

**Different Types of Placental Location and its Effect on Maternal Outcomes in Primigravida**Lithingo Lotha<sup>1</sup>, Dayananda Saikia<sup>2</sup>, Asha Borah<sup>3</sup>, Kavya S. Kumar<sup>4</sup><sup>1</sup>Associate Professor, Department of Obstetrics and Gynaecology, Assam Medical College & Hospital, Dibrugarh, Assam, India.<sup>2</sup>Assistant Professor, Department of Obstetrics and Gynaecology, Assam Medical College & Hospital, Dibrugarh, Assam, India.<sup>3</sup>Associate Professor, Department of Pathology, Assam Medical College & Hospital, Dibrugarh, Assam, India.<sup>4</sup>Postgraduate Trainee, Obstetrics and Gynaecology, Assam Medical College and Hospital, Dibrugarh, Assam, India.

Received: 13-11-2023 / Revised: 13-12-2023 / Accepted: 11-01-2024

Corresponding Author: Dr. Kavya S. Kumar

Conflict of interest: Nil

**Abstract:****Background:** The aim of the study is to determine the effects of different placental location in the upper segment of the uterus on maternal outcome in primigravida.**Methods:** A hospital based observational study of 570 primigravida with live born infants of more than 24 weeks admitted in the department of Obstetrics and Gynaecology at Assam medical college, Dibrugarh over a period of one year (July 2021-June 2022) with adequate information about the placental location from the second trimester ultrasound screening was done. Based on USG report, the patients were divided into 4 categories – fundal, anterior, posterior & lateral. The association between placental location & pregnancy outcomes was estimated as percentages.**Results:** In this hospital based observational study, both fundal and lateral placental locations, compared with anterior and posterior placental location, were associated with increased adverse maternal outcomes. Very preterm delivery (24-31 weeks) were found to be higher in lateral (42.31%), followed by fundal (26.92%) placental locations. Moderate preterm delivery (32-36 weeks) was found to be more common in posterior placental location (34.2%), followed by fundal (26.3%) and lateral (26.3%) placental location. PROM was found to be more associated with lateral placental location (30.65%), followed by fundal (24.19%) and posterior (24.19%) and then anterior placental location(20.97%). Additionally, lateral placental location was associated with increased risk of preeclampsia. (32.35%). Manual removal of placenta was more seen in lateral placental locations (43.75%), then fundal (37.5%), followed by posterior(12.5%) and anterior placental locations (6.25%). Lateral placentation was more associated with severe postpartum haemorrhage (52.94%), compared to other placental locations such as fundal (23.53%), anterior (11.76%) and posterior (11.76%). Manual removal of placenta in combination with severe postpartum haemorrhage was found to be more associated with lateral placental location (50%), followed by fundal (25%) and posterior (25%) placental locations.**Conclusion:** From our study, it was concluded that fundal and lateral placental locations were associated with a number of adverse maternal outcomes, compared to anterior and posterior placental locations. Placental location by ultrasound examination done in second trimester can be used as non-invasive predictor in determining adverse maternal outcomes.**Keywords:** Placental Location , Primigravida, Adverse Maternal Outcomes.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

**Introduction**

Placenta connects the developing fetus to the wall of the mother's uterus during pregnancy via umbilical cord and is an important organ for the maternal and fetal wellbeing. It plays a key role during pregnancy. Implantation in the endometrium occurs around 6-7 days after conception, and normally the blastocyst implants in the upper portion of the uterus[1]. The

site and size of placental implantation determine its blood supply and thereby the pregnancy outcome[2]. Low placentation, resulting in placenta previa, is usually defined as abnormal placental location. Today, many countries offers at least 1 second trimester ultrasound screening as a part of standard prenatal care, usually performed between 18 and 24

