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# PROPORTION OF LOW-LYING PLACENTA IN MID-TRIMESTER AND FACTORS ASSOCIATED WITH PLACENTAL MIGRATION: A PROSPECTIVE STUDY AT A TERTIARY CARE CENTRE

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**Abstract**

**Background**: Low-lying placenta and placenta previa, diagnosed in the mid-trimester, can lead to adverse maternal and fetal outcomes. Many low-lying placentas detected in the mid-trimester migrate to a normal position by term. This research aimed to identify the prevalence of low-lying placenta during the mid-trimester and assess factors associated with placental migration in the third trimester.

**Materials and Methods**: In this prospective study, 200 pregnant women attending a tertiary care center underwent routine mid-trimester obstetric ultrasound. Placental location and distance from the internal os were documented. Patients were followed up in the third trimester to assess placental migration. Relevant clinical data were collected. Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS).

**Results**: The proportion of low-lying placenta in the mid-trimester was 35% (70/200). By the third trimester, the proportion decreased to 14% (28/200), with a 60% migration rate. Factors significantly associated with placental migration were previous vaginal delivery (85%, p=0.007), placental location (anterior 82.1%, p=0.002), and initial distance from the internal os ≥1.5 cm (83.3%). Factors hindering migration were previous Lower Segment Cesarean Section (LSCS) (61.5%, p=0.005), history of Medical Termination of Pregnancy (MTP) (76.9%, p=0.003), and initial distance from the os <1 cm (67.8%).

**Conclusion**: While a significant proportion of pregnancies had low-lying placenta in the mid-trimester, the majority migrated by the third trimester. Factors such as previous vaginal delivery, anterior placental location, and greater initial distance from the os favored placental migration. Conversely, previous LSCS, history of MTP, and shorter initial distance from the os hindered migration.

**Keywords:** cesarean section, placental location, pregnancy trimester, prenatal, ultrasonography, low-lying placenta, initial distance from internal os, placental migration, placenta previa

## INTRODUCTION

Placental location plays a pivotal role in determining pregnancy outcomes, especially when the placenta is positioned abnormally close to the internal os, as seen in low-lying placenta and placenta previa. These conditions are linked to an increased risk of significant maternal and fetal complications, including hemorrhage, preterm delivery, and the necessity for cesarean section [1]. Placenta previa, which occurs in about 0.5% of pregnancies at term, can lead to severe outcomes if not managed properly [2]. However, the incidence of a low-lying placenta in the mid-trimester is considerably higher, with various studies reporting rates ranging from 6% to 46%, depending on the population and diagnostic criteria used [3,4,5].The phenomenon of placental migration refers to the apparent movement of the placenta away from the internal os as pregnancy progresses. This migration is largely due to the differential growth of the lower uterine segment and the placenta itself, leading to an apparent

upward shift of the placenta relative to the internal os [6]. Understanding the factors that influence placental migration is crucial for managing pregnancies complicated by a low-lying placenta. Factors such as parity, history of cesarean section, placental location and initial distance from the internal os have been implicated in the likelihood of placental migration [7,8]. For instance, previous studies have shown that placentas with an anterior location are more likely to migrate than those with a posterior location, possibly due to differences in uterine blood flow and contractility between the anterior and posterior walls [9,10].

Assessing the proportion of low-lying placenta in the mid-trimester and understanding the factors associated with placental migration can significantly aid in patient counselling and management. Anticipating whether a low-lying placenta will persist or resolve by term can influence decisions regarding the timing and mode of delivery, ultimately improving maternal and fetal outcomes [11,12]. Despite the clinical importance, there remains a need for further research to better predict placental migration and its implications. This study aimed to address this gap by evaluating the proportion of low-lying placenta in the mid-trimester and identifying the factors associated with placental migration in a cohort of pregnant women attending a tertiary care center.

