Original Research Article

A study on assessment of different levels of iron, TIBC, transferrin and ferritin during pregnancy trimesters and lactation

Vellanki Lakshmi Narasamma[1], G Prem Kumar[2*], K Satyasri[3]

[1]Associate Professor, Department of Biochemistry, Government General Hospital, Srikakulam, INDIA.
{[2]Associate Professor, Department of Biochemistry} {[3]Associate Professor, Department of Pathology} Andhra Medical College, Visakhapatnam, INDIA.
Email: lifesresearch9@gmail.com

Abstract

Background: Iron deficiency is the most common nutritional disorder in the pregnant women. This study was conducted to investigate the possible contribution and impact of iron status on pregnancy in a costal population. One hundred seventy pregnant women aged between 18-38 years are taken in the current study. The women were followed up weekly till delivery after which neonatal anthropometrics and other birth out comes were recorded. Mean serum Hemoglobin, ferritin and iron were found to be lower in 3rd trimester as compared to 1st trimester, which become lower at postpartum then reach nearly to normal value during lactation. While serum ferritin was found to be lower in 2nd trimester as compared to 1st trimester, it was significantly higher in 3rd as compared to second trimesters and also decreased at postpartum and lactation. Serum TIBC, transferrin and Fe/TIBC levels increased during 1st, 2nd and 3rd trimesters, Serum TIBC also elevated at postpartum, then decreased during lactation. This result provides that, it is important to detect which form of iron become abnormal during trimesters of pregnancy, postpartum and lactation which may lead to cause of nutritional deficiency in pregnant women, so as to reduce public problem.

Keywords: Pregnancy, iron form, postpartum and lactation.

***Address for Correspondence:**
Dr G Prem Kumar, Associate Professor, Department of Biochemistry, Andhra Medical College, Visakhapatnam, INDIA.
Email: lifesresearch9@gmail.com

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INTRODUCTION

Iron is one of the most important micronutrients for human populations, given its central role in key biological processes. Iron is especially critical during pregnancy given the rapid cell and tissue development involved in fetal growth. Pregnancy has a net iron cost in the range of 600- 800mg[1,2]. It has been reported that 56% of pregnant women in low income countries are affected in contrast to 18% in high income countries[3]. In pregnant women, an adequate iron status is important to ensure an uncomplicated pregnancy as well as a normal development of the fetus and maturity of the newborn child[4]. Iron deficiency during pregnancy is associated with a number of maternal and fetal problems including the risks of preterm births, low birth weight babies, perinatal mortality and intrauterine growth retardation[5]. The hemoglobin concentration is often used as a pseudo marker for iron deficiency. However, hemoglobin is not suitable to asses iron-status especially not in pregnancydue to hypervolaemia and haemodilution. Hemoglobin yields information about the presence of anemia in general when body iron reserves are depleted[6]. The diagnostic workup for iron deficiency includes red blood cell indices, serum iron,

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serum total binding capacity, serum transferrin saturation and serum ferritin level. Serum iron transferrin is frequently abnormal in pregnancy. Low sensitivity of transferrin saturation and day to day and even hour to hour fluctuation of serum iron levels renders it less efficient than serum ferritin level for diagnosing iron deficiency which is the only condition associated with decreased serum ferritin concentration[7,8]. Serum ferritin, a marker of iron storage, has the advantage of being a sensitive indicator of iron deficiency, but because it is increased in the presence of inflammation, ferritin is not a specific indicator of iron deficiency[9,10,11]. Approximately 800 mg of iron are requirement in pregnancy, over and above the 230 mg of iron that the women would have required even if she had not been pregnant, and the 150mg that she may lose through blood loss at delivery[12,13]. Though this iron expenditure is offset by the lack of menstrual blood loss during this time, the net cost is still high enough that iron recommendation during pregnancy (27 mg/day) for exceed those for non-pregnant, Not Lactating women (18mg/day) (1). While iron recommendations for lactating women are much lower than those for non-pregnant, non-lactating women (9mg vs. 18mg), this number is based on the assumption of lactation induced amenorrhea and does not take into account that many women enter or conclude pregnancy with iron insufficiency or deficiency[1]. The aim of the present study therefore is to report the values of some important iron forms as parameters in apparently healthy pregnant subjects residing in coastal region. The parameters assessed include: serum iron (Fe), total iron binding capacity (TIBC), serum transferrin, serum ferritin, hemoglobin and Fe/TIBC%. These parameters were study also during postpartum and lactation which compared with normal women. This study might establish the normal reference ranges for these parameters for pregnant women in coastal population.

