13 (11.3)	74 (64.4)	87 (75.6)
Total	38 (33)	77 (67)	115 (100)
Statistical analysis	$\Psi^2$ value = 49.6087; P value < 0.00001 Statistically significant		

**Table 2: Gender wise distribution of IDA among the study participants; n (%)**

Gender	IDA	Non IDA	Total
Boy	11 (9.6)	36 (31.3)	47 (41)
Girl	27 (23.5)	41(35.6)	68 (59)
Total	38 (33)	77 (67)	115 (100)
Statistical analysis	$\Psi^2$ value = 3.338; P value = 0.06769 Statistically not significant		

**Table 3: Gender wise distribution of HI among the study participants; n (%)**

Gender	HI	Non HI	Total
Boy	15 (13)	32 (28)	47 (41)
Girl	13 (11.3)	55 (47.8)	68 (59.1)
Total	28 (33)	87 (67)	115 (100)
Statistical analysis	$\Psi^2$ value = 2.4709; P value = 0.115969 Statistically not significant		

**Discussion**

Hookworm is among the major three soil-transmitted helminths, alongside *Ascaris lumbricoides* and *Trichuris trichiura*. Collectively, these three helminths infect over two billion people globally, and the associated disease burden could rival that of malaria. [5] Soil-transmitted helminth infections impose a substantial and often unnoticed

load of morbidity and mortality on impoverished populations in developing countries, constituting approximately 85% of the burden. Despite the implementation of control programs, the prevalence of hookworm disease remains substantial. Presently, around 500 million people are affected by hookworm, and a staggering 5.1 billion individuals are at risk of acquiring the infection globally. [9] The

findings from this parasitological survey, conducted within a stratified cohort of 6089 individuals nested within the Deworm3 trial population of 140,932 individuals in southern India, revealed that hookworm infection was the most prevalent.

In this research, the prevalence of HI was 33% (38) and IDA was 21.8% (25) and statistically there was significant difference (Table 1). Gender wise, the prevalence of HI was 13% and 11.3% respectively in male and female, statistically there was no significant difference (Table 3). As per the available literature, males are occasionally identified as being at a higher risk of hookworm infection [10]. Also studies have consistently shown no significant association between sex and hookworm infection. [11, 12] While not statistically significant, the infection prevalence by sex remained comparable until the fourth decade, after which women exhibited a higher prevalence than men. Prior research has observed an escalation in the intensity of infection, though not in prevalence, among older girls. [13, 14]

IDA common among the women, other than nutritional factors, HI was reported to be the important cause of this. [15] In this research also high rate of IDN was detected among the HI cases. Gender wise, high rate of IDA was detected in girls and there was no statistical significance (Table 2). Though there was less incidence of HI among the girls, menstrual loss also to be considered because literature also reported similar findings. [16]

In this study there is high incidence of IDA among the HI children. Consideration should be given to implementing school health program for HI prevention, incorporating behaviour change communication to promote dietary modification, along with universal iron supplementation. However small sample size, short duration of the research are the limitations.

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