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SONOGRAPHIC ASSOCIATION BETWEEN ANTENATAL PLACENTAL LOCALIZATION AND NEONATAL GENDER

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Abstract

Background: Ultrasound imaging plays a crucial role in delivering high-quality obstetric care, serving purposes such as gender determination and assessing various parameters. Placenta is known to play a substantial part in fetal development and there is a keen interest in finding any association between placental location and neonatal gender but no consistent fallouts have been found.

Aim: The study aims to explore the correlation between antenatal placental localization and neonatal gender in pregnant women during labor through the useof ultrasound.

Patients and Methods: Conducted as a cross-sectional analytical study, this research delved into ultrasound findings in 179 pregnant patients within the gynecology department. The study employed a convenient sampling technique. Neonatal gender estimates were made based on placental location (anterior, posterior), and these estimates were then used to correlate with after-birth gender. By using version 21 of SPSS software, statistical analyses were performed, with a set significance level of P value less than 0.05.

Results: Among 179 participants, a significant association was observed between neonatal gender and placental location. Male neonates were more prevalent (73.0%, p=0.001) in the posterior side of the placenta, while females exhibited a higher incidence (68.0%, p=0.001) in the anterior location. This association reached statistical significance with a p-value of less than 0.0001.

Conclusion: In conclusion, the study establishes a notable correlation between placental localization and neonatal gender. Females tend to have mostly anterior placenta, whereas males are associated more with a posterior placenta.

Key words: Ultrasound, Placental localization, Neonatal Gender, anterior placenta,posterior placenta.

INTRODUCTION

Intrauterine development generates a balance between placenta, mother and fetus (1). Optimal fetal growth and development rely on the well-being of the placenta (2). Placenta, originating from the fetus, is the largest organ with a vital role in the development and functioning of fetus, by serving as the interface for exchange of nutrients and oxygen between maternal and fetal circulations. The foundation of fetal development lies in placental function, and inadequate placental function can potentially endanger fetal development, increasing the susceptibility to both pre and postnatal diseases (3). The strong correlation between placental weight and neonatal birthweight underscores the significance of placental growth, location, and development (4).

The placental localization and its structure can change during gestation (1). Around the 5^{th} week of gestation, placenta is made up of chorionic villi at the site of implantation. Around 9^{th} or 10^{th} week, developing placenta is represented by a diffuse granular echo pattern on ultrasound (5). Placenta is usually seen as smooth and uniform during the 2^{nd} trimester (6). Antenatal placental diagnosis and its association with fetal health is relatively a new idea (7).

Placental localization has been explained by many researchers in different ways. According to research, placenta attaches to the anterior (37%), posterior (24%) or fundal (34%) side of the uterus. This can also be attached to the lateral wall of the uterus (1). Moreover, the anterior and posterior placentas are the most prevalent, accounting for 60 to 90 percent. The correlation of neonatal sex on placental location has undergone limited study till date (8). Available research shows some correlation between anterior and posterior placental position and neonatal gender (9).

The significance of ultrasound imaging cannot be overstated in delivering excellent obstetric care. Adequate visualization of fetal parameters is achieved through high-resolution dynamic ultrasonography during routine examinations. The timely identification of fetal biometric parameters during antenatal phase enables effective planning for a comprehensive management at the time of birth (10). In remote and underserved areas, the restricted access to ultrasound imaging significantly contributes to a healthcare disparity for expectant mothers (11).

The use of sonography to document the placental location is common among most of the pregnant females. Sometimes connections to unfavorable pregnancy results, such as fetal growth restriction (FGR) and pre-eclampsia, have been attributed to the placental volume and vascularity (12). Although sonographic gender determination is possible for most pregnancies, there are situations where it can be challenging (13). Technical challenges, such as those related to fetal lie and presentation, fetal activity, number of fetuses, amniotic fluid volume, and maternal obesity, have been extensively discussed and explained in the literature (14).

Figure shows normal sonographic features of posterior placenta, hypoechoic and homogenous pattern.

Some studies have demonstrated that placental location plays a significant role in fetal growth and gender determination. Therefore, exacting scrutiny of placental growth during pregnancy, particularly through ultrasonography, can assist physicians in evaluating both the baby's gender and overall well- being. However, other studies have suggested that placental localization is an independent factor and not reliant on other variables. Another influential factor affecting placental location and weight is gestational age, known as a principal determining factor in both placental weight and location (15).

