



Original

“A Study of Red Blood Cells and Platelet Parameters in Pregnancy”

S. Aneeshia¹, P. L. Rajagopal*², K. Premaletha² and S. Dilijit Kuttoor²

¹Department of Medical Laboratory Technology, Academy of Paramedical Sciences, Pariyaram Medical College, Kannur, India

²Department of Pharmacognosy, Academy of Pharmaceutical Sciences, Pariyaram Medical College, Kannur, India

ARTICLE INFO

Received 04 Aug. 2014
Received in revised form 21 Aug. 2014
Accepted 03 Sep. 2014

Keywords:

Red Blood Cells,
Anaemia,
Platelets,
Pregnancy.

Corresponding author: Department of
Pharmacognosy, Academy of
Pharmaceutical Sciences, Pariyaram
Medical College, Kannur, India

E-mail address: just4rajagopal@gmail.com

ABSTRACT

Objective: Normal pregnancy may be complicated by various hematological abnormalities. Thrombocytopenia is the most common platelet disorder in pregnancy. This study is an attempt to assess certain parameters during pregnancy like haemoglobin and packed cell volume, platelet count, mean platelet volume, plateletcrit, prothrombin time and activated partial thromboplastin time.

Methodology: Various analytical techniques like CELL-DYN-3200 and Blood coagulation analyzer were used in the routine examination of blood samples.

Results: It is clearly revealed that both in normotensive and in hypertensive pregnant subjects, there were no significant variation of platelet count and other associated parameters. Even though, physiological anaemia of pregnancy were observed in the case of few study subjects.

© 2014 British Biomedical Bulletin. All rights reserved

Introduction

Pregnant women are susceptible to haematological abnormalities that may affect any women of childbearing age. These include chronic disorders such as hereditary anaemia and immunological thrombocytopenia. Pregnancy associated anaemia is undoubtedly the most common medical complication in pregnancy, affecting an excess of 50% of all pregnant women. The physiologic changes and

cardiovascular adaptations in pregnancy lead to an increase in oxygen consumption, an increase in blood volume and an increase in cardiac output by 30 to 50%. The increase in blood volume is due to increase in both plasma volume and red cell mass. The disproportionate increase in blood volume in relation to the red cell volume results in a fall in erythrocyte, haemoglobin and hematocrit count. The consequence of this



process is physiologic anaemia or hydraemia of pregnancy, which is not a disease, but rather than a symptom that can be reversed in most instances¹.

Platelets are the cytoplasmic fragments of megakaryocytes, produced in bone marrow, circulating as small discs in the peripheral blood. They are responsible for haemostasis and maintaining the endothelial lining of the blood vessels¹. A number of conditions can cause to use up or destroy platelets more rapidly than they are produced leading to a shortage of platelets in the blood stream.

Examples include pregnancy, idiopathic thrombocytopenic purpura and hemolytic uremic syndromes². An abnormally low platelet count in pregnancy is usually associated with gestation is mild and is an incidental finding in asymptomatic women with no other risk factors. Thrombocytopenia in pregnancy can be defined as a platelet count below the lower limit of the non pregnant reference interval and typically less than 1, 50, 000/micro liter³.

Materials and Methods

Source of data

Eighty pregnant women in various trimesters in the department of Obstetrics and Gynaecology of a tertiary care hospital in Kerala were selected for the study. Blood samples from these pregnant women were collected for assessing haematological parameters like haemoglobin (Hb), Packed cell volume (PCV) and platelet parameters like Platelet count, Mean platelet volume (MPV) and Plateletcrit and also for the coagulation study. In addition to this, variations in their blood pressure was also monitored. Pregnant females between the age group 20-40 were included and females suffering from Diabetes mellitus were excluded from the study. The study was

conducted after obtaining the ethical committee clearance (ACME/12/etcl-2008).

Analytical techniques

Blood routine examination

The CELL-DYN-3200 was utilized for the determination of the haematological parameters. In this instrument haemoglobin is measured as Cyanmeth haemoglobin and Red blood cells and platelets are counted and sized by impedance technology¹⁰.

Prothrombin and activated partial thromboplastin time

The blood coagulation analyzer is used for the determination of Prothrombin and Activated Partial Thromboplastin Time. The CA-50 is an automated blood coagulation analyzer that can quickly analyze samples with a high degree of accuracy¹⁰.

