

ASSESSMENT OF PACKED CELL VOLUME AMONG PREGNANTS IN URBAN AREA OF WARANGAL

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Abstract: Background & objectives: The most critical determinant of blood viscosity is the hematocrit. Blood viscosity reflects its rheological properties which can be influenced by packed cell volume. The objective of the present study is to determine packed cell volume in normal pregnancy **Methods:** The packed cell volume (PCV) can be determined by centrifuging heparinized blood in microhematocrit tubes. **Results:** PCV values showed statistically significant decrease in pregnant women of 1st trimester, 2nd trimester and 3rd trimester when compared to controls, respectively. There was also statistically significant decrease in PCV values of pregnant women in 3rd trimester when compared to pregnant women in 2nd trimester and 1st trimester. **Interpretation & conclusion:** PCV decreased significantly in pregnant women in 1st trimester, 2nd trimester and pregnant women in 3rd trimester when compared to that of controls.

Key Words: PCV, Pregnants, Blood viscosity, Rheological properties

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Introduction:

Viscosity of blood reflects its rheological properties which can be influenced by packed cell volume, plasma viscosity, red cell aggregation and red cell deformability with plasma viscosity primarily depending on the concentration of plasma proteins especially fibrinogen.

The most critical determinant of blood viscosity is the haematocrit. Hematocrit is the product of the mean cell volume (MCV) and the red blood cell (RBC) count, both of which are directly measured by the analyzer. Therefore, if there are any inaccuracies in measurement of the MCV or RBC count, the HCT will reflect those inaccuracies.

However, many studies have shown increase in fibrinogen concentration during pregnancy; this study was undertaken to determine haemorrhheologic activity in pregnancy using packed cell volume (PCV). PCV is a directly measured value obtained from centrifuging blood in a microhematocrit tube. It is measured as the height of the red cell column. It is the quickest and most readily available measure of the red cell component of blood.

The objective of the present study is to determine packed cell volume in normal pregnancy which in turn is regulated by hemodynamic alterations during normal pregnancy.¹

The increase in plasma volume and RBC mass provides a 45% increase in circulating blood volume which will protect from hemodynamic instability, may serve to dissipate fetal heat production and provide increase renal filtration.²

Material and Methods:

The study was conducted in the Department of Physiology, Kakatiya Medical College, Warangal.

The study was a Randomized Controlled Trial with two different groups, consisting of 50 normal healthy pregnant women in 1st, 2nd and 3rd trimester each, between 20- 30 years were selected consecutively as and when they presented to the obstetric outpatient department of Government Maternity Hospital, Warangal. 50 normal non-pregnant women of the same age group were selected randomly from the general population.

Following an explanation about the nature and purpose of the study, those subjects who were willing to participate in the study were included after obtaining informed consent.

INCLUSION CRITERIA

1. Normal healthy pregnant women in 1st, 2nd and 3rd trimester between 20-30 years of age.
2. Normal healthy non pregnant women between 20-30 years of age.

EXCLUSION CRITERIA

1. Women aged less than 20 and more than 30 years.
2. Women with any organic cardiac disease.
3. Women with renal disease.
4. Women with severe anemia.
5. Women with thyroid disease.
6. Women with diabetes, hypertension, chronic medication and surgery.

Determination of PCV

The packed cell volume (PCV) can be determined by centrifuging heparinized blood in a capillary tube (also known as a microhematocrit tube) at 10,000 RPM for five minutes. This separates the blood into layers. The volume of packed red blood cells divided by the total volume of the blood sample gives the PCV. Because a tube is used, this can be calculated by measuring the lengths of the layers.

Result:

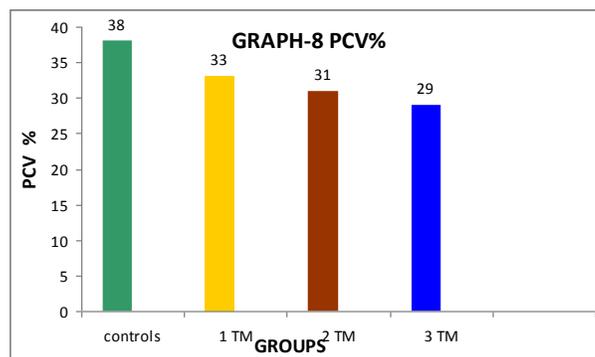
Results are analyzed with the help of Graph pad calculator and expressed as Mean \pm SD for continuous data and number and percentages for categorical data. One way ANOVA was used for multiple group comparisons followed by 'Post – hoc – Tukey' test for group – wise comparisons. Categorical data was analyzed by Chi – square test.

