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Hematological and selected biochemical indices in preeclamptic pregnant women attending Elnihoud teaching hospital

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ABSTRACT

Background. Preeclampsia (PE) is a form of hypertensive disorder of pregnancy, leading to maternal and perinatal morbidity and mortality worldwide. It is major obstetric problem in developing countries and affecting 2–10% of all pregnancies. Aim. This study aimed to evaluate hematological and some biochemical parameters in preeclamptic pregnant women attending Elnihoud Teaching Hospital, Sudan, and to compare the findings with the severity of the disease. Methods. A descriptive cross sectional study was carried out in Elnihoud Teaching Hospital with total of forty tow pregnant women as participants (14–45 years old). They were selected from the Wards of the Hospital at admission before starting treatment. Hematological and selected biochemical parameters were measured and analyzed for every preeclamptic patient. Results. The study revealed no significant elevation in plasma total protein, total white blood cells (TWBCs), lymphocytes and mean corpuscular volume (MCV) among severe preeclamptic patients versus mild cases. Decrease with no significant value in hemoglobin level, platelets count (PLT), red blood cells (RBCs) and mean corpuscular hemoglobin (MCH) was observed in severe preeclamptic cases compared to mild preeclamptic cases. Conclusion. It is concluded that measurement of hematological and some biochemical parameters might reflect to some extent the effect of preeclampsia on pregnant women. Recommendation. Further studies with more parameters can provide guidance for the evaluation intervention and management of pregnant women who suffering from PE.

Research Article

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Preeclampsia, Hypertension, Proteinuria, Papillodema.

INTRODUCTION

Preeclampsia is one of the most serious health problems affecting pregnant women and contributes to both maternal and infant morbidity and mortality worldwide [1]. The disorder is defined by the onset of hypertension (blood pressure 140/90 mm Hg) and proteinuria (0.3 g of protein in the urine within a 24-hour period) during the second half of pregnancy (20 weeks) in a woman with previously normal blood pressure [2]. Although multiple mechanisms and factors have long been recognized, including increased oxidative stress; abnormal placentation; cardiovascular maladaptation to pregnancy; malfunction in genetic, immunological, nutritional, hormonal, angiogenic mechanisms; and inflammation the understanding of the exact pathophysiology of preeclampsia has been elusive [3, 4].

Systemic inflammation can be measured by using a variety of biochemical and hematological markers might provide prognostic and diagnostic clues to diseases related to chronic low-grade inflammation [5-7]. In Sudan there is high prevalence of maternal mortality with PE, and accounting 4.2% of all obstetric complications and 18.1% of maternal deaths [8].

The aim of the current study was to evaluate plasma total protein, hemoglobin, total white blood cells (TWBCs), red blood cells (RBCs), platelets count (PLT), lymphocytes, packed cell volume (PCV), mean corpuscular volume (MCV) and mean corpuscular hemoglobin, or "mean cell hemoglobin" (MCH) as complete blood count for preeclamptic patients attending Elnihoud Teaching Hospital and to compare the findings with the severity of the disease.

MATERIAL AND METHODS

This study was descriptive cross sectional study; carried out in Elnihoud Teaching Hospital, Elnihoud Locality, West Kordufan State, Sudan from January 2018 to December 2018. A total of forty tow pregnant women were included in this study. They were selected from the Wards of the Hospital at admission before starting treatment.

Inclusion criteria

Preeclamptic women with ages 14 – 45 years old, blood pressure ≥ 140/90, and also with proteinuria ≥300mg/24hrs urine collection were included. Preeclamptic patients with blood pressure ≥ 160/110 or/and proteinuria ≥ 1g/ 24 hours urine collection or/and presence of papillodema were taken as severe preeclamptic cases, while preeclamptic patients with blood pressure 159/109 – 140/90, proteinuria 0.3 to 1g/ 24 hours urine collection and absence of papillodema taken as mild preeclampsia.

