

IMPACT OF NUTRITIONAL SUPPLEMENTS ON HEMATOLOGICAL PROFILE OF PREGNANT WOMEN

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ABSTRACT

Eighty one pregnant women (20±2 weeks of gestation) were assessed for their nutritional status. They were divided into three groups; Group I women (n=30) were given 200 mg ferrous sulphate (FeSO₄ tablet per day for 15 weeks, Group II women (n=25) were given FeSO₄ tablets along with 2,00,000 IU of vitamin A as single dose in beginning of study; and Group III women (n=26) were not given any supplements and served as controls. To study impact of supplements on hematological profile of pregnant women, Hb, PCV, RBC, TS%, TIBC and serum levels of iron, zinc, copper, manganese and vitamin A were assessed at 20±2 weeks and 36±2 weeks of gestation by standard techniques. Pregnant women in Group I (Fe suppl) and group II (Fe + vitamin A suppl) had significantly ($p < 0.01$) higher Hb, PCV, RBC, TS% and serum iron levels than the controls. Group II had significantly ($p < 0.05$) higher values of these indices as compared to Group I. Levels of serum zinc, copper, manganese were not affected by supplements. Iron supplements improved the hematological profile of pregnant mothers but Fe + vitamin A supplements were more beneficial.

Key words: Hematological profile, Iron supplements, Serum vitamin A, Pregnant women.

Anemia is a major public health problem in India and has the highest prevalence ranging from 60-80% during pregnancy, when nutritional needs are the maximum(1). Among the nutrients, iron and folic acid assume a prime role in pregnancy as they are essential for maternal health and performance. Studies in children and adults have demonstrated significant positive relationship between concentration of vitamin A in serum and biochemical indicators of iron status. Thus anemia can be a consequence of vitamin A deficiency(2). The National Institute of Nutrition (NIN) reports that vitamin A may also play an important role in hemopoiesis(3). Hence this study was conducted to see the impact of nutritional supplements, *i.e.*, iron, folic acid and vitamin A on hematological profile of pregnant women.

Material and Methods

The investigation was carried out on 81 pregnant women of Ludhiana City, belonging to low income status with mean per capita income of Rs.369 per month. The nutritional status of subjects was assessed at 20±2 weeks of gestation (T₁) and 36±2 weeks of gestation (T₂) by four methods, *viz.*, dietary survey, anthropometric measurements, clinical examination and biochemical investigation of blood. Hb, PCV and RBC count were determined using standard tech-

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niques. Serum minerals (iron, Zn, Cu and Mn) were determined by atomic absorption spectrophotometer after wet digestion by the method of Piper(4). TIBC was estimated by the method of Teitz(5). Serum vitamin A was determined by method of Kimbe(6). The subjects were divided into three groups making sure that each group had pregnant women with more or less identical nutritional status at 20 ± 2 weeks of gestation.

Pregnant women who were willing to come to the hospitals/centres once a week to collect iron supplements and consume them regularly were included in Groups I and II. Rest of the subjects who were not willing to take supplements were included in the control group. The various groups were: (i) *Group I: Iron supplemented (Fe suppl)* - 30 women were given one tablet of 200 mg FeSO_4 per day (containing 60 mg elemental iron and 500 μg folic acid) for a period of 15 weeks; (ii) *Group II: Iron + vitamin A supplemented (Fe + vit A suppl)* - 25 women were given 2,00,000 IU of vitamin A as a single dose along with 200 mg FeSO_4 per day for a period of 15 weeks; and (iii) *Group III: Control* - 26 women who did not receive any supplements served as controls.

The mean and standard errors of mean were computed for all the parameters. The significance of difference in the means of various indices was first tested by analysis of variance (F test), when the values of 'F' were significant, it was followed by a modified 't' test.

Results

In the present investigation, the hemoglobin (Hb) levels of subjects varied from 8.0 to 13.5 g/dl at T_1 and 7.8 to 13.2 g/dl at T_2 . The mean value of Hb at T_1

was 10.12 g/dl in subjects of all the three groups. At T_2 the Hb values increased to 10.4 and 10.7 g/dl in iron supplemented and iron+vit A supplemented groups, respectively. However, Hb levels decreased to 9.5 g/dl in control group. A similar trend was observed in case of packed cell volume (PCV) and red blood cell (RBC) count (*Table I*). The values of Hb, PCV and RBC count were below the normal range both at T_1 and T_2 .

At T_1 , the mean total iron binding capacity (TIBC) was 346 $\mu\text{g}/\text{dl}$ in all the three groups. At T_2 the TIBC values significantly ($p < 0.01$) increased to 393 $\mu\text{g}/\text{dl}$ in the control group; however, values were almost maintained in supplemented groups, *i.e.*, 340 $\mu\text{g}/\text{dl}$. The mean value of percentage transferrin saturation (%TS) at T_1 was 28.2 in all the three groups. At T_2 , %TS decreased to 26.1, 17.0 in Fe supplemented and control groups, respectively but it was maintained in Fe + vit A suppl group, *i.e.*, 28.6.

At T_2 the value of Hb, PCV, RBC count and serum iron and TS% were significantly ($p < 0.01$) higher in Fe suppl and Fe + vit A suppl groups as compared to control group. All the values in Fe + vit A suppl group were significantly ($p < 0.05$) higher as compared to Fe suppl group. The prevalence of anemia at T_1 was 75% in all the groups, at T_2 the incidence decreased to 65.5% in supplemented groups and increased to 90% in control group. The mean serum iron levels at T_1 were between 97 and 98.3 $\mu\text{g}/\text{dl}$ in all the three groups. At T_2 , the levels decreased to 86.9 and 66.8 $\mu\text{g}/\text{dl}$ in Fe supplemented and control groups, respectively, whereas in Fe + vit A suppl group the level was almost maintained, *i.e.*, 96.6 $\mu\text{g}/\text{dl}$.

