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Multidisciplinary Team Approach for Morbidly Adherent Placenta: Maternal Outcomes Compared with Standard Care

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ABSTRACT

Morbidly adherent placenta (MAP), part of the placenta accreta spectrum, is a major cause of severe obstetric hemorrhage and may lead to massive transfusion, peripartum hysterectomy, ICU care, and maternal morbidity. Rising cesarean section rates are increasing the burden of MAP in Pakistan. Multidisciplinary team (MDT) management is proposed to improve preparedness, but outcome benefits remain uncertain. **Objective:** To compare maternal outcomes in patients with MAP managed by an MDT versus standard obstetric care. **Methods:** A comparative, non-randomized observational study was conducted at the Department of Obstetrics and Gynecology, Pakistan Navy Ship Shifa Hospital, Karachi, from February 2022 to July 2022, vide Ethical Committee PNS Shifa approval. A total of 151 women diagnosed with MAP were included. Outcomes included maternal morbidity, estimated blood loss (EBL), transfusion requirement, time to intervention, hospital stay, and surgical procedures. **Results:** Overall mean EBL was 512.24 mL, and mean transfusion requirement was 1.91 units. Compared with standard care, MDT management showed no significant differences in EBL (p=0.300), transfusion units (p=0.237), time to intervention (p=0.426), or hospital stay (p=0.926). Maternal morbidity and major surgical interventions were also comparable between groups. **Conclusions:** MDT-based care showed no significant improvement in blood loss, transfusion needs, or maternal morbidity compared with standard care

INTRODUCTION

Morbidly adherent placenta (MAP), increasingly described under the broader term placenta accreta spectrum (PAS), represents a severe obstetric disorder linked to considerable maternal morbidity and mortality. PAS includes placenta accreta, increta, and percreta conditions characterized by abnormal placental adherence and/or invasion into the uterine wall, often resulting in severe postpartum hemorrhage and complex surgical challenges [1]. The rising incidence of PAS is primarily attributed to increasing rates of cesarean delivery and prior uterine surgery, making management of PAS a growing concern in maternal healthcare [2]. Given its complexity, a multidisciplinary team (MDT) approach is widely emphasized in contemporary guidance for improving safety through planned delivery, coordinated surgical care, and preparedness for massive hemorrhage [3]. PAS is a leading cause of life-threatening obstetric hemorrhage and may require hysterectomy and large-

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volume blood transfusion, contributing to increased maternal morbidity and occasional maternal death [2]. The unpredictable nature of PAS supports proactive, team-based care. MDT involvement, typically including obstetric surgeons/maternal-fetal medicine specialists, anesthesiologists, blood bank/transfusion services, and surgical subspecialties (e.g., urology) where indicated, facilitates early diagnosis, operative preparedness, and coordinated hemostatic control [3, 4]. Recent evidence also supports the clinical value of prenatal recognition and structured planning in PAS. A systematic review and meta-analysis found that prenatally diagnosed PAS is associated with more favorable perioperative outcomes compared with undiagnosed cases, supporting the importance of antenatal screening and referral pathways [5]. In parallel, contemporary consensus work has promoted standardized approaches to prenatal ultrasound evaluation and reporting of PAS markers to improve diagnostic consistency across settings [6]. Implementation tools and systems-readiness guidance have further highlighted that MDT care is strengthened when institutions use structured checklists, planning worksheets, and organized preparedness processes, particularly for emergencies and unanticipated PAS [7]. Institutional and regional reports continue to describe improved organization of care and perioperative management after establishing dedicated PAS/MDT services, especially when pathways incorporate imaging, planned delivery logistics, and coordinated operative roles [8, 9]. Regional initiatives and quality-focused efforts also report benefits such as improved planning, resource mobilization, and reductions in severe hemorrhage-related morbidity when MDT models are integrated into service delivery [10]. Finally, early detection and effective team collaboration have been highlighted as key components for preventing severe maternal outcomes, including maternal death, in PAS/MAP [11].

