IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 22, Issue 8 Ser.5 (August. 2023), PP 07-13
www.iosrjournals.org

Assessment Of Platelet Counts In Pregnant Women With Preeclampsia Attending A Tertiary Care Hospital In North-East India.

Majumder I[1], Chakraborty D[2] & Saha S[3]
[1](Dr. Ipsita Majumder, MD Physiology, Senior Resident, Department of Physiology, AGMC, Agartala)
[2](Prof. Dr. Debasish Chakraborty, MD Physiology, Professor, Department of Physiology & Academic in-charge, AGMC, Agartala)
[3](Dr. Satabdi Saha, MD & DNB Physiology, Senior Resident, Department of Physiology, AGMC, Agartala)

Abstract:
Background and Aim*: Preeclampsia is known to be a leading cause of maternal and neonatal death worldwide. It is a multi-system disorder of pregnancy with unknown origin, characterized by development of hypertension to the extent of 140/90mm Hg or more with proteinuria after the 20th week in a previously normotensive and non-proteinuric patient. The fall in the platelet count is most frequent abnormality & is probably due to consumption during low grade intravascular coagulation. The current study aims to evaluate the platelet count in pre-eclampsia and normotensive pregnant women.*
Materials and Methods*: A case control study was conducted in the Department of Physiology, RIMS, Imphal, Manipur among 40 preeclampsia patients and 40 controls (physiological pregnant women). Platelet count was analyzed by Sysmex Hematology Analyzer. Data collected was analyzed using SPSS version 21(IBM). A p value of <0.05 was taken as significant.*
Results*: Mean platelet count in cases was (189 ± 89.7) 10^3/µl and in control group (201.1±62.36) 10^3/µl and the difference was statistically significant (p value: 0.012). Platelet count decreased significantly lower in pregnant women with preeclampsia compared to healthy pregnant women.*
Conclusion*: Patients with preeclampsia are more likely to have significant decrease in platelet count as compared to healthy pregnant women. These changes can be observed at an earlier gestational age than significant rise in BP can be observed. Thus, estimation of platelet count can be considered as an early & simple procedure in the assessment of severity of pre-eclampsia.*
Key Word*: Pre-eclampsia, Platelet count, Thrombocytopenia, Pregnancy.*

Date of Submission: 06-08-2023 Date of Acceptance: 16-08-2023

I. INTRODUCTION

Preeclampsia (PE) is a pregnancy-specific multi-organ syndrome that affects 2% to 8% of pregnancy.[1] The abnormal invasion of placenta and the release of placenta-derived adverse factors during the first trimester are thought to be the main cause of the extensive damage to the maternal endothelium and systemic inflammatory response involving many systems and organs in late pregnancy. To date, there is no effective treatment for PE in addition to the termination of pregnancy. Therefore, a reliable predictor for PE would play an important role in early prevention and intervention. PE can be classified into two degrees, mild PE (mPE) and severe PE (sPE), and there are different treatments and clinical outcomes for each degree. It is necessary to predict the severity of PE for rational gestational management.[2]

Although the average platelet count decreases monotonically in pregnancy, there is an increase in platelet aggregation especially during last 8 weeks of gestation.[3] It has been reported that there can occur significant fall in platelet count from 32 weeks gestation onwards which is partly due to hemodilution and partly due to increased platelet activation and accelerated clearance.Increased consumption of platelets as well as decreased life span in the uteroplacental circulation has been suggested to be the explanation of the reduction in the number of circulating platelets during pregnancy.[4] Platelet count as well as other hemostatic factors return to normal after 6 weeks of delivery.[5] It has been suggested that the alterations in coagulation and fibrinolysis play a role in the pathogenesis of preeclampsia. Thrombocytopenia or decrease in platelet count is the most common hematological abnormality observed in preeclampsia and it may be due to consumption of platelets during abnormal activation of the coagulation system[4]. Platelet count may be used as an early marker for the diagnosis of preeclampsia. After anemia, most common hematological abnormality during pregnancy is thrombocytopenia.[6]

The current study aims to evaluate the platelet count in pre-eclampsia and normotensive pregnant women so as to identify pregnant women at increased risk of developing preeclampsia, thus allowing early intervention to prevent the occurrence of the disorder and improve pregnancy outcomes.

II. MATERIALS AND METHODS

A Hospital based case control study was carried out in the Department of Physiology in collaboration with Department of Obstetrics &Gynaecology, Regional Institute of Medical Sciences (RIMS), Imphal for a period of two years from September 2018 to August 2020.

