

Increased Serum Ferritin and Iron Levels in Preeclampsia

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Abstract:

Aim:The aim of the study was to assess the status of serum ferritin and iron in preeclampsia. **Materials & Method:**This case control study was conducted in the Department of Biochemistry, Bangalore Medical College, Bangalore. In this study serum samples from 26 pre-eclamptic women and 26 age matched pregnant normotensive controls at Vani Vilas Hospital, Bangalore, were assessed for ferritin and iron levels and the results were analysed for statistical significance.

Results: The mean serum ferritin concentration in cases and controls were 55.35µg/l and 17.19µg/l respectively. Mean serum iron concentration in cases was 190.88 µg/dl and that in controls was 83.66µg/dl. **Conclusion:**This study showed significantly higher level of serum ferritin and serum iron in preeclamptic group as compared to the normotensive control group..

Key words: Preeclampsia, serum ferritin, serum iron

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I. Introduction

Pre-eclampsia is a multisystem disorder of unknown etiology and is unique to pregnant women after twenty weeks of gestation. Hypertension, proteinuria, excessive weight gain and edema are the classic clinical manifestations^[1]. In a developing country like India, preeclampsia is one of the significant causes of maternal mortality and morbidity.

Disturbances in iron homeostasis have already been observed in previous studies in pre-eclampsia^[2,3,4,5]. When tissues become ischemic, reactive oxygen species such as superoxide and hydrogen peroxide are produced, but neither of these is reactive enough to initiate cellular damage directly^[6]. However, in the presence of catalytic amounts of transition metal ions, particularly iron, which may arise in the ischemic placenta by destruction of red blood cells^[7] from thrombotic, necrotic and hemorrhagic areas^[8,9], these species can generate the highly reactive hydroxyl radical by Fenton chemistry^[7,10]. This radical can initiate the process of lipid peroxidation which, if uncontrolled, may result in endothelial-cell damage, as hypothesized by Hubel and colleagues^[11].

This study therefore compares the serum iron and serum ferritin levels, in pre-eclamptic women and age matched normotensive pregnant controls for any statistically significant differences.

II. Material And Methods

Study was carried out in the department of Biochemistry, Bangalore Medical College, Bangalore, in collaboration with department of obstetrics and gynaecology, Vani Vilas Hospital, Bangalore. Study was performed on 52 pregnant women of age ranging between 15-35 years and having gestational age between 28 to 34 weeks. 26 obstetric patients were identified as having pre eclampsia according to specific criteria. Gestational hypertension was defined as an absolute blood pressure >140/90 mm Hg after 20 weeks gestation. Proteinuria was defined as >500mg per 24 hr urine collection or >2+ on a voided random urine specimen. 26 healthy normotensive pregnant subjects were taken as controls, having uncomplicated pregnancies and without proteinuria.. Subjects having hemolytic anemia, liver disease, chronic renal disease, chronic hypertension, history of repeated blood transfusion, hematomas and those having chronic disease such as tuberculosis and rheumatoid arthritis were excluded from the study. The clinical characteristics recorded were maternal age, gestational age at the time of blood sampling, systolic and diastolic blood pressure, degree of proteinuria and presence and distribution of edema. The blood pressure was recorded. Ten ml of venous blood was collected from all subjects, centrifuged and serum obtained was stored frozen at -20°C until assay. Estimation of serum ferritin and serum iron concentration was done by fully automated random access chemistry analyzer

Cobas Integra,Roche make.Statistical analysis was performed by using computer based software, Statistical Package for Social Sciences (SPSS) for Windows version 14.0. Mean values of different parameters were compared to determine the differences between two groups by using Student's unpaired't' test.For all statistical analysis, two tailed 'p' value<0.05 was considered as a lowest level of significance.

III. Results

Table-I: Comparison of serum ferritin concentration between cases and controls: Parameters Case (n=26) Control (n=26) t value & p value

Unit-(µgm/L)	Cases(30)	Controls(30)
Mean	55.35	17.19
SEM	10.96	2.28
SD	55.18	11.66
t value	3.41	
p value	0.0013 -significant	

Student's unpaired 't' test was done as a test of significance

Table-II: Comparison of serum iron concentration between cases and controls Parameters Case (n=26) Control (n=26) t value& p value iron (□ g/dl)*Student's unpaired 't' test was done as a test of significance*

Unit(µgm/dL)	Cases(30)	Controls(30)
Mean	190.88	83.66
SEM	22.35	6.34
SD	113.96	32.37
t value	4.62	
p value	<0.0001 -Significant	

IV. Discussion

The current study was undertaken to evaluate serum ferritin and iron status and its possible contributory role in pre eclampsia^[12,13]. Normotensive women have decrease in serum iron and ferritin during the third trimester of pregnancy as their stores of iron are depleted because of fetoplacental demand and required expansion of red cell mass^[14,15]. However, elevated level of serum iron have been observed in pre eclamptic as compared to normal pregnant women^[16]. Local iron excess and iron mediated oxidative stress have been demonstrated in the intestinal mucosa, liver spleen, bone marrow and placenta and the production of hydroxyl and methoxyl radicals in both the luminal and mucosal contents of the gastrointestinal tract verify the role of iron in free radical damage^[17,9]. These results point to the possible contribution of released iron free radicals from ischemic placenta in pre eclampsia to its etiology^[18].Serum ferritin is found elevated in pre eclamptic group,which is in agreement with study conducted by Hubel et al^[18]. Serum ferritin is a reliable indicator of total body iron status in non diseased individuals, with low concentration being diagnostic of iron deficiency. However a high ferritin does not always signify iron excess^[19].Elevated serum ferritin occurs in a variety of clinical conditions with non utilization of iron and destruction of tissues such as in hemolytic anemia, hepatic damage or to suppression of erythropoiesis leading to accumulation of storage iron^[2,20]. A prospective observational study was performed on 450 women by^[12]. He observed that high ferritin was associated with increased risk for preterm delivery and neonatal asphyxia, while the lower ferritin level was associated with decreased risk of pre eclampsia, pre labour rupture of membranes^[21]. Increased concentration of serum ferritin during third trimester may be part of an acute phase response, which suggests maternal infection and increased risk of poor pregnancy outcome^[22]. On the other hand iron supplements and increased iron stores have recently been linked to maternal complications e.g. gestational diabetes and increased oxidative stress during pregnancy^[5,23].Consequently while iron supplementation may improve pregnancy outcome when the mother is iron deficient, it is also possible that prophylactic supplementation may increase risk when the mother does not have iron deficiency. Estimates of gestational iron requirements and of the proportion of iron absorbed from different iron supplements suggest that with present supplementation schemes the intestinal mucosal cells are constantly exposed to unabsorbed iron excess and oxidative stress^[23,24].

V. Conclusion

From this study it can be concluded that serum iron and serum ferritin are significantly increased in pregnant women with pre eclampsia. Excess iron may be postulated as causal factor in the oxidative stress,which might be involved in pathogenesis of preeclampsia.However further studies are required to substantiate the same.

Therefore, iron status of pregnant women with pre eclamptic toxemia should be assessed before giving iron supplements as these may cause more harm than benefit.

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