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COMPARATIVE STUDY OF PLACENTA PREVIA RELATED BLEEDING RISK FOR PREGNANCY OUTCOMES WITH RESPECT TO THE MODE OF DELIVERY AND NEONATAL APGAR SCORE

Original Research

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ABSTRACT

Background: Placenta previa is a high-risk obstetric condition in which the placenta partially or completely covers the cervical os, leading to substantial risks of antepartum hemorrhage, adverse pregnancy outcomes, and emergency interventions. Women with complete placenta previa often experience more severe hemorrhage, increased need for cesarean delivery, and higher neonatal risk. Early recognition through ultrasonography and Doppler assessment is essential for predicting bleeding severity and optimizing delivery planning, especially in low-resource settings where delayed diagnosis increases the likelihood of maternal–fetal complications.

Objective: To compare placenta previa–related bleeding risk for pregnancy outcomes with respect to mode of delivery and neonatal Apgar scores.

Methods: A prospective cross-sectional study was conducted on 92 pregnant women diagnosed with placenta previa after 20 weeks of gestation. Placental characteristics—including type, edge-to-os distance, vascularity, Doppler flow indices, and cervical length—were assessed using standardized ultrasonography. Data on antepartum bleeding, severity of hemorrhage, mode of delivery, gestational age at birth, neonatal birth weight, and Apgar scores were recorded. Statistical analysis using SPSS version 25 included chi-square tests and regression modelling to determine associations among placenta previa type, bleeding severity, delivery method, and neonatal outcomes.

Results: Complete placenta previa accounted for 44.6% of cases and showed the highest association with antepartum bleeding (92.7%) and severe hemorrhage (41.4%). Cesarean delivery was performed in 90.2% of participants, particularly in all complete and partial previa cases. Infants delivered via cesarean section demonstrated higher Apgar scores at 1 minute, with no score of 5 recorded in this group. Vaginal deliveries accounted for all low Apgar scores (5.4%). Bleeding severity demonstrated a borderline association with lower Apgar scores, while ultrasound parameters—such as reduced placental edge-to-os distance, increased vascularity, and thicker placentas—were strongly linked to bleeding risk.

Conclusion: Placenta previa significantly affects maternal bleeding patterns and neonatal wellbeing. Cesarean delivery provides improved neonatal outcomes, especially in high-risk complete and partial previa. Early ultrasound-based assessment remains crucial for predicting hemorrhage, guiding delivery decisions, and safeguarding maternal-fetal health.

Keywords: *Apgar Score, Cesarean Section, Hemorrhage, Placenta Previa, Pregnancy Outcome, Ultrasonography, Uterine Bleeding.*

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INTRODUCTION

Placenta previa remains one of the most challenging obstetric complications because it involves the abnormal placement of the placenta over or near the internal cervical os, creating a substantial risk of antepartum hemorrhage and adverse maternal–fetal outcomes (1). It accounts for a major proportion of bleeding episodes in late pregnancy and continues to endanger both maternal and neonatal health despite advances in obstetric care (2). Although the global prevalence is estimated at 0.5–1%, the incidence rises considerably among women of advanced maternal age, those with multiparity, previous cesarean deliveries, or prior uterine surgery—highlighting the influence of reproductive history and surgical interventions on placental implantation (3). Region-specific data indicate an even higher burden in Asian populations, where approximately 12.2 per 1000 pregnancies are affected (4). The clinical significance of placenta previa lies in its potential to cause recurrent, painless, and sometimes massive hemorrhage, necessitating emergency cesarean birth and close antenatal monitoring. The risk of severe bleeding is further amplified among women aged thirty-five years and above and among those with multiple prior cesarean sections, where the likelihood of complications rises to 2–5% (5,6). Obstetricians frequently encounter unpredictable and often dangerous bleeding patterns associated with placenta previa, especially in late gestation, when cervical dilation or uterine activity disrupts placental attachment (7). The condition is difficult to manage clinically because it may remain asymptomatic until a sudden episode of bright red, painless bleeding occurs, distinguishing it from placental abruption, which typically presents with uterine tenderness and contractions (8). Recurrent hemorrhage can lead to maternal anemia, hypovolemia, and in severe cases, disseminated intravascular coagulation, while complete coverage of the os almost always necessitates cesarean delivery to prevent catastrophic hemorrhage during labor (7). The decision regarding timing and mode of birth is multifactorial, influenced by gestational age, fetal growth, maternal stability, extent of bleeding, placental distance from the os, and the patient's obstetric history (9).