Study design: Hospital based case control study

Study location: the study was carried out in the Department of Physiology in collaboration with Department of Obstetrics &Gynaecology, Regional Institute of Medical Sciences (RIMS), Imphal

Study Period:Two (2) years, September 2018-August 2020.

Sample size: 80 participants.

Sample size calculation: A purposive sampling was done. It is a matched case control study, so gestational age matched normal pregnant women were enrolled for each case of pre-eclamptic pregnant women and case to control ratio is (1:1). Sample size based on the previous data from the study of Chauhan P et al[7] was undertaken. The sample size was calculated by using the formula:

$$\frac{(u+v)^2(S_1^2+S_2^2)}{(m_1-m_2)^2}$$

Where: m1 (mean of 1st study population): 222.93
m2 (mean of 2nd study population): 157.18
u=1.28 (power=90)
v= 1.96 (5% level)
S_1= (standard deviation of 1st study population): 97.94
S_2= (standard deviation of 2ndstudy population): 56.66

Study population: The study population was divided into two groups as follows:

- Case group consisted of known 40 cases of pre-eclampsia> 20 weeks gestation belonging to age group of 18-45 years attending Obstetrics out-patient department and in-patient antenatal ward, RIMS, Imphal.
- Control group consisted of 40 normal pregnant women > 20 weeks gestation belonging to age group of 18-45 years attending, Obstetrics OPD.

Inclusion Criteria:

- Controls: Normal healthy pregnant women in the range of 18 – 45 years of age and >20 weeks gestation for control group.
- Cases: Diagnosed case of preeclampsia having fulfilled the following diagnostic criteria:
- Maternal systolic blood pressure ≥ 140mmHg or diastolic blood pressure ≥ 90 mmHg measured at resting for two times at 4- hour intervals after 20 weeks of gestation in a previously normotensive woman.
- Proteinuria based on either measurement of ≥300mg per 24-hour urine collection or at least one positive dipstick reading.

Exclusion criteria:

- History of thyroid dysfunction, cardiovascular disease, diabetes mellitus, chronic hypertension, chronic liver disease, and chronic renal disease
- History of intake of any medication that might affect platelet function.
- Pregnant women of age <18 years &>45years.
- History of multiple gestations.
- History of intake of any antihypertensive drug.

Study variables:

- SBP
- DBP
- Weight
- Height

- Platelet count

Study tools:

1. Samsung LABGEOHC10HematologyAnalyzer.
2. Mercury Sphygmomanometer-Diamond, Industrial Electronic & Allied Products, Pune, India.
3. Stethoscope-Littmann quality, 113H39682, Made in USA.
4. Weighing machine (Victoria DX, Ramon surgical co.ltd. Delhi)

Procedure: All the subjects for the study were explained about the nature and purpose of the study. Those subjects willing to participate in the study were included after obtaining informed consent.

The subjects had undergone detailed general physical and systemic examination. Physical examination of all the subjects included measurement of height in centimeters, weight in kilograms, recording of pulse rate by palpating the radial artery and blood pressure recording with mercury sphygmomanometer using appropriate sized cuff. Clinical examination of the cardiovascular system and respiratory system was done. The findings of the examination were recorded in proforma.

Blood sample collection:

a. Blood samples of 2ml were drawn from the antecubital vein with aseptic precaution from each subject after taking prior consent.

b. Then blood was collected in a sterile vial with EDTA for investigation of platelet indices which was analyzed by Samsung LABGEOHC10Hematology Analyzer.

Statistical analysis:

Data were entered and analyzed using IBM SPSS statistics version 21 for windows. Data were summarized using descriptive statistics like percentages for categorical data, means (standard deviation) and median for continuous data. Student's t- test was used for data analysis with normal distribution. A p value of < 0.05 was taken as significant.

III. RESULT

The study included 80 participants, 40 preeclampsia patients were included as cases and 40 normal healthy pregnancy of same gestational age were included as controls. Figure 1 shows the age distribution of the participants. The minimum age of the participants was 18 years and maximum age was 45 years with a mean age of 23.5±5.49 years in the case group and 27.89±8.55 in the control group. Majority of the participants belong to the age group of 18-25 years (51.7%) in case group and in control group belong to the age group of 26 -35years (54.4%.) Difference observed was found to be statistically significant (p<0.05).

