SUCCESSFUL VAGINAL BIRTH AFTER CESAREAN ACROSS MATERNAL AGE GROUPS: A 9-YEAR SINGLE-CENTER CASE SERIES

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Abstract: Cesarean section as method for delivery is increasingly performed worldwide. As a result, more and more pregnant women with previous uterine scar are potential candidates for trial of vaginal labor in subsequent pregnancies. Vaginal birth after cesarean section has a number of advantages for the mother and newborn, but at the same time it carries a certain risk of uterine rupture. Advanced maternal age is often associated with lower success rates of VBAC, but its role as an independent predictor of adverse outcomes, such as uterine rupture or stillbirth, remains unclear.
Objective: The aim of this study was to determine the age distribution of women undergoing vaginal delivery after cesarean section and the influence of age on the success of TOLAC, the risk of uterine rupture and the likelihood of stillbirth.
Materials and methods: This study included successful VBAC cases between 2017 and 2025 in a maternity clinic at the University Hospital "Maichin Dom", Sofia. Patients were categorized into four age groups: <30, 30–34, 35–39, and ≥40 years. Cases of intrauterine fetal demise were classified as antepartum events when diagnosed prior to the onset of labor. Intrapartum fetal deaths were recorded separately. Uterine rupture cases were included if associated with uterine contractions.
Results: The largest proportion of patients was observed in the 30–34 age group, followed by the 35–39 age group. Advanced maternal age (≥40 years) represented a substantial subgroup within the cohort. The highest proportion of successful VBAC was observed in women aged 30–34 years (34.1%), followed by those aged 35–39 years (30.2%). Women aged ≥40 years accounted for 14.8% of all successful VBAC cases. No cases of intrapartum fetal death were observed in the cohort. The distribution of antepartum intrauterine fetal demise was similar across maternal age groups. The overall proportion of uterine rupture among women presenting in labor was 4.7%. Rupture cases were distributed across multiple age groups, with the highest proportion observed in women aged 35–39 years (6.8%), followed by <30 years (5.0%) and 30–34 years (4.6%). No rupture cases were observed in women aged ≥40 years
Conclusion: Maternal age alone is not an independent predictor of VBAC success, uterine rupture, or stillbirth in women undergoing TOLAC
Keywords: TOLAC, VBAC, uterine rupture, stillbirth

1. INTRODUCTION

Cesarean section is a method of operative delivery that is increasing in frequency worldwide. This results in more and more pregnant women with previous uterine scar who are potential candidates for trial of labor (TOLAC) in subsequent pregnancies. Vaginal birth after cesarean section (VBAC) has several benefits for the mother and newborn, such as reduced surgical morbidity and improved recovery, and is considered an important strategy to reduce repeat cesarean sections and their associated morbidity. Maternal age is among the important factors related to the success and safety of TOLAC. Advanced maternal age is often associated with lower VBAC success rates and is included in several predictive models, including those developed by Grobman. ACOG, RCOG and FIGO clinical guidelines consider maternal age as a factor that reduces the likelihood of success during VBAC. However, its role as an independent predictor of adverse outcomes, such as uterine rupture or stillbirth, remains unclear.
Objective: The aim of this study was to determine the age distribution of women undergoing vaginal delivery after cesarean section and the influence of age on the success of TOLAC, the risk of uterine rupture and the likelihood of stillbirth.

2. MATERIALS AND METHODS

This retrospective study included only successful VBAC cases between 2017 and 2025. The study was conducted in a maternity clinic at the University Hospital "Maichin Dom", Sofia. Women with failed TOLAC were excluded. Patients were categorized into four age groups: <30, 30–34, 35–39, and ≥40 years. Clinical data were extracted from institutional records and included maternal age, obstetric history, delivery mode, and perinatal outcomes. Cases of intrauterine fetal demise (IUFD) were classified as antepartum events when diagnosed prior to the onset of labor.