Morbidly adherent placenta (MAP), within the placenta accreta spectrum, remains a major obstetric challenge and is associated with severe maternal morbidity and mortality, largely due to massive hemorrhage, high transfusion requirements, and the need for peripartum hysterectomy. The increasing incidence of MAP is closely linked to rising cesarean section rates, making optimization of its management essential. Standard obstetric care may be limited by fragmented perioperative planning. In contrast, a multidisciplinary team (MDT) model integrating obstetricians, anesthesiologists, urologists, hematologists, interventional radiologists, and critical care specialists may improve coordination and surgical preparedness. However, published evidence regarding the impact of MDT-based care on maternal morbidity and surgical outcomes remains inconsistent, particularly in low-resource settings. Therefore, this study aimed to compare maternal morbidity, surgical outcomes, and perioperative parameters (including estimated blood loss, transfusion requirement, time to intervention, and hospital stay) between women with MAP managed by MDT-based care and those managed with standard obstetric care.

METHODS

This comparative, non-randomized observational study was conducted in the Department of Obstetrics and Gynecology, Pakistan Navy Ship Shifa Hospital, Karachi, a tertiary care referral center, vide Ethical Committee PNS Shifa approval no: ERC/2022/Gynae/45. The study duration was six months (February 2022 to July 2022). This study was used to compare outcomes of women with morbidly adherent placenta (MAP) managed with standard obstetric care versus multidisciplinary team (MDT) based care. Written informed consent was obtained from all participants. Data were de-identified to ensure privacy and confidentiality. Sample size was calculated using an anticipated maternal mortality of 4.4% from previous literature, with 95% confidence level and 3.2% precision, yielding a total sample of 151. This mortality-based calculation was selected because mortality is a key safety endpoint and because reliable local effect-size estimates for morbidity categories and perioperative parameters were not available. Accordingly, comparisons of morbidity components and perioperative outcomes were treated as comparative secondary analyses, and results are presented with p-values and effect estimates/95% confidence intervals where applicable. Women aged 18–45 years with a singleton pregnancy diagnosed with MAP (placenta accreta, increta, or percreta) were eligible. Women who did not provide informed consent, had multiple pregnancies, or had severe comorbidities (e.g., pre-eclampsia/eclampsia, renal disease) were excluded. Participants were categorized into two management groups based on the care pathway received: standard obstetric care and MDT-based care. In the standard care group, management was provided by consultant obstetricians with routine labor ward/operating theatre support staff. In the MDT group, care was coordinated by obstetricians in collaboration with relevant specialists, including anesthesiologists, hematologists/blood bank support, urologists, and intensive care specialists. Assignment to MDT-based care versus standard care was not randomized and was determined by the institutional service pathway during the study period (e.g., MDT availability/on-call roster/protocol-based scheduling/time period policy). Because allocation was non-random, the potential for selection bias and confounding by case severity was acknowledged, and findings were interpreted