Results

Out of eighty pregnant women selected for the study, Seventy one woman has no significant illness and one with an associated illness like systemic lupus erythematosus is and other with mild gestational hypertension that is their systolic blood pressure were greater than 140mm Hg and diastolic blood pressure were less than 110mm Hg.

In the eighty study subjects, the maximum forty were in the age group between 26-30 years and thirty eight subjects were in the second trimester.

Physiological anaemia were seen six of the subjects in the first trimester, eighteen of the subjects in the third trimester and fourteen of the subjects in the second trimester. 50% of the subjects showed decreased haematocrit that is <32%.

A platelet count of all the study subjects including those with mild hypertension were found to be within the

normal range. The MPV was increased for one subject and plateletcrit was above the normal range for six study subjects. PT and APTT of all the eight hypertensive subjects were within the normal range.

Discussions

Pregnancy induces physiological changes that often confuse the diagnosis of haematological disorders and assessment of their treatment. Pregnant women are susceptible to haematological abnormalities that may affect any women of childbearing age, which include chronic disorders like hereditary anaemia and immunological thrombocytopenia⁴.

Anaemia is defined as a condition where, haemoglobin concentration <12gm/dl in nonpregnant women and <10gm/dl during pregnancy. The modest fall in haemoglobin level during pregnancy is caused by a relatively greater expansion of plasma volume compared with the increase in red cell volume. The average expansion of blood volume is 40 to 50%. Women with multiple pregnancies, have a larger increase in blood volume than those with single tons. Because plasma volume increases more than RBC mass, maternal haematocrit falls. This so called physiologic anaemia of pregnancy reaches a nadir at 30 to 34 weeks. Since the RBC mass continues to increase after 30 weeks when the plasma volume expansion has plateaued, the hematocrit may rise somewhat after 30 weeks⁵.

Against the above background the centers for disease control have published guidelines for the diagnosis of anaemia in pregnancy. In the first and third trimesters the lower limit for normality of haemoglobin are 11gm/dl and in the second trimester the lower limit is 10.5gm/dl. The lower limit of packed cell volume in pregnancy period is 32%.

Hypertensive disorders complicating pregnancy are common and form one of the

deadly triad, along with the hemorrhage and infection that contribute greatly to maternal morbidity and mortality. The term gestational hypertension is used now to describe any form of new onset pregnancy related hypertension.

A feature of gestational hypertension is blood pressure $\geq 140/90$ mm Hg for the first time during pregnancy. The blood pressure returns to normal less than 12 weeks postpartum.

Patients with labile or borderline hypertension are several pathophysiologic alterations with elevated cardiac output, central redistribution of blood volume, enhanced activity of the autonomic nervous system, increased left ventricular ejection rate and a normal total peripheral resistance⁶. Chronic hypertension in pregnancy is classified as mild or severe, depending on the systolic or diastolic blood pressure reading.

Affecting approximately 4% of pregnancies, thrombocytopenia is the most frequent haematological complication of pregnancy resulting in consultation. Platelet count generally falls slightly due to hemodilution and increased turnover as gestation progresses. Platelet counts, however should not fall below the normal range. Patients with gestational thrombocytopenia usually present with mild to moderate thrombocytopenia⁹. These patients usually require no therapy. The decrease in platelet count, occurring gestational thrombocytopenia, is not merely due to dilution of platelets with increasing blood volume. It appears to be due to an acceleration of the normal increase in platelet destruction that occurs during pregnancy. This is demonstrated by the fact that the mean platelet volume is increased in patients with gestational thrombocytopenia, but these complications are rarely reported. A study reported by Hart et.al in 1986 showed that, twenty eight of hundred and

sixteen pregnant women who were evaluated prospectively during an eight month period in 1983 had platelet counts less than $1,50,000/\text{mm}^3$ at least once during pregnancy. In all seventeen patients who were followed after delivery, platelet counts return to normal⁴⁻⁶.

Conclusion

In this study both in normotensive and in hypertensive pregnant subjects, there were no significant variation of platelet count and other associated parameters. But physiological anaemia of pregnancy were observed in the case of few study subjects.

Acknowledgement

The authors are thankful to the Principal and staff of the Pariyaram Medical College Hospital, Academy of Pharmaceutical Sciences and Academy of Paramedical Sciences, Kannur, Kerala for providing the essential facilities for the completion of this project.

