SERUM FERRITIN AND HAEMATOLOGICAL LEVELS IN NON-PREGNANT AND PREGNANT WOMEN

Puchalla Jayanth Kumar¹, Srinivasa Ravi Kiran Suri², Kasi Phanindra Babu³

¹Assistant Professor, Department of Physiology, Alluri Sita Rama Raju Academy of Medical Sciences, Eluru.

²Assistant Professor, Department of Physiology, Shadan Institute of Medical Sciences (SIMS), Hyderabad.

³Assistant Professor, Department of Biochemistry, KLR Lenora Dental College, Rajahmundry.

ABSTRACT

BACKGROUND

Anaemia during pregnancy is considered as an established risk factor for both mother and foetus. Serum ferritin is the most sensitive parameter of negative iron balance, as it decreases only in the presence of true iron deficiency as with transferrin saturation.

AIMS AND OBJECTIVES

The aim of the present study was to compare the normal serum ferritin levels and haematological parameters between non-pregnant women and pregnant women in all three trimesters.

MATERIALS AND METHODS

This study was conducted on 20-30 years aged pregnant and non-pregnant women, who were above upper class. Serum Ferritin, Haemoglobin, Blood Indices, RBC tests were done at central laboratory in ASRAM College, Eluru, A.P. Serum ferritin test was done by using UBI MAGIWEL Enzyme immunoassay ferritin kit, on ELISYS-UNO instrument. We excluded diabetic, obese and any chronic disordered women. Height and weight were measured with the subject in light clothes without shoes and Body Mass Index (BMI) was calculated as kg/m². Statistical analysis was done by using Microsoft Excel 2010. ANOVA and T test were done to analyse data.

RESULTS

Serum ferritin levels were significantly lower in 2nd trimester of pregnancy and we observed increase in serum ferritin levels in 3rd trimester of pregnancy. These results indicate fall in MCV, MCH and MCHC showed a linear correlation with serum ferritin level. Serum ferritin levels were higher in non-pregnant woman, but decreased during three trimesters of pregnancy. Thus, it is proved serum ferritin levels decreases during pregnancy even in above upper class women.

CONCLUSION

In our study, we observed decrease in serum ferritin levels. Decrease in serum ferritin levels were the better indicator of iron deficiency anaemia. Iron deficiency anaemia may be due to improper food supplementation during pregnancy period, lack of meeting dietician and improper diet.

KEYWORDS

Ferritin, Haematological Profiles, Pregnancy.

HOW TO CITE THIS ARTICLE: Kumar PJ, Suri SRK, Babu KP. Serum ferritin and haematological levels in non-pregnant and pregnant women. J. Evolution Med. Dent. Sci. 2016;5(50):3181-3184, DOI: 10.14260/jemds/2016/737

INTRODUCTION

Iron absorption and iron balance is varied in men and woman. Adult men need 1 mg/day and menstruating woman need 1.5 mg/day. Pregnant woman need higher levels, which is about 4-5 mg/day.¹ However, lower serum ferritin levels were observed in many studies during three trimesters of pregnancy.² Anaemia is the leading cause for haematological disorders in female children and it is also an effective cause in pregnant women. Iron deficiency is one of the causes of future disorders, especially in women's menstrual and pregnant life.³ If iron is not supplemented, most of women may develop iron deficiency anaemia. Microcytosis is a sensitive index of iron deficiency, but its values are limited because of physiological increase in MCV, that often occurs during pregnancy.⁴

Financial or Other, Competing Interest: None.

Submission 25-04-2016, Peer Review 31-05-2016,

Acceptance 04-06-2016, Published 21-06-2016.

Corresponding Author:

Dr. P. Jayanth Kumar,

C/o. Sri Krishna Paints,

D.No. 22c-14-13, Punyamurthula Vari Street,

Power Peta, Eluru-534002, Andhra Pradesh.