Complications associated with placenta previa extend beyond hemorrhage and include an increased likelihood of placenta accreta spectrum (PAS) disorders, intraoperative bleeding, longer surgical duration, and the potential need for hysterectomy when abnormal placental adherence coexists with a history of cesarean section (9-11). Effective management therefore demands coordination among multidisciplinary teams, including anesthesiology, blood bank services, neonatology, and surgical specialists, especially in high-risk cases (12). Ensuring fetal well-being is equally critical, as disturbances in maternal hemodynamics and impaired placental perfusion can lead to fetal hypoxia, preterm birth, and low Apgar scores, particularly when acute hemorrhage complicates delivery (10,13). Since a persistently low Apgar score at five minutes increases the likelihood of neonatal morbidity and long-term developmental concerns, understanding the factors that influence early neonatal adaptation holds major clinical value (14). Despite the extensive literature on maternal and neonatal consequences of placenta previa, few studies have jointly examined the interplay between mode of delivery, severity of bleeding, and newborn Apgar scores (9,13). Ultrasonography remains central to diagnosis, with transvaginal imaging providing the most accurate assessment of placental location and its distance from the cervical os (14). Doppler studies further enhance risk evaluation by identifying abnormal vascular patterns and placental thickness, although interpretation varies widely among clinicians and lacks standardized scoring parameters (15-17). This inconsistency often leads to either overly aggressive interventions or insufficient preparation for high-risk cases, underscoring the need for a unified approach to evaluating hemorrhage risk (16,18). Emerging evidence suggests that integrated ultrasound-based scoring systems may improve clinical decision-making by stratifying patients into meaningful risk categories, enabling tailored surveillance and timely interventions (3,10). A comprehensive understanding of how placenta previa-related bleeding influences both maternal outcomes and neonatal Apgar scores is essential for strengthening evidence-based obstetric practice. Bridging this gap may assist clinicians in predicting complications more accurately, optimizing delivery planning, and improving neonatal transition immediately after birth. Therefore, the study aims to compare placenta previa–related bleeding risk with pregnancy outcomes in relation to the mode of delivery and neonatal Apgar scores, thereby contributing to a more refined and patient-centered approach in managing this high-risk obstetric condition.

METHODS

The study was conducted as a prospective cross-sectional investigation over a period of four months at the Gilani Center, Lahore. The design allowed for the real-time assessment of pregnant women diagnosed with placenta previa, enabling the evaluation of their clinical characteristics, bleeding risk, and pregnancy outcomes within a defined period. A sample size of 92 participants was calculated using

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the standard formula for prevalence studies, $n = Z^2P(1–P)/d^2$, ensuring adequate statistical power for meaningful interpretation. A convenient sampling technique was employed, and all eligible individuals presenting during the study window were invited to participate. Participants were included if they were pregnant women diagnosed with placenta previa through ultrasound after 20 weeks of gestation, had singleton pregnancies, and provided written informed consent. Pregnancies complicated by placental abruption, placenta accreta spectrum disorders, multiple gestations, or incomplete ultrasound findings were excluded to ensure homogeneity in evaluating placenta previa–specific risks. These criteria were selected to improve internal validity by minimizing confounding conditions that could independently influence bleeding patterns or neonatal outcomes. Ultrasound assessments were performed using a Toshiba Xario machine equipped with a 2.5–5 MHz curvilinear multiphase probe, allowing for standardized imaging of placental location and cervical relationship. Diagnostic findings were recorded systematically, and all data were coded to maintain participant confidentiality. Although the statistical formula for sample size was referenced, the methodology did not explicitly describe the statistical tests planned for data analysis. Typically, such research would require descriptive statistics, chi-square analysis for categorical variables, and regression modeling for associations; these should be specified in future protocols to ensure methodological transparency. Ethical principles were strictly upheld throughout the research process. Approval was obtained from the Ethical Review Committee of Superior University and all procedures adhered to institutional and international standards for human subject research. Written informed consent was taken from each participant after explaining the purpose, procedures, benefits, and voluntary nature of participation. Confidentiality was maintained by anonymizing all collected data, and participants were assured that they could withdraw at any stage without any consequences. No physical risks were associated with the study procedures, and all efforts were made to safeguard participant privacy and dignity.

