Journal of Advances in Medicine and Medical Research

30(8): 1-7, 2019; Article no.JAMMR.50907
ISSN: 2456-8899
(Past name: British Journal of Medicine and Medical Research, Past ISSN: 2231-0614, NLM ID: 101570965)

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

Safa F. Omer[1], Suaad Elnour[2] and GadAllah Modawe[3*]

[1]Department of Clinical Chemistry, Faculty of Medical Laboratory Sciences, Alneelain University, Khartoum, Sudan.
[2]Department of Obstetrics and Gynecology, Faculty of Medicine and Health Science, Omdurman Islamic University, Omdurman, Sudan.
[3]Department of Biochemistry, Faculty of Medicine and Health Sciences, Omdurman Islamic University, Omdurman, Sudan.

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
Editor(s):
(1) Dr. Babatunde Olanrewaju Motayo, Department of Pathology, Federal Medical Center, Abeokuta, Ogun State, Nigeria and Department of Virology, College of Medicine, University of Ibadan, Ibadan, Nigeria.
Reviewers:
(1) Rupali Sengupta, India.
(2) Filip Nina, University of Medicine and Pharmacy 'Grigore T. Popa', Romania.
(3) Kojom Foko Loick Pradel, University of Douala, Cameroon.
Complete Peer review History: http://www.sdiarticle3.com/review-history/50907

Original Research Article

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

**Corresponding author: E-mail: gadobio77@hotmail.com;*

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 with (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 (-20C˚) 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 spectrophoto metric 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 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, were presented in the Table 1. 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), were presented in Figs. 2, 3, 4, 5.

4. DISCUSSION

Anemia is the most common hematological disorder during pregnancy. According to the reports of World Health Organization reports, from 35% to 75% (56% on average) of the pregnant women in developing countries are anemic. Prevalence of anemia in Sudan countries is among the highest. Pregnancy induces significant metabolic changes. The levels of serum lipid profiles appreciably during pregnancy, principally affected by maternal hormonal changes. The data of the study reported that treatments of iron deficiency anemic women with oral iron significant improved the haemoglobin concentration. Recovery of haemoglobin after supplementation of iron may be due to the fact that iron is an essential constituent of haemoglobin and enhance the erthyropoietic mechanism [8]. 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, our results agree with the [9] and also disagree with [10]. the age of study population ranged between (20 to 40years) and Their mean age was (31.7 ± 4.34). The age study similar to [11] and differ in most study. 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 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 amemia 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 $O2^{\cdot-}$, 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 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.

