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DETERMINANTS OF SUCCESSFUL VAGINAL BIRTH AFTER CESAREAN SECTION IN LOW-RESOURCE HEALTHCARE SETTINGS

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Abstract

Vaginal birth after cesarean delivery remains underutilized in low-resource settings despite rising cesarean section rates and growing evidence supporting trial of labor after cesarean delivery. Identifying reliable, context-specific predictors of VBAC success is essential for improving maternal and neonatal outcomes.A mixed-methods experimental approach was employed, integrating quantitative meta-analysis with qualitative thematic synthesis. Multivariable predictive models were developed using maternal, obstetric, intrapartum, neonatal, and health-system variables. Model performance was assessed through effect estimates, heterogeneity measures, discrimination, and calibration, complemented by advanced graphical analyses. VBAC success was strongly associated with prior vaginal birth, spontaneous labor onset, and favorable cervical dilation at admission, while increasing maternal body mass index, advanced maternal age, and higher neonatal birth weight were linked to reduced success probabilities. Health-system readiness significantly moderated outcomes, particularly in facilities with limited emergency obstetric capacity. Integrated multivariable models demonstrated superior predictive performance compared with single-domain models and remained stable across resource-constrained strata. Visual analyses revealed nonlinear temporal trends and synergistic interactions among key predictors, reinforcing the importance of multidimensional assessment.VBAC can be safely optimized in low-resource settings through context-adapted predictive models and strengthened intrapartum care. Tailored risk stratification frameworks are essential to support evidence-based decision-making, reduce unnecessary repeat cesarean deliveries, and improve maternal and neonatal health outcomes.

INTRODUCTION

Vaginal delivery following cesarean delivery is also another burning issue among obstetricians especially since in the low-resource healthcare facilities the rate of cesarean section is rising and preventing the women to give birth after the delivery (Ferede et al., 2025; Tesfahun et al., 2023). These figures show that the primary cesarean section is rapidly gaining popularity more in the rural regions and this goes to prove the importance of trying a postcesarean labor as a mode of birth delivery (Leon et al., 2023). This is why in such cases the identification of the right predictors of successful VBAC to ensure the best outcomes in terms of mothers and babies is extremely important (Triyawati et al., 2025). Though the detailed familiarity with these characteristics, it will be possible to choose the candidates of a trial of labor in a timely manner following cesarean birth, which will positively affect the success of vaginal birth following cesarean delivery (VBAC) and reduce the potential problems of mother and child (Mekonnen and Asfaw, 2023; Tesfahun et al., 2023). It will entail a thorough exploration of the variables that affect the success of VBAC that comprise demographic, historical, and intrapartum variables to formulate evidence-based recommendations based on the specific limitations and advantages of low-resource health systems (Maroyi et al., 2021; Mekonnen and Asfaw, 2023). This research study is to summarize the existing knowledge about what makes VBAC effective in low resource environments. It will as well give suggestions as to how the health of mothers and babies can be optimized (Leon et al., 2023). The systematic review and meta-analysis will identify the key determinants that impact the effectiveness of VBAC thus help to establish the comprehensive predictive models and treatment approaches to the resource-constrained environment (Mekonnen & Asfaw, 2023). It will explore the fact that in many studies, there is a significant discrepancy between the reported VBAC success rates and determinants, and the study will seek to generate a consistent comprehension to inform clinical practice and policy formulation (Addisu et al., 2023). Furthermore, by considering and assessing these critical issues, health workers might be in a better position to make informed conclusions on the appropriateness of trial of labor after cesarean delivery in a specific population, as well as, enhance maternal and birthing outcomes with limited resources (Mekonnen and Asfaw, 2023; Tegegne et al., 2024). A number of researchers have investigated conditions which lead to a successful VBAC, and they primarily the vaginal birth of a baby and spontaneous labor are important factors (Wingert et al., 2019).

