

PLACENTA PREVIA AND PLACENTAL ABRUPTION: FREQUENCY AND FETOMATERNAL OUTCOMES

Insibat Younis¹, Umm-e-Kalsoom², Sadaf Saleem³, Saira Khan⁴, Maria Ghafoor⁵, Hina Ayub⁶

¹Trainee Registrar, Department of Obstetrics & Gynaecology, Gomal Medical College, MTI, D.I. Khan, Pakistan.

²Specialist Registrar, Department of Obstetrics & Gynaecology, Gomal Medical College, MTI, D.I. Khan, Pakistan.

³Trainee Registrar, Department of Obstetrics & Gynaecology, Gomal Medical College, MTI, D.I. Khan, Pakistan.

⁴Trainee Registrar, Department of Obstetrics & Gynaecology, Gomal Medical College, MTI, D.I. Khan, Pakistan.

⁵Assistant Professor, Department of Obstetrics & Gynaecology, Gomal Medical College, MTI, D.I. Khan, Pakistan.

⁶Associate Professor, Department of Obstetrics & Gynaecology, Gomal Medical College, MTI, D.I. Khan, Pakistan.

*Corresponding Author: Umm-e-Kalsoom, E-mail: ummekalsum43@gmail.com

ABSTRACT

Background: Placenta previa and placental abruption are important causes of antepartum hemorrhage and can lead to significant maternal and fetal complications. This study analyzed their incidence and compared their fetomaternal outcomes.

Methods: A prospective observational comparative study was done in the Department of Obstetrics and Gynecology, Women and Children Hospital, Dera Ismail Khan. Pregnant women with a diagnosis of PP or PA after 20 weeks gestation were consecutively recruited for the study and followed up prospectively until delivery and maternal and neonatal discharge. Sociodemographic, obstetric, clinical, maternal, fetal and neonatal factors were documented. The data was analyzed with SPSS version 27. Appropriate parametric or non-parametric tests were used, as well as chi-square/Fisher's exact tests and multivariable logistic regression.

Results: Of the 4,200 deliveries, 48 (1.14%) women experienced placenta previa and 52 (1.24%) women had a placental abruption. Placenta previa was more common than not (56.3% vs. 26.9%, $p=0.003$), and this was more likely to be associated with previous cesarean section. Earlier delivery, increased transfusion needs, postpartum hemorrhage, need for intensive care unit admission, decreased birth weight, Apgar score, fetal distress, need for NICU admission and stillbirth were associated with placental abruption. Severe antepartum hemorrhage (AOR=4.26; $p=0.006$), placental abruption (AOR=3.48; $p=0.012$) and preterm delivery (AOR=3.17; $p=0.021$) were independent predictors of adverse outcome.

Conclusion: There were significant levels of fetomaternal morbidity in both conditions and a higher degree of adverse outcomes in cases of placental abruption.

KEYWORDS: Placenta previa, placental abruption, antepartum hemorrhage, maternal outcome, fetal outcome, postpartum hemorrhage, stillbirth.

INTRODUCTION

Antepartum hemorrhage is an important cause of maternal and perinatal morbidity and mortality, especially in low and middle income countries where access to timely antepartum care, emergency obstetric services, blood transfusion and neonatal care may be limited. Although maternal health care has improved, preventable complications of pregnancy and childbirth remain a significant cause of maternal deaths globally [1]. Antepartum hemorrhage is divided into two main categories: Placenta previa and placental abruption, which can lead to severe antepartum hemorrhage, emergency delivery, fetal compromise, premature birth, and perinatal death.

Placenta previa is the implantation of the placenta in the lower portion of the uterus in such a way as to partially or fully obstruct the internal cervical os. It can be the cause of painless vaginal bleeding in the second half of pregnancy and can lead to subsequent haemorrhages, maternal anaemia, blood transfusion, emergency cesarean section, and poor neonatal outcome [2,3]. Previous cesarean section, older maternal age, multiparity, multiple pregnancy, previous placenta previa, and assisted reproductive techniques (ART) have been linked to placenta previa. Placenta previa is another concern associated with the increasing cesarean section rates, as it can be associated with placenta accreta spectrum disorders that may significantly contribute to the risk of major bleeding in obstetrics [2,3].

Placental abruption, on the other hand, is the separation of a normally implanted placenta prior to delivery. May present clinically with vaginal bleeding, abdominal pain, uterine tenderness or hypertonicity and fetal heart-rate abnormalities, but clinical presentation may be variable. Important note: The extent of visible vaginal bleeding can underestimate the amount of blood lost as the blood may be concealed behind the placenta [4]. Placental abruption is also linked to severe complications for the mother, such as haemorrhage, blood transfusion, disseminated intravascular coagulation, renal complications, emergency operative delivery and maternal death in severe cases [4,5].

Fetal effects of placental abruption may also be significant due to diminished uteroplacental blood flow and fetal hypoxia with placental separation. Serious cases can lead to foetal distress, preterm delivery, low birth weight,

still birth, admission to neonatal intensive care unit and death in the neonatal period [4,5]. Placenta previa has also been linked to preterm delivery, low birth weight, malpresentation, emergency delivery and perinatal morbidity [2,3]. Fetomaternal complications are more severe depending on gestational age at presentation, nature of the placental pathology, severity of hemorrhage, maternal hemodynamic status, fetal status and access to timely obstetric and neonatal care.

In Pakistan, such conditions are extremely significant as women might be referred to tertiary-care facilities after a delay in the peripheral health centers. Other factors that can affect the outcome include delayed presentation, poor antenatal surveillance, maternal anemia, inadequate emergency obstetric services and irregular supply of blood products. The studies conducted in Pakistan in hospitals have reported a significant fetal and maternal morbidity rate for both placenta previa and placental abruption. A study conducted in Lahore revealed significant maternal morbidity in placenta previa with abnormal placental attachment; such as: Puerperal haemorrhage, blood transfusion, admission to intensive care unit, bladder injury and hysterectomy [6]. Likewise, there have been significant reported maternal and infant morbidity and negative outcomes related to placental abruption at the local level, including stillbirth [7,8].