## MATERIALS AND METHODS

This prospective study was conducted at the Department of Radiodiagnosis and the Department of Obstetrics at Saveetha Medical College from March 2018 to April 2019. The study population included all pregnant women attending the antenatal outpatient department (OPD) clinic for routine mid-trimester obstetric ultrasound. The inclusion criteria were singleton pregnancies at 18-20 weeks of gestation. Women with multiple pregnancies, fetal anomalies, or those who did not provide consent were excluded.

The sample size was calculated using the formula $n = (Z1\text{-}\alpha/2)2 \times P \times (1\text{-}P) / d2$, where P is the proportion of low-lying placenta in mid-trimester, $Z1\text{-}\alpha/2$ is the standard normal variate at 5% type I error (1.96), and d is the absolute error or precision (4%). Based on a previous study by Shravage et al. [7], the proportion of low- lying placenta in mid-trimester was 8.08%. Substituting these values in the formula, the calculated sample size was 200. All consecutive cases meeting the inclusion criteria were included until the desired sample size was reached.

After obtaining informed consent, relevant clinical data were collected using a structured questionnaire. The information included socio-demographic details, obstetric history (parity, previous vaginal deliveries, cesarean sections, and medical termination of pregnancies), and comorbidities (hypertension, diabetes mellitus, anemia, and congenital heart disease).

Transabdominal ultrasound examinations were performed by experienced radiologists using a 4 MHz convex probe. The placental location was documented as anterior, posterior, right, or left. The distance between the lower edge of the placenta and the internal os was measured. Low-lying placenta was defined as a placental edge within 2 cm of the internal os [8]. Patients with low-lying placenta in mid-trimester were followed up in the third trimester (34-36 weeks) to assess placental migration.

Figure 1 through Figure 4 illustrate the various types of placental positioning that can occur in pregnancy. These images help visualize the spectrum of placental locations from normal to complete placenta previa. Ultrasound image demonstrates a low-lying placenta partially covering the internal cervical os, consistent with partial placenta previa [Figure 1].


**FIGURE 1: Ultrasound Image Demonstrating Partial placenta previa**

Ultrasound image shows the placental edge abutting the internal cervical os, consistent with marginal placenta previa [Figure 2].


**FIGURE 2: Ultrasound Image Demonstrating Marginal placenta previa**

Ultrasound image reveals the placenta implanted in the lower uterine segment, close to but not covering the internal cervical os, indicative of a low-lying placenta previa [Figure 3].


**FIGURE 3: Ultrasound Image Demonstrating Low lying placenta previa.**

Ultrasound image shows the placenta completely covering the internal cervical os, consistent with complete placenta previa [Figure *4*].

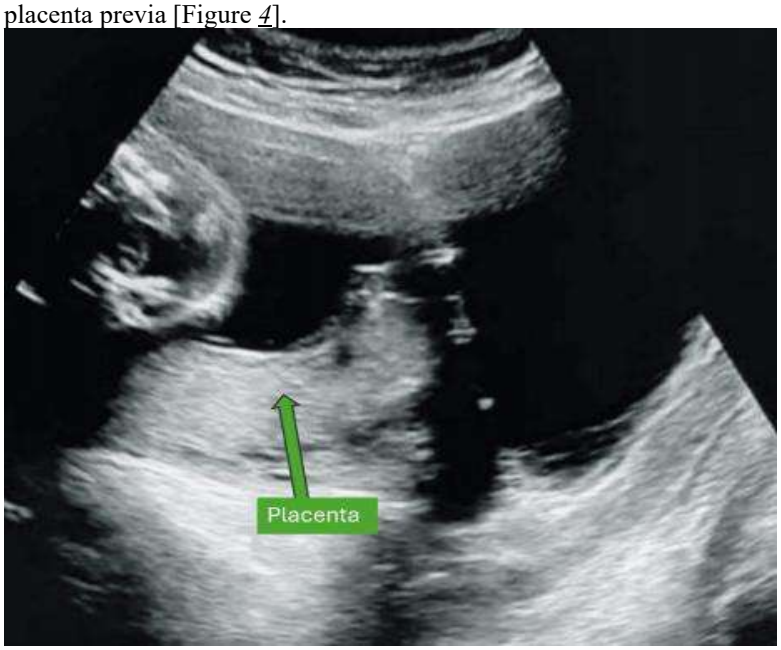


**FIGURE 4: Ultrasound Image Demonstrating Complete Placenta Previa**

Data entry was performed in Microsoft Excel and subsequently analyzed using Statistical Package for the Social Sciences (SPSS) version 16. Categorical variables were described as frequencies and percentages, while continuous variables were reported as mean ± standard deviation. The relationship between categorical variables was evaluated using the chi-square test or Fisher's exact test when appropriate. A p-value of less than 0.05 was deemed statistically significant.

