Effect Of Maternal Iron Deficiency Anemia On The Baby Anthropometric Measurements And Hematological Indices

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Abstract

Anemia is one of the most prevalent nutritional deficiency problems afflicting pregnant women. Objective: - to evaluate the impact of maternal anemia on the baby anthropometric measurements (B. weight, length, head circumference) & biochemicals (HB, S. iron, S. ferritin). Prospective cross-sectional hospital based study was conducted on 200 Pregnant women attending labor room at AL-Jamhoria hospital from 1st April to end of May 2012, aged between 18-42years old, who delivered vaginally. Maternal venous blood was extracted few hours before delivery for (HB, S. iron, S. ferritin) and umbilical cord blood immediately after delivery for baby (HB, s. ferritin, s. iron) and babies' anthropometric measurements (B. weight, Length, Head circumference) were taken. 85(42.5%) of total 200 pregnant women were anemic where (27%, 15.5%, 0%) with mild, moderate and severe anemia respectively, with hemoglobin levels (10- 10.9 g/dL, 7- 9.9 g/dL, ≤ 7 g/dL) respectively. 177 (88.5%) of them received iron supplement where (54%, 21.5%, 13%) among control, mild anemia & moderate anemic groups respectively, the mean maternal hemoglobin for control, mild anemic & moderate anemic groups were (12.15±0.82, 10.45±0.30, 8.97±0.74) respectively. The mean maternal iron level for control, mild anemic & moderate anemic groups were (86.35±38, 74.77±2.77, 59.38±35.6) respectively, the mean babies iron levels were (41.2± 1.38, 39.3± 1.38, 37.4± 1.34) for control, mild anemic & moderate anemic groups respectively. The mean maternal ferritin level for control, mild anemic, moderate anemic groups were (40.65±1.88, 24.03±39.52, 13.79±13.37) respectively with mean babies ferritin level for control, mild anemic & moderate anemic groups were (260± 2.63, 321± 2.79, 195± 1.91) respectively. The Anemia is highly prevalent among pregnant women in our country and reaches 42.5% & have impact on the baby growth & hematological indices.

Keywords: Anemia, maternal hemoglobin, Baby Anthropometric.

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1. INTRODUCTION

Anemia: - It is one of the most prevalent nutritional deficiency problems afflicting pregnant women and iron deficiency anemia is the most common cause in the world and account for 33-75% of all cases of anemia in pregnant women and approximately half of all anemia cases worldwide, it is the result of advanced stage of iron deficiency which diminishes erythropoiesis and causes the development of anemia\(^1\). The world Health Organization reports anemia among the top ten most important contributors to global ill health and deaths. It is estimated that about a third of the world's population of 7 billion have hemoglobin levels below the WHO criteria for diagnosis of anemia.\(^2\) Transfer of iron from the mother to the fetus is supported by a substantial increase in maternal iron absorption during pregnancy and is regulated by the placenta. Serum ferritin usually falls markedly between 12 and 25 wks of gestation, probably as a result of iron utilization for expansion of the maternal red blood cell mass. Most iron transfer to the fetus occurs after 30 weeks of gestation, which corresponds to the time of peak efficiency of maternal iron absorption\(^3\) where its effect on fetal outcome:-

1. Fetal and neonatal consequence include
   A. Low birth weight.
   B. Poor mental and psychomotor performance.
   C. The infant development.

2. Preterm delivery.

Patients and methods: - Prospective cross-sectional hospital based study was conducted on 200 Pregnant women attending labor room at AL-Jamhoria hospital from 1st April to end of May 2012, aged between 18-42years old, who delivered vaginally. They were healthy and nonsmoker pregnant women with gestational age (GA) of ≥ 37 weeks. Based on the World Health Organization (2001) reference, the anemic mothers were considered if their pre delivery hemoglobin level:

1. Control group (non-anemic): with Hb ≥ 11g/dl. Mean ± SD (12.15±0.82) with significant P-value.
2. Mild anemic group: with Hb (10-10.9g/dl). Mean ± SD (10.45±0.30) with non-significant P-value.
3. Moderate anemic group: with Hb (7-9.9g/dl). Mean ± SD (8.97±0.74) with non-significant P-value.

