Evaluation of Hemoglobin and Packed Cell Volume (PCV) at Different Trimesters of Pregnancy Among Women in Elele, Rivers State

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ABSTRACT

This study evaluates the packed cell volume (PCV) and hemoglobin (Hb) in 150 pregnant women booked out-patients for routine antenatal care at Madonna University Teaching Hospital (MUTH) Elele, Rivers State and healthy non-pregnant women in Enugu town, Enugu State were used in this study. 2 ml of venous blood each was drawn from 150 pregnant women and 50 non-pregnant women (age; 20-45 years). 50 pregnant women (first trimester, 0-12 weeks), 50 pregnant women (second trimester, 13-26 weeks) and 50 pregnant women (third trimester, 27-41 weeks); blood samples were taken from the antecubital fossa vein by venopuncture in the morning and collected in EDTA bottle. The hematological values were determined within standard 2 hours of collecting the sample. The PCV was estimated using the microhaematocrit method and hemoglobin was estimated using the Sahlis method. Data showed that PCV was statistically significant difference at $P < 0.05$ between non-pregnant (36.17 ± 0.34) compared to first trimesters (30.46 ± 0.12), second trimesters (28.18 ± 0.23) and third trimesters (31.34 ± 0.24). There was no statistically significant difference at $P > 0.05$ between first trimesters (30.46 ± 0.12) compared with third trimesters (31.34 ± 0.24). The result on Hb showed statistically significant difference at $P < 0.05$ between non-pregnant control group (12.82 ± 0.19) compared to first trimesters (11.35 ± 0.12), second trimesters (9.46 ± 0.12) and third trimesters (11.72 ± 0.14). There was also no statistically significant difference at $P > 0.05$ between first trimesters (11.35 ± 0.12) compared with third trimesters (11.72 ± 0.14). Results showed a decrease in PCV during first trimester and a decrease in Hb during the second trimester suggesting that women at these groups are at risk of poor pregnancy outcome.

Keywords: Hemoglobin, Packed Cell Volume, Pregnancy and Trimesters.

INTRODUCTION

The hematological profile of an individual to a large extent reflects their general health; however, many studies have identified the hematological profile of the

pregnant woman as one of the factors affecting pregnancy and its outcome (Bothwell *et al.,* 1981; Meng *et al.,* 1991; WHO, 1993; Allen, 2000). The most commonly referred of the hematological indices are the indicators of packed cell volume (PCV), hemoglobin concentration (Hb), and low hemoglobin is the most widely identified hematological abnormality which is associated with adverse pregnancy outcome (Bothwell *et al.,* 1981; Meng *et al.,* 1991). Therefore, this present study investigates the PCV and Hb concentration in pregnant women at different trimesters attending antenatal care in Madonna University Teaching Hospital (MUTH) Elele in comparison with standards.

METHODS
Study Area/Center
All the 150 pregnant women used in this study were booked out-patients for routine antenatal care at MUTH Elele, Rivers State and non-pregnant women in Enugu town in Enugu State were used as standards (Control group).

Ethical Clearance and Consent
Ethical clearance and approval was obtained from the Ethical committee of the hospitals. This study was first introduced to the pregnant women on their first visit to the antenatal clinic in order to obtain their consent.

Sample Collection
2 ml of venous blood each was drawn from 150 pregnant women and 50 non-pregnant women (age; 20-45 years). 50 pregnant women (first trimester, 0-12 weeks), 50 pregnant women (second trimester, 13-26 weeks) and 50 pregnant women (third trimester, 27-41 weeks); blood samples were taken from the antecubital fossa vein by venopuncture in the morning and collected in EDTA bottle. The hematological values were determined within standard 2 hours of collecting the sample. The PCV was estimated using the microhaematocrit method (Koepke *et al.,* 2000). The hemoglobin was estimated using the Sahlis method.

Statistical Analysis
All quantitative data was analyzed using SPSS version 15. Descriptive statistics were computed for all relevant data. This was carried out by employing the ANOVA to compare the mean values of the test groups with control and when significant, they were verified through the Turkey's test. The results were presented as the mean ± SEM. A $P < 0.05$ was considered to be statistically significant.

RESULTS
At the end of this study, result in figure 1 showed the mean PCV of the three trimesters (first, second and

third trimesters) in comparison to the control. There was statistically significant difference at P < 0.05 between non-pregnant control group (36.17 ± 0.34) compared to first trimesters (30.46 ± 0.12), second trimesters (28.18 ± 0.23) and third trimesters (31.34 ± 0.24). There was a slight increase in the third trimesters (31.34 ± 0.24) while the second trimesters (28.18 ± 0.23) recorded the lowest value. However, there was no statistically significant difference at P > 0.05 between first trimesters (30.46 ± 0.12) compared with third trimesters (31.34 ± 0.24).

