

# Determination of Anemia Iron Deficiency Anemia and $\beta$ -thalassemia during Pregnancy

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## ABSTRACT

**Aim:** To observe the frequency of anemia, iron deficiency anemia and  $\beta$ -thalassemia during pregnancy.

**Study type, setting & duration:** This cross sectional study was undertaken at antenatal clinic of gynecology, Unit V of Lady Aitcheson Hospital Lahore from October 2018 to March 2019.

**Methodology:** The study was commenced after formal written permission. A total of 310 pregnant women were included in this study and their demographic information was taken on predesigned Proforma. Blood samples from all females were collected from the peripheral vein of upper limb and was sent to hospital laboratory for analysis of Hemoglobin and other necessary parameters. All female were labeled as iron deficiency anemia or  $\beta$  thalassaemia as per operational definition. Data was entered and analyzed in SPSS.

**Results:** Mean age of females was  $26.23 \pm 5.26$  years and mean gestational age was remained to be  $16.632 \pm 10.62$  weeks. The mean hemoglobin  $8.55 \pm 2.10$  g/dl, mean iron binding capacity was  $13.07 \pm 6.55$   $\mu$ g/dl and mean serum ferritin was  $43.50 \pm 76.93$   $\mu$ g/L. Anemia was seen in 270(87.1%), iron deficiency anemia was diagnosed in 239(77.1%) while  $\beta$  thalassaemia was seen in 29(9.4%) of the pregnant women. There was significant association between parity with anemia and  $\beta$  thalassaemia, p-value < 0.05. While iron deficiency anemia was not associated with parity.

**Conclusion:** Anemia, iron deficiency anemia and  $\beta$ -thalassaemia are much high and require recognition at early gestations. Various factors are reported to be involved which may be controlled by early supplementation.

**Keywords:** Anemia, Iron deficiency,  $\beta$ -thalassaemia, pregnancy, trimester, parity.

## INTRODUCTION

Anemia has been remained amongst the most precarious illnesses affecting global population. The progression of condition is slow and silent characterized by the mild physical symptoms. Anemia is also common among pregnancy carrying various health risks including low-weight birth, premature birth, neonatal malformations thus can pose extra expenditures on health<sup>1</sup>. Importance of anemia is considered a big public health challenge due to its natural reason of frailty and equally responsible for compromised foetal outcomes both in unindustrialized and industrialized world<sup>2</sup>. According to World Health Organization (WHO) anemia is linked to the poor motor and cognitive development of children which ultimately influence the work capacity on adulteration thus indirectly affects the economic development of country<sup>3</sup>.

Iron deficiency anemia (IDA) among pregnant women is also associated with poor reproductive outcomes including diminished iron storage for infants and leads to impaired development. Consequences of failure to decrease the anemia during pregnancy may experience poor quality of women's life impaired growth, development and learning ability of children. Anemia is the primary indicator of poor health and nutrition. Estimates of WHO presented a global prevalence of anemia as 29.9% among females of reproductive age which make more than half a billion ladies of age 15-49 years. Similarly 29.6% women without conception and 36.5% during conception were reported to have anemia<sup>3</sup>.

Eastern Mediterranean, South-East Asia and African Regions of WHO had shown the lowest levels of blood hemoglobin inversely shown highest anemic populations. Pregnant women in these regions showed an alarming prevalence of anemia as 48.7%<sup>4</sup>. Situation in Pakistan however remained more vulnerable as 50% pregnant women showed hemoglobin levels as <11.0 g/dl and 2.1% as <7.0g/dl<sup>5</sup>. Women development indicators set by World Bank in 2016 had shown a prevalence of anemia as 51.3% among women of reproductive age (15-49years). Various reports

have shown different ranges of anemia among women of reproductive age as 50.4%<sup>6</sup> and as high as 76.7%<sup>7</sup> and 46%<sup>8</sup> among pregnant women in different areas of country.

