

Placental Site Implantation Disorders and Its Implications in the Third Trimester of Pregnancy

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ABSTRACT

Background: The placenta, a temporary but indispensable organ of pregnancy, normally implants itself into the upper uterine segment. Sometimes, it may encroach upon the lower segment or attach itself too deeply into the uterine wall. This abnormal implantation leads to a myriad of complications affecting both the mother and fetus. Our study aims to highlight the risk factors and outcomes of such high-risk pregnancies.

Methods: A prospective observational study conducted in a public sector tertiary care institute from September 2020 to August 2022. 100 cases diagnosed with abnormal placental implantation were enrolled post-delivery and followed up till discharge from hospital.

Results: The prevalence of placenta previa was 8 in 1000 pregnancies. Majority of the cases were booked at the study institute. Age, parity, assisted reproductive techniques, previous uterine surgeries were identified as risk factors. All complications such as postpartum hemorrhage, need for obstetric hysterectomy, blood transfusions, prolonged hospital stay, prolonged need for antibiotics were higher in major placenta previa compared to minor variety. Prematurity was found to be the major fetal adverse outcome.

Conclusions: The study highlights the higher association of placenta previa in the cases with previous caesarean section and uterine curettage. Neonates born to women with placenta previa are at risk of preterm delivery, low birth weight, and respiratory distress syndrome. All cases of placenta previa must be managed at higher centres with blood component facility and neonatal intensive care.

Keywords: Placenta previa, Placenta accreta spectrum, Caesarean, Feto-maternal Outcomes

INTRODUCTION

The placenta is an organ that develops within the uterus during pregnancy and provides oxygen and nutrition to the baby and eliminates waste products¹. The placenta connects to the baby through the umbilical cord. Normally, the placenta attaches at the fundus or lateral walls (upper segment) of the uterus. In some cases, the placenta develops in the wrong location or attaches itself too deeply into the uterine wall.

Primary disorders of placental implantation have immediate consequences for the

outcome of a pregnancy. These have been known to clinical science for more than a century, but had been relatively rare. Recent epidemiologic obstetric data have indicated a rise in their incidence over the last 2 decades has been iatrogenic in origin. In particular, the increased use of caesarean section for delivery has been associated with higher frequencies of previa implantation, accreta placental, abnormal placental shapes, and velamentous cord insertion². These disorders frequently occur together. Also, rising numbers of pregnancies

resulting from in vitro fertilization (IVF) play a factor in abnormal implantation.

They carry the risk of severe obstetric complications including severe maternal hemorrhage, shock, and fetal hypoxia. Bleeding, in turn, could lead to an increased risk of blood transfusion, hysterectomy, ICU admission, thrombophlebitis, and maternal death. Risk factors for this condition include multiparity, previous abortion, previous cesarean delivery, multiple gestations, smoking, and increased maternal age. Adverse infant outcomes include prematurity, stillbirth, and neonatal death. The gold standard investigation for diagnosis of placenta previa is a transvaginal ultrasound. Placenta previa is diagnosed when the placenta is implanted less than 2 cm away from the cervical os. Women with placenta previa must be delivered by cesarean section³; this is performed under regional or general anesthesia. Availability of blood products at the institution where delivery is performed is mandatory as the condition can be associated with massive blood loss. One in 200 deliveries is complicated by placenta praevia⁴; it is a leading cause of second and third trimester vaginal bleeding. The rate of placenta previa is increasing mainly due to the increase in the rate of cesarean section. Maternal and fetal outcomes with placenta previa, vasa previa, and placenta accrete have improved considerably with antenatal diagnosis and modern management. Thus, it is important for clinicians to screen all pregnancies for these conditions at the time of their routine second-trimester ultrasonography. In addition, patients with risk factors (e.g., multiple prior cesarean deliveries) should undergo targeted screening for placenta accreta⁵. These conditions are all indications for iatrogenic preterm birth between 34 and 37 weeks of gestation. These cases must be managed only in centers where there are facilities for blood transfusion, immediate operative intervention and NICU facilities round the clock to attend to the usually preterm babies. Better antenatal and thorough

screening of the patient with second trimester scan, better referral system, transport and more hospitals with 24 hours blood bank facility are the need of the hour. All these measures can probably bring down the maternal and perinatal mortality and morbidity rates associated with abnormal placental implantations.