Exclusion criteria

Pregnant women with pre-gestational diabetes mellitus, primary or secondary lipid disorders, severe anemia, those suffer from any other hematological or endocrine disorders were excluded. Questionnaires were filled and blood samples were obtained for measurement of laboratory parameters by using chemical and hematological analyzers. Data were analyzed by SPSS program version 20.

Ethical approval

The review board and ethics committee of University of West Kordufan for Medical Education and Research approved the study protocol and informed consents were taken from all the participants.

RESULTS

Figure 1 show the ages of participants which were 14 – 20 (28.5%), 21 – 25 (21.5%), 26 – 30 (30.9%) and > 30 (19.1%). Figure 2 shows the parity of the study group, primiparous (45.2%), multiparous (34.7%) and grand multiparous (19.2%). From the entire participants, (76%) have severe preeclampsia and (24%) have mild preeclampsia.

Characteristics and description of the study group

Table 1 shows the characteristics and description of the study group. The occupations of the participants were teacher (2.4%), employee (2.4%), farmer (7.1%) and housewife (88.1%). The study group ages at time of marriage per year were 14-20 (73.8%), 21-25 (14.3%), 26-30 (7.1%) and > 30 (4.8%) years old. Regarding gestational ages at onset of preeclampsia per week they were 20 - 24(9.5%), 24+1 –28(7.1%), 28+1 – 32(19%), 32+1 – 36(40.5%) and > 36(23.9%). The participants having blood pressure ≥ 160/110 represent (42.9%) and those having blood pressure 159/109 – 140/90 were (57.1%)

Laboratory findings of study group

Table 2 shows the laboratory findings of the participants. Proteinuria (dipstick) for the study group were + (19%), ++ (42.9%) and +++ (38.1%), and there was significant elevation in the cases of severe preeclampsia with ++ and +++ (P=0.052). (52.4%) of the participants have proteinuria from 0.3 – 1 and (47.6%) have proteinuria > 1 with significant elevation in sever preeclampsia compared to mild preeclampsia (P=0.002). Plasma total protein for the study group was (33.3%) normal (66.7%) high and no participant having low plasma total protein and there was no significant difference between sever and mild cases. Hemoglobin level for participants was (81%) low, (19%) normal and no patient have high hemoglobin level and there was no significant difference between sever and mild cases. For TWBCs, (83.3%) of participants their TWBCs were normal, (16.7%) have leucocytosis and no one have low TWBCs count, with no significant difference between sever and mild patients. Regarding the RBCs for study group, (11.9%) have low count, (85.7%) their RBCs were in normal range, while (2.4%) have high RBCs count and there was no significant difference between sever an mild cases. Concerning PLT, (38.1%) low PLT, (57.1%) normal PLT count and (4.8%) high PLT count with no significant difference between sever and mild cases. For lymphocytes, (31%) of the participants have normal lymphocytes (69%) have high lymphocytes and no one have low lymphocytes count with no significant difference between sever and mild preeclamptic patients. (2.4%) of entire participants have low MCV, no normal MCV, while (97.6%) have high MCV and there was no significant difference between sever and mild cases. For MCH, (92.9%) of the participants have low MCH, (2.4%) have normal MCH and (4.8%) have high MCH, with no significant difference between sever an mild cases in all.

