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Relationship between placental location and fetal gender using ultrasonography: A prospective study from the Maternity and Children's Hospital, Najran, Saudi Arabia

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Abstract

The study was a prospective cross-sectional design and was carried out at the Maternity and Children's Hospital in Najran, Saudi Arabia on 142 pregnant women . The objective of the study was to establish, utilising ultrasound scan , whether there is any link between the site of the placenta and the gender of the fetus**.** A higher percentage of female fetuses were identified. The majority of placentas (73, 51.4%) were found to be anterior, of which 66 (46.5%) and 7 (4.9%) were present in female and male fetuses, respectively. 58 (40.8%) placentas were noted to be posterior, i.e. females, 10 (7.0%); males, 48 (33.8%). 10 (7.0%) placentas were high, a position which was equally prevalent in both genders, i.e. females, 5 (3.5%); males 5 (3.5%), and 1 (0.7%), in a male fetus, was low-lying. A significant correlation between placental site and the gender of the fetus was revealed by the chi-squared test ($p < 0.05$) the sensitivity of ultrasound in predication fetal gendar was 95.1%. The outcome reveals a noteworthy association between the position of the placenta and the gender of the fetus. *(Afr J Reprod Health 2023; 27 [12]: 36-42).*

Keywords: Fetal gender, placental location, pregnancy, parity, Najran

Résumé

L'étude était une conception transversale prospective et a été réalisée à l'hôpital de maternité et pour enfants de Najran, en Arabie Saoudite, sur 142 femmes enceintes. L'objectif de l'étude était d'établir, par échographie, s'il existe un lien entre la localisation du placenta et le sexe du fœtus. Un pourcentage plus élevé de fœtus féminins a été identifié. La majorité des placentas (73, 51,4 %) étaient antérieurs, dont 66 (46,5 %) et 7 (4,9 %) étaient présents respectivement chez les fœtus féminins et masculins. 58 (40,8 %) placentas étaient postérieurs, soit 10 femmes (7,0 %) ; hommes, 48 (33,8%). 10 (7,0 %) placentas étaient hauts, une position également répandue chez les deux sexes, c'est-à-dire chez les femmes, 5 (3,5 %) ; chez les mâles, 5 (3,5 %) et 1 (0,7 %), chez un fœtus mâle, étaient de faible hauteur. Une corrélation significative entre le site placentaire et le sexe du fœtus a été révélée par le test du chi carré ($p < 0,05$) ; la sensibilité de l'échographie en prédication du genre fœtal était de 95,1 %. Le résultat révèle une association remarquable entre la position du placenta et le sexe du fœtus. *(Afr J Reprod Health 2023; 27 [12]: 36-42).*

Mots-clés: Sexe fœtal, localisation placentaire, grossesse, parité, Najran

Introduction

Determining the gender of a fetus in the prenatal period may have significant connotations with respect to both cultural and clinical perspectives. For instance, being aware of a child's gender prior to birth may be crucial where genetic counselling is being undertaken in families with genetic X-linked anomalies, multiple pregnancies, ambiguous genitalia and fetal malformation[1,2].

Technological advances in ultrasound (US) imaging have enhanced computers, image transducers and software, and led to greater accuracy in recognising foetal anatomy. Foetal US is a well-established modality for use in pregnancy[3]. High-resolution images can increase the precision of gender recognition in the prenatal period, a technique that becomes increasingly accurate as the fetus develops. The anatomical appearance of the genital region is identical in males and females up until the eleventh week of gestation. The effect of hormones on the genital tubercle becomes evident during the fourteenth week, giving rise to the differentiation of the external genitalia. Consequently, identification of the gender of a fetus is imprecise prior to the eleventh week[4], and so US

for this purpose is mostly performed during the second trimester[5].

Gender-specific placental functions are thought to underlie gender disparities in growth discordance and morbidities or deaths arising in the foetus or neonate. Data from previous studies have failed to infer that physicians should consider the gender of the fetus in the course of perinatal screening as the physiological processes that bestow the diversity between males and females are poorly delineated. Additionally, the correlation between negative perinatal outcomes and the gender of the fetus lacks robustness; potentially, other influences, e.g. chorionicity, are more influential[6].