MATERIALS & METHODS

This retro-prospective observational study was carried out from September 2020 to August 2022 at a tertiary care centre in public sector.

Patients were enrolled post-delivery upon diagnosis of an abnormal implantation disorder on ultrasonography findings (beyond 28 weeks) or intra-operative findings or post-delivery placental examination. Total 100 cases were studied over the period of 2 years. Endpoint of the study was till discharge or death of woman. Neonatal follow up was taken till 7 days post-delivery.

Inclusion criteria:

All pregnant women, 18 years and above, with singleton pregnancy who delivered at the institute (enrolment to study being post-delivery) with an antenatal or intranasal or postnatal diagnosis of placental site implantation disorder.

Exclusion criteria:

- Women below 18 years of age
- Women diagnosed with placental implantation disorder before 28 weeks of gestation.
- Women with multifetal pregnancy (to avoid over-representation of high risk women).
- Women with antepartum haemorrhage due to any other cause (such as placental abruption, trauma, cervical polyp, uterine fibroid, coagulation disorders, etc.)
- Placental implantation disorders of the upper segment (such as, adherent placenta after an upper segment myomectomy)

- Women who delivered at other centres, but were referred for any complication to the study institute.
- Women not consenting for the study.

- A. Fetal parameters -
- Birth weight
 - Gender
 - APGAR at birth
 - Neonatal complications
 - NICU admission
 - Neonatal death

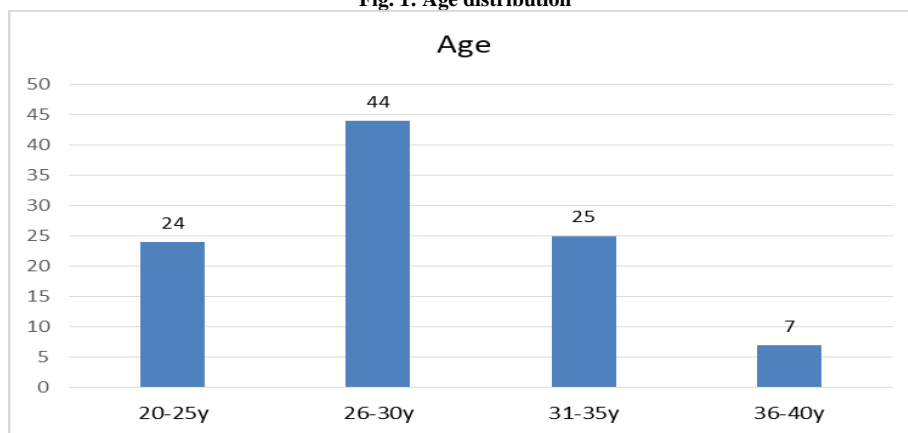
Outcomes measured:

- Maternal parameters -
- Age
- Parity
- Gestational age at delivery
- Previous history of uterine surgeries
- Mode of delivery
- Need for Obstetric hysterectomy
- Post-partum haemorrhage
- Need for blood transfusion
- Need for antibiotics
- HDU/ICU care
- Days of Hospital stay

