

Gross Anatomical Placental Anomalies Observed at the Time of Delivery Associated with Maternal Anemia, Diabetes and Hypertension

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ABSTRACT

Aim: To observe the gross anatomical placental anomalies at the time of delivery associated with maternal anemia, diabetes and hypertension.

Study design: It was a cross sectional study.

Place and duration of study: The study was carried out for a period of one and half year from September 2018 to February 2020 at Pak Red Crescent Medical College and Teaching Hospital, Dina Nath, Multan Road, Kasur.

Methods: Written informed consent was taken from all participants. Maternal characteristics like age, mode of delivery and risk factors such as hypertension, anemia and diabetes were recorded. All placentas were obtained either by vaginal route or by caesarean section. The placentas were found normal if the weight was upto 470g, width 2.5cm, diameter 22cm, cord length 5.5-6cm & centrally placed, cord attachment centrally attached and with dark maroon color. Data was collected through questionnaire, which was entered and statistically analyzed using SPSS 24.0.

Results: The mean age of the mothers was 28.96±6.77 years. Most of the mothers (58.5%) had history of anemia, followed by hypertension (53.5%) and diabetes mellitus (15.5%). Among mothers, 9% mothers (18) were found with placental and cord abnormalities. Placental anomalies were found statistically significant with hypertension and diabetes.

Conclusion: Study concluded that gross anatomical placental anomalies were associated with maternal diabetes and hypertension.

Keywords: Placental anomalies, delivery, anemia, diabetes, hypertension

INTRODUCTION

The placenta is most important for pregnancy^[1] and described as mirror of the perinatal period.^[2] It is responsible for oxygen and nutrient transport, protection from infectivity, waste products removal, maternal resistant system modulation and production of hormone to preserve the pregnancy.^[3] Normal placenta is oval or round-shaped and almost 22 centimeter in diameter. Its thickness is 2-2.5cm, weight almost 1 pound^[4] mostly one-sixth weight of fetus.^[5] Therefore, a normal placental growth is significant for a normal fetal and embryonic development. Thus, placental anomalies can vary from the structural abnormalities to the function disorders, to implantation anomalies site.^[6]

The anatomy of normal placenta includes the lacuna, anchoring and floating villi, syncytiotrophoblasts, extravillous & villous cytotrophoblasts and uterine connective tissue & blood vessels.^[7] Material diseases, for example, diabetes mellitus, anemia and hypertension that cause abnormal placental growth during early as well as mid-pregnancy are found directly related to reduced fetal development during late pregnancy⁸.

Hypertension is a very common medical issue linked with pregnancy.^[9] During pregnancy, hypertension

complaints disrupt almost 7 to 10% of total pregnancies. The pregnancy induced hypertension (PIH) that comprises eclampsia and pre-eclampsia, is accountable for 70 percent of pregnancy hypertensive disorders.^[10] During pregnancy hypertensive disorders have been linked with anomalies in placenta.^[11] The PIH outcome is firstly, the placental size reduction while thickness less than standard expected value and, finally, a decrease in fetal weight of the affected females¹².

Among pregnant females, the DM (Diabetes Mellitus) could be classified into pre-gestational or clinical diabetes and GDM (gestational diabetes), that is described as any level of sugar intolerance with commencement or first identification during the period of pregnancy. Gestational diabetes represents almost 90% of entire pregnancies complicated through diabetes mellitus while it affects about 2 to 5% of total pregnancies. During pregnancy, diabetes mellitus creates several placental anomalies for example, sizeable thickening of trophoblast basal membranes, basal membranes separation in the capillaries, proliferation & distension of the endothelial cells, perivascular gap disarrangements and reduction in terminal villi vascular surface⁸

During pregnancy, anemia is believed a leading health problem, mostly among underdeveloped and developing states. Among mothers, anemia global prevalence is 41.8% and 42.8% in South-east Asia while 39.1% pregnant females in Pakistan are found anemic.^[13]

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Anemia could induce development as well as alterations in the placental histology, morphology, morphometric traits of placental tissue, baby weight at delivery, child development after delivery, APGAR score, decrease in cord blood and in iron stores of mother milk. Under such conditions, anemia during pregnancy is a leading risk factor for anomalous growth of placenta. In such case, babies born with a big placenta have an elevated chance of developing hypertension in their later life while babies born with small size placenta have a sign of inadequate dietary intake to placenta causing placental hypoxia, that could eventually interfere its function^[14].

Maternal anemia, hypertension and diabetes are much common in Pakistan and little or no work is carried out here to assess the placental alterations in this condition.^[15] Therefore, current study is carried out to observe the gross anatomical placental anomalies at the time of delivery associated with maternal anemia, diabetes and hypertension.

MATERIALS AND METHODS

It was a cross sectional study in which 200 mothers were included to collect the placenta of full term pregnancy from labour room of Pak Red Crescent Medical College and Teaching Hospital, Dina Nath, Multan Road, Kasur. The duration of study was 1.5 year (Sep. 2018 to Feb. 2020). Convenient random sampling technique was used. Subjects included in this study were aged between 18-45 years.

