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Original article

Maternal and Fetal Outcomes of Morbidly Adherent Placenta Cases in Beni-Suef University Hospital

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Abstract

The aim of current Case-Control study is to evaluate maternal and fetal outcomes among women with morbidly adherent placenta (MAP) in Beni-Suef university hospital and to quantify the predisposing risk factors. The study was conducted from January 2020 to December 2020 in the out-patient and emergency Gynecology and Obstetrics department at Beni-Suef University Hospital. This study included a total of (30) MAP patients and an equal number (30) of matched pregnant females without MAP as a control group. At study inclusion, baseline demographic, past obstetric and medical history were collected first from all participants included in the study, then obstetric ultrasonography (USG) was done to determine position of placenta and type of placenta previa. Parity was significantly higher among women with MAP as compared with women with normal placenta. Number of previous CS was significantly higher among women with MAP. Incidence of antepartum hemorrhage was significantly

higher among studied cases with MAP as compared with women with normal placenta with a statistically significant difference. Estimated blood loss (L), incidence of blood transfusion, number of transfused units, and fresh frozen plasma (FFP) transfusion were significantly higher among MAP group. Neonatal weight was significantly lower in MAP women, no statistically significant differences in Apgar score at 1st minute and after 5 minutes in both groups. NICU admission was significantly higher among MAP neonates. In conclusion, Morbidly adherent placenta is associated with several adverse maternal and fetal outcomes. It is a life-threatening hemorrhagic condition associated with high fetal and maternal morbidities and mortalities.

1. Introduction:

The term "morbidly adherent placenta" (MAP) refers to the abnormal binding of the placenta to the uterine wall, either completely or partially [1]. In documented studies, the frequency of MAP varies from 0.001% to 0.9% of births. This diversity may be attributable to the population under investigation as well as the different criteria used to define MAP (clinical vs. histological diagnosis). Previously believed to be very rare, the frequency of severely adherent placenta has risen dramatically over the last several decades, and it is now predicted to occur in 1 out of every 533 births in the US. This is mostly due to the increasing prevalence of cesarean delivery [2].

Placenta accreta, increta, and percreta are subcategories that are characterized according to the extent of invasion. The most frequent way to describe all of these diseases is as placenta accreta [3]. Placenta previa after a previous caesarean section is the most significant risk factor for postpartum hemorrhage. Due to the increase in cesarean sections, uterine scars are becoming more common. Those women who have had many cesarean sections in the past are at a higher risk [4].

Uterine instrumentation, intrauterine scarring, smoking, maternal age above 35, grand multiparty, and recurrent miscarriage are additional risk factors for MAP. Ultrasound examinations may help identify

patients who may be at risk by looking for certain features [5]. Some of these changes occur during the first trimester, when the sac is low and seems to be attached to the front wall of the uterus. In the third trimester, things like placenta lacunae appear, the bladder line gets interrupted or bulging, there is less space between the placenta and myometrium, and the myometrium gets thinner [6].

Severe maternal morbidity and maternal mortality, with estimates reaching as high as 7%, are linked to the MAP. Eighty to ninety percent of women who have massive obstetric bleeding need a blood transfusion, and forty percent need more than ten units of red blood cells. This condition is the most often reported maternal morbidity. Infection, venous thromboembolism, fistula development, uterine rupture, and urinary tract damage are among the additional maternal morbidities linked to a morbidly adherent placenta [7].

To improve MAP results, it is important to identify high-risk pregnancies early on and provide risk-based counseling and care to such women [8].

Morbidly adherent placentas pose serious risks to the developing fetus, including premature birth, increased rates of neonatal intensive care unit admissions, stunted fetal development, perinatal mortality, and respiratory distress syndrome, the top cause of death in infants under the age of one year [9].

2. Patients and Methods:

This research was conducted as a case-control study at the Gynecology and Obstetrics outpatient and emergency departments of Beni-Suef University Hospital. The study spanned from January 2020 to December 2020, receiving approval from the Faculty of Medicine's ethical committee at Beni-Suef University (approval date and number noted).

2.1. Ethical Considerations:

All participants gave informed, written consent prior to being enrolled in the study. The study's objectives were fully explained to the participants, and the confidentiality of their data was strictly maintained throughout the process.