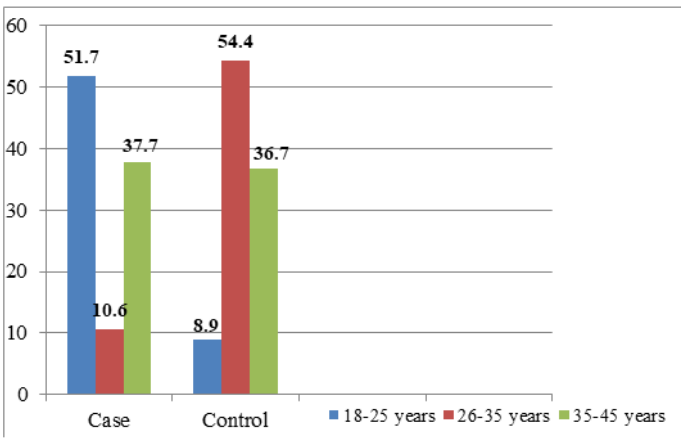

Fig 1: Age distribution of the participants (N=80)

Figure 2 shows Case group having higher SBP (156 ± 10) mmHg and higher DBP (96.6±5.6) mmHg compared to the control group SBP (110 ± 12) mmHg, DBP (76±10) mmHg. Difference observed was found to be statistically significant (p<0.05).

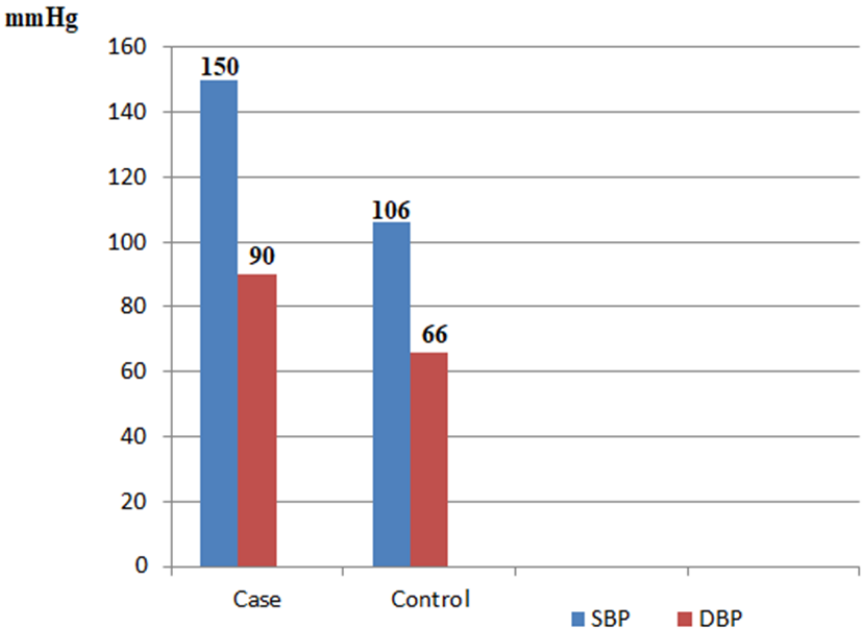

Figure 2. Blood pressure of the participants (N=80)

Figure 3 shows case group having higher BMI (31.6 ± 7.21) kg/m2 compared to the control group (28.14 ± 8.4)kg/m2.Difference observed was found to be statistically significant (p<0.05).