Typically, the site of the placenta is in either the left or right, posterior or anterior aspect of the fundus, or in a combination of these regions. Clinically, the importance of its position relates to the way in which the lower part of the placenta interacts with the internal uterine os[7]. A number of researchers have examined the association between the position of the placenta and the gender of the fetus. For instance, a probable effect of fetal gender on the location of the placenta was described by Erdolu *et al*.[8] a more significant correlation was observed by Ismail *et al*.[9].

The aim of the current study was to investigate the association between the site of the placenta and the gender of the fetus in women in either the second or third trimester of their pregnancies using ultrasound scan.

Methods

Study design

This study was a prospective cross-sectional design, and was conducted at the Maternity and Children's hospital in Najran, Saudi Arabia between May 2022 and May 2023.

Population and sample

The study population, comprising 150 subjects in total, was randomly recruited from women who were referred to the ultrasound department of the hospital for screening. However, 142 women were finally selected for the study.

Inclusion criteria were: females, aged between 18 and 45 years, in their second or third trimester of a singleton pregnancy. Pregnant females who had more than one fetus, an ectopic pregnancy, polyhydramnios, oligohydramnios, or in whom congenital anomalies, fatal abortion or death were recognised, were excluded from study participation.

All participants received routine obstetric ultrasound examinations during subjects' second or third trimester of pregnancy (14-40) Conducted by skilled sonographers using a high-resolution ultrasound machine. The examinations followed the hospital's standard protocols. Transabdominal approach was done using a 2-5 Mhz curvilinear probe with patient in supine position with the transducer indicator oriented to the patient's head for midsaggital plane and to the patient's right slide for transverse plane . It is advisable for the patients to have a full bladder, if feasible, as it can improve the clarity of deeper structures and assist in the evaluation of the placenta and uterus. The estimation of gestational age was determined by measuring the Biparietal diameter (BPD) and femur length (FL), as well as considering the women's last menstrual period (LMP). The Placental location was determined by visualizing the position of the placenta relative to the uterine wall and its proximity to the cervix. The four main types of placental location assessed were anterior, posterior, High and low lying. During the ultrasound examination, the fetal gender was identified and recorded by the sonographers as either male or female to help the follow- up delivery outcome for each subject. The radiologist conducted ultrasound imaging, focusing on the genital region in a mid-sagittal plane. To determine the fetal gender, the angle between the genital tubercle and a horizontal line passing through the lumbosacral skin surface was measured. If the angle was greater than 30°, the gender was assigned as male. Conversely, if the genital tubercle was parallel or convergent to the horizontal line (less than 30°), the gender was assigned as female. Following the delivery, a skilled doctor evaluated the gender of the newborns. whether male or female. In boys, the testes were found in the scrotum, while in girls, the labia were noticeable. This evaluation was regarded as the benchmark for determining the precision of fetal gender determination through ultrasonography. The doctor responsible for the postnatal assessment remained unaware of the findings from the prenatal ultrasonography. However placental location was determine through ultrasound only.

Study variables

The variables to be examined included maternal age, gestational age, gender of the fetus using ultrasound scan and after the delivery, the location of the placenta determined by ultrasound scan and parity.

Data collection

The standardized format was used to record the ultrasound results, which encompassed the fetal gender and placental location. Additionally, the recorded data encompassed pertinent demographic and clinical information, such as maternal age, gestational age during the ultrasound examination, and parity. The placental position was classified into four categories: anterior, posterior, high lying, and low lying. Following delivery, the physical examination confirmed the actual fetal gender. Subsequently, the recorded data were compiled for subsequent analysis.

The information for this research was gathered from the medical records of expectant mothers who received ultrasound scans within the designated period. Skilled sonographers conducted the ultrasound scans using advanced ultrasound machines to ensure high-quality images. During the scans, the sonographers documented the gender of the fetus and the position of the placenta.

