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Innovative Surgical Strategies for Morbidly Adherent Placenta: Optimizing Outcomes and Minimizing Maternal Morbidity

Saira Saeed, Uzma Gul, Uzma Urooj, Sumaira Khan

Department of Obstetrics & Gynecology, Combined Military Hospital, Rawalpindi/National University of Medical Sciences (NUMS) Pakistan

ABSTRACT

Objective: To analyze maternal outcomes associated with different surgical approaches during cesarean section for morbidly adherent placenta.

Study Design: Prospective longitudinal study.

Place and Duration of Study: Obstetrics & Gynecology Departments of Combined Military Hospital Sialkot, Quetta, Kharian, Rawalpindi, Pakistan from Jan 2015 to Dec 2024.

Methodology: This study analyzed 252 women. Patients underwent five types of surgical intervention at time of cesarean section: bilateral internal iliac artery ligation followed by hysterectomy, hysterectomy followed by bilateral internal iliac ligation, hysterectomy alone, placenta left in situ followed by Injection Methotrexate and bilateral internal iliac ligation followed by myometrial resection. Outcomes assessed included the operative time, number of transfusions, duration of hospital stay, incidence of re-laparotomy and postoperative sepsis.

Results: A total of 252 patients were included. Age group ranged between 26 to 40 years (Mean 34.4±3.3), the gestational age was between 34 to 37 weeks (Mean 35.6±0.94) and the mean BMI was 29.6 Kg/m2±1.9. Bilateral internal iliac ligation followed by hysterectomy was done in 138(54.8%), hysterectomy followed by Bilateral internal iliac ligation in 71(28.2%), hysterectomy in 27(10.7%), placenta left in situ in 2(0.8%) and myometrial resection in 14(5.6%) patients. The median hospital stay was 5 days, patients who did not undergo internal iliac ligation required more transfusions as compared to other surgical approaches (p<0.001)

Conclusion: There is variability in clinical outcomes with different surgical approaches for morbidly adherent placenta during cesarean section. The surgical procedures incorporating bilateral internal iliac artery ligation were associated with reduced intraoperative blood loss and improved outcomes.

Keywords: Blood transfusion, Hysterectomy, Hemorrhage, Morbidly adherent placenta.

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INTRODUCTION

Morbidly adherent placenta (MAP) or Placenta accreta spectrum (PAS) is a life-threatening obstetric condition characterized by abnormal adherence of the placenta to the uterine wall. Its incidence has risen in parallel with the increasing rates of cesarean deliveries.[1] and other uterine surgeries such as myomectomy, endometrial ablation and curettage. The exact cause of this condition is still not known but the abnormal adherence of the placenta to abnormal uterine wall makes the entire pelvis a highly vascular area.[1] According to current literature, PAS occurs in roughly 1 out of every 1000 births, with prevalence rates varying between 0.04% and 0.9%.[2] A retrospective multicenter study conducted in 2022 found that 36.1% cases of placenta praevia had a morbidly adherent placenta.[3]

Correspondence: Dr Uzma Gul, Department of Obstetrics & Gynecology, Combined Military Hospital, Rawalpindi Pakistan

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In recent years, diagnostic modalities and surgical techniques for MAP have greatly evolved. Early diagnosis and careful surgical planning can significantly improve maternal outcomes.[4] Managing MAP requires a well-defined pre and peroperative strategy coordinated by a multidisciplinary team in tertiary care centers.[5] Standard management of MAP has historically involved elective cesarean hysterectomy, often complicated by massive transfusions and significant maternal morbidity.[6] In an effort to mitigate blood loss and reduce morbidity, several adjunctive surgical techniques have been employed, including bilateral internal iliac artery ligation (BIIAL), leaving the placenta in situ, and conservative procedures such as myometrial resection.[7] The internal iliac artery (IIA) serves as the principal blood supply to the pelvis. In instances of significant obstetric or gynecological hemorrhage, ligation of the IIA can be a life-saving intervention. In recent practice, selective arterial embolization and temporary balloon occlusion have also become

available,[8] however, their use is often limited by resource availability and the need for specialized expertise.[9] Nonetheless, in life threatening obstetric hemorrhage, IIA ligation remains an important option, particularly when newer techniques are unavailable or contraindicated.[8]

Despite the availability of these diverse interventions, there is paucity of comparative data evaluating their relative effectiveness in optimizing surgical outcomes. Moreover, variations in surgical expertise, institutional resources and patient related factors further underscore the need for evidence based stratification of these approaches. This study aims to bridge this gap by systematically analyzing the outcomes of various innovative surgical strategies employed in the management of MAP. By comparing key surgical and clinical indicators across different operative modalities, this research seeks to identify contextually feasible and effective techniques that minimize maternal morbidity.

