

## Correlation of Maternal Anemia with Sonographic Placental Thickness

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### Background:

Anemia is a condition in which hemoglobin (Hb) concentration and/or red blood cell (RBC) numbers are lower than normal and insufficient to meet an individual's physiological needs, it affects roughly one-third of the world's population. **Objective:** To correlate the maternal anemia with placental thickness ultrasonographically. **Methodology:** Toshiba Nemio17 with Convex array transducer 3-5 MHz frequency was used. Patient were in spine position. Measurements of placental thickness were performed in the mid portion of the placenta, perpendicular to its long axis. The study was conducted at Gillani Ultrasound Centre and Mansoorah Teaching Hospital Lahore. Data of 110 patients was collected through cross-sectional, analytical study. Convenient Sampling Technique was used to analyze data. Statistical software for social sciences (SPSS version 22.0) is used for the analysis of data. **Results:** Out of 110 patients 44.5% patients were in 2<sup>nd</sup> trimester and 55.5% patients were in their 3<sup>rd</sup> trimester. In our study 26.4% patients had normal hemoglobin, 43.6% patients were diagnosed with moderate anemia and 30% patients were diagnosed with mild anemia. Hemoglobin rates varied between 7 g/dL to 15.40 g/dL. Placental thickness varied between 10.50mm and to 56.50mm. 9 patients had normal placental thickness, 89 had thick placenta and 12 had thin placenta. In 2<sup>nd</sup> trimester minimum placental thickness was noted 15.7 mm and maximum placental thickness was 47.2 mm. In 3<sup>rd</sup> trimester minimum placental thickness was noted as 10.5 mm and maximum thickness 56.5 mm. In normal placental thickness minimum hemoglobin was noted as 7 g/dL and maximum was 15.5 g/dL. In thick placenta minimum hemoglobin noted was; 7.8 g/dL and maximum hemoglobin was 15.4 g/dL. In thin placental thickness minimum hemoglobin was 8.9 g/dL and maximum was 11.2 g/dl. Majority patients came with hemoglobin rates between 8 to 11 (g/dL) and less than 5 patients came with hemoglobin 7 g/dL. In patients with mild anemia mean placental thickness was 30.57 mm. In patients with moderate anemia had mean placental thickness of 33.72 mm and in patients with normal anemia had mean placental thickness of 30.39 mm. Out of 110 patients, 29 had no anemia and from these 3 patients were found with normal placental thickness 4 with thick placenta and 2 were with thin. 81 patients who were diagnosed with anemia had normal placental thickness in 6 patients, 65 had thick placenta and 10 patients were found with thick placenta. **Conclusion:** We concluded that, maternal anemia has adverse effects on placental thickness and gestational age. In the present study we found that morphological and histological changes in placenta of anemic mother is undertaken, to study the effects of anemia on morphology of placenta and fetal outcomes.

**Keywords:** Ultrasound (US), anemia, placenta, placental thickness

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### INTRODUCTION

Anemia is a condition in which hemoglobin (Hb) concentration and/or red blood cell (RBC) numbers are lower than normal and insufficient to meet an individual's physiological needs, it affects roughly one-third of the world's population.<sup>1</sup>

Anemia remains a significant health problem globally, accounting for 60,534 deaths and 3.4% of global disability-adjusted life years (DALYs) in 2010 in women aged 15–49 y<sup>1</sup>. The majority of DALYs that are due to anemia occur in low-income countries, particularly in South Asia (5.7% of DALYs in women) and Sub-Saharan Africa (3.9% of DALYs in women)<sup>2</sup>. In high-income countries, 16% of women and 22% of pregnant women had anemia in 2011<sup>3</sup>. Despite achievements in maternal and child health-related programs over the past decade<sup>4,5</sup>, anemia remains a key health problem in pregnant women in low- and middle-income countries<sup>2,6,7</sup>. The principal causes of anemia are poor nutrition (iron, folic acid, and vitamin deficiencies), infectious diseases such as malaria, and untreated genetic hemoglobin disorders<sup>6,8</sup>. Anemia during pregnancy may cause low birth weight, preterm birth, and perinatal, neonatal and maternal mortality<sup>9,10</sup>, although findings on these risks have not been consistent, and systematic reviews are lacking for low- and middle-income countries.