2. RESULTS:

1. Distribution of Mothers according to Hemoglobin level:-

200 pregnant women divided into 3 groups according to pre-delivery hemoglobin level

1st-Control group (non-anemic): - 115 (57.5%), Mean ± SD (12.15±0.82) with significant P-value.
2nd-Mild anemic group: - 54 (27%), Mean ± SD (10.45±0.30) with non-significant P-value.
3rd-Moderate anemic group: - 31 (15.5%), Mean ± SD (8.97±0.74) with non-significant P-value.

The data collected include - Maternal age, gravidity, parity, H/O abortion, space between pregnancies, bleeding during pregnancy, H/O an iron supplement. Exclusion criteria: - The mothers were excluded if they had H/O chronic renal disease, H/O malabsorption or maldigestion, H/O chronic illness, H/O pre-eclampsia, H/O severe infection during pregnancy, H/O blood transfusion during pregnancy, gestational age < 37 week.

Sitting: - Labour room at AL-Jamhoria hospital (it is a governmental and referral center covering a large number of pregnant women from rural and urban areas of eastern part of Libya).

Study period: - 2 months for data collection and the rest for data analysis and writing.

Blood samples and Measurements: - Maternal biochemicals (Hb, Iron, Ferritin) were taken at least 1hour pre delivery and baby's cord blood for biochemicals (Hb, Iron, Ferritin) were taken with anthropometric measurements (weight, length, head circumference) immediately after birth all done by same person.
A-1 – Relationship between Maternal hemoglobin & Baby anthropometric measurements:-
No correlation exists between them in all groups.

A-2- Relationship between Maternal hemoglobin & Baby hemoglobin: -
The correlation were significant between them with significant P- Value.

A-3-Relationship between Maternal hemoglobin & Baby iron & Ferritin:-
There are no correlations that exist between them in all groups.

B-1-Relationship between Maternal iron & Baby anthropometric measurement:-
No correlation existed in all groups.

B-2-Relationship between Maternal iron & Baby iron: -
The correlation exist between them at control group only.

C-1-Relationship between Maternal Ferritin & Baby weight: -
There is significant correlation exists between them among moderate anemic group.

C- 2.& 3. Relationship between Maternal Ferritin & Baby Length & Head circumference:-
No correlation exists between them in all groups.

C- 4. Relationship between Maternal Ferritin & Baby Hemoglobin:-
The correlation found to be present at level of moderate anemic group.

C- 5. Relationship between Maternal Ferritin & Baby iron:-
No correlation exists between them in all groups.

C- 6. Relationship between Maternal Ferritin & Baby Ferritin: -
There are significant correlation that exist between them at control & moderate anemic groups.

D: Comparison of effect of maternal anemia on baby anthropometric measurements

D- 1: Comparison of effect of maternal anemia on Baby weight
The weight of moderate anemic mother's babies were heavier than mild once and those heavier than non-anemic mother's babies as noticed but statistically were non-significant p- value.

Table D-1: comparison of effect of maternal anemia on Baby weight.

D- 2: Comparison of effect of Maternal anemia on Baby Length:-
The length of anemic mother's Babies is less than non-anemic group as noticed but statistically were non-significant p- value.

D- 3: Comparison of effect of Maternal anemia on Baby Head Circumference:-
The head circumference of anemic mother's babies group lesser than non-anemic group as notice but statistically were non-significant p- value.

Table A-2: Relationship between Maternal hemoglobin & baby hemoglobin.