References

1. Brown RD. Haematology, A review of the last decade. *Aust J Med Lab Sci*, 1998; 9:35-41
2. Rowan RM, Platelet size distribution analysis-Principles, Techniques and Potential Clinical Utility, *Hematology reviews*, 1986;1:109-144.
3. Gulati GL, Hyun BH, Ashton JK, Advances of the past decade in automated hematology, *Am J Clin Pathol*, 1992;4:11-21.
4. Steven G Gabbe, Jennifer R Niebyl, Joe Leigh Simpson, *Obstetrics normal and problem pregnancies*;4th edition, 2007:1170-1173.
5. F.Gary Cunningham, Kenneth J Leveno, Steven L Bloom, John C Hauth, William obstetrics, Mc Graw Hill,22nd Edition: 1995.
6. John P Greer, John Foerster, Wintrobe's Clinical Hematology, Lippincott Williams and Wilkins, 11th edition: 2004.
7. Greinacher A *et al.*, Hereditary types of thrombocytopenia with giant platelets and inclusion bodies in the leukocytes, *Blut*. 1990; 60:53-60.
8. Nelson RB *et al.*, Electronically determined platelets indices in thrombocytopenic patients, *Cancer*, 1981;11:127-135.
9. Geoffery Chamberlain, Fiona Broughton Pipkin. *Clinical Physiology in Obstetrics*, Blackwell science, 3rd edition,1980:75-76.
10. Praful B Godkar, *Text Book of Medical Laboratory Technology*, Bhalani Publishing House, Mumbai, 2003;2:840.

