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Research Paper

Platelet Indices Values Between the Normotensive And Preeclamptic Women In A Tertiary Hospital In Ilorin, North-Central, Nigeria

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ABSTRACT:
Background: *Preeclampsia is the commonest hypertensive disorder of pregnancy It is responsible for a significant maternal and perinatal morbidity and mortality particularly in the developing world like Nigeria. Platelet activation is central to this disease entity. Therefore, platelet indices should be routinely measured to assess the severity of the disease and pregnancy outcome.*
Objectives: *To compare the platelet indices in normotensive and preeclamptic women in University of Ilorin Teaching Hospital, Ilorin.*
Study design: *A prospective case control study of consented subjects who were pregnant women at gestational age of 28 weeks and above diagnosed with preeclampsia that met the study criteria and controls who were consented healthy normotensive pregnant women at the same gestational age who also met the study criteria. Subjects and controls were matched for social status, gestational age and gravidity.*
Methodology: *A total of 140 parturient comprising 70 each from subjects and controls who satisfied the inclusion criteria were recruited for the study by purposive sampling. Subjects and controls were matched for gestational age, gravidity and social status. Social and medical histories of each parturient as well as the blood pressure and platelet indices samples were obtained. The results were analysed using SPSS version 21.0 with appropriate tables and figures generated.*
Results: *Platelet count was lower in the preeclamptic group than the control (155.47 ± 38.68 x 10^3/µL vs. 232.51 ± 53.79 x 10^3/µL, $p<0.001$), while the other platelet indices were higher in preeclamptic group than the control namely; MPV (11.88 ± 1.05fl vs. 10.77 ± 1.22fl, $p<0.001$), PDW (15.53 ± 2.28fl vs. 13.94 ± 2.25fl, $p<0.001$) and PLCR (39.89 ± 7.73% vs. 31.81 ± 7.97%, $p<0.001$).*
Conclusion: *Apact from the pletelet count that was lower in preeclamptic participants all other platelet indices were significantly higher in preeclamptic participants than their normotensive counterparts.*

Recommendation: *Platelet indices should be routinely assessed in the management of preeclampsia to evaluate the severity and outcome of the disease.*

KEYWORDS: *Platelet, Indices, Pregnancy, Nornotensive, Preeclampsia, Women.*

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I. INTRODUCTION:

Hypertensive disorders of pregnancy complicate about 5 – 8% of all pregnancies and these are of major concern as they affect both the mother and her baby.[1] Hypertensive disorders of pregnancy remain one of the leading causes of maternal and perinatal morbidity and mortality, especially in developing countries and responsible for 14% maternal deaths in the world.[2-4] Hypertensive disorders of pregnancy are diagnosed with the maternal blood pressure elevation of $\geq$ 140mmHg systolic or $\geq$ 90mmHg diastolic in pregnancy on two or more occasions, about four hours apart, in a woman who has been previously normotensive and in whom blood pressures may return to normal within twelve weeks of delivery or persist afterwards.[5]

Hypertensive disorder in pregnancy is classified by International Society for the Study of Hypertension (ISSHP) as chronic hypertension, gestational hypertension, preeclampsia and White-coat hypertension.[6] In Chronic hypertension, elevated blood pressure predates the pregnancy or noticed in the first half of pregnancy and persists beyond 12 weeks postpartum. Gestational hypertension is characterized by de novo hypertension after 20 weeks gestation without proteinuria. Preeclampsia is the presence of hypertension after 20 weeks gestation with proteinuria which is spot urine protein/creatinine >30 mg/mmol (0.3mg/mg) or >300mg/day or at least 1 g/L (2+) on dipstick testing and a remission of these symptoms usually by 6 - 12 weeks postpartum.[6] This may be mild or severe. Chronic hypertension can be superimposed with preeclampsia. Preeclampsia without intervention can progress to eclampsia, which is the occurrence of epileptiform convulsion unrelated to other cerebral conditions with signs and symptoms of preeclampsia.[7-9] The mother may develop disseminated intravascular coagulation, acute renal failure, stroke (ischaemia, due to vasospasm and microthrombosis or even haemorrhage due to severe thrombocytopenia), acute pulmonary oedema, cerebral oedema. Other complications are placental abruption, liver haemorrhage/rupture, development of Haemolysis, Elevated liver enzymes, Low platelet count (HELLP) syndrome, transformation to chronic hypertension, or even maternal death.[5,10] The fetal affectation seems to be due to placental insufficiency and may include: pregnancy loss, fetal death in-utero, intrauterine growth restriction, premature labour.[10,11]

