



## Hematological Parameters in Pregnant Women in A Rural Teaching Hospital

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### Abstract

**Introduction:** The hematological profile of an individual reflects to a large extent reflects their general health. The World health organization recommends that hemoglobin should ideally be maintained at or above 11.0gm/dl and should not fall below 10.5 g/dl in second trimester.

**Materials and methods:** Present study was conducted by pathology department of NRI institute of medical sciences, a teaching hospital in a rural area of Visakhapatnam, Andhra Pradesh. A total of 172 pregnant women attending to gynecology and obstetrics outpatient department were studied. The samples were collected in Ethylenediaminetetraacetic acid vacutainer and sent along with the requisition form to the pathology laboratory.

**Results:** The present study includes 172 pregnant women of which 76.7% (132) were anemic with a hemoglobin less than 11gm/dl of which 28% (38) were mildly anemic and 66%(88) were moderately anemic and 3.7%(5) were severely anemic. The hemoglobin was 10.09+/- 1.38, 9.59+/- 1.16, 9.0 +/- 1.38 in the first, second and third trimesters respectively. A steady decline in the hemoglobin was found from first to third trimester. The hematocrit in the first, second and third trimester were 30.43+/- 4.2, 29.20 +/-3.83, 29.12 +/- 5.16 respectively. Mean Corpuscular Volume declined from the first to third trimester in this study while MCH remained relatively stable through all trimesters. These findings may be a reflection of iron deficiency anemia which is responsible for 95% of anemia of pregnancy.

**Conclusion:** The hematological parameters early recognition of type of anemia during pregnancy and thereby improve the outcome of pregnancy

**Keywords:** Anemia, Hemoglobin, Hematocrit.

### INTRODUCTION

Normal pregnancy is characterized by profound changes in almost every organ and system to accommodate the demands of the fetoplacental unit. It is also one of the physiological conditions capable of causing remarkable and dramatic changes in hematological variables.<sup>[1]</sup> The

hematological profile of an individual reflects to a large extent reflects their general health.

Anemia is the most common nutritional deficiency disorder in the world. About 1/3 of the global population is anemic. Prevalence of anemia in all the groups is higher in India as compared to other developing countries.<sup>[2]</sup> WHO has estimated

that prevalence of anemia in pregnant women as 14% in developed and 15% in developing countries and 65-75% in India. In most developing countries, anemia in pregnancy makes an important contribution to maternal morbidity and mortality.

A hemoglobin concentration of less than 11g/dl is commonly taken as an indicator of anemia in pregnancy.<sup>[3]</sup>The World health organization recommends that hemoglobin should ideally be maintained at or above 11.0gm/dl and should not fall below 10.5 g/dl in second trimester.<sup>[4]</sup>

Pregnancy is typically broken into three trimesters, each of about three months.<sup>[5]</sup> Obstetricians define each trimester as lasting for 14 weeks, resulting in a total duration of 42 weeks, although the average duration of pregnancy is actually about 40 weeks.<sup>[6]</sup>Anemia is a common and serious problem in pregnancy and needs to be addressed.

The most commonly referred to of the hematological indicators are the indicators of hemoglobin concentration and low hemoglobin is the most widely identified hematological abnormality and is associated with adverse pregnancy outcome.<sup>[7]</sup>

The hematological status of a pregnant women can be analyzed by collection of blood samples during each of the three trimesters and measuring different variables such as Packed cell volume(PCV), mean corpuscular hemoglobin (MCH), Mean corpuscular hemoglobin concentration (MCHC), Mean corpuscular volume (MCV), Red blood cell (RBC) count, white blood cell count(WBC), Hemoglobin concentration.<sup>[8]</sup>

**Table:1.** Normal values

Parameters	Normal value
Hemoglobin concentration	12-16gm/dl
Red blood cells count	4.0- 5.2 million/cumm
Haematocrit	36-49%
Mean corpuscular volume	80-100fl
Mean corpuscular hemoglobin	25-35pg
Mean corpuscular hemoglobin concentration	31-37g%

## MATERIALS AND METHODS

Present study was conducted by pathology department of NRI institute of medical sciences, teaching hospital in a rural area of Visakhapatnam, Andhra Pradesh. A total of 172 pregnant women attending to gynecology and obstetrics outpatient department were studied. Prior permission from the ethical committee of the hospital and written consent was taken from every patient was taken. In all cases patient age, weight, clinical history and laboratory investigations were taken in proforma. The samples were collected in Ethylene diamine tetraacetic acid vacuttainer and sent along with the requisition form to the pathology laboratory.

