Hematological Profile of Healthy Pregnant Females in Association with Parity

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Abstract

Background: To determine the haematological profile of normal pregnant females.

Methods: In this cross sectional study 100 healthy young pregnant females, during third trimester of pregnancy, were included. Subjects were divided into two sub-groups, with 68 being multigravida and remaining 32 primigravida. Haematological analysis was undertaken. The mean and standard deviation of all the parameters were calculated and compared in association with parity and t-test was employed.

Results: The age range of the subjects was 18-38 years. Majority of the parameters did not show any significant difference but three parameters i.e., serum ferritin, serum transferrin receptors and transferrin receptor-ferritin index deviated from the usual trend of the others and showed a statistically significant difference between the two groups (p<0.05). In cases with pacing of pregnancy upto 1 year, 57.1% showed low serum ferritin, while in those with spacing of pregnancy more than 2 years, 12.8% showed low serum ferritin.

Conclusion: There is a need to develop reference haematological values in association with parity as some of the parameters vary significantly with it. Narrower is the spacing between pregnancies, more pronounced is the fall in ferritin levels.

Key Words: Pregnancy, haematological values

Introduction

Pregnancy manifests a number of changes in the normal physiology. Important of these changes are those which alter the haematological parameters. Plasma expansion and hemodilution during pregnancy contribute to majority of these changes. Variations of red cell indices and iron parameters of the mother play a major role in determining the birth outcome. Due to population specificity and varying results of different studies a consensus could not be reached so far so as to define the cut off values in general. During pregnancy a continuous monitoring of all the parameters is undertaken according to the available data to assure both maternal and fetal well-being.1-6

Low haemoglobin in the blood is widely identified as the commonest haematological abnormality and it is associated with adverse pregnancy outcome as hemoglobin levels continue to fall as the pregnancy advances.7,8 Iron deficiency is largely responsible for this low hemoglobin. Approximately 2 billion people suffer from iron deficiency and the residents of developed countries are also having iron deficiency.9 The pregnant women are even more prone to develop this deficiency because they tend to have an increased demand of iron to increase their erythrocyte mass and to supply iron to the developing fetus.10 The risk of developing iron deficiency is higher in multigravida as compared to primigravida.11 Iron deficiency can be diagnosed by measuring serum iron levels directly. However, serum ferritin and serum transferrin receptors can help to stratify individuals who are at risk of developing this deficiency even before it gets manifested.12

Subjects and Methods

This cross-sectional study was conducted at Obstetric department of a government hospital of Rawalpindi. The study involved 100 pregnant females aged 18 to 38 years coming for antenatal check-up during the third trimester of pregnancy. All ladies included in the study were non-anemic, having no associated medical or obstetrical problem and were following normal course of their pregnancy without any complications. Two sub-groups were made on the basis of parity, one having subjects having their first pregnancy, i.e. primigravida (n=32) and the others having more than one pregnancy, i.e; multigravida (n=68). Two ml blood was mixed with anticoagulant EDTA for analyzing haematological parameters. Five ml of clotted sample was used to determine the levels
of serum ferritin and serum transferrin receptors. Estimation of serum ferritin was done by chemiluminescent technique while serum transferrin receptors were determined by immunoenzymometric assay (IEMA).

Results

The age range was 18 to 38 years. Hematological parameters in primigravida and multigravida were compared (p>0.05). However, while comparing serum ferritin, serum transferrin receptors and transferrin receptor-ferritin index, the significant difference was noticed in between two sub-groups (p<0.05) (Table 1).

Table 1: Comparison of iron parameters in primigravida and multigravida females

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Primigravida (n=32)</th>
<th>Multigravida (n=68)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gestational age (weeks)</td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
<td></td>
</tr>
<tr>
<td>Hb (g/dl)</td>
<td>11.83 ± 0.76</td>
<td>11.83 ± 0.56</td>
<td>0.620</td>
</tr>
<tr>
<td>RBCs (millions/mm³)</td>
<td>4.19 ± 0.30</td>
<td>4.24 ± 0.38</td>
<td>0.312</td>
</tr>
<tr>
<td>PCV (%)</td>
<td>35.64 ± 3.25</td>
<td>35.96 ± 2.27</td>
<td>0.077</td>
</tr>
<tr>
<td>MCV (fl)</td>
<td>84.91 ± 7.93</td>
<td>83.97 ± 6.17</td>
<td>0.051</td>
</tr>
<tr>
<td>MCH (pg)</td>
<td>28.36 ± 1.95</td>
<td>28.09 ± 2.67</td>
<td>0.199</td>
</tr>
<tr>
<td>MCHC (g/dl)</td>
<td>33.30 ± 1.80</td>
<td>32.98 ± 2.11</td>
<td>0.967</td>
</tr>
<tr>
<td>Serum ferritin (µg/l)</td>
<td>35.08 ± 39.68</td>
<td>31.32 ± 16.41</td>
<td>0.016*</td>
</tr>
<tr>
<td>Serum transferrin receptors (µg/l)</td>
<td>2.73 ± 1.22</td>
<td>3.45 ± 3.38</td>
<td>0.027**</td>
</tr>
<tr>
<td>Transferrin receptor - ferritin index</td>
<td>1.93 ± 0.76</td>
<td>2.22 ± 1.66</td>
<td>0.016*</td>
</tr>
</tbody>
</table>