Preeclampsia is the most common hypertensive disorder of pregnancy.[12] Majority of these conditions are asymptomatic. The associated morbidities and mortalities can be prevented with early recognition and good antenatal care.[13,14] For proper intervention and prevention of further complications of preeclampsia, an early assessment of its progress and severity should be known but this is difficult as its pathophysiology is not clear.[15,16]

Many researches have been done in the past to develop a reliable test to predict preeclampsia.[13] Lately, several biochemical markers have been described such as angiogenic/anti-angiogenic factors, placental proteins, etc. for predicting preeclampsia. However, their role in resource-poor settings is doubtful due to the cost implications of these tests.[13] Profound changes in the coagulation and fibrinolytic system occurs during normal pregnancy causing a hypercoagulable state.[6,13] Out of all the haematological changes that occur in preeclampsia, low platelet count is the most commonly seen occuring in 11% to 29% of patients.[7,14,17-19] HELLP syndrome and disseminated intravascular coagulation (DIC) are known complications and are both related to change in platelet counts and may be fatal. Some vasoactive factors released by the platelets could play a role in the pathogenesis of preeclampsia. So, significant abnormality in platelet indices: platelet count, mean platelet volume (MPV), platelet distribution width (PDW) and platelet large cell ratio (PLCR), may suggest the disease entity and its severity.

There is thus a need to compare pletelet indices between normotensive pregnant women and preeclamptics in Ilorin. The available studies in Nigeria are only limited to platelet counts in preeclampsia and do not include an evaluation of other platelet indices and also comparison with normotensive pregnant women.[10] Thus, this case control study, therefore, aims to add to the body of evidence on platelet indices.

II. METHODOLOGY

Study Area: The study was carried out in the Department of Obstetrics and Gynaecology, University of Ilorin Teaching Hospital, Ilorin, Kwara State, Nigeria which is located at Oke-Oyi, Old Jebba Road in Ilorin. It predominantly plays the role of a teaching hospital but equally offers primary and secondary health services. It serves as a major referral centre for Kwara State and parts of the nearby states of Oyo, Osun, Ekiti, Kogi and Niger states. The hospital is approved for and undertakes undergraduate and postgraduate medical training. It is a training centre for Nursing, Post Basic Nursing in Midwifery, Accident and Emergency as well as Paediatric Nursing, Community Health Officers and Health Information Management System. The hospital has facilities for

the major clinical departments i.e. Obstetrics and Gynaecology, Paediatrics, Surgery, Internal Medicine and clinical laboratories. Obstetric services are delivered by four firms; each firm consists of consultants, resident doctors and house officers.

Study Population: The study population were pregnant women at 28 week gestational age and above, with preeclampsia and equal number of healthy normotensive pregnant women at 28 week gestational age and above, attending antenatal clinics or presenting in labour ward at the University of Ilorin Teaching Hospital, Ilorin.

Inclusion Criteria: Subjects must be consented preeclamptic women at gestational age of 28 weeks and above while controls must be healthy normotensive pregnant women at gestational age of 28 weeks and above.

Study Design: The study was a prospective case control study. Consented women diagnosed with preeclampsia at the routine antenatal clinic and those admitted into the obstetrics emergency ward of the University of Ilorin Teaching Hospital were selected. Subjects who met the criteria for the study were informed and counseled about the study. Controls were consented healthy normotensive pregnant women without any sign or history of hypertensive disorders of pregnancy. Subjects and controls were recruited consecutively till the sample size was completed. Each control was recruited as soon as possible after a case is enrolled to avoid any temporal bias, matching for gestational age and gravidity.

Study Tool: The study tool was study proforma.

Sample Size: The sample size was 140 comprising equal number of 70 participants each from consented women diagnosed with preeclampsia at 28 weeks gestational age and above as subjects and consented healthy normotensive pregnant women at 28 weeks gestational age and above as controls. It was determined by a previously validated formula for case-control study[20].