## RESULTS

A total of 200 pregnant women participated in the study, with an average age of 26.4 ± 4.2 years. Primigravida women comprised 50.5% (n=101) of the participants, while 49.5% (n=99) were multigravida. The socio-demographic and clinical characteristics of the participants are detailed in Table *1*.

| **Age** | **Multigravida** | | **Primigravida** | | **Total** | |
|---|---|---|---|---|---|---|
| | **N** | **%** | **N** | **%** | **N** | **%** |
| <24 | 18 | 23.1% | 60 | 76.9% | 78 | 100.0% |
| 24-28 | 50 | 62.5% | 30 | 37.5% | 80 | 100.0% |
| >28 | 31 | 73.8% | 11 | 26.2% | 42 | 100.0% |
| **Total** | 99 | 49.5% | 101 | 50.5% | 200 | 100.0% |

**TABLE 1: Distribution of Gravida Status Across Different Age Groups**

The proportion of low-lying placenta in mid-trimester (18-20 weeks) was 35% (70/200). In the third trimester (34-36 weeks), the proportion decreased to 14% (28/200). The migration rate of low-lying placenta from mid-trimester to third trimester was 60% (42/70) [Figure *5*].

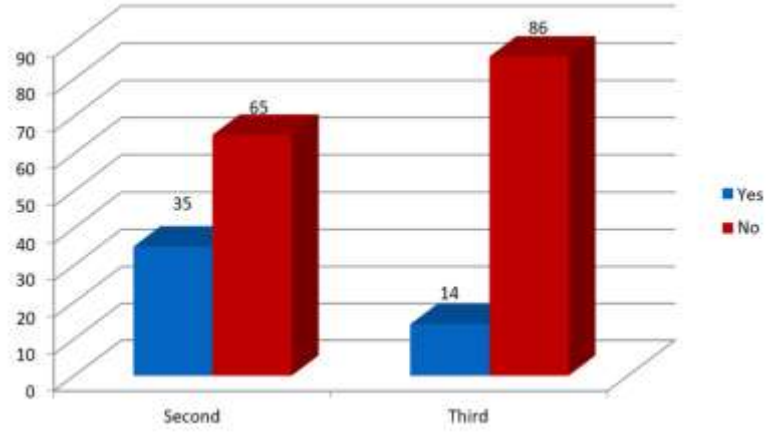


**FIGURE 5: Proportion of low-lying placenta in mid-trimester and third trimester**

**Factors Associated with Placental Migration**

Among women with low-lying placenta in mid-trimester, 85% (17/20) of those with a history of Previous Vaginal Delivery (PVD) showed placental migration, compared to 50% (25/50) of those without a history of PVD (p=0.007) [Figure 6].