RESULTS

The study included 92 pregnant women diagnosed with placenta previa. Maternal age ranged from 20 to 44 years, with a mean age of 32.43 years, indicating that most participants were in their early thirties. Gravidity ranged from 1 to 5; 26.1% of women were in their first pregnancy, 12.0% had two pregnancies, 21.7% had three, 20.7% had four, and 19.6% had five. Parity ranged from 0 to 4, with 28.3% nulliparous, 14.1% having one prior birth, 23.9% having two, 25.0% having three, and 8.7% having four previous births. The mean gestational age at assessment was 36.25 weeks (range 32–40 weeks), and the mean gestational age at delivery was 35.70 weeks (range 32.00–39.70 weeks), reflecting a predominance of late preterm and near-term deliveries. The mean birth weight was 2812.34 g, with values ranging from 2082 g to 3818 g, indicating that several newborns fell into the lower birth weight spectrum, consistent with earlier gestational ages at delivery. With respect to placental characteristics, complete placenta previa was the most frequent type, observed in 44.6% (41/92) of cases, followed by partial previa in 32.6% (30/92) and marginal previa in 22.8% (21/92). The distance from the placental edge to the internal os ranged from 0.00 cm to 3.00 cm, with a mean of 1.43 cm, indicating that a considerable proportion of placentas were either covering or in close proximity to the os. Placental thickness ranged from 2.00 cm to 5.00 cm, with a mean of 3.46 cm. Regarding placental vascularity, 31.5% (29/92) of cases demonstrated mild vascularity, 33.7% (31/92) moderate, 22.8% (21/92) severe, and 12.0% (11/92) showed no detectable vascularity. Abnormal flow patterns on Doppler assessment were present in 27.2% (25/92) of women, while 72.8% (67/92) had no abnormal flow. The mean uterine artery resistance index was 0.5946, with values ranging from 0.40 to 0.80. Cervical length ranged from 2.10 cm to 4.50 cm, with a mean of 3.38 cm.

Antepartum bleeding was documented in 62.0% (57/92) of participants, whereas 38.0% (35/92) had no bleeding episodes. Among those who bled, the severity of bleeding was classified as mild in 53.3% (49/92), moderate in 22.8% (21/92), and severe in 23.9% (22/92) of the total sample. The number of bleeding episodes ranged from 0 to 3; 26.1% (24/92) reported no episodes, 19.6% (18/92) reported one episode, and 27.2% (25/92) each reported two and three episodes, indicating that recurrent bleeding was common. A history of complications in previous pregnancies was present in 41.3% (38/92) of women, while 58.7% (54/92) reported no prior complications. There was a clear distributional pattern between placental type and antepartum bleeding. Among women with complete placenta previa (n=41), 38 experienced antepartum bleeding and 3 did not, whereas among those with partial previa (n=30), only 4 reported bleeding and 26 did not. In marginal previa (n=21), 15 experienced bleeding and 6 did not. The association between placental type and the presence of antepartum bleeding was statistically significant (Pearson chi-square = 47.313, df = 2, p = 0.000). When bleeding severity was examined across placental types, 12, 12, and 17 women with complete previa had mild, moderate, and severe bleeding, respectively; in marginal previa, 14 had mild, 3 moderate, and 4 severe bleeding; in partial previa, 23 had mild, 6 moderate, and 1 severe bleeding. The association between placental type and bleeding severity was also statistically significant (Pearson chi-square = 20.549, df = 4, p = 0.000).