Maternal anemia is associated with increased morbidity and mortality in women and children, poor birth outcomes, decreased work productivity in adults, and impaired cognitive and behavioral development in children<sup>11,12</sup>

The placenta is a fetal organ which provides the physiological link between a pregnant woman and the fetus. The placenta is a highly vascularized organ and its main functions are exchange of metabolic and gaseous products between maternal and fetal bloodstreams, and production of hormones<sup>13</sup>.

The placenta develops from the chorionic villi at the implantation site at about the fifth week of gestation and by the ninth or tenth week the diffuse granular echotexture of the placenta is clearly apparent at sonography<sup>14</sup>.

The human placenta is concerned with the exchanges that occur between the maternal and fetal organisms. The placenta acts like a sieve, moving oxygen and nutrients from the mother's body to baby and taking carbon dioxide and waste materials from the baby into mother's body for elimination.<sup>7</sup> It has two basic components: the maternal and fetal portions. The placenta originates from the fetal portion (Chorion Frondosum) and maternal portion (Endometrium) more specifically from the Decidua Basalis. Placental function begins around the 4th week of pregnancy, with the formation of the first anatomical elements necessary to ensure physiological exchanges<sup>15</sup>.

About 95% of anemia cases during pregnancy are iron deficiency anemia. The cause is usually (i) Inadequate dietary intake (especially in adolescent girls) (ii) A previous pregnancy<sup>16</sup>. The most recent data for overall prevalence of maternal anemia, estimated was 38.2%<sup>17</sup>. The prevalence of ultrasonographically thick placentas varies from 0.6% to 7.8%<sup>20</sup>. The newborns of anemic mothers are shorter and lower body mass, but not poorer vitality index<sup>18</sup>. Ionic iron is the mineral that promotes the formation of new hemoglobin and is the main source of energy and oxygen transportation to the organs of the body. Maternal anemia can develop due to both the unavailability of this element in the extracellular environment for erythropoiesis and the presence of infectious processes, which may influence the metabolism of hemoglobin. In general, the diagnosis of maternal anemia is defined by hemoglobin levels below 11 g/dl<sup>19</sup>.

## RESULTS

One hundred and ten patients participated in this study. Among them, the minimum age was 17 and the maximum age was 40. out of 110 patients 49 were in their 2<sup>nd</sup> trimester and 61 were in their 3<sup>rd</sup> trimester. 29 (26.4%) patients had normal hemoglobin, 48 (43.6%) patients were diagnosed with moderate anemia and 33 (30%) patients were diagnosed with mild anemia, according to table 1.

**Table1: stages of anemia**

		Anemia stages			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	mild	33	30.0	30.0	30.0
	moderate	48	43.6	43.6	73.6
	normal	29	26.4	26.4	100.0
	Total	110	100.0	100.0	

In 110 patients hemoglobin rates varied between 7 g/dL and 15.40 g/dL with mean value 10.5 SD± 1.88.

Minimum placental thickness noted was 10.50mm and maximum placental thickness was 56.50mm, according to table 2. Mean of placental thickness in 110 patients came 31.90 with standard deviation of 8.80.

**Table 2: descriptive statistics of placental thickness.**

Descriptive Statistics						
	N	Range	Minimum	Maximum	Mean	Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Placental Thickness (mm)	110	46.00	10.50	56.50	31.9018	.83905
						8.80002

9 had normal placental thickness, 89 had thick placenta and 12 had thin placenta. In 2<sup>nd</sup> trimester minimum placental thickness was noted 15.7 mm and maximum placental thickness was 47.2 mm. In 3<sup>rd</sup> trimester minimum placental thickness was noted as 10.5 mm and maximum thickness 56.5 mm.

In patients with normal placental thickness minimum hemoglobin was noted as 7 g/dL and maximum was 15.5 g/dL. In patients with thick placenta minimum hemoglobin noted was; 7.8 g/dL and maximum hemoglobin was 15.4 g/dL. In patients with thin placental thickness minimum hemoglobin was 8.9 g/dL and maximum was 11.2 g/dl, according to table 3.

