

# Correlation between placental location and maternal fetal outcome

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## Abstract

**Background:** Placenta is the vital link between fetus and the uterine wall. Based on location, it can be classified as anterior, posterior, lateral, fundal and low lying. Placental location can be easily determined in the antenatal period using ultrasound. **Materials and Methods:** Design: Prospective observational study. Study period: One year from January 2018 to February 2019 in a tertiary hospital in Salem district of Tamilnadu. Study population: After informed consent, 200 women with singleton pregnancy of  $\geq 28$  weeks attending antenatal OPD were included in the study. Women were followed up with ultrasound at 28 weeks and 34 weeks to identify any maternal and fetal adverse effects such as gestational hypertension, preeclampsia, preterm birth and NICU admission. **Results:** The mean age of the study participants was  $24.3 \pm 43$  years. Of the 200 women, 42% (n=84) of placenta were situated in fundus, 30% (n=60) were anterior, 18% (n=36) were lateral, 8% (n=16) were posterior and 2% (n=4) were low lying. Gestational hypertension was present in 22%, 13%, 12% in lateral, anterior and posterior placental location respectively. Preeclampsia was seen in 22% in lateral placental location. Preterm labour, PROM, low birth weight and NICU admission were common in posterior and lateral placental location. **Conclusion:** There was statistically significant association between low lying, posterior and lateral placental location and adverse maternal fetal outcomes. Hence ultrasound can be used as the safe, cost effective, non-invasive tool in predicting the adverse maternal and neonatal outcome.

**Keywords:** Placental location, Anterior placenta, Posterior placenta, Lateral placenta, Maternal fetal outcome

## Introduction

Placenta is the vital organ which connects fetus to the uterine wall [1]. Nutritive, respiratory, metabolic, endocrine and excretory functions of the fetus are carried out through the placenta. Pregnancy and childbirth itself has health risk to the mother even without pre-existing health problem [2]. In placenta there are two circulations- maternal and fetal. Hence abnormalities in placental location may affect the blood supply of fetus leading to adverse maternal and fetal outcomes such as gestational hypertension, preeclampsia, gestational diabetes, malpresentation, malposition, preterm birth, small for gestational age, intrauterine growth restriction, low birth weight, intrauterine demise, stillbirth etc.,

Placental location is classified as central (anterior and posterior), unilateral (right lateral, left lateral), fundal

and low lying (within 2 cm of internal os). There were only limited studies dealing placental location site and maternal fetal outcome. The hypothesis of this study was whether the placental implantation site predicts the adverse maternal fetal outcome?

Routinely obstetric ultrasound is done in the pregnant women in third trimester to look for fetal growth, amniotic fluid volume and placental location. Ultrasound is the primary modality of choice for placental location assessment. Hence this study was done to find the correlation between placental location and maternal fetal outcome.

## Materials and Methods

**Study design:** Prospective observational study.

**Study period:** One year from January 2018 to February 2019 in a tertiary hospital in Salem district of Tamilnadu.

Manuscript received: 10<sup>th</sup> July 2019

Reviewed: 20<sup>th</sup> July 2019

Author Corrected: 28<sup>th</sup> July 2019

Accepted for Publication: 2<sup>nd</sup> August 2019

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**Inclusion:** 200 women with singleton pregnancy of  $\geq 28$  weeks attending antenatal OPD were included in the study.

**Exclusion criteria:** Women with past or present medical and obstetric disorders at the time of study, those not willing for follow up were excluded.

**Methodology:** Trans abdominal ultrasound was performed to see the placental location using 3.5 MHz convex probe. The same machine was used by the same

sonologist for all study participants. Women were followed up with ultrasound for placental location at 28 weeks, 34 weeks to identify any maternal and fetal adverse effects such as gestational hypertension, preeclampsia, premature rupture of membranes, malpresentations, operative delivery, preterm birth and neonatal intensive care (NICU) admission.

**Statistics:** Statistical analysis was done using SPSS 21. Chi-square test was used for categorical data. P value  $< 0.05$  is considered as statistically significant.