TABLE I—Hematological Profile of Pregnant Women

Blood Parameters	Experimental Groups						Normal values	't' values for Groups comparison		
	Group I (Fe Suppl) (n=30)		Group II (Fe + vit A Suppl) (n=25)		Group III (Control) (n=26)			I vs III	II vs III	I vs II
	T ₁	T ₂	T ₁	T ₂	T ₁	T ₂				
Hemoglobin (g/dl)	10.1±0.18	10.4±0.15	10.2±0.20	10.7±0.16	10.1±0.22	9.5±0.17	11 ^a	3.40**	3.49**	2.14*
PCV (%)	32.03±0.61	32.70±0.46	31.88±0.68	33.40±0.52	32.14±0.57	30.32±0.43	36-47 ^b	3.46**	3.47**	2.37*
RBC count (10 ⁶ /mm ³)	3.53±0.10	3.63±0.07	3.54±0.09	3.68±0.08	3.57±0.08	3.43±0.07	3.9-4.6 ^b	3.38**	3.40**	2.25*
Total iron binding capacity (µg/dl)	346±3.4	341±3.1	345±3.3	338±2.6	348±3.3	393±2.2	300-400 ^c	3.44**	3.46**	0.78 ^{NS}
Transferrin saturation (%)	28.41±0.87	26.08±0.65	28.31±0.97	28.59±0.73	27.87±0.83	16.99±0.58	16 ^a	5.19**	6.28**	2.21*
Serum iron (µg/dl)	98.33±2.21	86.96±1.40	97.68±2.43	96.64±2.01	97.00±2.14	66.80±1.92	65-75 ^d	3.32**	3.46**	2.23*
Serum vitamin A (µg/dl)	32.23±0.48	27.88±0.47	31.27±0.63	38.98±0.50	31.25±0.64	26.50±0.62	40-60 ^e	1.81 ^{NS}	3.20**	3.28**

Values are mean ± SEM; T₁ - 20±2 weeks of gestation; T₂ - 36±2 weeks of gestation.

a: WHO(7); b: Passmore and Eastwood(8); c: Dutta(9); D: NIN(10); e: Harper(11).

* Significant at 5% level; ** Significant at 1% level; NS: Non significant.

At T₂, serum zinc levels decreased whereas levels of copper and manganese increased in all the three groups.

The mean serum vitamin A levels at T₁ were between 31.25 to 32.23 µg/dl in all the groups. At T₂, the levels increased to 39 µg/dl in Fe + vitamin A supplemented group. However, in other two groups it decreased to 27.2 M-g/dl.

Discussion

The present study shows that at 36 ± 2 weeks of gestation the levels of Hb, PCV and RBC increased in supplemented groups and decreased in control group. Similar observations were reported in studies conducted at NIN(3,12).

The change in Hb, PCV and RBC values in Group I and Group II were significantly (p <0.01) higher as compared to controls. The increase in Hb, PCV and RBC levels was significantly (p <0.05) higher in Group II as compared to Group I. Similar observations have been reported earlier(13,14). In the present study, data revealed that supplementation of Fe as well as Fe + vit A during the second half of pregnancy had a beneficial effect in improving the Hb, PCV and RBC count in pregnant women but combination of Fe and vit A was more beneficial than iron alone.

The values of TIBC increased in control group whereas it was almost maintained in subjects given supplements of Fe and Fe + vit A indicating better availability and utilization of iron in supplemented subjects as compared to control group. These findings were in agreement with those of Vijayalakshmi and Shobana(15).

After supplementation, TS% and serum iron levels in Fe Suppl and Fe + vit

A suppl groups were significantly (p <0.01) higher as compared to controls. In Fe + vit A suppl group, TS% and serum iron levels were significantly (p <0.05) higher as compared to Fe suppl group indicating more beneficial effect of Fe + vit A supplements. Others(12,14) too have reported similar findings. Vitamin A supplementation during pregnancy has beneficial effect on the hematological status due to improved utilization of iron. Vitamin A may play an important role in hemopoiesis(3). As a result of improving the metabolic utilization of iron with vit A supplement, the body's physiological response is better iron absorption(16). The primary effect of iron as well as iron + vit A supplementation during pregnancy is maintaining serum iron levels, which favor hematoiesis resulting in an increase in Hb, PCV and transferrin saturation.

In the present investigation, the serum zinc levels at T₂, i.e., 36±2 weeks of gestation decreased in all the groups. These observations were in complete agreement with the observations of others(17,18). This fall in serum zinc may reflect transfer of maternal zinc to the fetus in response to increased fetal demands. At T₂, the copper and manganese levels increased in all the groups. Others(17,19,20) too have reported similar findings.

The improvement in the levels of serum vitamin A was observed only in Fe + vit A suppl group indicating beneficial effect of vitamin A supplementation. This confirms the data of Panth *et al.*(21).

The present findings revealed that in low socio-economic group, iron supplements are likely to result in better hematological profile of pregnant wom-

en. Whenever iron supplementation is contemplated for expectant mothers, vitamin A supplementation should go hand in hand to achieve maximum benefit.

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