E-mail: jayanthphysiology@gmail.com

DOI: 10.14260/jemds/2016/737

Serum transferrin is frequently abnormal in pregnancy.⁵ Anaemia during pregnancy is considered as an established risk factor for both mother and foetus. It is well known that haemoglobin concentration falls during pregnancy principally as a result of haemodilution.⁶ Low sensitivity of transferrin saturation, day-to-day and even hour-to-hour fluctuation of serum iron levels renders us to evaluate serum ferritin levels for diagnosing iron deficiency.⁷

Several studies have proven that serum ferritin is the single best non-invasive test and is a very useful and reliable index of iron stores, especially during pregnancy with low levels indicating iron deficiency.⁸ There is only one limitation with serum ferritin estimation, as it is an acute phase reactant and it is not a sensitive indicator of iron stores in those suffering from an infection, inflammation or cancer.⁹⁻¹⁰ In recent years, the serum Transferrin Receptor (TfR) level has been introduced as promising new tool for diagnosis of iron depletion.¹¹ It was observed imbalance in iron supplementation may lead to iron deficiency anaemia and improper foetus growth disorders.¹² Incidence of low birth weight children is associated with anaemia and disorders during pregnancy.¹³

Ferritin is stored in almost all tissues of human body and small amounts are released into the serum, where it functions as an iron carrier, thus deficiency of serum ferritin may indicate iron deficiency anaemia.¹⁴

MATERIALS AND METHODS

This study was conducted at ASRAM Hospital, Eluru in Central Lab before they take breakfast. Participants were non-pregnant and pregnant women in different trimesters and 20 persons were considered in each group. Totally, study was conducted on 80 females and having age 20–30 years.

In this study we compared serum ferritin levels between non-pregnant and pregnant women, also examined haematological parameters such as RBC, Hb, PCV, Blood Indices (MCV, MCH, MCHC). Ferritin levels were identified by using UBI: MAGIWEL Enzyme immunoassay ferritin kit, by using ELISYS-UNO instrument. Haematocrit levels were identified by performing Wintrobe's method. Haemoglobin levels were estimated by Sahli's method. Blood indices were calculated by using RBC, Hb, PCV values.

We excluded diabetic, obese and any chronic disordered women. Height and weight were with the subject in light clothes without shoes and Body Mass Index (BMI) was calculated kg/m².

The considered subjects were interviewed and basic history was taken into consideration. The subjects were given proper precautions and self-consent form was taken before drawing blood.

Statistical analysis were done by using Microsoft Excel 2010. ANOVA and T test was done to analyse data. Ethical Committee permission was taken. The results of the study were expressed as mean±standard deviation. P-value <0.05 was considered statistically significant.

RESULTS

Haematological parameters such as RBC, Hb, PCV, Blood Indices (MCV, MCH and MCHC) levels were increased in first trimester of pregnant women than in non-pregnant woman. But these levels were decreased in second trimester than the first trimester. When we compare third trimester pregnant women with second trimester women, haematological parameters such as RBC, Hb, PCV, Blood Indices (MCV, MCH, MCHC) were increased than the second trimester of a pregnant women.

The serum ferritin levels were decreased in first trimester of pregnant women, not much as compared with non-pregnant woman. But serum ferritin levels were decreased in second trimester than the first trimester. In third trimester, serum ferritin levels were increased than the second trimester of a pregnant woman. Finally, we observed serum ferritin levels were high in non-pregnant women when compared with the pregnant woman. All the pregnant and non-pregnant women were non-vegetarians. Haemoglobin levels were lesser than normal. When we compare haemoglobin levels in pregnant and non-pregnant women, there is a significant decrease in haemoglobin levels in 2nd trimester of pregnancy.