Written informed consent was obtained from all participants. Maternal characteristics like age, mode of delivery and risk factors such as hypertension, anemia and diabetes were recorded. Hypertension was defined as BP above 140/90 mmHg. Anemia was defined as hemoglobin level <11g/dl. Diabetes was defined as FPG ≥126mg/dl (7.0mmol/l). Fasting was described as no caloric intake for at least 8 hour.

All placentas were acquired either by vaginal route or C-section. The collected placentas were preserved in 10% formalin; chorion and amnion were trimmed from placenta. The umbilical cord was cut 5cm away from its insertion site.

All placentas were weighed on the weighing machine graduated in grams, after rinsed with running tap water and dried with blotting paper. The placental diameter was measured with measuring tape in centimeters. Placentas were considered normal if weight was upto 470 gram, width 2.5 centimeter, diameter 22 centimeter, cord length 5.5-6 centimeter and centrally placed, cord centrally attached and with dark maroon color.

Data was collected through questionnaire, which was entered and statistically analyzed using SPSS 24.0. Frequencies and percentages were calculated and data was presented in tables and graphs. Chi-square test was applied to find out the association between placental anomalies and risk factors such as maternal anemia, diabetes and hypertension. Significance of the chi-square output was taken as p ≤0.05.

RESULTS

Table-1 describes that among 200 mothers, 81 (40.5%) were 18-25 years old and 73 (36.5%) were 26-35 years old

while 46 (23.0%) mothers were above 35 years old. The mean age of the mothers was 28.96 ± 6.77 years.

Table-2 demonstrates the mode of delivery and found that among 200 mothers, 139 (69.5%) had vaginal delivery while 61 (30.5%) mother delivered through C-section.

Table-3 depicts that most of the mothers 117 (58.5%) had history of anemia, followed by hypertension 107 (53.5%) and diabetes mellitus 31 (15.5%).

Table-4 exhibits that among 200 mothers, majority 182(91.0%) had placenta and cord normal while 18 (9.0%) mothers were found with placental and cord abnormalities.

Table-5 asserts that among 107 mothers who had hypertension, 91 (45.5%) had placenta and cord normal and 16 (8.0%) had anomalous. Likewise among 93 mothers who had no hypertension, 91 (45.5%) had placenta and cord normal and 2 (1.0%) had anomalous. The result was found statistically significant (P=0.002).

Among 31 mothers who had diabetes mellitus, 20(10.0%) had placenta and cord normal and 11 (5.5%) had anomalous. Similarly among 169 mothers who had no DM, 162 (81.0%) had placenta and cord normal and 7 (3.5%) had anomalous. The result was found statistically significant (P=0.000).

Among 117 mothers who had anemia, 107 (53.5%) had placenta and cord normal and 10 (5.0%) had anomalous. Among 83 mothers who had no anemia, 75 (37.5%) had placenta and cord normal and 8 (4.0%) had anomalous. The result was found statistically insignificant (P=0.790).

Table-1: Distribution of mothers according to age

Age	Frequency	Percentage
18-25 years	81	40.5
26-35 years	73	36.5
Above 35 years	46	23.0
Total	200	100.0
Mean ± SD	28.96 ± 6.77	

Figure-1: Distribution of mothers according to age

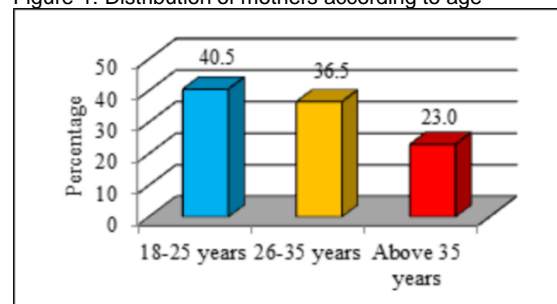


Figure-2: Mode of delivery

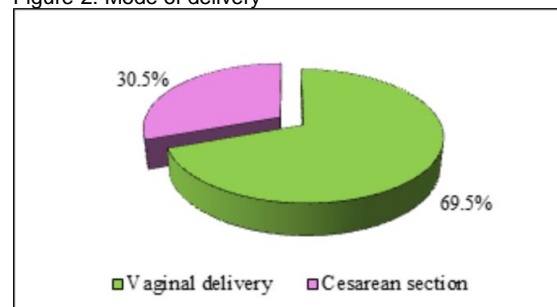


Table-2: Mode of delivery

Mode of delivery	Frequency	Percentage
Vaginal delivery	139	69.5
Cesarean section	61	30.5
Total	200	100.0

Table-3: Risk factors in obstetrical history (n=200)

Risk factors	Yes	No
Hypertension	107 (53.5%)	93 (46.5%)
Diabetes mellitus	31 (15.5%)	169 (84.5%)
Anemia	117 (58.5%)	83 (41.5%)

Table-4: Examination of placenta and cord

Examination	Frequency	Percentage
Normal	182	91.0
Anomalous	18	9.0
Total	200	100.0

Table-5: Gross anatomical placental anomalies observed at the time of delivery associated with maternal anemia, diabetes and hypertension