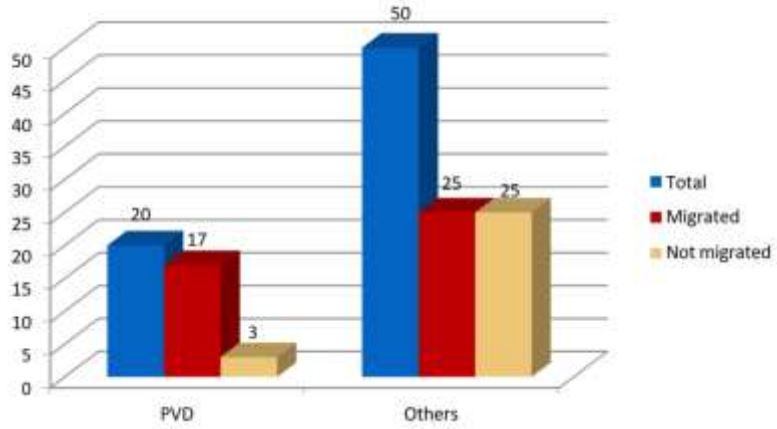


**FIGURE 6: Comparison of Placental Migration with and without History of PVD in the Third Trimester**

Placental migration was observed in 38.5% (10/26) of women with a history of Previous Lower Segment Cesarean Section (LSCS), compared to 72.7% (32/44) of those without a history of LSCS (p=0.005) [Figure *7*].

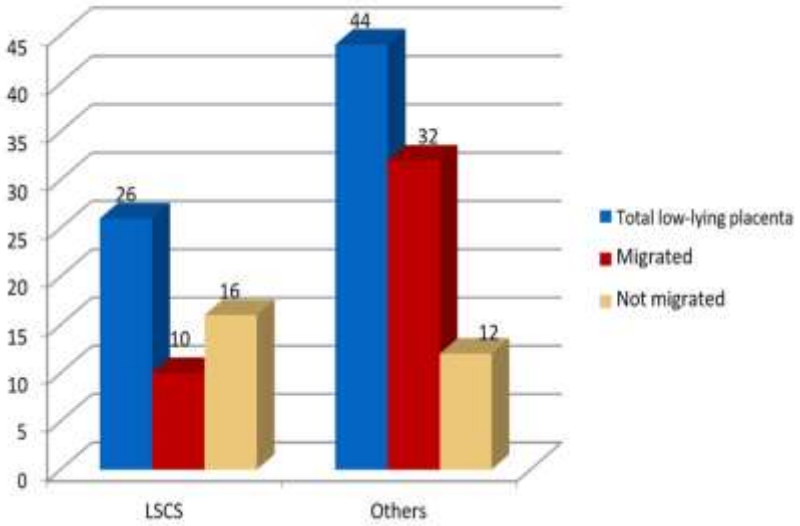


**FIGURE 7: Comparison of Placental Migration with and without History of LSCS in the Third Trimester**

Among women with a history of History of Medical Termination of Pregnancy (MTP), 23.1% (3/13) showed placental migration, compared to 68.4% (39/57) of those without a history of MTP (p=0.003) [Figure *8*]

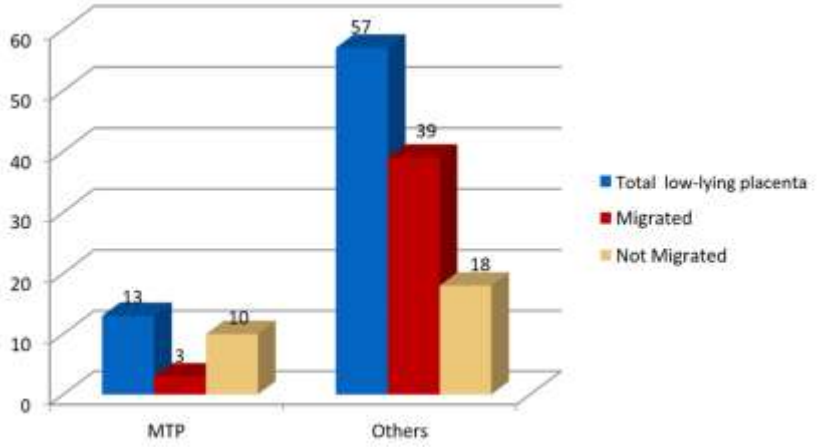


**FIGURE 8: Comparison of Placental Migration with and without History of MTP in the Third Trimester**

Location played a significant role, with the anterior placental location showing a much higher migration rate (82.1%, 23 out of 28 cases) compared to the posterior location (45.2%, 19 out of 42 cases), as indicated in Table *2* (p=0.002)

| Placental site | Distribution | Placental Migration | | Total |
|---|---|---|---|---|
| | | Yes | No | |
| Anterior | N | 23 | 5 | 28 |
| | % | 82.1% | 17.9% | 100.0% |
| Posterior | N | 19 | 23 | 42 |
| | % | 45.2% | 54.8% | 100.0% |
| Total | N | 42 | 28 | 70 |
| | % | 60.0% | 40.0% | 100.0% |