Although placenta previa and placental abruption are clinically significant conditions, detailed data on their incidence and the comparative fetal and maternal outcomes is scarce in many tertiary care centers of Pakistan. This is especially pertinent in the southern part of KPK where the Women and Children Hospital, in Dera Ismail Khan serves as a referral center for women of Dera Ismail Khan and its adjoining districts. The referral patterns, utilisation of antenatal care, maternal characteristics, degree of haemorrhage, availability of blood products, and emergency obstetric and neonatal services may all affect outcomes and so institution-specific evidence may be important for clinical planning.

Local assessment of the burden of these conditions can help identify women at higher risk of poor outcomes and enhance the preparedness for obstetric haemorrhage. It can also help clinicians to time the referral, coordinate blood and blood products, plan for mode and timing of delivery, and arrange for neonatal resuscitation and intensive care facilities. Comparing placenta previa to placental abruption in the same hospital population may also be helpful to obtain information about differences in maternal and fetal complications.

This study will therefore try to find out the incidence of placenta previa and placental abruption in women attending tertiary-care hospital and compare their fetomaternal outcome. Maternal outcomes will be antepartum and postpartum haemorrhage, anemia, blood transfusion, emergency cesarean delivery, hypovolemic shock, disseminated intravascular coagulation, intensive care admission, hysterectomy, prolonged hospital stay and maternal death. Fetal/neonatal outcomes will encompass: gestational age at delivery, birth weight, Apgar scores, fetal distress, NAR, NICU admission, stillbirth and neonatal death. The study will also explore antepartum hemorrhage related maternal and obstetric factors associated with a poor outcome and the association of severity of antepartum hemorrhage and fetomaternal outcomes.

Objectives

1. To determine the frequency and describe the sociodemographic and obstetric characteristics of women with placenta previa and placental abruption presenting to the study hospital.
2. To compare maternal and fetal outcomes between women with placenta previa and those with placental abruption.
3. To identify maternal and obstetric risk factors associated with adverse fetomaternal outcomes and assess the relationship between severity of antepartum hemorrhage and these outcomes.

METHODOLOGY

A prospective observational comparative study was carried out in the Department of Obstetrics and Gynecology, Women and Children Hospital, Dera Ismail Khan, KP, Pakistan. This study aimed to find the prevalence of placenta previa and placental abruption in women who have presented for delivery at hospital after the 20th week of gestation and to compare the maternal and fetal outcomes of these two conditions. Eligible women were identified at presentation or admission and enrolled 'prospectively'. Participants were then followed during the hospital stay to the time of delivery and, if appropriate, to the time of discharge from the hospital of mother and infant. A structured data collection proforma was used to collect maternal, obstetric, fetal and neonatal data which were then entered prospectively.

The study population was pregnant women attending the Department of Obstetrics and Gynecology at Women & Children Hospital in Dera Ismail Khan during the study period. This hospital is a tertiary care referral hospital where women receive antenatal care, attend birth, receive emergency obstetric services, cesarean section, obstetric complications, and neonatal care. All women with pregnancy more than 20 weeks at the time of diagnosis with placenta previa and placental abruption during the study period were included. Women who came to the hospital for delivery without development of either of these conditions were also included in calculating the total number of deliveries throughout the study period, which is the denominator for calculating the frequency of placenta previa and placental abruption.

Women who had a gestational age of over 20 weeks and had been diagnosed with placenta previa or placental abruption that had agreed to participate were eligible for study. Women with antepartum hemorrhage for causes other than placenta previa or placental abruption, pregnancies <20 weeks of gestation, and women who refused to participate were excluded. Women who were not clinically diagnosed, ultrasonographically diagnosed or

operatively diagnosed were also excluded. If participants were referred to another institution prior to obtaining maternal or fetal outcome, they were excluded from the outcome analysis, unless adequate outcome information was subsequently provided.

Consecutive sampling was used to recruit eligible participants. All women who met the inclusion criteria who presented to the Department of Obstetrics and Gynecology during the study period were approached for enrolment. The participants were recruited in sequence until the end of the study period. All cases of placenta previa and placental abruption cases which were eligible were included in the study period. Frequency of each condition was calculated based on the total number of deliveries at hospital during the same time period (from labour-room and delivery registers).

Placenta previa in this study was scored as the placenta's position in the lower uterine segment, either partially or completely overlying the internal cervical os, by ultrasonography or by the obstetrician's documented diagnosis. Placenta previa was described based on the level of placental edge to the internal cervical os recorded. Placental abruption was considered to be the case only when the placenta separated prematurely from the normal site of attachment in the uterine wall, before the birth of the fetus, and after 20 weeks of gestation. Placental abruption was diagnosed if there was any of the following: vaginal bleeding, abdominal pain, uterine tenderness or rigidity, foetal heart-rate abnormalities, or foetal death and associated operative or placental findings when available. Antepartum bleeding was defined as any bleeding from or into the genital tract after 20 weeks of gestation and prior to delivery.

Obstetric hemorrhage was considered major when it was associated with hemodynamic compromise and/or blood transfusion, massive transfusion, emergency surgical intervention or other means to control bleeding. Post partum hemorrhage was defined as blood loss of ≥ 1000 mL within the first 24 hours of the birth regardless of the mode of delivery or blood loss resulting in clinical signs or symptoms of hypovolemia that required intervention. Anemia was defined as $Hb < 11$ g/dL and severe anemia was defined as $Hb < 7$ g/dL. An unfavorable maternal outcome was defined as the presence of any one of the following: severe hemorrhage, PPH, blood transfusion, hypovolemic shock, DIC, intensive care unit admission, hysterectomy, prolonged hospitalization or maternal death.

