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Review Article

Serum Ferritin Level Among Sudanese Women with Hypertensive Disorders of Pregnancy, Khartoum State 2023

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Abstract

Hypertensive disorders of pregnancy HDP are the second leading cause of global maternal mortality behind maternal hemorrhage and are a significant cause of short- and long-term maternal and fetal/offspring morbidity. This study aimed to measure the ferritin level among Sudanese women with hypertensive disorders of pregnancy This was a case-control hospital-based study conducted at the laboratory of the Omdurman maternity hospital – in Khartoum, Sudan during the period of January 2023 to March 2023. It included All patients attending Omdurman maternity hospital that diagnosed with hypertensive disorders of pregnancy, and apparently healthy women were included as a control group. ELIZA was used for ferritin level measurement.The mean of ferritin levels in the cases was (102.5± 19.4), and in the control group was (114.1±11.7), when compared to the ferritin means between the case and control group there were insignificant differences with (p. v= 0.613). In addition to that ferritin levels had insignificant differences with the history of hypertension, types of hypertensive pregnancy, and negative correlation with age (p. v > 0.05). Among Sudanese women with hypertensive pregnancy ferritin levels had insignificant differences when compared between the case and control group, in addition, it had insignificant differences with the history of hypertension, types of hypertensive pregnancy, and had a negative correlation with age.

Keywords: hypertension; types of hypertensive pregnancy; ferritin, preeclampsia; eclampsia chronic hypertension; gestational hypertension

Introduction

Hypertensive disorders of pregnancy are a group of high blood pressure disorders, one of the three major causes of death in pregnancy that include preeclampsia, preeclampsia superimposed on chronic hypertension, gestational hypertension, and chronic hypertension. About 10% of pregnancies globally are complicated by hypertensive diseases. [1,2]

Ferritin provides the primary form of iron storage in the body. It consists of an apoprotein shell (mol. wt. 480000) which encloses a core of iron in the form of ferric hydroxy-phosphate, which may contain up to 4500 atoms of iron. Ferritin is a soluble protein but is degraded to an insoluble derivative, haemosiderin, which accumulates in lysosomes and is the 'stainable iron referred to by pathologists and hematologists. Normally much of the storage iron in the body (approx. 1 g in men and less in women) is in ferritin but with increasing iron overload the proportion present as haemosiderin increases. The ferritin in human tissues contains two types of subunits: H and L. H subunits have a molecular weight of 21 000 and are found in the more acidic iso ferritins in the heart, red blood cells, lymphocytes, and monocyte, the HeLa cell, and other tissues. L subunits have a molecular weight of 19000 and predominate in the more basic isofenitins of the liver, spleen, and placenta. Variation in the ratio of H to L subunits explains the charge heterogeneity of ferritin, which is most readily demonstrated by isoelectric focusing. The isoelectric point of ferritin is not significantly affected by its iron content, which varies from tissue to tissue and with the iron content of tissue. [3]

Material and method

This was a case-control hospital-based study conducted at the laboratory of the Omdurman maternity hospital – in Khartoum, Sudan during the period of January 2023 to March 2023. It included All patients attending Omdurman maternity hospital that diagnosed with hypertensive disorders of pregnancy, and apparently healthy women were included as a control group. participants under folic acid or iron therapy and those with a previous history of hypertensive disorders of pregnancy were excluded. The study was approved by the ethical committee of a national university, the faculty of medical laboratory, and the participants were fully informed about the advantages and disadvantages before participation in the research (verbal informed consent). From each participant, 3 ml of venous blood was collected in sterile plain containers. ELIZA was used for ferritin level measurement. SPSS version 23 statistical software (SPSS Inc., USA) was used for statistical analysis.

