



CORRELATION OF SERUM FERRITIN LEVELS WITH THE DEGREE OF ANAEMIA IN PREGNANT WOMEN

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ABSTRACT

Aims and objectives: To correlate serum ferritin levels, PCV and red cell indices with the degree of anaemia in pregnant women. **Materials and methodology:** this was a hospital based observational study conducted over a period of 12 months from June 2020 to May 2021 amongst 500 pregnant women who attended Antenatal Outpatient Department of Obstetrics and Gynaecology, Gauhati Medical College and Hospital, Guwahati, Assam. The serum ferritin levels were correlated with the degree of anaemia in pregnant women. **Results:** the incidence of anaemia in the 500 pregnant women studied was 88.4% with mild anaemia accounting for 31.9%, moderate anaemia accounting for 61.3% and severe anaemia accounting for 6.8% of the cases. The serum ferritin levels decreased with decrease in hemoglobin concentration indicating deficiency of iron stores. PCV, MCV, MCH, MCHC were correlated with serum ferritin levels and they showed significant correlation with serum ferritin levels in anaemic pregnant patients with microcytic hypochromic anaemia. However, in the non-anaemic pregnant patients with serum ferritin level of less than 11 ng/dL, none of the red cell indices were found to correlate with the serum ferritin level. **Conclusion:** Serum ferritin levels were compared with the degrees of anaemia and a significant correlation was found. The serum ferritin levels decreased with increase in the severity of anaemia. Significant number of non-anaemic pregnant women had serum ferritin level of less than 11 ng/mL, indicating deficiency of body iron stores.

KEYWORDS :

INTRODUCTION:

Anaemia is a significant global health problem with 36.5% of women affected worldwide¹ because of iron deficiency. In developing countries like India, social customs like early marriage, teenage pregnancies, poverty, poor nutritional status, lack of proper education and ignorance to female health are prevalent and more so in the rural areas. The anaemic state in the mother is aggravated by factors such as repeated pregnancies, short interval between pregnancies, large family practicing norms, poor prenatal and antenatal check-ups. Anaemia in pregnancy is associated with various maternal and fetal complications; maternal complications being- impaired immune function, cardiac failure, pre-eclampsia and antepartum hemorrhage, uterine inertia, maternal exhaustion, post-partum hemorrhage, puerperal sepsis and thrombo-embolic complications and lead to subinvolution of uterus, delayed wound healing and failure of lactation in the mother. Fetal complications include low birth weight, PROM, preterm birth, failure to thrive, are more prone to infections and show certain behaviour and learning defects. The ferritin measurable in the serum appears to be chiefly derived from macrophages² and does not contain storage iron but reflects overall storage iron and ferritin concentrations in the liver and other tissues³. Thus, serum ferritin is a routinely available indicator with well described associations with iron status but also recognised limitations associated with concomitant inflammation and liver disease. The serum ferritin level falls early in the development of iron deficiency and it is the first abnormal laboratory test in iron deficiency anaemia. It is not affected by recent iron ingestion.

Methodology:

This was a hospital based observational study conducted over a period of 12 months from June 2020 to May 2021 amongst 500 pregnant women who attended Antenatal Outpatient Department, Department of Obstetrics and Gynaecology, Gauhati Medical College and Hospital, Guwahati, Assam. Serum ferritin levels, PCV, red cell indices

were sent and findings were correlated with the degree of anaemia in pregnant women.

INCLUSION CRITERIA: Pregnant females with normal hepatic and renal function.

EXCLUSION CRITERIA:

- Blood loss during pregnancy.
- Active Infection/inflammation e.g. Hepatitis, Sickle Cell Disease, HIV infection, tuberculosis.
- Bleeding diathesis.
- Patients with history of medical disorder like diabetes, heart disease, renal disease, thyroid disorder etc.
- History of blood transfusion.
- Hemoglobinopathies.

All selected subjects were approached and personally met and briefed about the study. After taking informed consent, selected subjects were followed up during their subsequent antenatal visits. Strict confidentiality has been employed in carrying out the study. A detailed history was taken including maternal age, menstrual history, obstetric history, past history, family history of bleeding disorders. Anaemia profile of all selected patients were sent. Keeping the Hb level as 11 g/dL (WHO cut-off), the laboratory reports were evaluated.

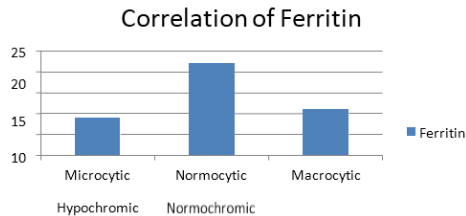
Results and Observations:

The most common type of anaemia in the present study was microcytic hypochromic anaemia in 415 patients (93.89%). Normocytic normochromic anaemia was seen in 18 patients (4.07%) and macrocytic anaemia in 9 patients (2.03%). Average serum ferritin level in microcytic hypochromic anaemia is 9 ± 1.2 ng/mL; in normocytic normochromic anaemia is 22 ± 2.7 ng/mL and in macrocytic anaemia it is 11 ± 1.6 ng/mL. The P-values are 0.0001 for microcytic hypochromic anaemia (statistically significant), 0.065 for normocytic normochromic anaemia (statistically insignificant) and 0.58 for macrocytic anaemia (statistically insignificant).