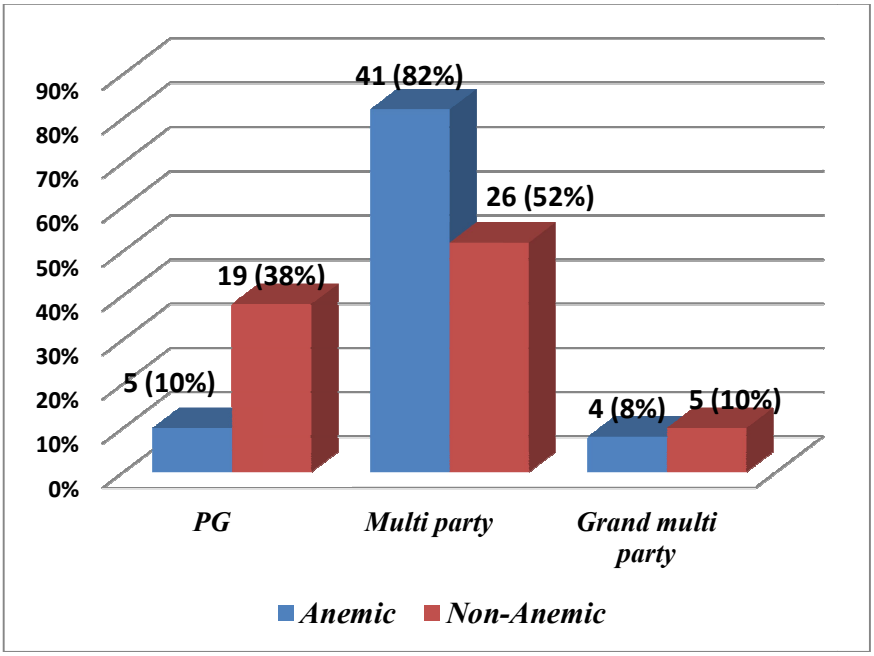

Fig. 1. Distribution of party in the study population

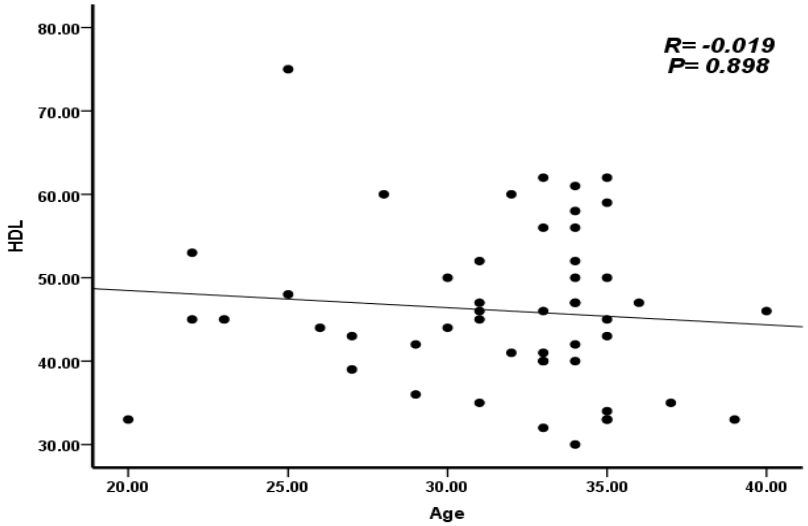

Fig. 2. The correlation between age and serum HDL

Table 1. The (mean±SD) of Hb and serum lipid profiles in the study populations

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

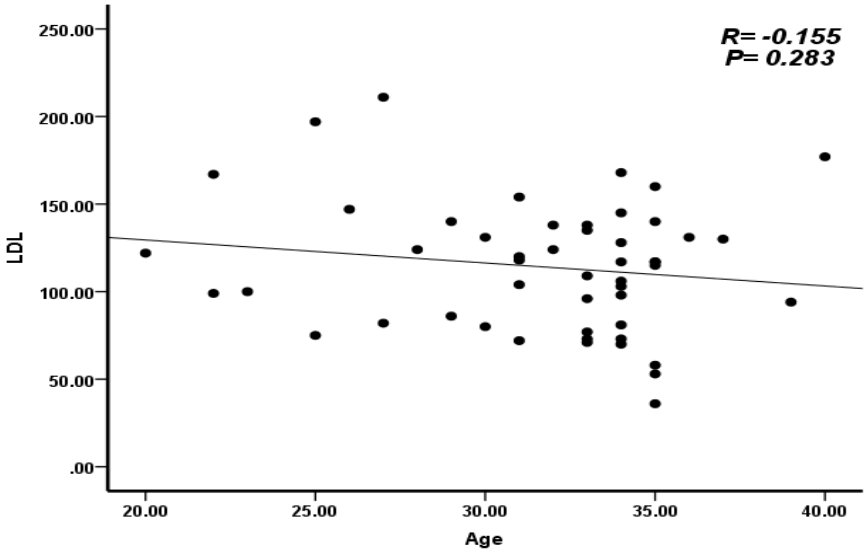

Fig. 3. The correlation between age and serum LDL

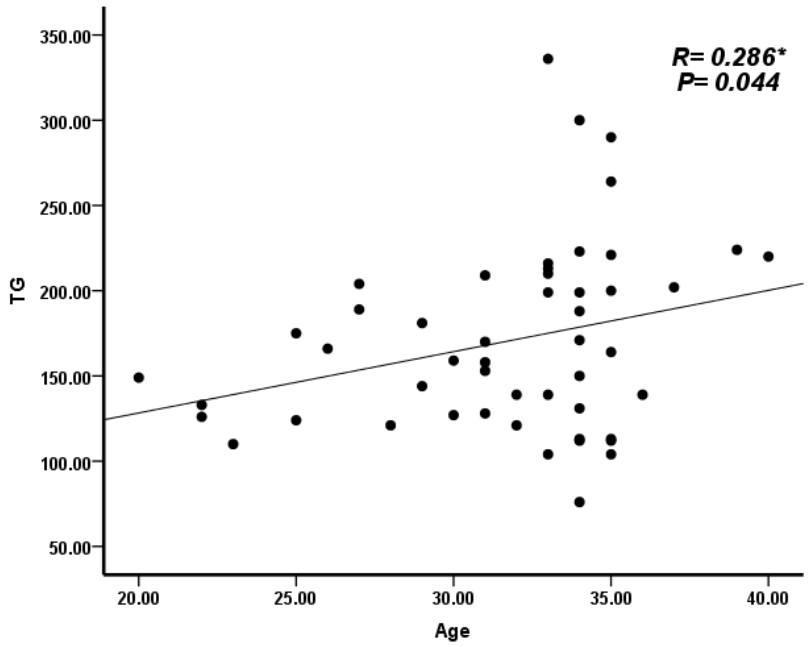

Fig. 4. The correlation between age and serum TG

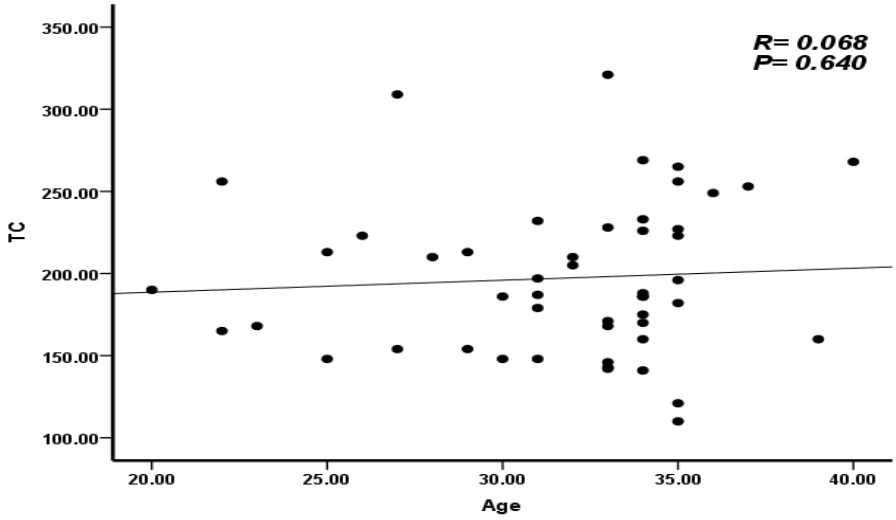

Fig. 5. The correlation between age and serum TC

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.

REFERENCES

1. Boyd EM. Pattern of lipid parameters in healthy women during pregnancy. J. Clin. Invest. 1934;13:347–363.
2. Stock MJ, Metcalfe J. Maternal physiology during gestation. In: Knobil E, Neil JD. (eds): The physiology of reproduction. Raven press, New York. 1994;947–983.
3. de Valk B, Addicks MA, Gosriwatana I, Lu S, Hider RC, Marx JJ. Nontransferrin-bound iron is present in serum of hereditary haemochromatosis heterozygotes. Eur J Clin Invest. 2000;30:248-251.
4. Vaya A, Iborra J, Falco C, Moreno I, Bolufer P, Ferrando F, Perez ML, Justo Aznar. Rheological behaviour of red blood cells in beta and *Deltabeta thalassemia* minor. Clin Hemorheol Microcirc. 2003;28: 71-8.
5. Brizzi P, Tonolo G, Esposito F, et al. Lipoprotein metabolism during normal pregnancy. Am J Obstet Gynaecol. 1999; 181:430-434.
6. Kaaja R. Insulin resistance syndrome in preeclampsia. Sem Reprod Endocrinol. 1998;16:41-46.
7. Toescu V, Nuttall SL, Martin U, Kendall MJ, Dunne F. Oxidative stress and normal pregnancy. Clin Endocrinol (Oxford). 2002; 57:609-613.