Iron is crucial due to its functions like enzymatic activity, electron transport and oxygen delivery for cells. More iron is desired during higher rates of metabolism and a surge in iron demand occurs during pregnancy. More than two billion people are expected to have IDA globally. Reports also propose high rates of IDA among pregnant females in industrialized countries as compared to underdeveloped regions. Oral supplementation is treatment of choice for IDA but adverse effects decrease the compliance and effectiveness<sup>9</sup>. Normochromic-normocytic anemia among pregnant women reflects a major surge in plasma levels, which excessively surpasses the escalation in the volume of red cells. Carriers of  $\beta$ -thalassaemia trait when conceive pregnancy, expansion in plasma volume causes more distinct anemia as anemia due to pregnancy also adds-on the pre-existed hypochromic-microcytic anemia however pregnancy outcomes are not expected to be different from other anemic pregnancies<sup>10</sup>.

A lot of work on anemia during pregnancy is available but there is scarce work on segregation of IDA,  $\beta$ -thalassaemia and their effects in Pramigravida and subsequent pregnancies. Present study will be the base to carry out the future work on such patients through systemic sampling and aimed to observe the frequency of anemia, IDA and  $\beta$ -thalassaemia during pregnancy.

## METHODOLOGY

This cross sectional study was undertaken at antenatal clinic of gynecology, Unit V of Lady Aitcheson Hospital Lahore from October 2018 to March 2019 after hospital ethical committee permission. A total of 310 cases were considered in this study by taking 5% absolute precision and 95% confidence level with expected percentage of anemia among pregnant women as 26.66%<sup>11</sup>.

**Inclusion and Exclusion Criteria** All females aged 18-40 years of age of any parity visiting in their any trimester of pregnancy were included in this study. Pregnant women having multiple gestations confirmed on ultrasonography, pre-diagnosed cases of

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thalassemia or Sick cell anaemia and having any known chronic medical disorder like Chronic Kidney Disease, Acid Peptic Disease or Piles etc. were excluded from this study<sup>15,16,17</sup>.

**Data Collection Procedure:** A total of 310 pregnant women were included. The study was commenced after formal written permission, the informed consent. Their demographic information regarding age, gestational age and parity was taken on predesigned proforma. Blood samples from all females were collected from the peripheral vein of upper limb and was sent to hospital laboratory for analysis of Hb and other necessary parameters. All female were labeled as iron deficiency anemia or  $\beta$  thalassaemia as per operational definition. All this data was entered into predesigned proforma.

**Statistical Analysis:** Data was entered and analyzed in SPSS. Qualitative variables like gender, age ranges and GeneXpert results were presented as frequency and percentage while quantitative variables were presented as mean $\pm$ standard deviation.

**RESULTS**

Mean age of females was 26.23 $\pm$  5.26 years with age range of 22 years (18-40 years) in this study while mean gestational age was remained to be 16.632 $\pm$ 10.62 weeks with range of 37 weeks (3–40 weeks).The mean hemoglobin 8.55 $\pm$ 2.10 g/dl with minimum and maximum 5 and 14.20, mean iron binding capacity was 13.07 $\pm$ 6.55 $\mu$ g/dl and mean serum ferritin was 43.50 $\pm$ 76.93 $\mu$ g/L with minimum and maximum as 3 and 294. Distribution of continuous variables is presented in Table 1.

Table 1: Distribution of continuous variables

Variable	Mean	St. Dev.	Range	Min.	Max.
Age (Years)	26.23	5.26	22.0	18.0	40.0
Gest. Age (Weeks)	16.63	10.62	37.0	3.0	40.0
Hemoglobin	8.55	2.10	9.2	5.0	14.2
Iron binding Capacity	13.07	6.55	26.0	6.0	32.0
Serum Ferritin	43.50	76.93	291.0	3.0	294.0

Table 2: Segregation of Anemia with age groups, trimester and parity

Category	Anaemia		Chi Square Value	p-value
	Yes (n=270)	No (n=40)		
<b>Age Groups (Years)</b>				
18-30	209(77.4%)	30 (75%)	0.114	0.735
31-40	61(22.6%)	10 (25%)		
<b>Trimester</b>				
1 <sup>st</sup>	146(54.1%)	24(60%)	0.833	0.659
2 <sup>nd</sup>	72(26.7%)	8(20%)		
3 <sup>rd</sup>	52 (19.2%)	8(20%)		
<b>Parity</b>				
<3	110(40.7%)	23(57.5%)	6.44	0.011
$\geq$ 3	160(59.3%)	17(42.5%)		

Table 3: Segregation of Iron Deficiency Anemia with Age Groups, Trimester and parity