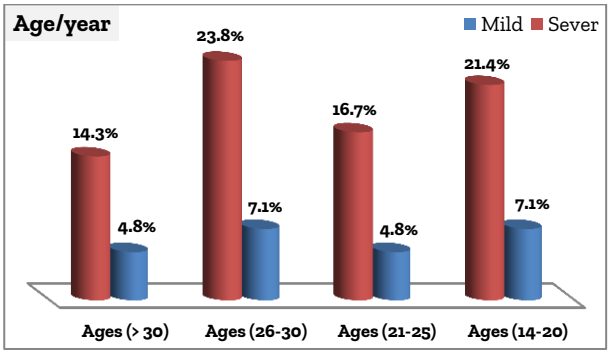

Figure 1. Ages of the study group

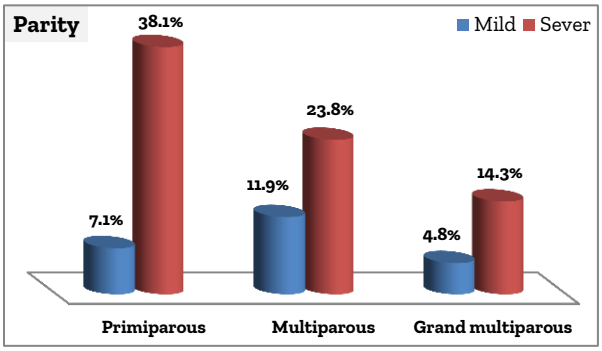

Figure 2. Parity of the study group

Table 1. Characteristics and description of the study group

Character		Preeclampsia status			p-value
		Mild	Sever	Total	
Occupation	Teacher	0	1(3.1%)	1(2.4%)	0.621
	Employee	0	1(3.1%)	1(2.4%)	
	Farmer	0	3(9.4%)	3(7.1%)	
	Housewife	10(100%)	27(84.4%)	37 (88.1%)	
Total		10(100%)	32(100%)	42 (100%)	
Age at time of marriage/year	14 – 20	7(70%)	24(75%)	31(73.8%)	0.693
	21 – 25	2(20%)	4(12.5%)	6(14.3%)	
	26 – 30	0	3(9.4%)	3(7.1%)	
	> 30	1(10%)	1(3.1%)	2(4.8%)	
Total		10(100%)	32(100%)	42 (100%)	
Gestational age at onset of preeclampsia / week	20 – 24	2(20%)	2(6.3%)	4(9.5%)	0.372
	24+1 – 28	0	3(9.3%)	3(7.1%)	
	28+1 – 32	2(20%)	6(18.8%)	8(19%)	
	32+1 – 36	5(50%)	11(34.4%)	17(40.5%)	
	> 36	1(10%)	10(31.2%)	10(23.9%)	
Total		10(100%)	32(100%)	42 (100%)	
Blood pressure	≥ 160/110	0	18(56.3%)	18(42.9%)	0.002
	159/109 – 140/90	10(100%)	14(43.7%)	24(57.1%)	
Total		10(100%)	32(100%)	42 (100%)	

Table 2. Laboratory findings of study group

Character	Preeclampsia status			p-value
	Mild	Sever	Total	
Proteinuria (dipstick)				
+	4(40%)	4(12.5%)	8(19%)	0.052
++	5(50.8%)	13(40.6%)	18(42.9%)	
+++	1(10%)	15(46.9%)	16(38.1%)	
Total	10(100%)	32(100%)	42 (100%)	
Proteinuria				
0.3 – 1	10(100%)	14(43.7%)	24(57.1%)	0.002
> 1	0	18(56.3%)	18(42.9%)	
Total	10(100%)	32(100%)	42 (100%)	
Plasma total protein				
Low	0	0	0	0.451
Normal	2(20%)	12(37.5%)	14(33.3%)	
High	8(80%)	20(62.5%)	28(66.7%)	
Total	10(100%)	32(100%)	42 (100%)	
Hemoglobin				
Low	8(80%)	26(81.3%)	34(81%)	1.00
Normal	2(20%)	6(18.7%)	8(19%)	
High	0	0	0	
Total	10(100%)	32(100%)	42 (100%)	
Total white blood cells				
Low	0	0	0	0.168
Normal	10(100%)	25(78.1%)	35(83.3%)	
High	0	7(21.9%)	7(16.7%)	
Total	10(100%)	32(100%)	42 (100%)	
Red blood cells				
Low	0	5(15.6%)	5(11.9%)	0.335
Normal	10(100%)	26(81.3%)	36(85.7%)	
High	0	1(3.1%)	1(2.4%)	
Total	10(100%)	32(100%)	42 (100%)	
Platelets count				
Low	3(30%)	13(40.6%)	16(38.1%)	0.541
Normal	7(70%)	17(53.1%)	24(57.1%)	
High	0	2(6.3%)	2(4.8%)	
Total	10(100%)	32(100%)	42 (100%)	
Lymphocytes				
Low	0	0	0	1.000
Normal	3(30%)	10(31.2%)	13(31%)	
High	7(70%)	22(68.8%)	29(69%)	
Total	10(100%)	32(100%)	42 (100%)	
Mean corpuscular volume				
Low	1(10%)	0	1(2.4%)	0.238
Normal	0	0	0	
High	9(90%)	32(100%)	41(97.6%)	
Total	10(100%)	32(100%)	42 (100%)	
Mean corpuscular hemoglobin				
Low	9(90%)	30(93.8%)	39(92.9%)	0.192
Normal	1(10%)	0	1(2.3%)	
High	0	2(6.2%)	2(4.8%)	
Total	10(100%)	32(100%)	42 (100%)	