RESULT

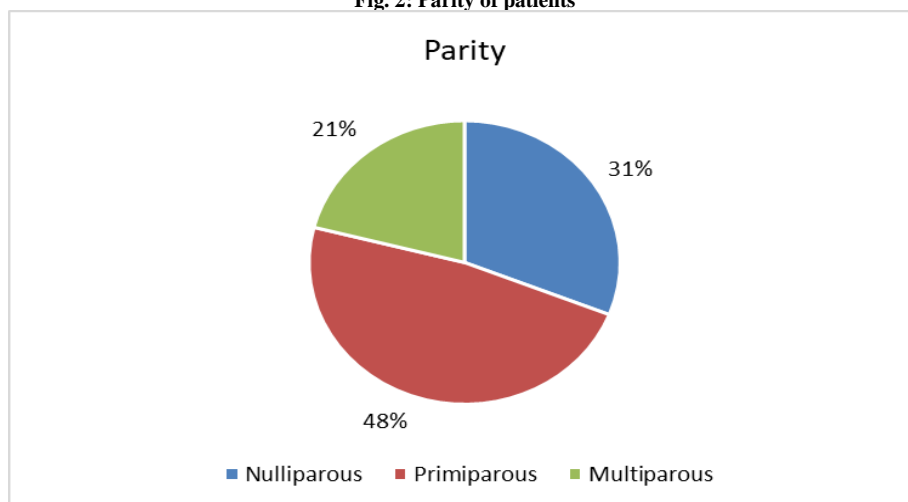
The incidence of placenta previa at our hospital over 2 years was approximately 0.83%. 64% cases were booked at this institute while remaining 36% were referrals. The demographic data of the patients shows that women aged between 26-30 years formed majority of the cases at 47%.

Fig. 1: Age distribution



31% patients were nulliparous. 48% had one previous delivery and 21% had 2 or more prior deliveries. 9% of the total cases conceived by assisted reproductive techniques (IUI/IVF).

Fig. 2: Parity of patients



A staggering 42% cases had a history of previous caesarean section. Amongst these, a single previous caesarean accounted for 29 cases followed by 10 cases of previous 2 caesarean and 3 cases of previous 3

caesarean. Previous uterine curettage was noted in 15% cases. 43% cases showed no known history of any uterine cavity operations.

Fig. 3: Distribution of previous caesarean section

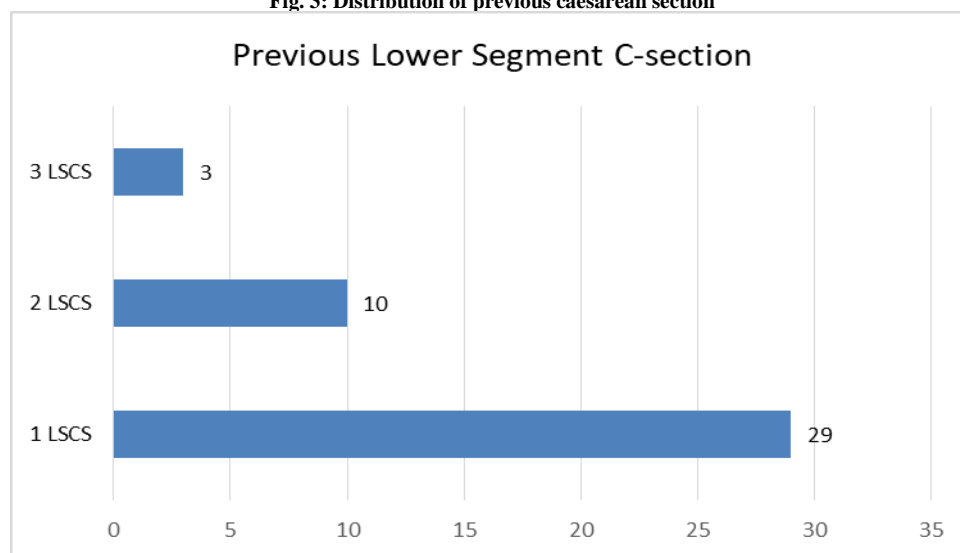
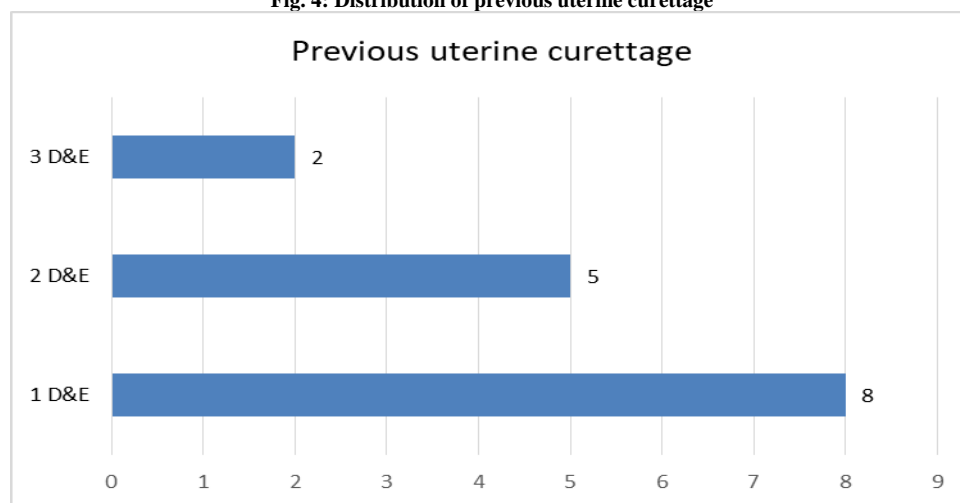