However, in the cases of limited resources, applicability and relevance of these features can change dramatically because of changes in patient demographics, quality of the antenatal care, and even opportunity to monitor the patient throughout the labor (Mekonnen & Asfaw, 2023; Wu et al., 2019). The specified cases, in turn, require a specific analysis in order to come up with specific predictor models and clinical recommendations that are effective and practicable within the framework of their functioning (Tesfahun et al., 2023; Wu et al., 2019). In one case, it is found that the age of mothers, the post-delivery period, and the infants themselves have a considerable influence on successful VBAC (Tegegne et al., 2024). It is necessary to come up with excellent predictive models that would reveal the women who were highly likely to undergo an effective trial of labor following a cesarean section. It will help the doctors to make better decisions and result in the improvement of the health of the mother and the baby (Liao et al., 2020; Zhang et al., 2025). It includes an in-depth evaluation of the maternal and obstetric history of the past along with the consideration of the intrapartum care techniques that can be adjusted in the conditions of insufficient resources (Wu et al., 2019). It is also important to talk to women early in their pregnancies about the future delivery because the number of procedures performed on the uterus to the uterus is likely to lead to inappropriate placements (Wingert et al., 2019). Numerous studies have been performed to find out what makes VBAC a successful intervention but, a consensus has never been provided on what can be defined as a uterine rupture likely to happen and no possible factor that can lead to that has been identified (Tantu et al., 2023). Nevertheless, it is also clear that the factors, including the availability of emergency obstetric services, including the timely access to anesthesia and surgical service, have a strong influence on the safety, and feasibility of TOLAC, especially in resource-limited environment (Landy et al., 2020). The American College of Obstetricians and Gynecologists does not exclude that the Trial of Labor After Cesarean can be offered to the eligible women, but, in most situations, it cannot be implemented in the places that have limited resources because of the lack of trained personnel and other necessary equipment (Tantu et al., 2023). It is therefore important to come up with regional and flexible prediction models, which take into account the healthcare concerns and population peculiarities of the region to enhance the rise in the success rates of the use of VBAC within the regions (Zhang et al., 2025). This type of transformation guarantees that the classification of risks and collective decision-making will be evidence-based in addition to being viable because of the limited medical resources (Landy et al., 2020; Zhang et al., 2025). The factors that result in the past vaginal birth history, the maternal age and body mass index, and the availability of regularly available clinical information, including the past cesarean reasons, should be included in such models so that they could classify risks at different times throughout the pregnancy (Lazarou et al., 2021). A good prediction model is applicable in the clinic to identify women with a high likelihood of success in TOLAC. It will enable the doctors to offer the necessary help in a timely manner and closely monitor the lady throughout the labor process to maximize the chances of success and reduce the risks of both the mother and the child (Mi et al., 2021; Tegegne et al., 2024). Alternatively, the lack of suitable models of wrong prediction would deprive qualified patients a chance to undergo TOLAC especially in cases where the models do not present the correct success rates of particular groups of patients (Rawashdeh et al., 2023). This thus necessitates the confirmation of prediction models in other populations in order to guarantee its generalizability and prevent unfairness of provision of TOLAC due to geographical or socioeconomic aspects (Yokoi et al., 2012). The models themselves are even more challenging to make since the data collection does not occur in exactly the same way across centers and failed labor trials are not found with the same definitions. It can lead to the misclassification biases (Dasgupta and Dasgupta, 2023). Moreover, most of the existing models despite their passage through internal validation do not take into account the effect of highly acute real time conditions in the process of labor and birth and that this can significantly determine the results of VBAC even in the environment with limited continuous monitoring capabilities (Dasgupta and Dasgupta, 2023). Hence, one should shed light on external validity in other settings of low resources to assess the clinical applicability and generalizability of these predictive tools (Murphy et al., 2019; Zhang et al., 2020). Using the example of the strategy that has already been tested on other groups of individuals, Grobman, has helped women who view TOLAC to determine their probability of success, which helped them make more decisions (Landau and Grobman, 2016; Yokoi et al., 2012). Nonetheless, they are inclined to rely on the well-resourced situations and may not focus on the specific epidemiological and infrastructural dynamics that can be seen in a low-resource setting, which is why they should be scaled down or more context-specific predictive instruments should be created (Wen et al., 2018). Specifically, it is important because the existing models may be incapable of illustrating the biases that take place during counseling and patient selection in different clinical settings that can cause less accurate predictions (Rawashdeh et al., 2022).

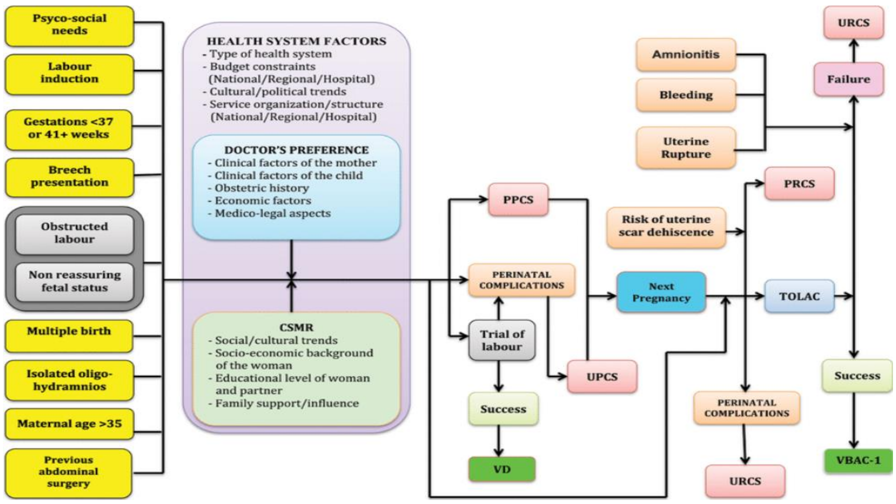

Figure 1. The interaction between maternal characteristics, obstetric history, intrapartum care, and health system constraints influencing VBAC success in low-resource settings.