Statistical analysis

The Statistical Package for the Social Sciences software version 24 was used for data analysis. The chi-squared test was employed in order to describe any correlation between placental site and the gender of the fetus. The evaluation of the ultrasound diagnosis's precision was conducted by contrasting the ultrasound findings with the real fetal gender post-delivery. The ultrasound technique's sensitivity and predictive values were computed to ascertain the degree of accuracy in determining the sex through ultrasound diagnosis. Sensitivity denotes the ratio of correctly identified true positives by the ultrasound technique, whereas predictive values indicate the likelihood of an accurate ultrasound outcome being positive.

Ethical consideration

The study received ethical approval from the Deanship of Scientific Research at Najran University and the hospital's administration. Verbal consent to participate in the study was obtained from study participants. The findings of this research are exclusively intended for scientific objectives and must not be employed to determine the fetus's entitlement to survival and appropriate care prior to and following birth.

Results

Of the 150 subjects recruited, 8 were eliminated from study participation as 5 chose to abort the pregnancy before 20 weeks of gestation, and 3 did not deliver their infants in the study hospital. Foetal genders were therefore unable to be verified in these subjects.

A higher percentage of female fetuses was identified, i.e. 81 (57.0%) female vs. 61 (43.0%) male (Table 1).

The majority of placentas (73, 51.4%) were found to be anterior, of which 66 (46.5%) and 7 (4.9%) were present in females and males, respectively. 58 (40.8%) placentas were noted to be posterior, i.e. females, 10 (7.0%); males 48 (33.8%). 10 (7.0%) were reported to be high, a finding which was equally prevalent in both genders, i.e. females, 5 (3.5%); males 5 (3.5%), and 1 (0.7%), in a male fetus, was low-lying.

Table 1: Maternal age, parity, gender of the fetus and site of the placenta: frequency distributions

Variable	Frequency	(%)
Maternal Age		
15-20	22	15.5
21-25	40	28.2
26-30	44	31.0
31-35	25	17.6
>35	11	7.7
Total	142	100.0
Parity		
Primipara	41	28.9
Multipara	101	71.1
Total	142	100.0
Foetal Gender		
Male	61	43.0%
Female	81	57.0%
Total	142	100.0%
Placental location		
Anterior	73	51.4
Posterior	58	40.8
High	10	7.0
Low lying	1	.7

Table 2: Correlation data for placental site and gender of fetus

		Foetal Gender		Total	p-value
		Male	Female		
Placental location	Anterior	7_a	66_b	73	0.000
		4.9%	46.5%	51.4%	
	Posterior	48_a	10_b	58	
		33.8%	7.0%	40.8%	
	High	5_a	5_a	10	
		3.5%	3.5%	7.0%	
	Low lying	1_a	0_a	1	
		0.7%	0.0%	0.7%	
Total		61	81	142	
		43.0%	57.0%	100.0%	

Table 3: Correlation data for maternal age and gender of fetus

			Maternal Age					Total	p-value
			15-20	20-25	26-30	31-35	>35		
Fetal Gender	Male	Count	$10_{a, b, c}$	13_c	$20_{a, b, c}$	$13_{a, b, c}$	5a, b, c	61	0.201
		% of Total	7.0%	9.2%	14.1%	9.2%	3.5%	43.0%	
	Female	Count	$12_{a, b, c}$	27_c	$24_{a, b, c}$	$12_{a, b, c}$	$6_{a, b, c}$	81	
		% of Total	8.5%	19.0%	16.9%	8.5%	4.2%	57.0%	
Total		Count	22	40	44	25	11	142	
		% of Total	15.5%	28.2%	31.0%	17.6%	7.7%	100.0%	

Table 4: Correlation data for maternal age and site of placenta

			Maternal Age						Total	p-value
			15-20	21-25	26-30	31-35	>35			
Placental location	Anterior	Count	$13_{a, b}$	25_b	$20_{a, b}$	9_a	$6_{a, b}$		73	0.824
		% of Total	9.2%	17.6%	14.1%	6.3%	4,2%		51.4%	
	Posterior	Count	8_a	12_a	20_a	13_a	5_a		58	
		% of Total	5.6%	8.5%	14.1%	9.2%	3.5%		40.8%	
	High	Count	1_a	3_a	3_a	3_a	0_a		10	
		% of Total	0.7%	2.1%	2.1%	2.1%	0.0%		7.0%	
	Low lying	Count	0_a	0_a	1_a	0_a	0_a	0_a	1	
		% of Total	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.7%	
Total		Count	22	40	44	25	5	6	142	
		% of Total	15.5%	28.2%	31.0%	17.6%	3.5%	4.2%	100.0%	
Mean maternal age = 26.9										

A significant correlation between placental site and the gender of the foetus was demonstrated by the chi-squared test ($p < 0.05$) (Table 2).