**Table 3: correlation between hemoglobin and placental thickness.**

Placental thickness (thick/thin/normal)	Hemoglobin (g/dL)				
	Mean	N	Std. Deviation	Minimum	Maximum
normal	10.8556	9	2.56569	7.00	15.20
thick	10.5843	89	1.90722	7.80	15.40
thin	9.9750	12	.74970	8.90	11.20
Total	10.5400	110	1.87657	7.00	15.40

Majority patients came with hemoglobin rates between 8 to 11 (g/dL) and less than 5 patients came with hemoglobin 7 g/dL. In 110 patients; 29 had no anemia and from these 3 patients were found with normal placental thickness 4 with thick placenta and 2 were with thin. 81 patients who were diagnosed with anemia had normal placental thickness in 6 patients, 65 had thick placenta and 10 patients were found with thick placenta, according to table 4.

**Table 4: crosstabulation between anemia and placental thickness.**

Anemia * placental thickness crosstabulation					
Count		Placental Thickness			Total
		Normal	thick	thin	
Anemia	no	3	24	2	29
	yes	6	65	10	81
Total		9	89	12	110

## DISCUSSION

One hundred and ten patients participated in this study. Among them, the minimum age was 17 and the maximum age was 40. The mean of the age came out to be 25.89 and  $SD \pm 4.24$ , according to the table 1 and graph 1. In 2013, study done by Smaïla Ouédraogo *et al*, shows that 941 pregnant women participated in this study<sup>8</sup>.

According to table 2, out of 110 patients 49 were in their 2<sup>nd</sup> trimester and 61 were in their 3<sup>rd</sup> trimester.

Out of 110 patients, 46 babies were in breech position and 64 were in cephalic position, according to table 3.

According to table 4, 41 patients had anterior placenta, 9 patients had fundo-anterior placenta, 8 patients had fundo posterior placenta, 49 patients had posterior placenta.

In current study, according to table 5; out of one hundred and ten patients 50 (45.5%) were gravida 1, 41 (37.3%) were gravid 2, 18 (16.4%) were gravid 3 and 1 (0.9%) was gravid 4. In 2013, study done by Smaïla Ouédraogo *et al*, shows that 18.9% patients were 1 gravid and 81.1% were more than 2 gravid<sup>8</sup>.

According to table 6, parity rate varied patient to patient. 58 (52.7%) females came with their first pregnancy. 35 (31.8%) patients had 1 para and 17 (15.5%) patients had 2 para.

Out of 110 patients, out of 110 patients, 29 (26.4%) patients had normal hemoglobin, 48 (43.6%) patients were diagnosed with moderate anemia and 33 (30%) patients were diagnosed with mild anemia, according to table 7.

According to table 8, in 110 patients hemoglobin rates varied between minimum hemoglobin rate being 7 g/dL and maximum rate as 15.40 g/dL with mean value 10.5  $SD \pm 1.88$ .

According to table 9; minimum hemoglobin in 2<sup>nd</sup> trimester noted was 8.50 g/dL and maximum hemoglobin was 15.20 g/dL. In 3<sup>rd</sup> trimester the minimum range of hemoglobin noted was 7.00 g/dL and maximum range was 15.40 g/dL.

In current study; minimum placental thickness noted was 10.50mm and maximum placental thickness was 56.50mm, according to table 10 and graph 2. Mean of placental thickness in 110 patients came 31.90 with standard deviation of 8.80.

Out of 110 patients came in our hospital, 9 had normal placental thickness, 89 had thick placenta and 12 had thin placenta, according to table 11.