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In terms of mode of delivery, 90.2% (83/92) of women delivered by cesarean section and 9.8% (9/92) had vaginal births. All cases of complete (41/41) and partial previa (30/30) were delivered by cesarean section, whereas marginal previa accounted for both cesarean (12/21) and vaginal deliveries (9/21). The relationship between placental type and mode of delivery was statistically significant (Pearson chi-square = 33.728, df = 2, p = 0.000). When mode of delivery was compared with severity of bleeding, 42 of the 83 cesarean deliveries were associated with mild bleeding, 20 with moderate, and 21 with severe bleeding. Among the 9 vaginal births, 7 had mild, 1 moderate, and 1 severe bleeding. The association between mode of delivery and bleeding severity did not reach statistical significance (Pearson chi-square = 2.409, df = 2, p = 0.300). Neonatal outcomes were described by Apgar scores and the presence of complications. At 1 minute, Apgar scores were 5 in 5.4% (5/92), 6 in 47.8% (44/92), and 7 in 46.7% (43/92) of newborns. At 5 minutes, scores of 7, 8, and 9 were recorded in 2.2% (2/92), 58.7% (54/92), and 39.1% (36/92) of neonates, respectively, showing overall improvement over the first five minutes of life. Neonatal complications were documented in 5.4% (5/92) of cases, whereas 94.6% (87/92) had no recorded complications.

When Apgar scores at 1 minute were analyzed in relation to placental type, none of the newborns from complete or partial previa pregnancies had a score of 5. In complete previa (n=41), 21 neonates scored 6 and 20 scored 7. In marginal previa (n=21), 5 scored 5, 10 scored 6, and 6 scored 7. In partial previa (n=30), 13 scored 6 and 17 scored 7. The association between placental type and Apgar score at 1 minute was statistically significant (Pearson chi-square = 19.282, df = 4, p = 0.001). In relation to bleeding severity, among women with mild bleeding (n=49), 5 newborns had an Apgar score of 5, 20 scored 6, and 24 scored 7 at 1 minute. In moderate bleeding (n=21), 9 scored 6 and 12 scored 7, with no score of 5. In severe bleeding (n=22), 15 scored 6 and 7 scored 7. The Pearson chi-square value for the association between bleeding severity and Apgar score at 1 minute was 8.493 (df = 4, p = 0.075), while the likelihood ratio test gave a p value of 0.036, indicating a borderline or inconsistent statistical signal that may require cautious interpretation. Apgar scores at 1 minute differed notably by mode of delivery. Among cesarean deliveries (n=83), none of the newborns had an Apgar score of 5; 40 scored 6 and 43 scored 7. In contrast, among vaginal births (n=9), 5 newborns scored 5, 4 scored 6, and none scored 7. The association between mode of delivery and Apgar score at 1 minute was statistically significant (Pearson chi-square = 50.798, df = 2, p = 0.000).

Table 1: Maternal Demographic and Obstetric Characteristics of Study Participants (n = 92)

Variable	Category / Statistic	Value
Maternal Age	Valid (N)	92
	Missing	0
	Mean (years)	32.43
	Minimum (years)	20
	Maximum (years)	44
Gravidity	1	24 (26.1%)
	2	11 (12.0%)
	3	20 (21.7%)
	4	19 (20.7%)
	5	18 (19.6%)
	Total	92 (100.0%)
Parity	0	26 (28.3%)
	1	13 (14.1%)
	2	22 (23.9%)

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Variable	Category / Statistic	Value
	3	23 (25.0%)
	4	8 (8.7%)
	Total	92 (100.0%)
Gestational Age	Valid (N)	92
	Missing	0
	Mean (weeks)	36.25
	Minimum (weeks)	32
	Maximum (weeks)	40

Table 2: Maternal, Placental, Bleeding, Delivery, and Neonatal Characteristics of Study Participants (n = 92)

Variable	Category / Statistic	Value
Placenta Previa Type	Complete	41 (44.6%)
	Marginal	21 (22.8%)
	Partial	30 (32.6%)
	Total	92 (100.0%)
Distance from Placental Edge to Os (cm)	Valid	92
	Missing	0
	Mean	1.4326
	Minimum	0.00
	Maximum	3.00
Placental Thickness (cm)	Valid	92
	Missing	0
	Mean	3.4587
	Minimum	2.00
	Maximum	5.00
Placental Vascularity	Mild	29 (31.5%)
	Moderate	31 (33.7%)
	None	11 (12.0%)
	Severe	21 (22.8%)
	Total	92 (100.0%)
Uterine Artery Doppler RI	Valid	92
	Missing	0