Results

A total of sixty participants were in a roll, thirty as a case group and thirty as a control group. the mean ages in the case group were (30.8±6.9) and in the control group were (28.9±5.5). in the case group, 20% had a history of abortion for one time, 26.7% had pregnancy for the first time, 50% were diagnosed with preeclampsia and50% were diagnosed with eclampsia, in addition, 63% had a family history of hypertension **(table1) (figure 1, 2.3,4)**

	N	Minimum	Maximum	Mean	Std. Deviation
Case					
Age	30	18	43	30.8	6.9
Control					
Age	30	18	40	28.9	5.5

Table 1: Descriptive Statistics

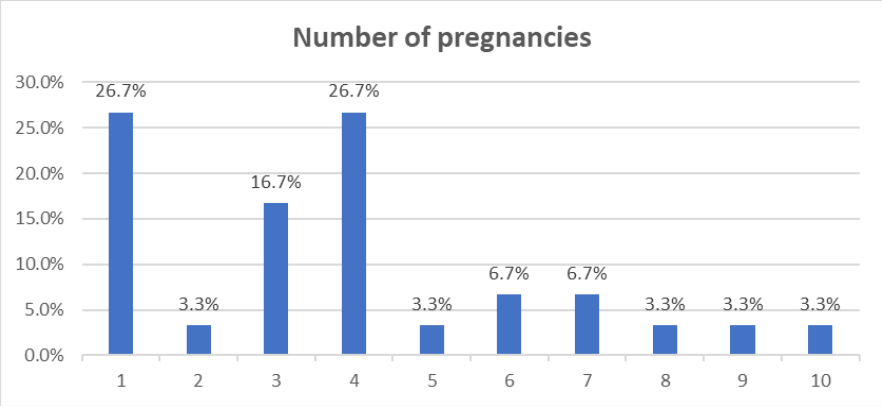

Figure 1: Distribution of the number of pregnancies

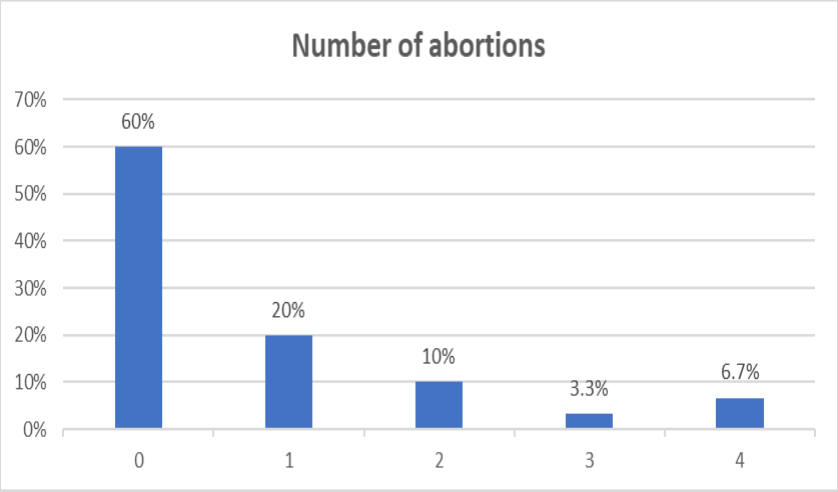

Figure 2: Distribution of abortions number

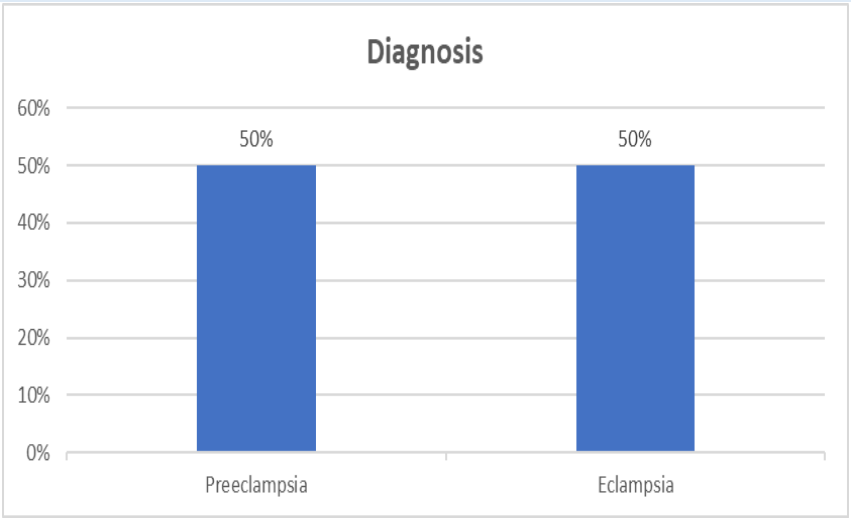

Figure 3: Distribution of Diagnosis

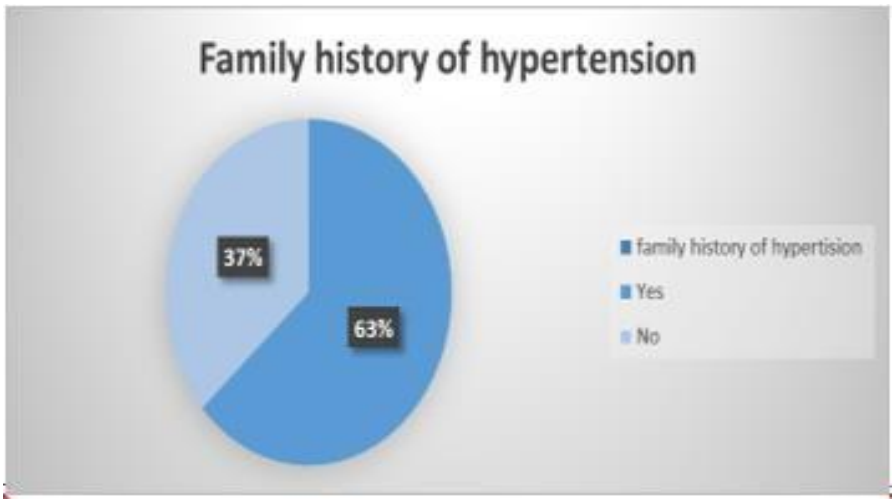

Figure 4: Distribution of hypertension family history Fig (2): Distribution of abortions number

Haematological Result

