

The effect of placental location on placental weight and infant birth weight of pregnant mothers: a cross-sectional study

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Keypoints

When performing surgery for a specific disease, the result of the operation, of course, depends on the skill of the surgeon, but the support, correction, and, if necessary, restoration of vital vital functions of the patient's body depends on the professionalism of the anesthesiologist. That is why the concept of patient safety in world medical practice is associated primarily with anesthesiology.

Abstract

Introduction

The placenta is considered to be the most vital organ of the infant. The intrauterine fetal growth and development indicates a harmony between the fetus, placenta, and mother. Studies show that placenta has different effects on maternal and neonatal outcomes. This study aimed to investigate the effect of placenta location on placental weight (PW) and infant birth weight (IBW) in pregnant mothers.

Material and Methods

This descriptive study was performed on 370 pregnant mothers and their newborns referring to Amir-al-Momenin Hospital in Zabol, south of Iran from October to March 2018.

The data collection tool included a researcher-made checklist consisting of two parts: maternal demographic information and infant information.

The placenta location was determined by ultrasound and recorded by a radiologist and the Apgar's score was measured by an obstetrician in the delivery room.

The collected data were then analyzed using descriptive and analytical tests.

Results

The mean± SD of maternal age, maternal BMI, Apgar score, and IBW was 30.39±5.44, 25.24 ± 4.54, 9.65 ± 0.65, 3244.61 ± 204.116 gr, and 548.83± 104.65 gr, respectively. Most of the infants were male (50.3%). The placenta was mainly located in the fundal portion of the womb (44.9%). Results showed no significant relationship between the placental location and IBW (p = 0.555). However, the results showed a significant relationship between the placental location and PW (p = 0.028).

Conclusion

Since the results of this study indicate the relationship between placental location and PW and infants' gender, specialists are recommended to consider placental location as a factor affecting PW.

Keywords

Placental location, placental weight, pregnancy

Introduction

The intrauterine development indicates a harmony between the fetus, placenta, and mother(1). The placenta is the organ that provides the fetus with the nutrients and respiratory gases to maintain the fetus's life (2). For a

baby to be healthy, there must be three important factors: a healthy mother, a genetically healthy fetus, ideal placental location (3). The normal placental function is vital to the proper development of the fetus. Proper growth of the fetus depends on getting enough nutrients from the mother, which itself requires proper uterine blood supply, flawless transfer of nutrients and wastes through placenta, and normal umbilical blood flow (4). Study and examination of the placenta can provide useful information on the fetus status. Many changes occur in the placental function and shape as the fetus goes through the different development stages, indicating that fetal needs are different at various stages of development, and to induce these changes, placental trophoblast cells must undergo metabolic, immunological, and secretory changes (5). Placental weight is one of several standard criteria for measuring and determining placental growth rate (6) and an indicator indicating placental growth and function and is related to maternal age, gestational age, maternal diabetes history, preeclampsia, birth weight, the fetus's gender, maternal height and weight, and the blood ferritin level (7). Placental weight gain during pregnancy is associated with fetal weight gain and is an independent factor in predicting birth weight (6). A large placenta in a low birth weight infant increases the odd ratio of developing hypertension in adulthood and also a maternal or fetal disorder such as gestational diabetes, severe anemia, hypertension, and hydrops fetalis can affect fetal and placenta weight (8).

Fundal placenta is seen in most pregnancies (9). Previous studies have shown that placenta attaches to the anterior, posterior, and fundal portions of the womb in 37%, 24%, and 34% of cases, respectively (10-12). The placental location and morphology can change during pregnancy. If the placentation occurs in a portion that is not suitable for placenta development, therefore, the placenta moves to an area with a better blood supply and those parts of the placenta that remain in a place with inadequate blood supply are weakened. Lateral placental position can cause uterus-placenta dysfunction in pregnant women,

reduce birth weight, and increases the risk of intrauterine growth retardation (IUGR) (13). Consequently, the amount of blood supply to the anterior and posterior regions of the uterus can vary and may cause changes in the birth weight and Doppler parameters (14).

We seek to investigate the relationship between placental weight and placental placement with IBW, since birth weight is one of the most important health indicators to assess infant health and a determining factor for survival, physical and mental development of the infant as well as neonatal morbidity and mortality (15). The aim of the present study was to determine the relationship between placental location with placental weight and IBW in pregnant women.

Material and Methods

Study design

This descriptive-analytical study was performed on 370 mothers referring to an educational hospital in Zabol, east of Iran from March to October 2019. Simple random sampling was used to select participants. All mothers who met the inclusion criteria were enrolled. The inclusion criteria were willingness to participate in the study. Exclusion criteria included having multiple pregnancies, polyhydramnios or oligohydramnios, fetal death, congenital anomalies, systemic diseases, and pregnancy complications such as gestational diabetes and hypertension during pregnancy as well as mothers who did not have their last ultrasound results indicated the placental location. Being assured of their participation in the study, written consent would be obtained from them.