Table showing different morphological types of anaemia and their correlation with serum ferritin:

Type of anaemia	Average Ferritin	P value
Microcytic hypochromic anaemia	9±1.2	0.0001
Normocytic Normochromic anaemia	22±2.7	0.065
Macrocytic anaemia	11±1.6	0.058

Figure showing different morphological types of anaemia and their correlation with serum ferritin:



In the present study, serum ferritin levels were compared with the degrees of anaemia. In the mild anaemic group, mean serum ferritin level was found to be 12.6±1.8 ng/mL. In the moderately anaemic group, mean serum ferritin level was found to be 9.6±4.2 ng/mL. In the severely anaemic group, the mean ferritin level was found to be 8.1±1.7 ng/mL. The average ferritin level in non anaemic pregnant women was 12.8±1.9 ng/mL. Table showing correlation of serum ferritin levels with the degree of anaemia:

Mild Anaemia	Moderate Anaemia	Severe Anaemia	Normal	Total Average of S. ferritin	p-value
Average of S. ferritin	Average of S. ferritin	Average of S. ferritin	Average of S. ferritin		
12.6±1.8	9.6±4.2	8.1±1.7	12.8±1.9	12.5±3.9	0.0415

PCV, MCV, MCH, MCHC were correlated with serum ferritin levels in non-anaemic pregnant women whose ferritin levels were less than 11 ng/mL and, none of the red cell indices were found to correlate with the serum ferritin level.

PCV, MCV, MCH, MCHC were correlated with serum ferritin levels in patients with microcytic hypochromic anaemia and they showed significant correlation with serum ferritin levels.

Table showing the number of cases with serum ferritin levels of <11 ng/mL and ≥11 ng/mL respectively:

Serum Ferritin	Anaemic patients	Non anaemic patients
<11	435	38
≥11	7	20
Total	442	58

Table showing correlation of PCV, MCV, MCH, MCHC with low serum ferritin level in non-anaemic subgroup:

Pearson Correlation of 38 subjects					
	PCV	MCV	MCH	MCHC	
S. Ferritin	Pearson Correlation	.002	.021	.265	.318
	P-value	.988	.902	.108	.051
	Number of cases	38	38	38	38

Table showing correlation of PCV, MCV, MCH, MCHC with serum ferritin level in microcytic hypochromic anaemia subgroup:

Pearson Correlation of 415 subjects					
	PCV	MCV	MCH	MCHC	
S. Ferritin	Pearson Correlation	.149**	.258**	.027	.331**
	P-value	.002	.000	.008	.000
	Number of cases	415	415	415	415

Discussion:

The most common type of anaemia in the present study was microcytic hypochromic anaemia which was seen in 415 patients (93.89%). Normocytic normochromic anaemia was seen in 18 patients (4.07%) and macrocytic anaemia was seen in 9 patients (2.03%). Ahmad Al-Khaffaf et al. (2020) also found that the most common type of anaemia in pregnancy is Iron-deficiency anaemia which accounted for 75% cases in his study. S. Sifakis et al also found iron-deficiency anaemia to be the most common cause of anaemia in pregnancy. Shalini Srivastava et al. in a study in 2017 also found microcytic hypochromic anaemia (91.3%) to be the most common type of anaemia in reproductive age group women. In the present study, average serum ferritin level in microcytic hypochromic anaemia was 9±1.2 ng/mL; in normocytic normochromic anaemia it was 22±2.7 ng/mL and in macrocytic anaemia, it was 11±1.6 ng/mL.

In the mild anaemic group, mean serum ferritin level was found to be 12.6±1.8 ng/mL. In the moderately anaemic group, mean serum ferritin level was found to be 9.6± 4.2 ng/mL. In the severely anaemic group, the mean ferritin level was found to be 8.1±1.7 ng/mL. In non-anaemic pregnant patients, the mean serum ferritin level was found to be 12.8±1.9 ng/mL.

PCV, MCV, MCH, MCHC were correlated with serum ferritin levels in non-anaemic pregnant women whose serum ferritin level was less than 11 ng/mL and, none of the red cell indices were found to correlate with the serum ferritin level. This finding is consistent with the findings of Lt Manu Tiwari et al (2012), in their study of correlation of hemoglobin and red cell indices with serum ferritin in Indian pregnant women.

PCV, MCV, MCH, MCHC were correlated with serum ferritin levels in patients with microcytic hypochromic anaemia and they showed significant correlation with serum ferritin levels.

This finding is consistent with the findings of Lt Manu Tiwari et al (2012), in their study of correlation of hemoglobin and red cell indices with serum ferritin in Indian pregnant women in 2nd and 3rd trimesters of pregnancy⁷

Conclusion:

In developing countries like India, anaemia is a significant public health challenge. There are many arrays to estimate the body iron status; of which the most commonly employed is the serum ferritin level. In the present study, serum ferritin levels were compared with the degrees of anaemia and a significant correlation was found. The serum ferritin levels decreased with increase in the severity of anaemia. Therefore, routine serum ferritin levels sent in anaemic pregnant patients to check for body iron status holds value and should be carried out in all anaemic pregnant women. This study showed significant correlation between PCV and red cell indices with serum ferritin levels in pregnant patients with microcytic hypochromic anaemia. However, no significant correlation was found between serum ferritin levels and normocytic normochromic anaemia and macrocytic anaemia, respectively. Also, significant number of non-anaemic pregnant women had serum ferritin level of less than 11 ng/mL, indicating deficiency of body iron stores. So, irrespective of the haemoglobin levels, prophylactic iron supplementation should be given to all Indian pregnant women.

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