Fig. 4: Distribution of previous uterine curettage



Ultrasonography was used as a primary method of fetal assessment and placental localization. Where feasible, MRI was utilized to rule out suspicion of placental adherence. A routine malformation scan done between 16-24 weeks was analyzed. 88% cases had a normal fetal anomaly scan, 5% cases had major fetal anomaly and 7% cases did not have this scan available. The major anomaly included 2 cases of bilateral renal agenesis, 2 cases of syndromic birth defects and 1 case of neural tube defect.

In cases of low-lying placentas, delivery is done by caesarean section at our institute between 37-38 completed weeks of gestation. For adherent placentas, elective delivery was scheduled between 36-37 completed weeks.

But, majority of the cases required premature termination for reasons such as placental bleeding, preterm premature membrane rupture, altered fetal heart rate patterns, etc. Hence, average gestational age at delivery was 35.5 weeks. Caesarean

section was the route of delivery in all patients of low-lying placentas (99% cases). Vaginal delivery was offered in one case which was a preterm fetal demise and the placenta was 2 cms from the cervical os. Elective surgery accounted for 47 cases while emergency surgery was performed in 52 cases. Amongst emergency indications, bleeding placenta previa was the commonest (33 cases out of 52), followed by preterm premature rupture of membranes (8 cases out of 52). The commonest surgery performed was lower segment caesarean section. In cases of diagnosed adherent placentas, a classical caesarean section was performed (19 cases). 26 patients underwent obstetric hysterectomy in total for either adherent placenta or intractable hemorrhage. 4 cases showed a urinary bladder invasion due to placenta percreta and required urosurgery intervention. The commonest fetal presentation was cephalic (77% cases); but, malpresentations were seen in a significant 23% cases. Breech was more common than transverse presentation.

Type I and II are minor while Type III and IV are major varieties. Posterior, type IV was the commonest (27% cases). Succenturiate lobes were seen in 2 cases- in these, main placental body was not low lying, but the succenturiate lobe was low lying and posterior. Vasa previa was seen in one case of Type II placental implantation in a bilobed placenta.

Overall, major placenta previa accounted for 68% cases and minor placenta previa accounted for 32% cases. Total 23 cases of adherent placenta were seen. Of these, 19 had a previous caesarean section and 4 had a previous uterine curettage.

Anterior placenta was found to be commonest (65.2%), followed by posterior (30.4%) and lateral (4.4%) implantation of main placental body. Amongst these there were 82.6% cases of major placenta previa and 17.4% cases of minor placenta previa. The proportion of adherent placentation seems to increase with the number of previous caesarean sections - 34.4% previous 1 caesarean, 60% previous 2 caesarean and 100% previous 3 caesarean had adherent placenta previa.