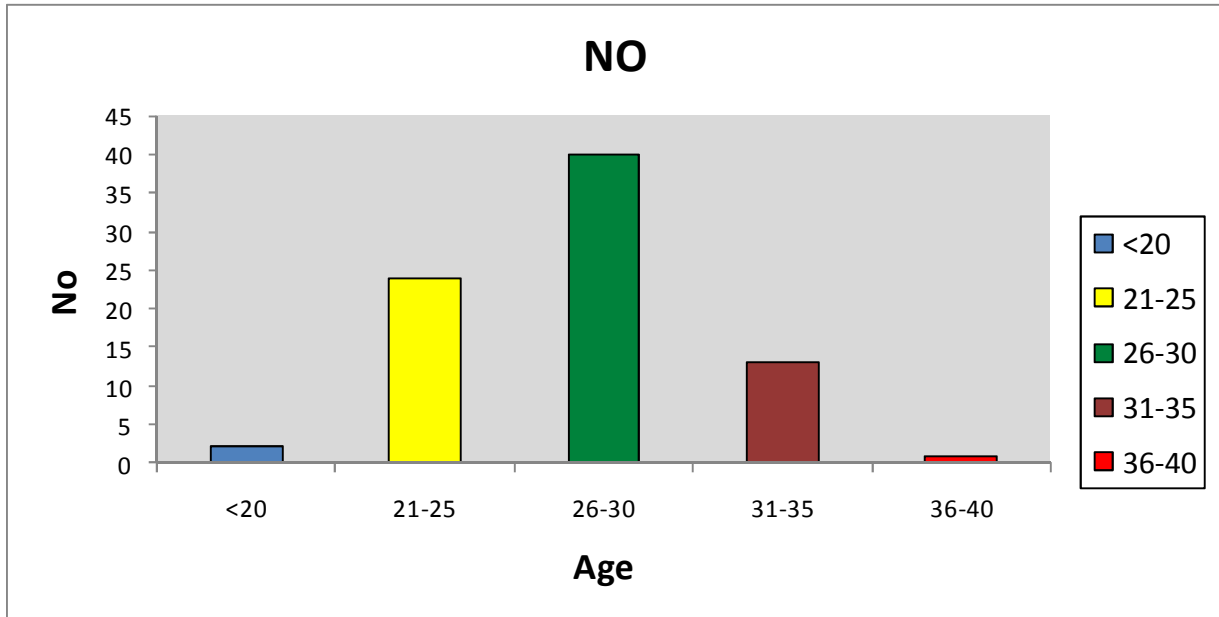


Fig. 1: Distribution of pregnant women in different age groups

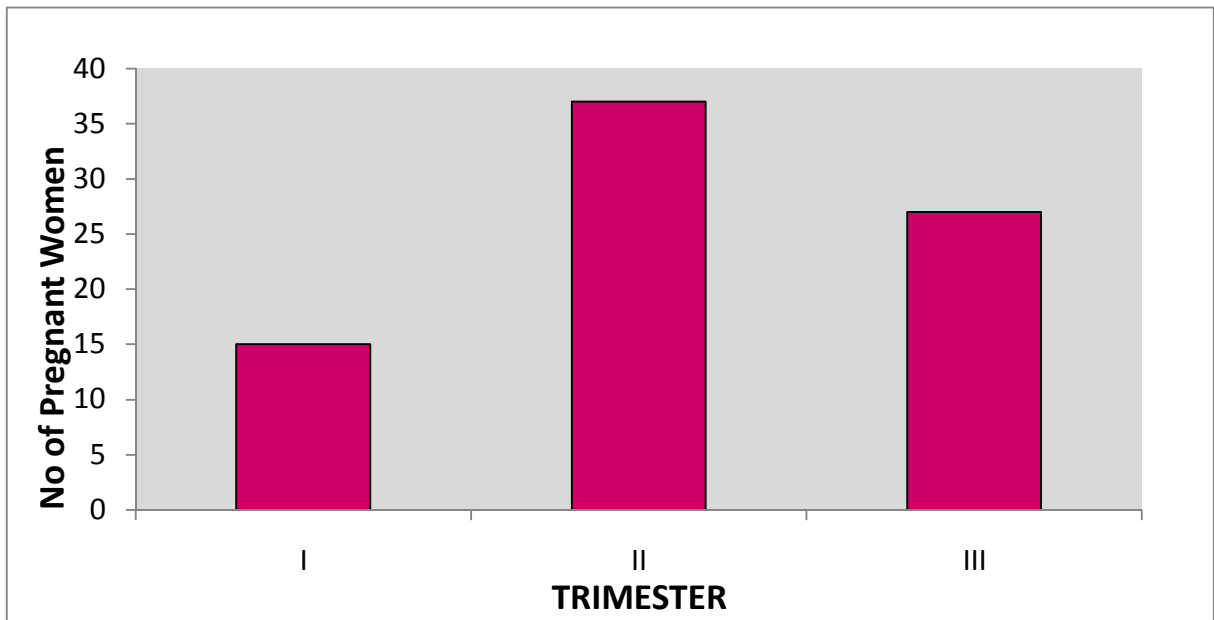


Fig. 2: Distribution of pregnant women in each trimester

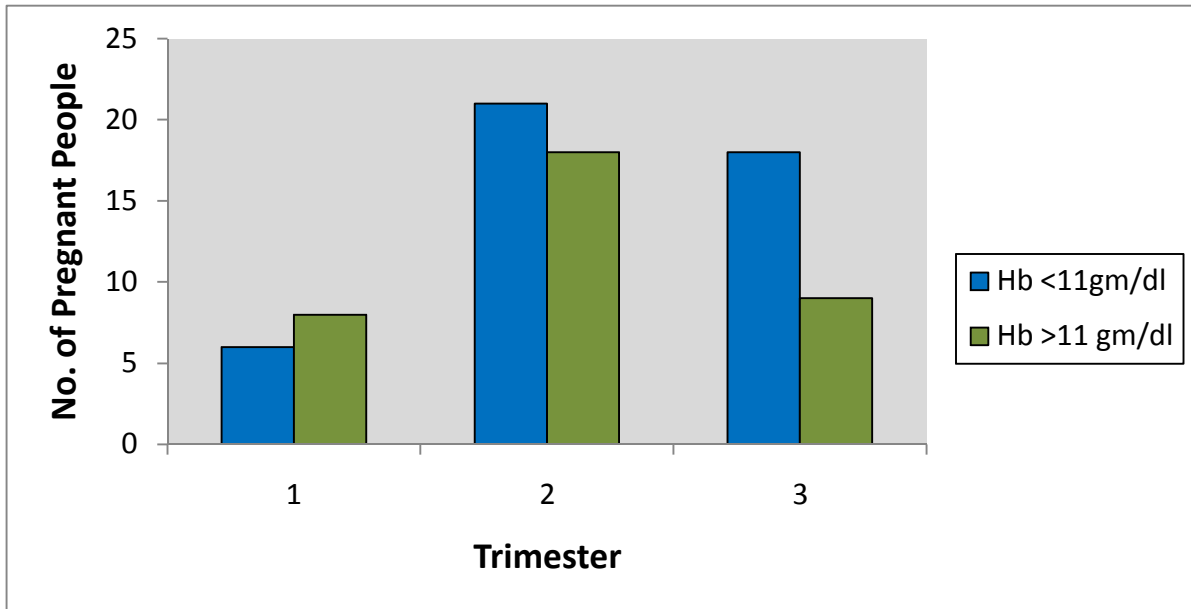


Fig. 3: Distribution of Haemoglobin in various trimesters (<11 gm/dl, >11 gm/dl)