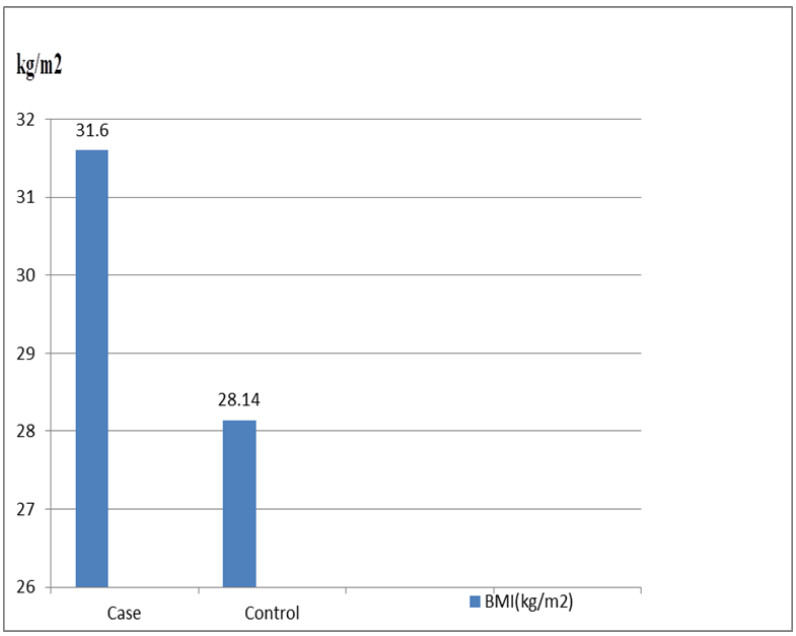

Figure 3. BMI of the participants (N=80)

Figure 4 shows that Mean platelet count of the control group (201.1± 62.36)10 ^{3}/µl was more than cases (189 ± 89.7) 10 ^{3} /µl. Difference observed was found to be statistically significant (p<0.05)

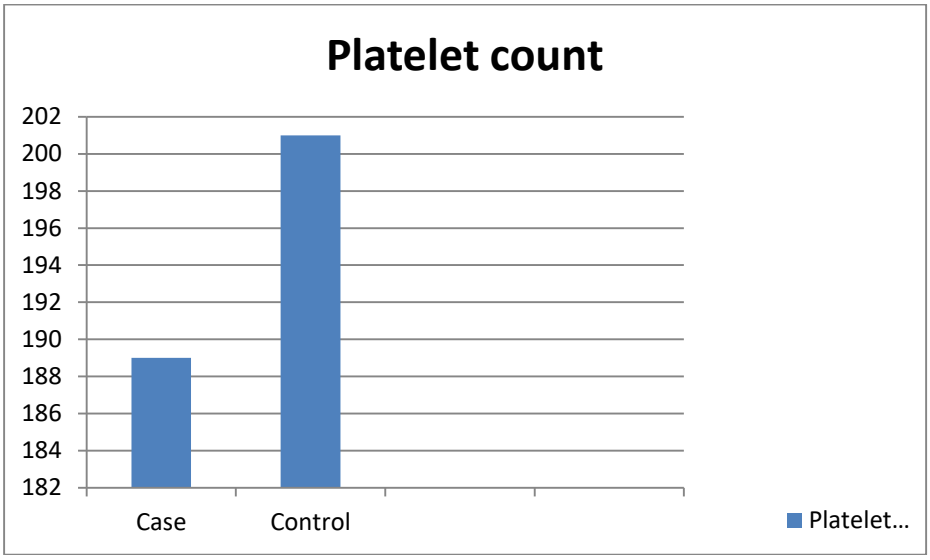

Figure 4. Mean platelet count of the participants

Table1. shows the baseline characteristics of case and control groups. The cases had a mean age of 23.5 years, mean BMI of 31.6,mean gestational age of 31.2 week, mean SBP of 156 mmHg, mean DBP of 96.6mmHg. The controls had a mean age of 27.89 years, , mean BMI of 28.14, mean gestational age of 28.6 week, mean SBP of 110 mmHg, mean DBP of 76mmHg.

Parameters	Study group(n = 40) Mean ± SD	Control group(n = 40) Mean ± SD	P value
Age (years)	23.5±5.49	27.89±8.55	0.033
BMI(kg/m2)	31.6±7.21	28.14±8.4	0.06
Mean GA wk	31.2±6.2	28.6±7.5	0.01
SBP (mmHg)	156±10	110±12	0.028
DBP (mmHg)	96.6±5.6	76±10	0.017

Table 1. Baseline variables of the study & control group

Table 2. shows outcome parameters between case & control group. In case group, mean platelet count was $1.89x10^3$/µl, mean neutrophil is 79.4 %, mean lymphocyte is 19.2%, mean haemoglobin was 11.1 g/dl, mean haematocrit was 35.4%,mean red cell distribution width was 17.14 %. In control group, mean platelet count was $2.01x10^3$/µl, mean neutrophil was 70.0 %, mean lymphocyte was 25.2%, mean haemoglobin was 12.2 g/dl, mean haematocrit was 34.3%, mean red cell distribution width was 16.19 % & all of their p-value was significant(<0.05).