Category	Iron Deficiency Anemia		Chi Square Value	p-value
	Yes (n=239)	No (n=71)		
<b>Age Groups (Years)</b>				
18-30	186 (77.8%)	53 (74.6%)	0.313	0.576
31-40	53 (22.2%)	18 (25.4%)		
<b>Trimester</b>				
1 <sup>st</sup>	131 (54.8%)	39 (54.9%)	0.273	0.872
2 <sup>nd</sup>	63 (26.4%)	17 (23.9%)		
3 <sup>rd</sup>	45 (18.8%)	15 (21.2%)		
<b>Parity</b>				
<3	103 (43.1%)	30 (42.3%)	0.016	0.900
$\geq$ 3	136 (56.9%)	41 (57.7%)		

Anemia was seen in 270(87.1%), iron deficiency anemia was diagnosed in 239(77.1%) while  $\beta$  thalassaemia was seen in 29(9.4%) of the pregnant women as shown in table 2. Data was stratified for maternal age, parity and gestational age to address

the affect modifier. No significant association was observed between iron deficiency anemia with (age, parity and gestational age), p-value > 0.05. There was significant association between parity with anemia and  $\beta$  thalassaemia, p-value <0.05. While iron deficiency anemia was not associated with parity. Further segregation was presented in table 2 and 3.

**DISCUSSION**

Maternal anemia is very common issue in the course of pregnancy, particularly in under-developed countries like Pakistan. In this perspective, a study was undertaken in Veterinary University Lahore to find the dynamics linked to the prevalence of nurturing anemia among various age groups seeking antenatal care from various healthcare facilities of provincial capital. Study presented a high prevalence of 57.7% anemia among pregnant women defining 34.4% mild anemia and 23.4% moderate anemia. Study applied bivariate analysis presented less education, low income, housewife occupants, high parity and rural residents had significant association with maternal anemia.<sup>12</sup> Findings are though, not much comparable to present study that very high 87.1% anemia among pregnant women. Women having >3 parity showed a significant association (p-value <0.05) with anemia and  $\beta$ -thalassaemia in this study.

A more recent comparative cross sectional study to see the effects of anemia on neonatal outcomes in the population of Hyderabad, Pakistan. A high proportion of 51.5% mothers had anemia of which highest 52.4% had normocytic normochromic morphology of red cells whereas 19.4% had microcytic hypochromic morphology considering  $\beta$ -thalassaemia<sup>13</sup>. A tremendous low Apgar score was found in 25.2% of anemic mothers while only 4.1% non-anemic mothers had this condition. Similarly incidence of low birth weight babies as 47.5% and caesarian section as 53.3% remained high in anemic group were also alarming<sup>13</sup>. Although some of these factors were not studied at present though microcytic hypochromic anemia considering  $\beta$ -thalassaemia 9.4% in present study is not in concomitant to above findings.

A high frequency of 77.1% IDA in present study is in concomitant to the other study presenting 63% IDA, 24.8% severe IDA while only 12% were normal subjects and concluded that maternal anemia remained as a big health apprehension which desired higher attention particularly in developing and under developed countries.<sup>14</sup> Another study presented 86% anemia of which 26% had mild anemia, 66% had moderate anemia and 8% were severely anemic<sup>15</sup> and findings are truly comparable to this study. Findings of a study proposed the interventions like Nutrition Support Program to upgrade nutritional prestige during pregnancy by giving food additives with emphasis on deprived and ostracized communities are suggested to avoid anemia<sup>12</sup>. Other than above a recent study from an area of south Punjab demonstrated thalassaemia trait among 3.3% males and 2.2% females is also alarming and considering the importance of pre-marital status.<sup>16</sup> Another study from Lahore also demonstrated the significance of pre-marital screening and presented 7.5% of thalassaemia trait using hemoglobin electrophoresis among women.

Anemia, IDA and  $\beta$ -thalassaemia are much high and require recognition at early gestations. Various factors are reported to be involved which may be controlled by early supplementation. Iron binding capacity and serum ferritin are good markers to identify the IDA in addition to the morphology.

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**Author's Contribution:** SB and TW conceived the idea and designed the project, SB, STS and AN collected the data, SB, SJ and AHS wrote the paper, TW and AHS observed the clinical relevance of data, TW and SJ revised the manuscript, SB and AHS did the data analysis.

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