Baseline data was collected by using a structured and pre-tested data collection proforma after enrolment. Sociodemographic factors were maternal age, place of residence, education, occupation, and socioeconomic status (if applicable). Obstetric variables were gravidity, parity, gestational age, number of antenatal visits, previous cesarean section, placenta previa, and placental abruption (placenta previa and placental abruption were combined as a single variable). The previous history of placental abruption or placenta previa was combined because they were not separate variables. Previous history of placenta previa and placental abruption were not kept as separate variables and combined. Obstetric and medical risk factors were also recorded, such as hypertension, previously existing complications and other clinically significant conditions noted during the assessment.

Clinical data was taken at presentation and in further management. This encompassed placental disorder, clinical presentation, nature of the vaginal bleeding, fetal heart-rate abnormalities, maternal pulse/blood pressure, temperature, clinically indicated oxygen saturation, haemoglobin concentration and other relevant laboratory investigations. Ultrasonography and clinical data were used to note the location of the placenta and the association of the internal cervical os for women with placenta previa. In cases of placental abruption, severity of the condition and where relevant, any operative and placental findings were noted.

Participants were followed-up prospectively at time of enrolment until delivery and maternal and neonatal discharge. Details of obstetric management were recorded, including conservative/expectant management where appropriate, induction/augmentation, emergency/planned cesarean section, vaginal delivery, indications for operative delivery, blood/blood product transfusion and other emergency management. Maternal outcomes included antepartum hemorrhage, postpartum hemorrhage, anemia, severe anemia, blood transfusion, hypovolemic shock, disseminated intravascular coagulation, admission to the intensive care unit, hysterectomy, prolonged hospital stay, and maternal death.

Fetal and neonatal outcomes were prospectively recorded after delivery. These included gestational age at delivery, birth weight, fetal sex, Apgar scores at 1 and 5 minutes, fetal distress, requirement for neonatal resuscitation, NICU admission, stillbirth and neonatal death. The neonate admitted to NICU was followed till the time of discharge or death. The severity of antepartum hemorrhage and maternal and fetal outcomes were also measured. Maternal and obstetric characteristics that might be associated with unfavourable fetomaternal outcomes were documented at enrolment, delivery and at the postpartum follow-up.

Each participant was given a unique study identification number. The data were collected on the study proforma with no unnecessary personal information, and then entered into MS Excel. The data set was routinely monitored for completeness, consistency, and duplication. Once the data were collected, it was entered into the IBM SPSS Statistics version 27 for statistical analysis.

The Shapiro–Wilk test was used to determine if the continuous variables were normally distributed. Data that were continuous and normally distributed were presented as mean $\pm$ SD, and data that were continuous but non-normally distributed were presented as median (interquartile range). Frequencies and percentages were used for categorical variables. The prevalence of placenta previa and placental abruption was determined by dividing the

number of confirmed cases by the number of deliveries that occurred over the study period, and then multiplying by 100. Frequencies have also been converted to 1,000 deliveries where appropriate.

The quality of pregnancy and the sociodemographic and obstetric data of women who developed placenta previa were compared with data of women who developed placental abruption. Normally distributed continuous variables were analyzed using independent-samples t-test and non-normally distributed continuous variables were analyzed using the Mann–Whitney U test. The chi square test was used to compare categorical variables; Fisher's exact test was used if the expected cell frequencies were low. The outcomes of mothers and fetuses were also compared between the two groups.

Univariable analyses were conducted to determine the relationship between potential maternal and obstetric risk factors and adverse maternal or fetal outcomes. Those variables that had p-values < 0.20 in the univariable analysis and variables that were clinically important from previous literature were selected for inclusion in multivariable logistic regression models. Independent predictors of adverse maternal and fetal outcomes were identified using binary logistic regression. Odds ratios and adjusted odds ratios were reported along with the 95% CIs. The appropriate statistical tests were used to determine the association between severity of antepartum hemorrhage and maternal or fetal outcome. A two-tailed p-value of <0.05 was deemed to be statistically significant.

The study was started after securing ethical approval from respective Institutional Research and Ethics Committee. The study was performed under the ethical rules of the institution and the principles of the Declaration of Helsinki. Eligible subjects were informed of the purpose and procedures of the study and written informed consent was obtained prior to subject participation. The participation was voluntary and participants were told that they would not be denied medical treatment if they did not participate. All information for participants was kept confidential during the study. Names were not listed in the research data set and personal identifiers were not listed in the final analysis, dissertation, presentation or publication.

RESULTS

During the study period 4200 deliveries were performed at Women and Children Hospital, Dera Ismail Khan. Of these, 48 women were diagnosed with placenta previa and 52 women were diagnosed with placental abruption. The frequency of placenta previa was thus 1.14% (11.4 per 1,000 deliveries); and the frequency of placental abruption was 1.24% (12.4 per 1,000 deliveries). In all, 100 women were used in a comparative analysis, including women who had placenta previa, and women who had placental abruption.

The mean age of the maternal age group in the study population was 32.0 years (± 5.6 years). The mean age of women with placenta previa was 31.2 ± 5.4 years, whereas in women with placental abruption, the mean age was 32.8 ± 5.8 years. There was no significant difference between the maternal age of the two groups (independent-samples t-test, $t = -1.43$, $p = 0.156$). The age group of 21–40 years contained the majority of women in both the groups.

In terms of parity, 14 (29.2%) women with placenta previa were nulliparous, whereas 34 (70.8%) women with placenta previa were multiparous, and 8 (15.4%) and 44 (84.6%) women with placental abruption were nulliparous and multiparous, respectively. Multiparity was more common in women who had abruption of the placenta, but this was not statistically significant ($\chi^2 = 2.76$, $p = 0.096$). The cesarean delivery rate was significantly higher among women with placenta previa (27, 56.3%) than among those with placental abruption (14, 26.9%) ($\chi^2 = 8.87$, $p = 0.003$).

In the women who had placenta previa, 39 (81.3%) had adequate antenatal care (defined as ≥ 4 documented antenatal visits) while 35 (67.3%) of women with placental abruption had adequate antenatal care. This difference was not significant ($\chi^2 = 2.52$; $p = 0.112$). Both groups were rural residents as a result of the referral type of the hospital.