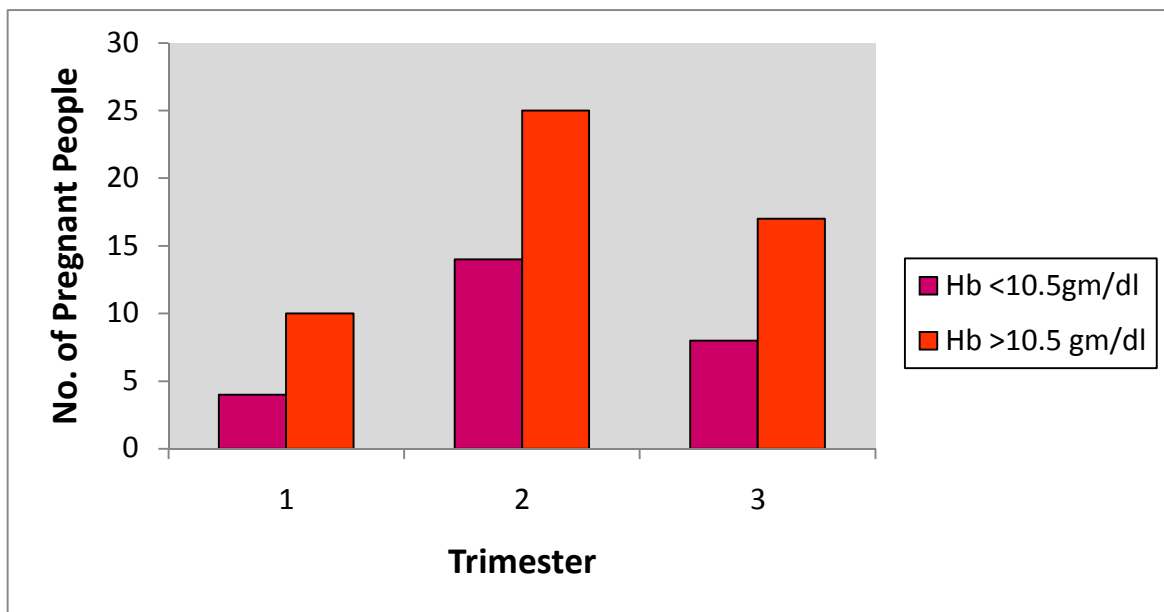


Fig. 4: Distribution of Haemoglobin in various trimesters (<10.5 gm/dl, 10.5 >gm/dl)