2.2. Inclusion and Exclusion Criteria:

The study population consisted of women visiting the Gynecology and Obstetrics department at Beni-Suef University Hospital. Participants were selected based on the following criteria:

Inclusion Criteria:

- Age between 20 and 35 years
- Gestational age exceeding 28 weeks as confirmed by ultrasound

- Presence of a low-lying placenta either partially or fully covering the internal cervical os
- Presence of a live fetus at the time of admission

Exclusion Criteria:

- Refusal to participate
- Coexisting medical conditions such as diabetes, hypertension, systemic lupus erythematosus, or thyroid disorders
- History of smoking, multiple pregnancies, use of assisted reproductive techniques, or uterine abnormalities

In total, 30 patients diagnosed with morbidly adherent placenta (MAP) were included, selected through convenience sampling based on the inclusion and exclusion criteria. A matched control group of 30 pregnant women was also included in a 1:1 ratio.

2.3. Methods:

1. Upon recruitment, baseline data was gathered from all participants, including demographic information and medical and obstetric history.
2. Obstetric ultrasound was performed to assess placental position and identify the type of placenta previa.
3. Operative details were recorded, including:

- Whether the cesarean section was elective or emergency
- Estimated blood loss during the procedure
- Volume of blood products transfused
- Additional procedures required to control bleeding
- Duration of the operation
- Any injury to organs such as the bladder, bowel, or ureters, and neurovascular complications
- Whether caesarean hysterectomy was performed

2.4. Study Outcomes:

1. **Maternal Outcomes:**

- Length of stay in the ICU during hospitalization for delivery
- Clinically estimated blood loss (EBL)
- Number of packed red blood cell units transfused
- Units of fresh frozen plasma, cryoprecipitate, and platelets transfused
- Incidents of significant hypotension (systolic BP <80 mm Hg or diastolic BP <50 mm Hg on two or more occasions at least 30 minutes apart)
- Incidents of significant tachycardia (maternal pulse >120 beats per minute at any point after delivery)
- Need for maternal ventilatory support
- Any additional unanticipated surgeries (such as organ repairs or hysterectomy)
- Total length of hospital stay

2. **Neonatal Outcomes:**

- Gestational age at birth
- Need for ventilatory support within 24 hours of birth
- Size for gestational age (classified as small, appropriate, or large using the 10th and 90th percentiles as reference points per the method of Duryea et al., 2014)
- Admission to the neonatal intensive care unit (NICU) and duration of NICU stay

2.5. Statistical Data Analysis:

Data was processed using SPSS for Windows, version 23. Continuous variables were expressed as means and standard deviations (SD), while categorical data were presented as percentages. Comparisons of categorical variables were carried out using the chi-squared and Fisher's exact tests, while independent sample t-tests were employed for continuous variables. A p-value of less than 0.05 was considered statistically significant.

3. Results:

In the current study the age, BMI, and Gestational age showed no statistically significant difference between both groups, (p-values >0.05). Parity was significantly higher among women with MAP as compared with women with normal placenta (2.46 ±1.074 vs. 1.76 ±0.773, p=0.005), respectively. Number of previous CS was significantly higher among women with MAP. No previous CS in only one case of MAP group while in the control group 11/30 (36.7%) cases have no prior CS. None of our studied participants had a past history of previous myomectomy or previous placenta previa. In all studied population we have 17 cases with antepartum hemorrhage. Incidence of antepartum hemorrhage was significantly higher among studied cases with MAP (15/30, 50%) as compared with women with normal placenta (2/30, 6.7%) with a statistically significant p-value= 0.001.

Table (1): Baseline data of both studied groups; (N= 60):

		MAP N= 30	Normal Placenta N= 30	p-value
Age	**Mean ±SD**	29.63 ±3.624	29.76 ±2.932	0.876
	Min - Max	20.00 - 40.00	23.00 - 36.00	
BMI	**Mean ±SD**	22.56 ±2.445	22.56 ±2.299	0.999
	Min - Max	18.00 - 30.00	20.00 - 29.00	
Parity	**Mean ±SD**	2.46 ±1.074	1.76 ±0.773	**0.005***
	Min - Max	1 – 6	1 - 4	
Gestational Age	**Mean ±SD**	37.50 ±0.861	37.83 ±1.176	0.216
	Min - Max	34.00 - 39.00	35.00 - 40.00	
Previous CS	**0**	1 (3.3)	11 (36.7)	**0.022***
	1	7 (23.3)	8 (26.7)	
	2	14 (46.7)	7 (23.3)	
	3	6 (20.0)	4 (13.3)	
	4	1 (3.3)	0 (0.0)	
	5	1 (3.3)	0 (0.0)	