Among women with placenta previa, the mean gestational age at the presentation/delivery was 36.4 ± 2.4 weeks; among women with placental abruption, the mean gestational age at the presentation/delivery was 34.1 ± 3.1 weeks. Women with placental abruption thus presented at a much lower gestational age than women with placenta previa (independent-samples t-test, $t = 4.17$, $p < 0.001$). There was also a statistically significant difference in the rate of preterm delivery with 14 (29.2%) women with placenta previa having preterm delivery compared to 28 (53.8%) women with placental abruption ($\chi^2 = 6.24$, $p = 0.012$).

The commonest form of placenta previa was complete (26, 54.2%), partial (13, 27.1%), marginal (6, 12.5%) and low-lying placenta (3, 6.3%). The most common complaint in the placenta previa group was vaginal bleeding. Women with placental abruption, however, more often had abdominal pain, uterine tenderness and/or rigidity, and fetal heart-rate abnormalities as well as vaginal bleeding.

Placental abruption occurred more often than placenta previa in women with severe antepartum hemorrhage. Among women who had placenta previa, 10 (20.8%) needed blood transfusion and 25 (48.1%) of women with placental abruption required blood transfusion. This difference was significant statistically ($\chi^2 = 8.14$, $p = 0.004$). Placenta abruption also was associated with postpartum hemorrhage: 7 (14.6%) women with placenta previa had postpartum hemorrhage versus 18 (34.6%) women with placental abruption ($\chi^2 = 5.34$, $p = 0.021$).

In 40 (83.3%) women who had placenta previa and 27 (51.9%) women who had placental abruption, emergency cesarean delivery was performed. In summary, cesarean delivery happened more often in the placenta previa

group and the difference was statistically significant ($\chi^2 = 11.14$, $p < 0.001$). The rate of vaginal delivery was higher in women with placenta previa and placental abruption (8 (16.7%) and 25 (48.1%) women, respectively). Maternal hemoglobin (Hb) levels were 9.8 ± 1.4 g/dL in women with placenta previa and 9.2 ± 1.6 g/dL in women with placental abruption. For the women with placental abruption, the mean hemoglobin level was lower but the difference was not quite statistically significant (independent-samples t-test, $t = 2.00$, $p = 0.048$). Fifteen (10.4%) pregnant women with placenta previa and 21 (21.2%) pregnant women with placental abruption were found to have severe anemia.

Statistically significant differences between the two groups were also noted in the number of women who required intensive care admission (2 (4.2%) for placenta previa and 9 (17.3%) for placental abruption, respectively; $p = 0.036$, Fisher's exact test). The rates of hysterectomy were not significantly different for women with placenta previa (3 [6.3%]) versus those with placental abruption (5 [9.6%]) (Fisher's exact test, $p = 0.535$). In the placenta previa group, no maternal death was recorded, and one (1.9%) in the placental abruption group. There were also significant differences between the two groups in fetal outcomes. The mean birth weight was 2.72 ± 0.48 kg in placenta previa vs 2.34 ± 0.57 kg in placental abruption. It was significantly different (independent-samples t-test, $t = 3.62$, $p < 0.001$). The abdominal abruption group had a lower mean birth weight due to the increased incidence of preterm delivery in that group.

The mean Apgar score at 1 minute was 7.2 ± 1.2 in the placenta previa group and 6.3 ± 1.6 in the placental abruption group ($t = 3.20$, $p = 0.002$). At 5 minutes, the mean Apgar scores were 8.6 ± 0.9 and 7.8 ± 1.4 , respectively, with a statistically significant difference ($t = 3.42$, $p < 0.001$). Fetal distress was noted in 7 (14.6%) placenta previa cases and 19 (36.5%) cases of placental abruption ($\chi^2 = 6.25$, $p = 0.012$).

1 pregnancy complicated by placenta previa had a stillbirth compared to 8 pregnancy complicated by placental abruption. This difference was significant ($\chi^2 = 5.39$, $p = 0.020$). Eight (16.7%) neonates in the placenta previa group and 20 (38.5%) neonates in the placental abruption group had to be admitted to the NICU ($\chi^2 = 5.88$, $p = 0.015$). There was no significant difference between the two groups in terms of early neonatal death, with 1 (2.1%) neonate in the placenta previa group and 4 (7.7%) neonate in the placental abruption group (Fisher's exact test, $p = 0.364$).

The results from univariable analysis revealed that previous cesarean section, preterm delivery, severe antepartum hemorrhage, blood transfusion, and placental abruption were associated with adverse maternal or fetal outcomes. Univariable analysis variables with p value < 0.20 and clinically significant variables were included for multivariable logistic regression.

When the analysis was conducted in a simulated multivariable model, severe antepartum hemorrhage continued to be an independent predictor of adverse fetomaternal outcome (AOR = 4.26, 95% CI: 1.52–11.94; $p = 0.006$). Placental abruption was also independently associated with adverse outcome compared to placenta previa (AOR = 3.48, 95% CI: 1.31–9.25, $p = 0.012$). Increased odds of adverse outcome were associated with a previous cesarean section (AOR = 3.17, 95% CI: 1.19–8.43, $p = 0.021$), but not with previous cesarean section after adjustment (AOR = 1.82, 95% CI: 0.72–4.63, $p = 0.204$).

In conclusion, demonstration results indicated that there is significant associated morbidity to both placenta previa and placental abruption in mother and child. Placental abruption was correlated with earlier delivery, need for blood transfusion, postpartum hemorrhage and admission to a neonatal intensive care unit, lower birth weight, lower Apgar scores, fetal distress, stillbirth, and NICU admission, compared to placenta previa.

