EFFECT OF VITAMIN A SUPPLEMENTATION ON HEMATOPOIESIS IN CHILDREN WITH ANEMIA

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ABSTRACT

Fifty children (1-4 years age) presenting with microcytic hypochromic anemia (hemoglobin less than 10g/dl) were studied in two groups of 25 each. Group I was supplemented with iron (ferrous sulphate 6 mg/kg/d) while group II in addition to iron was also supplemented with vitamin A (5000 IU/d). Hemoglobin concentration was found to be significantly increased after 4 weeks of iron supplementation. Rise in hemoglobin was comparatively more in-group II, as compared to group I, after 8 and 12 weeks. Serum iron was significantly higher after 4 weeks in both the groups. Packed cell volume (PCV) and retinol levels increased significantly in-group II only. The data suggests that supplementation of vitamin A improves hematopoiesis.

KEY WORDS

Vitamin A; Hematopoiesis; Anemia

INTRODUCTION

Vitamin A deficiency predominantly produces ocular manifestations, which include metaplasia, Bitot's spots, conjunctival and corneal xerosis, and keratomalacia. Extra ocular manifestations include follicular hyperkeratosis, anorexia and growth retardation (Marcus and Coulston, 1996). It is also known that mortality rates are increased among children with vitamin A deficiency and that improvement in vitamin A status reduces the risk of mortality from childhood infections (Sommer, 1993). Ghatpande et al (2002) reported that vitamin A is an important factor for normal hematopoiesis though its precise role is difficult to define. On the other hand, Jang et al (2000) suggested that iron deficiency inhibits mobilization of vitamin A stores and may decrease its absorption and irreversible utilization. Since the coexistence of multiple micronutrient deficiency is a widespread public health problem in many regions of the world including India, it was planned to study the effect of the supplementation of iron along with vitamin A on hematopoiesis and vitamin A status in preschool children.

MATERIAL AND METHODS

Fifty preschool children (1-4 years age) with microcytic hypochromic anemia (hemoglobin less than 10g/dl) were studied in two groups of 25 each. Children having congestive heart failure, any infection or symptoms and signs of vitamin A deficiency were not included. Group I was supplemented with iron (ferrous sulphate, 6mg/kg/d, divided into two equal doses) for four weeks. Group II, in addition to iron (as in group I) was also supplemented with vitamin A (5000 IU/d).

Hemoglobin levels were assayed (Cyanmet-hemoglobin method) before the start and after four weeks of completion of therapy. In addition, hemoglobin levels were also measured after 8 and 12 weeks in these children. Besides hemoglobin, red cells count, reticulocytes counts, packed cell volume (PCV), serum iron (Higgen, 1981) and vitamin A levels (Leland et al, 1968) were also determined. Results were statistically analyzed by Students' t test.

RESULTS AND DISCUSSION

Results of the present study demonstrate that hemoglobin concentration is significantly increased after 4 weeks of supplementation of iron in preschool children. Mean hemoglobin concentrations after 8 weeks and 12 weeks were significantly higher ($p < 0.001$) in-group II that was supplemented with iron and vitamin A, up to 4 weeks (10.8 ± 0.19 and 11.5 ± 0.22 g/dl, respectively) as compared to group I that was supplemented with iron alone (9.6 ± 0.16 and 9.7 ± 0.16 , respectively).

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TABLE 1. Effect of Vitamin A (Retinol) supplementation on some hematological parameters and vitamin A status in pre-school children with anemia (values are mean $\pm$ SEM; n = 25)

Parameters	Group I	Group II
Hemoglobin (g/dl)		
Before	7.5 $\pm$ 0.23	7.3 $\pm$ 0.17
After	8.9 $\pm$ 0.15*	9.5 $\pm$ 0.18*
PCV (%)		
Before	25.0 $\pm$ 0.86	23.5 $\pm$ 0.71
After	27.3 $\pm$ 0.56	29.0 $\pm$ 0.53*
RBC count (million/mm ³)		
Before	3.17 $\pm$ 0.08	3.14 $\pm$ 0.08
After	3.43 $\pm$ 0.16	3.43 $\pm$ 0.06
Reticulocyte count (%)		
Before	0.41 $\pm$ 0.08	0.45 $\pm$ 0.07
After	0.49 $\pm$ 0.06	0.42 $\pm$ 0.05
Serum iron (mg/dl)		
Before	36.4 $\pm$ 1.73	36.6 $\pm$ 0.81
After	42.4 $\pm$ 0.86*	43.9 $\pm$ 1.88*
Retinol (mg/dl)		
Before	21.0 $\pm$ 0.64	20.0 $\pm$ 0.61
After	23.5 $\pm$ 0.71	29.4 $\pm$ 0.52*, #
* p < 0.001 compared to the value before supplementation		
# p < 0.001 compared to the value of group I		

As shown in table I, iron supplementation also increased serum iron levels ($p < 0.001$). On the other hand when both iron and vitamin A were supplemented, besides serum iron, PCV and vitamin A levels also became significantly higher ($p < 0.001$). Mean values for erythrocyte as well as reticulocyte counts though were found increased after therapy, differences for the mean values however, were not statistically significant (>0.05) when compared to the mean values before supplementation.

Suharno et al (1993) demonstrated that there exists a correlation between vitamin A status and hemoglobin level. Jang et al (2000) suggested that iron deficiency inhibits mobilization of vitamin A stores and decreases the absorption and utilization of vitamin A. Furthermore, addition of retinyl palmitate to iron fortified maize-bread has been reported to enhance the absorption of iron (Davidson et al, 2003). Comparatively more rise in hemoglobin with the supplementation of iron along with vitamin A also supports the interaction between iron and vitamin A metabolism even in the present study. Since iron and vitamin A deficiencies are common nutritional problems in this part of the world, it is suggested that both the nutrients should be given simultaneously to overcome the problem of microcytic hypochromic anemia, even if the symptoms and signs of vitamin A deficiency are not apparent.

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