Sampling Technique: The sampling technique was by purposive sampling and consenting participants that met the inclusion criteria were recruited. Subjects and controls were recruited consecutively till the sample size was completed.

Recruitment of subjects and controls: The recruitment of patients were at the antenatal clinic and the obstetrics emergency ward where women with preeclampsia are admitted for inpatient care, while that of controls were at the antenatal clinic. Eligible women who satisfied the inclusion criteria were informed and counseled about the study in a language they understood and informed consents were obtained. A study proforma was administered. Information obtained were sociodemographic status, gestational age, history of presenting complaints, obstetric history, personal, medical and family histories including the history of bleeding disorders, hypertension, diabetes mellitus, pregnancy induced hypertension, genotype and other related history. General physical examinations were done to obtain height, weight, vital signs and exclude anaemia, cyanosis, jaundice, oedema. Recruitments were done by the researcher with assistance from the research assistants. The research assistants were four junior residents (one from each firm) who were trained about the study protocol (such as the contents of the proforma, consent form and also sample collection) daily for one week before commencement of the study.

Blood pressure measurement and Urinalysis: Blood pressure was measured with patient in comfortable sitting or supine position with the arm outstretched and supported at approximately same level as the heart, using Accoson mercury sphygmomanometer. The cuff length was at least 80% of the circumference of the upper arm and the lower edge one inch above the cubital fossa when wrapped around the arm. A second reading was taken after 4-6 hours. They were classified as mild if readings are ≥140/90mmHg or severe if ≥160/110mmHg.

Urinalysis was done using dipstick measurement with Combi 2 urinalysis strips and it was read as negative, trace, 1+ (30mg/dl), 2+ (100mg/dl), 3+ (300-1999mg/dl) and 4+ (>2g). A clean catch or catheter sample was used for the tests.

Blood Sample Collection: After application of tourniquet and taking all aseptic precautions, 3ml of venous blood was collected by venepuncture from the median antecubital vein of all participants using 22 Gauge size needle and 5ml disposable syringe. It was deposited into a sample bottle containing ethylene diamine tetraacetate (EDTA) and thorough mixing done to prevent clot formation. Sample was analyzed with an automated cell counter using Sysmex KX21, an autoanalyzer.

Patients Follow Up: Patients were followed up till delivery. The preeclampsia group was categorized as mild or severe based on their blood pressures on admission, urinalysis and clinical features.

Data Analysis: The data was analyzed using the Statistical Package for Social Sciences Software (SPSS) version 21.0 Chicago, Illinois, USA. The data was presented in frequency tables and chart. Chi-square analysis was used to test relationships between categorical variables while continuous variables were analyzed with Independent Samples T test and Analysis of Variance (ANOVA). Spearman correlation was used to determine the platelet indices and severity of preeclampsia while Receiver Operating Curve (ROC) was used to determine the association criterion of the platelet indices in differentiating severity of preeclampsia as well as in predicting pregnancy outcomes. Probability (p) values less than 0.05 was accepted as statistically significant.

Ethical Consideration: An institutional approval for this study has been obtained from the Ethical Review Committee of University of Ilorin Teaching Hospital, Ilorin. Informed written consent was obtained from each participant after adequate counselling and the data obtained from the study were treated with confidentiality and used solely for the purpose of the study.

Study Limitations:

1. The study was done in a single center thus was limited in terms of participants' heterogeneity.
2. Larger sample size would be more representative of what is obtainable in this environment.
3. The study only described findings and outcomes in selected cases of preeclampsia at 28 weeks and above with exclusion of other hypertensive disorders in pregnancy.
4. Samples were taken at point of diagnosis of preeclampsia; serial samples would have allowed detection of a possible trend and changes in platelet indices in preeclampsia and normal pregnancy.

III. RESULTS:

The study was conducted over a period of 9 months (July 2017 to March 2018). A total of 140 participants were enrolled for this study comprising 70 participants in each arm.

Table 1 showed the socio-demographic variables, gravidity, booking status and blood pressure measurements of the study participants.