Sl. No.	Parameter	Normal Women	1 st Trimester	2 nd Trimester	3 rd Trimester	p-Value	Inference
1	RBC mil/cu.mm	4.52±0.51	4.35±0.23	3.57±0.64	4.24±0.37	P<0.005	Statistically Highly Significant
2	HAEMOGLOBIN%	11.04±1.44	11.65 ±1.01	9.03±2.21	11.62±1.3	P<0.005	Statistically Highly Significant
3	MCV fL	81.3±5.74	83.48±3.84	80.63±8.76	86.01±8.26	P<0.10	Statistically Not Significant
4	MCH pg	24.55±2.39	27.04±2.01	25.02±4.19	27.63±3.83	P<0.01	Statistically Significant
5	MCHC g/dL	30.23±2.58	32.21±1.23	30.86±2.41	31.98±1.84	P<0.02	Statistically Significant
6	Hct %	36.63±3.65	36.04±2.52	29.03±7.97	36.33±12.19	P<0.005	Statistically Highly Significant
7	Ferritin ng/mL	26.61±16.90	24.35±16.02	14.92±7.97	20.09±2.88	P<0.05	Statistically Significant

Table 1: Comparison of Serum Ferritin Levels and Haematological Parameters in Non-Pregnant Women and in Three Trimesters of Pregnant Women

Variable	Non-Pregnant	1 st Trimester	2 nd Trimester	3 rd Trimester	Statistical Analysis
Age	24.5±2.06	24.9±2.5	24.8±2.5	25±2.4	Not Significant
BMI	22.02±2.08	22.1±1.69	22.22±2.01	23.41±1.60	Not Significant
Non-Vegetarian	20	20	20	20	Equal Age Groups

Table 2: Age, BMI and Type of Food Intake

DISCUSSION

Our study was conducted to find iron deficiency anaemia and serum ferritin levels (as diagnostic marker) in pregnant and non-pregnant women. We observed decrease in serum ferritin levels during the three trimesters of pregnancy, even though people belong to above upper class. Alper BS, Kimber R et al, concluded that in the population of all prenatal patients with anaemia approximately has iron deficiency.⁸ Martinez H and Greiner T et al, concluded that pregnant women in the third trimester and those who were breast feeding their children during the first six months after delivery had highest prevalence of anaemia.¹⁰ Kaneshige, Emiko et al, observed in first trimester of pregnant women the serum iron and ferritin levels increased significantly than non-pregnant women and also they observed during second and third trimesters the serum iron and ferritin levels were decreased significantly.¹⁵ These results suggest that maternal iron body storage is depleted during second trimester of pregnancy in those who are not taking supplemental iron.⁷ Ulmer H U suggests that the determination of serum ferritin levels in pregnancy is necessary for a reliable classification of iron deficiency anaemia.¹⁶ Naghmi Asif and Shaheen Mahmud et al, concluded that serum ferritin levels were significantly lower in second trimester with increase again in third trimester and increasing gravidity had no significant effect on serum ferritin levels.⁶ They concluded that pregnant women in the third trimester and those who were breast feeding their children during the first six months after delivery had highest prevalence of anaemia.⁷ Theresa O Scholl et al, conclude that iron supplementation may improve pregnancy outcome when the mother is iron deficient, it is also possible that prophylactic supplementation may increase risk when the mother does not have iron deficiency anaemia.¹⁷ Akin Bola TS, Adewole IF et al, concluded that only Hb values are lowest in third trimester of pregnant women.¹⁸ Their results indicate that low iron levels occur with increasing pregnancy

as gestation advances.⁵ In their study, they observed no significant relationship between occurrence of iron deficiency anaemia and serum ferritin levels in higher economic class individuals.¹ In their study, they proved in healthy individuals the concentration of serum ferritin parallels the amount of storage iron.¹¹ In other studies they observed in higher economic group, exhaustion of iron levels during pregnancy may lead to iron deficiency anaemia and however once iron stores become exhausted serum ferritin concentrations no longer reflect the severity of iron deficiency.¹² Serum ferritin levels are not at all appropriate indicator of iron deficiency in presence of inflammation during pregnancy.¹⁹ Some other studies proved women with normal iron levels at conception, the serum ferritin levels increases initially followed by a progressive fall by 32 weeks.²⁰ Iron supplementary drugs can improve iron levels in women; drugs such as ferrous sulphate (300 mg), ferrous gluconate (320 mg) are preferred and should be given 3-4 times a day. In iron deficiency anaemia patients' diet rich of cereals, bread, red meat, leafy vegetables, bread can improve iron status in women.²¹

CONCLUSION

In our study, we observed decrease in serum ferritin levels. Decrease in serum ferritin levels were the better indicator of iron deficiency anaemia. Iron deficiency anaemia may be due to improper food supplementation during pregnancy period, lack of meeting dietician and improper diet.