Previous research has explored the connection between the placenta and fetal development, birth weight, Doppler parameters, and pregnancy-related complications. However, the link between placental localization and neonatal gender remains relatively understudied. Consequently, there is a demand for an affordable and non-invasive diagnostic tool to determine placental location and its potential impact on gender, which can be confirmed after birth.

There is a hypothesis that the position of the placenta could potentially act as a predictor of the neonatal gender. Late third-trimester ultrasound scans emerge as an indispensable component of contemporary prenatal care, providing a wealth of information that not only aids in clinical decision-making but also aligns with the expectant mother's desire for comprehensive insights into the well-being of her developing fetus. Researching the relationship between placental localization just before birth and neonatal gender has the potential to improve sonographer’s confidence in performing obstetrical scans.

MATERIAL AND METHODS

This was a Cross Sectional Analytical Study conducted for a period of nine months. Data was collected using the Convenient Sampling technique. Pregnant females admitted at labor were included in the study. However, cases involving twin pregnancies or congenital anomalies were excluded. Females with a history of Chronic renal disease, chronic hypertension, or diabetes mellitus and, those with known diseases that can affect fetal growth, such as early miscarriage, assisted conception, or placental abnormalities were disqualified. Data was collected after obtaining informed consent from the participants.

Ultrasound examination was performed using HITACHI ARIETTA V70 machine and convex sector probe with a frequency range of 2-10 MHz. Prior to each ultrasound scan, the procedure was thoroughly explained to the patient. The transabdominal ultrasound was conducted during labor to observe the placenta's location, which includes anterior, posterior, right, left, fundal, and lateral positions. Fetal gender was confirmed immediately after the birth.

Statistical analysis: The data analysis was performed utilizing statistical software SPSS version 21. Results were shown as Mean and ± SD for continuous variables and as percentages and frequencies for categorical data. The chi-square test was applied and the P-value was used to determine statistical significance of correlations and associations between variables. A P-value less than 0.05 was considered statistically significant.

Results

A total of 179 pregnant females were included in the study, maximum and minimum age was 39 and 19 years respectively. The mean of age was 27.1508. Standard deviation was recorded at 5.33113. Maximum and minimum BMI was 27 and 18, respectively. The mean BMI was 23.5955. Standard deviation was recorded at 2.2.183 (Table 1).

Table 1:

Demographic characteristics of the subjects

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Mother age	179	19.00	39.00	27.1508	5.33113
BMI	179	18.10	27.60	23.5955	2.20183

There was a slight difference in the frequency of male and female fetuses. Out of 179 fetuses, 91 were identified as male, and remaining 81 were female. Percentage of male neonates was slightly higher (50.8%) than the percentage of female neonates (49.2%).

It was detected that the frequency and percentage of anterior and posterior placenta exhibit differences. The proportion of anteriorly located placenta was higher (54.2%) whereas the proportion of posteriorly located placenta was comparatively lower (45.8%). Also, the same difference was seen in the frequency of anterior and posterior placenta, which is 97 and 82, respectively as shown in Table 2.

Table 2:

Frequency distribution of placental localization

Placenta	Frequency	Percent
Anterior	97	54.2
Posterior	82	45.8
Total	179	100.0

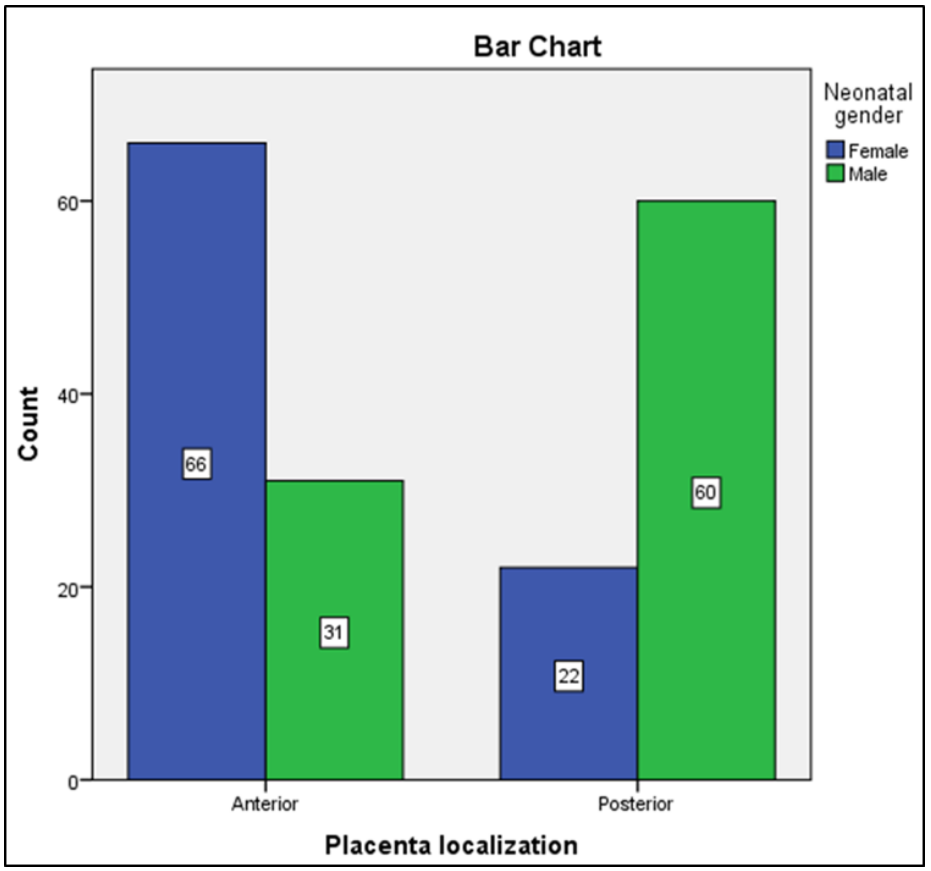
The results shown by cross-tabulation between placental localization and neonatal gender revealed that 97 neonates were found in the anteriorly located placenta, whereas 82 of total neonates were found in the posteriorly located placenta. Anterior placenta showed a higher ratio of female neonates (68.0 %) (p=0.001) as compared to male neonates (32.0%), whereas, (73.2%) (p=0.02) male babies were found when the placenta was located posteriorly and the percentage of female babies was (26.8%) (Table 3).

Table 3:

Placenta localization * Neonatal gender Cross tabulation

		Neonatal gender		Total
		Female	Male	
		66	31	97
Placenta localization	Anterior	68.0%	32.0%	100.0%
	Posterior	22	60	82
		26.8%	73.2%	100.0%
Total		88	91	179
		49.2%	50.8%	100.0%

The bar chart between placental localization and neonatal gender revealed that 66 female neonates had anterior placenta and the number of male neonates with anteriorly located placenta was 31. Similarly 60 male fetuses had posterior placenta while the number of female fetuses having posterior placenta was as low as 22.



Bar chart between Placenta Localization and Neonatal gender

A significant association was found between location of placenta and neonatal gender. The chi-square analysis affirmed a strong correlation between neonatal gender and placental location. P value stood at 0.43ns. (Table 4)

Table 4:

Chi Square Test

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	30.197[a]	1	.000		
Continuity Correction[b]	28.570	1	.000		
Likelihood Ratio	31.169	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	179				
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 40.31.					
b. Computed only for a 2x2 table					

Neonate's birth weight was estimated when the placenta was anterior and when its location was posterior. Birth weight were estimated in kilograms. For a total of 97 neonates with anteriorly located placenta, the mean birthweight was estimated at 2.75. The remaining 82 neonates with posteriorly located placenta showed a mean birth weight of 3.01 with standard deviation of 0.436 and 0.458 respectively.

Table 5 provides group statistics for neonate's birth weight with respect to their gender. The mean neonate birth weight for male gender was 3.14 whereas for the female gender was 2.60. Standard deviation and standard error deviation were also calculated.