Sample Size and Instruments

In the present study, a similar study was used to determine sample size. Taking into account the probability of a Type 1 error ($p > 0.05$), power of 90%, 95% confidence interval, the sample size was estimated 370 individuals. A researcher-made checklist consisting of two parts was used to collect data. The first part included demographic information such as maternal age, sex, maternal BMI, group, maternal occupation and education, maternal nutritional status. The second part contained information on

infants such as IBW, placental location, neonatal Apgar score, delivery, and PW.

Data collection

After coordinating with the authorities in charge of the related department and selecting the participants, the study objectives were explained to the participants enrolled in the study. The placental location was determined and recorded in these mothers by a radiologist by ultrasound at 20 -23 gestational weeks. Then, PW and IBW were measured using a standard scale with appropriate measurement accuracy. PW was measured in the delivery room by removing and drying clots and extra blood from the placenta using gauze and cutting foetal membranes around the placenta 1-2 cm away from the placenta by a trained obstetrician. IBW weight was also measured in the neonatal ward and the information was recorded in the relevant checklist.

Ethical considerations

This study was approved by the Ethics Committee of Zabol University of Medical Sciences (code: IR.ZBMU.REC.1396.98). Written and oral consent was obtained from all participants before the study. STROBE tool was used to report the study (16).

Data analysis

Descriptive and analytical tests were used for data analysis. Simple linear regression was used to determine the relationship between PW and IBW. ANOVA was used to determine the relationship between placental location with PW and IBW. Independent T-test was used to determine the relationship between placental weight and fetus's gender. Since both placental location and fetus's gender were qualitative variables, chi-square test was used to determine the relationship between them. SPSS Version 18.0 for Windows (SPSS Inc., Chicago, IL, USA) was used to analyze the data. Confidence interval of 95% and a significance level of P-value less than 0.05 was considered significant.

Results

A total of 370 infants were investigated in this study. The mean ± SD of maternal age, maternal BMI, Apgar's Behzadmehr. Placental location and weight

score, IBW, and PW was 30.39±5.44 year, 25.24 ± 4.54 gr, 9.65 ± 0.65, 3244.61 ± 204.116 gr, and 548.83 ± 104.65 gr, respectively. Most of the neonates were male (50.3%). Placental location was mainly located in the fundal portion (44.9%). (Table 1)

Table 1. Demographic characteristics of participants

Variable		Mean
Maternal age		30.39±5.44
BMI		25.24±4.54
Apgar's score		0.65±9.65
IBW		3244.61 ± 204.116
PW		548.83 ± 104.65
Infant's gender	N (%)	
	Male	186(50.3%)
	Female	184(49.7%)
Placental location	Anterior	103(27.8)
	Posterior	101(27.3)
	Fundal	166(44.9)

The results showed no significant relationship between placental location with IBW (p = 0.555). However, the results showed a significant relationship between placental location and PW (p = 0.028). Post-hoc test (Bonferroni) and pairwise comparison of the groups showed that PW was significantly higher in anterior placenta than posterior placenta, but there was no significant weight difference between anterior placenta with fundal placenta and posterior placenta with fundal placenta. Therefore, the lowest PW was seen in the posterior placenta. The results of the present study showed a significant relationship between placental placement and the infant's gender (p = 0.001). The results of pairwise comparisons based in Bonferroni test showed significantly higher anterior placenta frequency in boys than in girls, while the posterior placenta frequency was significantly higher in girls than in boys. There was no significant difference between the two genders in terms of the frequency of the fundal placenta. The results also showed no significant relationship between placental location and Apgar's score (p = 0.957) (Table 2). The results also showed no significant relationship between IBW and maternal BMI, maternal age, PW. (Table 3)

Table 2. Determination of effect of placental placement on IBW, PW, placental sex, and Apgar's score in pregnant women

Variable	Variables		P-value	
	Birth weight			
Placental location	Anterior	3271.41 ± 176.57	0.446	
	Posterior	3239.89 ± 215.18		
	Fundal	3230.85 ± 212.56		
	Placental weight			0.028
	Anterior	572.33 ^a ± 107.82		
	Posterior	536.55 ^b ± 102.255		
	Fundal	541.72 ^{ab} ± 102.37		
	Infant gender			<0.001
		Male	Female	
	Anterior	75(40.3%)	28(15.2%)	
	Posterior	29(15.6%)*	72(39.1%)	
	Fundal	82(44.1%)	84(45.7%)	
Apgar score			0.957	
Anterior	0.652 ± 9.65			
Posterior	0.657 ± 9.64			
Fundal	0.647 ± 9.66			

Table 3. Determination of the effect of maternal BMI, maternal age, and PW on IBW

