



Assessment of iron status in pre-eclamptic pregnant ladies attending Omdurman midwives hospital

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Abstract

Pre-eclampsia as one of pregnancy related complications is a notable burden of adverse health. The aim of this study was to assess the variation in the levels of serum iron, ferritin, and total iron binding capacity and percentage saturation of transferrin in pre-eclamptic Sudanese women compared to healthy pregnant ladies.

Materials and Methods: in this study 50 pre-eclamptic pregnant women in addition to 30 healthy pregnant ladies matched for age was enrolled. The study was carried out at Omdurman Midwives Hospital, Khartoum, Sudan. A well-controlled fully automated hem analyzer was used for complete blood picture (CBC). Serum iron and total iron binding capacity were measured using Ferrozine method via semi-automatic chemistry analyzer. Serum ferritin levels was measured using the AIA-PACK two-site immuno enzyme-metric assay. All the study group were Sudanese.

Results: Serum iron in pre-eclamptic women was (140.6±51.3mg/dl), versus (71.7±19.7 mg/dl) in the control group with P-value (0.008). Serum ferritin was (76.7±27.3mg/dl) versus (62.9±28.2 mg/dl) with P-value (0.034). The percentage saturation of transferrin in pre-eclamptic women was (62.5± 28.7%) versus (27.5±5.9%) with P-value (0.034). The total iron binding capacity in pre-eclamptic ladies was (247.6± 57.7mg/dl) versus (270.0± 33.9mg/dl) with P-value (0.047). Hemoglobin was (11.5± 0.84g/dl) versus (12.5±0.62g/dl) with P-value (0.000). No significant variation in the mean age, BMI or urine proteins between the two groups was found.

Conclusion: In Sudanese ladies with pre-eclampsia in Omdurman Midwives Hospital; serum ferritin and percentage saturation of transferrin significantly increase; while serum iron, total iron binding capacity and hemoglobin significantly decrease.

Keywords: pre-eclampsia, iron, ferritin, transferrin, total iron binding capacity

Introduction

Pre-eclampsia is a multisystem disease of unknown etiology, with diverse clinical manifestations ^[1, 2]. Pre-eclampsia is a hypertensive disorder unique to human pregnancy ^[3], it is unique to pregnant ladies after twenty weeks of gestation ^[1]. In general; the etiology of preeclampsia is not fully understood ^[4]. Preeclampsia is associated with the morbidity and the mortality for both the mother and fetus worldwide ^[5]. Preeclampsia occurs approximately in 6% of the general population ^[6, 1]. The classic clinical manifestations of preeclampsia are hypertension, proteinuria, excessive weight gain and edema ^[7, 1], or a new-onset hypertension and proteinuria at ≥20 weeks of the gestation ^[8]. Currently there is no predictive tests available for diagnosis of pre-eclampsia ^[3]. Iron status of pregnant women should be measured before giving iron supplements to the lady as these may cause more harm than benefit ^[1]. Ferritin is a good indicator of total body iron status ^[9]. Low serum ferritin values signify low iron stores ^[10]. The incidence pre-eclampsia varies with predisposing factors, geographic area, maternal age, multiple gestation and the socioeconomic status ^[1]. Pre-eclampsia may have severe complication for the mother and her infant especially cardiovascular disease later in life ^[11, 12, 13]. In Sudanese women with preeclampsia the systolic and diastolic blood pressures significantly increase, while the platelets significant decrease ^[5]. *

Materials and Methods

In this descriptive case control study, patients and control were recruited from Midwives Hospital, Omdurman, Sudan. Fifty pre-eclamptic pregnant ladies in addition to 30 control healthy pregnant ladies were included in this study. Gestational hypertension was defined by an obstetrician depending on a specific standard criterion (blood pressure and proteinuria). Proteinuria was defined as >500 per 24 hrs. Urine collection or >2+ on a voided or >1+ on a random urine specimen. Healthy pregnant women from the same hospital were taken as controls, having uncomplicated pregnancy and were normotensive throughout gestation and without proteinuria. Data was collected from each patient using structured questionnaire in addition to reviewing the hospital form. Five ml of venous blood sample was collected from each patient and control using sterile disposable syringe and applying aseptic, standardized and non-traumatic vein puncture technique. The sample was then emptied into an EDTA vacutainers. Blood was mixed with the anticoagulant by gently inverting the container several times and labelled with patient name and serial number. After measuring the hemoglobin using a well-controlled fully automated hemocytometer (Mindray BC-3000 plus). Plasma was separated by centrifugation at 3000rpm/5min. The plasma was then used for the measurement of iron, ferritin and TIBC. Serum concentration of iron and total iron binding capacity

(TIBC) were measured using Ferrozine method via semi-automatic chemistry analyzer (Mindray BA-88A). Serum ferritin levels was measured using the AIA-PACK two-site immuno enzyme-metric assay which is performed entirely using the AIA-PACK F test cups. Patients and controls were also instructed to collect random urine samples in 50ml new plastic urine containers. Semi-quantitative measurement of urine protein was performed by dipping urine testing strip into the patient's urine sample and compared the color change with a standard label.

Data analysis

Data obtained was analyzed using the statistical package of social science (SPSS) program version 21.

Ethical consideration

This study was approved from the ethical committee of Shandi University, Faculty of Graduate Studies and the administration of Midwives Hospital, Omdurman, Sudan. An informed consent was taken from each participant.

Results

Out of 50 pre-eclamptic ladies 27 (54%) aged from 20-29 years, 21(42%) were between 30-39 years, one of the ladies 1(2%) was less than 20 years, while the last one was more

than 40 years in age. Concerning the history of pre eclamptic pregnancies in the study population, 29(58%) of them have pre-eclampsia for the first time, 19(38%) were in their second conception with preeclampsia, just 2(4%) were in third pregnancy with preeclampsia Fig. (1). All the women with pre-eclampsia included in this study had protein with different grades in their urine Fig. (2). concerning the body mass index (BMI); 15(30%) of the study population had normal BMI, while 35 (70%) were obese.

This results also showed that, the mean serum iron in pre-eclamptic women was (140.6±51.3mg/dl), while it was versus (71.7±19.7 mg/dl) in the control group with significance difference (P-value = 0.008). The mean serum ferritin was (76.7±27.3mg/dl) versus (62.9±28.2 mg/dl) in the women with normal pregnancy with significance difference (P-value = 0.034). The mean percentage saturation of transferrin in pre-eclamptic women was (62.5± 28.7%) versus (27.5±5.9%) in the control group with significance difference (P-value = 0.034). The mean total iron binding capacity in pre-eclamptic ladies was (247.6± 57.7mg/dl) versus (270.0± 33.9mg/dl) in the healthy women with uncomplicated pregnancy with P-value (0.047). The mean hemoglobin was (11.5± 0.84g/dl) versus (12.5±0.62g/dl) with P-value (0.000). No significant variation in the mean age, BMI or urine proteins between the two groups was found Table (1).

Table 1: comparative study of serum iron, ferritin, total iron binding capacity and percentage saturation of transferrin in pre-eclamptic pregnant ladies and their control at Omdurman Midwives Hospital (Sudan)

Parameters	Pre-eclamptic women group (n=50)	Control group (n=30)	P-value
Hb level (g/dl)	11.5±0.84	12.5±0.65	0.000
Serum iron (mg/dl)	140.6±51.3	71.7±19.7	0.008
Serum ferritin (mg/dl)	76.7±27.3	62.9±28.2	0.034
TIBC (mg/dl)	247.6±57.7	270.0±33.9	0.047
Percentage saturation of transferrin (%)	62.5±28.7	27.5±5.9	0.000

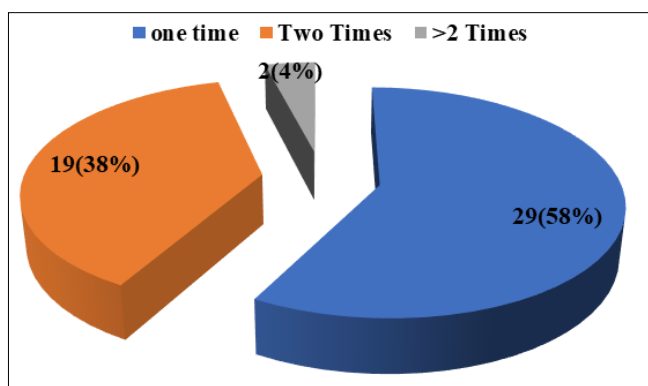


Fig 1: Number of pre-eclamptic pregnancies in the women with preeclampsia included in the study (Sudan).

Discussion

Pre-eclampsia is still one of the leading causes of maternal and fetal morbidity and mortality. The etiology of this disorder remains an enigma in human pregnancy. In the pregnant women, knowing the iron status may be of value before giving iron supplements.

In this study the mean serum iron, ferritin and percent saturation of transferrin levels were significantly elevated in

Sudanese women with pre-eclampsia compared to pregnant women without pre-eclampsia (P -value: 0.008, 0.034 and 0.00 respectively). The same findings were supported by Rayman *et al.* (2002) [14] and Tasneem *et al.* (2008) [1]. It is known that normal pregnant women have decrease in serum iron and ferritin during the third trimester as the stores of iron are depleted because of feto-placental demand and required expansion of red cell mass. But in pre-eclampsia the situation is disturbed. Elevated serum iron in women with preeclampsia as observed in this research may be a causal factor for oxidative stress and increased free radicals, which may accelerate vascular damage in preeclamptic women as reported by Tasneem *et al.* (2008) [1].

Even serum ferritin is a reliable indicator for total body iron status as reported recently by Axel *et al.* (2018) [15]; a high ferritin does not always signify excess iron, especially in an acute-phase reactant where ferritin elevates in response to inflammation as written by Axel *et al.* (2018) [15]. Elevated serum ferritin is also linked to coronary artery diseases and malignancy as stated by Mary *et al.* (2009) [16].

Another finding of this research is that, total iron binding capacity (TIBC) is significantly lowered in pre-eclamptic group in relative to normal pregnancy group. The same finding was reported by Robabeh *et al.* (2007) [17]. TIBC may

also decreases in some conditions like malnutrition, malignancy, anemia of chronic disease as stated by Robabeh *et al.* (2007) [17].

In this study there is also a significant reduction in hemoglobin levels in pre-eclamptic pregnant ladies when compared with their control (P-value 0.00). Which is contrary to findings of Tasneem *et al.* (2008) [11]

Conclusion

Iron profile should be assessed, before giving iron supplements to a pregnant woman especially who are suspected to have pre-eclampsia; as it may cause harm than benefit.

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