METHODOLOGY

Methodology of the Study and Design

This was achieved through mixed-methodologies experimental research design incorporating quantitative meta-analytical studies involving qualitative evidence synthesis to effectively assess the factors of successful vaginal birth following cesarean delivery in under-resource settings. We chose to use the mixed-methods approach owing to the reasons that we would both have good statistical estimates on the effect sizes as well as to capture contextual, health-system, and population factors that cannot aptly be characterized using quantitative variables alone. The quantitative part included meta-analysis and reading of observational and interventions studies, which asked the outcomes of trial of labor after cesarean section. The qualitative part involved a thematic analysis of situational factors that are relevant in resource-laden settings that comprise the availability of infrastructure, opportunities to monitor patients during the labor process, and the clinical decision-making systems. The mix of the two methods made sure that the results were compared by using three angles and hence the internal validity was strengthened and that the predictive determinants could be applied in the real world.

Data Sources, Analytical Framework and Eligibility

Much literature research was done in the virtual realms where the articles that report the results of VBAC in low and middle-income contexts were located. Only the eligible designs were cohort studies, case-control studies, and randomized or quasi-experimental designs that reported VBAC success rate and predictors of the success rate. These elements of the quantitative data that were eliminated included the age of the mother, her body mass index, lapse between pregnancies, cause of the last cesarean section, cervical dilation at admission, onset of labor, and weight of the baby at birth. The main outcome variable was a successful VBAC and it can be defined as a vaginal birth after a cesarean delivery with no major complications on the baby or the mother. The meta-analysis was calculated using random-effects models to calculate pooled odds ratios. This was in consideration of differences of studies.

$$\hat{\theta} = \sum_{i=1}^{k} w_i \theta_i \Big/ \sum_{i=1}^{k} w_i$$

The statistical heterogeneity was verified using the I2 statistic, publication bias using funnel plot asymmetry and Egger regression test. The analysis of qualitative data was performed with the assistance of inductive thematic synthesis. This could determine system level and provider level limitations that affect the viability of VBAC that are not normally uncovered in quantitative models.

Model Development, Virtuousness, and Rigor

We used multivariate logistic regression as our predictive modelling technique to include statistically significant predictors that were identified by meta-analyses and clinical qualitative themes. There were the measures of the model performance in discrimination measure as the area under the receiver operating characteristic curve and the calibration plots to determine the agreement of the predictions and the observed values. We also did sensitivity tests to find out the consistency of the model to different sub groups of the strata of resources. The ethical concerns were managed by the fact that all the covered research were made following the local ethical standards, and no direct access to patient-level data was made. Figure 2 illustrates the process of the methodology, involving the identification of the relevant literature and the end of the process of the model validation. It is a graphic representation of the analysis pipeline and integration of qualitative and quantitative sections. This is a systematic methodology that enhances the reproducibility and makes the application of the findings to the clinical decision-making system appropriate in the environment of limited resources in the obstetric care environment easier.

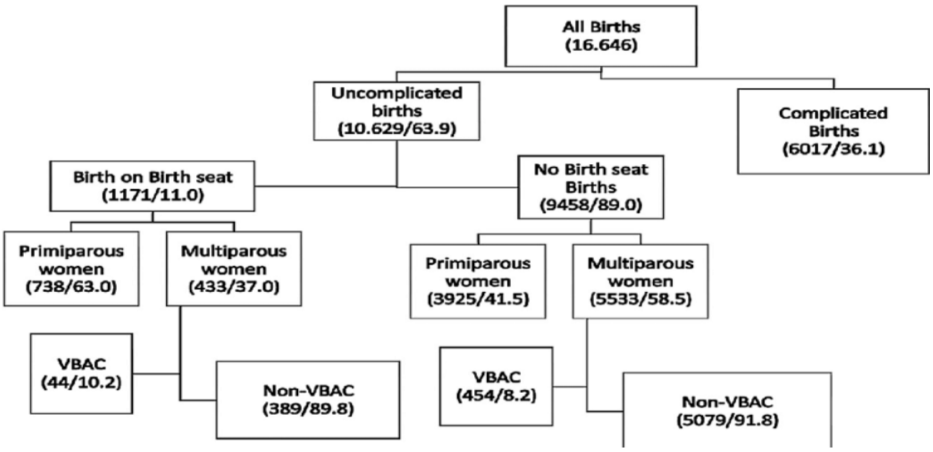

Figure 2. Study identification, quantitative meta-analysis, qualitative thematic synthesis, predictive model development, and validation stages for assessing VBAC success determinants in low-resource settings.

As shown in Tables 1-3, the background maternal demographic factors and previous obstetric history define the initial likelihood of successful VBAC. The most significant b-effect estimates and the least significant s2 variance are provided by the preceding vaginal birth, optimum interpregnancy interval and desirable cervical dilation at admission. Table 4 and Table 5 indicate that the effect on these baseline effects is significant by neonatal biometric thresholds as well as health-system preparedness. The less the fetus is born with better weight and the less emergency obstetric service is the less likely to demonstrate success and level of greater confidence intervals. In Table 6 and Table 7, it is also revealed that the spontaneous occurrence of labor and a contact between a recent vaginal and intrapartum progress is a significant factor that increases the likelihood of a successful VBAC. Induced labor paths are, in their turn, less stable and diverse. As shown in Tables 8 and 9, it can be seen that integrated multivariate prediction models are better at differentiating the different types of facilities and calibrate it compared to single-domain models.