Data is presented as mean ±SD for quantitative data
Statistical analysis carried out by independent sample t-test analysis.
**p-value ≤0.05 is considered statistically significant.*

Table (2) demonstrates the comparison between both groups regarding incidence of blood transfusion. Estimated blood loss (L) was significantly higher among MAP group as compared with normal placenta group (p= 0.024). Incidence of blood transfusion was significantly higher among studied cases with MAP (11/30, 36.7%) as compared with women with normal placenta (4/30, 13.3%) with a statistically significant p-value= 0.036. Regarding the number of transfused units, it was slightly higher among studied women with MAP, with a statistically significant difference between both groups, (p-value= 0.040). It was ranged from one to five units in women with MAP with an average of (1.63 ±1.21) units and one to two units in control group with an average of (1.25 ±0.50) units. Fresh frozen plasma (FFP) transfusion was significantly higher among MAP group. Only two cases required platelets transfusion and two cases required Cryoprecipitate in the MAP group. One case in the MAP group required Recombinant activated factor vii transfusion. There were none-statistically significant differences regarding hemoglobin, PT, and INR between studied groups, p-values >0.05.

Table (2): Estimated blood loss, Incidence of Blood & Blood Components Transfusion Comparison between both groups; (N= 60):

		Studied Population		p-value
		MAP N= 30	Normal Placenta N= 30	
Estimated blood loss (L)	**Median (IQR)**	2 (3.25)	1 (1.00)	**0.024***
	Range	1 - 8	1 – 3	
Blood Transfusion		11 (36.7)	4 (13.3)	**0.036***
Blood Transfusion (RBCs units)	**Median (IQR)**	5 (6.00)	1 (0.75)	**0.040***
	Range	1 - 12	1 – 2	
F.F.P Transfusion		27 (90.0)	0 (0.00)	**0.001***
F.F.P Transfusion (Number of units)	**Median (IQR)**	1 (1)	-	--
	Range	1 – 6	-	
Platelet transfusion		2 (6.67)	0 (0.00)	0.161
Cryoprecipitate		2 (6.67)	0 (0.00)	0.161
Recombinant activated factor vii		1 (3.33)	0 (0.00)	0.320

*FFP (fresh frozen plasma), Data is presented as frequency (%) for qualitative data and Median (IQR) for quantitative non-parametric data, Statistical analysis carried out by Chi-Square test and Mann-Whitney Test analysis. *p-value ≤0.05 is considered statistically significant.*

Figure (1) demonstrates Degree of Morbid Adherence among MAP group, Focal Accreta was the most prevalent type (12/30, 40%) followed by Accreta in (9/30, 30%), Inaccreta (7/30, 23.3%), and Peraccreta (2/30, 6.70%). Figure (2) demonstrates the doppler signs of adherent placenta among studied MAP group.

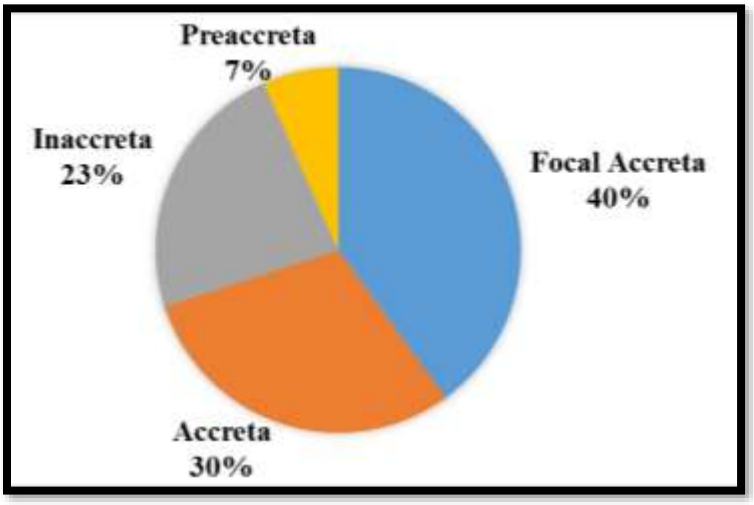

Figure (1): Degree of Morbid Adherence as detected by Ultrasound among studied MAP group.