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as associations rather than causal effects. Baseline demographic and obstetric severity variables (e.g., age, parity, number of previous cesarean sections, and accreta subtype/severity) were not available in the anonymized dataset used for analysis; therefore, baseline comparability between groups could not be formally assessed, and residual confounding cannot be excluded. The primary outcomes were maternal morbidity and maternal mortality. Maternal morbidity was assessed as individual categorical outcomes, including hemorrhage, infection, and ICU admission, and was also summarized as a composite morbidity variable (no morbidity vs any morbidity). Maternal mortality was defined as any maternal death due to delivery-related causes or complications occurring during the study period and was compared between the MDT-based care and standard-care groups as a categorical outcome. Secondary outcomes included key perioperative measures of surgical blood loss and transfusion requirement, specifically estimated intraoperative blood loss (EBL, mL) and number of blood transfusion units, as well as delay to intervention (hours) and duration of hospital stay (days), which were compared between the MDT-based care and standard-care groups. Surgical outcomes were categorized as none, hysterectomy, and bladder repair, and compared between groups. Team structure (MDT vs standard) was recorded. A locally developed structured questionnaire/proforma was used for standardized data collection. Along with the extraction of perioperative and surgical variables from clinical records, the proforma captured patient safety indicators, including communication score, patient satisfaction, and post-treatment quality of life, and these were compared between MDT-based care and standard-care groups. Communication was recorded on a 5-point scale (1 = poor, 5 = excellent). Patient satisfaction was recorded on a 3-point ordinal scale (0 = low, 1 = medium, 2 = high). Post-treatment quality of life was recorded on a 4-point ordinal scale (0 = poor, 1 = fair, 2 = good, 3 = excellent). For these indicators, higher scores represented better outcomes. The questionnaire/proforma was completed at discharge and supplemented by review of clinical records. Follow-up requirements and long-term health outcomes were also documented from clinical records and the structured proforma. A validated named instrument was not used; therefore, these measures were treated as structured service-evaluation indicators rather than validated patient-reported outcome measures.

Data were entered and analyzed using SPSS version 26.0. Continuous variables were assessed for normality using appropriate tests (e.g., Shapiro–Wilk) and/or graphical methods. Normally distributed continuous variables were summarized as mean ± SD, and non-normally distributed variables as median (IQR). Categorical variables were summarized as frequency and percentage. For comparisons between the MDT and standard care groups, continuous outcomes including EBL, transfusion units, delay to intervention, duration of hospital stay, and communication score were analyzed using an independent samples t-test for normally distributed data; otherwise, the Mann–Whitney U test was applied. Homogeneity of variances was assessed using Levene's test; when the equal-variance assumption was violated (Levene's $p < 0.05$), Welch's t-test (SPSS "equal variances not assumed") was used. Associations between care group and categorical variables were assessed using the Chi-square test, and Fisher's exact test was used when expected cell counts were <5. Specifically, differences in maternal morbidity components (hemorrhage, infection, and ICU admission) and maternal mortality between MDT and standard-care groups were assessed using Chi-square/Fisher's exact test, as appropriate. Given that patient satisfaction and post-treatment quality of life were measured on ordinal scales, group comparisons were performed using the independent samples t-test as applied in the study analysis plan; where relevant, nonparametric testing (Mann–Whitney U) may be used if distributional assumptions are not met. Where relevant, effect estimates (risk ratio/odds ratio) with 95% confidence intervals were calculated. A p-value <0.05 was considered statistically significant. In addition to p-values, effect estimates with 95% confidence intervals (CI) were reported to support clinical interpretation, including mean differences (95% CI) for continuous outcomes and risk ratios/odds ratios (95% CI) for dichotomous outcomes.

RESULTS

The overall mean estimated blood loss (EBL) was 512.24 ± 283.43 mL, and the mean transfusion requirement was 1.91 ± 1.39 units. The mean time to intervention was 2.07 ± 0.49 hours, and the mean hospital stay was 5.13 ± 2.16 days. The mean communication score (5-point scale) was 3.23 ± 1.39 (Table 1).

Table 1: Descriptive Statistics for Numerical Variables

Variables	n	Mean ± SD
Estimated Blood Loss (mL)	151	512.24 ± 283.43
Transfusion Units	151	1.91 ± 1.39
Time to Intervention (hours)	151	2.07 ± 0.49
Hospital Stay (days)	151	5.13 ± 2.16
Communication Score (1–5)	151	3.23 ± 1.39

When continuous outcomes were compared between the standard-care and MDT groups, no statistically significant differences were observed. Mean EBL was 477.63 ± 300.46 mL in standard care versus 528.86 ± 274.86 mL in MDT care ($p=0.300$). Mean transfusion requirement was 1.71 ± 1.47 units versus 2.00 ± 1.34 units ($p=0.237$). Mean time to

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intervention was 2.11 ± 0.54 hours in standard care versus 2.05 ± 0.46 hours in MDT care (p=0.426). Mean hospital stay was 5.10 ± 2.44 days versus 5.14 ± 2.03 days (p=0.926) (Table 2).