Table 1: Different types of placental location

Placenta location	Type I	Type II	Type III	Type IV
Anterior	6	6	8	19
Posterior	8	8	10	27
Lateral	0	3	0	2
Succenturiate	0	0	0	2
Vasa praevia	0	1	0	0

Table 2: Distribution of placental implantation and previous surgery in adherent placentas

Previous uterine surgery	Total no. of cases(n)	Cases of adherent placenta	Percentage	Anterior	Posterior	Lateral	Major	Minor
1 LSCS	29	10	34.4	8	2	0	9	1
2 LSCS	10	6	60	4	2	0	5	1
3 LSCS	3	3	100	2	0	1	3	0
1 D&E	8	1	12.5	1	0	0	0	1
2 D&E	5	1	20	0	1	0	1	0
3 D&E	2	2	100	0	2	0	1	1

Post-partum hemorrhage was seen in 48% cases. Average units of packed red cells transfused was four. High dependency units (HDU) were utilized for 26 cases, and Intensive care units (ICU) were needed for 3 patients. All patients received minimum 3 days of intravenous antibiotics post-procedure. Prolonged

duration (>7days) was needed for 9 patients. These included surgeries with prolonged duration and multi-specialty intervention. Mean antibiotic course was 4.9days. One case received IV antibiotics for 21days. Average days of in-hospital stay (post-partum) was 8 days. Maximum 28 days and minimum 4 days.

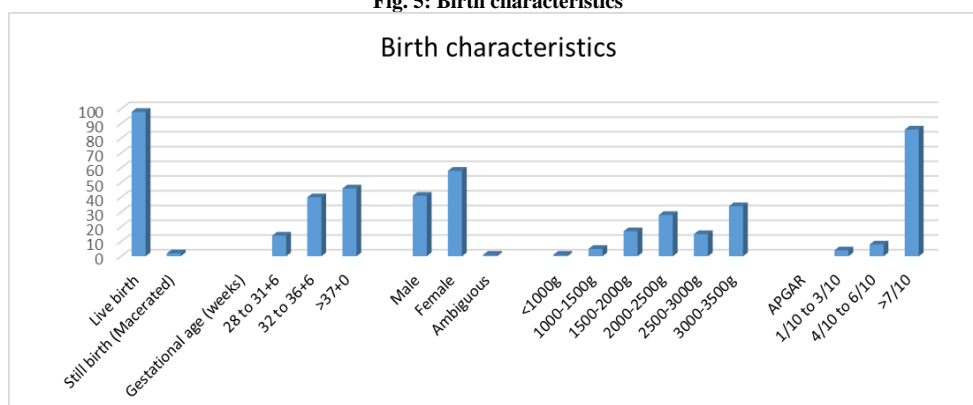
Table 3: Maternal outcomes in major vs minor placenta previa

Maternal outcome	Major placenta praevia (n=68)		Minor placenta praevia (n=32)		Total cases of placenta praevia (n=100)	
	Frequency	%	Frequency	%	Frequency	%
Complications						
Post-partum haemorrhage	39	57.3	9	28.5	48	48
Need for blood transfusion	44	64.7	12	37.5	56	56
Placenta accreta spectrum	19	28	4	12.5	23	23
Need for hysterectomy	22	32.3	4	12.5	26	26
Prolonged IV antibiotic course (>7days)	9	13.2	0	0	9	9
HDU/ICU Care	25	36.7	4	12.5	29	29
Prolonged hospital stay >14days	23	33.8	3	9.3	26	26

98 out of 100 births were live births. 2 still births were reported. The frequency of preterm birth was 54 out of 100. Early preterm births comprised 14% and late preterm comprised 40% cases. Earliest delivery was at 28+4 weeks while the average gestation was 35+5 weeks. Female births were more common (58 cases) than

male births (41 cases). One case of ambiguous genitalia was noted. Average birth weight was 2.468kg. Lowest was 998 grams and maximum were 3.25 kg. Low birth weight (<2.5 kg) was seen in 51% cases. APGAR score recorded at 1st minute after birth was low (<7/10) in 12 cases.