In 2<sup>nd</sup> trimester minimum placental thickness was noted 15.7 mm and maximum placental thickness was 47.2 mm. In 3<sup>rd</sup> trimester minimum placental thickness was noted as 10.5 mm and maximum thickness 56.5 mm. mean placental thickness in 3<sup>rd</sup> trimester noted was 35.0393mm, according to table 12 and graph 2. In 2009, study done by CC Ohagwu *et al*, the results of their study show that the maximum mean placental thickness of 45.1+- 6.4mm occurred at 3<sup>rd</sup> trimester of gestation<sup>9</sup>. Mital P in 2009 studied that, in 2<sup>nd</sup> trimester mean placental thickness was 15 mm and in 3<sup>rd</sup> trimester mean placental thickness was 37.5 mm<sup>22</sup>. In Sadler TW study done in 2006 shows, mean placental thickness at term to be 37.5mm<sup>21</sup>. These values in previous studies correlate well with current study.

In current study, in normal placental thickness minimum hemoglobin was noted as 7 g/dL and maximum

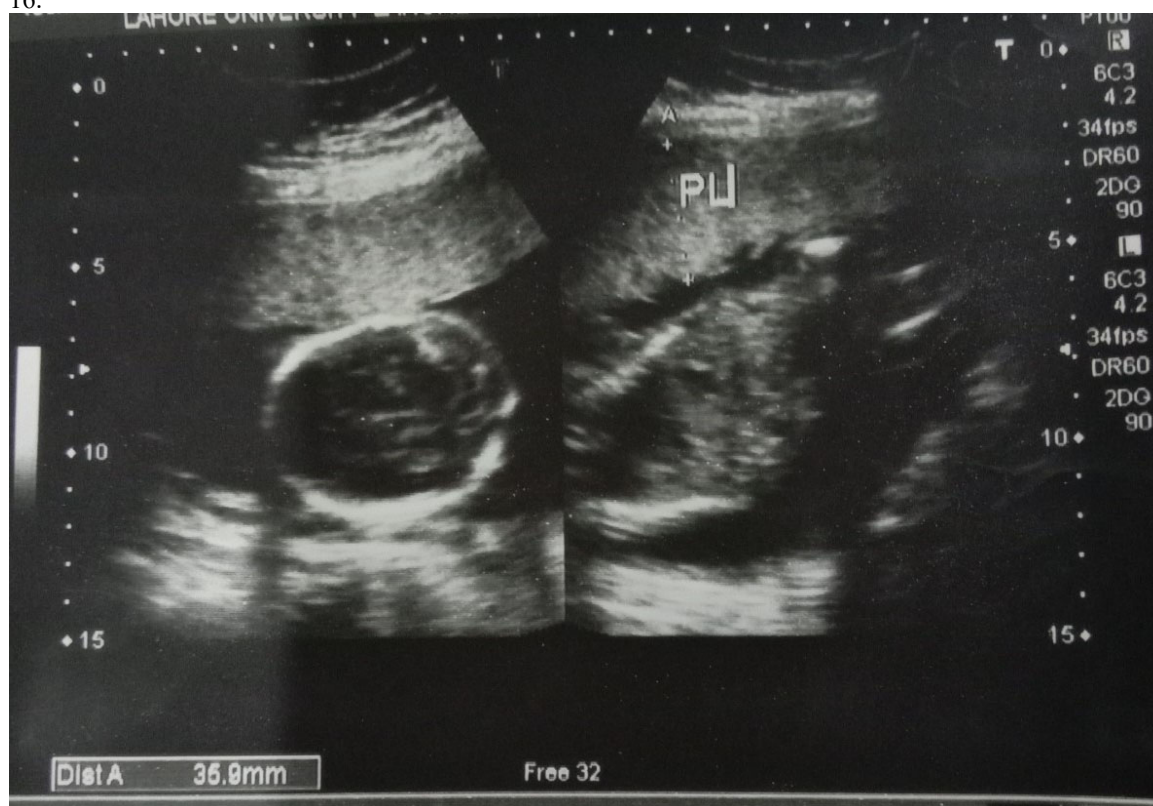
was 15.5 g/dL. In thick placenta minimum hemoglobin noted was; 7.8 g/dL and maximum hemoglobin was 15.4 g/dL. In thin placental thickness minimum hemoglobin was 8.9 g/dL and maximum was 11.2 g/dl, according to table 13.

