

**Hemoglobin, Serum Iron and Total Iron Binding Capacity in Pregnant Anemic Woman**P. A. Waghmare¹, K. N. Pujari*² and S. C. Choudhari³¹ Department of Pathology, Government Medical College, Miraj.² Department of Biochemistry, Government Medical College, Miraj.³ Department of Biochemistry, Government Medical College, Miraj.**Correspondance Author:** Dr. K. N. Pujari, Associate professor, Department of Biochemistry, Government Medical College, Miraj-416410 (INDIA).**Conflicts of interest:** None to declare**Abstract**

Iron is a vital element for all living cells which plays an important role in various metabolic pathways. It is key component of hemoglobin and myoglobin which transport CO₂ and O₂ in organism. It acts as coenzymes for many enzymes involving in oxidation reduction reactions concern with energy generation.

Iron deficiency and Iron deficiency anemia are the most common nutritional disorders in pregnancy. The prevalence of Iron deficiency anemia during pregnancy is 14 % in pregnant women developed countries and 56 % in developing countries. Anemia is in the form of reduced concentration of hemoglobin and or red blood cell in the circulatory system, which results in the reduction of oxygen transfer capacity of the body. We have estimated the Hemoglobin, serum Iron and serum TIBC in pregnant anemic women and pregnant healthy woman (control). We found significantly decreased hemoglobin and serum Iron and significantly increased TIBC in pregnant anemic women as compared to control. Estimation of serum Iron and TIBC may be useful for the diagnosis of iron deficiency anemia in pregnant woman.

Keywords: Hemoglobin, Iron, Anemia, TIBC.**Introduction:**

Iron is a vital element for all living cells which plays an important role in various metabolic pathways [1]. It is key component of hemoglobin and myoglobin which transport CO₂ and O₂ in organism. It acts as coenzymes for many enzymes involving in oxidation reduction reactions concern with energy generation [2, 3].

Iron deficiency and Iron deficiency anemia are the most common nutritional disorders in pregnancy [3, 4, 5]. The prevalence of Iron deficiency anemia during pregnancy is 14 % in pregnant women developed countries and 56 % in developing countries [3]. Anemia is in the form of reduced concentration of hemoglobin and or red blood cell in the circulatory system, which results in the reduction of oxygen transfer capacity of the body [6].

The physiological changes occur during pregnancy have a major impact on hematological and biochemical parameters available for the measurement of Iron status. Most important parameter used for the detection of anemia is hemoglobin because of its low cost and available reference values [4]. We have estimated hemoglobin, serum Iron and TIBC in pregnant anemic woman and compared these values with normal healthy pregnant woman.

Materials and Methods:

The present study was carried out in the Department of Biochemistry, Government Medical College and Hospital, Miraj and P.V.P. Government Hospital, Sangli (Maharashtra). Study protocol was approved by ethical committee of Government Medical College. Miraj.

Sample size: The study includes total 90 subjects. This includes patients as well as control.

Control: Consists of 30 normal healthy pregnant woman selected from staff members and normal healthy pregnant woman attaining the OPD of Government Medical College and Hospital.

Patients: This includes 60 patients with anemic pregnant women hospitalized or attaining Gynecology OPD at Government Medical College and Hospital. The diagnosis of the patient was done on the basis of the patient's condition, clinical history, personal history and physical examination by clinician.

Inclusion criteria: The females between age 18 to 40 years with no other complications were selected for the study.

Exclusion Criteria: The subjects having history of other hematological disorders which may affect hemoglobin, serum Iron, and serum TIBC concentrations were excluded from study.

Blood Collection:

Informed consent was obtained from the subjects. About 3 ml blood was drawn from an antecubital vein through disposable syringe and needle with all aseptic precautions. 1ml blood was collected in EDTA bulb for hemoglobin estimation and remaining 2 ml blood was collected in plain bulb, clear serum was separated and used for the estimation of Iron and TIBC.

Hemoglobin level was estimated by using Cyanmethemoglobin method [7] and levels were expressed in gm%. Serum Iron and TIBC was determined

by Ferrozine Method [8] and values were expressed in mg/dl. The data were statistically evaluated by using student 't'.

Results:

We found significantly decreased ($p<0.001$) hemoglobin and Iron and significantly increased TIBC ($p<0.001$) in patients with Iron deficient anemia as compared to control and are given in table no. 1.

Table No. 2 shows correlation of hemoglobin with serum Iron and TIBC in patients and control. We found highly significant positive correlation of hemoglobin with Iron and highly significant negative correlation with TIBC in patients as well in control.

Discussion:

We found significant reduction in hemoglobin and serum Iron level in patients ($p<0.001$) as compared to control. Decreased level of hemoglobin in our study may be due to Iron deficiency. Iron is essential component of heme [2, 3] and it may lead to decreased hemoglobin synthesis.

Usually hemoglobin concentration is lower in pregnant woman as compared to non pregnant woman [9]. This may be due increase in fluid/plasma concentration during pregnancy. The increased plasma volume may dilute the red blood cells that may leads to decrease level of hemoglobin. Iron deficiency may due to insufficient bio available dietary Iron and increased Iron requirement during pregnancy [9].

The main causes of Iron deficiency are deficient intake including reduced bioavailability of Iron due to dietary fiber, phytates, and oxalates. Impaired absorption of Iron may be due to intestinal malabsorptive diseases and abdominal surgery. Excessive loss of Iron may be during menstruation and gastro-intestinal bleeding in peptic ulcer, diverticulosis or malignancy [10]. Maize is staple diet in the rural areas, which contains large amounts of phytates. Phytates are known to interfere with the intestinal uptake

of Iron [9]. Our study demonstrates that the serum Iron is helpful for the diagnosis of Iron deficiency anemia in pregnant women.