In the present study, the results showed that; The mean of ferritin levels in the cases was (102.5± 19.4), and in the control group was (114.1±11.7), when comparing the ferritin means between the case and control group there were insignificant differences with (p. v= 0.613) (figure5) (table 2). in addition to that ferritin level had insignificant differences with the history of hypertension, types of hypertensive pregnancy and negative correlation with the age (p. v > 0.05) (Table 3,4,5).

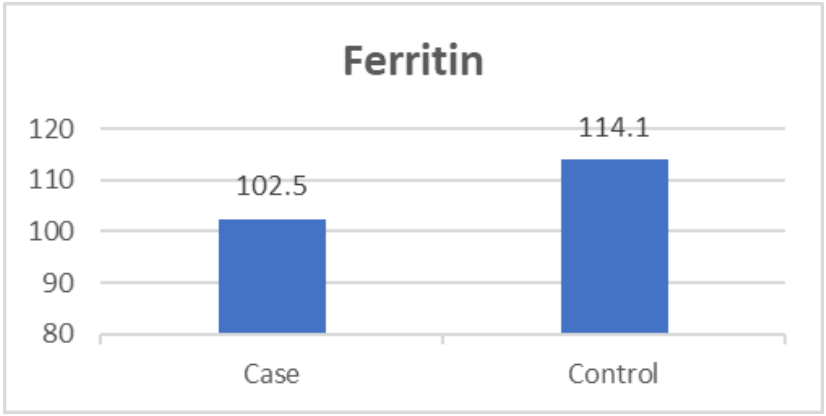

Figure 5: Mean of ferritin in case and control

Parameters	Study population		P. value
	Case (n=30)	Control (n=30)	
Ferritin	102.5 ± 19.4	114.1 ± 11.7	0.613

Table 2: Comparison of ferritin level between case and control

Parameters	History of Hypertension in the Family		
	Yes (n=19)	No (n=11)	
Ferritin	93.7 ± 27.2	117.8 ± 84.8	0.559

Table 3: Comparison of ferritin level according to the history of hypertension

Parameters	Diagnosis		P. value
	Preeclampsia (n=15)	Eclampsia (n=15)	
Ferritin	75.7 ± 18.4	129.3 ± 33.6	0.172

Table 4: Comparison of ferritin, protein C, protein S, and folate according to diagnosis