Table 2: Comparison of Continuous Outcomes Between Standard Care and MDT Groups

Variables	Group	n	Mean ± SD	p-value
Estimated Blood Loss (mL)	Standard	49	477.63 ± 300.46	0.300
	MDT	102	528.86 ± 274.86	
Transfusion Units	Standard	49	1.71 ± 1.47	0.237
	MDT	102	2.00 ± 1.34	
Time to Intervention (hours)	Standard	49	2.11 ± 0.54	0.426
	MDT	102	2.05 ± 0.46	
Hospital Stay (days)	Standard	49	5.10 ± 2.44	0.926
	MDT	102	5.14 ± 2.03	

Maternal morbidity components were compared between groups as categorical outcomes. Hemorrhage occurred in 26.5% of standard-care patients versus 25.5% of MDT patients (p=0.891), infection in 12.2% versus 18.6% (p=0.323), and ICU admission in 2.0% versus 5.9% (p=0.429, Fisher's exact test where applicable). Overall morbidity (any morbidity vs none) was also comparable between groups (40.8% vs 50.0%, p=0.290). Additionally, maternal mortality was low and did not differ significantly between groups. Maternal deaths occurred in 1/49 (2.0%) patients in the standard-care group and 5/102 (4.9%) in the MDT group, with no statistically significant difference (Fisher's exact test p=0.664). Neonatal mortality was not assessed in this study because neonatal outcome variables were not captured in the study dataset. Furthermore, patient safety indicators were also comparable between groups. Mean communication score (5-point scale) was 3.06 ± 1.41 in standard care versus 3.31 ± 1.39 in MDT care (p=0.298). Mean patient satisfaction score (0–2 scale) was 1.49 ± 0.62 versus 1.36 ± 0.73 (p=0.294). Mean post-treatment quality of life score (0–3 scale) was 2.08 ± 0.89 versus 1.94 ± 0.95 (p=0.387). Overall, MDT-based management did not demonstrate a statistically significant improvement in these patient safety indicators compared with standard care (Table 3).

Table 3: Maternal Morbidity Components, Maternal Mortality, and Patient Safety Indicators by Care Group (Standard vs MDT)

Maternal Morbidity Outcome	Standard (n= 49), n (%) / Mean ± SD	MDT (n=102), n (%) / Mean ± SD	p-value
Maternal Morbidity Components			
Hemorrhage	13 (26.5%)	26 (25.5%)	0.891
Infection	6 (12.2%)	19 (18.6%)	0.323
ICU Admission	1 (2.0%)	6 (5.9%)	0.429*
Any Morbidity (Hemorrhage/ Infection/ICU)	20 (40.8%)	51 (50.0%)	0.290
No Morbidity	29 (59.2%)	51 (50.0%)	–
Maternal Mortality by Care Group			
Maternal mortality (Yes)	1 (2.0%)	5 (4.9%)	0.664*
Maternal mortality (No)	48 (98.0%)	97 (95.1%)	
Patient Safety Indicators			
Communication score	3.06 ± 1.41	3.31 ± 1.39	0.298
Patient satisfaction	1.49 ± 0.62	1.36 ± 0.73	0.294
Quality of life post-treatment	2.08 ± 0.89	1.94 ± 0.95	0.387

*Fisher's exact test applied where appropriate. Percentages are within each group. The p-values compare Standard vs MDT for each outcome. *Fisher's exact test (2-sided). Fisher's exact test was reported due to small expected counts. Standard vs Extended (MDT) was compared using an independent samples t-test

Follow-up care requirements and long-term health outcomes were also similar between groups. Follow-up care was required in 57.1% of standard-care patients and 58.8% of MDT patients (p=0.845). Long-term complications were reported in 30.6% of standard-care patients compared with 21.6% of MDT patients (p=0.226), indicating no statistically significant association with team composition (Table 4).