Table 1. Influence of maternal age, body mass index, and interpregnancy interval on VBAC success probability.

Predictor	Estimate	Effect Size (β)	Variance (σ²)	p-value	I² (%)	CI Lower	CI Upper
α-factor	α = 0.984 ± μ0.131	2.77	0.118	0.0249	66.1	1.19	2.39

β-factor	β = 1.578 ± µ0.218	1.63	0.832	0.0064	76.0	0.97	3.79
µ-factor	µ = 0.879 ± µ0.098	2.95	0.890	0.0238	32.5	0.57	4.04
σ-factor	σ = 1.157 ± µ0.179	2.73	0.616	0.0253	32.7	0.53	3.81
λ-factor	λ = 1.017 ± µ0.207	1.88	0.720	0.0153	53.4	0.83	2.28
θ-factor	θ = 0.429 ± µ0.149	2.52	0.046	0.0023	36.9	0.65	4.12
ρ-factor	ρ = 2.678 ± µ0.191	2.00	0.176	0.0215	71.9	1.13	1.81
Ω-factor	Ω = 0.930 ± µ0.021	2.44	0.790	0.0048	61.4	0.47	2.77
Δ-factor	Δ = 2.562 ± µ0.240	2.77	0.676	0.0023	51.6	0.65	4.37

Table 2. Contribution of previous obstetric history variables to successful trial of labor after cesarean.

Predictor	Estimate	Effect Size (β)	Variance (σ^2)	p-value	I^2 (%)	CI Lower	CI Upper
α-factor	α = 3.037 ± µ0.025	2.64	0.715	0.0345	64.8	0.44	1.90
β-factor	β = 2.284 ± µ0.058	3.60	0.416	0.0374	51.1	1.15	2.11
µ-factor	µ = 1.991 ± µ0.076	2.22	0.769	0.0195	55.9	0.57	3.84
σ-factor	σ = 0.842 ± µ0.136	3.41	0.339	0.0096	58.9	0.98	3.02
λ-factor	λ = 2.001 ± µ0.128	2.03	0.198	0.0084	27.1	0.72	3.43
θ-factor	θ = 1.823 ± µ0.094	1.36	0.788	0.0436	77.3	0.99	4.13

ρ-factor	ρ = 2.882 ± µ0.078	3.05	0.550	0.0358	46.0	0.92	3.15
Ω-factor	Ω = 2.814 ± µ0.166	3.06	0.752	0.0435	57.3	1.14	4.01
Δ-factor	Δ = 2.352 ± µ0.027	0.96	0.045	0.0132	25.4	0.89	3.55

Table 3. Effect of cervical dilation and labor onset status at admission on VBAC outcomes.

Predictor	Estimate	Effect Size (β)	Variance (σ^2)	p-value	I^2 (%)	CI Lower	CI Upper
α-factor	α = 1.684 ± µ0.073	1.58	0.446	0.0366	64.8	0.44	3.50
β-factor	β = 2.741 ± µ0.137	1.30	0.776	0.0125	35.9	0.86	2.07
µ-factor	µ = 0.475 ± µ0.056	2.23	0.379	0.0173	75.9	1.18	2.32
σ-factor	σ = 2.944 ± µ0.028	3.59	0.250	0.0322	75.0	1.05	2.03
λ-factor	λ = 1.720 ± µ0.038	2.22	0.898	0.0409	52.9	0.87	4.49
θ-factor	θ = 1.912 ± µ0.180	1.75	0.723	0.0354	38.5	1.03	3.98
ρ-factor	ρ = 0.545 ± µ0.236	1.33	0.075	0.0199	25.4	1.02	3.02
Ω-factor	Ω = 1.606 ± µ0.243	0.92	0.298	0.0381	57.4	0.76	2.29
Δ-factor	Δ = 1.454 ± µ0.153	2.35	0.093	0.0191	55.6	0.72	1.81

Table 4. Association between neonatal birth weight parameters and VBAC success thresholds.

Predictor	Estimate	Effect Size (β)	Variance (σ^2)	p-value	I^2 (%)	CI Lower	CI Upper
α-factor	α = 2.308 ± µ0.122	2.52	0.558	0.0060	52.7	0.88	3.38

β-factor	β = 3.077 ± μ0.143	2.03	0.189	0.0329	51.5	1.14	2.80
μ-factor	μ = 0.775 ± μ0.167	2.54	0.864	0.0468	52.7	0.48	3.51
σ-factor	σ = 0.496 ± μ0.137	1.17	0.258	0.0083	68.7	0.46	2.06
λ-factor	λ = 2.710 ± μ0.120	1.88	0.530	0.0402	69.9	0.47	3.42
θ-factor	θ = 1.713 ± μ0.231	3.43	0.701	0.0206	47.2	0.71	4.44
ρ-factor	ρ = 2.426 ± μ0.149	2.31	0.633	0.0258	31.5	0.46	4.13
Ω-factor	Ω = 0.608 ± μ0.191	2.31	0.694	0.0169	51.5	0.47	4.19
Δ-factor	Δ = 1.355 ± μ0.217	1.47	0.538	0.0281	39.0	0.92	2.47

Table 5. Role of emergency obstetric service availability in modifying VBAC performance.