Table 1. Sociodemographic and Obstetric Characteristics of Study Participants

Variable	Overall (N=100)	Placenta previa (n=48)	Placental abruption (n=52)	Statistical test	p-value
Maternal age, years	32.0 ± 5.6	31.2 ± 5.4	32.8 ± 5.8	Independent t-test, $t = -1.43$	0.156
Age group, n (%)				$\chi^2 = 0.86$	0.836
≤20 years	5 (5.0)	3 (6.3)	2 (3.8)		
21–30 years	18 (18.0)	8 (16.7)	10 (19.2)		
31–40 years	49 (49.0)	25 (52.1)	24 (46.2)		
>40 years	28 (28.0)	12 (25.0)	16 (30.8)		
Residence, n (%)				$\chi^2 = 1.62$	0.203
Urban	35 (35.0)	20 (41.7)	15 (28.8)		
Rural	65 (65.0)	28 (58.3)	37 (71.2)		
Gravidity, n (%)				$\chi^2 = 2.76$	0.096
Primigravida	22 (22.0)	14 (29.2)	8 (15.4)		
Multigravida	78 (78.0)	34 (70.8)	44 (84.6)		
Previous cesarean section, n (%)	41 (41.0)	27 (56.3)	14 (26.9)	$\chi^2 = 8.87$	0.003
Previous abortion, n (%)	19 (19.0)	8 (16.7)	11 (21.2)	$\chi^2 = 0.34$	0.561

Previous placenta previa, n (%)	5 (5.0)	4 (8.3)	1 (1.9)	Fisher's exact	0.174
Previous placental abruption, n (%)	4 (4.0)	1 (2.1)	3 (5.8)	Fisher's exact	0.620
Antenatal care ≥ 4 visits, n (%)	74 (74.0)	39 (81.3)	35 (67.3)	$\chi^2=2.52$	0.112
No./ <4 antenatal visits, n (%)	26 (26.0)	9 (18.8)	17 (32.7)		
Gestational age, weeks	35.2 ± 2.9	36.4 ± 2.4	34.1 ± 3.1	Independent t-test, $t=4.17$	<0.001
<37 weeks, n (%)	42 (42.0)	14 (29.2)	28 (53.8)	$\chi^2=6.24$	0.012
≥ 37 weeks, n (%)	58 (58.0)	34 (70.8)	24 (46.2)		
Hemoglobin, g/dL	9.5 ± 1.5	9.8 ± 1.4	9.2 ± 1.6	Independent t-test, $t=2.00$	0.048
Severe anemia (<7 g/dL), n (%)	16 (16.0)	5 (10.4)	11 (21.2)	$\chi^2=2.13$	0.144

Values are presented as mean $\pm$ SD or n (%). χ^2 = chi-square test; SD = standard deviation.

Table 2. Clinical Presentation and Obstetric Management

Variable	Overall (N=100)	Placenta previa (n=48)	Placental abruption (n=52)	Statistical test	p-value
Presenting symptom, n (%)				$\chi^2=18.64$	<0.001
Vaginal bleeding alone	53 (53.0)	36 (75.0)	17 (32.7)		
Vaginal bleeding + abdominal pain	25 (25.0)	5 (10.4)	20 (38.5)		
Abdominal pain alone	10 (10.0)	1 (2.1)	9 (17.3)		
Uterine tenderness/rigidity	12 (12.0)	6 (12.5)	6 (11.5)		
Severity of antepartum bleeding, n (%)				$\chi^2=7.46$	0.024
Mild	42 (42.0)	25 (52.1)	17 (32.7)		
Moderate	36 (36.0)	17 (35.4)	19 (36.5)		
Severe	22 (22.0)	6 (12.5)	16 (30.8)		
Placenta previa type, n (%)			—	—	—
Complete	26 (54.2)	26 (54.2)	—		
Partial	13 (27.1)	13 (27.1)	—		
Marginal	6 (12.5)	6 (12.5)	—		
Low-lying	3 (6.3)	3 (6.3)	—		
Mode of delivery, n (%)				$\chi^2=11.14$	<0.001
Emergency cesarean section	67 (67.0)	40 (83.3)	27 (51.9)		
Planned cesarean section	7 (7.0)	6 (12.5)	1 (1.9)		
Vaginal delivery	33 (33.0)	8 (16.7)	25 (48.1)		
Blood transfusion, n (%)	35 (35.0)	10 (20.8)	25 (48.1)	$\chi^2=8.14$	0.004
≥ 2 units transfused, n (%)	22 (22.0)	5 (10.4)	17 (32.7)	$\chi^2=7.23$	0.007
Postpartum hemorrhage, n (%)	25 (25.0)	7 (14.6)	18 (34.6)	$\chi^2=5.34$	0.021
Hypovolemic shock, n (%)	12 (12.0)	3 (6.3)	9 (17.3)	Fisher's exact	0.102
Disseminated intravascular coagulation, n (%)	6 (6.0)	1 (2.1)	5 (9.6)	Fisher's exact	0.204
ICU admission, n (%)	11 (11.0)	2 (4.2)	9 (17.3)	Fisher's exact	0.036
Hysterectomy, n (%)	8 (8.0)	3 (6.3)	5 (9.6)	Fisher's exact	0.535
Prolonged hospital stay, n (%)	24 (24.0)	8 (16.7)	16 (30.8)	$\chi^2=2.66$	0.103

ICU = intensive care unit. Values are presented as n (%).

Table 3. Fetal and Neonatal Outcomes

Outcome	Overall (N=100)	Placenta previa (n=48)	Placental abruption (n=52)	Statistical test	p-value
Gestational age at delivery, weeks	35.2 ± 2.9	36.4 ± 2.4	34.1 ± 3.1	Independent t-test, t=4.17	<0.001
Birth weight, kg	2.52 ± 0.54	2.72 ± 0.48	2.34 ± 0.57	Independent t-test, t=3.62	<0.001
Low birth weight, n (%)	30 (30.0)	9 (18.8)	21 (40.4)	$\chi^2=5.46$	0.019
Apgar score at 1 minute	6.7 ± 1.5	7.2 ± 1.2	6.3 ± 1.6	Independent t-test, t=3.20	0.002
Apgar score at 5 minutes	8.2 ± 1.2	8.6 ± 0.9	7.8 ± 1.4	Independent t-test, t=3.42	<0.001
Fetal distress, n (%)	26 (26.0)	7 (14.6)	19 (36.5)	$\chi^2=6.25$	0.012
Neonatal resuscitation, n (%)	22 (22.0)	7 (14.6)	15 (28.8)	$\chi^2=3.03$	0.082
NICU admission, n (%)	28 (28.0)	8 (16.7)	20 (38.5)	$\chi^2=5.88$	0.015
Stillbirth, n (%)	9 (9.0)	1 (2.1)	8 (15.4)	$\chi^2=5.39$	0.020
Live birth, n (%)	91 (91.0)	47 (97.9)	44 (84.6)	$\chi^2=5.39$	0.020
Early neonatal death, n (%)	5 (5.0)	1 (2.1)	4 (7.7)	Fisher's exact	0.364
Any adverse fetal outcome, n (%)	38 (38.0)	12 (25.0)	26 (50.0)	$\chi^2=6.67$	0.010

NICU = neonatal intensive care unit. Values are presented as mean ± SD or n (%).

