

A comparative Study to Observe the Effect of Vitamin A, Vitamin B₂, Vitamin C and Iron Supplementation on Haemoglobin Levels among Dewormed and Undewormed Groups of School Children

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Introduction

The soil transmitted helmenthic infections, specially the ascariasis and ankylostomiasis have received a worldwide importance^(1,2). Mutallib⁽³⁾ examined 5960 children of 13 villages of different districts of Bangladesh and found that gross prevalence of parasitism was 99.05% and if parasites were considered separately then infestation of *Ascaris*, Hookworm and *Trichuris trichura* were found to be 92.2%, 9.9% and 52.46% respectively. Among the common parasites, the hookworms are well established as the cause of microcytic hypochromic anaemia^(4,5). Hookworms have been reported to cause hypoalbuminemia⁽⁶⁾. Two recent studies^(7,8) have suggested that there is an association between heavy ascariasis and retardation of growth in normal children and between light infection and growth retardation in children suffering from protein energy malnutrition. *Trichuris trichura* is a widely prevalent human parasite but the majority of the infection are subclinical and even these subclinical cases may suffer some degree of damage because of they consume small amount of blood⁽⁵⁾. Vitamin A supplementation may increase the haemoglobin level in animals⁽⁹⁾. Iron is

needed for Haemoglobin formation⁽¹⁰⁾. Vitamin C reduces anaemia by influencing the formation of Haemoglobin and deposition of Iron in the liver⁽¹¹⁾. Iron deficiency is caused by riboflavin deficiency and so it appears that riboflavin deficiency interferes with the production of RBC in men⁽¹¹⁾. Clinical studies demonstrated that malabsorption of protein, carbohydrate, fat and Vitamin A among the children with ascariasis⁽¹²⁾. It has also been seen that deworming improves absorption function and results in significant increase of serum levels of Vitamin A⁽⁷⁾. Rodger⁽¹³⁾ found a group of patients infected with *ascaris* to have lower level of serum Vitamin A value as compared to uninfected controls. Mahlambis⁽¹⁴⁾ found that patients with *ascaris* showed relatively poor absorption of radio actively labeled Vitamin A as compared to uninfected controls. Another study showed no significant differences in mean blood levels of Vitamin A. Haematocrit and vitamin C between subjects infected with *ascaris* and controls⁽¹⁵⁾. Blumenthal⁽¹⁶⁾ found that ascariasis had a statistically significant adverse effect on the levels of plasma Vitamin and riboflavin. *Ascaris* and other parasites were found to destroy vitamin in vitro and the larger the worm the greater the degree of

destruction⁽¹⁷⁾. There appears to be significant evidence of an adverse effect of ascariasis on the Vitamin A and Vitamin C absorption from the intestine⁽¹⁶⁾. There are no special studies about the effect of Vitamin A, Vitamin B₂, Vitamin C and Iron supplementation on the levels of haemoglobin among dewormed and undewormed groups of Bangladeshi Children. The present paper described the changes of Haemoglobin levels after proper supplementation of Vitamins (Vitamin A, Vitamin B₂, Vitamin C) and Iron either separately or combinedly among dewormed and undewormed groups of rural school children of Bangladesh.

Materials and Methods

The study was carried out among 137 school children situated in different places of Bangladesh. The age group was 14 to 15 years. They were selected purposively. The students were divided into 6 groups. They were as follows: (A) 24 Children for Vitamin A supplementation, (B) 32 children for Vitamin B₂ supplementation, (C) 28 children for Vitamin C supplementation (D) 17 children for Iron supplementation, (E) 30 children for a combined supplementation of Vitamin A, Vitamin B₂, Vitamin C and Iron and (F) 12 children for placebo without any supplementation. Routine examination of stool for AL, AD, and TT were done by clinical laboratory method⁽¹⁸⁾. Deworming was done by Mebendazole using conventional doses. Dietary findings of the 137 experimental students were found by recall method. Dietary information showed the deficiencies of Vitamin A, Vitamin B₂, Vitamin C and Iron among the students.

Under each major group, two sub-groups (both wormed and dewormed) were supplemented with respective supplements such as Vitamin A, Vitamin B₂, vitamin C, and Iron and the combined supplements of vitamin A, vitamin B₂, Vitamin C & iron administered together. Supplementation was continued for 4 weeks. The doses of Vitamin A, Vitamin B₂, Vitamin C and Iron were 200000 I.U. once, 1.25 mg daily, 125 mg daily and 20 mg daily respectively. Group F was not given any supplementation. Haemoglobin levels of each group (A-F) were determined before and after supplementation. Haemoglobin was determined by the method of Jhon. D. Baner⁽¹⁹⁾, Mean differences, % changes and significant tests of Haemoglobin levels were done for each dewormed and undewormed categories for A to F groups for comparative study.