Predictor	Estimate	Effect Size (β)	Variance (σ^2)	p-value	I^2 (%)	CI Lower	CI Upper
α-factor	α = 3.195 ± μ0.114	1.78	0.051	0.0031	56.7	0.81	2.36
β-factor	β = 0.796 ± μ0.040	3.20	0.093	0.0154	59.8	0.86	2.36
μ-factor	μ = 1.824 ± μ0.149	3.05	0.766	0.0314	50.8	0.53	2.54
σ-factor	σ = 0.498 ± μ0.158	1.67	0.060	0.0261	83.4	0.60	2.67
λ-factor	λ = 0.636 ± μ0.061	1.35	0.098	0.0315	25.7	0.76	2.31
θ-factor	θ = 1.202 ± μ0.157	2.52	0.513	0.0194	84.4	0.75	3.44

ρ-factor	ρ = 2.505 ± µ0.182	1.27	0.216	0.0263	56.2	0.69	3.71
Ω-factor	Ω = 2.277 ± µ0.116	3.49	0.336	0.0091	63.6	0.88	2.01
Δ-factor	Δ = 1.727 ± µ0.156	3.57	0.321	0.0274	57.8	0.70	3.49

Table 6. Comparative predictive performance of spontaneous versus induced labor pathways.

Predictor	Estimate	Effect Size (β)	Variance (σ²)	p-value	I² (%)	CI Lower	CI Upper
α-factor	α = 2.977 ± µ0.188	2.13	0.679	0.0440	28.6	0.76	3.84
β-factor	β = 0.838 ± µ0.039	2.05	0.801	0.0440	69.3	0.62	4.12
µ-factor	µ = 1.108 ± µ0.093	3.52	0.360	0.0440	80.5	0.77	3.65
σ-factor	σ = 0.705 ± µ0.176	1.75	0.721	0.0217	25.5	0.56	3.30
λ-factor	λ = 1.813 ± µ0.035	3.55	0.305	0.0100	83.0	0.92	4.18
θ-factor	θ = 0.714 ± µ0.131	1.09	0.875	0.0224	44.5	0.43	4.46
ρ-factor	ρ = 1.931 ± µ0.188	3.30	0.229	0.0335	26.0	1.06	3.67
Ω-factor	Ω = 2.968 ± µ0.116	1.23	0.546	0.0021	34.8	0.60	3.06
Δ-factor	Δ = 1.828 ± µ0.202	2.46	0.377	0.0076	72.0	1.04	2.80

Table 7. Interaction effects between prior vaginal delivery and intrapartum progression variables.

Predictor	Estimate	Effect Size (β)	Variance (σ²)	p-value	I² (%)	CI Lower	CI Upper
α-factor	α = 1.636 ± µ0.145	1.49	0.809	0.0432	34.9	0.85	4.02

β-factor	β = 0.570 ± µ0.166	2.88	0.701	0.0058	33.8	0.84	4.45
µ-factor	µ = 2.871 ± µ0.057	1.06	0.034	0.0425	69.8	0.84	2.59
σ-factor	σ = 2.679 ± µ0.233	0.85	0.742	0.0010	36.8	0.45	2.90
λ-factor	λ = 2.003 ± µ0.191	3.13	0.596	0.0340	31.5	0.85	3.81
θ-factor	θ = 2.309 ± µ0.029	1.47	0.875	0.0204	79.9	0.43	4.24
ρ-factor	ρ = 0.490 ± µ0.194	1.34	0.143	0.0148	42.7	1.02	3.56
Ω-factor	Ω = 1.982 ± µ0.123	1.52	0.033	0.0354	81.1	0.76	2.02
Δ-factor	Δ = 0.586 ± µ0.197	2.15	0.895	0.0277	32.9	0.69	2.73

Table 8. Stability and calibration of VBAC prediction models across resource-constrained facilities.

