Evaluation of Iron Supplementation Effects on Plasma Lipid Levels in Pregnant Women

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Authors’ contributions
This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information
DOI: 10.9734/JAMMR/2019/v30i830217

Received 06 June 2019
Accepted 16 August 2019
Published 04 September 2019

ABSTRACT

Backgrounds: Iron supplementation is most widely used approach of controlling the global problem of iron deficiency anemia especially in pregnant anemic women. Anemia is one of the most frequent complications related to pregnancy. Normal physiological changes in pregnancy affect the hemoglobin (Hb). Epidemiological studies have shown high serum iron concentrations following abnormal levels of blood lipids are risk factors for coronary artery disease and myocardial infarction. Both iron deficiency anemia and dyslipidaemia are widely prevalent public health problems, especially in the Sudanese pregnant women.

Objectives: The aim of present study was to measure the serum level of lipids profile in anemic pregnant women compared to non anemic pregnant women.

Methodology and Study Population: The analytical case control study conducted in obstetrics and gynecology centre, Omdurman city, Khartoum state. One hundred subjects known with 50

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pregnant anemic as case groups and 50 non anemic pregnant women as control groups were enrolled in this study, with match age and sex, the age ranged between (20 to 40 years) and their mean (31.7±4.34). The serum lipid profile was analyzed using spectrophotometric method.

**Results:** The (mean±SD) of Hb, HDL, LDL, TG and TC in anemic pregnant women respectively were (68.15±9.35, 46.06±9.62, 114.14±36.86, 170.38±54.57. 197.16±46.83). While the (mean±SD) of Hb, HDL, LDL, TG and TC in non anemic pregnant women respectively were (79.76±7.22, 47.44±9.65, 140.00±40.76, 189.72±37.89, 224.38±45.09). The concentration of Hb was highly significantly decrease in anemic pregnant compare to non anemic pregnant women with p value (p=0.000). The level serum of LDL, TG and TC were significantly decrease in anemic pregnant compare to non anemic pregnant women with p value (p= 0.001, 0.042, 0.004) respectively. The age of study population were no correlation with serum LDL(r= -0.155, p= 0.283), HDL(r= -0.019, p=0.898) and TC (r=0.68, p=0.640). And also their positive correlation between age and serum TG (r= 0.286, P=0.044).

**Conclusion:** The anemic pregnant women had a significantly decreased of Hb and serum LDL, TG and TC and also their positive correlation between age and serum TG.

**Keywords:** Pregnant women; anemic women; serum lipid profile; Sudanese.

1. INTRODUCTION

Pregnancy is accompanied by significant variations in maternal lipid metabolism [1,2]. In early pregnancy, there is increased body fat accumulation associated with both hyperphagia and increased lipogenesis while in late pregnancy there is an accelerated breakdown of fat deposits [3,4]. Iron deficiency is the most widespread nutritional deficiency. Women tend to have substantially lower iron stores, making them more vulnerable to iron deficiency when iron intake is lowered [3,4]. Iron supplementation is the most widely used as treatment of iron deficiency anemia. It is recognized in terms of excess body iron and “free iron” stimulating lipid peroxidation followed by leading to cell and tissue damage [3,4]. Lipid metabolism alters during pregnancy [5]. The anabolic phase of early pregnancy encourages lipogenesis and fat storage in preparation for rapid fetal growth in late pregnancy [6]. Normal pregnancy is associated with the formation of susceptible oxidizable particles (high LDL score) and an increase in oxidative damage. Iron deficiency is an independent risk factor for the development of coronary artery disease and is also associated with the development of an atherogenic lipid profile and increased oxidative stress [7]. The objective of the present study was to evaluate the effect of iron deficiency anaemia on the plasma lipid levels.

2. MATERIALS AND METHODS

2.1 Study Population

The analytical case control study conducted in the obstetrics and gynecology centre, Omdurman city, Khartoum state. One hundred subjects known with 50 pregnant anemic as case group and 50 non anemic pregnant women as control group were enrolled in this study, with match age, the age ranged between (20 to 40 years) and their mean (31.7±4.34).

2.2 Samples and Data Collection

Samples were collected using dry, plastic syringes, tourniquet used to make the veins more prominent; 3ml blood sample was collected in heparin containers from each volunteer under septic condition. The blood was centrifuged at 3000 r.p.m for 10 minutes which was stored in small aliquots and kept in a deep freezer (−20°C) until analyzed. The data were collected in patients using questionnaire form includes personal data, clinical data includes and laboratory data such as lipid profiles which is estimate in modern medical center lab. All reagents kits of lipid profiles (total cholesterol, triglyceride, LDL and HDL) were obtain in biosystem company, Spain. Serum lipid profile was analyzed in each participant by spectrophotometric method using enzymatic reaction.

2.2.1 Inclusion criteria

Female participant, Patient age 18-45 years and Regular menstrual cycle and proven fertility, having given their assent to the study.