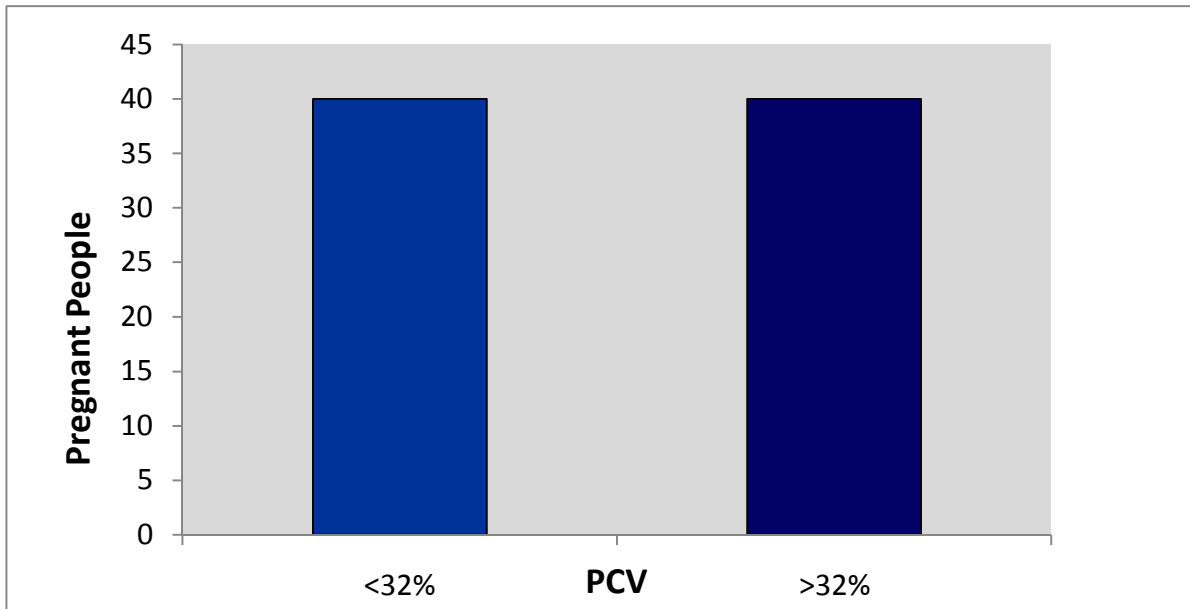


Fig. 5: Distribution of Packed cell volume in pregnancy

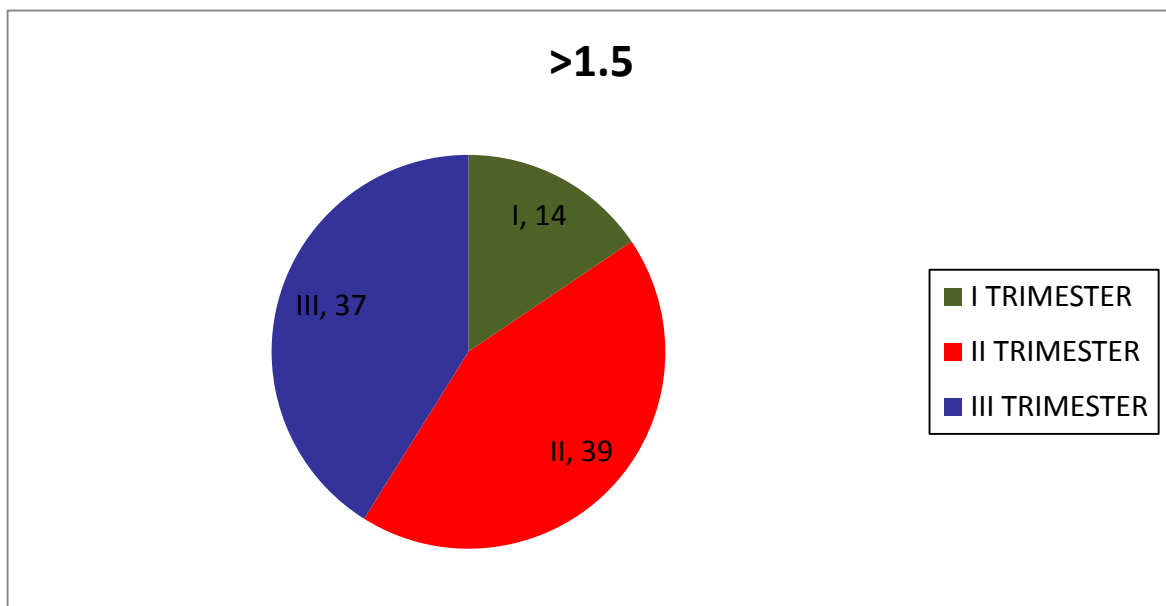


Fig. 6: Distribution of platelet count in each trimester