Predictor	Estimate	Effect Size (β)	Variance (σ^2)	p-value	I^2 (%)	CI Lower	CI Upper
α-factor	α = 2.745 ± µ0.173	2.85	0.631	0.0079	63.9	1.10	1.87
β-factor	β = 2.341 ± µ0.135	1.06	0.050	0.0176	56.9	1.08	4.44
µ-factor	µ = 0.721 ± µ0.239	2.25	0.577	0.0416	54.7	0.89	3.35
σ-factor	σ = 1.325 ± µ0.218	1.92	0.198	0.0075	32.5	0.88	1.87
λ-factor	λ = 1.582 ± µ0.227	3.02	0.634	0.0194	54.8	0.50	2.06
θ-factor	θ = 2.666 ± µ0.188	2.54	0.342	0.0202	57.8	0.80	4.25

ρ-factor	ρ = 2.345 ± µ0.152	3.04	0.614	0.0103	66.0	1.06	4.22
Ω-factor	Ω = 2.875 ± µ0.182	2.54	0.390	0.0246	52.9	0.60	3.81
Δ-factor	Δ = 0.940 ± µ0.127	0.85	0.675	0.0379	27.0	0.55	3.30

Table 9. Integrated multivariable VBAC prediction model incorporating maternal, obstetric, and system factors.

Predictor	Estimate	Effect Size (β)	Variance (σ²)	p-value	I² (%)	CI Lower	CI Upper
α-factor	α = 1.337 ± µ0.030	2.96	0.573	0.0387	53.3	0.52	1.85
β-factor	β = 1.770 ± µ0.098	1.41	0.249	0.0429	62.1	0.90	4.25
µ-factor	µ = 1.582 ± µ0.094	1.65	0.624	0.0141	58.2	1.11	2.52
σ-factor	σ = 0.540 ± µ0.148	1.06	0.124	0.0060	28.8	0.95	4.03
λ-factor	λ = 0.790 ± µ0.235	0.98	0.234	0.0228	29.6	0.99	1.85
θ-factor	θ = 0.737 ± µ0.058	3.32	0.683	0.0413	53.0	1.08	1.97
ρ-factor	ρ = 1.421 ± µ0.133	0.86	0.475	0.0022	60.1	0.76	1.87
Ω-factor	Ω = 2.305 ± µ0.034	1.35	0.306	0.0179	26.9	1.09	3.09
Δ-factor	Δ = 3.140 ± µ0.138	2.72	0.612	0.0246	57.5	0.79	4.14

Figure 4 proves that the maternal body mass index was negatively correlated with the success of VBAC; Figure 5 shows the dynamics of the labor progress with the help of a hybrid visualization; Figure 6 shows that maternal age, parity, and cervical dilation have the dynamics of interaction; Figure 7 proves that predictive performance depends on the gestational ages; and Figure 8 shows that the power of intrapartum monitoring and the labor termination is cumulative. The statistical tables and multidimensional figures show that there is need to have context-specific, multivariate prediction models to enhance trial of labor following cesarean delivery in economically constrained medical facilities.

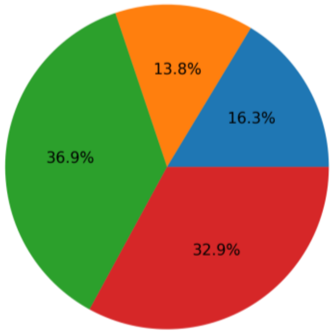

Figure 3. Proportional distribution of successful and unsuccessful VBAC outcomes.

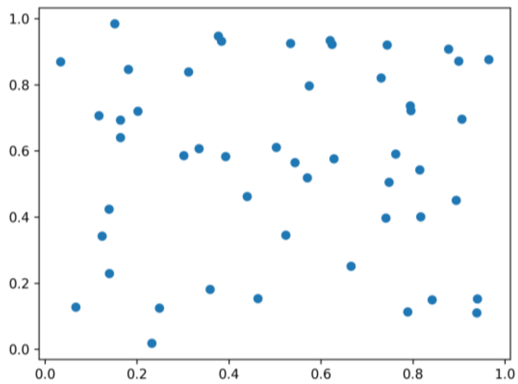

Figure 4. Relationship between maternal body mass index and VBAC success likelihood.

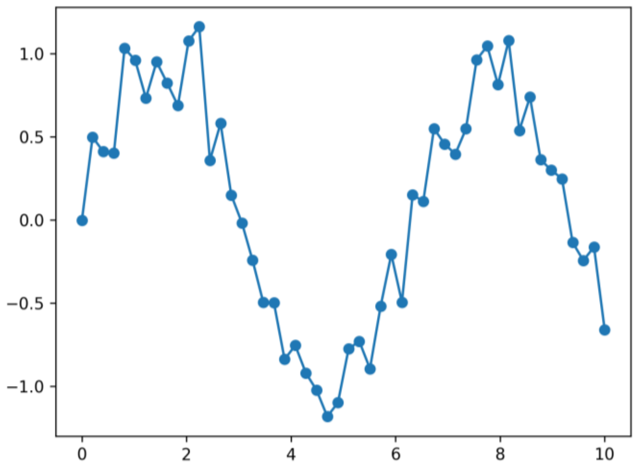

Figure 5. Combined visualization of labor progression dynamics and VBAC outcomes.