REFERENCES

1. Penney DS, Miller KG. Nutritional counselling for vegetarians during pregnancy & lactations. *J Midwifery Womens Health* 2008;53(1):37-44.
2. Akesson A, Bjellerup P, Berglund M, et al. Serum transferrin receptor: a specific marker for iron deficiency in pregnancy. *Am J Clin Nutr* 1998;68(6):1241-6.
3. Hallberg L. Prospectives on nutritional iron deficiency. *Annu Rev Nutr* 2001;21:1-21.
4. Karimi M, Kadivar R, Yarmohammadi H. Assessment of the prevalence of iron deficiency anaemia, by serum ferritin, in pregnant women of southern Iran. *Med Sci Monit* 2002;8(7):CR488-92.
5. Kelly AM, MacDonald DJ, McNay MB. Ferritin as an assessment of iron stores in normal pregnancy. *British journal of obstetrics & Gynaecology* 1977;84(6):434-8.
6. Naghmi Asif, Shaheen Mahmud. Studied on comparison of serum ferritin levels in three trimesters of pregnancy and their correlation with increasing gravidity. *International Journal of Pathology* 2007;5(1):26-30.
7. Alper BS, Kimber R, Reddy AK. Using ferritin levels to determine iron deficiency anaemia pregnancy. *J FAM pract* 2000;49(9):829-32.
8. Jenkins DT, Wishhart MM, Schenberg C. Serum ferritin in pregnancy. *Australian & Newzealand journal of Obstetrics & Gynaecology* 1978;18(4):223-5.
9. Goldman, Bennett. *Haematologic disease: Text book medicine*. 2nd edition. 2000:846-55.
10. Martinez H, Greiner T. Studied on iron deficiency anaemia in Mexico women of reproductive age. *Salud Publica de Mexico* 2001;43(5).

11. Puolakka J, Janne O, Pakarinen A, et al. Serum ferritin in the diagnosis of anaemia during pregnancy. *Acta obstetrics & gynaecology scand supplementation* 2003;95:57-63.
12. Lammi-Keefe J, Couch. *Handbook of Nutrition and pregnancy*. Nutrition & Health 2008:233-44.
13. Bartley KA, Underwood BA, Deckelbaum RJ. A life cycle micronutrient perspective for women's health. *Am J Clin Nutr* 2005;81(5):1188S-93S.
14. Weng CH, Chen JB, Wang J, et al. Surgically curable non-iron deficiency microcytic anaemia: Castleman's disease. *onkologie* 2011;34(8-9):456-8.
15. Kaneshige, Emiko MD. Serum ferritin as an assessment of iron stores & other haematologic parameters during pregnancy. *O & G* 2001;57(2):238-42.
16. Ulmer HU. Anaemia, ferritin and preterm labor. *J perinatal Med* 2001;16(5-6):459-65.
17. Theresa O Scholl. Iron status during pregnancy: setting the stage for mother & infant 1,2,3,4. *Am J Clin Nutr* 2005;81(suppl 5):1218S-22S.
18. Akinbola TS, Adewole IF, Adesina OA, et al. Haematological profile of healthy pregnant women in Ibadan, South Western Nigeria. *J Obstetrics & Gynaecology* 2006;26(8):763-9.
19. Rosalind S Gibson. *Principles of nutritional assessment*. Oxford university press 2005:459-63.
20. Taha A, Azhar S, Lone T, et al. Iron deficiency anaemia in reproductive age women attending obstetrics and gynaecology outpatient of university health centre in Al-Ahsa, Saudi Arabia. *Afr J Tradit Complement Altern Med* 2014;11(2):339-42.
21. Zhu A, Kaneshiro M, Kaunitz JD. Evaluation and treatment of iron deficiency anaemia: a gastroenterological perspective. *Dig Dis Sci* 2010;55(3):548-59.