According to table 14 and graph 3, out of 110 patients 49 patients were in 2<sup>nd</sup> trimester and 61 patients were in their 3<sup>rd</sup> trimester, with the mean of 25.69 and 26.04 respectively. The minimum age of the patients came in 3<sup>rd</sup> trimester was 18 and maximum age was 36. The minimum age of the patients came in 2<sup>nd</sup> trimester was 17 and maximum age was 40.

According to graph 4, majority patients came with hemoglobin rates between 8 to 11 (g/dL) and less than 5 patients came with hemoglobin 7 g/dL.

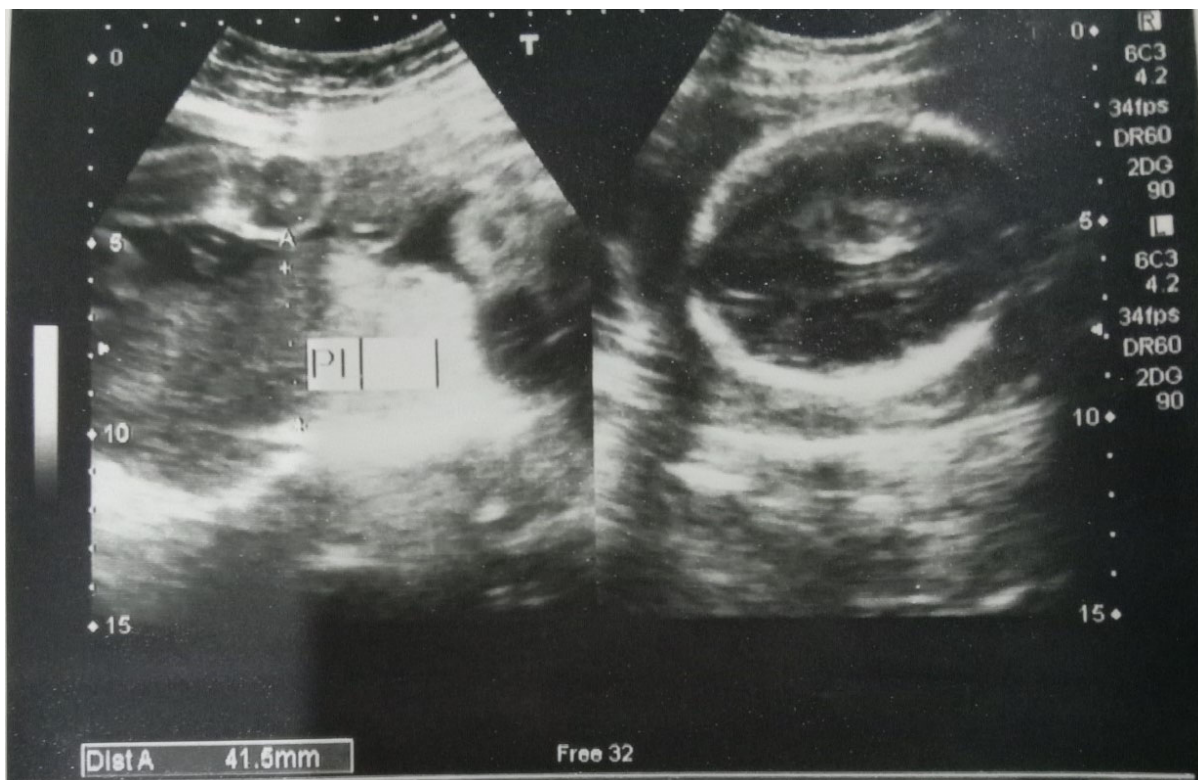
In patients with mild anemia mean placental thickness was 30.57 mm. In patients with moderate anemia had mean placental thickness of 33.72 mm and in patients with normal anemia had mean placental thickness of 30.39 mm, according to table 15.

In 110 patients 29 had no anemia and from these 3 patients were found with normal placental thickness 4 with thick placenta and 2 were with thin. 81 patients who were diagnosed with anemia had normal placental thickness in 6 patients ,65 had thick placenta and 10 patients were found with thick placenta, according to table 16.



**Fig 1: TA gray scale image showing, placental thickness of 36.9mm.**





**Fig 2: TA gray scale image showing, placental thickness of 41.6mm.**

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