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Variable	Category / Statistic	Value
	Mean	0.5946
	Minimum	0.40
	Maximum	0.80
Cervical Length (cm)	Valid	92
	Missing	0
	Mean	3.3837
	Minimum	2.10
	Maximum	4.50
Abnormal Flow Patterns	No	67 (72.8%)
	Yes	25 (27.2%)
	Total	92 (100.0%)
Antepartum Bleeding	No	35 (38.0%)
	Yes	57 (62.0%)
	Total	92 (100.0%)
Severity of Bleeding	Mild	49 (53.3%)
	Moderate	21 (22.8%)
	Severe	22 (23.9%)
	Total	92 (100.0%)
Bleeding Episodes	0	24 (26.1%)
	1	18 (19.6%)
	2	25 (27.2%)
	3	25 (27.2%)
	Total	92 (100.0%)
Previous Pregnancy Complications	No	54 (58.7%)
	Yes	38 (41.3%)
	Total	92 (100.0%)
Mode of Delivery	Cesarean	83 (90.2%)
	Vaginal	9 (9.8%)
	Total	92 (100.0%)
Gestational Age at Delivery (weeks)	Valid	92
	Missing	0
	Mean	35.7022

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Variable	Category / Statistic	Value
	Minimum	32.00
	Maximum	39.70
Birth Weight (grams)	Valid	92
	Missing	0
	Mean	2812.34
	Minimum	2082
	Maximum	3818
Apgar Score at 1 min	Score 5	5 (5.4%)
	Score 6	44 (47.8%)
	Score 7	43 (46.7%)
	Total	92 (100.0%)
Apgar Score at 5 min	Score 7	2 (2.2%)
	Score 8	54 (58.7%)
	Score 9	36 (39.1%)
	Total	92 (100.0%)
Neonatal Complications	No	87 (94.6%)
	Yes	5 (5.4%)
	Total	92 (100.0%)

Table 3: Crosstabulation between Placental Type and Antepartum Bleeding

		Antepartum Bleeding		Total
		No	Yes	
Placental Type	Complete	3	38	41
	Marginal	6	15	21
	Partial	26	4	30
Total		35	57	92
Chi-Square Tests				
	Value	df	Asymptotic Significance (2- sided)	
Pearson Chi-Square	47.313a	2	.000	
Likelihood Ratio	52.074	2	.000	
N of Valid Cases	92			

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Table 4: Association of Placental Type and Mode of Delivery with Severity of Antepartum Bleeding (n = 92)

Variable	Category	Mild	Moderate	Severe	Total
Placental Type × Severity of Bleeding	Complete	12	12	17	41
	Marginal	14	3	4	21
	Partial	23	6	1	30
Totals	—	49	21	22	92
Chi-Square Test	Pearson Chi-Square = 20.549 (df = 4, p = .000)		Likelihood Ratio = 23.194		
	Valid Cases = 92		Minimum Expected Count = 4.79		
Mode of Delivery × Severity of Bleeding		Mild	Moderate	Severe	Total
	Cesarean	42	20	21	83
	Vaginal	7	1	1	9
Totals	—	49	21	22	92
Chi-Square Test	Pearson Chi-Square = 2.409 (df = 2, p = .300)		Likelihood Ratio = 2.564		
	Valid Cases = 92		Minimum Expected Count = 2.05		

Table 5: Association of Placental Type, Bleeding Severity, and Mode of Delivery with Neonatal Apgar Score at 1 Minute (n = 92)

Variable Relationship	Category	Apgar 5	Apgar 6	Apgar 7	Total
Placental Type × Apgar Score (1 min)	Complete	0	21	20	41
	Marginal	5	10	6	21
	Partial	0	13	17	30
Totals	—	5	44	43	92
Chi-Square Test	Pearson Chi-Square = 19.282 (df = 4, p = .001)		Likelihood Ratio = 17.352		
	Valid Cases = 92		Minimum Expected Count = 1.14		
Severity of Bleeding × Apgar Score (1 min)		Apgar 5	Apgar 6	Apgar 7	Total
	Mild	5	20	24	49
	Moderate	0	9	12	21
	Severe	0	15	7	22
Totals	—	5	44	43	92
Chi-Square Test	Pearson Chi-Square = 8.493 (df = 4, p = .075)		Likelihood Ratio = 10.311		
	Valid Cases = 92		Minimum Expected Count = 1.14		
Mode of Delivery × Apgar Score (1 min)		Apgar 5	Apgar 6	Apgar 7	Total
	Cesarean	0	40	43	83
	Vaginal	5	4	0	9