## Results

The study group consisted of 200 women. The mean age of these women was  $24.3 \pm 4.3$  years. Table 1 describes the age distribution of the women in study group. Of the 200 participants, 63% (n= 126) of women were in the age group of 20 to 25 years, 21% (n= 42) were 26 to 30 years, 18% (n= 9) were more than 30 years and 14% (n=7) were less than 20 years.

**Table-1: Age distribution.**

Age in years	N=200 n(%)
<20	14 (7%)
20-25	126 (63%)
26-30	42 (21%)
>30	18 (9%)

Table 2 describes the distribution of gravida in the study group. 44% (n=88) women were primigravida, 43% (n=86) were second gravida, 13% (n=26) were third gravida.

**Table-2: Gravida distribution**

Gravida	N=200 n(%)
1	88 (44%)
2	86 (43%)
3	26 (13%)

Table 3 describes the ultrasound distribution of placental location. Of the 200 women, 42% (n=84) of placenta were situated in fundus, 30% (n=60) were anterior, 18% (n=36) were lateral, 8% (n=16) were posterior and 2% (n=4) were low lying.

**Table-3: Ultrasound placental location**

Placental location	N=200 n(%)
Fundal	84 (42%)
Anterior	60 (30%)
Posterior	16 (8%)
Lateral	36 (18%)
Low lying	4 (2%)

Maternal complications were more in posterior and lateral placental location. Least number of complications was seen in anterior and fundal.

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Table 4 describes the distribution of maternal complications. Gestational hypertension was present in 22%, 13%, and 12% in lateral, anterior and posterior placental location respectively. Preeclampsia was seen in 22% in lateral placental location. Malpresentation such as breech was observed in 50% of low lying placenta. Premature rupture of membranes (PROM) was common in 12.5% posterior and 5.5% lateral placental location.

Table-4: Maternal Outcome.

Maternal Outcome	Fundal N=86 n(%)	Anterior N=60 n(%)	Posterior N=16 n(%)	Lateral N=36 n(%)	Low lying N=4 n(%)	P 0.001*
Gestational hypertension	NIL	8 (13 %)	2 (12 %)	8 (22 %)	NIL	
Preeclampsia	NIL	NIL	NIL	8 (22 %)	NIL	
PROM/PPROM	2 (2.3 %)	NIL	2 (12.5 %)	2 (5.5 %)	NIL	
Malpresentation	NIL	NIL	NIL	NIL	2 (50 %)	

Normal vaginal delivery was more in fundal and anterior placental location contributing 71% and 66% respectively. Operative deliveries such as caesarean were more in low lying, posterior and lateral placental location contributing 100%, 62% and 61% respectively.

Table 5 describes the neonatal outcome. Of the neonates, term babies were more in fundal and anterior placenta contributing 97% and 96% respectively. Preterm babies were common in low lying, posterior and lateral placental location contributing 50%, 37.5% and 33% respectively. Low birth weight <2.5 kg babies were born in 87.5% posterior and 77% lateral placental location. NICU admission was more in low lying 50% followed by posterior 37.5% and lateral placental location 22%. P value was <0.05 statistically significant. The most common causes for NICU admission includes preterm, low birth weight, respiratory distress syndrome and meconium stained liquor.

Table-5: Neonatal Outcome.

Neonatal outcome	Fundal N=86 n(%)	Anterior N=60 n(%)	Posterior N=16 n(%)	Lateral N=36 n(%)	Low lying N=4 n(%)	p-value 0.001*
Preterm	2 (2 %)	2 (3 %)	6 (37.5 %)	12 (33 %)	2 (50 %)	
Low birth weight <2.5 kg	4 (4.6 %)	4 (6.6 %)	14 (87.5 %)	28 (77 %)	NIL	
NICU admission	2 (2 %)	2 (3 %)	6 (37.5 %)	8 (22 %)	2 (50 %)	

## Discussion

The maternal blood supply to the placenta derives mainly from the uterine arteries. It is not uniformly distributed. In pregnancies with unilateral placentas, uterine artery resistance is lower in the ipsilateral side vs contralateral measured by Doppler velocimetry. The resistance is similar in both sides in centrally situated placenta. There are limited studies showing association between placental location, maternal and fetal outcome.