METHODOLOGY

This prospective longitudinal multi centered study was conducted at the Gynecology and Obstetrics Departments of four Combined Military Hospitals, CMH Sialkot, CMH Quetta, CMH Kharian and CMH Rawalpindi after approval from Ethical Review Committee (ERC/27/2025 dated July 2025 {CMH Sialkot}, CMH-QTA-IERB/106/2025 dated 14 july 2025 {CMH Quetta}, A/25/52 dated june 2025 {CMH Kharian}, ERC Cert No 892 dated 25 June 2025 {CMH Rawalpindi}).

Inclusion Criteria: Women aged between 25 to 40 years, gestational age between 34 to 37 weeks, confirmed cases of MAP at delivery were included (both emergency and elective cesarean cases).

Exclusion Criteria: Suspected cases, focal accreta and placenta praevia without evidence of morbid adherence were excluded from the study and so were patients with other co-morbidities.

A total of 252 women aged 25–40 years with prenatally confirmed MAP [via ultrasound (grey scale with Doppler) and/or MRI, done by consultant radiologist], who underwent cesarean section between 34 to 37-weeks' gestation, were included. The sample size was determined based on an anticipated prevalence of morbidly adherent placenta (MAP) of 5%,[10] Non-probability convenient sampling technique was used.

Patients were admitted one to two days before surgery. Multidisciplinary liaisons were made with urologist, anesthesiologist, vascular surgeon, neonatologist and hematologist. Blood products were arranged. High risk consent was taken from patients including consent for hysterectomy, multiple transfusions, visceral injury, intensive care admission and ventilatory support. Choice of anesthesia was made by the anesthesiologist. Abdomen was opened through infraumbilical midline incision. Bladder was carefully separated from uterus. Hysterotomy and fetal extraction were performed away from the invaded area. Following delivery of the fetus and clamping of the umbilical cord, no attempts were made to remove/detach the placenta and uterine incision was closed with Vicryl 1 suture.

Uterus was then exteriorized and patients underwent one of the following five surgical procedures, Bilateral internal iliac artery ligation followed by hysterectomy, Hysterectomy followed by bilateral internal iliac artery ligation, Hysterectomy alone, Placenta left in situ followed by Inj Methotrexate, BIIAL followed by partial myometrial resection of focal adherent placenta (Uterus was preserved in patients undergoing this procedure).

Bilateral internal iliac artery ligation was performed by accessing the retroperitoneal space after incising the peritoneum medial to the infundibulopelvic ligament. The common iliac artery was traced to its bifurcation, and the internal iliac artery was carefully isolated approximately 2–3 cm distal to its origin. The anterior division was encircled using a right-angle clamp, and a Vicryl 1 suture was passed and securely tied without transecting the artery. The same steps were repeated on the opposite side to achieve bilateral ligation.

The choice of surgical method was guided by intraoperative findings, type of placental adherence, accessibility to internal iliac vessels, BMI, degree of postpartum hemorrhage, parity, age of patient, blood group and blood product availability, medical/surgical comorbidities and institutional protocols. Patients undergoing the five surgical procedures were divided into five groups and in all the groups, the following outcomes were assessed. Primary outcomes were Number of blood product transfusions (packed red cells, FFP, platelets), Operative time (hours), Duration of hospital stay (days), Re-laparotomy rates. Secondary outcomes were Postoperative sepsis (as per CDC criteria). Sepsis

was identified using the Centre for Disease Control and prevention (CDC) Adult Sepsis Event (ASE) definition. A case was classified as sepsis if it met the following two criteria: A blood culture order, indicating suspected infection and evidence of acute organ dysfunction within ± 2 days of the culture order. This definition was applied based on clinical, laboratory and treatment data available in-patient records and is consistent with CDC surveillance methodology,[11] (Figure).