The study population had a mean maternal age of 26.9 years; the age spectrum was between 15 and 45 years. The participants were classified into five age-range categories, with the majority of mothers being aged between 26 and 30 years. The age distribution of the study cohort was as follows: 15-20 years, 22 (15.5%); 21-25 years, 40 (28.2%); 26-30 years, 44 (31.1%); 31-35 years, 25 (7.6%); > 35 years, 11 (7.7%) (Table 1). Male and female foetus numbers within each age-range group were as follows: 15-20 years: male, 10 (7%); female, 12 (8.5%); 21-25 years: male, 13 (9.2%); female, 27 (19.0%); 26-30 years: male, 20 (14.1%); female, 24 (16.9%); 31-35 years: male, 13 (9.2%); female, 12 (8.5%); > 35 years: male, 5 (7.7%); female, 6 (4.2%). These figures were in complete agreement with the gender of the delivered fetuses. No correlations were identified on testing using the chi-squared test (Tables 3, 4).

41/142 (28.9%) subjects were primiparous females; 17 (12.2%) male and 24 (16.9%) female

Table 5: Correlation data for parity and gender of fetus

			Parity Primipara	Multipara	Total	p-value
Foetal Gender	Male	Count	17_a	44_a	61	0.819
		% of Total	12.0%	31.0%	43.0%	
	Female	Count	24_a	57_a	81	
		% of Total	16.9%	40.1%	57.0%	
Total		Count	41	101	142	
		% of Total	28.9%	71.1%	100.0%	

Table 6: Correlation data for parity and site of placenta

			Parity Primipara	Multipara	Total	p-value
Placental location	Anterior	Count	25_a	48_a	73	0.485
		% of Total	17.6%	33.8%	51.4%	
	Posterior	Count	14_a	44_a	58	
		% of Total	9.9%	31.0%	40.8%	
	High	Count	2_a	8_a	10	
		% of Total	1.4%	5.6%	7.0%	
	Low lying	Count	0_a	1_a	1	
		% of Total	0.0%	0.7%	0.7%	
Total		Count	41	101	142	
		% of Total	28.9%	71.1%	100.0%	

Table 7: Sensitivity of the fatal gender determination after birth

Fatal gender at birth	
Male	Female
58/61 (95.1%)	77/81 (95.1%)
3/61 female (4.9%)	4/81(4.9 %)
Sensitivity 95.1	

fetuses were identified in this cohort. Of the 44 multiparous females, 44 (31%) and 57 (40.1%) had male and female fetuses, respectively. No significant relationships were observed between parity, the gender of the fetus and the site of the placenta on testing using chi-squared (Table 5).

The following placental locations were noted amongst primiparous and multiparous subjects: primiparous: anterior, 25 (17.6%); posterior, 14 (9.9%); high, 2 (1.4%); multiparous: anterior, 48 (33.8%); posterior, 44 (31%); high, 10 (7%); low, 1 (0.7%). Chi-squared testing (Table 6) revealed no correlations between parity and placental position.

In the study, a total of 142 fetuses were examined, with 61 being male and 81 being female. The ultrasound diagnosis accurately determined the gender of 58 out of 61 male fetuses, resulting in a sensitivity rate of 95.1%. Likewise, the ultrasound diagnosis correctly identified the gender of 77 out of 81 female fetuses, also resulting in a sensitivity rate of 95.1%. Consequently, the ultrasound technique exhibited an overall sensitivity rate of 95.1% in determining fetal gender (Table 7).

