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Research Paper

The study correlation of hookworm infection and mean corpuscular haemoglonbin concentration in rural pre-school children population of Aurangabad (M.S.), India

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Abstract

The study Correlation of hookworm infection and Mean corpuscular haemoglonbin concentration was carried out in rural Pre-school children population of Aurangabad (M.S), India. The sampling method was stratified random sampling. Sample size was calculated which was 547 and the subjects were selected from the above locality. Among the sampled population 158 were found hookworm positive. Stool and blood samples of hookworm positive cases were taken who were 158 in number, and calculation of M.C.H.C. level and hookworm infection burden in terms of No. of ova per gm of faeces was made. Haemoglobin level was estimated by cyanmethaemoglobin method and packed cell volume by microhaematocrit method. Quantitative estimation of hookworm ova in stool was carried out by stoll's modified egg counting technique. Results of the study showed a significant relationship between M.C.H.C. level and No of hookworm ova per gram of faeces (r = - 927), a strong negative correlation.

Keywords: Hookworm infection, Mean corpuscular haemoglonbin concentration, Aurangabad.

Introduction

Hookworm infection and schistosomiasis rank among the most important health problems in developing countries. Both cause anaemia and malnutrition, and schistosomiasis also results in substantial intestinal, liver and genitourinary pathology [1]. It has also been observed that hookworm infection is common in rural areas near rivers [2]. The common cause of iron deficiency anemia in adult male and post menopausal women is blood loss from GI tract, the commonest cause in India is hookworm infestation. Pre-school children are also prone to this parasitic infestation. Nearly 1/4th of the world population is infested with hookworm. It is estimated that hookworm alone is responsible for daily loss of blood equivalent to; total exsanguinations of about 1.5 million people [3].

Soil-transmitted helminths (STHs) are widely distributed in tropical and sub-tropical areas. Globally, more than Soil-transmitted helminths (STHs) are widely distributed in tropical and sub-tropical areas. Globally, more than1, 500 million people suffer from these geohelminths. Approximately 300 million people are estimated to be suffering from severe morbidity due to malnutrition and anemia [4, 5]. School aged children are at high risk for STH infections because of their habit of playing in the dirt which may be contaminated

with the infective stages of STH eggs/larvae and their lacks of good personal hygiene [4, 6]. Children in this age group are in a period of intense learning, but helminthic infections hinder their performance, and may retard physical and mental growth and development [4]. Children in this age group are in a period of intense learning, but helminthic infections hinder their performance, and may retard physical and mental growth and development [4].

Hookworms have long been recognized as an important cause of intestinal blood loss leading to iron deficiency and protein malnutrition. The iron deficiency anemia that accompanies moderate and heavy hookworm burdens is sometimes referred to as hookworm disease [7]. When host iron stores are depleted, the extent of iron deficiency anemia is linearly related to the intensity of hookworm infection [8]. Because of their underlying poor iron status, children, women of reproductive age, and pregnant women are frequently the ones most susceptible to developing hookworm anemia [9]. Iron deficiency anemia during pregnancy has been linked to adverse maternal-fetal consequences, including prematurity, low birth weight, and impaired lactation [10].

The present study has got two important objectives is that to find out prevalence, rate and intensity of hookworm infection and find out whether a significant correlation exists between hookworm infection and M.C.H.C.

Materials and Methods

Collection and examination of Blood samples

The survey was conducted during June 2011 to April 2012. The stool samples were collected from 547 male as well as female school children in the age group 9-10 years from different 7 Talukas of Aurangabad district Maharashtra, India. After proper briefing and training clean labeled bottle were distributed to the subjects for collection of stool samples. Blood samples were taken from 158 hookworm positive cases. 158 hookworm positive cases were subjected to detailed investigations. Blood samples were taken by sterile technique [11]. Quantitative estimation of hookworm ova in faeces was performed by stoll's modified egg counting technique [12]. Haemoglobin was estimated by Cyanmethaemoglobin method [13, 14]. Packed cell volume (PCV) was determined by micro-haematorit method. Mean corpuscular haemoglobin concentration was determined by the formula,

M.C.H.C = Haemoglonbin in gram per 100 ml of blood X 100 Volume of packed cells in ml per 100 ml of Blood.

Prevalence and Intensity

Five hundred and forty seven school children, age 9-10 years, in 8 randomly selected primary schools in Aurangabad district, Maharashtra state, were investigated for their intestinal helminthic infections between June 2011 to April 2012.

Collection and examination of faecal samples

The pupils were educated on the causes of intestinal helminthic infections among school aged children and they were convinced that every child ought to be free from such infections, thus the necessity of participating in the research work was appreciated by them. Thereafter, wide mouth corked sterile bottles were given to the pupils for the collection of their stool samples at home and structured questionnaires were distributed among the participating pupils for the collection of demographic information such name (optional), age, sex, type of toilet facility used, and number of individuals in the house, parents occupation, religion, foot were habits, pet/domestic animals reared, regularity of deworming etc and accordingly labeled (ID).

The schools included are as follows:

S. No.	School	Code
1.	Bhartiya Primay School, Hudco, N-11 Aurangabad	S1
2.	Amar Primary School, Sanjay Nagar, Aurangabad	S2
3.	Zilla Parishad School, (Z.P.), Waluj, Tal –Gangapur	S3
4.	Zilla Parishad School, (Z.P.), Dongergaon, Tal – Phulambri.	S4
5.	Ramkrishna School, Tal- Sillod	S5
6.	Zilla Parishad School, (Z.P.), Tal. Paithan	S6
7.	Central school, Yellora, Tal- Khultabad	S7
8.	Zilla Parishad School, (Z.P.), Tal – Vaijapur.	S8

The pupils were taught how to collect stool samples and with the aid of their teachers, the questionnaires were correctly filled. The height and weight of the pupils were taken in the morning of the following day as they submitted their stool samples between 7.30 and 8.30 am. The stool samples were properly labeled and were carried in a cold box filled with ice packs and transported to the private laboratory for analysis. The samples that could not be analysed immediately were preserved using 10% formalin until they were examined [15]. Stool analysis was performed using the Kato-Katz technique [16].