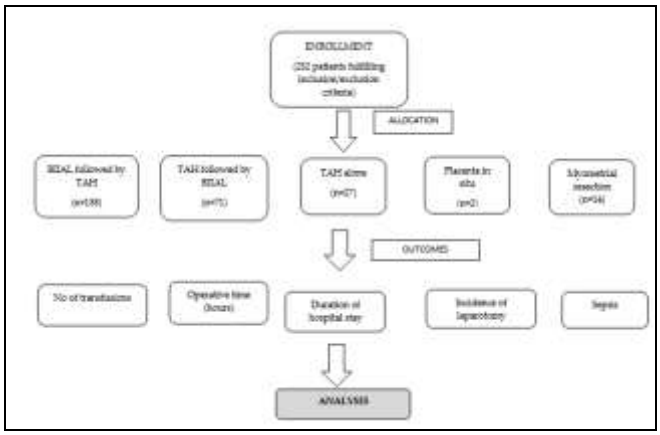

Figure: Patient flow diagram (n=252)

All data were analyzed using Statistical Package for the Social Sciences (SPSS) version 20. Continuous variables, including maternal age, gestational age, body mass index (BMI), duration of surgery, hospital stay, and units of blood transfused, were found to be normally distributed thus expressed as Mean±SD. Categorical variables, such as parity, previous cesarean section, history of placenta previa, type of surgical procedure, postoperative complications (sepsis, re-laparotomy), were summarized as frequencies and percentages.

As data was found to be normally distributed with equal variances, so analysis of variance (ANOVA-one way) was applied, as it allows assessment of differences in mean values (e.g., mean surgery time, mean hospital stay, mean blood transfusion units) among more than two groups. A two-sample t-test was used to compare the mean difference between two independent groups, such as when analyzing selected continuous outcomes between pairs of surgical procedures. The Chi-square test was employed to compare categorical variables, such as the distribution of complications (sepsis, re-laparotomy) across different surgical groups, in order to determine whether differences in proportions were statistically significant. The *p*-value of ≤ 0.05 was considered statistically significant.

RESULTS

A total of 252 patients were included in the study. The age group ranged between 26 to 40 years (Mean 34.4 years ± 3.3), the gestational age was between 34 to 37 weeks (Mean 35.6 weeks ± 0.94) and the mean BMI was 29.6 Kg/m2± 1.9. Among these patients, 148 women (58.7%) had a parity ≥3 and 181 (72%) of them had ≥2 previous cesarean section. Among the patients, 40 (16%) had previous history of placenta previa.

The distribution of surgical procedures performed is shown in Table-I. The most frequently performed procedure was bilateral internal iliac ligation (BIIL) followed by total abdominal hysterectomy. (TAH) in 138 patients (54.8%), TAH followed by BIIL in 71 patients (28.2%). Other approaches included TAH alone in 27 cases (10.7%), myometrial resection in 14 cases (5.6%), and leaving placenta in situ with injection methotrexate in 2 cases(0.8%).

Table-I: Comparison of Surgical Procedures (n=252)

Surgical Procedures	n (%)
Bilateral Internal Iliac Ligation followed by Hysterectomy	138(54.8%)
Hysterectomy followed by Bilateral Internal Iliac ligation	71(28.2%)
Hysterectomy Alone	27(10.7%)
Leaving Placenta followed by Inj Methotrexate	2(0.8%)
Myometrial Resection	14(5.6%)

There were 5 cases (1.98%) of postoperative sepsis: 3 cases (60%) in patients with placenta left in situ + methotrexate, 1 case (20%) following myometrial resection, 1 case (20%) following hysterectomy alone.

Additionally, 8 patients (3.17%) required re-exploration surgery: 3 cases (2.17%) in BIIL followed by hysterectomy, 1 case (3.7%) after hysterectomy alone, 2 cases (100%) in patients with placenta left in situ, 2 cases (14.2%) following myometrial resection.

Comparison of different surgical procedures in terms of operative time, hospital stay, and blood transfusion requirements is presented in Table-II.

Table-II: Perioperative Outcomes of Different Surgical Procedures (n=252)

	Bilateral Internal Iliac Ligation followed by hysterectomy (n=138)	Hysterectomy Followed by Bilateral Internal Ligation (n=71)	Hysterectomy Alone (n=27)	Myometrial Resection (n=14)	Leaving Placenta followed by Methotrexate (n=2)
Surgical Time (min)(Mean±SD)	120.00 ±0.58	125.00± 0.60	141.00±0.60	110.00 ±0.50	70.00 ±0.30
Hospital Stay (days) (Mean±SD)	3.50± 0.73	3.80± 0.50	5.20 ±0.60	6.00±0.64	13.00± 1.40
Blood Products Transfused (Mean±SD)	3.40 ±0.80	5.80± 1.40	6.14 ±1.32	6.00± 1.30	6.50±0.70
p-value	<0.001	<0.001	<0.001	<0.001	<0.001

Among the different surgical approaches, bilateral internal iliac ligation followed by hysterectomy appeared to be the most employed (54.7%) and may reflect a preferred strategy for optimal bleeding control. Conversely, higher blood product requirements were observed in patients undergoing hysterectomy followed by internal iliac ligation, myometrial resection and leaving placenta in situ, as compared to bilateral internal iliac ligation followed by hysterectomy (p<0.001). The mean hospital stay when placenta was left in situ was significantly higher (p<0.001) than the other procedures suggesting prolonged postoperative recovery time.

