

# Placental Location in Women Experienced Cesarean Section using Ultrasonography: A Case-Control Study on Sudanese Women

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## Abstract

**The objective** of this study was to assess the placental location in women with a previous cesarean section (CS) using ultrasonography and the impact of cesarean section (CS) on placenta location.

**Methods and Results:** This case-control study included 205 pregnant women with normal singleton pregnancies (83 women with previous CS [case group] and 122 without previous CS [control group]). The study was conducted at three general hospitals in Khartoum State from August to November 2019. The women were investigated using a Mindary ultrasound machine DP\_2200 equipped with 3.5 MHz transducers. The anterior placenta location was more prevalent than others: 43.4% and 45.9% for cases and control, respectively. The incidence of placenta previa (PP) and the low-lying placenta (LLP) was 1.2% and 3.6%, respectively, in the case group, and 0.0 and 0.8%, respectively, in the control group. Women with a previous CS were at high risk of the LLP and PP (OR=6.12).

**Conclusion:** Our study concluded that the most common sites of the placenta in women with a previous CS were anterior and posterior locations. The study also concluded that women with a previous history of CS are at high risk for LLP and PP. (International Journal of Biomedicine. 2022;12(3):391-395.)

**Keywords:** placenta • cesarean section • ultrasonography

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## Abbreviations

CS, cesarean section; LLP, low-lying placenta; PP, placenta previa

## Introduction

The placenta is a temporary organ of pregnancy that permits the exchange of oxygenated, arterial maternal blood (rich in oxygen and nutrients) for deoxygenated venous fetal blood.<sup>(1)</sup> Careful examination of the placenta by sonography

contributes directly to enhancing patient care and improved outcomes.<sup>(2)</sup> By 9 to 10 weeks, the diffuse granular echotexture of the placenta is apparent via sonography. Echoes arising from the villous tree, bathed in maternal blood, produce this echotexture.<sup>(3)</sup> General evaluation of the placenta should be a routine part of patient care every second and third trimester.

Routine evaluation of the placenta with color Doppler is now favored to find the placental cord insertion site rapidly and to detect vascular abnormalities in the placenta and the retroplacental uterine wall.<sup>(4)</sup> The definitive placenta is established and visualized only after 10–12 weeks; by 14–15 weeks, the placenta is well established, and a prominent hypoechoic area (retroplacental complex) is noted. It is composed of decidua, myometrium, and uterine vessels. If the placenta covers the internal cervical os entirely or partially, it is described as PP. If the placenta edge is less than 2 cm from the internal os, the placenta is defined as marginal; if the border is more than 2 cm, it is described as low-lying placenta (LLP).<sup>(5)</sup>

As cesarean section (CS) rates continue to increase globally, placenta previa (PP), placenta accreta, and maternal mortality rates continue to increase.<sup>(6)</sup> The prevalence of PP increases following prior CS or other surgical intervention of the uterus, with subsequent scar formation being a known risk factor.<sup>(6,7)</sup> Swetha<sup>(8)</sup> stated that the PP prevalence in women with a previous CS was 6% compared to the incidence of only 1.75% in the control group ( $P<0.05$ ). Furthermore, Lydon-Rochelle et al.<sup>(9)</sup> found the occurrence of PP at a second birth to be 5.2 per 1000 (OR=1.4; 95% CI=1.1-1.6), compared to women with previous vaginal deliveries, while Nielsen et al.<sup>(10)</sup> found the incidence was 1.22%, compared to only 0.25% in women with no previous cesarian scar, as stated.

As the incidence of abnormal placental location in women with previous CS increases worldwide, this study aimed to assess the placenta location using ultrasonography in women who had a previous CS in Sudan. Secondly, there is a lack of studies concerning the placenta's sonographic evaluation, so this study will satisfy the knowledge gap. It will be beneficial for obstetricians and clinicians.

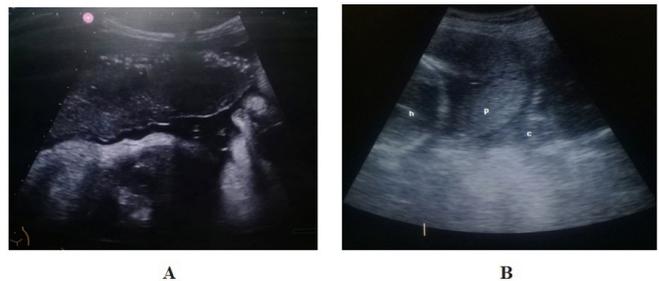
## Materials and Methods

This cross-sectional, case-control study aimed to assess the placenta location in Sudanese women with previous CS using ultrasonography. The study was conducted at the department of Omdurman obstetrics hospital, Bashair educational hospital, and Elsoudi maternal hospital in Khartoum State, Sudan. The study was conducted in the period from August to November 2019.