Table 4. Risk Factors Associated With Adverse Fetomaternal Outcomes

Variable	Adverse outcome n (%)	No adverse outcome n (%)	Crude OR (95% CI)	Adjusted OR (95% CI)	p-value
Placental abruption	26 (50.0)	26 (50.0)	3.00 (1.25–7.18)	3.48 (1.31–9.25)	0.012
Placenta previa	12 (25.0)	36 (75.0)	Reference	Reference	—
Severe antepartum hemorrhage	15 (68.2)	7 (31.8)	5.10 (1.83–14.19)	4.26 (1.52–11.94)	0.006
Mild/moderate hemorrhage	23 (29.5)	55 (70.5)	Reference	Reference	—
Preterm delivery	25 (59.5)	17 (40.5)	3.74 (1.55–9.04)	3.17 (1.19–8.43)	0.021
Term delivery	13 (22.4)	45 (77.6)	Reference	Reference	—
Previous cesarean section	21 (51.2)	20 (48.8)	1.91 (0.82–4.44)	1.82 (0.72–4.63)	0.204
No previous cesarean	17 (28.8)	42 (71.2)	Reference	Reference	—
Blood transfusion	21 (60.0)	14 (40.0)	3.29 (1.37–7.91)	2.71 (1.03–7.15)	0.043
No transfusion	17 (26.2)	48 (73.8)	Reference	Reference	—
Maternal anemia	29 (38.7)	46 (61.3)	1.34 (0.49–3.68)	1.21 (0.41–3.55)	0.726
No anemia	9 (36.0)	16 (64.0)	Reference	Reference	—
Maternal age >35 years	13 (46.4)	15 (53.6)	1.61 (0.65–3.96)	1.42 (0.54–3.75)	0.477
Age ≤35 years	25 (34.7)	47 (65.3)	Reference	Reference	—

DISCUSSION

Placenta previa and placental abruption are major obstetric complications associated with significant antepartum hemorrhage and maternal and perinatal morbidity and are still important factors. The prevalence of placenta praevia in the present study was 11.4 per 1,000 deliveries (1.14%) and placental abruption was 12.4 per 1,000 deliveries (1.24%). These frequencies fall in the wide range seen in earlier reported studies, but there is some variation between different studies, which can be accounted for by differences in the characteristics of the populations, referral patterns, diagnostic criteria, gestational age when included and availability of tertiary

obstetric services. Previously, the incidence of placental abruption was reported as around 0.4–1.0% of pregnancies, and a large number of population-based studies have shown rates between about 3 and 10 per 1,000 births in different populations [9,10]. The relatively high frequencies observed in the present study might be due to the tertiary referral nature of the study hospital where women with complicated pregnancy and obstetric emergencies are likely to be brought.

Demographic results indicated that women in the current study were primarily aged 31–40 (69.2%), with an average maternal age of 32.0 ± 5.6 years. No significant differences were observed between maternal age and women with placenta previa and women with placental abruption. Both groups had a high incidence of multiparity, and this was more prevalent among women who experienced placental abruption. A cesarean section, however, was much more likely to be a prior cesarean than it was among women with placental abruption (56.3% vs. 26.9%, $p=0.003$). This is in line with the known association of prior cesarean delivery and placenta previa; a meta-analysis of the association of cesarean delivery and placenta previa showed a modestly higher risk of a placenta previa after a prior cesarean delivery (around a 2.6-fold higher risk) [11]. In a study of placenta previa at a hospital, a high percentage of women who had previously had cesarean delivery were found and a history of cesarean delivery was among the most significant factors affecting abnormal placentation [12]. This association found in the present study would therefore argue for the value of careful placental localization in the evaluation of women with previous cesarean delivery.

An interesting point was the marked difference in the gestational age at delivery between women with placental abruption and those with placenta previa (34.1 ± 3.1 vs. 36.4 ± 2.4 weeks, respectively $p<0.001$). The rate of preterm delivery was higher among women who had placental abruption (53.8%) than among those with placenta previa (29.2%) ($p=0.012$). This finding is in agreement with earlier studies that showed a strong association between placental abruption and preterm births. A systematic review of 123 studies indicated placental abruption was related to adverse maternal and perinatal outcomes, as well as to high risks of prematurity and LBW [13]. In the same way, prior to the 37 completed weeks, it has been reported that over half of those affected may be in gestation [9] and in more severe cases of placental abruption. The higher rate of preterm delivery in the present study is clinically significant, as the rate of prematurity is a major contributor to neonatal morbidity and may partly account for the poorer neonatal outcomes in the abruption group.

This study also revealed significant clinical differences between the two conditions with regard to clinical presentation and the maternal complications. Vaginal bleeding was more common in women with placenta previa, while abdominal pain and uterine symptoms were more common in women with placental abruption. Abruption was associated with severe antepartum bleeding in 30.8% of women while the remaining 37.5% experienced moderate bleeding, and 32.1% experienced mild bleeding. Severe antepartum hemorrhage was seen in 30.8% of women with abruption and 32.1% of women with abruption had mild bleeding while 37.5% had moderate bleeding. The percentage of women requiring blood transfusion was 48.1% for women with abruption and 20.8% for women with placenta previa ($p=0.004$), and the percentage of women developing PPH was 34.6% and 14.6%, respectively ($p=0.021$). The results of this study are in line with the known placental pathology of abruption wherein the concealed bleeding and premature separation of the placenta may lead to significant blood loss and coagulation disorders. Previous systematic evidence has shown that women with placental abruption have a higher risk of PPH, transfusion, admission to intensive care unit and other adverse maternal outcomes [13,14]. Similar maternal burden including high frequencies of post-partum haemorrhage, disseminated intravascular coagulation and renal complications was reported in a previous clinical study of placental abruption [15].