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Variable Relationship	Category	Apgar 5	Apgar 6	Apgar 7	Total
Totals	—	5	44	43	92
Chi-Square Test	Pearson Chi-Square = 50.798 (df = 2, p = .000)		Likelihood Ratio = 32.124		
	Valid Cases = 92		Minimum Expected Count = .49		

Table 6: Crosstabulation between Placental Type and Mode of Delivery

		Mode of Delivery		Total
		Cesarean	Vaginal	
Placental Type	Complete	41	0	41
	Marginal	12	9	21
	Partial	30	0	30
Total		83	9	92
Chi-Square Tests				
	Value	df	Asymptotic Significance (2- sided)	
Pearson Chi-Square	33.728a	2	.000	
Likelihood Ratio	30.249	2	.000	
N of Valid Cases	92			

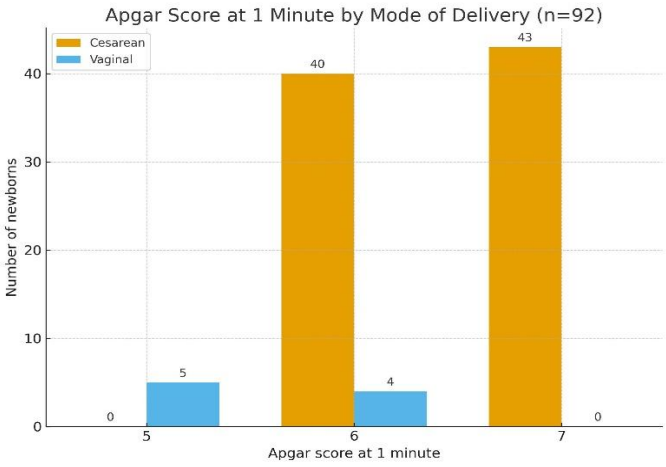


Figure 1 Apgar Scores at 1 Minute by Mode of Delivery (n=92)

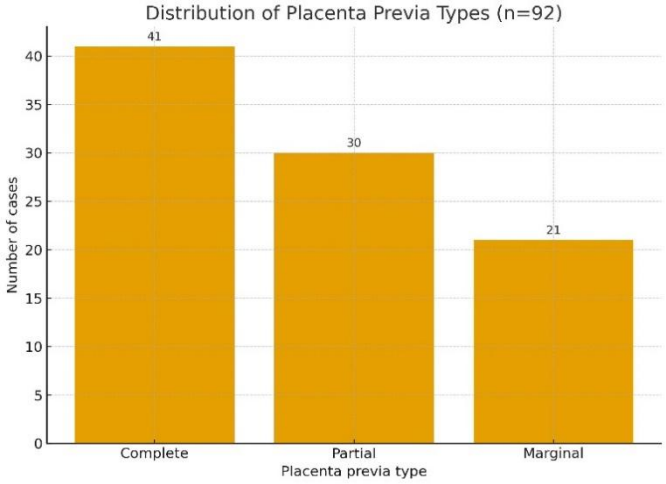


Figure 1 Distribution of Placenta Previa Type (n-92)

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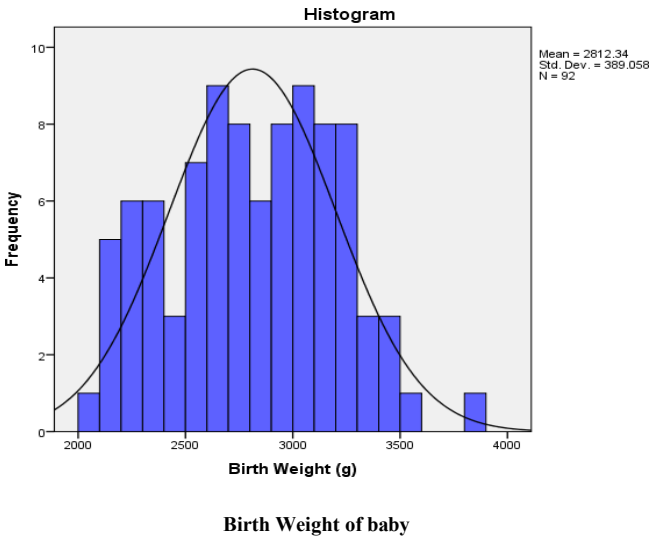