		Age
Ferritin	Pearson Correlation	.023
	P. value	.905

Table 5: Correlations of age with ferritin

Discussion

The hypertensive syndromes of pregnancy are the leading cause of maternal and fetal morbidity and mortality in the developed world, occurring in around 8% of pregnancies. Several studies have suggested a possible role for the nitric oxide synthase gene and the HLA system in the genesis of the disease, which would fit within a wider picture of maternal immune responses to the trophoblast that lead to defective placentation, activation of the inflammatory cascade and endothelial dysfunction. [4]

This was a case-control hospital-based study conducted at the laboratory of the Omdurman maternity hospital - Khartoum, Sudan during the period January 2023 to March 2023, and aimed to measure the ferritin Level among Sudanese Women with Hypertensive Disorders of pregnancy the results showed that; in the case group the mean of ages was (30.8±6.9), 20% had a history of abortion for one time, 26.7% had pregnancy for the first time, 50% diagnosed as preeclampsia and50% diagnosed as eclampsia, in addition, 63% had a family history of hypertension. This finding agreed with Zhang et al who reported; The incidence of eclampsia, severe preeclampsia, and superimposed preeclampsia remained unchanged during the 10 years. Women with preeclampsia and eclampsia had a 3- to 25-fold increased risk of severe complications. African American women not only had a higher incidence of hypertensive disorders in pregnancy but also tended to have a greater risk for most severe complications. Preeclamptic and eclamptic women younger than 20 years or older than 35 years had substantially higher morbidity.[5]

However, Mohamedain et al mentioned; in the women with preeclampsia and who had a history of spontaneous abortion, there was no significant difference in age, parity, education level, employment status, blood group, body mass index, and hemoglobin level between the patient and control groups. Also revealed that previous spontaneous abortion reduced the risk of preeclampsia by 59.0%.[6] Similarly, Su et al. reported that a history of induced abortion was associated with a lower risk of preeclampsia among nulliparous women in China. Moreover, Parker et al. observed a 10% reduction in the risk of preeclampsia in women with a history of one induced abortion and a 30% reduction in women with a history of three or more induced abortions [7,8]

In the present study, the results revealed that; The mean of ferritin levels in the cases was (102.5± 19.4), and in the control group was (114.1±11.7), when comparing the ferritin means between the case and control group there were insignificant differences with (p. v= 0.613), in addition to that ferritin level had insignificant differences with the history of hypertension, types of hypertensive pregnancy and negative correlation with the age (p. v > 0.05). These results consist of Taeubert et al study which reported; In nonpregnant populations, higher serum ferritin, which reflects high iron stores, is associated with an increased risk of hypertension. No consistent associations were present of maternal iron status in early pregnancy with gestational hemodynamic adaptations or the risks of gestational hypertensive disorders, also Shaheen et al steady; in preeclamptic women, Ferritin levels were not significantly (p=0.23) different when compared between the case and control group. [9,10]

On the contrary, Raman et al study found that; Mean of ferritin levels were significantly elevated both in PIH and eclampsia as compared to controls indicating that ferritin measurement in PIH and eclampsia would not reflect iron nutritional status. [11] In addition Amal et al results showed that patients with preeclampsia have higher levels of serum ferritin compared to control subjects. [12] also, Hubel et al said; Total serum ferritin concentrations were approximately fivefold higher in preeclampsia than in women with healthy pregnancies, which contributed to increased cellular damage in preeclampsia. It was also hypothesized that ferritin synthesis is increased in preeclampsia. This is attributed to hepatocellular, rather than placental

damage. [13] However, in another study, it was reported that increased serum iron and ferritin are rendered to decreased hepcidin levels, the peptide hormone that coordinates iron absorption and distribution, in women with preeclampsia. Although it was reported by Muhsin et al., that serum hepcidin levels were within the normal ranges in women with preeclampsia, yet significantly higher than in controls. [12]

Finally, Goldenberg et al concluded their study with; Plasma ferritin is considered the best measure of total body iron, with low levels diagnostic of iron deficiency. High levels have been associated with inflammation and infection. High, but not low, plasma ferritin levels, especially at 26 weeks, were strongly associated with subsequent preterm delivery and birth weight. [14]

Conclusion

Among Sudanese women with hypertensive pregnancy ferritin levels had insignificant differences when compared between the case and control group, in addition, it had insignificant differences with the history of hypertension, and types of hypertensive pregnancy and had a negative correlation with age.

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