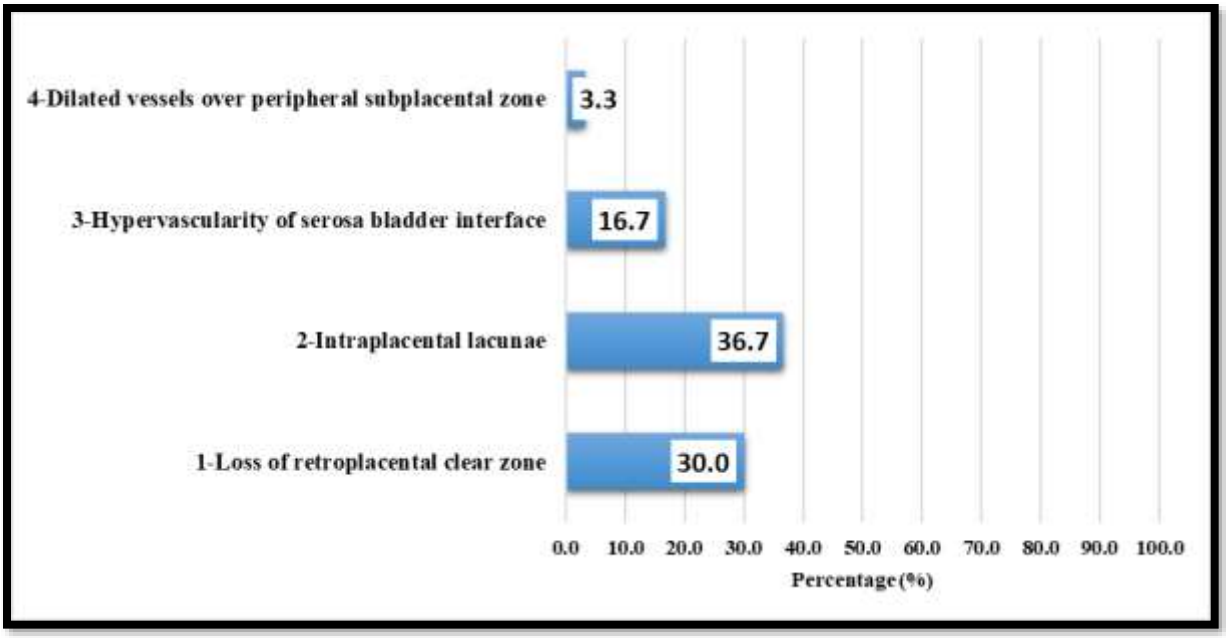

Figure (2): Doppler Signs of adherent placenta among studied MAP group.

All cases with normal placenta in the current study underwent C.S for fetal or obstetric indication, with no cases required hysterectomy, while in the MAP group 6/30 (20%) underwent C.S with hysterectomy. Women with MAP showed more complications as compared with women with normal placenta. MAP women has higher incidence of bladder injury (13 vs. 0, p=0.001). No cases had bowel injury in both groups, operative and post-operative blood transfusion was significantly more among women with MAP with transfused units ranged from 1 to 5 units. Post-operative DIC occurred in two cases from the MAP group. Only one case had surgical site infection without a statistically significant difference between both groups. Post-operative hospital stay was significantly longer in women with MAP as compared with normal placenta group (4.56 vs. 1.63 days, p=0.001). ICU admission was significantly higher among MAP group. One mother died from MAP complications (due to irreversible hemorrhagic shock) with no statistically significant difference between both groups.

Table (3): Comparison of maternal outcome in Normal placenta and MAP; (N= 60):

		Diagnosis		*All population*	*p-value*
		MAP N= 30	**Normal Placenta N= 30**		
a) C.S only		24 (80.0)	30 (100.0)	54 (90.0)	**0.024***
b) C.S with hysterectomy		6 (20.0)	0 (0.00)	6 (10.0)	**0.024***
c) Bladder injury		13 (43.3)	0 (0.0)	13 (21.7)	**0.001***
d) Bowel injury		0 (0.00)	0 (0.0)	0 (0.00)	--
e) Intra-Operative Blood Transfusion		29 (96.7)	0 (0.0)	29 (48.3)	**0.001***
f) Postoperative Blood Transfusion		15 (50.0)	0 (0.0)	15 (25.0)	**0.001***
g) ICU admission		12 (40.0)	0 (0.0)	12 (20.0)	**0.001***
h) DIC Incidence		2 (6.7)	0 (0.0)	2 (3.33)	0.492
i) Surgical Site Infection		1 (3.33)	0 (0.00)	1 (1.67)	0.870
j) Duration of Hospital Stay (Days)					
	Median (IQR)	5 (5)	2 (1)	5 (5)	**0.001***
	Range	1 - 7	1 - 3	1 - 7	
k) Maternal Mortality		1 (3.3)	0 (0.0)	1 (1.7)	0.500