Intrapartum fetal deaths were recorded separately; however, no such cases were identified in the study cohort. Uterine rupture cases were included if associated with uterine contractions.
Statistical analysis was performed using chi-square tests for categorical variables and univariate logistic regression to assess the association between maternal age and outcomes. A p-value <0.05 was considered statistically significant.

3. RESULTS

A total of 183 cases of trial of labor after cesarean (TOLAC) were analyzed over a 9-year period (2017–2025). Maternal age ranged from 17 to 46 years, with a mean age of 32.15 years and a median of 33 years.
The largest proportion of patients was observed in the 30–34 age group, followed by the 35–39 age group. Advanced maternal age (≥40 years) represented a substantial subgroup within the cohort. (Table1)

Table 1: Age distribution of all births

Age group	n	%
<30	38	20.9%
30–34	62	34.1%
35–39	55	30.2%
≥40	27	14.8%

Source: author's research

No statistically significant association was found between maternal age and successful vaginal birth after cesarean (VBAC) according to maternal age. Chi-square analysis demonstrated no significant differences in VBAC rates across age categories (p = 0.151). In univariate logistic regression analysis, maternal age was not a significant predictor of VBAC success (OR = 1.054 per year increase; 95% CI 0.940–1.181; p = 0.370).
The distribution of successful VBAC cases across maternal age groups is presented in Table 2. The highest proportion of successful VBAC was observed in women aged 30–34 years (34.1%), followed by those aged 35–39 years (30.2%). Women aged ≥40 years accounted for 14.8% of all successful VBAC cases.
These findings demonstrate that successful VBAC occurs across a wide maternal age spectrum, including a substantial proportion of women of advanced maternal age.

Table 2: Distribution of cases with success in TOLAC according to maternal age

Maternal age group	Number of successful VBAC (n)	Proportion (%)
<30 years	38	20.9%
30–34 years	62	34.1%
35–39 years	55	30.2%
≥40 years	27	14.8%
Total	182	100%

Source: author's research

Intrauterine fetal demise cases included in the analysis were antepartum events diagnosed prior to the onset of labor. No cases of intrapartum fetal death were observed in the cohort. The distribution of antepartum IUFD was similar across maternal age groups, with no statistically significant association identified (p = 0.244). These findings indicate that maternal age was not associated with the occurrence of antepartum fetal demise in this cohort. (Table 3)

Table 3: Distribution of cases with IUFD by age

Age group	Total (n)	Antenatal IUFD (n)	IUFD (%)
<30 years	38	4	10.5%
30–34 years	62	5	8.1%
35–39 years	55	6	10.9%
≥40 years	27	3	11.1%
Total	182	18	9.9%

Source: author's research

A total of 191 women with a previous cesarean delivery presented in labor during the study period. Of these, 182 achieved successful VBAC, while 9 required emergency cesarean delivery in whom uterine rupture was identified. The overall proportion of uterine rupture among women presenting in labor was 4.7%. Rupture cases were distributed across multiple age groups, with the highest proportion observed in women aged 35–39 years (6.8%), followed by <30 years (5.0%) and 30–34 years (4.6%). No rupture cases were observed in women aged ≥40 years (Table 4). No clear trend of increasing rupture frequency with advancing maternal age was identified.

Table 4: Distribution of cases with uterine rupture by age

Maternal age group	VBAC (n)	Uterine rupture (n)	Total labor cases (n)	Rupture proportion (%)
<30 years	38	2	40	5.0%
30–34 years	62	3	65	4.6%
35–39 years	55	4	59	6.8%
≥40 years	27	0	27	0%
Total	182	9	191	4.7%

Source: author's research

4. DISCUSSION

Recent studies have shown that maternal age is a significant factor in the outcome of TOLAC. Age-specific analyses have shown a reduced rate of successful VBAC and an increased likelihood of repeat cesarean section with advanced maternal age. In large cohort studies, age has been implicated as an independent predictor of TOLAC failure and increased risk of complications, although its effect is weaker than that of factors such as previous vaginal birth.