<table>
<thead>
<tr>
<th>Groups</th>
<th>No</th>
<th>%</th>
<th>Mean ±SD Mot.HB</th>
<th>Mean ±SD Bab.HB</th>
<th>r</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>115</td>
<td>57.5%</td>
<td>12.15±0.82</td>
<td>15.12±1.88</td>
<td>0.202</td>
<td>0.030</td>
</tr>
<tr>
<td>Mild anemia</td>
<td>54</td>
<td>27%</td>
<td>10.45±0.30</td>
<td>14.80±1.82</td>
<td>0.422</td>
<td>0.04</td>
</tr>
<tr>
<td>Moderate anemia</td>
<td>31</td>
<td>15.5%</td>
<td>8.97±0.74</td>
<td>14.01±1.13</td>
<td>0.481</td>
<td>0.006</td>
</tr>
</tbody>
</table>

Table B-2: Relationship between Maternal iron & Baby iron.

<table>
<thead>
<tr>
<th>Groups</th>
<th>No</th>
<th>%</th>
<th>Mean ±SD Mot.iron</th>
<th>Mean ±SD Bab.iron</th>
<th>r</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>115</td>
<td>57.5%</td>
<td>86.35±38.5</td>
<td>41.2±1.38</td>
<td>0.405</td>
<td>0.000</td>
</tr>
<tr>
<td>Mild anemia</td>
<td>54</td>
<td>27%</td>
<td>74.77±2.77</td>
<td>39.3±1.38</td>
<td>0.056</td>
<td>0.685</td>
</tr>
<tr>
<td>Moderate anemia</td>
<td>31</td>
<td>15.5%</td>
<td>59.38±35.63</td>
<td>37.4±1.34</td>
<td>0.234</td>
<td>0.206</td>
</tr>
</tbody>
</table>
Table C-1: Relationship between Maternal Ferritin & Baby weight.

<table>
<thead>
<tr>
<th>Groups</th>
<th>No</th>
<th>%</th>
<th>Mot.ferritin</th>
<th>Bab.wt</th>
<th>r</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>115</td>
<td>57.5%</td>
<td>40.65±1.88</td>
<td>3.35±0.47</td>
<td>0.066-</td>
<td>0.483</td>
</tr>
<tr>
<td>Mild anemia</td>
<td>54</td>
<td>27%</td>
<td>24.03±39.52</td>
<td>3.58±1.64</td>
<td>0.158</td>
<td>0.255</td>
</tr>
<tr>
<td>Moderate anemia</td>
<td>31</td>
<td>15.5%</td>
<td>13.79±13.37</td>
<td>3.63±1.96</td>
<td>0.420</td>
<td>0.019</td>
</tr>
</tbody>
</table>

Table C-4: Relationship between Maternal Ferritin & Baby Hemoglobin.

<table>
<thead>
<tr>
<th>Groups</th>
<th>No</th>
<th>%</th>
<th>Mot.ferritin</th>
<th>Bab.HB</th>
<th>r</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>115</td>
<td>57.5%</td>
<td>40.65±1.88</td>
<td>15.12±1.88</td>
<td>0.000</td>
<td>0.999</td>
</tr>
<tr>
<td>Mild anemia</td>
<td>54</td>
<td>27%</td>
<td>24.03±39.52</td>
<td>14.80±1.82</td>
<td>0.034</td>
<td>0.808</td>
</tr>
<tr>
<td>Moderate anemia</td>
<td>31</td>
<td>15.5%</td>
<td>13.79±13.37</td>
<td>14.01±1.13</td>
<td>0.408</td>
<td>0.023</td>
</tr>
</tbody>
</table>

Table C-5: Relationship between Maternal Ferritin & Baby iron.

<table>
<thead>
<tr>
<th>Groups</th>
<th>No</th>
<th>%</th>
<th>Mot.ferritin</th>
<th>Bab.ferritin</th>
<th>r</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>115</td>
<td>57.5%</td>
<td>40.65±1.88</td>
<td>260±2.63</td>
<td>0.334</td>
<td>0.00</td>
</tr>
<tr>
<td>Mild anemia</td>
<td>54</td>
<td>27%</td>
<td>24.03±39.52</td>
<td>321±2.79</td>
<td>0.171</td>
<td>0.216</td>
</tr>
<tr>
<td>Moderate anemia</td>
<td>31</td>
<td>15.5%</td>
<td>13.79±13.37</td>
<td>195±1.91</td>
<td>0.594</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Table C-6: Relationship between Maternal Ferritin & Baby Ferritin.