Maternal age: The participants in the preeclamptic group were within the age range of 22–40years (mean age of 28.16years ± 4.62), while the normotensive participants were 22 – 43 years (29.59years ± 4.92) which was not statistically significant (p= 0.078). The highest percentage of participants were in the age group of 25-29years 47(33.6%) while the least number of participants were greater than 40years 5(3.6%) in both groups.

Marital status: Majority of the participants, 95% (133) were married, of these, 63(90%) were in the preeclamptic group and 70(100%) in normotensive group while 5% of the participants were single.

Educational status: Eighty nine participants (63.6%), had tertiary level of education, 33(47.1%) in the preeclamptic group and 56(80%) in the normotensive group. Eight participants (5.7%) had no formal education, 7(10%) in the preeclamptic group and 1(1.4%) in the normotensive group and this was statistically significant (p= 0.002)

Employment status: Twenty four (34.3%) women were unemployed in the preeclamptic group while 21(30.0%) were unemployed in the normotensive group. Also, 40 (57.1%) and 22 (31.4%) participants were self-employed in the preeclamptic and normotensive group respectively. Employed participants in the preeclamptic and normotensive group were 6 (8.6%) and 27 (38.6%) respectively.

Religion: Most of the participants 111(79.3%) were Muslims; 55(78.6%) in the preeclamptic group and 56(79.3%) in the normotensive group. Fifteen (21.4%) women in the preeclamptic group and 14(20%) in the normotensive group were Christians. There was no statistically significant difference (p= 0.835) in the distribution of participants by their religion among the two groups.

Ethnicity: Majority of the participants in both study groups were of Yoruba ethnicity; 53 (75.7%) of these from the preeclamptic and 59(84.3%) from the normotensive group.

Gravidity: Majority of the participants in both arms of the study were multigravida, 80(57.1%). There were 19(27.1%) and 15(21.4%) primigravida in the preeclamptic and normotensive groups respectively and the difference was not significant (p= 0.714).

Booking: Most of the women 59 (84.3%) in the normotensive group booked antenatal at the study centre while only 21(30%) preeclamptics booked at the place of study and it was statistically significant (p<0.001).

Blood Pressure: The mean systolic blood pressure in the preeclamptic group was 174.14 ± 23.23mmHg, while that of the normotensive group was 115.29 ± 19.13mmHg; (p= <0.001). The mean diastolic blood pressure in the preelamptic group was 113.00 ± 14.66mmHg and that of the normotensive group was 74.71 ± 11.44mmHg and the difference was statistically significant (p= <0.001).

There were more cases of severe preeclampsia than mild preeclampsia, 48 (68.6%) and 22(31.4%) respectively.

Table 2 showed the Platelet Count, MPV, PDW and PLCR in preeclamptics and normotensive pregnant women.

There were statistically significant differences in all the platelet indices between the preeclamptic and normotensive pregnant women. Apact from the main platelet count that was lower in the preeclamptic group all other indices were higher in the women with preeclampsia than those without the disease. Mean platelet count (155.47 ± 38.68 x 10^3/µL vs. 232.51 ± 53.79 x 10^3/µL; p<0.001), MPV (11.88 ± 1.05fl vs. 10.77 ± 1.22fl; p<0.001), PDW (15.53 ± 2.28fl vs. 13.94 ± 2.25fl; p<0.001) and the PLCR (39.89 ± 7.73% vs. 31.81 ± 7.97%; p<0.001).

Table 3 showed the comparison of platelet indices in normotensive women and severity of disease in preeclamptics.

This table described the platelet indices of normotensive women and those with mild and severe preeclampsia. It was found that platelet count declined with severity of preeclampsia, while MPV, PDW and PLCR elevated as disease severity increased. The differences in the platelet indices in the three groups were statistically significant. The mean platelet count declined across normotensive, mild, and severe preeclamptic groups respectively as follows; 232.51 ± 53.79 x 10^3/µL, 181.68 ± 44.42 x 10^3/µL and 143.46 ± 29.09 x 10^3/µL. The mean MPV increased from the normotensive category, through mild preeclampsia and severe preeclampsia; 10.77 ± 1.22fl, 11.24 ± 0.92fl and 12.19 ± 0.97fl respectively. The mean PDW was 13.94 ± 2.25fl, 14.99 ± 2.22fl and 15.78 ± 2.29fl for the normotensive, mild preeclampsia and severe preeclampsia respectively. While the PLCR was 31.81 ± 7.97%, 39.27 ± 7.90% and 40.19 ± 7.72% for the normotensive, mild preeclampsia and severe preeclampsia respectively. The differences were significant for all the indices (p<0.001).