Our study showed that maternal age alone is not an independent predictor of adverse outcomes in women undergoing TOLAC. Although previous studies and predictive models have suggested that advanced maternal age is associated with reduced success rates of VBAC, our findings suggest that age is not an independent predictor of uterine rupture or stillbirth. Importantly, the incidence of uterine rupture in our cohort was observed across multiple age groups, including younger patients, challenging the assumption that this complication is primarily associated with advanced maternal age. The observed incidence of uterine rupture does not necessarily reflect the situation in a clearly defined and structured TOLAC. In some women with uterine rupture, the event occurred early in labor outside the hospital or before admission to the delivery room, i.e., before the conditions for safe TOLAC were met. Furthermore, in some of them, after the rupture occurred, a previous corporal incision was established, which is among the major absolute contraindications for TOLAC. Therefore, the observed proportion reflects real clinical scenarios and not the safety profile of an observed setting for TOLAC.

The cases of intrauterine fetal death were distributed across the age spectrum, suggesting that factors other than maternal age are more critical in determining perinatal outcomes. These findings are consistent with the concept that TOLAC outcomes are multifactorial, with important contributions from obstetric history, labor management and clinical context, rather than age alone. From a clinical perspective, our results support an individualized approach to

TOLAC decision-making rather than exclusion based solely on maternal age. Advanced maternal age should be considered in the broader clinical context but should not be considered a contraindication for TOLAC.

5. CONCLUSION

Maternal age alone is not an independent predictor of VBAC success, uterine rupture, or stillbirth in women undergoing TOLAC. Clinical decision-making should be based on a comprehensive assessment of individual risk factors rather than maternal age alone.

REFERENCES

American College of Obstetricians and Gynecologists. (2019). *Vaginal birth after cesarean delivery: ACOG Practice Bulletin No. 205*. *Obstetrics & Gynecology, 133*(2), e110–e127.

Barnea, E. R., et al. (2025). FIGO good practice recommendations for vaginal birth after cesarean section. *International Journal of Gynecology & Obstetrics, 171*, 17–31.

Bashan, Y., et al (2026). Success rates of trial of labor after cesarean delivery: The impact of prior vaginal deliveries on outcomes. *Archives of Gynecology and Obstetrics, 313*(1), 63.

Duran, M. N., Ilgin, S. K., Demir, S. S., Sengi, A., & Demir, B. (2026). Vaginal birth after cesarean: Maternal and fetal outcomes in a multicenter study. *Journal of Maternal-Fetal & Neonatal Medicine, 39*(1), 2622238.

Grobman, W. A., et al (2007). Development of a nomogram for prediction of vaginal birth after cesarean delivery. *Obstetrics & Gynecology, 109*(4), 806–812.

Grobman, W.A., et al. (2021). Prediction of vaginal birth after cesarean delivery in term gestations: A calculator without race and ethnicity. *American Journal of Obstetrics and Gynecology, 225*(6), 664.e1–664.e7.

Landon, M. B., et al. (2004). Maternal and perinatal outcomes associated with a trial of labor after prior cesarean delivery. *New England Journal of Medicine, 351*(25), 2581–2589.

Mariyam, S., Minisha, F., Abu Yaqoub, S., AlDewik, N. & Farrell, T. (2025). Second pregnancy vaginal birth after cesarean: Impact of maternal age on outcomes from a retrospective cohort study. *Journal of Perinatal Medicine, 54*(3), 481–492.

Royal College of Obstetricians and Gynaecologists. (2015). *Birth after previous caesarean birth (Green-top Guideline No. 45)*. RCOG Press.

Smith, G. C., White, I. R., Pell, J. P.,& Dobbie, R. (2005). Predicting cesarean section and uterine rupture among women attempting vaginal birth after prior cesarean section. *PLoS Medicine, 2*(9), e252.

Srinivas, S.K., et al (2007). Vaginal birth after caesarean delivery: Does maternal age affect safety and success? *Paediatric and Perinatal Epidemiology, 21*(2), 114–120.