In the present study fundal placental location was common 84% followed by anterior, posterior, lateral and low lying placenta. This was similar to Zia S et al [3]. Gestational hypertension, preeclampsia, Intrauterine growth restriction (IUGR) was more common in lateral placental location. This may be due to non-uniform

blood supply. Kofinas et al, Seadati et al and Singh et al studies reported the same observations [4-6]. This was contrast to Magann et al and Devarajan et al study. They showed no significant association between preeclampsia and lateral placentation [7, 8]. Booth et al reported the association between fundal placental location and pregnancy induced hypertension [9].

In the present study, preterm labour, increased caesarean deliveries, prematurity, lowbirth weight and NICU admission of babies were statistically associated with low lying placenta followed by posterior and lateral placental location. Mal presentations were common in low lying placenta. This was similar to Rajeswari et al study [10].

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Literature reviews described that posterior placental location is less efficient and associated with preterm labour, Intrauterine demise (IUD) and stillbirth. This was mainly due to uneven blood supply because of the longer, thicker anatomy of posterior wall of pregnant uterus [11, 12]. Zia S et al and Torricelli et al and Cho JY et al found significant association between preterm labour and posterior placental location ( $P < 0.001$ ) [3, 13, 14]. Singh et al, Warland et al and Jaisal et al concluded that posterior placenta was associated with still birth [6, 15, 16]. This was contrast to Zia S et al as they found that anterior placenta was associated with IUD [3].

Hadley et al found that fundal placental location increases the risk of premature rupture of membranes. They assumed that fundal placental location has the weakest point of membranes over the cervical os predisposing to premature rupture of membranes [17].

In the study by Nair VV et al, central placental location was most common [18]. Abnormal outcomes such as gestational hypertension, preeclampsia, IUGR, antepartum haemorrhage, preterm delivery, NICU admission was significantly associated with lateral placental location. Singh et al and Kalanithi et al found significant correlation between IUGR and lateral placenta [6, 19].

In the present study, NICU admission was more in low lying placenta followed by posterior and lateral placental location. P value was  $< 0.05$  statistically significant. Preterm, low birth weight, respiratory distress syndrome and meconium stained liquor are the most common causes for NICU admission. However Zia et al, Jaisal et al and Jackson et al found no association between placental location and NICU admissions [3, 16, 20].

The limitation of the study is its small sample size. Also it doesn't include gross and intrinsic placental abnormalities.

## Conclusion

Thus in the present study, placental location significantly correlates to the maternal and fetal outcome. Ultrasound is the simple, safe and non-invasive imaging modality to detect placental location. Anterior placenta seems to be safe. Posterior, lateral and low lying placentas were associated with adverse maternal and fetal events. However, more number of prospective studies is needed in future to predict the outcome in this context area of research.

## What this study adds in the existing knowledge?

This study adds to the existing knowledge about the importance of placental location assessment by ultrasounds as a predictor to detect maternal fetal adverse effects at the earliest for its timely intervention.

## Author's contribution:

**Dr. Sakshi Dhingra, Dr. Bhuvaneshwari K.** collected data. **Dr. Premapriya G.** and **Dr. Gayathri N.** performed ultrasound and data analysis. **Dr. Premapriya G.** drafted the manuscript. **Dr. Vimala D.** verified. All authors contributed to final manuscript.

**Funding:** Nil, **Conflict of interest:** Nil

**Permission from IRB:** Yes

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**How to cite this article?**

Dhingra S, Premapriya G, Bhuvaneshwari K, Gayathri N, Vimala D. Correlation between placental location and maternal fetal outcome. *Obs Rev: J obstet Gynecol* 2019;5(3):128-132.doi:[10.17511/joog.2019.i03.01](https://doi.org/10.17511/joog.2019.i03.01).

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