Table 1: Socio-Demographic Variables, Booking Status Gravidity and Blood Pressure Measurements of Study Participants

Variable	Group		Total	χ^2/t	*p* value
	Preeclamptic n = 70 (%)	Normotensive n = 70 (%)			
Age group (years)					
< 25	18 (25.7)	10 (14.3)	28 (20.0)	5.467	0.243
25 – 29	26 (37.1)	21 (30.0)	47 (33.6)		
30 – 34	16 (22.9)	25 (35.7)	41 (29.3)		
35 – 39	8 (11.4)	11 (15.7)	19 (13.6)		
≥ 40	2 (2.9)	3 (4.3)	5 (3.6)		
Mean ± SD	28.16 ± 4.62	29.59 ± 4.92		-1.776[t]	0.078
Range	22 - 40	22 – 43			
Marital status					
Single	7 (10.0)	0 (0.0)	7 (5.0)	5.414[Y]	0.020*
Married	63 (90.0)	70 (100.0)	133 (95.0)		
Education					
None	7 (10.0)	1 (1.4)	8 (5.7)	15.403[Y]	0.002*
Primary	9 (12.9)	1 (1.4)	10 (7.1)		
Secondary	21 (30.0)	12 (17.1)	33 (23.6)		
Tertiary	33 (47.1)	56 (80.0)	89 (63.6)		
Employment status					
Unemployed	24 (34.3)	21 (30.0)	45 (32.1)	18.789	<0.001*
Self employed	40 (57.1)	22 (31.4)	62 (44.3)		
Employed	6 (8.6)	27 (38.6)	33 (23.6)		
Religion					
Christianity	15 (21.4)	14 (20.0)	29 (20.7)	0.043	0.835
Islam	55 (78.6)	56 (80.0)	111 (79.3)		
Ethnicity					
Yoruba	53 (75.7)	59 (84.3)	112 (80.0)	8.223[Y]	0.042*
Hausa	11 (15.7)	1 (1.4)	12 (8.6)		
Igbo	2 (2.9)	6 (8.6)	8 (5.7)		
Others	4 (5.7)	4 (5.7)	8 (5.7)		
Gravidity					
1	19 (27.1)	15 (21.4)	34 (24.3)	0.674	0.714
2 – 4	39 (55.7)	41 (58.6)	80 (57.1)		
> 4	12 (17.1)	14 (20.0)	26 (18.6)		
Booking status					
Booked	21 (30.0)	59 (84.3)	80 (57.1)	42.117	<0.001*
Unbooked	49 (70.0)	11 (15.7)	60 (42.9)		
Blood Pressure					
SBP(mmHg)	174.14 ± 23.23	115.29 ± 19.13		16.289	<0.001*
DBP(mmHg)	113.00 ± 14.66	74.71 ± 11.44		17.156	<0.001*
MAP(mmHg)	170.99 ± 20.02	113.10 ± 16.80		18.450	<0.001*

χ^2: Chi square test, [Y]: Yates corrected, t: Independent samples T test, *: *p* value < 0.05 (statistically significant) SBP: Systolic blood pressure, DBP: Diastolic blood pressure, MAP: Mean arterial pressure

Table 2: Platelet Count, MPV, PDW and PLCR in Preeclamptics and Normotensive Pregnant Women

Variable	Preeclamptic	Normotensive	T	*p* value
Platelet Count (x 10^3/µL)				
Mean ± SD	155.47 ± 38.68	232.51 ± 53.79	-9.603	<0.001*
Range	109 - 254	150 – 365		
MPV (fl)				
Mean ± SD	11.88 ± 1.05	10.77 ± 1.22	5.622	<0.001*
Range	9.5 – 13.7	8.1 – 12.6		
PDW (fl)				