Results

Mean Haemoglobin level was found to be 10.0% higher in vitamin A supplemented dewormed children as compared to baseline mean Haemoglobin levels (Table 1). While average haemoglobin level was found to be 2.4% higher in Vitamin A supplemented undewormed category as compared to the base line level (Table-1). Vitamin B₂ supplementation in undewormed group caused a 2.6% rise in haemoglobin (Table 2) while a 3.3% rise in haemoglobin was found to be associated with the supplementation of Vitamin B₂ in dewormed children (Table-2). A 3.8% rise in haemoglobin levels was found to be associated with vitamin C supplemented dewormed children (Table-3) While Vitamin C supplementation in

undewormed children was followed by a 2.2% rise in Hb (Table-3) . A 5.9% rise of haemoglobin level was found in Iron supplemented dewormed children (Table-4) while 5.5% rise was found in Iron supplemented undewormed children (Table 4). Rise of Haemoglobinb levels percentage (5.4%) was better in Vitamin A, Vitamin B₂, Vitamin C and Iron supplemented dewormed category (Table-5). Least percent change (4.5%) of haemoglobin levels has found in vitamin A, vitamin B₂, vitamin, C & iron

supplepnted undewormed catgory (Table-5). 4.9% change of Haemoglobin levels was found in dewormed category with no supplementation (Table-6). 2.4% change of Haemoglobin levels was found in undewormed with no supplementation category (Table -6). The mean differences of Haemoglobin levels in each dewormed and undewormed categories of A to F group were insignificant (P>0.05) though the percent changes of Haemoglobin levels were encouraging.

Table 1 : Effect of vitamin A supplementation on Haemoglobin levels among Dewormed and Undewormed Students.

Parameter	Dewormed (n=12)				Undewormed (n=12)			
	B.S.	AS	MD	% change	BS	AS	MD	% Change
Haemoglobin Levels (Mean gm/dl)	12.41	13.65	1.24**	10.0	14.68*		0.34*	2.4

BS = Before supplementation, AS=After supplementation

MD = Mean difference

P>0.05

P<0.05

Table-2 : Effect of Vitamin B₂ supplementation on Haemoglobin Levels in dewormed and undewormed students.

Parameter	Dewormed (n=12)				Undewormed (n=11)			
	B.S.	AS	MD	% change	BS	AS	MD	% Change
Haemoglobin Levels (Mean gm/dl)	13.14	13.57	0.43*	3.3	3.35	13.69	0.35	2.6

BS = Before supplementation

AS = After supplementation

P>0.05

Table 3 : Effect of vitamin C supplementation on Haemoglobin levels among dewormed and undewormed children.

Parameter	Dewormed (n=15)				Undewormed (n=13)			
	B.S.	AS	MD	% change	BS	AS	MD	% Change
Haemoglobin levels (Mean gm/dl)	13.0	13.5	0.5*	3.8	13.4	13.7	0.3*	2.2

BS = Before supplementation AS = After supplementation
P> 0.05

Table 4 : Effect of Iron Supplementation on Haemoglobin levels among dewormed and undewormed students

Parameter	Dewormed (n=6)				Undewormed (n=12)			
	B.S.	AS	MD	% change	BS	AS	MD	% Change
Haemoglobin levels (Mean gm/dl)	13.4	14.2	0.8*	5.9	12.7	13.4	0.7*	5.5

BS = Before supplementation
AS = After supplementation
P>0.05

Table 5 : Effect of Vitamin A, Vitamin B2, Vitamin C and Iron combined supplementation on Haemoglobin Levels among dewormed and undewormed students.

Parameter	Dewormed (n=13)				Undewormed (n=17)			
	B.S.	AS	MD	% change	BS	AS	MD	% Change
Haemoglobin Levels (Mean gm/dl)	12.9	13.6	0.7*	5.4	13.1	13.7	0.6*	4.5

BS = Before supplementation
AS = After supplementation
P>0.06

Table 6 : Effect of Deworming on Haemoglobin Levels among students.

