SERUM FERRITIN AS THE MOST SENSITIVE MEASURE OF IRON STORES IN PREGNANT WOMEN

Pages with reference to book, From 185 To 187

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Abstract

To detect iron deficiency, Hb concentration, RBC count, PCV, MCV, MCHC, red cell morphology, serum iron and serum ferritin concentrations were measured in 80 pregnant women. Half of these women were with and the other half without iron supplementation. Fifty percent of the unsupplemented group had anaemia (Hb < 1 ig/dI) and 65% deficient iron stores (serum ferritin< 12ng/ml). Ten percent of the supplemented pregnant women were anaemicand 37.5% had deficient iron stores . The number of iron deficient pregnant women detected by serum ferritin measurement was much higher than those detected by other hematological parameters. Therefore, serum ferritin is more sensitive indicator of iron status during pregnancy than any other hematological parameter. The values of all the hematological parameters were significantly less in unsupplemented than in supplemented pregnant women (JPMA 38 :185, 1988).

INTRODUCfION

Hematological parameters used to detect iron deficiency during pregnancy are Hb concentration, PCV, MCV, MCH, MCHC, red cell morphology, serum iron and serum ferritin concentrations. As pregnancy proceeds the red cell count, haemoglobin and PCV fal[1] but MCV and MCII show very little change[1]. Serum iron concentration falls by about 35% and there is a rapid fail in serum ferritin concentration[2]. Haemoglobin and PCV are unsatisfactory indicators of iron deficiency during pregnancy because of disproportionate increase in the plasma volume and red cell mass[2]. Haemoglobin estimation fails to identify lesser ‘extent of iron deficiency when iron stores are depleted but Hb synthesis is not impaired. Mean corpuscular volume (MCV) and mean corpuscular haemoglobin (MCH) are useful for the assessment of iron status and the diagnosis of iron deficiency anaemia. Mean corpuscular haemoglobin concentration (MCHC) is a reliable index of iron deficiency but it is a late sign of anaemia[4]. Examination peripheral blood film is helpful only in the long standing cases of iron deficiency anaemia of pregnancy.[5] Serum iron concentration is used to detect iron deficiency, but its values vary from day to day and even hour to hour.[6]

Serum ferritin is a useful and accurate measure of body iron stores particularly in an iron deficiency state not severe enough to produce microcytosis, hypochromia or anaemia or when haemoglobin and serum iron concentration are normal[7]. A small amount of ferritin is present normally in human plasma. It has been suggested that ferritin present in the plasma is derived from iron stores present in the reticulo-endothelial cells, so changes in iron stores are followed rapidly by changes in serum ferritin concentration.[8] It has been estimated that ing/mi of serum ferritin is equivalent to about 8mg of storage iron[9].

Measurement of serum ferritin concentration by radioimmunoassay has proved to be a useful and accurate method to evaluate iron stores in pregnant women[10]. This study reports serum ferritin levels and their usefulness in the diagnosis of iron deficiency in pregnant women.

SUBJECTS AND METHODS

Eighty pregnant women in 8th or 9th month of gestation were included in this study. None of them had abnormal bleeding, donated or received blood or undergone any extensive operation. They were divided into two groups. One group (40) was without iron supplementation and the other (40) was on iron therapy at least for one month, Haemoglobin (cyan methemoglobin method), PCV (micro method), RBC count, MCV, MCH, MCHC (coulter counter), red cell morphology, estimation of serum iron and serum Ferritin (RIA) were done in all the cases. Statistical analysis was done using chi Square and student 't' tests.

RESULTS

Various hematological parameters in the supplemented and unsupplemented groups are shown in Tables I and II.

Table I. Comparison of Hematological Parameters between unsupplemented and supplemented Pregnant Women.

Hematological parameters	Pregnant (unsupplemented) (–Fe) n = 40	Pregnant (supplemented) (+Fe) n = 40	Significance of difference between two groups
	Mean ± S.E.	Mean ± S.E	P – value
Serum ferritin (ng/ml) mean ± SEM	12.45 ± 2.21	24.75 ± 3.45	P < 0.01
Hb(g/dl)	10.88 ± 0.24	12.24 ± 0.14	P < 0.001
PCV (%)	33.32 ± 0.61	36.85 ± 0.40	P < 0.001
MCV (fl)	83.27 ± 0.78	85.74 ± 0.51	P < 0.01
MCH (pg)	27.20 ± 0.37	28.47 ± 0.17	P < 0.05
MCHC (g/dl)	32.57 ± 0.19	33.23 ± 0.10	P < 0.01
RBC count (10^6/ul)	3.98 ± 0.06	4.30 ± 0.05	P < 0.001
Serum iron (ug/dl)	78.50 ± 5.82	107.00 ± 6.72	P < 0.01

Table II. Number and Percentage of unsupplemented and supplemented Pregnant Women with the Hematological Parameters below the normal Values.

Hematological parameters	Values	Pregnant women (unsupplemented (−Fe) n = 40		Pregnant women (supplemented) (+ Fe) n = 40	
		Number	Percentage	Number	Percentage
Serum ferritin	12ng/ml	26	65%	11	37.5
Hb	11.00 g/dl	20	50%	4	10
PCV	33%	17	42.5%	9	22.5
MCV	77 fl	5	12.5%	0	0
MCH	27 pg	15	37.5%	1	2.5
MCHC	31 g/dl	0	0	0	0
RBC count	3.8 x 10^6/ul	10	25%	1	2.5
Serum iron	50 ug/dl	6	15%	0	0
Red cell morphology (Hypochromia, microcytosis)	17	42.5%	3	7.5	

In the unsupplemented group values of all heinatological parameters were significantly less than those who were on iron supplements (Table 1).

Fifty percent of unsupplemented pregnant women had anaemia (Hb < 11 g/dl) and 65% had deficient iron stores (Serum Ferritin < 12 ng/ml). The number of iron deficient pregnant women detected by

serum ferritin measurement was higher than those diagnosed by other hematological parameters (Table II).

DISCUSSION

During normal pregnancy, there is a fall in haemoglobin concentration which is often referred to as "the physiological anaemia of pregnancy.[9,10] This occurs because of greater expansion of plasma volume than increase in red cell mass. In correlation observed between blood,haemoglobin concentration and total haemoglobin mass is not seen during pregnancy because of hemodilution[8]. Therefore, the lower limit for normal haemoglobin concentration in pregnant women has been suggested to be 1 ig/di instead of 12g/dl in non-pregnant women[11]. The serum ferritin concentration is not affected by the hemodilution and is proportional to iron stores in the[12]. Individuals having serum ferritin concentration below l2ng/ml are considered to be iron deficient[8].

The mean serum ferritin concentration in unsupplemented pregnant women was 12.45ng/ ml, the values reported by others are 14.7ng/ml2 and 21mg/ml11 1. The mean serum ferritin concentration in. supplemented pregnant women was 24.7 5ng/ml and the value reported by Puolakka[10] is 63ng/ml. This study revealed that the values of serum ferritin, haemoglobin and other hematological parameters were significantly lower in unsupplemented than in supplemented pregnant women. This indicates the need of iron supplementation in pregnant women[6].

The number of iron deficient pregnant women detected by serum ferritin measurement was much higher than those detected by Hb, serum iron or other hematological parameters. Therefore, serum ferritin is the most sensitive measure of iron stores in a pregnant woman. Latent subclinical iron deficiency can be detected by serum ferritin determination before Hb or serum iron decrease. Serum ferritin determination has the advantage that its results are not significantly affected by other types of anaemia or oral iron therapy[6] and only a small amount (0.2m1), of serum is required for the serum ferritin assay.

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