Mean ± SD	15.53 ± 2.28	13.94 ± 2.25	4.003	<0.001*
Range	10.4 – 19.3	9.9 – 20.0		
PLCR (%)				
Mean ± SD	39.89 ± 7.73	31.81 ± 7.97	5.911	<0.001*
Range	20.9 – 52.3	14.2 – 46.7		

t: Independent samples T test, *: *p* value < 0.05 (statistically significant)

Table 3: Comparison of Platelet Indices in Normotensive Women and Severity of Disease in Preeclamptics

Variable	Normotensive	Mild Pre-eclampsia	Severe Pre-eclampsia	F	*p* value
Platelets Count (x 10^3/µL)					
Mean ± SD	232.51 ± 53.79	181.68 ± 44.42	143.46 ± 29.09	55.013	<0.001*
Range	150 – 365	109 – 254	109 – 248		
MPV (fl)					
Mean ± SD	10.77 ± 1.22	11.24 ± 0.92	12.19 ± 0.97	22.738	<0.001*
Range	8.1 – 12.6	9.5 – 13.7	9.5 – 13.7		
PDW (fl)					
Mean ± SD	13.94 ± 2.25	14.99 ± 2.22	15.78 ± 2.29	8.986	<0.001*
Range	9.9 – 20.0	10.4 – 19.2	10.4 – 19.3		
PLCR (%)					
Mean ± SD	31.81 ± 7.97	39.27 ± 7.90	40.19 ± 7.72	17.466	<0.001*
Range	14.2 – 46.7	22.4 – 52.3	20.9 – 52.3		

F: Analysis of Variance (ANOVA), *: *p* value < 0.05 (statistically significant)

IV. DISCUSSION

The disproportionate increase in plasma volume associated with pregnancy results in a haemodilution and therefore, lower platelet level.[21] Further changes in platelet indices are seen in preeclampsia. This study compared the platelet indices in normotensive pregnant women and those with preeclampsia. It was found that platelet indices were significantly different in the preeclamptics compared to the normotensive controls. However, there were varying degrees of association of platelet indices with severity of preeclampsia.

In this study, platelet indices of 70 participants each in the preeclamptic and normotensive groups were analyzed. The mean platelet count in the preeclamptic group was significantly lower than in the normotensive group while the MPV, PDW and PLCR were significantly higher in the preeclamptic group than the normotensive group.

The mean platelet count in the normotensive group in this study agreed with reports from other parts of Nigeria and also lower than non-pregnant values by some authors.[10,22,23] Similarly, the mean values of MPV and PDW were also consistent with findings of other authors which were higher than values in non-pregnant women.[13,22,24] However, The PLCR of the normotensive group was found to be higher than findings of Ammar et al and Biva et al in Egypt and India respectively and consistent with elevation in pregnancy.[24,25] This was as a result of bone marrow compensation for the rapid turnover of platelets; the release of younger and larger platelets which increase MPV, PDW and PLCR, which were indices of measurements of average platelet size.[26] Differences in sample size, number of controls and type of haematological autoanalyzer may explain the little difference in mean PLCR in this study and other reports.[24,25] Hence, it is important to have baseline values of platelet indices in our environment so as to serve as reference values and also using appropriate study designs that are multicentered with large sample sizes wound be of help.

The mean platelet count in preeclamptics was significantly lower than the mean value in the controls. This was similar to findings of Onuigwe et al in Sokoto, Ammar et al in Egypt, Sultana et al in Bangladesh and Amita et al in India.[10,13,17,24] However, Santos et al in Turkey found no significant difference.[27] The further significant reduction in platelet count in preeclamptics could be linked to increased production of thromboxane A_2 that induces supplementary platelet aggregation and endothelial damage, contributing to platelet dysfunction and promoting platelet consumption resulting in low platelet count, which is an important sign of preeclampsia.[28]

The mean MPV for the preeclamptic group was significantly higher than in the normotensive group. This was in agreement with findings in similar studies.[24,27] However, Studies by Amita et al and Ceyhan et al though found increase in MPV in preeclamptics, but were not statistically significant.[13,29] These studies used varying sample sizes and some were multicentred based studies compared to what was obtained in this study. Bone marrow produces and releases large platelets due to increased consumption of platelets leading to increase MPV in preeclampsia.[13]