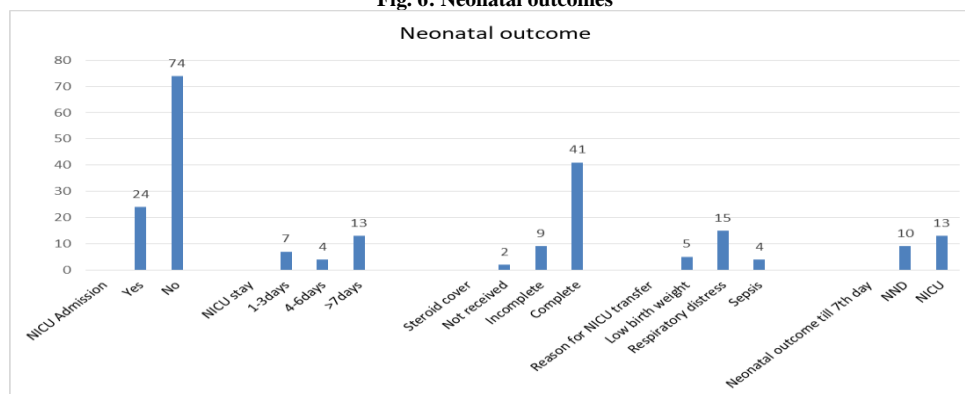
Fig. 5: Birth characteristics



Neonatal admissions to the NICU were reported in 25.5% cases. The commonest reason for transfer to NICU was respiratory distress (15 out of 25) followed by low birth weight (5 out of 25) and miscellaneous (5

out of 25) causes such as sepsis, congenital syndromes, etc. 56% of the NICU admissions stayed beyond day 7. Neonatal deaths were seen in 10 cases while 13 cases were still in intensive care at the end of day 7.

Fig. 6: Neonatal outcomes



DISCUSSION

In present study, the prevalence of placenta praevia was 0.83% and there were 100 cases of various grades of placenta praevia. Incidence in present study is concurrent with the incidence reported by various studies in India and abroad^{6,7,8}.

Average maternal age was 29.37 ± 4.76 years. Mean age group was reported as 25-30 years. This was comparable to the results in study by Shital Umesh Lad et al⁶, but an older maternal age group was noted in the study by Ashete Adere et al⁸. Our study reported a higher incidence of nulliparous women. 9% of the total cases conceived by assisted reproductive techniques (IUI/IVF). History of uterine cavity operations (LSCS/ Surgical abortion) was an identifiable risk factor. Previous LSCS rate in our study was 42% and previous surgical abortion rate was 15%. This number is significantly higher than previous studies as this is a tertiary care institute receiving a high case load of patients for emergency caesarean sections due to non-availability of operative facilities at peripheral centres. Shital Umesh Lad et al⁶ and Ashete Adere et al⁸ reported 20.76% and 26.1% respectively, while in the study by Turaia A. Almaksoud 56% cases of previous caesarean were noted.

Caesarean section was the main mode (99%) of termination and vaginal delivery was offered in only one case. Emergency indications for surgery included bleeding placenta previa (33 cases out of 52), followed by preterm premature rupture of membranes (8 cases out of 52).

Malpresentations were seen in a significant 23% cases. Breech was commoner than transverse presentation. In comparison, Shital Umesh et al⁶ found 16.15% cases of malpresentation.

High incidence of central and posterior placentas was seen in this study. Incidence

of major vs minor placenta was comparable. Placenta accreta spectrum (PAS) was seen in 23 cases. Of these, 82.6% had a previous caesarean section and 17.3% had a previous uterine curettage. Both of these are identifiable risk factors. Amongst the PAS, anterior placentation was found to be commonest (65.2%), followed by posterior (30.4%) and lateral (4.4%) implantation of main placental body. This is in contrast to the usual placental implantation (posterior > anterior) and indicates the placental tropism for the scar site in previous caesarean sections.

