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Study on Iron Deficiency in Pregnant Women By Determining Iron Status

Dr Asma Kalim Assistant Professor, Department of Pathology, Heritage Institute of Medical Sciences, Varanasi,Uttar Pradesh, India

Dr. Priyanka Singh Assistant Professor, Department of Pathology, Heritage Institute of Medical Sciences, Varanasi,Uttar Pradesh, India

ABSTRACT

Iron deficiency is thought to be the most common cause of anemia globally. Pregnancy is associated with increased demand for all the nutrients like iron, copper, zinc, vit.-B12, folic acid and ascorbic acid. Deficiency of any of these substances might affect pregnancy, delivery and outcome of the pregnancy. Laboratory investigations of the cases and controls were done to determine haemoglobin, MCV, Serum Ferritin, Serum iron level, Total iron-binding capacity (TIBC), Unsaturated iron-binding capacity, and Percentage saturation of transferrin (iron /TIBCx100). Iron deficiency anemia is one of the major complications of pregnancy. In spite of the increasing knowledge and advances in the medical field iron deficiency anemia can be the cause of worry for the gynecologists. Hemoglobin, MCV, serum iron, serum ferritin, total iron binding capacity and iron saturation levels might be helpful for the treatment of iron deficiency anemia.

KEYWORDS : Iron; Ferritin; (TIBC); Iron saturation; Anemia; Pregnancy.

Introduction:

Iron deficiency is thought to be the most common cause of anemia globally1. Pregnancy is associated with increased demand for all the nutrients like iron, copper, zinc, vit.-B12, folic acid and ascorbic acid. Deficiency of any of these substances might affect pregnancy, delivery and outcome of the pregnancy2. Minerals have important influence on the health of pregnant women and of the growing fetus. All body functions are affected by iron deficiency in general and not only by anemia, which appears late in the process of tissue iron deficits3.

Iron deficiency continues to be the leading single nutritional deficiency in the world, despite considerable efforts over decades to decrease its prevalence4,5. estimates from the WHO report that from 35% to 75% (56% on average) of pregnant women in developing countries and 18% of women from industrialized countries are anemic. It is estimated that Iron deficiency anemia accounts for 12.8% of maternal deaths during pregnancy and childbirth in Asia6.

Iron is an essential component of the haemoglobin without iron haemoglobin cannot be synthesized and red cells become microcytic and hypochromic7. Iron deficiency anemia can be defined as a clinical condition characterized by reduction in haemoglobin concentration of blood below the normal for age, sex and physiological condition8. recent studies suggest that maternal Iron deficiency anemia may be associated with postpartum depression and poor performance on mental and psychomotor tests in offspring, most often pneumonia, urinary tract infection, endometritis, pregnancy induced hypertension, heart failure and pulmonary infraction9,10. WHO has accepted up to 11 gm% as the normal hemoglobin level in pregnancy, therefore any hemoglobin level below 11 gm% should be considered as anemia. However in India and most of the developing countries the lower limit is often accepted as 10 gm%.

Serum studies are helpful in identifying Iron deficiency anemia. Serum iron level is less than 60µg/dl and serum total iron binding capacity (TIBC) is more than 400 µg/dl in Iron deficiency anemia. Serum ferritin is the best indicator of bone marrow stores of iron and has largely replaced bone marrow examination. Ferritin is a high molecular weight glycoprotein in circulation. A value less than 12 ng/ml indicates Iron deficiency anemia. The simplest and direct assay of Iron deficiency is the ratio of serum iron to the total iron binding capacity. Our aim was to determine the Hb, MCV, serum iron, serum ferritin, total iron binding capacity and iron saturation in between Group A & Group B.

Material and Methods:

The present study was conducted in Department of Pathology, Heritage Institute of Medical Sciences, India. All of them were in the third trimester, attending antenatal clinic in the department of obstetrics and gynaecology of the Heritage Institute of Medical Sciences, India during the period from December 2015 to may 2016. Institutional ethical committee approved this study and verbal informed consent was also taken from the patients. The present study consists of total 75 subjects who are further subdivided in to two groups;

Group-A: Includes total 50 iron deficiency anemic pregnant women as cases.

Group-B: Consists of 25 non anemic pregnant women as controls.