8. Brittenham GM. Disorder of iron metabolism: Iron deficiency and iron overload, in Hematology: Basic principles and practice, Hoffman RE, Benz J, JR; SJ. Shattil et al. eds; Churchill Livingstone, Philadelphia. 2000;416.
9. Ravishanar S, Anil N, Muninarayana C, Prathima S, Sheela S. Prevalnce of anemia among pregnant women. Inter Journal of Med and Public Heath. 2016;5-3.
10. Malik G, Chandranai L, Ruwan F. Intermittent oral iron supplement during pregnancy. Ceylon Medical Journal. 2001; 46(4).
11. Festus O, Idonije O, Eseigbe M. Comparative study of lipid profile of normal

pregnant women in the different trimesters. Arch. Appl. Sci. Res. 2011;3(3):528-532.
12. Amit K, Abbas A, Sanjay M. Iron supplementation and lipid profiles in pregnant women. (IJSR). 2016;5(1).
13. Aziz R, Mahboob T. Pre-eclampsia and lipid profile. Pak J Med Sci. 2007;23:751-754.
14. Habbel RP, Eaton JW, Balasingam M, Steinberg MH. Spontaneous oxygen radical generation by sickle erythrocytes. J Clin Invest. 1982;70:1253-1259.
15. Aslan M, Thornley-Brown D, Freeman BA. Reactive species in sickle cell disease. Ann N Y Acad Sci. 2000;899:375-391.
16. Toescu V. Oxidative stress and normal pregnancy. Clinical Endocrinology (Oxford). 2002;57:609-613.
17. Choi JW. Changes in serum lipid concentrations during Iron depletion and after iron supplementation. Annals of Clinical & Laboratory Science. 2001;31: 151-156.
18. Tanzer F. Serum free carnitine and total triglyceride levels in children with iron deficiency anemia. International Journal for Vitamin and Nutrition Research. 2001;71: 66-69.

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