weeks of gestation. The main objective of this ultrasound scan is to provide accurate diagnostic information to optimize antenatal care to achieve the best possible outcomes for mother and fetus[3]. Assessment of placental location is one of the recommended minimum requirements for the second-trimester ultrasound[3]. There is no official classification of placental location, but the location is usually described as fundal, anterior, posterior, lateral, low and/or previa. As the anatomical conditions vary across different areas of the uterus, both with respect to the shape of the cavity and the blood supply, other placental locations than previa may also be associated with adverse maternal outcomes. Fundal and lateral placental locations are associated with an increased risk of very preterm delivery, PROM, manual removal of placenta, severe PPH and manual removal of placenta in combination with severe PPH in mothers. The anterior and posterior parts of the uterine cavity are flattened, but both fundal and lateral parts are relatively sharp angled, which might be disadvantageous for placental function. The main communicating vessels of the uterine blood supply reach the uterus laterally and a little more towards the posterior site. This might explain the association with increased risk for adverse pregnancy and maternal outcomes in fundal placental location, the location farthest away from the main blood supply, and the small but significant risk for anterior placental location. Centrally located placenta receives equitable distribution of blood flow from both the uterine arteries whereas in laterally located placenta, the uterine artery closer to the side of placenta has a low resistance and a good blood flow, which causes disparity in blood distribution. The other uterine artery supplying the placenta located laterally receives less contribution from the collateral circulation and facilitates development of preeclampsia[4]. We therefore conducted a population-based observational study in primigravida with the aim to investigate if placental location other than previa at the second-trimester ultrasound screening associated with the adverse maternal outcomes.

### Materials and Methods

This is a hospital based observational study of 570 primigravida with live born infants of more than 24 weeks admitted in the department of Obstetrics and Gynaecology at Assam Medical College, Dibrugarh over a period of one year (July 2021-June 2022). Approval from the institutional ethical committee was obtained. Maternal demographic information including hospital number, age, parity, LMP, EDD, POG and placental location details in the second trimester scan (18-24weeks) were collected. Primigravida with a second trimester ultrasound

screening between 18 & 24 weeks of the gestation with placenta in the upper segment was considered for the study. In women who underwent >1 mid trimester ultrasound examination during the time period, the latest scan with information about placental location was included. Considering 95% CI with a margin of error of 5% and lateral placenta has an abnormal outcome of 60.3%, sample size for the present study calculated to be 570. Inclusion criteria includes patients who gave informed consent, primigravida with a second trimester ultrasound screening between 18 and 24weeks of gestation with placenta in the upper segment with singleton pregnancy admitted in hospital and with adequate information about placental location in the second trimester scan. Exclusion criteria includes patients not willing to give informed consent, multigravida, multiple pregnancy, placenta previa at ultrasound/ delivery, no information about the placental location in the ultrasound scan report, medical disorders including diabetics, Rh negative pregnancy, liver disorders, syphilis in pregnancy congenital anomalies / genetic disorders in fetus and uterine anomalies. Informed written consent was taken and the patients were enrolled for the study. Ultrasound reports of the patients were collected and based on the placental location of the scan, the patients were divided into 4 categories – fundal, lateral, anterior and posterior placenta. We categorised placental location, classified at the second trimester ultrasound screening report, in a descending hierarchy as follows:

1. Fundal placenta (fundal with/without additional information).
2. Lateral placenta (left/ right, with/ without additional information).
3. Anterior placenta (anterior in the absence of posterior location, with/ without additional information).
4. Posterior placenta (posterior in the absence of anterior location, with/ without additional information).

For example if fundal and anterior are indicated, the placental location is taken as fundal. If posterior and left lateral are indicated, the placental location is classified as lateral. If marginal is indicated, the information about placental location is considered as insufficient. The following maternal outcomes were studied which includes very & moderate preterm delivery (24-31 & 32-36 weeks of gestation respectively), PROM, preeclampsia, manual removal of placenta, severe PPH and manual removal of placenta in combination with severe PPH.