Laboratory investigations of the cases and controls were done to determine haemoglobin, MCV, Serum Ferritin, Serum iron level, Total iron-binding capacity (TIBC), Unsaturated iron-binding capacity, and Percentage saturation of transferrin (iron /TIBCx100). Mean and standard deviation were calculated for Hb%, Serum Ferritin, Serum Iron, TIBC, and Fe/TIBC%. Statistical analysis was done using the unpaired T test.

Result and Discussion:

Comparing the results obtained from the 50 pregnant women with IDA and the 25 non anemic pregnant women using t test. The mean of hemoglobin (Hb) was found (9.95±1.21g/dl) for the patients versus (12.03±2.04g/dl) for control. The mean cell volume (MCV) was (59.2 ± 0.6fl) for the patients versus (80.02 ± 1.23 fl) for non anemic pregnant women. Table-1 shows the significance difference ($p < 0.0001$) between the means of Hb, MCV, serum iron, serum ferritin, TIBC, and iron saturation in the IDA patients and their control.

Table 1: Comparison of Hb, MCV, serum iron, serum ferritin, total iron binding capacity & iron saturation in between Group A & Group B:

Parameters	Group A (Cases) (N=50)	Group B (Controls) (N=25)	P-value
	(Mean ± Std)	(Mean ± Std)	
Hb(g/dl)	9.95±1.21	12.03±2.04	0.0001
MCV (fl)	59.2 ± 0.6	80.02 ± 1.23	0.0001
Ferritin (µg/l)	12.92±3.1	85.42±8.01	0.0001
Iron (µg/dl)	40.22± 17.03	75.61± 15.13	0.0001
TIBC (µg/dl)	434.06± 43.2	302.17± 25.05	0.0001
Saturation (%)	14.03 ±0.2	27.02 ± 0.6	0.0001

(Statistically Significant (P<0.05)

Iron deficiency anemia is the most common single cause of anemia. It is the micronutrient deficiency most prevalent in the world. Pregnant women are at the high risk of iron deficiency anemia. Its prevalence is about 56%.11 Epidemiological studies have shown that iron deficiency anemia in pregnancy increases fetal and maternal mortality and morbidity. Improvement of health of pregnant women is important for the survival of mother as well as for good physical and mental health of fetus.

Most of the patients attending the ANC clinic in Tertiary care hospital were from poor socioeconomic status because of which they were having poor dietary intake of iron and so we were interested in measuring the activity of serum iron level in iron deficiency anemia.

The decrease in the serum iron level may be due to the decreased dietary intake of iron or increased demand of iron from fetus during pregnancy. High fetal demands for iron render for iron deficiency which is the most common cause of anemia in pregnancy.12

Increased total iron binding capacity in iron deficiency anemia may be due the increased absorption of iron in gastrointestinal tract or increase in iron liberated from the mucosal cells to meet the body's need for iron. Elevated serum iron binding capacity and reduced serum iron levels were found in many subjects.13

It is observed that iron deficiency anemia is documented by decreased iron saturation. Ferritin below 15ng/ml confirms the depletion of iron.14 Serum ferritin declined sharply until the 28th week of pregnancy but only slightly thereafter these data suggests at least one determination of serum ferritin concentration in pregnant women for a sufficient prophylaxis of iron deficiency anemia during pregnancy.15

Serum ferritin concentration is an early indicator of the status of iron stores and is the most specific indicator available of depleted iron stores especially when used in conjunction with other tests to asses iron status. In the light of above facts it becomes clear that estimation of haemoglobin, serum ferritin, serum iron, TIBC, and Fe/TIBC% are valuable parameters in assessing iron deficiency in pregnancy. A more effective method is to use various combinations of measurements to enhance the specificity of prevalence estimates or to define varying stages of iron lack.

Conclusion:

A single best marker of iron deficiency does not exist, however, the different tests efficiently compliment each other by detecting different stages, and individually show the clinical extent of iron deficiency. Iron deficiency anemia is one of the major complications of pregnancy. In spite of the increasing knowledge and advances in the medical field iron deficiency anemia can be the cause of worry for the gynecologists. Hemoglobin, MCV, serum iron, serum ferritin, total iron binding capacity and iron saturation levels might be helpful for the treatment of iron deficiency anemia. Therefore these parameters will help the clinicians in appropriate management, treatment and prevention of the serious conditions related to iron deficiency.

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