<table>
<thead>
<tr>
<th>Groups</th>
<th>mean± SD of non-anemic group</th>
<th>mean± SD B. wt</th>
<th>95% confidence interval</th>
<th>P (2 tail)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean± SD</td>
<td></td>
<td>Lower</td>
<td>Upper</td>
</tr>
<tr>
<td>Mild anemic</td>
<td>3.35± 0.47</td>
<td>3.58± 1.64</td>
<td>-0.652</td>
<td>0.310</td>
</tr>
<tr>
<td>Moderate anemic</td>
<td>3.35± 0.47</td>
<td>3.63± 1.96</td>
<td>-0.828</td>
<td>0.522</td>
</tr>
</tbody>
</table>
3. DISCUSSION:

The anemia was highly prevalent among pregnant women in our study account for 42.5% of them, this is according to WHO, which states that if the prevalence of anemia is ≥ 40% in any group, severe public health problem exists. 

No study was carried out in Libya to show the size of this problem and fetal outcome in comparison to other studies which were done mainly in developing countries the prevalence of anemia in Indian studies were 9.59% & 89.9% done by (Samta Gaur, et al. 2015) (5), (Reeta Bora, et al. 2014) (6) respectively. In Iranian studies were 23.3% & 51.4% done by (Leila Alizadeh, et al. 2014) (7) & (Norimah A. et al. 2010) (8) respectively. 

88.5% of all pregnant women in our study received iron supplement, where (54%, 21.5%, 13%) were among control, moderate & mild anemic groups respectively, as compared with Gaza study; 65.8% of their women received iron supplement where (93.5%, 38.1%) among non-anemic & anemic group respectively done by (Mohammad EL Hindi. 2011) (9). From the above-mentioned results, we found that anemia among Libyan women still important issue and need to be solved by educating pregnant women about proper food & iron supplement.

A significant correlation existed between maternal hemoglobin & baby hemoglobin, this found in Iranian study (Norimah A. et al. 2010) (8) & Gaza study (Mohammad EL Hindi. 2011) (9).

At level of iron study, no correlation existed among anemic groups. The significant ones were at control group and this shows the importance of an iron supplement during pregnancy where the baby continues to take up iron from mother even if their stores are depleted. These results found in Gaza study (Mohammad EL Hindi. 2011) (9), Peruvian study (Kimberly O, et al. 2003) (10) & Chinese study (Lao TT, et al. 1991) (11).

The baby's weight has been affected by ferritin level among moderately anemic group, this result coincides with Indian study (P. N. Singla, et al. 1997) (12) & Bangladeshi study (Akhter S, et al. 2010) (13). Also the correlation between mother ferritin and baby ferritin was strong especially among moderate anemic group and same result has been reported in Bangladeshi study (Akhter S, et al. 2010) (13) & Gaza study (Mohammad EL Hindi. 2011) (9).

As consequence of anemia, the weight of anemic mothers' babies were heavier than non-anemic and this result agrees with Russian study (Elena L, et al. 1973-2002) (14). The baby length & head circumference decreases with increasing degree of anemia & this result agrees with Turkish study (Berrin Telatar, et al. 2009) (15). Indian study (P. N. Singla, et al. 1997) (12), Iranian study (Norimah A. et al. 2010) (8) & Indian study (Samata Gaur, et al. 2015) (9).

This explains the importance of iron in the improvement of hematological status of women & their fetal outcome.

4. CONCLUSION:-

The Anemia is highly prevalent among pregnant women in our country and reaches 42.5% & have impact on the baby growth & hematological indices.
5. REFERENCES:


