

## ORIGINAL ARTICLE

IMPACT OF MULTIPARITY ON IRON CONTENT  
IN MULTIPAROUS WOMEN

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**Background:** The effect of multiple pregnancies, a very common pattern in reproductive lifestyle of Pakistani women, needs to be addressed to see if it affects the iron content and hence cause iron deficiency. Recognising this deficiency prior to development of anaemia can prevent disastrous consequences that can complicate the life of the mother and foetus especially in developing countries. The objective of this study was to assess the effect that the stress of multiple pregnancies has on the iron status of the body. **Methods:** This comparative study was conducted in a focus group of female population. Two hundred subjects were selected by convenient sampling and grouped depending on their parity status. Data regarding diet, and socioeconomic history was collected on pre-designed questionnaire. Serum Ferritin was used to assess iron deficiency using the Electrochemiluminescence Immunoassay (ECLIA). Data was statistically analysed using SPSS-17. **Results:** Mean value of serum Ferritin in the nulliparous group was  $76.52 \pm 4.92$  ng/mL with 16% of nulliparous subjects showing lower than normal values. Thirty-six percent of uniparous subjects showed low serum Ferritin values, mean value being  $45.74 \pm 4.51$  ng/mL. Seventy-two percent of the multiparous subjects showed iron deficiency with Ferritin levels of  $< 20$  ng/mL. Mean serum Ferritin in this group was  $25.21 \pm 2.75$  ng/mL. The differences between the Ferritin levels of the study groups were highly significant ( $p < 0.01$ ). **Conclusions:** Multiparous women had lower serum Ferritin levels than the control group suggesting that the stress of multiple pregnancies takes its toll on the iron content of the body.

**Keywords:** Multiparous, Ferritin, Iron deficiency, Electrochemiluminescence Immunoassay

## INTRODUCTION

Iron deficiency, one of the most frequent medical problems that confront a physician, is the number one nutritional disorder in the world.<sup>1</sup> It is ranked at the top of three global 'hidden hungers', i.e., sub-clinical deficiency without visible signs of deficiency, including Iron, Iodine and Vitamin A.<sup>2</sup> The important aspect to understand is that iron deficiency and iron deficiency anaemia, which represents the extreme lower end of the distribution of iron deficiency, are not one and the same. A person may be iron deficient without being anaemic. Iron deficiency is defined as a condition in which there are no mobilisable iron stores and in which signs of a compromised supply of iron to tissues including the erythron are noted. Iron deficiency anaemia, hence should be regarded as a subset of iron deficiency.<sup>3</sup>

Worldwide estimates of iron deficiency alone are available and show a wide range, but the number almost certainly exceeds one billion persons globally.<sup>4</sup> Although estimates of iron deficiency anaemia in the Pakistani female population are readily available, estimates for prevalence of iron deficiency at a stage at which changes of anaemia are not yet obvious are lacking. Recent statistics show a prevalence of around 45% of iron deficiency anaemia in Pakistan realising failure of public health measures to control it.<sup>5</sup> In the same database, the country estimates of anaemia prevalence in non-pregnant women of reproductive age is 27.9%,<sup>5</sup> hence highlighting the fact that iron

deficiency is most prevalent among older adolescent girls.<sup>6</sup>

Pakistani women, particularly in rural areas are culturally assigned with low priorities for their education and health care, especially their reproductive health. The female mortality is thus high and there is a lack of access to medical facilities in far flung areas. Multiparity<sup>7</sup> is a norm in the Pakistani women reproductive history. As a medical and social problem, it has been drawing attention of health professionals in many countries, especially those with a tendency towards hyper-populations.<sup>8</sup>

Although it is known that women with anaemia are reported having high foetal mortality and maternal mortality<sup>9</sup>, it cannot be emphasised enough that recognising this deficiency at a stage prior to anaemia development would be greatly beneficial for the reproductive age female population. These disastrous consequences can be prevented as anaemia that complicates pregnancy threatens the life of both the mother and the foetus.<sup>10</sup>

The best indicator for detecting iron deficiency is serum Ferritin.<sup>3,11</sup> Total body iron calculated from serum Ferritin concentrations allows for the evaluation of the full range of iron status.<sup>12</sup> It is the most specific biochemical test that correlates with relative total body iron stores. A low serum Ferritin level reflects depleted iron stores and hence is a precondition for iron deficiency.

The reference ranges for Ferritin are 30–400 ng/mL for males, and 13–150 ng/mL for females.<sup>13,14</sup> Clinically, a threshold value of 20 ng/mL has proved useful in the diagnosis of iron deficiency.<sup>15</sup> Iron deficiency with anaemia is seen when a person has low values of both serum Ferritin and haemoglobin.<sup>16</sup>

This study was designed to see the Iron content of blood in multiparous women and compare it with the same in nulliparous and uniparous women.<sup>17,18</sup>

## MATERIAL AND METHODS

This comparative study was conducted at Fauji Foundation Hospital, Rawalpindi from April 2010 to April 2011. Selection of 200 female subjects who met the specified criteria, between the age group of 20–40 years was done through convenient sampling. They were divided into groups on the basis of their parity. These women belonged to middle socioeconomic class (average monthly income of PKR 20,000–25,000). Age, socioeconomic status and dietary variables were kept in a constant range so as to least affect the results. Pregnant women, lactating mothers, women showing detectable causes of iron deficiency on history and clinical examination, and women taking iron supplements were excluded from the study. Consent of the patient to participate in this study was taken.