Table 5:

Group Statistics for Birth Weight of Neonatal Gender

	Neonatal gender	N	Mean	Std. Deviation	Std. Error Mean
Birth Weight (Kg)	Male	91	3.14	.394	.041
	Female	88	2.60	.360	.038

Discussion

Extensive research has highlighted a notable connection between fetal outcomes and the placental location at term. This association prompts inquiry into whether the in-utero placement of the placenta could serve as an indicator of fetal gender

This study is an attempt to systematically investigate the correlation between placental location and neonatal gender. The objective was to ascertain whether such an association exists. The study included one hundred and seventy-nine patients with a healthy pregnancy. The subjects were examined in the ultrasound department .

In our study, a higher percentage of male neonates (73.0%) (p=0.001) was observed at posterior placenta as compared to its anterior location. Conversely, higher percentage of female neonates (68.0%) (p=0.001) was observed when placenta was located anteriorly. Male neonates identified with posterior placenta exhibited a larger birth weight compared to females. Our results indicated that 73% of male neonates were associated with posteriorly located placentae, while only 32% males were concomitant with anteriorly located placenta.

Our findings align with the cross sectional study conducted by Razieh Mohammad et al, among 200 assessed placentas, 97 were posterior and 103 were found to be anterior. The anterior placenta results indicated that 75 were female whereas only 28 were male ($P < 0.001$). Conversely, 66 of the male cases had a posterior placenta, whereas only 31 of the female cases had a posterior placenta ($P < 0.001$). These findings revealed a significant relationship between placental positions (anterior and posterior) and neonatal gender (17).

Similarly, Rana A-R et al. observed comparable results in their ultrasound examination of 117 placentae. In their study, a pronounced trend emerged, showcasing a significant proportion of male infants exhibiting a posterior placental position, while female infants tended to have an anterior placental site. For male babies, 34.7% had an anterior placenta, and 58.7% had a posterior placenta. In contrast, female babies showed 59.6% anterior and 23.8% posterior placental positions, reinforcing a notable correlation between placental location and neonatal gender (16).

A retrospective study conducted by Erdolu et al supported our study. Statistical analysis was conducted on collected data and results revealed that percentage of female neonates tend to higher in anterior placenta compared to posterior placenta with P value equal to .023. Moreover, a higher female to male ratio was observed in anterior placentas (1.63). This higher female to male fetus ratio indicates a strong association between placental localization and neonatal gender (17).

Moreover, Al Bayati et al.'s study, encompassing 50 neonates, found a distinct correlation between placental position and gender. Male fetuses, preponderantly, had posterior placentas, whereas, female fetuses mainly had anterior placentas (8).

However, some studies disagreed with our findings, such as Hammad H et al. invastigated results from 150 participants and concluded that a higher percentage of female fetuses had posterior placentas and a higher proportion of male fetuses had anterior placenta (14). Another study reported by Fariba Morbolouk et al.

showed similar dissenting results. The total sample was consisted of 800 women. According to the results, left posterior placenta was associated with female neonates and the right anterior placenta with male neonates (18). A research undertaken by Behzadmehr R et al. did not found a significant correlation between neonatal gender and placental location. They observed a higher frequency of anterior placenta in boys and a higher frequency of posterior placenta in girls (1).

The exact factor associated with placental location according to fetal gender is unknown but some suggestions have been made. According to Kavraiska and Nazarova, right side of uterus receives high blood flow than the left side of uterus. Due to this blood flow difference fetus may prefer the most suitable site in the uterus according to its sex (19). Studies also inferred that endometrial movement and electrical activity may affect sperm transport in the uterus. Positively charged male sperm may transport to one side of the uterus while, negatively charged female sperm may move to the other side of the uterus (20). This might be another possible explanation of different implantation sites according to neonatal gender.

Proper placental diagnosis prior to delivery is critical, directing clinical selection of the appropriate treatment scheme and reducing the likelihood of various problems. The study provides a description of the advantages and limitations of existing imaging technologies in establishing correlations between placental localization and neonatal effects.

Moreover, the study advocates for additional research endeavors with a larger sample size and more intricate investigations into placental locations, recognizing the potential for further nuances in the relationship between placental characteristics and neonatal gender.

Conclusion

There exists a positive association between placental location and neonatal gender. Female neonates are mainly associated with anterior placentas, whereas male neonates tend to have posterior placentas.

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