### Results

**Table 1: Showing Placental Location Distribution**

Placental Location	Number (n)	Percentage (%)
Fundal	288	50.53
Lateral	64	11.23
Anterior	119	20.88
Posterior	99	17.37
<b>TOTAL</b>	<b>570</b>	<b>100.00</b>

Out of 570 cases, 288 primigravida had fundal placental location (50.53%), 119 had anterior placenta (20.8%), 99 had posterior placenta (17.37%) and remaining 64 had lateral placentation (11.23%).

**Table 2: Showing Placental Location Distribution in Very Preterm Delivery (24-31 weeks)**

Placental Location	Number (n)	Percentage (%)
Fundal	7	26.92
lateral	11	42.31
Anterior	3	11.54
Posterior	5	19.23
<b>TOTAL</b>	<b>26</b>	<b>100.00</b>

Within the study population it was found that out of 26 cases of very preterm delivery(24-31 weeks), maximum number of cases is seen in lateral placental location, followed by fundal placenta. Out of 26 cases, 11 (42.31%) were lateral, 7 were fundal. 5 were posterior and 3 cases were anterior.

**Table 3: Showing Placental Location Distribution in Moderate Preterm Delivery (32-36 weeks)**

Placental Location	Number (n)	Percentage (%)
Fundal	10	26.32
lateral	10	26.32
Anterior	5	13.16
Posterior	13	34.21
<b>TOTAL</b>	<b>38</b>	<b>100.00</b>

Out of 38 cases of moderate preterm delivery (32-36 weeks), 13 cases were found to have posterior placental location(34.21%), 10 cases of both lateral (26.3%) and fundal (26.3%) had moderate preterm delivery and 5 cases of anterior had moderate preterm delivery.

**Table 4: Showing Placental Location Distribution in Preterm Rupture of Membranes**

Placental Location	Number (n)	Percentage (%)
Fundal	15	24.19
Lateral	19	30.65
Anterior	13	20.97
Posterior	15	24.19
<b>TOTAL</b>	<b>62</b>	<b>100.00</b>

In the present study, PROM is found to be more associated with lateral placental location(30.65%), followed by fundal (24.19%) and posterior (24.19%) and then anterior placental location(20.97%).

**Table 5: Showing Placental Location Distribution in Pre-eclampsia**

Placental Location	Number (n)	Percentage (%)
Fundal	18	26.47
lateral	22	32.35
Anterior	21	30.88
Posterior	7	10.29
<b>TOTAL</b>	<b>68</b>	<b>100.00</b>

In the above study, we found that in pregnant females in whom placenta was laterally and anteriorly located, preeclampsia was more in number. 22 cases of lateral placenta (32.35%) and 21 cases of anterior

placenta (30.8%) were having preeclampsia. Remaining 18 cases of fundal (26.47%) and only 7 cases of posterior placental location (10.29%) developed preeclampsia.

**Table 6: Showing Placental Location Distribution in Manual Removal of Placenta**

Placental Location	Number (n)	Percentage (%)
Fundal	6	37.50
lateral	7	43.75
Anterior	1	6.25
Posterior	2	12.50
<b>TOTAL</b>	<b>16</b>	<b>100.00</b>

In the present study, there were total total 16 cases in which manual removal of placenta was done. Out of that, 7 cases were having lateral placental locations (43.75%), then fundal (37.5%), followed by posterior (12.5%) and anterior placental locations (6.25%).

**Table 7: Showing Placental Location Distribution in Severe Postpartum Haemorrhage**

Placental Location	Number (n)	Percentage (%)
Fundal	4	23.53
Lateral	9	52.94
Anterior	2	11.76
Posterior	2	11.76
<b>TOTAL</b>	<b>17</b>	<b>100.00</b>

In the present study, lateral placentation was more associated with severe postpartum haemorrhage (52.94%), compared to other placental locations such as fundal (23.53%), anterior (11.76%) and posterior (11.76%).