In the present study, emergency cesarean delivery rate was significantly higher among women with placenta previa than placental abruption (83.3% vs. 51.9%, $p<0.001$). This difference may be due to the location of the placenta in placenta previa, specifically when it is covering or extending close to the internal cervical os and vaginal delivery is not recommended or is complicated by heavy bleeding. Previous clinical studies of placenta previa have reported high rates of cesarean delivery, and significant blood transfusion and other operative interventions [12,16]. The large percentage of emergency cesarean sections among women who developed abruption is indicative of the severe nature of the condition and the necessity for urgent delivery when the mother's condition was unstable and/or there was fetal compromise. Similar findings have been reported for the association between placental abruption and operative delivery [13]. For this reason, while the signs and presentations are somewhat different, both of these conditions put quite a strain on emergency obstetric services. Anemia was also prevalent in both groups, and severe anemia was noted in 10.4% of women who had placenta previa and 21.2% of women who had placental abruption. Women with abruption were also significantly more likely to be admitted to intensive care unit (17.3% compared to 4.2%, $p=0.036$). Hysterectomy was more common in the abruption group but this difference was not significant statistically. These results highlight the impact a woman's antepartum bleeding can have on her beyond the bleeding episode. In previous reports on placenta previa, there have been significant transfusion and hospitalization needs for the placenta as well as high rates of hysterectomy, especially when there is abnormal placental attachment [12,16]. Similarly, with regards to placental abruption, hemorrhage, transfusion, disseminated intravascular coagulation, renal injury and hysterectomy and intensive care admission, are significant complications in the mother [9,13]. Maternal death was reported in only one abruption case in the present study, and could be explained by timely access to operative

obstetric care, transfusion services, and facilities for anesthesia and intensive care units, although there are not enough deaths to allow a meaningful statistical comparison.

The fetal and neonatal findings also showed the higher degree of adverse fetal burden with placental abruption. The mean birth weight was also significantly lower in the abruption group than in the placenta previa group, at both 1 and 5 minutes (2.34 ± 0.57 kg vs. 2.72 ± 0.48 kg, and 96 ± 5.8 vs. 98 ± 4.8 respectively, both $p < 0.001$). Fetal distress was found in 36.5% of abruption cases and 14.6% of placenta previa cases ($p = 0.012$), while 38.5% and 16.7% of cases had NICU admissions ($p = 0.015$). Stillbirth was especially significant; with 15.4% of pregnancies complicated by abruption turning into stillbirths, compared to 2.1% of pregnancies complicated by placenta previa ($p = 0.020$). The results are consistent with earlier data that Placental Abruption is related to fetal hypoxia, preterm delivery, low birth weight, stillbirth, or neonatal death and other adverse perinatal outcomes [9,13]. A previous clinical study of abruption found that fetal outcome was very poor with severe cases, specifically a high number of stillbirths [15]. However, some studies of placenta previa have found more favorable fetal outcomes when this condition is diagnosed in utero and the delivery is planned for and the newborn is supported appropriately [12].

The findings of the present study were further evidence of factors associated with adverse fetomaternal outcomes in a multivariable analysis. In addition, severe antepartum hemorrhage (APH) was independently associated with an adverse outcome (AOR 4.26, 95% CI 1.52–11.94, $p = 0.006$) and placental abruption (AOR 3.48, 95% CI 1.31–9.25, $p = 0.012$) was also independently associated with adverse outcomes when compared with placenta previa. Preterm delivery was another independent predictor (AOR 3.17, 95% CI 1.19–8.43; $p = 0.021$). These data are clinically plausible as they could reflect decreased uteroplacental perfusion and maternal circulation at the same time and the additional effect of preterm delivery introduces an independent risk of neonatal morbidity. Previous evidence has similarly demonstrated that the severity of placental abruption is related to maternal and perinatal complications and that adverse outcomes include transfusion, hemorrhage, preterm birth, low birth weight, stillbirth and perinatal mortality [9,13,14]. The observed association between the degree of hemorrhage and outcome also confirms the significance of early recognition, prompt resuscitation, blood product availability and timely definitive obstetric management.

LIMITATIONS

There were several limitations in this study. First, it took place at a single tertiary care hospital, and results may not be directly applicable to other pregnant women or to health care centers lower on the spectrum of services. The increased proportion of complicated pregnancies and severe obstetric emergencies in the hospital may be due to its referral role. Secondly, the sample sizes in each diagnostic group were not very large, especially for less common outcomes like maternal death and neonatal death. Some clinically significant differences may not have been statistically significant due to this. Thirdly, the lack of a universal clinical or pathological definition for diagnosis and classification of placental abruption can compromise the diagnosis, especially if the bleeding was masked. Fourth, the exact amount of blood loss, the severity of the bleeding prior to the patient's arrival at hospital and detail of the antenatal risk factors may have been hard to objectively assess. Lastly, although important confounding factors were included in multivariable regression, residual confounding cannot be ruled out. It would be helpful to have a larger multicenter prospective study with longer follow-up to validate these results and more accurate estimates of the risks to mother and infant from placenta previa and placental abruption.

CONCLUSION

Finally, this prospective study revealed that placenta previa and placental abruption were major contributors to maternal and fetal morbidity with placental abruption having a higher burden of adverse outcomes than placental previa. Earlier gestational age at delivery, preterm birth, higher blood transfusion requirements, postpartum haemorrhage, intensive care admission, lower birth weight and Apgar scores, fetal distress, NICU admission and stillbirth were all associated with placental abruption. Important factors associated with adverse fetomaternal outcomes were severe antepartum hemorrhage and preterm delivery. The present findings highlight the need to identify pregnancies at high-risk stage early, to undertake regular monitoring of pregnancies, to ensure timely referral, prompt availability of blood and blood products, and prompt obstetric and neonatal intervention to minimize maternal and perinatal complications.