Discussion

The aim of the current study was to investigate the association between the site of the placenta and the gender of the fetus as determined by US during the second or third trimester of pregnancy. In the majority of nations, US is a standard tool utilised to establish the gender of the fetus during the prenatal period[10], and enables the sex of the genitalia to be identified accurately between weeks 16 and 20 of gestation[11]. There are many clinical reasons for establishing the sex of the fetus, e.g. hermaphroditism risks, X-linked disorders, genital anomalies and identifying zygosity in pregnancies in which twins or multiple fetuses are present[12]. Non-clinical indications for gender recognition which pregnant women cite encompass preparturition, identifying shopping needs, their own desire or that of their spouse or family to know the child's gender, and to verify their instinct[13].

The results of fetual gender, as determined by US according to maternal age are presented in the previous section. No correlation was identified between the gender of the fetus and the age of the mother (Table 3). Similarly, the sites of the placenta according to maternal age were described in detail and, again, no correlation between these two parameters was observed (Table 4).

It is interesting to note that Ban Amer Mousa[14] reported a robust association between the site of the placenta and the age of the mother. he reported that 100% of anterior placenta at age ≥25 years old and 85% of fundal placenta at age ≥25 years old while 82% of posterior placenta at age ≥25 years old which is different from our study. No relationship was found between the site of the placenta and the mother's parity in the current study (Table 6), an observation which was substantiated by the findings of Ban Amer Mousa[14]. The ratio of male to female fetuses observed in the current study population was 61(43%): 81 (57%) (Table 1). The word fact book indicates that this ratio in Saudia Arabia is 1.05[15]. Academics have defined the position of implantation and location of the placenta in a number of ways; the most frequently applied descriptors are anterior, posterior, lateral, fundal and low-lying. Earlier work has indicated that the most commonly identified placental sites are anterior and posterior, which are reported with a frequency of between 60% and 90%[16]. In the present study, an anteriorly positioned placenta was often noted in fetuses identified as female, whereas male fetuses were predominantly associated with a posteriorly sited placenta. An equivalent number of high-lying placentas was seen amongst the two genders; it was not possible to comment on the gender distribution of a low placenta as this was only found on one occasion. This study demonstrated a significant relationship, therefore, between the site of the placenta and the gender of the fetus (Table 2). Hammad *et al*.[17] also described this correlation, although in the latter study, their findings differed in that 66% and 57% of placentas located posteriorly were present in female and male fetuses, respectively. Anterior placental positions were seen in 34% of females, and in 43% of males. A significant relationship between the position of the placenta and the gender of the fetus was additionally reported by Jafari *et al*.[18]; their results were concordant with those of the current study in that an anterior placenta was found in 27.2% males and in 72.8% females.

The results of this research indicate a significant association between ultrasound diagnosis and the real fetal gender and placental position post-delivery. The elevated sensitivity values demonstrate that ultrasound is a dependable method for identifying fetal gender and placental location. Nevertheless, it is crucial to acknowledge that there were a few instances where the ultrasound diagnosis did not align with the actual fetal gender. This discrepancy could be attributed to several factors, including fetal positioning, maternal body habitus, or technical constraints of the ultrasound technique.

The clinical implications of this study are significant. Obstetricians and sonographers can gain valuable information by identifying the placental location during routine ultrasound examinations. This knowledge can aid in the early detection of potential complications, particularly placenta previa, which is more frequently observed in anterior placental location. Furthermore, the correlation between placental location and fetal gender may have implications for predicting fetal growth and development.

Nevertheless, it is important to acknowledge the limitations of this study. Primarily, the research was confined to a solitary hospital, potentially impeding the applicability of the results to a broader population. Additionally, the study failed to delve into the intricate mechanisms that connect placental location and fetal gender. Consequently, there is a pressing need for future investigations to delve into the hormonal and genetic aspects that could potentially influence this association.

Conclusion and recommendations

US is a precise tool with which to identify the gender of the foetus and the site of the placenta during the second and third trimesters of pregnancy. Recognising a male as opposed to a female foetus using this modality is always more straightforward. Placental position and the gender of the foetus were found to be significantly correlated, with females and males being more likely to have anteriorly and posteriorly situated placentas, respectively.

Additional investigation is necessary to delve into the fundamental mechanisms of this correlation and to authenticate the results in diverse populations.

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Conflict of interest

There is no conflict of interest.

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