* = statistically significant

Table 2: Percentage of low serum ferritin subjects in multigravida sub-group with respect to spacing between pregnancies

<table>
<thead>
<tr>
<th>Spacing between pregnancies</th>
<th>Total subjects (n=68)</th>
<th>No(%) with low serum ferritin (n=18)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upto 1 year</td>
<td>21</td>
<td>12 (57.1)</td>
</tr>
<tr>
<td>More than 2 years</td>
<td>47</td>
<td>6 (12.8)</td>
</tr>
</tbody>
</table>

* Serum ferritin < 12 µg/l

Table 3: Percentage of low serum ferritin subjects in multigravida group with respect to number of children

<table>
<thead>
<tr>
<th>No. of Children</th>
<th>Total Subjects (n=68)</th>
<th>No (%) with low serum ferritin (n=31)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 child</td>
<td>33</td>
<td>17 (51.5)</td>
</tr>
<tr>
<td>&gt;1 child</td>
<td>35</td>
<td>14 (40.0)</td>
</tr>
</tbody>
</table>

* Serum ferritin < 12 µg/l

All of these hematological parameters can be considered as iron status parameters which depicted a significant iron deficiency in multigravida. Therefore, further analysis was done on serum ferritin levels in the multigravida females based on the spacing between subsequent pregnancies and number of children of the subjects. It can be inferred that a spacing of upto 1 year can have notable effects on the iron status of the pregnant females whereas if the spacing period is more than two years, then we can get much better results on the iron status of pregnant females. The number of children does not affect the iron status of pregnant females much as compared to the spacing between pregnancies (Table 3).

Discussion

During pregnancy the physiological adjustments vary depending upon the health status of a pregnant female, genetic determinant of fetal size and maternal lifestyle. Proper dietary intake and regular intake of hematinics is beneficial for both mother and fetus. It was found that no significant difference in the values of majority of the parameters analyzed when compared in the two sub-groups i.e. primigravida and multigravida except serum ferritin, serum transferrin receptors and transferrin receptor-ferritin index. It was observed in the present study that multigravida women showed a significant lowering of their serum iron status as compared to the primigravida subjects as quoted in other studies. The most important cause of hemoglobin lowering in pregnant females is relative hemodilution due to plasma expansion by 30-50%. In multigravida females in addition to this plasma expansion, iron deficiency can play a major role in lowering of the hemoglobin concentration and therefore making them more prone to develop anemia as compared to the primigravida. It is an established fact that maternal iron stores become depleted in second and third trimesters of pregnancy. Most of the iron transfer from mother to fetus occurs during this period which corresponds to the time of peak efficiency of maternal iron absorption. The current study showed mean value of serum ferritin as 35.08 ± 39.68 µg/l in primigravida whereas 31.32 ± 16.41 µg/l in multigravida women with a p-value of 0.018 depicting a significant lowering of iron stores in multiparous ladies as compared to the primigravida. Similar trends were observed in the values of serum transferrin receptors and transferrin receptor-ferritin index with both showing a significant elevation in multigravida women. These females are prone to develop iron deficiency anemia in near future. These results are in agreement with the study carried out by Zuguo Mei et al showing that multigravida ladies have a very high serum transferrin receptor concentrations. Analysis of data of multigravida subjects in order to determine
the effects of spacing and number of children on their iron status revealed that the women who had a spacing period of upto 1 year between the subsequent pregnancies had lower iron levels as compared to those having spacing of upto two years. This data further strengthens the fact that minimum spacing recommended should be 2 years in between subsequent pregnancies as recommended by WHO.\textsuperscript{19} Number of children does not affect the iron status of the pregnant females much as compared to the spacing period. Haider et al and Elhassan et al concluded that both spacing and number of children tends to have a lesser impact as such as an indicator. Subsequent pregnancies in a shorter period can have ominous effects on the mother and baby and can also affect the health of already born children.\textsuperscript{22}

### Conclusion

Repeated pregnancies with narrow spacing should best be avoided by adopting appropriate family planning measures.

### References