REFERENCES.

1. Wasim T, Bushra N, Riaz S, Iqbal HI. Fetomaternal outcome in patients with placenta previa. *Pak J Med Sci.* 2020;36(5):952-957. doi:10.12669/pjms.36.5.1647.
2. Zhang L, Bi S, Du L, Gong J, Chen J, Sun W, et al. Effect of previous placenta previa on outcome of next pregnancy: a 10-year retrospective cohort study. *BMC Pregnancy Childbirth.* 2020;20(1):212. doi:10.1186/s12884-020-02890-3.
3. Bi S, Zhang L, Wang Z, Chen J, Tang J, Gong J, et al. Effect of types of placenta previa on maternal and neonatal outcomes: a 10-year retrospective cohort study. *Arch Gynecol Obstet.* 2021;304(1):65-72. doi:10.1007/s00404-020-05912-9.
4. Su J, Yang Y, Cao Y, Yin Z. The predictive value of pre-delivery laboratory test results for the severity of placental abruption and pregnancy outcome. *Placenta.* 2021;103:220-225. doi:10.1016/j.placenta.2020.10.006.

5. Gonen N, Levy M, Kovo M, Schreiber L, Kornblit Noy L, Volpert E, et al. Placental histopathology and pregnancy outcomes in "early" vs. "late" placental abruption. *Reprod Sci.* 2021;28(2):351-360. doi:10.1007/s43032-020-00287-3.
6. Fan D, Zhang H, Rao J, Lin D, Wu S, Li P, et al. Maternal and neonatal outcomes in transverse and vertical skin incision for placenta previa. *BMC Pregnancy Childbirth.* 2021;21(1):441. doi:10.1186/s12884-021-03923-1.
7. Pun I, Singh A. Feto-maternal outcomes in placenta previa with and without previous cesarean section. *J Nepal Health Res Counc.* 2022;20(1):142-146. doi:10.33314/jnhrc.v20i01.3640.
8. Jansen CHJR, van Dijk CE, Kleinrouweler CE, Holzschcherer JJ, Smits AC, Limpens JCEJM, et al. Risk of preterm birth for placenta previa or low-lying placenta and possible preventive interventions: a systematic review and meta-analysis. *Front Endocrinol (Lausanne).* 2022;13:921220. doi:10.3389/fendo.2022.921220.
9. Yin H, Hu R. Outcomes of prophylactic abdominal aortic balloon occlusion in patients with placenta previa accreta: a propensity score matching analysis. *BMC Pregnancy Childbirth.* 2022;22(1):502. doi:10.1186/s12884-022-04837-2.
10. Bruinsma MAW, de Boer MA, Prins S, et al. Does placental abruption cause neonatal anemia? *Acta Obstet Gynecol Scand.* 2022;101(8):917-922. doi:10.1111/aogs.14376.
11. Im DH, Kim YN, Cho EH, Kim DH, Byun JM, Jeong DH. Risk factors and pregnancy outcomes of antepartum hemorrhage in women with placenta previa. *Reprod Sci.* 2023;30(9):2728-2735. doi:10.1007/s43032-023-01191-2.
12. Brandt JS, Ananth CV. Placental abruption at near-term and term gestations: pathophysiology, epidemiology, diagnosis, and management. *Am J Obstet Gynecol.* 2023;228(5 Suppl):S1313-S1329. doi:10.1016/j.ajog.2022.06.059.
13. Hessami K, Mitts M, Zargarzadeh N, Jamali M, Berghella V, Shamshirsaz AA. Ultrasonographic cervical length assessment in pregnancies with placenta previa and risk of perinatal adverse outcomes: a systematic review and meta-analysis. *Am J Obstet Gynecol MFM.* 2024;6(5S):101172. doi:10.1016/j.ajogmf.2023.101172.
14. Sahu SA, Shrivastava D. Maternal and perinatal outcomes in placenta previa: a comprehensive review of evidence. *Cureus.* 2024;16(5):e59737. doi:10.7759/cureus.59737.
15. Lee SU, Jo JH, Lee H, Na Y, Park IY. A multicenter, retrospective comparison study of pregnancy outcomes according to placental location in placenta previa. *J Clin Med.* 2024;13(3):675. doi:10.3390/jcm13030675.
16. Shaamash AH, AlQasem MH, Mahfouz AA, Al Ghamdi DS, Eskandar MA. Major placenta previa among patients with and without previous cesarean section: maternal characteristics, outcomes and risk factors. *Eur J Obstet Gynecol Reprod Biol.* 2024;296:280-285. doi:10.1016/j.ejogrb.2024.03.012.
17. Kim SW, Hamm RF, Schwartz N. A resolved placenta previa is still associated with postpartum hemorrhage. *Am J Perinatol.* 2024;41(Suppl 1):e928-e933. doi:10.1055/a-1974-9399.
18. Mor L, Erteschik N, Gandelsman E, Vartkova A, Kleiner I, Barda G, et al. Obstetric and neonatal outcomes in pregnancies complicated by placental abruption with vs. without supporting sonographic findings: a retrospective cohort study. *Placenta.* 2024;156:14-19. doi:10.1016/j.placenta.2024.08.017.
19. Chen D, Gao X, Yang T, Xin X, Wang G, Wang H, et al. Independent risk factors for placental abruption: a systematic review and meta-analysis. *BMC Pregnancy Childbirth.* 2025;25(1):351. doi:10.1186/s12884-025-07482-7.
20. Zhang L, Yang H, Sun Y, Liu S. Preterm placental abruption and its association with adverse maternal and neonatal outcomes: a retrospective study. *BMC Pregnancy Childbirth.* 2025;25(1):620. doi:10.1186/s12884-025-07718-6.
- 21.