Table (4) demonstrates a comparison of fetal outcome in Normal placenta and MAP groups. Regarding neonatal gender, females were more among our studied population but with non-statistically significant difference. Neonatal weight was significantly lower in MAP women (2.81 vs. 3.01 kg, p=0.014), no statistically significant differences in Apgar score at 1st minute and after 5 minutes in both groups. NICU admission was significantly higher among MAP neonates (10 vs. 3, p=0.029).

Table (4): Comparison of fetal outcome in Normal placenta and MAP; (N= 60):

		Studied Population		*Total*	*p-value*
		MAP N= 30	**Normal Placenta N= 30**		
a) Gender	**Male**	13 (43.3)	10 (33.3)	23 (38.3)	0.596
	Female	17 (56.7)	20 (66.7)	37 (61.7)	
b) Neonatal Weight	**Mean ±SD**	2.81 ±0.30	3.01 ±0.29	2.91 ±0.31	**0.014***
	Range	2.00 – 3.30	2.50 – 3.50	2.00 – 3.50	
c) Apgar at 1st min	**≥ 6/10**	22 (73.3)	26 (86.7)	48 (80.0)	0.197
	< 6/10	8 (26.7)	4 (13.3)	12 (20.0)	
d) Apgar 5 min	**≥ 6/10**	27 (90.0)	29 (96.7)	56 (93.3)	0.301
	< 6/10	3 (10.0)	1 (3.3)	4 (6.7)	
e) NICU admission	**No**	20 (66.7)	27 (90.0)	47 (78.3)	**0.029***
	Yes	10 (33.3)	3 (10.0)	13 (21.7)	

4. Discussion:

Morbidly adherent placenta (MAP) refers to the abnormal attachment of placental tissue to the myometrium, classified into three categories based on the depth of invasion: placenta accreta, increta, and percreta [10]. This condition is one of the most significant complications in obstetrics, known to cause severe maternal morbidity and mortality [11]. MAP is responsible for an estimated 7-10% of maternal deaths, making it a critical area of concern in maternal health.[12]

Over the past three decades, the incidence of MAP has risen dramatically. This increase is closely linked to the rising rates of cesarean deliveries and the declining rates of vaginal births after cesarean [13]. Currently, MAP occurs in approximately 1 in 533 deliveries [14]. In Egypt, the prevalence of cesarean sections has surged, with more than half of deliveries performed via cesarean, regardless of whether the women reside in urban or rural areas [15]. The development of MAP is associated with the absence of the decidua basalis and poor formation of Nitabuch's layer, which impedes proper placental separation.[16]

Identifying high-risk patients early is essential in managing MAP. This enables proper counseling and monitoring using ultrasonography (US) to confirm the diagnosis [17]. Studies recommend that women with suspected placenta accreta should be transferred to tertiary centers equipped with large blood banks and specialized surgical teams to ensure optimal care.[18]

The primary objective of this study was to evaluate the maternal and neonatal outcomes among women diagnosed with MAP at Beni-Suef University Hospital and to identify the major risk factors. A case-control study design was employed, including 30 patients with MAP and a control group of 30 pregnant women with normal placentation, matched 1:1.

The two most significant risk factors for MAP are placenta previa and previous cesarean deliveries, with the risk increasing substantially when both factors are present [14]. Additionally, maternal age is a known risk factor for placenta previa, which, in turn, raises the likelihood of MAP. Studies suggest that advancing maternal age may contribute to uterine atherosclerosis and placental underperfusion, both of which are linked to placenta previa [19, 20]. However, in our study, there was no significant difference in maternal age between the MAP and control groups, likely due to the matched case-control design, which balanced baseline

characteristics such as age, BMI, and gestational age.