Table 1 Comparison of PCV (%) between various groups

PCV %	Controls (a)	1 st trimester (b)	2 nd trimester (c)	3 rd trimester (d)
Mean \pm SD	38 \pm 2	33 \pm 2	31 \pm 2	29 \pm 3
Range	35-41	34-40	30-35	25-32

Table 2 Differences between various groups

F Value	Differences Between Groups				
	A-B	A-C	A-D	B-C	B-D
F=54.33	P<0.05	P<0.05	P<0.05	P<0.05	P<0.05
S	S	S	S	S	S
	P<0.05 SIGNIFICANT-S				

Graph-1 Comparison of PCV (%) between various groups**PCV**

PCV values (in %) were 38 \pm 2, 33 \pm 2, 31 \pm 2, 29 \pm 3 among controls, pregnant women in 1st trimester, 2nd trimester and 3rd trimester respectively (Table–1, Graph –1). PCV values showed statistically significant decrease in pregnant women Of 1st trimester, 2nd trimester and 3rd trimester when compared to controls with (p <0.01). There was also statistically significant decrease in PCV values of pregnant women in 3rd trimester when compared to pregnant women in 2nd trimester and 1st trimester. (p < 0.01)

Discussion: Our study showed that haemorrhagic properties are influenced by packed cell volume, similar findings were given by Harkness and Whittington, Tommaso et al., Kametas et al., in their study on “Haemorrhological adaptation during pregnancy in a Latin American population”.³ Haemorrhology is the study of flow properties of blood and its elements . Proper tissue perfusion can occur only when blood's rheological properties are within certain levels. Alterations of these properties play significant roles in disease processes. Blood viscosity is determined by plasma viscosity, hematocrit (volume fraction of red blood cell, which constitute 99.9% of the cellular elements) and mechanical properties of red blood cells.⁹

Previous studies by Usanga et al., 1994; Stuart and Christoph, 2000; Salawuand Durosinmi, 2001 have shown significantly reduced PCV values in pregnancy and this common finding is evident in this study also.^{4,5}

The reduced PCV values in pregnancy as compared to non-pregnant subjects could be due to marked increase in plasma volume associated with normal pregnancy observed in this study agrees with that of an earlier reports by Stuart and Christoph, Salawu and Durosinmi, 2001; Koos and Moore.⁶

Reduced relative whole blood viscosity in pregnancy observed in this study agrees with that of an earlier report by (Tommaso et al., 1991). This could be associated with lower PCV values as relative whole blood viscosity correlated with PCV in this study which substantiated previous reports by Tommaso et al., 1991; Famodu et al., 19984.

The findings from different authors like Kametas et al., Salawu and Durosinmi on the decreased PCV values in pregnancy have been confirmed in this study.⁷

This study has shown that in pregnancy, haemorrhologic activity differs significantly due to decreased values of PCV these findings are consistent with the study on "Haematocrit and haemoglobin, parameters of haematic viscosity in pregnancy" by Tommaso MD, Ferreti C, Conforti D, D'Ancona RL, Baronci D, Cianciulli D, Branconi F.4 Our study is consistent with the study "The viscosity of blood, plasma and serum dys and paraproteinaemias' done by Somer T.⁸

Conclusion:

PCV decreased significantly in pregnant women in 1st trimester, 2nd trimester and pregnant women in 3rd trimester when compared to that of controls. There was also statistically significant increase in PCV in pregnant women in 3rd trimester when compared to pregnant women in 2nd trimester and 1st trimester.

Though our study is by no means exhaustive, it does provide a glimpse into the variety of adaptations in hematological parameters during normal pregnancy, which brings about changes in PCV. Since only very few studies have been done on this aspect, further research is needed to study the effect of normal pregnancy on PCV.

This study might give more accurate results if the same subjects were taken as controls before pregnancy and were followed during pregnancy, which could not be done in this study because of time factor. Hence further studies are needed to evaluate the effect of normal pregnancy on PCV.

This study has been approved by the ethical committee of Kakatiya Medical College, Warangal.

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