The proportion of adherent placentation seems to increase with the number of previous LSCS- 34.4% previous 1 LSCS, 60% previous 2 LSCS and 100% previous 3 LSCS had low lying adherent placentas. Similarly, in the study conducted by Turaia A. Almaksoud⁹, 23.1% cases of PAS were observed. Placenta percreta was reported in 4 cases. Number of previous caesarean did not seem to influence the probability of having a percreta.

Placenta previa was found as a significant cause of postpartum hemorrhage (48% cases) requiring multiple blood unit transfusion (average being about 4 units). But, majority of the cases were in fact adherent placentas requiring elective/ emergency obstetric hysterectomy.

Due to high surgical risk, these cases also required longer duration of intravenous antibiotic course; 9 cases required more than 7 days of intravenous antibiotics, indicating the risk of sepsis in cases of placenta previas.

High dependency unit care was required in 26 cases and 3 cases were shifted to the intensive care immediate post-partum. Longer in-hospital stay was observed. No maternal death was reported.

Table 4: Comparative analysis of maternal outcomes

Study	Postpartum hemorrhage	Blood transfusion	Emergency hysterectomy	Hospital stay(≥ 14 days)
Test study	48%	56%	10%	26%
Shital Umesh Lad et al ⁸	32.3%	86.15%	8.07%	-
Turaia A. Almaksoud ⁹	41.4%	45.12%	-	-
Ashete Adere et al ⁶	22.4%	40.3%	4%	38%

A comparative analysis between the maternal outcomes seen in major versus minor type placenta praevia was done. Study revealed major placenta previa as the main contributor to postpartum hemorrhage, blood transfusion, antibiotic course, intensive care and in-hospital stay. 2 still births were noted. 54% babies were premature. Other complications included low birth weight, low APGAR scores, need

for resuscitation, and admission to intensive care unit.

Most common reason for admission to neonatal intensive care unit was prematurity and respiratory distress (15 out of 25), followed by low birth weight, sepsis, and miscellaneous causes (10 out of 25). 15 neonates survived beyond day 7, while 10 succumbed.

Table 5: Comparative analysis of neonatal outcomes

Neonatal outcome	Test Study	Ashete Adere et al ⁶	Shital Umesh Lad et al ⁸
Live birth	98%	98%	90.29%
Still birth	2%	2%	9.7%
Prematurity	54%	49.8%	44.4%
Low birth weight	51%	45.2%	65.68%
NICU admission	25.5%	25.7%	57.46%
Respiratory distress	15.3%	14.9%	-
Neonatal death	10.2%	-	7.83%

Neonatal outcomes closely resembled the results reported by Ashete Adere et al⁸. Major congenital anomalies were seen in 5% cases. This result was comparable to the study conducted by Vijaya Kacherla et al¹⁰ which reported 6.2% cases. A systematic review and meta-analysis by Ensiyeh Jenabi et al¹¹ provide evidence that there is a positive and significant association between placenta previa and congenital malformations.

CONCLUSION

This study showed that the magnitude of placenta previa was 8 in 1000 pregnancies. The study highlights the higher association of placenta previa in cases with history of previous caesarean section and previous surgical abortions. Adverse maternal outcomes associated with placenta previa were postpartum hemorrhage and the need for blood transfusion after significant amount of blood loss due to the disease condition and its complications. There is higher risk and adverse maternal and fetal outcome comparatively in the cases with major placenta previa than in the cases of minor placenta previa.

Neonates born to women with placenta previa were at risk of preterm delivery, low birth weight, and respiratory distress syndrome. Early detection and monitoring

for congenital abnormalities in the fetus of a mother with placenta previa is necessary. Patients with placenta previa should be considered as high risk, and compatible blood should always be available for such cases before considering caesarean section. Family planning should also be emphasized as a strategy towards reduction of parity, caesarean section rate, and thereby the incidence of placenta previa. Strategies and protocols should be settled to reduce the rate of caesarean section. There is need for timely referral of placenta previa case to a tertiary care obstetrics centre with availability of blood bank and NICU. This will help to improve the maternal and perinatal outcomes.

Declaration by Authors

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Conflict of Interest: The authors declare no conflict of interest.

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