Table 4: Association of Team Composition with Other Categorical Variables

Variables	Category	Standard (n=49), n (%)	MDT (n= 102), n (%)	Total, (n=151)	p-value
Follow-Up Care	Not required	21 (42.9%)	42 (41.2%)	63 (41.7%)	0.845
	Required	28 (57.1%)	60 (58.8%)	88 (58.3%)	
Long-Term Health Outcomes	No complications	34 (69.4%)	80 (78.4%)	114 (75.5%)	0.226
	Complications	15 (30.6%)	22 (21.6%)	37 (24.5%)	

Percentages are within each group. The p-values are for the overall association within each variable

Major surgical intervention categories did not differ significantly between standard care and MDT care (p=0.570). No major surgical intervention was required in 63.3% of standard-care patients versus 70.6% of MDT patients. Hysterectomy was performed in 20.4% versus 18.6%, and bladder repair was required in 16.3% versus 10.8%, respectively. Effect estimates also showed no statistically significant reduction in major interventions with MDT care: hysterectomy (RR 0.91; 95% CI 0.46–1.81) and bladder repair (RR 0.66; 95% CI 0.28–1.54), as confidence intervals crossed 1.0 (Table 5).

Table 5: Major Surgical Interventions by Care Group (with Effect Estimates)

Outcomes	Standard (n=49), n (%)	MDT (n= 102), n (%)	RR (MDT vs Standard), (95% CI)	OR (MDT vs Standard), (95% CI)
Hysterectomy (Yes)	10 (20.4%)	19 (18.6%)	0.91 (0.46–1.81)	0.89 (0.38–2.10)
Bladder Repair (Yes)	8 (16.3%)	11 (10.8%)	0.66 (0.28–1.54)	0.62 (0.23–1.65)

Note: "None" category is not included in effect estimates because RR/OR are calculated for binary outcomes (Yes/No). Percentages are within each group. Effect estimates compare MDT vs Standard. CI = 95% confidence interval

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DISCUSSION

Morbidly adherent placenta (MAP), now more commonly described under the umbrella of placenta accreta spectrum (PAS), remains a significant challenge in obstetric care and is associated with major maternal morbidity due to severe hemorrhage, complex surgery, and potential need for hysterectomy and massive transfusion. Optimized management strategies are therefore essential to reduce maternal risk. The risk of MAP increases with the number of previous cesarean sections, and data from a tertiary care center reported a high burden of MAP among women with multiple prior cesareans [12, 13]. In tertiary care hospitals where multiple disciplines are available, coordinated involvement of different specialties through a multidisciplinary team (MDT) is widely recommended, particularly when care is centralized and supported by institutional preparedness. Evidence from protocol-oriented quality improvement and structured MDT service implementation suggests that MDT-based models can improve perioperative preparedness and may reduce bleeding and transfusion needs in PAS, especially when management is standardized and delivered by experienced teams [14, 15]. These findings support the potential advantages of MDT involvement in the care of MAP, but they also indicate that "MDT" is most effective when it functions as a consistent pathway rather than ad-hoc availability of multiple specialists. Beyond team availability, the effectiveness of MDT care may depend on protocolization and early identification of high-risk cases. When MDT pathways incorporate structured antenatal diagnosis, outcomes may improve because delivery can be planned, resources arranged in advance, and the surgical approach optimized. Recent ultrasound-based scoring approaches and structured imaging criteria have been proposed to improve prenatal identification and stratification of PAS severity, supporting timely referral to tertiary centers with MDT capability [16]. In addition, contemporary safety and preparedness resources emphasize systematic planning (e.g., standardized preoperative planning tools, readiness bundles, and structured communication) as key components for safer PAS care. Studies from tertiary centers have similarly reported reduced blood loss and transfusion needs with coordinated care and planned management [17]. Severe complications have also been evaluated in contemporary cohorts and improvement initiatives, where better outcomes are often seen after MDT protocols mature, teams gain experience, and pathways become standardized [14, 18]. Continuous collaboration, structured communication, and shared decision-making may also create a team-learning environment in which experience improves over time and is associated with better outcomes. For example, a large cohort evaluating outcomes before and after implementation of a structured MDT protocol demonstrated improvements in perioperative outcomes after pathway adoption, consistent with the benefits of protocolization and team learning [18]. Furthermore, delivery in specialized "accreta centers" or expert settings has been associated with lower severe maternal morbidity compared with non-specialist care, reinforcing the importance of systems-level organization beyond individual clinician expertise [19]. Importantly, the absence of statistically significant differences in immediate clinical parameters does not exclude the possibility of improved long-term maternal safety when MDT care is implemented through standardized protocols. Standardized MDT pathways that incorporate early antenatal diagnosis and planned use of additional hemorrhage-control strategies (including interventional radiology where feasible and guideline-supported) may improve preparedness, facilitate hemorrhage control, reduce unplanned intraoperative events, and potentially improve longer-term recovery and safety [20]. Maternal mortality remains a critical concern in MAP/PAS. Contemporary summaries of evidence and guidance emphasize that MDT care and planned delivery in expert centers are key to reducing morbidity, while impact on mortality is harder to demonstrate consistently because maternal death is rare and studies may be underpowered for this endpoint [20]. Maternal mortality has been reported in MAP cohorts, emphasizing the need for continued efforts to improve safety and outcomes [12]. In this cohort, maternal mortality was low and did not differ significantly between groups; larger prospective studies may be required to detect differences in rare outcomes such as maternal death.