The mean PDW in the preeclamptic group was significantly higher than in the normotensive group, similar to study by Ammar et al in Egypt, and other similar studies.[13, 24,30] The increase in PDW was due to platelet turnover which would support the fact that platelet survival time was decreased leading to increased destruction of platelets.[13]

The mean PLCR was significantly lower than mean value of normotensive controls. This finding was similar to study by Ammar et al in Egypt.[24]

Furthermore, comparison of mean platelet counts in normotensive women and mild to severe preeclamptics showed a significant inverse relationship between the count and degree of severity. This is in agreement with other similar studies.[14,24] This was due to the fact that the platelet numerical and functional anomalies worsen with the severity of the disease.[28]

The mean MPV in normotensive women and those with mild and severe preeclampsia showed increasing values from normotensive ones to severe preclamptics. This proportionate increase with degree of severity was similar to findings of Ammar et al in Egypt, but different from reports of Amita et al probably because of the differences in gestational age, Amita et al used cases at earlier gestational age.[13,24] In the same vein, mean PDW and PLCR also increased with severity of disease. This was consistent with findings from earlier studies.[13,24]

V. CONCLUSION:

Apact from the pletelet count that was lower in preeclamptic participants all other platelet indices were significantly higher in preeclamptic participants than their normotensive counterparts.

VI. RECOMMENDATIONS

1. Close monitoring should be ensured in the preeclamptics with suggestive platelet indices results.
2. Multicenter studies in platelet indices in normal pregnancies and preeclamptics should be carried out to establish the reference values in this environment.
3. Further studies should be carried out to determine the prognostic values of each platelet indices.
4. Studies on serial platelet indices in pregnancy should be carried out to establish reference values across trimesters.

REFERENCES

[1]. Miller DA. Hypertension in Pregnancy. In Decherny AH, Lauren N, Laufer N, Roman SA (eds). Current Diagnosis and Treatment Obstetrics and Gynaecology. 11th edition. New York: McGraw Hill; 2013. 454-464.

[2]. Vanderjagt DJ, Patel RJ, El-Nafaty AU, Melah GS, Crossey MJ, Glew RH. High-density lipoprotein and homocysteine levels correlate inversely in preeclamptic women in northern Nigeria. Acta obstet Gynecol Scand. 2004; 83(6):536-542.

[3]. Centre for Maternal and Child Enquiries. Saving Mothers' Lives: Reviewing Maternal Deaths to Make Motherhood Safer: 2006–08. The Eighth Report on Confidential Enquiries into Maternal Deaths in the United Kingdom. BJOG 2011; 118(Suppl 1):201–203.

[4]. World Health Organization; Maternal mortality. Fact sheet N°348, May 2014.

[5]. Lim KH, Steinberg G. Preeclampsia. 2009. e-medicine, http://emedicine.medescape.com/article/ 1476919 (accessed 04 January 2017).

[6]. Brown MA, Zeeman GG, Steyn W, Sibai BM, Roberts J, Magee L, et al. Pregnancy Hypertension. Int J Womens Health. 2014; 4(2): 97–104.

[7]. Sibai BM. Hypertension. In: Gabbe SG, Niebyl JR, Simpson JL. Obstetrics - Normal and Problem Pregnancies. 5th ed. Philadelphia: Elsevier Churchill Livingstone; 2007: 253-257.

[8]. Vrunda JK, Shaila S. Lowered Platelet Count: A Prognostic Index in Pregnancy Induced Hypertension. J Obstet Gynecol Ind. 2004; 54(3): 235-236.

[9]. Osungbade KO, Ige OK. Public Health Perspectives of Preeclampsia in Developing Countries: Implication for Health System Strengthening. J Pregnancy. 2011; 15:1-6. doi:10.1155/2011/481095.

[10]. Onuigwe FU, Udoma FP, Dio A, Abdulrahaman Y, Erhabor O. Platelet Count in Women with Pregnancy Induced Hypertension in Sokoto, North Western Nigeria. J Obstet Gynaecol Res. 2015; 3(1): 1-4.

[11]. Mutter AS, Walter PK. Molecular Mechanism of Preeclampsia. Microvascual Research 2009; 75: 1-8.

[12]. Jason JS, Waugh S, Maria S. Hypertensive Disorders. In: Edmonds DK (ed). Dewhurst textbook of Obstetrics and Gynaecology. 8th ed. London: Wiley-Blackwell. 2012; 101-110.