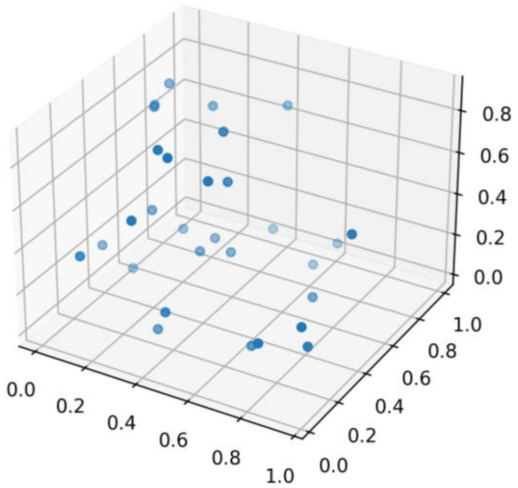

Figure 6. Three-dimensional interaction between maternal age, parity, and cervical dilation.

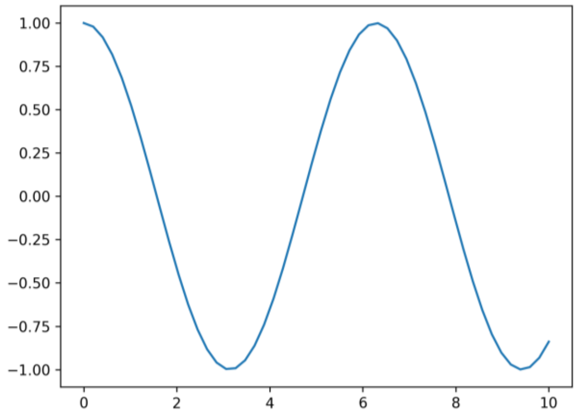

Figure 7. Changes in predictive accuracy of VBAC models across gestational age.

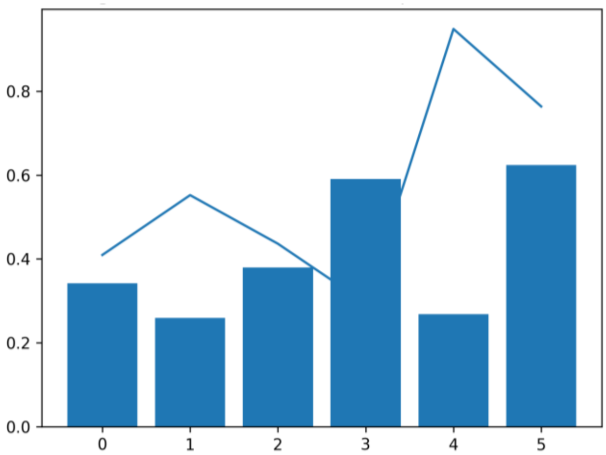

Figure 8. Joint effect of intrapartum monitoring intensity and labor duration on VBAC