Figure 3 Birth Weight of baby

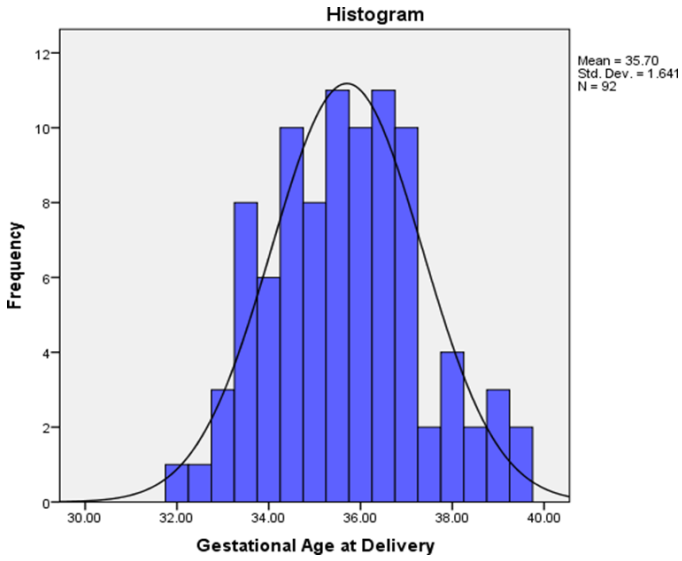


Figure 3 Gestational Age at Delivery

DISCUSSION

The findings of this study provided important insight into the clinical interactions among placenta previa–related bleeding, mode of delivery, and neonatal Apgar scores. The distribution of placental types, the frequency and severity of bleeding, and the predominance of cesarean births reflected patterns widely reported in contemporary obstetric research. Complete placenta previa was consistently associated with the highest rates of antepartum hemorrhage and more severe bleeding episodes, whereas marginal and partial types demonstrated relatively milder presentations. These observations aligned closely with previous work in which specific placental imaging characteristics and placental topography were shown to correlate strongly with massive peri-operative blood loss and adverse maternal outcomes (14). The present study supported this association, documenting that 62% of participants experienced bleeding during pregnancy and nearly one-quarter had severe episodes, reinforcing the need for closer surveillance in complete placenta previa. The statistically significant relationship between placental type and antepartum bleeding in the current data set underscored the clinical value of placental localization as part of early risk stratification. Previous research describing the use of structured sonographic scoring systems for predicting adherent placenta risk demonstrated similar utility. By confirming that placental type influenced both the presence and severity of hemorrhage, the study strengthened the evidence base for incorporating detailed placental assessment into routine antenatal evaluation (15-18). Mode of delivery showed predictable trends that mirrored global obstetric practice. Cesarean section accounted for more than 90% of births in the cohort, and all cases of complete and partial placenta previa were delivered surgically. This pattern reflected long-standing recommendations from international obstetric guidelines, which consistently endorse cesarean delivery when the placenta obstructs the cervical os. The observed lack of statistical association between delivery mode and bleeding severity suggested that clinicians intervened surgically before hemorrhagic decline occurred, a strategy also described in studies where timely cesarean delivery reduced the likelihood of catastrophic blood loss in anterior or invasive placentas (19,20). Vaginal delivery occurred only in selected marginal previa cases, and it was within this subgroup that all the lowest Apgar scores at 1 minute were recorded. These observations supported earlier evidence that neonatal compromise is more likely when labor progresses in the presence of placental obstruction or recurrent antepartum bleeding (21).