Variable	Pearson correlation coefficient	P-Value
Maternal BMI	0.008	0.885
Infant's weight		
Maternal age	0.049	0.347
Infant's weight		
Placental weight	0.05	0.340
Infant's weight		

Discussion and Conclusion

The aim of this study was to investigate the effect of placental location on PW and IBW of pregnant mothers referring to Amir al-Momenin Hospital in Zabol, Iran in 2018. The results showed that PW was significantly higher in anterior placenta than posterior placenta, but there was no statistically significant weight difference between anterior placenta with fundal placenta and posterior placenta with fundal placenta; overall, it can be said that the placental location can affect the PW. The results of the present study showed no significant relationship between placental location and IBW. The results of our study were consistent with the results of the Devarajan's study, which investigated the placental location and the IBW among 796 newborns with gestational age greater than 37 weeks in 2012 (13). Devarajan reported no significant relationship between the placental location

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(lateral, fundal, and central) with IBW (13). The results of the present study were inconsistent with those of the study by Müzeyyen's study, which investigated the placental location, IBW, Doppler ultrasound parameters, and infants' gender in 50 healthy pregnant mothers in 2014. Müzeyyen observed a relationship between the placental location and IBW and further reported that infants with anterior placenta had higher birth weight, while our study showed that birth weight was higher in anterior placenta, but no significant relationship was observed. Such difference could be due to sample size difference and ethnicity (14). Uterine and ovary arteries are the main source of nutrition of the uterus(17). Uterine blood is not uniformly distributed, so, the placental location is an important determinant of placental blood flow (18-20). The lateral portions of the uterus may receive less blood from the ipsilateral artery of the uterus than the central region because the central uterine region receives blood from two blood arteries (21). In pregnancies with lateral placental, uterine vascular resistance is lower on the right than on the opposite side (22). This resistance is similar to the resistance of the left and right arteries in pregnancy with the placenta in the center of the uterus (23, 24). Therefore, unilateral pregnancy due to decreased uterine-placental perfusion provides conditions for low birth weight(25). In pregnancy with anterior placenta, there are more cases of gestational diabetes mellitus (GDM), pregnancy-induced hypertension (PIH), abortion, IUGR, and IUFD compared to posterior or fundal placenta. Women with a posterior placenta are more at risk for preterm labor and the placental location affects successful pregnancy (26-28).

PW is influenced by gestational age, prenatal care, and vitamin C intake (7, 29). The results of the present study revealed a significant relationship between placental location and PW. PW was significantly higher in anterior placenta than posterior placenta, but there was no statistically significant weight difference between anterior placenta with fundal placenta and posterior placenta with fundal placenta. Therefore, the lowest PW was observed

in the posterior placenta. So far, no studies have investigated the relationship between placental location and PW.

The results of the current study demonstrated a significant relationship between placental location and infant's gender so that the frequency of anterior placenta was significantly higher in boys than girls, while the frequency of the posterior placenta was significantly higher in girls than in boys. There was no significant difference between the two sexes in terms of the frequency of the fundal placenta. The results of our study are consistent with the results of the Müzeyyen's study (14). Müzeyyen also showed that the frequency of posterior placenta was significantly higher in girls than boys, however, inconsistent with present study, Müzeyyen found that the frequency of anterior placenta was significantly higher in girls than in boys, and the frequency of posterior placenta was significantly higher in boys than anterior placenta (14). The present study didn't show a significant relationship between PW and IBW, which is inconsistent with Patimah et al.'s study (30). They stated that the maternal age and prenatal care were significantly correlated with PW. PW is also positively correlated with IBW. The results of the present study are also inconsistent with the results of Panti et al.'s study that found that there was a positive relationship between PW and IBW, however, the PW-IBW ratio decreases in term neonates with increasing gestational age, thus prolonged term pregnancies have an adverse effect on the neonate (31).

Also Senapati et al. study stated that that low birth weight infants have lower placental parameters such as weight, placental level than normal infants, so color Doppler ultrasound and imaging can be used to diagnose low birth weight infants (32). The present study revealed no significant relationship between placental location and Apgar's score, which is consistent with the results of Sekiguchi et al.'s study which reported that there was no significant relationship between placental location and Apgar score at 1 minute (33). According to the results of this study, there was no significant relationship between

maternal age and IBW, which is consistent with a similar carried out by Adamson et al. (2007). They observed no significant relationship between maternal age and low birth weight (34). The results of this study showed no significant relationship between maternal BMI and IBW, and since there was no similar study, we couldn't compare the results of our study. The strength of the present study was the large sample size and sufficient participation of the participants. The limitation of the present study was that it was a descriptive study and had specific methodological limitations of these studies. According to the results of the study, which indicate the relationship between placental location with PW and infant's gender, it is recommended that specialists consider placental location as a factor affecting PW. The researchers are also suggested to conduct study with a larger sample size.

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