**TABLE 2: Comparison of placental migration in relation to placental site in third trimester**

Placental migration was more likely when the initial distance from the internal os was between 1.5-2 cm (83.3%, 25 out of 30 cases) compared to distances of 1-1.5 cm (66.6%, 8 out of 12 cases) and less than 1 cm (32.1%, 9 out of 28 cases), as shown in Table*3*.

| Initial distance from internal os | Distribution | Placenta previa | | Total Cases Migrated (42) |
|---|---|---|---|---|
| | | Second Trimester (Total- 70) | Third Trimester (Total -28) | |
| <1 cm | N | 28 | 19 | 9 |
| | % | 100.0% | 67.8% | 32.1% |
| 1-1.5 cm | N | 12 | 4 | 8 |
| | % | 100.0% | 33.3% | 66.6% |
| 1.5–2 cm | N | 30 | 5 | 25 |
| | % | 100.0% | 16.6% | 83.3% |

**TABLE 3: Placenta previa and placental migration in relation to initial distance from internal os in anterior placental location**

A concise recap of the key factors associated with placental migration, including previous vaginal delivery, placental location, initial distance from the internal os, and history of medical termination of pregnancy, is provided in Table *4*.

| Factor | Association with Migration |
|---|---|

| | |
|---|---|
| Previous Vaginal Delivery (PVD) | Promotes Migration (85%, p = 0.007) |
| Placental Location (Anterior) | Promotes Migration (82.1%, p = 0.002) |
| Initial Distance from Internal Os ≥ 1.5 cm | Promotes Migration (83.3%) |
| Previous Lower Segment Cesarean Section (LSCS) | Hinders Migration (61.5%, p = 0.005) |
| History of Medical Termination of Pregnancy (MTP) | Hinders Migration (76.9%, p = 0.003) |
| Initial Distance from Internal Os < 1 cm | Hinders Migration (67.8%) |

**TABLE 4: A summary of the key factors associated with placental migration**

This study identified that a significant portion of pregnant women (35%) had a low-lying placenta during the mid-trimester. This finding is consistent with previous studies, which reported the prevalence of low- lying placenta in mid-trimester ranging from 6% to 46% [9,10]. The wide variation in the reported prevalence could be attributed to differences in study populations, diagnostic criteria, and imaging techniques. By the third trimester, the proportion of low-lying placenta decreased to 14%, with a migration rate of 60%. This observation highlights the dynamic nature of placental position throughout pregnancy [Figure *9*].