The study comprised 205 pregnant women in the third trimester of pregnancy with a gestational age of  $\geq 28$  weeks (83 women with previous CS [case group] and 122 without previous CS [control group]). They were chosen using a convenient sampling method. The exclusion criteria were women with multiple pregnancies, fetal anomalies, and any other risk for PP, rather than the previous CS. The data were obtained using a designed data collection sheet that included the demographic variables, such as age, history of CS, number of CS, and parity. The placenta's sonographic assessment data were dependent variables, such as placental site and gestational age.

The women were investigated using a Mindary ultrasound machine DP\_2200 equipped with 3.5MHz transducers. Fetal scanning was performed in the second and third trimesters with a curvilinear low-frequency probe

placed over the suprapubic area. Fetal anatomy, movement, positioning, and uterine cervix were sonographically scanned in sagittal and longitudinal sections through the maternal abdomen. The placentas are often identified by tracing the endometrium until an isoechoic structure is seen. The placenta location was assessed as normal (anterior (Figure 1A), posterior, or fundal) when the placental edge was  $\geq 5$  cm from the internal cervical os. Abnormal LLP was determined when the placenta was  $\leq 2.5$  cm from the inner os and considered PP if the placenta covered the interior os partially or entirely (Figure 1B). The placental size and thickness were assessed. The retroplacental complex was monitored and evaluated for abnormal adherence or attachment to the myometrium and uterine wall. Cord insertion site within the placenta, cord abnormalities, and amniotic fluid were evaluated.



**Fig. 1.** Obstetrical ultrasound images: (A) Anterior placenta at 37 weeks for a 33-year-old primigravida woman; (B) PP at 30 weeks for a 36-year-old primigravida woman with two CSs.

Statistical analysis was performed using IBM SPSS Statistics 23. The frequencies of categorical variables were compared using Pearson's chi-squared test or Fisher's exact test (2-tail), when appropriate. Binary logistic regression analysis was used to find associated risk of CS with LLP/PP expressed as an odd ratio (OR) with a 95% confidence interval (95% CI). A probability value of  $P<0.05$  was considered statistically significant.

This study was approved by the ethics committee of the National Ribat University. Verbal consent was obtained from each patient.

## Results

The mean maternal age was 30.57 years in the case group; the frequency of CS ranged from 1 to 5, and the gestational age - 28-41 weeks. The mean maternal age in the control group was 27.93 years, and the gestational age - 28-41 weeks (Table 1).

There was no significant correlation ( $P=0.484$ ) between the frequency of CS and the location of the placenta (Figure 2). The most common location of the placenta in women of the case group was anterior, followed by posterior (43.4% and 38.6%, respectively), then fundal (13.2%), low-lying (3.6%), and PP (1.2%) (Table 2). LLP and PP were found in women with one or two previous CSs (Figure 2). Concerning the placenta location in both groups, there were no significant differences in placenta location.

**Table 1.**

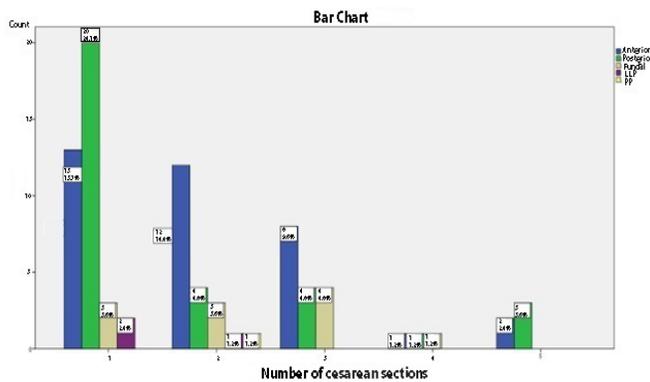
*Descriptive Statistics for age, gravida, para, and gestational age in the case and control groups*

Variable	Case group	Control group
Mean age (years)	30.57±5.87	27.93±5.86
Gravida	2-10	1-10
Para	0-9	0-8
Numbers of cesarean section	1-5	---
Gestational age (years)	28-41(34.32±3.29)	28-41(35.36±3.29)
Total	83	122

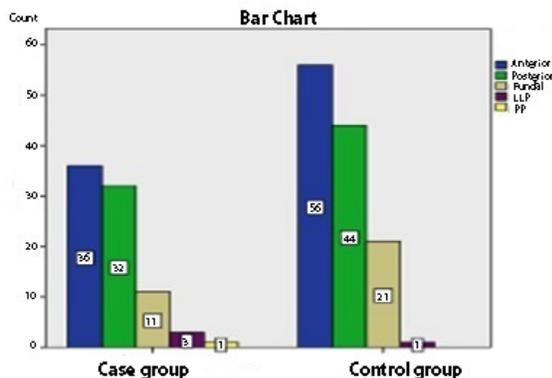
**Table 2.**

*The placenta location in the study groups*

Study group	Placenta site					Total	P-value
	Anterior	Posterior	Fundal	LLP	PP		
Case group	36 43.4%	32 38.6%	11 13.2%	3 3.6%	1 1.2%	83	0.393
Control group	56 45.9%	44 36.1%	21 17.2%	1 0.8%	0 0%	122	
Total	92	76	32	4	1	205	



**Fig. 2.** Association between a number of CSs and placenta location (P=0.484).



**Fig. 3.** Placenta location in women with previous CS versus control group.

The anterior placenta was more frequent, followed by the posterior and the fundal. LLP and PP were more frequent in the case group than in the control group (3.6% vs. 0.8% and 1.2% vs. 0.0%, respectively) (Table 2, Figure 3).