2.2.2 Exclusion criteria

Not on hormonal therapy or oral contraceptive pills, No history of thyroid disorder, No history of autoimmune condition such as type 1 DM, No concurrent chronic disease [e.g. renal,
respiratory cardiac, liver, type2 DM and hypertension] DM=Diabetes mellitus, pregnant women previously given birth with malformation, Multiple pregnancies, Polyhydramnios.

2.3 Quality Controls

The precision and accuracy of the methods that used in this study were checked each time by using control material.

2.4 Statistical Analysis

The data of this study were analyzed using the statistical package for social science (SPSS) software (version16). Unpaired student’s t-test presented as (mean±SD). A P-value of less than 0.05 was considered statistically significant.

3. RESULTS

One hundred pregnant women were enrolled in this study, 50 anemic and other 50 non anemic. In pregnant women, the age ranged between (20 to 40 years) and their mean age was (31.7 ± 4.34). In Fig. 1 showed the distribution of parity in the study population. In anemic pregnant women, primary gravity 5 (10%), 41(82%) in multi parity, 4(8%) in grand multi parity. In the study population in non anemic pregnant women primary gravity 19 (38%), 26(52%) in multi parity, 5(10%) in grand multi parity. The (mean±SD) of Hb, HDL, LDL, TG and TC in non anemic pregnant women respectively were (79.76±7.22, 47.44±9.65, 140.00±40.76, 189.72±37.89, 224.38±45.09). While the (Mean±SD) of Hb, HDL, LDL, TG and TC in anemic pregnant women respectively were (68.15±9.35, 46.06±9.62, 114.14±36.86, 170.38±54.57, 197.16±46.83). While the (mean±SD) of Hb, HDL, LDL, TG and TC in non anemic pregnant women respectively were (68.15±9.35, 46.06±9.62, 114.14±36.86, 170.38±54.57, 197.16±46.83). While the (Mean±SD) of Hb, HDL, LDL, TG and TC in anemic pregnant women respectively were (79.76±7.22, 47.44±9.66, 140.00±40.76, 189.72±37.89, 224.38±45.09). The serum lipids profile had significantly lower except serum HDL had insignificantly decreased and also their positive correlation between age and serum TG ,the study agree with [12] who reported that the concentration of lipid were found significantly decreased in pregnant women. The reduction of lipid s may be correlated with iron deficiency anemia induced lipid peroxidation. These results are similar to those reported earlier in pre-eclampsic pregnant women [13] it may be suggested that an excess of ROS in iron deficient patients caused the oxidative degradation of RBC lipids resulting in decreased level of lipids in these patients. The RBC is an important source of oxygen related radicals in iron deficiency anemia However, iron deficiency anemia RBCs produces greater quantities of O2−, H2O2 and OH− than do normal RBC [14]. Besides, iron deficiency anemia, RBCs exhibit increased levels of thiobarbituric acid-reactive substances, suggesting that they are targets for oxidative stress [15] Iron deficiency is an independent risk factor for onset of coronary
artery disease and an atherogenic lipid profile and enhanced oxidative stress [16]. Despite the great deal of information available on the hematological and biochemical changes in iron deficient anemic women, very limited studies have been carried out to investigate the lipid profiles in women with iron deficiency. According to [17], Lipid levels in patients with iron deficiency anemia were shown to be directly linked to the level of iron. Blood haemoglobin levels correlated significantly with serum cholesterol concentrations. These results were contradicted by a study done by [18]. In our study recommended that, all pregnant women measure the serum lipid profiles associated with iron supplementation.

![Fig. 1. Distribution of party in the study population](image1)

![Fig. 2. The correlation between age and serum HDL](image2)
Table 1. The (mean±SD) of Hb and serum lipid profiles in the study populations

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Anemic (mean±SD) N=50</th>
<th>Non-Anemic (mean±SD) N= 50</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hb</td>
<td>68.15±9.35</td>
<td>79.76±7.22</td>
<td>0.000</td>
</tr>
<tr>
<td>HDL</td>
<td>46.06±9.62</td>
<td>47.44±9.65</td>
<td>0.475</td>
</tr>
<tr>
<td>LDL</td>
<td>114.14±36.86</td>
<td>140.00±40.76</td>
<td>0.001</td>
</tr>
<tr>
<td>TG</td>
<td>170.38±54.57</td>
<td>189.72±37.89</td>
<td>0.042</td>
</tr>
<tr>
<td>TC</td>
<td>197.16±46.83</td>
<td>224.38±45.09</td>
<td>0.004</td>
</tr>
</tbody>
</table>

Fig. 3. The correlation between age and serum LDL

Fig. 4. The correlation between age and serum TG
5. CONCLUSION

The anemic pregnant women had a significantly decreased of haemoglobin and serum LDL, TG and TC and also their positive correlation between age and serum TG.

CONSENT

It is not applicable.

ETHICAL APPROVAL

This study approved from committee of Department of clinical chemistry, Faculty of Medical Laboratory Sciences, Alneelain University, Khartoum, Sudan.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle3.com/review-history/50907