Increased gravidity, parity, and the number of prior cesarean sections have been consistently associated with a higher risk of MAP [19]. In our study, parity was significantly higher among women with MAP compared to the control group (2.46 ± 1.07 vs. 1.76 ± 0.77, p=0.005). This finding is in line with multiple studies, which demonstrate a higher incidence of MAP in women with a history of multiple cesarean sections. For example, studies have shown that the incidence of MAP is significantly higher in patients with a history of cesarean deliveries compared to those with normal deliveries [21-23]. A study assessing maternal and fetal morbidity linked to placenta previa and MAP reported that 96.4% of MAP cases involved prior cesarean deliveries, with 50% of women having undergone more than three cesareans.[24]

The increase in cesarean sections is concerning because it not only raises the risk of MAP but also contributes to severe maternal morbidity, including postpartum hemorrhage, massive blood transfusions, disseminated intravascular coagulation (DIC), and urologic injuries, especially bladder injuries. Young women with MAP are at a higher risk of undergoing peripartum hysterectomy, which leads to the loss of fertility at a young age. MAP now accounts for nearly 47% of peripartum hysterectomies [25]. If cesarean delivery rates continue to rise, the incidences of placenta previa, MAP, and associated maternal mortality will inevitably follow.[26]

Although the incidence of MAP after placenta previa is estimated to be between 4-8% [27], there was no history of placenta previa in the current study's patient groups. Antepartum hemorrhage, a significant cause of maternal and neonatal morbidity and mortality, complicates 2-5% of pregnancies [28]. MAP is a major contributor to this condition. In our study, 56.67% of all participants experienced antepartum hemorrhage, with a significantly higher incidence among MAP cases (50%) compared to the control group (6.7%, p=0.001). This finding is consistent with a descriptive cohort study that examined maternal complications and fetal outcomes in cases of placenta previa and MAP.[30]

In terms of placental invasion, a study by Nasrullah et al. (2016) reported the following distribution: 69.6% of cases involved placenta accreta, 13% placenta increta, and 17.4% placenta percreta. Similarly, a study conducted at Zagazig University Hospital on 120 MAP patients found that 62.5% had

placenta accreta, 3.4% had placenta increta, and 5.8% had placenta percreta [6]. Our findings are somewhat different, as focal accreta was the most common form (40%), followed by accreta (30%), increta (23.3%), and percreta.(%6.7)

Maternal morbidity in MAP patients is mainly related to extensive surgical intervention and its associated complications, including massive blood transfusions and urologic injuries. In our study, bladder injuries were significantly more common among MAP patients (13 vs. 0, p=0.001). This is consistent with other studies highlighting the high incidence of bladder injuries in MAP cases [32]. The need for intraoperative and postoperative blood transfusions was also significantly higher among MAP patients, with 96.7% of MAP cases requiring transfusions compared to 50% in the control group. This finding is comparable to other studies, which report median transfusion requirements ranging from 3 to 6 units in MAP patients [33-35]. In some cases, even larger blood losses have been reported, with transfusions exceeding 10 units.[36]

Postoperative complications were also significant in our study, with 40% of MAP patients requiring ICU admission, compared to 21% reported in other studies [35, 37]. Additionally, hospital stays were significantly longer for MAP patients (4.56 days vs. 1.63 days, p=0.001), consistent with findings from previous research [38-40, 24, 35]

In terms of neonatal outcomes, previous studies have reported mixed results. Some studies indicate poorer outcomes for neonates, including lower birth weights and increased rates of preterm birth [41-44], while others report favorable neonatal outcomes, including term deliveries and higher birth weights [45, 46]. In our study, neonatal weight was significantly lower in MAP patients (2.81 kg vs. 3.01 kg, p=0.014), and the rate of NICU admission was significantly higher (10 vs. 3, p=0.029). These results are consistent with previous findings that neonates born to MAP mothers have higher rates of NICU admission [34,30] The primary limitation of our study is its relatively small sample size and the fact that it was conducted in a single tertiary care hospital. However, the strength of the study lies in its ability to highlight key risk factors and maternal and neonatal outcomes associated with MAP. Larger, multi-center studies are needed to provide a more comprehensive understanding of the condition and improve management strategies. National-level research could also provide more robust data on MAP and help

establish policies aimed at reducing cesarean section rates and improving the care of women at risk for this serious condition.

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