Logistic regression analysis revealed that the previous history of CS was a significant risk factor for LLP and PP, as LLP and PP were 6.12 times more likely to occur in the case group than in the control group. The LLP rate was 4.53 times more frequent in the case group than in the control group, while PP alone was noted only in the case group (Table 3).

**Table 3.**

*Logistic regression adjusted the effect of previous CS for the LLP and PP.*

Variable	OR	95% CI	P-value
LLP and PP	6.12	0.627-55.824	0.088
LLP	4.53	0.464-44.394	0.183

## Discussion

Assessment of the placenta is essential for preventing severe antepartum, intrapartum, and postpartum bleeding. Sonography accurately detects PP, which is associated with high risks for preterm birth, and maternal and fetal/neonatal morbidity.

The current study was conducted to determine the placental location by using ultrasonography in women who experienced CS. Our results showed that the anterior location of the placenta was the most common site in women with a history of CS (43.4%), followed by posterior (38.6%) and fundal locations (13.2%). This finding is consistent with Belachew et al.<sup>(11)</sup> who reported that most of the placenta location in women with previous CS was anterior. In comparison, Naji O et al.<sup>(12)</sup> found that the posterior placenta was more prevalent than the anterior-located ones. Furthermore, in our study, the percentage of the fundal placenta was 13.2%, which is more prevalent than that reported by Naji O et al. (4.7%)<sup>(12)</sup> and Belachew et al. (5.3%).<sup>(11)</sup>

The current study estimated the incidence of PP in women with a previous CS section was 1.2%, which was approximately consistent with Nielsen et al.<sup>(10)</sup> (1.22%) but less than in studies by Belachew et al.<sup>(11)</sup> and Jauniaux & Jurkovic,<sup>(13)</sup> who reported 2% and 5%, respectively. The present study found that the overall percentage of PP is 4.87 per 1000 pregnancies (1 case in 205 pregnancies); another study stated that the incidence of PP was approximately 5 per 1000 pregnancies.<sup>(14)</sup>

Our study revealed no significant correlation between placental location and the number of CS scars on the uterus. Naji et al.<sup>(12)</sup> stated similar results and found that the number of previous cesarean deliveries has no significant effect on placental location.

The current study showed that LLP and PP are more prevalent in pregnant women with previous CS than in the controls. These changes in placenta location could be attributed to the presence of CS scars in the uterus, which is linked to an

increase in the number of posterior placentae and a decreased number of implants in the uterine fundus.<sup>(12)</sup> Consistently, Parvin et al.<sup>(15)</sup> stated that PP was significantly associated with several CSs.

Our results manifested that LLP and PP were six times more likely to occur in the pregnant women with a previous CS history than in the controls (OR=6.12). The incidence of PP was 1.2% in women with previous CSs, while no PP was noted in the control group. In agreement with this finding, a meta-analysis study reported that the overall OR for PP after CS was 1.47.<sup>(16)</sup> Furthermore, these results were consistent with To et al. and Leung et al.,<sup>(17)</sup> who found that the PP incidence was significantly more prevalent in women with a previous CS (1.31%) than in those with an unscarred uterus. Getahun et al.<sup>(18)</sup> stated that the pregnancy after CS increased the risk of PP by 0.63%, compared to vaginal delivery (0.38%). Likewise, Gurol-Urganci et al.<sup>(19)</sup> stated an increased risk of PP in pregnant women after CS delivery at first birth. They reported that the adjusted effect of a previous CS would result in one case of PP in the subsequent pregnancy. In contrast, Prigani et al.<sup>(20)</sup> found no relation between LLP or PP and a previous CS, but it increased the odds of anterior placental implantation. Hendricks et al.<sup>(21)</sup> found a strong, significant correlation between previous CS and the risk of subsequent development of PP; the risk increased with the number of previous CSs. Jauniaux et al.<sup>(22)</sup> also showed that this risk elevates as the number of prior CSs increases.

Finally, an increasing number of CSs leads to an increased incidence of LLP and PP. Assessing LLP and its prevalence is essential to predict adverse maternal and fetal outcomes.

## Limitation

The limitation of this study is that the number of women with previous cesarean sections is less than expected, so further research with a large sample size is needed to obtain more precise results.

## Conclusion

Our study concluded that the most common sites of the placenta in women with a previous cesarean section were anterior and posterior locations. The study also concluded that women with a previous history of cesarean section are at high risk for low-lying placenta and placenta previa.

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## Competing Interests

The authors declare that they have no competing interests.

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