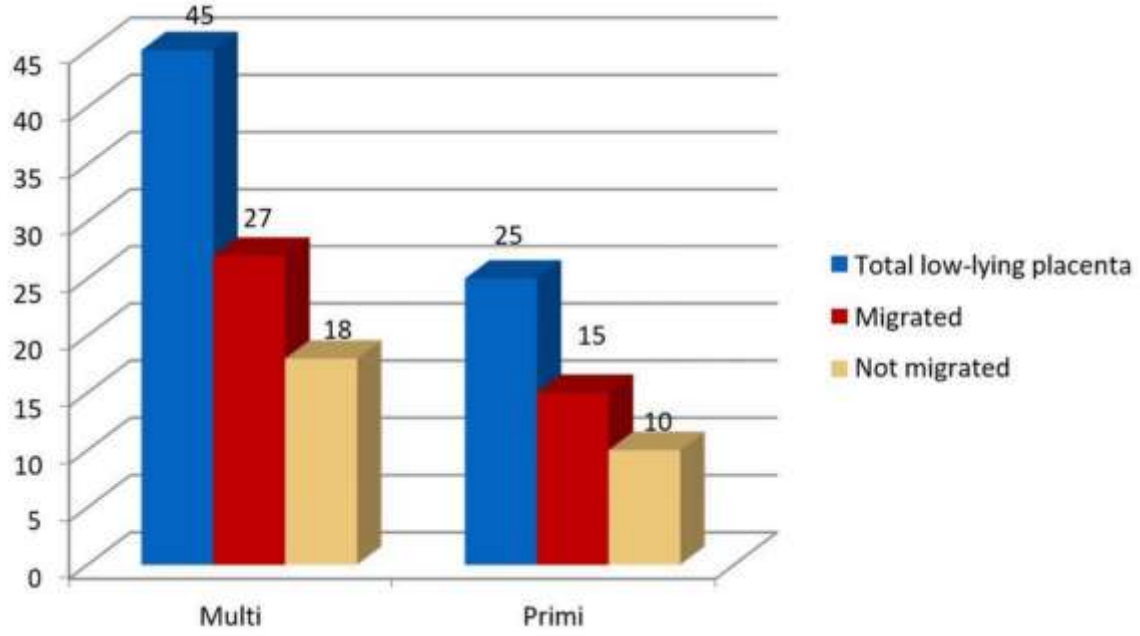


**FIGURE 9: Gravida and Placental migration in third trimester**

## DISCUSSION

The movement of the placenta away from the internal os is believed to be influenced by the varying growth rates of the lower uterine segment and the placenta [11]. As the pregnancy advances, the lower segment of the uterus grows and elongates, leading to an apparent upward shift of the placenta relative to the internal os [12].

Several factors were found to be associated with placental migration in this study. Women with a history of previous vaginal delivery had a higher migration rate (85%) compared to those without such history. This finding is in agreement with the study by Shravage et al. [7], which reported a migration rate of 78.5% in women with previous vaginal delivery. The exact mechanism behind this association remains unclear, but it may involve variations in uterine contractility and the development of the lower uterine segment in women with previous vaginal deliveries [13].

Conversely, a history of previous LSCS was associated with a lower likelihood of placental migration (38.5%). This observation is consistent with the literature, which suggests that cesarean section scars may impair the normal development and elongation of the lower uterine segment, thereby hindering placental migration [14,15].

Similarly, women with a history of MTP had a lower migration rate (23.1%) compared to those without such history. The presence of uterine scars from MTP may also interfere with the normal migration process [16].

Placental location was found to be a significant factor influencing migration. Anterior placentas had a higher migration rate (82.1%) compared to posterior placentas (45.2%). This finding is in line with previous studies that reported a higher migration rate for anterior placentas [7, 17]. The precise cause of this association is not fully understood, but it may be linked to variations in blood flow and contractility between the anterior and posterior uterine walls. [18].

The likelihood of placental migration in the mid-trimester was also linked to the initial distance of the placenta from the internal os. Placentas located between 1.5-2 cm from the os had a higher migration rate (83.3%) compared to those located closer to the os. This observation suggests that placentas with a greater initial distance from the os have a higher chance of migrating to a normal position by term. Previous studies have reported comparable findings [19,20].

The strength of this study is its prospective design and thorough evaluation of various factors influencing placental migration. However, this study has certain limitations. First, the relatively small sample size could restrict the generalizability of the results. Second, the study was limited to a single tertiary care center, which may affect the applicability of the findings to other settings with different patient populations and 8 of 10 management practices.

## CONCLUSIONS

This study found that a significant proportion of pregnant women had low-lying placenta in mid-trimester, but the majority of these placentas migrated to a normal position by the third trimester. Factors such as previous vaginal delivery (PVD), anterior placental location, and greater initial distance from the internal os were associated with a higher likelihood of placental migration. Conversely, a history of lower segment cesarean section (LSCS), medical termination of pregnancy (MTP), and shorter initial distance from the os were associated with a lower migration rate. These findings can help in counseling pregnant women with low-lying placenta and guide management decisions regarding the timing and mode of delivery. Further large-scale, multicenter studies are needed to validate these results and explore other potential factors influencing placental migration.

**Additional Information**

**Disclosures**

**Human subjects:** Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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