Variable	Study group (n=40) Mean ± SD	Control group (n=40) Mean ± SD	P value
Neutrophils, (%)	79.4 ± 9.7	70.0 ± 6.4	0.033
Lymphocytes, (%)	19.2 ± 9.3	25.2 ± 6.5	0.042
Haemoglobin, g/dL	11.1 ± 2.3	12.2 ± 3.1	0.642
Hematocrit, %	35.4 ± 2.32	34.3 ± 2.4	0.3471
Red cell distribution width , %	17.14 ± 2.7	16.19 ± 2.0	0.025
Platelet count, × 10^3/µl	189 ± 89.7	201.1 ± 62.36	0.012

Table 2. Comparison of outcome variables of the study & control group

IV. DISCUSSION:

Hypertension is one of the most common obstetric problems seen in pregnant women.[8]In most of patients, the clinical appearance is mild, presenting only with small increase in blood pressure or protein in the urine.[9] The obstetrician relies solely, upon laboratory tests for the management of pregnant women. The estimation of platelet indices is a reliable method.[10]In this study an attempt has been made to assess the role of platelet count in normotensive pregnant women with pre-eclampsia patient.

In my present study, meanplatelet countin patients with pre-eclampsia was significantly lower compared with the control group and the (p value-0.012).No significant differences between the two groups

were observed forhemoglobin (p value- 0.642). No significant differences between the two groups were observed for hematocrit(p value-0. 3471). In the present study, platelet count was significantly lower in women with pre- eclampsia compared with controls. Platelet activation plays an important role in the pathogenesis of pre- eclampsia and might manifests as low platelet count.The results of the present study were similar to those of Woldeamanuel GG et al, who also concluded that statistically significant decrease in platelet count was observed in patients with pre- eclampsiairrespective of severity and presence or absence of associated complications, even before the onset of preeclampsia and in the second trimester of pregnancy.[11]Kaur S et al conducted a study to monitor hematological parameters during pregnancy. In that study they found that average platelet count decreases monotonically in pregnancy, there is an increase in platelet aggregation especially during last 8 weeks of gestation. They also found a significant fall in platelet count from 32 weeks gestation onwards. They alsosuggested that increased consumption of platelets as well as decreased life span in the uteroplacental circulation could be the reason behind the reduction in the number of circulating platelets during pregnancy.[12]

Priyadarshini GP et al conducted a cross sectional study to compare the coagulation parameters in the patients with preeclampsia and normal pregnant women. Their study was comprised of 100 pregnant women with preeclampsia in age group 18-35years. A significant decline in platelet count with increase in PT, aPTT, BT& CT was seen in preeclampsia as compared to normal pregnancy. They also concluded from the study that total platelet count estimation can be taken as an early and rapid procedure for screening preeclampsia cases at admission followed by serial platelet counts while monitoring coagulation indices.[13]

Chauhan P et al conducted a study to compare the coagulation parameters in patients with preeclampsia and eclampsia with normotensive pregnant patients. In pre-eclampsia and eclampsia, decrease in platelet count (157.18±56.66 lacs/cumm) was highly significant ($p<0.001$). PT, aPTT and CT were normal but BT (322.46±171.39 sec) was significantly prolonged ($p<0.001$) in pre eclampsia and eclampsia patients. They found that the Platelet count was significantly decreased while bleeding time was found to be significantly increased in patients with pre eclampsia and eclampsia.[7]

Mohammed FE et al found a marked decline in platelets in pre-eclampsia and eclampsia groups in their study and this decline was directly proportional to the severity of the hypertension. The MPV, PDW values were elevated proportionally with the severity of pre-eclampsia when compared to the control group.[14]

Abass AE et al conducted a case control study in 87 pregnant women with 28 weeks gestation. Their study revealed mean platelet counts of the PE group were lower than normal group, thrombocytopenia was observed in about third of the total included cases of PE. They also observed that platelet numbers were inversely related to the severity of pregnancy induced hypertension.[15]

Dadhich S et al conducted a retrospective study among 200 pregnant woman, out of which 26 developed preeclampsia & among 26 preeclampsia 23 was mild & 3 was severe preeclampsia. Patient with preeclampsia had significant decrease in platelet count, increase in platelet distribution width & increase in mean platelet volume in comparison to normotensive counterparts.[16]

Gogoi P et al concluded that platelet activation plays an important role in the pathogenesis of pre-eclampsia and manifests as low platelet count, high MPV, and increased plasma concentration of other platelet factors in pre- eclampsia. In cases of thrombocytopenia, an intensified platelet activation state most likely occurs before the onset of pre- eclampsia. They concluded that it can be used as a screening test for pre- eclampsia.[17]

Findings of the above mentioned studies are in favor of the findings of the present study. Platelet activation plays an important role in the pathogenesis of pre- eclampsia and manifests as low platelet count. Regular assessment of platelet count is therefore necessary for early diagnosis and proper management of the patients with preeclampsia.