Risk factors	Examination of placenta and cord		Total	P-value
	Normal	Anomalous		
Hypertension				
Yes	91 (45.5%)	16 (8.0%)	107 (53.5%)	0.002
No	91 (45.5%)	2 (1.0%)	93 (46.5%)	
Total	182 (91.0%)	18 (9.0%)	200 (100.0%)	
Diabetes mellitus				
Yes	20 (10.0%)	11 (5.5%)	31 (15.5%)	0.000
No	162 (81.0%)	7 (3.5%)	169 (84.5%)	
Total	182 (91.0%)	18 (9.0%)	200 (100.0%)	
Anemia				
Yes	107 (53.5%)	10 (5.0%)	117 (58.5%)	0.790
No	75 (37.5%)	8 (4.0%)	83 (41.5%)	
Total	182 (91.0%)	18 (9.0%)	200 (100.0%)	

DISCUSSION

The current study “Gross anatomical placental anomalies observed at the time of delivery associated with maternal anemia, diabetes and hypertension” was carried out at Pak Red Crescent Medical College and Teaching Hospital, Dina Nath, Multan Road Kasur. To acquire appropriate outcomes, 200 mothers were included in the study and found that majority of the mothers were in their best reproductive age group as 77.0% mothers were 18-35 years old and only 23.0% were more than 35 years old. The mean age of the mothers was 28.96 ± 6.77 years. The findings of a similar study conducted by Chhatwal and teammates (2018) are comparable but exhibited better scenario than our study who confirmed that mean age of the mother was 26.89±4.17¹⁶

Mode of vaginal delivery is preferred to avoid future complications among females. It is significant to mention that most of the mothers (69.5%) had vaginal delivery while 30.5% had cesarean section. A recent study performed by Awuah and fellows (2020) confirmed that among mothers, significant majority (98.5%) had vaginal delivery only 1.5% had cesarean section⁹

When the risk factor among mothers were assessed, study disclosed that majority of the mothers had anemia (58.5%), followed by hypertension (53.5%) and diabetes mellitus (15.5%). But the results of a study undertaken by Thakur and comrades (2020) demonstrated that most of

the mothers had anemia (62.7%), followed by diabetes (32.9%) and hypertension (30.2%)¹⁷

Placenta is considered a helpful indicator regarding fetal and maternal diseases. Majority of pregnancy disorders are linked with elevated perinatal morbidity & mortality which are normally accompanied by the morphological modifications in placenta. Such placental modifications are directly dependent upon the disease progression and its severity.^[2] Study revealed that most of the mothers had normal placenta and cord except nine percent mothers who had anomalous placenta and cord.

During hypertensive pregnancies placental development pattern indicates a modifiable pattern because of placental insufficiency¹⁸. When the association between risk factors (hypertension, DM, anemia) and placenta & cord (normal, anomalous) was assess, study showed significant results (P=0.002) between hypertension and placenta & cord. A study undertaken by Efang and coworkers (2020) found significant association (P=0.000) among hypertensive mothers¹² In a study Begum and colleagues (2014) found that among hypertensive mothers, thickness, diameter and number of cotyledon demonstrated statistically insignificant difference.^[10] Baloch et al. (2012) reported in their study that placental surface areas and weight were found significantly low among hypertensive mothers.^[15] A study carried out by Kartha and associates (2014) highlighted that all placental morphometric parameters were significantly changed among hypertensive mothers.^[19] Goswami and Shah (2016) reported in their study that among mothers with pregnancy induced hypertension, mean placental diameter, weight, thickness, volume, length of umbilical cord and cotyledon number were less than controls²⁰.

The effect of diabetes mellitus on the outcomes of pregnancy has become a rising health issue. Maternal glucose during pregnancy can traverse the placenta that causes fetal exposure to high blood sugar during intrauterine growth critical stages. Growing evidence helps the notion that complications during pregnancy as well as poor fetal outcomes related to diabetes may be associated with deficiency in placental growth and function.^[21] In our study significant results (P=0.000) were found between diabetes mellitus and placenta & cord. Khaskhelli and collaborators (2013) found significant association (P <0.05) and asserted that gross assessment of placenta demonstrated that placenta from mothers with diabetes were larger in size when compared with controls.^[8] A study performed by Ashfaq and partners (2005) indicated that weight, diameter and central thickness were significantly higher among diabetic mothers as compared to controls.^[22]

During pregnancy anemia affects the placental growth. At the start of pregnancy, if mothers experience acute anemia, it may affect the placental structure and weight, hence, it affects the oxygen and nutrients transport to fetus.^[23] The results of our study showed insignificant association (P=0.790) between anemia and placenta & cord. In a study Rejeki and partners (2020) also showed insignificant association (P=1.00) between anemia and placenta shape.^[14] A study carried out by Baptiste-Roberts and coworkers (2008) reported that anemia was related to a reduced possibility of growth restriction for the placental weight²⁴.

CONCLUSION

Study concluded that gross anatomical placental anomalies were associated with maternal diabetes and hypertension. Further studies are required to be conducted on large scale to assess the gross anatomical placental anomalies observed at the time of delivery associated with maternal anemia, diabetes and hypertension.

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