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EVALUATION OF IRON STATUS AND SOME HAEMATOLOGICAL PARAMETERS OF PREGNANT WOMEN IN ENUGU, SOUTH EASTERN NIGERIA

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ABSTRACT

Iron is an essential functional component of Hemoglobin and the production of erythrocytes require timely delivery of iron to erythroid precursors, especially in pregnancy when rate of erythropoiesis is believed to be increased.This study was carried out to evaluate the iron status and level of some haematological parameters among pregnant women in enugu south eastern nigeria. A total number of 100 subjects and 50 controls were used. Blood samples were collected into plain containers and EDTA containers and analyzed for their iron level and some haematological parameters respectively,using Bio Elab fully automated chemistry analyzer, AS-280, and Mindray auto haematology analyzer,BC-2800 model, and the results expressed as mean ± S.D.The mean iron level of the subjects was 102.83 ± 1.38 mg/dl, while that of the control was 102.68 ± 0.94 mg/dl.The iron levels and Hemoglobin were found to be moderately correlated, $r(150) = .425$, $p<.005$. The result shows that there is no significant difference between the iron levels of the subjects and the control and also there is a moderate correlation between the iron level and hemoglobin.

INTRODUCTION

Iron is an essential functional component of Haemoglobin in erythrocytes; therefore the production of erythrocytes requires the timely delivery of iron to erythroid precursors. The process of erythropoiesis is by far the largest consumers of iron in the body. Steady-state erythropoiesis involves the production of 200 billion new red blood cells per day (Ponka *et al*., 2012).

Iron is needed to make haemoglobin to supply the growing foetus with oxygen and nutrients as a result the demand for iron increases. Low iron levels during pregnancy increases the risk of premature birth and low birth weight of the baby (Lee *et al*., 2006) as well as low iron stores and impaired cognitive or behavioral development in infants.

Iron is available in a wide variety of foods and it an essential nutrient in diet. It comes in two different forms: Haeme iron and non haeme iron. Haeme iron is the form of iron that is present in muscle tissue and blood and so is found in animal based sources like the red meat and fish. The non haeme comes from plant based sources like dark leafy vegetables. The difference between these two forms is that haeme iron is easily absorbed by the body. In addition to food sources that are rich in iron, oral iron supplements increase the levels of iron and haemoglobin in the body. These supplements can be particularly helpful among people who are prone to low iron levels especially in pregnancy if they're unable to maintain a good iron status through diet alone. There are many different types of oral iron supplements, including pills, capsules, drops (WHO, 2012).

Diets are changing with rising evidence that household food purchases and consumption vary by income levels. Urban food environments with supermarkets, restaurants, food vendors, improve access to nutritious food for people, with pregnant women inclusive (Hawkes *et al*., 2017). In urban areas the level of food and nutrient intake is enough to prevent widespread, deficiency diseases compared to low income populations in the rural settings who receive food aid or other social anti-poverty programme. People, pregnant women inclusive consume more animal source foods, fats and oils, processed food as there is scarce availability of fresh foods and vegetables. Majority of pregnant women are aware of the perceived benefits of iron supplements. However, the rural women had more limited information about the benefits of iron supplements than the urban women.

Pregnant women are often required to take dietary sources rich in iron to boost their blood level. Pregnant women in the urban centres are believed to have good

iron status through diet alone, as they have a better standard of living, and access to nutritious food sources rich in iron unlike in the rural areas, therefore they have a normal level of iron. Iron supplements are recommended as part of antenatal care to reduce the risk of low birth weight, maternal anaemia and iron deficiency (WHO, 2012) But since urban women have a normal level of iron which they obtain through their nutritious diet intake, there is no need to purchase iron supplements as it is seen to be a waste of resources for them to procure the iron supplement, Hence, the need for this study to evaluate the iron status of pregnant women in urban areas in Nigeria.

The study was done to evaluate the iron status in pregnant women in Enugu, South Eastern Nigeria.

MATERIALS AND METHODS

STUDY AREA

The study was done in a maternity hospital in Enugu State, Nigeria. It is located in the south eastern part of Nigeria.

STUDY POPULATION

A total number of 100 pregnant women and 100 controls from the maternity hospital were involved for this study and their blood sample was collected. They all gave consent to participate in this study.

INCLUSION CRITERIA

Pregnant women who live in the urban areas were used for the study.

EXCLUSION CRITERIA

Pregnant women who are not living in the urban areas were not used.

PROCUREMENT OF IRON

A commercially prepared serum iron test kit product of BioSystems reagents and instruments company limited were used to assay the iron level.

ETHICAL CONSIDERATION

Ethical approval was gotten from the management of the maternity. the consent of both the subjects and control were obtained.

SAMPLE COLLECTION TECHNIQUE

A standard clean venipuncture was used to collect the blood. 5mls of blood was collected from a prominent vein in the antecubital fossa of the arm of the subjects.2mls of the blood sample was delivered into a plain container and the remaining 3mls of blood sample was transferred into a commercially prepared ethylene diamine tetra acetic acid (EDTA) container and mixed properly. A total number of 200 samples in the plain container were spun with a centrifuge, the serum was extracted using an automatic micropipette and placed in a labelled container. The serum samples were stored frozen until analyzed. The analysis was done at Bioquest diagnostic laboratory Parklane Avenue, Enugu state.