The materials used for collection of blood samples include

1. 2 ml syringe
2. EDTA container
3. Toniquette
4. Disposable hand gloves
5. Automated hematology analyser (Horiba Company).

### **Inclusion criteria:**

Pregnant women age group 18-35 yrs  
Both vegetarian and non vegetarian

### **Exclusion criteria:**

Obesity  
Diabetes  
Any complication related to pregnancy

**RESULTS**

Out of the 172 patients who attended the antenatal clinic 11% (19) were below 20 yrs, majority of them were between 20-25yrs amounting to 68.6%(118), the remaining 17%(30) of them were aged from 26 – 30 yrs and very few 2% (5) of

them were more than 35 yrs. Most of them were in the third trimester 47% (82) and 33% were in the second trimester and only 18% were in the first trimester.

**Table: II.** Profile of anemic pregnant women

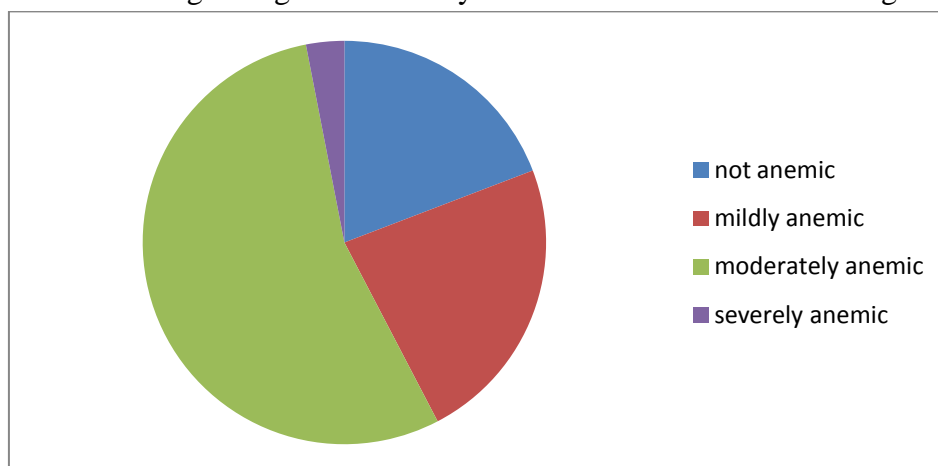
Age	Number	%
<20yrs	19	11
20-25yrs	118	68.6
26-30yrs	30	17
<35yrs	5	2

Trimester	Number	%
First	31	18
Second	57	33
Third	82	47

The present study includes 172 pregnant women of which 76.7% (132) were anemic with a hemoglobin less than 11gm/dl of which 28% (38)

were mildly anemic and 66%(88) were moderately anemic and 3.7% (5) were severely anemic

**Figure 1:** Distribution according to degree of severity of anemia on the basis of hemoglobin concentration.



The hemoglobin was 10.09+/- 1.38, 9.59+/- 1.16, 9.0 +/- 1.38 in the first, second and third trimesters respectively. A steady decline in the hemoglobin was found from first to third trimester. There was not much of a variation in the Red blood cell count except for a slight decrease in the third trimester.

The hematocrit in the first, second and third trimester were 30.43+/- 4.2, 29.20 +/-3.83, 29.12 +/- 5.16 respectively.

The red cell indices, Mean corpuscular volume was 73.2 +/- 10.25, 72.9 +/- 7.0, 72.7+/-6.72 in the first, second and third trimester respectively. Mean corpuscular hemoglobin was 24.72+/-2.36, 23.8+/-2.6, 23.76+/- 2.48 in the first second and third trimesters respectively.

