

Effect of Deworming vs Iron-Folic Acid Supplementation Plus Deworming on Growth, Hemoglobin level, and Physical Work Capacity of Schoolchildren

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The effect of deworming vs deworming and weekly Iron-Folic acid (IFA) on growth, hemoglobin level, and physical work capacity of children was studied. Children from three rural schools studying from 4th to 7th standard were selected. One set of school children were given deworming tablet (400 mg albendazole) once in six months while the second school children received deworming tablet along with weekly dose of Iron Folic acid Tablet (60 mg of elemental iron and 0.5 mg folic acid). Anthropometric measurements, hemoglobin, and physical work capacity was estimated. No significant change was noticed in the prevalence of malnutrition or physical work capacity of the children. As compared to only deworming, IFA + Deworming showed 17.3 % increase in the hemoglobin levels ($P < 0.001$). Thus weekly IFA along with deworming has shown beneficial effect on the hemoglobin levels of the children.

Key words: Anemia, Child, Deworming, Growth, Iron-Folic Acid, Physical work capacity.

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Intestinal parasitic infections can adversely affect the health status of a high proportion of school age children, causing iron-deficiency anemia, and decrease in work capacity and fitness [1].

One of the reasons for the apparent failure to reduce the prevalence of anemia is the assumption that the only cause of anemia is iron deficiency due to nutritional causes. Thus the role of other causes has been underestimated, and that iron-deficiency without anemia has not been addressed. We conducted this study to evaluate the impact of deworming alone vs deworming with weekly (IFA) supplementation on growth, hemoglobin status and physical work capacity of rural school going children.

METHODS

This trial was conducted over a period of one year. Out of the 45 schools functioning in the rural industrial area of Vadodara, three schools were randomly selected for conducting the study.

To estimate growth, anthropometric measurements *i.e.* height and weight were taken. Hemoglobin estimation was done by Cyanmet hemoglobin method [2]. To elicit information on physical work capacity, Step test was done [3]. Weight was taken with the help of digital bathroom

scale with least count of 0.01 kg. The bathroom scale was calibrated before use. Height was taken by standardized fiber glass tape. After 30 weeks of supplementation, all the indicators *i.e.* height, weight, hemoglobin and step test were repeated on the children.

Considering the prevalence of anemia in the age group as 90-95 % in this area, the minimum sample size calculated for the study was 144. All the children from 4th to 7th standard of all the three schools were enrolled for the study. The three schools were randomly allocated the intervention. In one school, IFA (60 mg elemental iron and 0.5 mg folic acid) was administered on weekly basis for 30 weeks along with deworming (400 mg albendazole tablet) every six months (at start of study and 6 month later). In the second school, only deworming was done; while in the third school, standard care conditions were maintained without any supplement-tation. All the drugs were given under supervision compliance sheets were maintained. If a child was absent on the day of distribution of tablets, he/she was given it on the next day. During the three week Diwali vacation, each child was given 3 IFA tablet in a pouch to consume every week during vacation. After the vacation, the compliance for these tablets was noted.

Approval for the study was obtained from the ethical

committee of the home institution ethical board. Written consent was taken from the school authorities and the parents to carry out the study. Children were demonstrated the methodology of growth monitoring, hemoglobin estimation and step test, and verbal assent from the children was obtained.

Statistical analysis: The data were entered into Microsoft Excel spreadsheet and then subjected to statistical analysis using Microsoft excel data analysis package for calculating mean and standard deviation. Anthropometric measurements were assessed by converting the corresponding parameters to Z score through Epi info 6.0 [4] for CDC 2000 standards [5] and WHO anthro plus package was used for WHO 2007 standards [6]. During analysis, Z scores obtained by WHO 2007 package was used for analysis. ANOVA was used to check the variation between the three intervention arms while paired *t* test was used to check the significance level of intervention before and after the 8-month period. The differences were statistically significant at $P < 0.05$.

