STUDY OF SERUM IRON IN NORMAL PREGNANCY AND TOXEMIA OF PREGNANCY

by

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SUMMARY

Iron levels were estimated in the sera of normal pregnant women, patients of toxemia of pregnancy and healthy non-pregnant women. In the latter group the mean iron levels were 85.08 ± 1.72 microgram/dl. They were 66.88 ± 0.48 microgram/dl in normal pregnancy group and 53.65 ± 0.85 microgram/dl in toxemia of pregnancy group. The decrease in pregnancy and toxemia of pregnancy was statistically highly significant ($p < .001$). Not many studies have been undertaken to estimate serum iron in toxemia of pregnancy. Possible causes of this fall in the serum iron levels have been discussed in the present article.

Introduction

Iron, an essential element of the body, comprises of approximately 0.006-0.007% of the total body weight (Widdowson *et al* 1953). Estimatable iron is carried in the serum as a beta-globulin complex and makes up less than 0.1% of the total body iron. The total body iron content tends to remain fixed within narrow limits. Excess or lack results into siderosis and deficiency respectively.

Approximately 500 mg. of iron is required in the course of pregnancy for the increase in maternal tissues and the development of the products of conception. Most of this is needed late in pregnancy. There is a variable loss of iron to be met in the haemorrhage which accompanies parturition, average being 150 mg. In all, the additional iron requirement of pregnancy totals about 900 mg. The menstruating female looses about 25 mg. of iron each month, a total of about 250 mg. during the duration of a normal pregnancy. The pregnant woman, therefore, requires about 650 mg. of iron over and above her normal need. In addition, she requires on an average a further 500 mg. for the increase in the circulating haemoglobin mass. This iron, however, is not lost from the body and returns to its stores during puerperium.

In toxemia of pregnancy a fall in serum iron level in addition to that found in normal pregnancy is expected. Insufficient dietary intake being one important reason attempts to elucidate other causes may assist in the management of anaemia in toxemia of pregnancy.

Material and Methods

The present study was conducted on 125 females admitted in the P.B.M. Hospital, Bikaner. Fifty of these were suffer-

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ing from toxaemia of pregnancy and another 50 had normal pregnancy. Their age ranged from 15-35 years. Twenty five non-pregnant healthy females of matching age acted as controls. Blood was collected during the first stage of labour for the estimation of serum levels of iron. The estimation was done by the method described by Peters and Ross (1956).

Results

The mean serum iron levels in the control group was 85.08 microgram/dl ± 1.72. It was 66.88 microgram/dl ± 0.48 in the normal pregnancy group and 53.65 microgram/dl ± 0.85 in the toxaemia group. The decrease in levels of serum iron in normal pregnancy as well as in toxemia of pregnancy as compared to the controls is statistically highly significant (Table I).

TABLE I

Serum Iron Levels in Control, Normal Pregnancy and Toxemia of Pregnancy (Microgram/dl)

S.N.	Group	mean	S.E.	P value
1.	Control	85.08	1.72	
2.	Normal pregnancy	66.88	0.48	<.001
3.	Toxemia of pregnancy	53.65	0.85	<.001

Discussion

Studies on serum iron levels have been undertaken by quite a number of individuals but they have been done only in the normal pregnant women (Mukherjee and Mukherjee, 1953; Mennon and Ramaswamy, 1955; Joshi *et al* 1962). Similar studies in toxemia of pregnancy are utterly lacking. An increase in the turnover of iron due to fetal demands seems to be the most plausible explanation of the fall in the serum iron levels in pregnant women (Bhatnagar, 1961 and Krishna Menon, 1965). A slight but definite rise of serum levels in the last trimester as compared to the second trimester was found by Andleigh and Joshi (1965) who also correlated this with a temporary increase in the blood volume. They, however, stressed upon the need for further evaluation to substantiate this hypothesis. Alternatively, they considered that by the end of pregnancy the fetal demands for iron reduce considerably and the mother possibly prepares herself for the impending loss of blood and, therefore, iron during parturition.

In contrast to the present findings Sharma *et al* (1958) did not find any significant fall in the serum iron levels during pregnancy was found by Albers (1941) but his findings have not been substantiated. Rath and Finch (1949) who failed to find any significant change in serum iron during pregnancy suggested that any tendency towards anaemia is due to block in the haemopoiesis caused by estrogenic suppression of the bone marrow.

Selye (1950) stressed upon the effect of cortisone and mineralocorticoids upon the regulation of the mineral balance of the body. An increase in the corticosteroids causes mobilisation of the iron rendering more available iron for fetal consumption. Such an increase in corticosteroid levels does occur in the last trimester of pregnancy (Tobian, 1949).

The possibility of a rise in the plasma volume causing a relative fall in the serum iron levels is open to discussion.

It is established that the increase in the plasma volume does not commence before the 10th week, although the serum iron is low at that time also. This suggests that the reduction in the serum iron level is greater than can be expected from the effect of hydraemia of pregnancy.

Enhanced absorption of iron has been observed by Hahn *et al* (1951) and Heinreich (1967). This helps to mitigate the deficiency caused by increased fetal demands. Besides, the absorption has been found to be far more rapid in subjects suffering from anaemia due to iron deficiency.

According to Ventura and Klopper (1951) the orientation of iron metabolism changes during pregnancy, the total serum iron being lowered without a significant change in the total haemoglobin. The increase in the fetal demand of iron which begins after 20 weeks of pregnancy serves to be a searching test for the iron reserves of the mother. During this period the iron level falls into a zone of latent deficiency. If the reserve is poor it is likely to culminate into a manifest deficiency.

The intake of iron commensurate with the increased need is another important factor. Patients of low socio-economic status and those having poor vegetarian diet deficient in iron are more prone to have iron deficiency.

The patients of toxaemia of pregnancy are victims of multiple deficiencies. Their intake of essential nutrients is inadequate as a result of a generalised feeling of being ill. Anorexia, nausea and, at times, vomiting hamper the normal dietary intake. Severely ill patients are treated by parenteral therapy. Iron demands in these cases can not be fulfilled. Moreover, haemodilution caused by intravenous infusions is likely to produce a relative decrease in the serum iron levels.

Plasma volume changes do not seem to affect serum iron levels in toxemia. It has been shown that in mild toxemia the plasma volume changes are similar to those in the normal pregnancy but in severe toxemia the plasma volume decreases (Dieckman *et al* 1952; Friedberg, 1958 and Cope, 1961). Had this been an important factor responsible for the rise or fall of iron levels a significant increase would have been observed in eclampsia. Results contrary to this have been found in the present study indicating, thereby, that plasma volume hardly plays any role in changing serum iron levels in such patients.

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