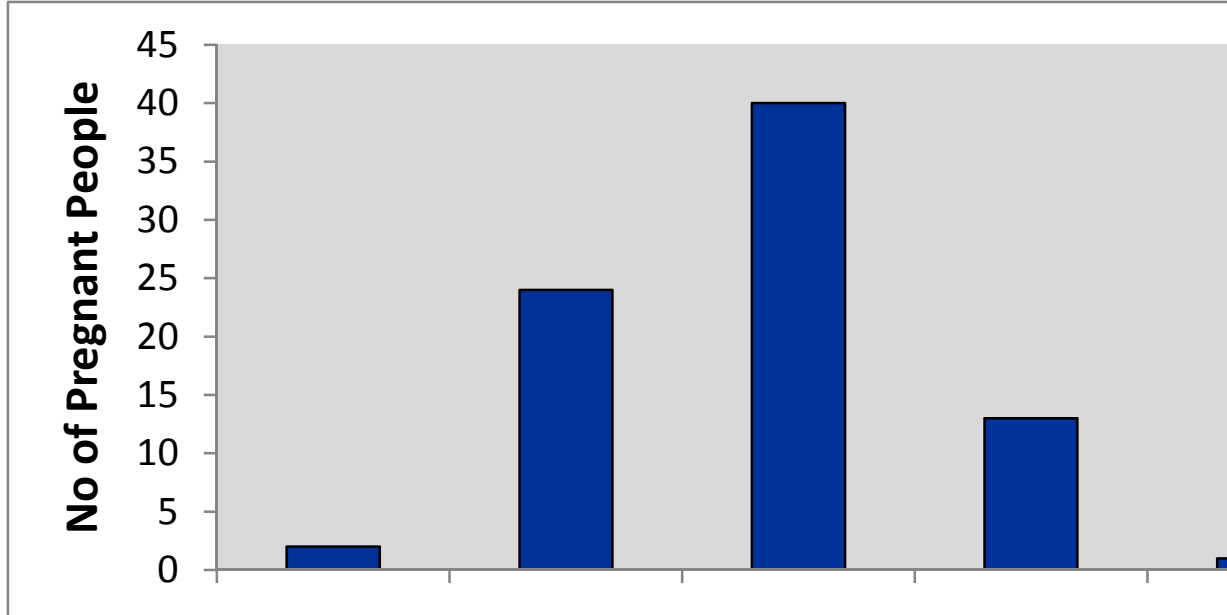


Fig. 7: Distribution of platelet count in various age groups

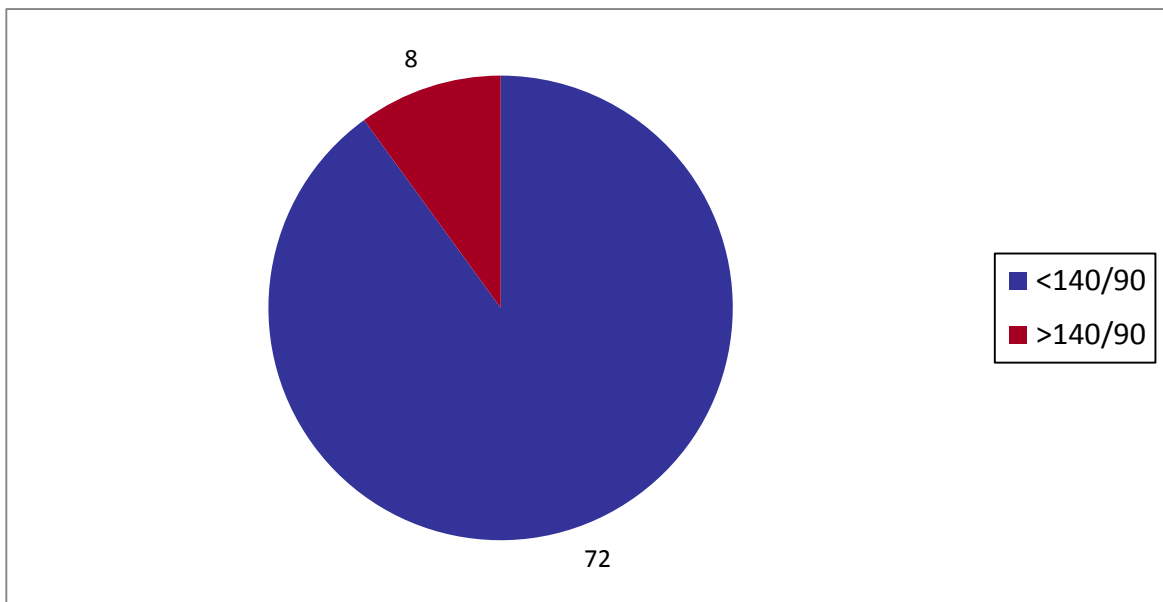


Fig. 8: Distribution of pregnancy induced