Ultrasound findings played a meaningful role in explaining bleeding patterns. Increased placental vascularity, particularly moderate to severe levels, appeared to correlate with more severe hemorrhage, a pattern widely reported across imaging-based evaluations of placenta previa and placenta accreta spectrum disorders (22). Though Doppler indices such as the uterine artery resistance index did not show independent predictive value in this cohort, their relevance has been suggested in larger studies where vascular resistance changes contributed to risk profiling in abnormal placentation (23). The current data also supported the observation that higher placental thickness and shorter cervical lengths were more common in complete placenta previa with severe bleeding. This association aligned with

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advanced imaging studies describing cervical morphology and placental contour as determinants of bleeding risk and surgical complexity. The consistency between the present findings and existing literature highlighted the potential value of integrating multiple ultrasound markers into structured risk assessment models. Neonatal outcomes offered further insight into the relationship between maternal bleeding and early neonatal adaptation. Although the Pearson chi-square test did not show a statistically significant association between bleeding severity and Apgar scores at 1 minute, the likelihood ratio test indicated a possible trend toward significance, implying clinical relevance even if the sample size limited statistical power. Major neonatal compromise was uncommon, and 94.6% of newborns had no documented complications. Nonetheless, lower Apgar scores were concentrated among vaginal deliveries, supporting the conclusion that cesarean delivery provides a safer neonatal profile in placenta previa. Similar findings have been noted in studies linking maternal hemorrhage, placenta previa, and reduced neonatal wellbeing (24). The study contributed meaningfully to the growing evidence base advocating for the integration of sonographic markers—such as placental edge-to-os distance, vascularity, and cervical length—into decision-making frameworks. Multiple risk prediction models described internationally, including those incorporating MRI or Doppler criteria, have emphasized that combining clinical and imaging parameters improves the anticipation of hemorrhage and neonatal compromise. Although this study did not employ such scoring tools, its findings paralleled the core components of those models and underscored the potential benefit of adopting standardized scoring systems in similar clinical settings.

A major strength of the study was its detailed ultrasound assessment, which included multiple placental and cervical parameters rather than relying on placental type alone. The consistent data collection and structured analysis facilitated meaningful comparisons across clinical subgroups. The study also provided valuable regional insights, particularly relevant to South Asian populations where late presentation to antenatal care and limited screening resources may heighten bleeding risks. Important limitations were also present. The sample size was relatively small, which restricted statistical power, especially in subgroup analyses involving Apgar scores and bleeding severity. The single-center setting and use of convenience sampling introduced potential selection bias, limiting generalizability. The exclusion of placenta accreta spectrum cases prevented assessment of the full range of complications associated with placenta previa. Neonatal outcomes were evaluated only through Apgar scores without longitudinal follow-up, limiting understanding of the lasting effects of maternal bleeding or delivery complications. The study also did not conduct multivariable analysis, which could have clarified the independent influence of placental type, bleeding, and ultrasound markers on neonatal outcomes. Despite these limitations, the findings reinforced the necessity for comprehensive antenatal imaging and individualized delivery planning for women with placenta previa. Future research involving larger, multicenter cohorts would provide more robust statistical models and improve the accuracy of bleeding and neonatal risk prediction. Incorporating standardized scoring systems, advanced imaging modalities, and long-term neonatal follow-up would enhance clinical relevance and support the development of region-specific management protocols. The study emphasized the importance of integrating placental imaging findings into obstetric decision-making and highlighted the continued need for evidence-based strategies to reduce maternal hemorrhage and improve neonatal outcomes in placenta previa.

CONCLUSION

This study concluded that placenta previa plays a decisive role in shaping both maternal and neonatal outcomes, with the type of placenta previa strongly influencing bleeding severity, delivery decisions, and early neonatal wellbeing. Complete previa was associated with greater hemorrhagic risk, prompting the need for cesarean delivery, which demonstrated more favorable Apgar scores and enhanced safety for newborns. The incorporation of ultrasound indicators—such as placental location, vascularity, thickness, and cervical characteristics—proved valuable in anticipating complications and guiding clinical planning. Overall, the findings emphasized the importance of individualized antenatal monitoring and proactive delivery strategies to optimize outcomes for mothers and infants affected by placenta previa.

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AUTHOR CONTRIBUTION

Author	Contribution
Aqsa Rao*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Hafiza Zuha Bashir	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Khansa Saleem	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Fahmida Ansari	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
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