The result in figure 2 showed statistically significant difference at P < 0.05 between non-pregnant control group (12.82 ± 0.19) compared to first trimesters (11.35 ± 0.12), second trimesters (9.46 ± 0.12) and third trimesters (11.72 ± 0.14). The same slight increase was recorded in the third trimesters (11.72 ± 0.14) and lowest value in the second trimesters (9.46 ± 0.12) respectively. There was also no statistically significant difference at P > 0.05 between first trimesters (11.35 ± 0.12) compared with third trimesters (11.72 ± 0.14).
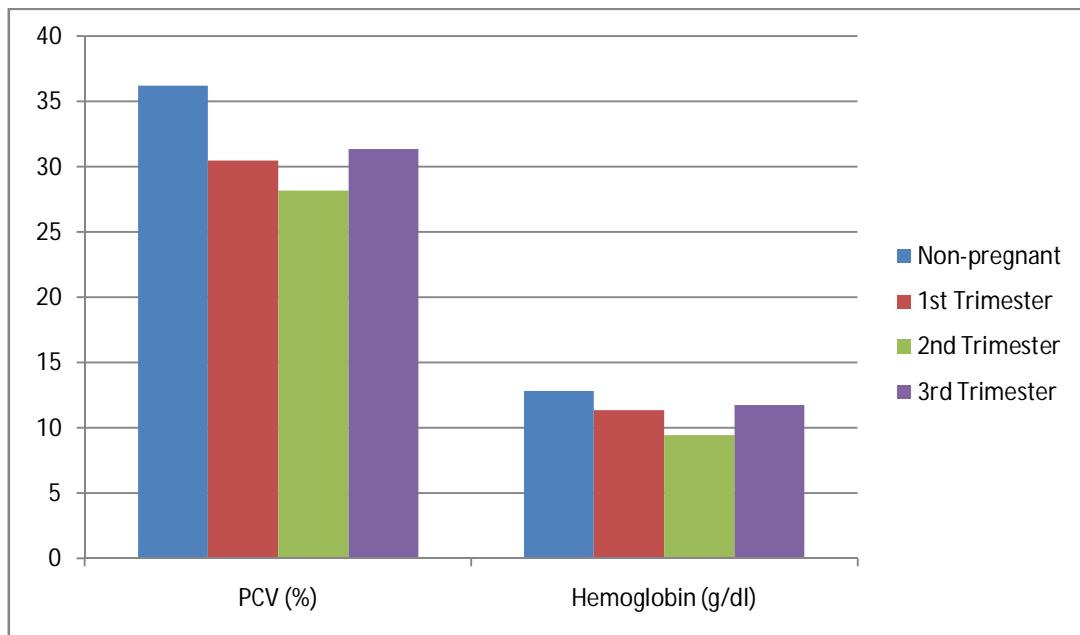
Figure 1: Packed Cell Volume (PCV) and Hemoglobin (Hb) in Pregnant and Non-pregnant Women at Different Trimesters

DISCUSSION

There has been an increased maternal and infant mortality in Elele population and this present study evaluates the hematological profile of pregnant women at different trimesters and to compare PCV and Hb concentration of pregnant women in Elele and healthy non-pregnant women in Enugu city. In this population, data showed a marked decrease in packed cell volume and hemoglobin especially in second trimester. It has been confirmed the morbidogenic nature of low hemoglobin and hematocrit levels during pregnancy and the optimal hemoglobin appears to be in the vicinity of 11 -12 g/dl and optimal hematocrit of 31 – 35 % (Garn *et al.,* 1981). Decrease in PCV may be due to increase in plasma volume during pregnancy causing hemo-diluution, infection (e.g. malaria), hormonal changes that increase fluid retention and iron deficiency (James *et al.,* 2008; Waheed *et al.,* 2008; Sembulingam and Sembulingam 2010). As observed in this present study, a low level of PCV was recorded in first and second trimesters. Low PCV in early pregnancy was associated with a higher rate of preterm birth (Ren *et al.,* 2007). In Nepali study, the association between low PCV values and the risk of low birth weight was much stronger in the first trimester than in the third trimester, and no association was found in the second trimester (Bondevik *et al.,* 2001) thus suggesting that first trimesters in our study are at risk of poor pregnancy outcome.

The risk of low birth weight, preterm birth and small for gestational age was increased steadily with a decrease of first trimester hemoglobin (Ren *et al.,* 2007). This risk of preterm birth was increased in women with low hemoglobin level in the first and second trimester (Scanion *et al.,* 2000) revealing that second trimesters at increased risk of preterm birth.

These findings conclude that low first trimester PCV and second trimester hemoglobin observed may be the cause of increased risk of adverse pregnancy outcomes and may contribute significantly to increased infant and maternal mortality in Elele population. Therefore, there is urgent need to tackle adverse pregnancy outcomes by evaluating available data on women visiting MUTH Elele, Rivers State.

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