**Table 8: Showing Placental Location Distribution in Manual Removal of Placenta in combination with Severe Postpartum Haemorrhage**

Placental Location	Number (n)	Percentage (%)
Fundal	2	25.00
lateral	4	50.00
Anterior	0	0.00
Posterior	2	25.00
<b>TOTAL</b>	<b>8</b>	<b>100.00</b>

In this study, manual removal of placenta in combination with severe postpartum haemorrhage is found to be more associated with lateral placental location (50%), followed by fundal (25%) and posterior (25%) placental locations.

### Discussion

In our study, 570 cases of primigravida with live born infants of more than 24 weeks with second trimester ultrasound scan report (18-24 wks) with placenta in the upper segment were included. In this study, the percentage of fundal location of placenta was 50.53%, anterior was 20.88%, posterior was 17.37% and lateral location of placenta was 11.23%. Most common placental location was fundal which was comparable with the study done by Alka Patil et al. [5], Jaiswal et al. [6], Singh et al. [7] In this hospital based observational study, both fundal and lateral placental locations, compared with anterior and posterior placental location, were associated with an increased risk of very preterm delivery, PROM, manual removal of placenta, severe PPH and manual removal of placenta in combination with severe PPH. Additionally, lateral placental location was associated with an increased risk of preeclampsia. Moderate preterm delivery was found to be more common in posterior placental location, followed by fundal and lateral in this study.

Anatomical conditions vary across different areas of the uterus, both with respect to the shape of the cavity and the blood supply. The anterior and posterior parts of the uterine cavity are flattened, but both fundal and lateral parts are relatively sharp angled, which might be disadvantageous for placental function. The main communicating vessels of the uterine blood supply reach the uterus laterally and a little more towards the posterior site. This

might explain the association with increased risk for adverse pregnancy and neonatal outcomes in fundal placental location, the location furthest away from the main blood supply, and the small but significant increased risk for anterior placental location. [4]

In the present study, lateral placentation was found to be more associated with preeclampsia, followed by anterior placenta. 22 cases of lateral placenta (32.35%) and 21 cases of anterior placenta (30.8%) were having preeclampsia. In laterally located placentas, the utero- placental blood flow needs are mainly met by only one instead of both uterine arteries, so might be suboptimal. [4] Singh et al [7] showed lateral placentation had a increased risk of preeclampsia (62.2%). Similar findings were observed in the studies conducted by Seadati et al. [8], Nair VV et al. [9] and Alka Patil et al. [5] Within the study population it was found that out of 26 cases of very preterm delivery(24-31 weeks), maximum number of cases is seen in lateral placental location, followed by fundal placenta. Similar findings were observed in the study conducted by Michaele Gransfors et al. [4] Preterm delivery is found to be more associated with lateral and fundal placental location in studies conducted by Alka Patil et al. [5], Nair VV et al. [9] but in this study, moderate preterm delivery was found to be more associated with posterior location followed by fundal and lateral. This can be explained by the fact that blood flow at the back of the uterus can sometimes be less efficient due to the posterior wall being longer and thicker, which may increase the chance of a preterm labour. Shumaila Zia et al. [10] concluded that preterm labour were associated with posterior placenta with an outcome of 3.7%. Seadati et al [8] conducted a descriptive analytical epidemiological study and concluded that preterm delivery were seen in low

placentation with an outcome of 7.2%. Jaisal P et al. [11] also showed increased association of preterm labour in posterior placental location.