hypertension in study population

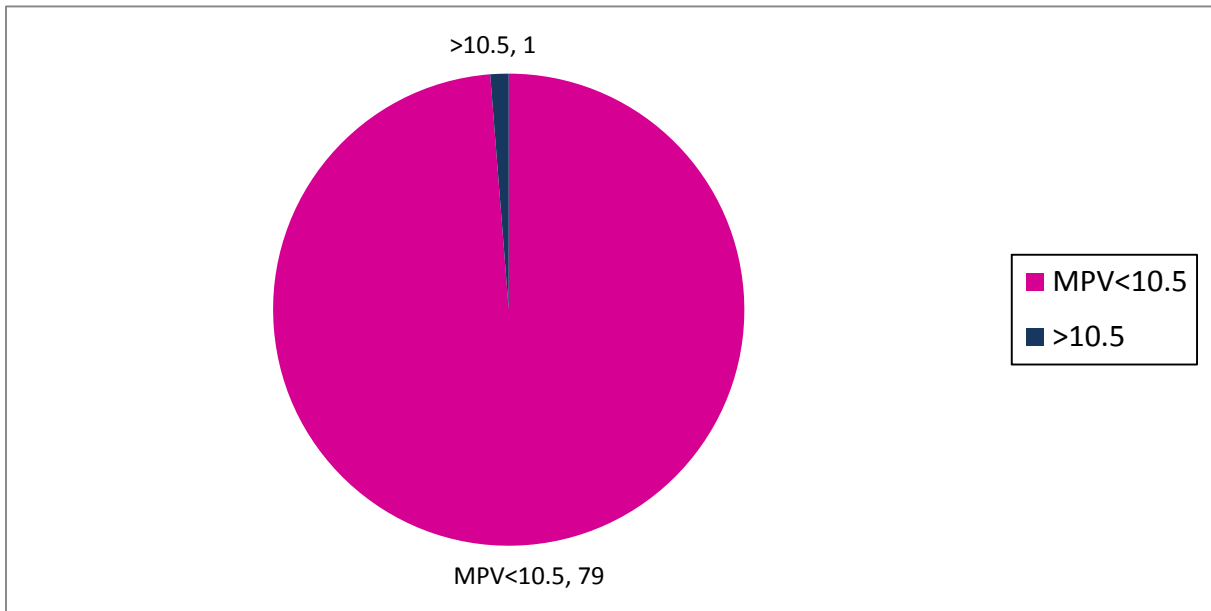


Fig. 9: Frequency of mean platelet volume

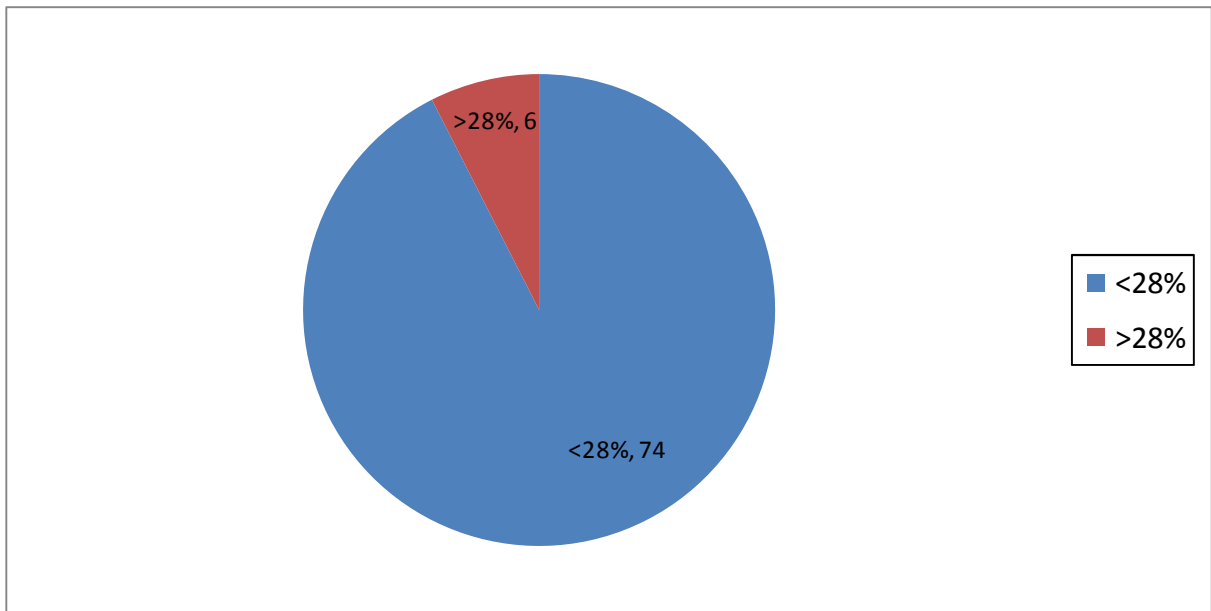


Fig. 10: Frequency of plateletcrit