V. CONCLUSION

Patients with preeclampsia are more likely to have rapid and significant decrease in platelet count in comparison to the normotensive counterparts. These significant changes can be observed at an earlier gestational age than significant rise in BP can be observed and changes are more significant in patients who are destined to develop progressive severe hypertension. Thus estimation of platelet count seems to be a reliable, rapid, easy and economical method and a potential marker to identify and predict preeclampsia.

References

[1]. Konar H. DC Dutta's Textbook Of Obstetrics. 8thed. New Delhi: Jaypee Brothers;2015.
[2]. Duley L. The Global Impact Of Pre- Eclampsia And Eclampsia. J Semperi 2009;33(3):130-7
[3]. Fay RA, Hughes AO, Farron NT. Platelets In Pregnancy: Hyperdestruction In Pregnancy. Obstet Gynecol. 1983;61:238-40
[4]. Ahmed Y, Van Iddekinge B, Paul C, Sullivan MHF, Elder MG. Retrospective Analysis Of Platelet Numbers And Volumes In Normal Pregnancy And Preeclampsia. Br J Obstet Gynecol. 1993;100:216-20.
[5]. Shehlata N, Burrows RF, Kelton JG. Gestational Thrombocytopenia.Clinobstet Gynecol. 1999;42:327-34
[6]. Khellaf M, Loustau V, Bierling P, Michel M, Godeau B. Thrombocytopenia And Pregnancy. Rev Med Intern. 2012 Aug;33(8):446-52.

[7]. Chauhan P, Rawat U, Bisht V, Purohit RC. Comparison Of Coagulation Profile In Pre-Eclamptic And Eclamptic Patients With Normotensive Pregnant Patients. J Evol Med Dent Sci. 2014;3(1):3208-15.
[8]. George JN, Dale GL (1995) Platelet Kinetics. Williams Hematology. (5th Edn) 1202-05
[9]. Walker JJ, Cameron AD, Bjornsson S, Singer CR, Fraser C (1989) Can Platelet Volume Predict Progressive Hypertensive Disease In Pregnancy? Am J Obstetgynecol 161: 676-79
[10]. Taylor DJ, Lind T (1976) Haematological Changes During Normal Pregnancy: Iron Induced Macrocytosis. Br J Obstetgynaecol. 83: 760-67.
[11]. Woldeamanuel GG, Tlaye KG, Wu L, Poon LC, Wang CC. Platelet Count In Preeclampsia: A Systematic Review And Meta-Analysis. Am J Obstetgynecol MFM. 2023 Apr;1(1):100979.
[12]. Kaur S, Khan S, Nigam A. Hematological Profile And Pregnancy: A Review. Int J Adv Med 2014;1(2):68-70.
[13]. Priyadarshini GP, Mohanty RR. Assessment Of Coagulation Profile And Its Correlation With Severity Of Preeclampsia In Women Of Odisha-A Comparative Cross-Sectional Study. Inter J Basic Applied Physiol.2014 ;3(1)
[14]. Mohammed FE, Khalil HB, Idriss MI, Mohamadeinabdalla TE, Elnomanelbadawi NE. Variations Of Platelets Indices In Pregnancy Induced Hypertension. J Physiobiochemmetab 2013;2(1).
[15]. Abass AE, Abdalla R, Omer I, Ahmed S, Khalid A, Elzein H. Evaluation Of Platelets Count And Indices In Pre-Eclampsia Compared To Normal Pregnancies. J Dent Med Sci. 2016;1(15):5-8.
[16]. Dadhich S, Agrawal S, Soni M, Choudhary R, Jain R, Sharma S, Et Al. Predictive Value Of Platelet Indices In Development Of Preeclampsia. J South Asian Federobstgynae. 2012;4(1):17-21
[17]. Gogoi P, Sinha P, Gupta B, Firmal P, Rajaram S. Neutrophil-To-Lymphocyte Ratio And Platelet Indices In Pre-Eclampsia. Int J Gynaecolobstet2019 ;144(1):16-20.