DISCUSSION

Although PE only affects approximately 2%–8% of pregnancies worldwide it is associated with severe complications such as eclampsia, hemorrhagic stroke, hemolysis, elevated liver enzymes and low platelets (HELLP syndrome), renal failure and pulmonary edema in addition to other variable mode of clinical presentation and hematological and biochemical changes . Importantly, there is no "cure" for the disease except for early delivery of the baby and placenta [9].

Hypertension, proteinuria, excessive weight gain and edema are classic clinical manifestations of the preeclampsia [10]. Other features include thrombocytopenia, hyperuricemia, abnormal liver function tests and hemoconcentration [11].

The current study revealed that most of the participants were, marriage at age 14 – 20 years old (73.8%), with sever preeclampsia (76%) their blood pressure 159/109 – 140/90 (57.1%). The present study shows significant increase in proteinuria (dipstick) and proteinuria among the sever preeclamptic participants compared to mild group. The elevation of proteinuria showed by the current study might be attributed to impairment of glomerular filtration and loss of intermediate weight proteins such as albumin and transferrin as consequence of preeclampsia.

The study revealed an elevation in the plasma total protein, TWBCs, lymphocytes and MCV among severe preeclamptic patients versus mild cases but with no significant values. These findings were in agreement with Vilchez et al. [12] and Elgari et al. [13] whom stated similar results. The results of the present study disagree with similar studies results carried out by Hale et al. [14] and Ali et al. [15] whom reported that there was decrease with no significant value in the levels of those parameters in preeclamptic women. The elevation of those parameters which revealed by the present study might be due to endothelial damage that associated with preeclampsia.

For hemoglobin level, PLT, RBCS and MCH the study shows decrease with no significant values in severe preeclamptic cases compared to mild preeclamptic cases. These findings were in accordance with similar studies results carried out by Hale et al. [14] and Ali et al. [15] whom reported that there was no significant decrease in the levels of those parameters in preeclamptic women. In contrast, the PLT result of the current study disagrees into some extent with Imteyaz et al., Yaprak et al. and Han et al. [16-18] whom stated that there was significant decrease in PLT level among severe preeclamptic women. Preeclampsia is associated with hematological system impairment and that is might be the cause of the decrease of those parameters which shown by this study.

CONCLUSION AND RECOMMENDATIONS

Preeclampsia as multisystemic disorder can exhibit its harmful effect on all body organs and systems. Because measurement of some biochemical and hematological parameters is fast and easily applicable, they may be used to evaluate to some extent the effect of preeclampsia on pregnant women. Further studies with more parameters can provide guidance for the evaluation intervention and management of pregnant women who suffering from PE.

DECLARATIONS

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Authors' contributions

All authors contributed equally to this work.

Competing interests

The authors declare that they have no competing interests.

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