We found significant increase ($P < 0.001$) in serum TIBC in patients as compared to control. Transferrin is Iron binding protein; each transferrin molecule can bind with two atoms of ferric Iron. The plasma transferrin can bind with 400 mg of Iron/dl plasma. This is known as total Iron binding capacity [11].

Increased total Iron binding capacity in patients may be due the decreased absorption of Iron in gastrointestinal tract or increase in Iron liberated from the mucosal cells or increased Iron demand during pregnancy.

Mathieu Nahounou Bleyere et al [3] and P.Sushma et al [12] found decrease in hematological parameters in pregnant adolescents at the third trimester of pregnancy compared with control. Similarly P.Sushma et al [12] and Okoroiwu Ijeoma Leticia et al [2] showed significant decrease in serum Iron and significant increase in serum TIBC in pregnant women. Adriana de A Paiva et al [4] showed relationship between the Iron status of pregnant women and their newborns. Among pregnant women they found 19% were anemic and 30.5% were Iron deficient. They showed weak association between neonatal and maternal Iron status parameters.

Conclusion:

Estimation of serum Iron and TIBC may useful for the diagnosis of iron deficiency anemia in pregnant woman.

References:

1. Enaam A. Abdelgader, Tayseer A. Diab, Anwar A. Kordofani and Sana E. Abdalla. Haemoglobin level, RBCs Indices, and iron status in pregnant females in Sudan. *Basic Research Journal of Medicine and Clinical Science* 2014 Feb; 3(2):08-13.
2. Okoroiwu Ijeoma Leticia, Obeagu Emmanuel Ifeanyi, Elemchukwu Queen and Ochei Kingsley Chinedum.

Determination of ferritin level and total iron binding capacity in pregnancy and postpartum subjects in Owerri. *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)* 2014 Sept; 13(9) (Ver. III):70-73.

3. Mathieu Nahounou Bleyere, Anthelme Semi Nene-Bi, Mama Kone, Duni Sawadogo and Paul Angoue Yapo. Iron status and red cell parameters in pregnant and non-pregnant adolescents in Cote d'Ivoire (West Africa). *International Blood Research & Reviews* 2014; 2(1): 8-22.
4. Adriana de A Paiva, Patricia H C Rondo Regina A Pagliusi, Maria do R D O Latorre, Maria A A Cardoso and Sheila S R Gondim. Relationship between the iron status of pregnant women and their newborns. *Rev Saude Publica* 2007; 41(3):321-7.
5. Asia Taha, Saira Azhar, Talib Lone, Ghulam Murtaza, Shujaat Ali Khan, Amara Mumtaz, Muhammad Hassham Hassan Bin Asad, Rozina Kousar, Sabiha Karim, Imran Tariq, Syed Saeed ul Hassan and Izhar Hussain. Iron deficiency anaemia in reproductive age women attending obstetrics and gynecology outpatient of university health centre in al-ahsa, Saudi Arabia. *Afr J Tradit Complement Altern Med* 2014; 11(2):339-342.
6. Saranaz Jangjoo and Leila Hosseini. The prevalence of iron-deficiency anemia in non-pregnant women of reproductive age [14-45] with anemia in Marvdasht's Shahid Motahari Hospital in 2012-2013. *Electronic Journal of Biology* 2016; 12(3): 294-299.
7. Dacie JV and Lewis SM. *Practical Hematology* 4th edition, 1968J & A Churchill, UK, page no 37.
8. Siedel J. et al (1984) *Clinical Chemistry*, Vol.30 pp 975.
9. Nuzhat Raza, Iram Sarwar, Bibi Munazza, Muhammad Ayub and Muhammad Suleman. Assessment of iron deficiency in pregnant women by

determining iron status. J Ayub Med Coll Abbottabad 2011; 23(2):36-40.

10. Pankaja Naik. Mineral Metabolism: in Essentials of Biochemistry 2th edition, published by Jaypee, 2017, page no 293-311.
11. Dr. U Satyanarayana and Dr. U Chakrapani. Mineral metabolism: in Biochemistry published by Books and Allied (p) ltd. 3rd edition 2006, page no 403-424.
12. P. Sushma, Asiya Naaz, D.V.H.S.Sarma and R.Shireesha. A Study on Serum Iron, TIBC and Nutritional Status in III Trimester Pregnancy. International Journal of Scientific and Research Publications 2014 Dec; 4(12):1-3.

Table No 1: Biochemical parameters in patients and control

Parameters	Patients (n=60)			Control (n=30)
	1 st trimester	2 nd trimester	3 rd trimester	
Hemoglobin (gm %)	9.89 ± 0.63*	9.39 ± 1.06*	8.56 ± 1.60*	11.27 ± 0.39
Iron (mg/dl)	38.56 ± 18.76*	35.79 ± 18.24*	26.13 ± 11.46*	41.93 ± 4.26
TIBC (mg/dl)	434.04 ± 36.38*	444.34 ± 44.02*	467.11 ± 46.00*	386.87 ± 15.42

* Highly significant (p< 0.001)

Table No. 2: Correlation of hemoglobin with serum Iron and TIBC in patients and Control.

	Patients		Control	
	Iron	TIBC	Iron	TIBC
Hemoglobin gm%	0.585** P<0.001	-0.502** P<0.001	0.471* P<0.009	-0.337* P<0.06