[13]. Amita K, Nithin KH, Shonha SN, Vijay S. The Role of Platelet Parameters as a Biomaker in the Diagnosis and in Predicting the Severity of Preeclampsia. IJPO. 2015; 2(2): 57-60.

[14]. Sameer MA, Meshram DP, Desphande SA, Sadhu D, Pandit S. Role of Platelet Count as an Important Prognostic Marker in Pregnancy Induced Hypertension. IOSR-JDMS. 2014; 13(4): 39-43.

[15]. Vinod PT, Ramachandra GL. Prognostic Significance of Platelet Count in Pregnancy Induced Hypertension. IJCAP. 2015; 2(4): 204-207.

[16]. Solomon CG, Seely EW. Preeclampsia – Searching for the Cause. N Eng J Med. 2004; 350(7): 641-642.

[17]. Sultana R, FazlulKarim SM, Atia F, Ferdousi S, Ahmed S. Platelet Count in Preeclampsia. J. Dhaka Natl Coll Hos. 2012; 18(2): 24-26.

[18]. Alkholy EA, Farg EA, Behery MA, Ibrahim MM. The Significance of Platelet Count, Mean Platelet Volume and Platelet Width Distribution in Preeclampsia. AAMJ. 2013; 11(1): 200-214.

[19]. Mohapatra S, Pradhan BB, Satpathy UK, Arati M, Pattnaik JR. Platelet Estimation: Its Prognostic Value in Pregnancy Induced Hypertension. Indian J Physio Pharmacol. 2007; 51(2): 160-164.

[20]. Varkevisser CM, Pathmanatham I, Brownlee A. Designing and Conducting Health Systems Research Projects. Kit Publishers, Amsterdam International Development Research Centre in Association with WHO regional office for Africa. 2003. 216.

[21]. Valera M, Parant O, Vayssiere C, Arnal JO, Payrastre B. Physiologic and Pathologic Changes of Platelets in Pregnancy. Platelets. 2010; 21(8):587-595.

[22]. Pughikumo OC, Pughikumo DT, Iyalla C. Platelet Indices in Pregnant Women in Port Harcourt, Nigeria. IOSR-JDMS. 2015; 14(3): 28-31.

[23]. Akinbami AA, Ajibola SO, Rabiu KA, Adewunmi AA, Dosunmu AO, Adediran A, et al. Haematological Profile of Normal Pregnant Women in Lagos, Nigeria. Int J Women's Health. 2013; 5: 227-232.

[24]. Ammar WAEK, Abd El Hei MAEH, Gehad MH, Mohamed MI. Evaluation of platelet indices and their significance in Preeclampsia. Nature and Science 2014; 12(3): 147-153.
[25]. Biva RM, Debatosh P, Tuhin S, Qudusur R, Sharmeen A. Assessment of Platelet Count and Platelet Indices in Pre-Eclampsia and Eclampsia. AJIRAS. 2015; 1(3): 80-84.
[26]. Vagdatli E, Gounari E, Lazaridou E, Katsibourlia E, Tsikopoulou F, Labrianou I. Platelet Distribution Width: a Simple, Practical and Specific Marker of Activation of Coagulation'. Hippokratia. 2010; 14(1):28-32.
[27]. Santos EV, José MF. Measurement of Platelet Parameters in Normal and Preeclamptic Pregnant Women. Rev Bras Ginecol Obstet 2004; 26:201-206.
[28]. Heilmann L, Rath W, Pollow K. Hemostatic Abnormalities in Patients with Severe Preeclampsia. Clin Appl Thromb Hemost, 2007; 13(3):285-291.
[29]. Ceyhan T, Beyan C, Baser I, Kaptan K, Gungor S, Ifran A. The Effect of Pre-eclampsia on Complete Blood Count, Platelet Count and Mean Platelet Volume. Ann Hematol 2006; 85: 320-322.
[30]. Annam V, Sriivasa K, Yatnatti SK, Suresh DR. Evaluation of Platelet Indices, Platelet Count and Their Significance in Preeclampsia and Eclampsia. Int J Biol Med Res. 2011; 2: 425-428.