Parameter	Dewormed (n=6)				Undewormed (n=6)			
	B.S.	AS	MD	% change	BS	AS	MD	% Change
Haemoglobin Levels (Mean gm/dl)	12.80	13.43	0.63*	4.9	12.40	12.70*	2.4	0.31

MD = Mean difference

P>0.05

Discussion

The study has been carried out among 137 school children of 14 to 15 years of age of different school children of Bangladesh to observe the change of Haemoglobin levels after supplementation of Vitamin A, Vitamin B₂, Vitamin C and Iron separately and Vitamin A, Vitamin B₂, Vitamin C combinedly in dewormed and undewormed subjects. Most interesting was that the percent change of Haemoglobin levels was the highest in Vitamin A supplemented dewormed category (Table-I). So the result favoured the mass supplementation of Vitamin A among the children who were disinfested. Percent change of Haemoglobin levels was higher (3,3%) among dewormed category with Vitamin B₂ supplementation than undewormed supplemented category (Table-3). So mass Vitamin B₂ supplementation is not encouraged and deworming is needed for change of Haemoglobin levels for more effective Vitamin B₂ Supplementation. Percent rise of Haemoglobin levels was higher (3,8%) in Vitamin C supplemented dewormed subjects (Table-3). In the same way, percent change of Haemoglobin levels were higher (5,9%)

when Iron was supplemented in dewormed category (Table-4). So, Vitamin C and Iron supplementation were more effective in changing Haemoglobin levels among the population who were disinfested. But Tilles et al (20) found that dietary supplementation of Iron corrects the anaemia without the need for deworming which is contrary of our study. Another study(21) also confirmed that a small daily supplements of Iron alone maintains normal haemoglobin levels in subjects infected with hook worms. Percent rise of haemoglobin levels was 5.4% when Vitamin A, Vitamin B₂, Vitamin C and Iron were supplemented combinedly in dewormed subjects (Table-5), leading to conclusion that deworming plays an important role in increasing haemoglobin levels when Vitamin A, Vitamin B₂, Vitamin C and Iron were supplemented combinedly in dewormed category. The study (Table -6) also revealed that only deworming (without supplementation of any of 3 Vitamins and Iron) has a special role in promoting haemoglobin levels. A percent rise of 4.9% haemoglobin level was found in dewormed children, who were not given any supplementation of Vitamins and

Iron. On the other hand a percent rise of 2.4% in haemoglobin level was found in undewormed group without any supplementation of Vitamins or Iron. Dewormed and undewormed children did not differ significantly in terms of their percent rise in Hb level. This finding is consistent with a previous observation of Margin who did not find any significant difference in the change of Hb level between infested and non-infested groups.

Summary

The present study describes the effects of supplementation of Vitamin A, Vitamin B₂, Vitamin C and Iron on haemoglobin levels among dewormed and undewormed children. The experiment was done purposively in 137 children of 14 to 16 years old in different schools of Bangladesh. The children were divided into 6 groups. They were as follows: (A) 24 children for Vitamin A supplementation, (B) 33 children for Vitamin B₂ supplementation (C) 28 children for Vitamin C supplementation (D) 17 children for Iron supplementation (E) 30 children for a combined supplementation of Vitamin A, Vitamin B₂, Vitamin C and Iron and (F) 12 children for no supplementation. Each of the main groups (A to E) was again divided into a dewormed and undewormed categories. Undewormed children were found to be infected with mild loads of AL, AD and TT. Dewormed categories were selected after total disinfestation. In each main group both wormed dewormed children were supplemented with Vitamin A, Vitamin B₂, Vitamin C and Iron separately and Vitamin

A, Vitamin B₂, Vitamin C and Iron combinedly for a period of 4 weeks respectively Haemoglobin levels were compared before and after the 4 weeks period supplementation in each of the categories. Haemoglobin levels were substantially increased (10% change, $P > 0.05$) when Vitamin A was supplemented in dewormed categories. Percent change of Haemoglobin levels were found to be 3.3% ($P > 0.05$) and 2.6% ($P > 0.05$) in dewormed and undewormed categories respectively when Vitamin B₂ were supplemented. Percent change of Haemoglobin levels were found 2.2% ($P > 0.05$) and 3.8% ($P > 0.05$) in undewormed and dewormed categories when they were supplemented by Vitamin C. An increase of Haemoglobin levels of 5.5% ($P > 0.05$) and 5.9% ($P > 0.05$) were found in undewormed and dewormed categories respectively when iron was supplemented. Overall mean changes of Haemoglobin levels was 5.4% ($P > 0.05$) when all the micronutrients were supplemented combinedly in dewormed category, while mean changes of Haemoglobin levels was 4.5% ($P > 0.05$) in undewormed category, while it was 2.4% ($P > 0.05$) in undewormed category when no supplementation was made. So an increase in Haemoglobin levels were found among dewormed and undewormed categories of children, when Vitamins (Vitamin A, Vitamin B₂ and Vitamin C) and Iron were supplemented and the change of Haemoglobin levels were found to be higher in dewormed categories than to undewormed categories.

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