In the present study, PROM was found to be more associated with lateral placental location (30.65%), followed by fundal (24.19%) and posterior (24.19%) which is comparable to the study conducted by Elbehissi Omnia M et al. [12]

We found a considerably increased risk of manual removal of the placenta in women with a fundal or lateral placental location who delivered vaginally. This confirms findings from a previous study, but the possible underlying mechanism is still unknown. [4]

Controlled cord traction, which has been shown to reduce the risk of manual removal of the placenta, and to a small extent also the amount of blood loss during the third stage of labour is usually recommended in settings where skilled birth attendants are available. The traction angle in fundal and lateral compared with anterior or posterior placental locations might, however, be disadvantageous for placental release, which might explain the increased risk of manual removal of the placenta in this group. [4]

Similarly, severe postpartum haemorrhage and manual removal of placenta along with severe PPH was also associated with lateral placenta which is comparable with the study conducted by Michaele Gransfors et al. [4]

The major limitation of our study is the lack of complete, detailed and validated information about placental location. Apart from placenta previa, there is no official classification regarding placental location, either nationally or internationally. In our study, we chose to categorize placenta location into 4 locations, although placentas are rarely completely fundal, lateral, anterior or posterior. This categorization might therefore be imprecise. However, data on placenta location were registered before the outcomes, and this possible source of misclassification can therefore be assumed to be nondifferential.

### Conclusion

From our study, it was concluded that fundal and lateral placental locations are associated with a number of adverse maternal outcomes, compared to anterior and posterior placental locations. Therefore, our findings suggest that some aspect of placental implantation in the fundal and lateral aspect of the uterus leads to more maternal complications than implantation in other sites. Placental location by ultrasound examination done in second trimester can be used as non-invasive predictor in determining adverse maternal outcomes.

### References

1. D Cunha Castro EC, Popek E. Abnormalities of placenta implantation. *Apmis*. 2018 Jul; 126(7): 613-20.
2. Olive EC, Roberts CL, Nassar N, Algert CS. Test characteristics of placental location screening by transabdominal ultrasound at 18–20 weeks. *Ultrasound in obstetrics & gynecology*. 2006 Dec;28(7):944-9.
3. Salomon LJ, Alfirevic Z, Berghella V, Bilardo C, Hernandez-Andrade E, Johnsen SL, Kalache K, Leung KY, Malinger G, Munoz H, Prefumo F. Practice guidelines for performance of the routine mid-trimester fetal ultrasound scan. *Ultrasound in Obstetrics & Gynec*.
4. Granfors M, Stephansson O, Endler M, Jonsson M, Sandström A, Wikström AK. Placental location and pregnancy outcomes in nulliparous women: A population-based cohort study. *Acta obstetrica et gynecologica Scandinavica*. 2019 Aug;98(8):988-96.
5. Patil Alka, Badade Bhagyashree TS. Study of neonatal outcome in relation to placental location in tertiary care centre.
6. Jaiswal J, Jaiswal A, Nagaria T, Ramteke A. Prediction of pregnancy induced hypertension by USG guided placental localization. *Journal of Evolution of Medical and Dental Sciences*. 2015 Oct 8;4(81):14163-73.
7. Singh N, Gupta R, Pandey K, Gupta N, Chandanan A, Singh P, Das TK. To study second trimester placental location as a predictor of adverse pregnancy outcome. *Int J Reprod Contracept Obstet Gynecol*. 2016;5(5):1414-7.
8. Seadati N, Najafian M, Cheraghi M, Mohammadi B. Placental location at second trimester and pregnancy outcomes. *J Pharm Sci Innov*. 2013;2(2):32-4.
9. Nair VV, Nair SS, Radhamany K. Study of placental location and pregnancy outcome. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*. 2019 Apr 1;8(4):1393-8.
10. Zia S. Placental location and pregnancy outcome. *Journal of the Turkish German Gynecological Association*. 2013;14(4):190.
11. Jaisal P, Bhonsale D. Association of Placental Localization at 16-24 Week and Pregnancy Outcome. *Int J Med Res Prof*. 2016;2(4):7-9
12. Elbehissi OM, Abd El-Hakim SF, Affat DM. Placental location and the development of hypertensive disorders of pregnancy. *The Scientific Journal of Al-Azhar Medical Faculty, Girls*. 2021 Oct 1;5(4):831.