TABLE I IMPACT OF WEEKLY IFA WITH DEWORMING AND DEWORMING ALONE ON ANTHROPOMETRIC INDICES, HEMOGLOBIN AND PHYSICAL WORK CAPACITY

Variable	Control	IFA+DW	DW
<i>Height (cm)</i>			
Initial	131.4 ± 9.1	134.1 ± 10.0	133.8 ± 9.0
Final	134.2 ± 9.3	137.9 ± 10.2	139.0 ± 9.5
Difference	2.8 ± 1.36	3.9 ± 2.1	5.2 ± 2.6
<i>Weight (kg)</i>			
Initial	23.7 ± 4.8	26.5 ± 6.7	24.6 ± 5.4
Final	27.4 ± 5.7	27.9 ± 7.6	27.1 ± 6.2
Difference	3.7 ± 2.1	1.4 ± 2.6	2.4 ± 3.0
<i>BMI (kg/m²)</i>			
Initial	13.5 ± 1.8	14.5 ± 2.0	13.6 ± 1.6
Final	15.1 ± 1.7	14.4 ± 2.2	13.9 ± 1.7
Difference	1.6 ± 1.5	0.1 ± 1.68	0.2 ± 1.4
<i>Hemoglobin (g/dL)</i>			
Total	(n=108)	(n=230)	(n=161)
Initial	10.5 ± 1.4	11.5 ± 0.93	11.4 ± 1.3
Final	10.4 ± 1.6	13.5 ± 1.2	11.4 ± 1.3
<i>Number of steps</i>			
Total	(n=131)	(n=191)	(n=153)
Initial	32.5 ± 3.9	33.2 ± 5.6	29.7 ± 7.3
Final	35 ± 2.3	37.0 ± 6.4	35.6 ± 6.5

*Significant at $P < 0.05$; ** significance at $P < 0.01$; ***Significance at $P < 0.001$. All values in mean ± SD; DW: deworming; IFA: iron folic acid.

RESULT

The compliance for the tablets was 100%. The dropout rate for the post-intervention data ranged from 17% to 40%. In all the three groups there was equal representation of children in all the age group. In control group there were 153 children, IFA+DW supplemented group had 215 children while deworming supplemented group had 128 children. Majority of the children were in the age group of 8-12 years.

In IFA+ Deworming supplemented group, there was a 5% increase in the prevalence of underweight while the same prevalence marginally decreased (3%) in deworming supplemented group (**Table I**). Both the intervention did not make significant improvement in the prevalence of stunting. There was increase in the prevalence of thinness (14%) in IFA+ deworming supplemented group and in deworming supplemented group (4%).

As compared to only deworming supplementation, IFA+ deworming supplementation was more effective in increasing the hemoglobin levels of the children (**Table I**). The increase in the hemoglobin levels was more in anemic children as compared to non-anemic children ($P < 0.01$). 65% of the children moved to non-anemic status after the intervention in the IFA+ deworming supplemented group. This shift was predominantly from mild anemic to normal category. After the intervention none of the children were in severe category of anemia. A significant improvement ($P < 0.01$) was found when deworming group was compared with control group.

DISCUSSION

The growth of children did not have significant impact in either of the study groups. The IFA + deworming did improve the hemoglobin status of the children.

Only IFA supplementation has not been shown to improve the growth pattern. The study reflected that iron supplementation may lead to reduction in dietary intake, poor nutrient absorption and negative energy balance [7, 8]. Positive results for improvement in the hemoglobin levels were seen in study done by Tee, *et al.* [9]. The consistent increase in the hemoglobin level could be attributed to the mucosal block theory [10].

Hotez, *et al.* [11] summarized that treatment of worm infestation reduces the burden of anemia. In another study, improvement in the hemoglobin levels was not detected until 10 months of deworming intervention [12]. It is expected that in the present study too the positive impact of the study could be seen in the later years.

By introduction of one more experimental group of

WHAT DOES THIS STUDY ADDS?

- Weekly IFA supplementations (60 mg elemental Iron + 0.5 mg folic acid) along with deworming tablet every six month improved the hemoglobin status of 8-12 years old school children after 30 weeks.

children, where in the children would have got some extra macro-nutrients along with the IFA and deworming tablet would have given more clearer picture as to effect of both macro and micronutrients on the growth profile of children. In the government school in the rural area, the students strength decreases after the lunch break, as majority of the children go back home after having the mid-day meal. If the data could have been collected before the lunch time, the number of dropouts would have been reduced to some extent. The dropout rate was high in the school setup because of high rate of absenteeism in the school because of migration. The dropout rate was high in hemoglobin estimation as the children did not consent to give blood during data collection.

We conclude that improving iron folate nutrition in schoolchildren has a direct benefit on their well-being.

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