Demographic and medical history was taken. Dietary history through Food Frequency questionnaire<sup>19</sup> with stress on frequency of intake of iron rich foods was taken. Clinical examination was performed on all subjects and findings were entered in a Performa. Five to ten ml. venous blood was collected from the selected subjects and centrifuged for 1–2 minutes. Serum was transferred to another tube and used for assessment of Ferritin by Electro-chemi-luminescence Immunoassay (ECLIA) Serum Ferritin assay using COBAS E.<sup>13</sup> A two step ‘sandwich’ immunometric technique was performed. Results were determined by the calibration curve generated by the machine.

Data was analysed using ANOVA on SPSS-17. Quantitative variables were described as Mean±SD and 95% confidence interval. Categorical variable were expressed as frequencies or percentages. Post Hoc Tukey’s Test was applied to see multiple comparison between individual groups and  $p < 0.05$  was taken as significant.

## RESULTS

A total of 200 females were included in this study. There were 50 nulliparous and 50 uniparous women in the control group and 100 multiparous women in the study group.

The percentage of subjects with below normal serum Ferritin is shown in Table-1. The mean Ferritin level of the study group was found to be 43.21 ng/mL. Table-2 shows the mean Ferritin concentrations of the

individual groups. Table-1 shows that mean Ferritin concentration was lowest in the multiparous group with a value of 25.21±2.75 (95% confidence interval for mean being 19.81–30.76). A highly significant difference ( $p < 0.01$ ) was seen when multiple comparisons between the serum Ferritin values of individual groups was done (Table-3).

**Table-1: Percentage of subjects with low serum Ferritin levels in the study groups**

| Parity              | Number | Percentage |
|---------------------|--------|------------|
| Nulliparous (n=50)  | 8      | 16         |
| Uniparous (n=50)    | 18     | 36         |
| Multiparous (n=100) | 72     | 72         |

**Table-2: Serum Ferritin Mean±SEM**

| GROUPS                  | Ferritin Concentration Mean±SEM |
|-------------------------|---------------------------------|
| Group 1-A (Nulliparous) | 76.52±4.92                      |
| Group 1-B (Uniparous)   | 45.74± 4.51                     |
| Group -2 (Multiparous)  | 25.21±2.75                      |

**Table-3: Comparison between individual groups**

| Comparison between      | <i>p</i> |
|-------------------------|----------|
| Group 1-A and Group 1-B | 0.0000*  |
| Group 1-A and Group 2   | 0.0000*  |
| Group 1-B and Group 2   | 0.0000*  |

\*Highly Significant

## DISCUSSION

According to the WHO Global Database, anaemia affects 1.62 billion people globally which corresponds to 24.8% of the population.<sup>20</sup> However, the population group with the greatest number of individuals affected is non-pregnant women. The most significant contributor to the onset of anaemia is iron deficiency so that ‘iron deficiency anaemia’ and ‘anaemia’ are often used synonymously.<sup>3</sup>

The important health effects of severe anaemia, i.e., increased risk of maternal and child morbidity and mortality have been well documented.<sup>21</sup> In Pakistan several studies focusing on apparent iron deficiency anaemia have been carried out and it has been observed that non-anaemic women are significantly taller, weighed more, and had a higher body mass index.<sup>22,23</sup> However, the detection of iron deficiency at an early and easily curable stage needs to be targeted as this aspect has not been reported adequately.

Our study shows a significant difference in the Ferritin concentration between groups depending on their parity status. In the nulliparous group, 8 subjects showed low serum Ferritin concentrations, the lowest value of serum Ferritin being 14.7 ng/mL. Eighty-four percent of the subjects in this group had a normal serum Ferritin indicating presence of iron deficiency in them. As majority of these females did not have to go through the stress of pregnancy, childbirth and eventual breast feeding, their iron content was within the normal range. With full term pregnancy about 900 mg of iron is lost by the mother to the foetus through placenta and due to

haemorrhage during delivery. In the absence of supplemented iron, however, the mother's stores will be depleted and will not be able to meet the needs of the foetus.<sup>24</sup>

In the multiparous group 64% had normal serum Ferritin, the average value being 45.74 ng/mL. Eighteen (36%) subjects showed Ferritin concentrations in the range of iron deficiency. Hence the effects of iron deficiency are evident in this group as during pregnancy, women have an increased demand for iron in order to expand their erythrocyte mass and fulfil the iron needs of the growing foetus.<sup>25,26</sup> In the multiparous group only 28% had normal serum Ferritin levels, and mean serum Ferritin concentration in this group was 25.21 ng/mL. Seventy-two percent of the multiparous women showed Ferritin levels in the range of <20 ng/mL to a threshold of 13 ng/mL. It is due to the fact that a cycle of deteriorating health from pregnancy to pregnancy occurs when these women are unable to replace blood loss during childbirth and their anaemia became exacerbated by the demand of breast feeding.<sup>27</sup> It is generally acknowledged that in order to go through a pregnancy without developing iron deficiency, the women should have mobilisable body iron stores of at least 500 mg prior to pregnancy.<sup>28,29</sup>

These results show that the stress of multiparity has a significant effect on the health of females in our population where women are unaware of the fact that repeated child birth and breast feeding takes its toll of the level of various micronutrients in their body especially iron.

## CONCLUSIONS

The relationship between multiparity and iron content of body is a major public health problem that needs to be addressed especially in developing countries. Women of reproductive age group should be made aware of the necessity of having a normal iron content and haemoglobin levels prior to conception and on the need to maintain this level throughout life especially during their reproductive years. Interventional approaches at a stage of iron deficiency are required where it can easily be cured and the complexities associated with anaemia have not yet set in.

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