METHODS

Estimation of Iron Level by Automation

BIO E LAB FULLY AUTOMATED CHEMISTRY ANALYZER. AS-280 MODEL from Nanjing City, Jiangsu province china was used for the analysis.

Estimation of Red blood cell parameters by Electrical Impedence for counting and cyanide free for haemoglobin.

MINDRAY AUTO HEMATOLOGY ANALYZER. BC-2800 MODEL from Guangdong, China(mainland)was used for the analysis.

STATISTICAL ANALYSIS

Data analysis was conducted using the statistical package for social sciences (SPSS) version 26.0.The results were expressed as mean ± S.D. Data obtained from this study were analysed using t-test to compare iron level of the subjects and control. The level of significance was set at $P<0.05$

RESULT

The mean Iron level of the subjects was 102.83 and S.D of 1.38. That of the control was 102.68 and S.D of 0.94.

Table 1: Mean ± S.D of Iron Level among Subjects and Control.

Parameter	Mean Value (Subjects)	Mean Value (Control)	t-value	p-value
Iron Level (µmol/L)	102.83±1.38	102.68±0.94	0.701	0.484

A t-test was conducted to compare Iron Level for subjects and controls. The mean for subjects (M=102.83, SD=1.38) and control (M=102.68, SD=0.94) conditions; t (150) =.484, p = 0.71. These results suggest that the difference between the Iron level for subjects and controls is not really much. Specifically, our results suggest that when the difference is insignificant.

Table 2:Correlation between Iron Level in the Serum and the Red Blood Parameters.

Parameters	Mean	Correlation co-efficient	p-value
Hb (g/dl)	11.70 ± 1.41	.425	.000
PCV(%)	36.61 ± 30.34	.032	.755
MCHC(g/l)	349.36±15.51	-.362	.000
MCV(Fl)	85.59±6.40	.075	.455
MCH(Pg)	30.57±2.41	-.217	.030

The variables iron level and Hb were found to be moderately correlated, r (150) = .425, p < .005. The strength of the correlation signifies that Iron levels positively affect Hb levels in the subjects. That is as iron levels increases, the level of Hb in the serum of the subjects also increases.

Table 3: Distribution of participants with relation to red blood cell parameters and iron levels.

Parameters	Iron Levels		
	Low Iron Level	Normal Iron Level	High Iron Level
Hb			
Severe (<7g/dl)	0(0.0)	71(71.0)	0(0.0)
Mild (9-11g/dl)	0(0.0)	29(29.0)	0(0.0)
PCV(%)			
Moderate	0(0.0)	0(0.0)	10(10.0)
Slight	0(0.0)	0(0.0)	90(90.0)
MCHC(g/l)			
Low (200-300g/L)	0(0.0)	2(2.0)	0(0.0)
Normal (315-360g/L)	0(0.0)	74(74.0)	0(0.0)
High (>350g/L)	0(0.0)	24(24.0)	0(0.0)
MCV(fl)			
Microcytic Anaemia (20-70µg/cell)	0(0.0)	0(0.0)	0(0.0)
Normal	0(0.0)	86(86.0)	0(0.0)
Macrocytic Anaemia (>100µg/cell)	0(0.0)	14(14.0)	0(0.0)
MCH(pg)			
Hypochromic	0(0.0)	12(12.0)	0(0.0)
Normal	0(0.0)	87(87.0)	0(0.0)

Table 3 shows the distribution of the various red blood indices with respect to iron levels. From the table, a high percentage of the test subjects had a normal iron level. Of those with a normal level of MCH, 87.0% (87/100) had a normal iron level. Table 2 reports this relationship to be statistically significant at p <0.05.

DISCUSSION

Evaluation of Iron status is generally recommended by the world health organization (WHO) during pregnancy as it's importance in supporting erythropoiesis is unquestioned especially in pregnancy so as to meet the iron needs of both mother and baby.

The current study compares the iron level in pregnant and non-pregnant women while checking for the effect of the iron level on some haematological parameters in pregnant women. In our study, the mean difference in the iron level of the -pregnant and non-pregnant women was low (0.151). However, with a p-value greater than 005, our study also indicates that the difference was not statistically significant. The low difference between the pregnant and non-pregnant women could be attributed to non-precarious nutritional status of both of them.

Red blood parameters especially haemoglobin concentrations are most commonly used to screen for iron deficiency; these measures reflect the amount of functional iron in the body. In our study; the haemoglobin parameter is positively correlated with iron levels; and this relationship is statistically significant. So, unlike the former studies that linked it to education of over 12years; this study found a statistically significant relationship between iron levels and haemoglobin parameter in the serum of pregnant women. Table 4.3 shows that 98.7% of the participants had a normal level of Iron; thus; there will not be cases of decreased iron status. Ahenkorah *et al.* (2018) reported a statistically insignificant relationship between iron levels and MCV likewise iron levels and MCHC.

CONCLUSION

This study shows that the difference between the iron level of pregnant women and non pregnant women (control) is slight, therefore from the result of this study there is no significant change, That is to say there will be no need for iron supplements for the pregnant women as their diet intake is enough to supply the iron they need. Iron level and hemoglobin level were found to be moderately correlated; this signifies that iron level positively affects the hemoglobin level. Based on the results it is concluded that the iron levels of the pregnant women in the urban area are normal.

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