MATERIALS AND METHODS

This prospective, cross-sectional study was performed at Government General Hospital, Srikakulam. A total number of 170 apparently health pregnant subjects aged between 18-38 years were recruited into the study. All subjects were selected randomly during their antenatal visits. Patients with history of Diabetes, hypertension, hepatitis and any other acute or chronic illness were excluded from the current study. A 2-3 ml of EDTA blood sample was collected for hematological parameters which were measured on a fully automated hematology analyzer (sysmax analyzer) and 3 ml of blood was collected and centrifuged at 3000 rpm for 5min. The supernatant was used to quantify the serum TIBC and iron level by fully automated biochemical analyzer, France. The ceruloplasmin levels in human serum by turbidimetric method supplied fortress Diagnostics[14]. Transferrin can be estimated indirectly from the TIBC value by the following equation[15]. Transferrin (g/dl) = 0.7 × TIBC (g/dl). All statistical analyses in studies were performed using r tool and windows excel spread sheet version 10 for Windows. Descriptive analysis was used to show the mean and standard deviation of variables.

RESULTS

A total (170) women were selected in the study, (100) pregnant women as test group and (70) non- pregnant women as control. overall, the subjects were in the age range 18 – 38 years. Age distribution of the studied group was between 18 to 38 years old, and that of the pregnant group irrespective of the trimester of pregnancy and the lactation was comparable to that of the control group $p>0.05$. Age representation, number of abortion and number of children in pregnant women in three trimesters and at postpartum with lactation as shown in table1. The different levels of serum iron, serum ferritin, total iron binding capacity, hemoglobin, serum transferrin and Fe/TIBC%. are shown in table 2.

Table 1: Age and Relevant Clinical Parameters

Parameters	Control No of case	1st trimester	2nd trimester	3rd trimester	P.P	Lactati on
Age in Years	19-38	18-38	18-32	19-36	18-37	19-38
No of abortion	0-1	0-1	0-3	0-1	0-2	0
No of children	0-2	1-3	0-3	0-1	1-2	0-2

Table 2: Comparison of biochemical parameters in pregnant women classified by trimester of pregnancy and lactation with control subjects

Parameters	control	1st trimester	2nd trimester	3rd trimester	Postpartum	Lactation
S. Iron g/dl	70.15±9.92	59.93±11.23	50.97± 12.20	40.99± 16.89	48.89± 16.78	73.25± 10.83
Ferritin ng/ml	49.95± 12.12	16.02± 4.8	13.69± 5.9	15.01± 4.91	13.09± 3.37	12.01± 2.91
TIBC gm/dl	300.86± 25.13	320± 95	339.81± 49.93	442.06± 41.04	472.5± 80.06	390.91± 21.82
Hemoglobin gm/dl	12.43± 2.18	11.21 ±0.87	10.61± 1.01	10.58 ±0.69	9.02± 0.76	9.60±0.23
Transferrin mg/dl	200.1± 11.9	204.81±12.82	239.81±19.37	225.19± 20.09	290.31± 19.83	295.81±20.31
Fe/TIBC%	23.3	18.9	15.3	11.53	16.84	18.73

DISCUSSION

Pregnancy is a risk factor for development of iron deficiency anaemia. In developing countries iron deficiency is very common, even without pregnancy. This study was designed to assess iron status in coastal area pregnant women at the time of delivery, regardless of whether they were taking iron supplementation or not, in order to find out the prevalence of iron deficiency among them, we also take serum from women during lactation in order to find which one of these markers affected by lactation. Statistically significant difference was observed in the values of serum iron concentration amongst the three trimesters of pregnancy, highest value being observed amongst subjects in the first trimester and lowest value amongst subjects in the third trimesters of pregnancy. This is consistent with reports of changes in serum iron concentration during pregnancy in Filipino, Caucasin and Tariah[16-18]. During pregnancy the physiologic need for iron is extraordinary high. In women of reproductive age, the requirement for absorbed iron is on average 0.8mg/day. The average requirements for absorbed iron increased steadily during pregnancy from 0.8mg/day in the third trimester. The average requirement for absorbed iron in the entire gestation period is ~4.4 mg/day[19, 20]. This study agreed with Fenton *et al.* in 1997 who had concluded that serum iron and TIBC are frequently abnormal in pregnancy and so they are of little help in diagnosis of iron deficiency anemia during pregnancy [21]. Serum ferritin was found to be low in most of the mothers where ferritin level is the best parameter for assessment of iron are unreliable during pregnancy[22]. During pregnancy Hb levels in woman is naturally lower than when she is not pregnant. This is because the fluid (plasma) increases by about 50%during pregnancy (peaking at about 32 weeks)[23]. The increased plasma dilutes the red cells, making their level drop. Results of this study did not differ from those of other studies carried out in different parts of the country and abroad and have been found in conformity with previous works carried out by various workers. Several factors were observed to be responsible for a high rate of iron forms deficiency in a community like ours. Multi parity, poor socio economic and educational status are the principal reasons for a high prevalence of iron deficiency anemia in our population[24]. The current study focused to describe the consequence of iron forms deficiency in pregnancy and to outline strategies for prevention.

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