The following formula is used to calculate the prevalence and intensity of infection in a community according to WHO guidelines.

$$\text{Prevalence} = \frac{\text{Number of subjects testing positive}}{\text{Number of subjects investigated}} \text{ X } 100$$

Stool examination

Fresh morning stool samples were collected in nylon containers containing 10 ml of 10% formaldehyde. The containers were labeled, and immediately transported to the pathology laboratory for further processing. The stool specimens were processed using Water low's classification.

Results and Discussion

The prevalence rate of hookworm infection among 547 subjects under study is given below (Table 1).

Table 1: Prevalence of hookworm infection in sampled population n = 547

	No. of sample	% Age
Hookworm positive	158	28.88
Hookworm negative	389	71.11
Total	547	100

This relationship is statistically significant (Correlation value (r) is calculating using Minitab 16 software).

In Table 2 intensity of hookworm infection in terms of Number of ova per gram of faeces has been shown versus mean M.C.H.C values.

Table 2: Intensity of hookworm infection in terms of No of ova per gram of faeces has been shown versus mean M.C.H.C values

No. of ova per gram of faeces	No. of sample	Mean M.C.H.C Values
<1500	35	31.24
2000-3000	47	29.63
3001-4000	39	26.54
4001-5000	25	21.48
5001-6000	8	19.14
6001-7000	5	17.24
7001-8000	3	13.14
P < 0.05		r = - 0.927

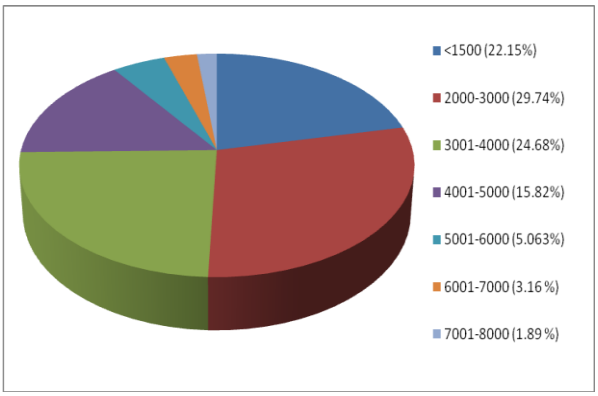

Figure 1: Intensity wise distribution of hookworm infection positive cases

In pie diagram intensity wise distribution of hookworm ova in hookworm positive cases has been shown.

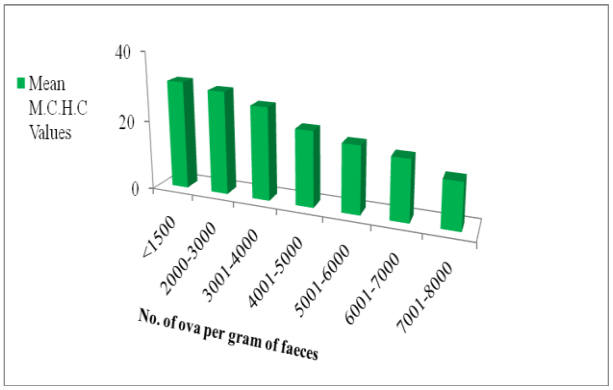

Figure 2: The relationship between No of ova per gram of faeces and M.C.H.C values

The Graph depicts that there is a negative relationship between intensity of hookworm infection and M.C.H.C values. The curve shows a sloping trend. It also shows that there is a consistent decrease of M.C.H.C values with increasing intensity of hookworm ova per gram of faeces. It is clear that with increasing intensity of hookworm infection the degree of fall in M.C.H.C values also increases and the difference between two adjacent values increases. This indicates that heavy infection of hookworm cases decreases the level of M.C.H.C more appreciably.

This study has shown a strong negative correlation of undoubted significance between hookworm infection and M.C.H.C levels, with a coefficient of correlation of r= -0.927. This study coincides the previous studies in favour of relationship between hookworm infection and M.C.H.C values and on the other hand contradicting the studies, which show no relationship between hookworm infection and M.C.H.C values.

Watthanakulpanich *et al* [17] has been study on blood tests of 182 hookworm-positive primary school children, composed of 22 heavy, 65 moderate and 95 light infections, were compared with a control group of 57 children who were helminth-free both before and after receiving deworming medicine. In this study, hookworm-infected schoolchildren had lower RBC, Hb, Hct, MCH, MCHC and albumin levels than the helminth-free group. Hotez [18] also shows mild anemia in schoolchildren may not be evident on physical exam. Hookworm control still relies on the frequent use of antihelminthic drugs, either through deworming programs targeting school-aged children or integrated control programs

The study on similar with a strong negative correlation of undoubted significance between hookworm infection and M.C.H.C levels, with a coefficient of correlation of r=-0.908[19]. Vaterlaws *et al* [20] study on similar Full blood counts were carried out on 349 male and 22 female apparently healthy Papua New Guinea subjects, most of whom were highlanders. In males, MCHC were significantly lower than the Australian normal means and females, MCHC were lower than Australian means.

The study also finds out various explanations for the shortcomings in the studies, which find no relationship between hookworm infection and M.C.H.C values. In some studies the sample size was too small [21]. In some studies the burden was not measured in terms of No of ova per gram of faeces or the methods used were inaccurate [22, 23, 24]. In some of the studies which did not find any relationship between burden and M.C.H.C there was no heavy infection in the series by [25].

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