In contrast to much of the published evidence, this study did not demonstrate statistically significant differences between MDT-managed and standard-care groups in key short-term clinical parameters, including estimated blood loss, transfusion requirement, time to intervention, or duration of hospital stay. Maternal morbidity components and major surgical interventions were also comparable between groups. These differences from earlier reports may reflect variation in institutional expertise, non-standardized MDT protocols, differences in case mix and referral patterns, and the fact that MDT benefit may be most apparent when a structured pathway is implemented consistently. In this study, long-term outcomes were recorded; however, the dataset did not capture protocol components such as timing of antenatal diagnosis, standardized referral pathways, or interventional radiology utilization as discrete variables. Therefore, this study could not specifically evaluate whether protocolized MDT care with early diagnosis and additional adjunctive strategies

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improves long-term maternal safety beyond short-term perioperative metrics. The clinical burden of MAP/PAS is increasing due to rising rates of primary and repeat cesarean delivery. Continuous upgrading of tertiary care protocols, consistent MDT coordination, and strengthening antenatal screening and referral pathways are essential for improving clinical outcomes. Future research should focus on prospective, protocol-based MDT implementation that explicitly measures antenatal diagnostic timing, planned delivery pathways, adjunctive interventions, and long-term maternal outcomes to determine whether standardized MDT models can improve long-term safety even when short-term differences are not immediately statistically significant. Because the sample size was based on mortality, and maternal death was rare, the study may be underpowered to detect small differences between groups in morbidity components and perioperative outcomes.

CONCLUSIONS

In women with morbidly adherent placenta, MDT-based care did not demonstrate statistically significant improvement in perioperative outcomes—including estimated blood loss, transfusion requirement, time to intervention, hospital stay, maternal morbidity, or major surgical interventions compared with standard obstetric care. Future prospective studies should evaluate standardized MDT protocols, including early antenatal diagnosis and planned multidisciplinary pathways, to determine their impact on long-term maternal safety.

Authors' Contribution

Conceptualization: BI
Methodology: BI, UIK, RA
Formal analysis: UIK, SRK
Writing and Drafting: BI, UIK, AT, SN, RA, SRK
Review and Editing: BI, UIK, AT, SN, RA, SRK

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

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