**Table III:** Hematological profile of pregnant women based on trimester

Trimester	Hb gm/dl	RBC (10 <sup>6</sup> / $\mu$ l)	PCV (%)	MCV (fl)	MCH (Pg)	MCHC (g/dl)
First	10.09 +/-1.38	4.07 +/-0.42	30.43 +/-4.2	73.27 +/- 10.5	24.72 +/- 2.36	32.55 +/- 1.59
Second	9.59 +/-1.16	4.08 +/- 0.41	29.12 +/- 5.16	72.9 +/- 7.0	23.8 +/- 2.6	32.30 +/- 1.51
Third	9.8 +/-1.2	3.99 +/- 0.55	29.20 +/- 3.83	72.7 +/- 6.72	23.76 +/- 2.48	32.13 +/- 2.25

Mean corpuscular volume, mean corpuscular hemoglobin, showed slight variations in the first, second and third trimester where as the mean corpuscular hemoglobin concentration remained the same with not much variation.

## DISCUSSION

The aim of the study was to determine the overall mean values for the hematological indices in pregnancy and the trimester specific mean values for hematological indices in pregnant women.

We found that a preponderance of the participants in this study registered for antenatal care in their second trimester were 33%(57) and third trimester were 47%(82) when their pregnancy was beyond 20 wks , while only 18% (31) of participants had registered early for antenatal care. This was similar to a study done by shah et al<sup>[9]</sup> where in their study 19.7% were in first trimester and 39.2% were in second trimester and 41.1 % in third trimester.

The present study includes 172 pregnant women of which 76.7% (132) were anemic with a hemoglobin less than 11gm/dl of which 28% (38) were mildly anemic and 66%(88) were moderately anemic and 3.7%(5) were severely anemic. The degree of severity was classified based on the who classification. Umesh kapil et al<sup>[10]</sup> found that 78.8 % pregnant women were suffering from anemia as defined by their hemoglobin levels and the percentages of mild, moderate and severe anemia were 29%, 48%, 2% respectively.

The hemoglobin was 10.09+/- 1.38, 9.59+/- 1.16, 9.0 +/- 1.38 in the first, second and third

trimesters respectively. The hematocrit in the first, second and third trimester were 30.43+/- 4.2, 29.20 +/-3.83, 29.12 +/- 5.16 respectively.

We found a progressive decline in hemoglobin concentration from first to third trimester. There was a slight rise in hematocrit in the third trimester. These findings corroborate with those of a similar study undertaken by akingbola et al & akinbami et al<sup>[11,12]</sup> which reported exactly the same pattern.

The progressive decline in Hemoglobin from first trimester to third trimester may be due to an increased demand for iron as pregnancy progresses. More iron is required to meet the expansion of hemoglobin mass and the needs of fetal growth. The additional progesterone and estrogen that are secreted by the placenta during pregnancy cause a release of rennin from the kidneys. Renin stimulates the aldosterone-renin-angiotensin mechanism, leading to sodium retention and increase in plasma volume. The increase in plasma volume is relatively greater than the increase in red cell mass which results in fall in maternal hemoglobin, hence the physiological anemia that occurs in pregnancy.

Despite the physiological hemodilution associated with pregnancy, which also contributes to drop in packed cell volume in the first and second trimesters in late pregnancy plasma volume increases at a slower rate inducing a slight increase in hematocrit that may account for the slight rise in packed cell volume in the third trimester.

Mean Corpuscular Volume declined from the first to third trimester in this study while MCH

remained relatively stable through all trimesters. Mean Corpuscular Hemoglobin concentration was stable in the first and second trimester but dropped in the third. These findings may be a reflection of iron deficiency anemia which is responsible for 95% of anemia of pregnancy.

## CONCLUSION

Inadequacies during pregnancy can trigger a cascade of metabolism disorders and result in severe health disorder which can adversely affect mothers and child's health and contributes to deteriorating fetus development and fetus conditions which leads to increasing newborn morbidity.

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