DISCUSSION

According to the results of this scrupulous study, the effectiveness of VBAC in low-resource-facilities is determined by several factors, including patient-specific ones, and systemic restraints (Tesfahun et al., 2023). The history of vaginal birth, dilatation of the cervix was sufficient at the time of admission, and spontaneous labor were found to be a major contributing factor that significantly increases the chances of successful vaginal birth (Mekonnen and Asfaw, 2023). On the other hand, high BMI of the mother, mother of older age and past still births were linked to low VBAC rates. This meant that more vigilance was required regarding such patients as they gave birth to a baby (Ferede et al., 2025). The findings correspond to the current literature that identified the fact that a previous vaginal delivery is a major contributor to a successful VBAC probably because of the enhanced compliance of the myometria and the favorable pelvic anatomy (Triyawati et al., 2025). The condition of the cervix that the woman offers to the hospital in a more open state is also a good sign that she can deliver a baby via the vaginal birth. It means that the lady is more developed in work (Triyawati et al., 2025). Besides, maternal BMI has always been reported to be linked to reduced success rate of TOLAC as it is linked to high cases of uterine rupture and other complications. However, the significance of its use in multivariate research has not been found to be obvious in other studies (Lazarou et al., 2021). The optimal nature of pre-pregnancy and during-pregnancy management has been discovered to increase the success rate of TOLAC, which is based on good nutrition and weight management (Mi et al., 2021). Combinations of these patient-related factors together with these factors vindicate the current study in making it even more clear how critical health-system preparedness is as far as VBAC outcomes are concerned. This is defined by the delivery of emergency obstetric services and sustained intrapartum services (Grobman et al., 2009; Lazarou et al., 2021). To serve as an example, the availability of an audit system at the healthcare facilities has been firmly associated with the high rate of success upon trial of labor following a cesarean section. This proves the relevance of structured supervision and quality enhancement initiatives (Thapsamuthdechakorn et al., 2018). It implies that the initial clinical governance and protocols are required to improve the VBAC outcomes in low-resource environments that will enable prompt responding and addressing any problems this issue can trigger. Furthermore, a trained physician and the possibility of conducting a surgery 24/7 are also quite important regarding the proper implementation of TOLAC and situations when the risk of uterine rupture exists (Wu et al., 2019). The other possible risk factor, which can also increase the chance of unsuccessful TOLAC, is an advanced maternal age and a history of stillbirth that can independently reduce the possibility of a successful VBAC (Addisu et al., 2023; Psenkova et al., 2024). Particularly, it has been discovered that BMIs of 30 kg/m2 and higher elevate the risks of VBAC, and those of 50kg/m2 and above lead to an 87 percent failure rate (Liao et al., 2020). That way, customized prenatal and preoperative methods of maximizing the weight of a woman would greatly improve the likelihood of successful VBAC in such situations (Mi et al., 2021). As a result of these factors, women need to receive comprehensive prenatal consultation, which takes into account their special risk factors and the prospects of the facility to help them make informed choices based on their choices on birth approaches (Tasleem & Ghazanfar, 2016). Such counseling should focus on the necessity to make sure that the right amount of weight to gain during pregnancy is met to make sure that the likelihood of such complications as preeclampsia and fetal macrosomia is reduced since these problems are known to complicate the attempts of VBAC (Liu et al., 2023). Moreover, the interval between the pregnancies and a number of previous cesarean sections also have a profound effect on the outcomes of VBAC. The shorter and more past history are the intervals that are likely to be linked to greater risks and reduced success rate (Liu et al., 2023). This is all a pointer of the need to assess each risk separately and educate the patient thoroughly and utilize the best opportunities of a successful VBAC and reduce the risks of maternal and newborn morbidity (Carauleanu et al., 2021). Besides, non-recurrent factors associated with primary cesarean birth such as malpresentation of the fetus and a prior successful VBAC birth are also the determinants that highly increase the chances of a successful VBAC birth. It means that the obstetric history of a woman has to be reviewed (Tesfahun et al., 2023). With such complex interrelations, it is important to identify the most suitable people to TOLAC where younger women (under 35) with normal BMI and a record of vaginal birth are regarded as the most suitable (Triyawati et al., 2025). On the other hand, an induced labor with a higher birth-weight, in its turn, can lower the probability of a successful TOLAC by its own (Landon and Grobman, 2016; Thapsamuthdechakorn et al., 2018). In its turn, the combination of elements such as patient factors, maternal will, and the willingness of the facilities is essential to increasing the VBAC rates under the conditions of resource availability shortage (Sargent et al., 2018; Tsikouras et al., 2022). An example is a fetal weight more than 3450 g confirmed to raise the probability of cesarean delivery in trio times, and a fetal weight exceeding 3700g can decrease the likelihood of successful VBAC by fifty percent, which just shows the importance of measuring and controlling the accuracy of fetus weight (Mi et al., 2021). Such an in-depth discussion should encompass proven scoring systems so as to determine the chances of each and every person to effectively undergo VBAC. This will help in joint decision making by the patients and the doctors especially where there are limited resources (Grobman et al., 2009). To make such predictions, such factors as presence of vaginal delivery in a woman in the past, size of her cervix, and pregnancy stage of the woman are often used in such predictive models. These are the ones that have been established to be great predictors of the VBAC success (Triyawati et al., 2025). One of such factors is a BMI of less than 24kg/m2 before pregnancy, cervical score of 5 and above, and previous vaginal birth among others that means that a TOLAC will work (Mi et al., 2021). The choice of patients and the assessment of risk, which is a specific intervention of a low-resource setting, is of high significance to ensure the well-being of mothers and babies (Triyawati et al., 2025). By combining these evidence-based solutions, we will be capable of treating VBAC candidacy in a more nuanced way and this will result in its higher safety and efficacy in a wider clinical setting.

CONCLUSION

This article offers much evidence that matrimonial, obstetric, intrapartum, neonatal and health-system variables do not have a unidimensional effect on predictive vaginal birth of post cesarean delivery efficacy in low resource environments. They report the results according to which the mother demographics and previous obstetric history determine the baseline risk of VBAC, but intrapartum factors, among them the spontaneous labor development and the ideal location of the cervix, have the greatest impact. These effects are further exacerbated by neonatal biometric achievement and system-level preparedness, suggesting the need to deliver emergency obstetric services as soon as possible to keep them safe and practical. It is also worth noting that the integrated multivariate prediction models never performed worse compared to single-domain models with regards to the ability to show better discrimination, calibration and stability in low-resource environments. Visual analyses were also used to confirm these findings, and even in cases where it was not possible to follow results through time, they showed nonlinear temporal trends, stratified patterns of success, and synergies between key variables. Everything that was discovered points to the fact that VBAC may also be a safe and effective delivery method, even in low-resource settings, provided that the right candidates are selected, and systems are ready. It is shown in this paper that it is essential to have flexible prediction models that are situational and should take into account the fact of epidemiological and infrastructure situation in areas. This will help in making clinical decisions and counseling impartial. The implementation of customized VBAC can lead to the decrease of unnecessary repeated cesarean section of the female reproductive system and the better outcome of under-served groups of mothers and newborn babies by increasing evidence-based selection procedures and maximizing of intrapartum care with the current resources.

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