DISCUSSION

Morbidly adherent placenta (MAP) continues to pose a significant obstetric risk, primarily due to massive hemorrhage and related complications.[12] In our study among the interventions evaluated, those incorporating bilateral internal iliac artery ligation; either before or after hysterectomy, were associated with reduced intraoperative blood loss and improved hemostatic control. A study at a tertiary care hospital in Pakistan in 2023 identified prior cesarean sections and placenta praevia as key maternal risk factors for morbidly adherent placenta, with most cases requiring hysterectomy and presenting significant complications such as bladder injury.[13] A variety of interventions have been employed to manage life threatening postpartum hemorrhage in cases of morbidly adherent placenta, including cervical lift off sutures, uterine tamponade, compression sutures, vascular ligation of uterine and internal iliac arteries, balloon occlusion techniques and in severe cases hysterectomy.[14,15] In morbidly adherent placenta, persistent bleeding may occur despite uterine artery ligation due to continued perfusion from cervical and vaginal arteries supplying the lower uterine segment. Internal iliac artery ligation is effective in controlling refractory hemorrhage as it reduces blood flow to all these vessels.[16] Another study demonstrated that performing bilateral internal iliac artery ligation during cesarean delivery for placenta praevia significantly reduced the need for hysterectomy.[17] Our study aimed to compare maternal outcomes across five surgical strategies and identify the most effective approach in minimizing morbidity and optimizing recovery. Our findings strongly suggest that bilateral internal iliac artery ligation (BIIAL) prior to or after hysterectomy reduces blood loss, shortens hospital stay, and decreases the incidence of serious postoperative complications. Similar findings were reported by a meta-analysis of 795 patients in 2022, which showed that internal iliac artery ligation in combination with uterine tamponade minimized bleeding, yielded lower hysterectomy rates and reduced overall morbidity.[18]

A recent prospective study demonstrated that performing bilateral internal iliac artery ligation (BIIAL) prior to hysterectomy in cases of placenta accreta significantly reduced intraoperative blood loss, minimized transfusion requirements and provided a more controlled surgical field by lowering pelvic arterial perfusion.[19] Our results support this: women undergoing BIIAL before hysterectomy required significantly fewer blood products compared to those who had hysterectomy first. This led to somewhat longer operative time as compared to procedures where vascular ligation was not performed (although not statistically significant) but translated into a shorter hospital stay and reduced need for re-laparotomy.

Postoperative complications such as sepsis was also lower in the BIIAL-hysterectomy group (although not statistically significant). These improvements may

be attributable to better hemostatic control and reduced surgical trauma, both of which contribute to lower systemic inflammation and faster recovery. The traditional approach of performing hysterectomy before BIIAL, although still commonly practiced, was associated with greater blood loss, higher morbidity, and longer hospital stays. Similar findings were noted in a recent research, who reported that performing hysterectomy before internal iliac artery ligation was associated with higher intraoperative blood loss and increased morbidity, underscoring the advantages of internal iliac artery ligation.[20]

A quasi experimental study on 77 patients with PAS, conducted at a teriary care hospital of Pakistan in 2024,[21] compared maternal outcomes when BIIAL was performed before or after obstetric hysterectomy. They found that BIIAL before hysterectomy was associated with reduced incidence of severe post operative anemia (p=0.006) Conservative strategies such as leaving the placenta in situ, while used in select cases, showed poor outcomes in our sample, with high rates of sepsis and reoperation. Both cases where placenta was left in situ had to be re-operated later and a delayed hysterectomy had to be performed. A review in 2021 on conservative management options of PAS, reported that expectant management of Placenta accreta spectrum via leaving the placenta in situ was associated with a high complication rate (56-87.5%), including postpartum hemorrhage, infection, sepsis and coagulopathies often necessitating delayed hysterectomy.[22] This was similar to the outcomes in our study.

Myometrial resection following BIIAL, although used in a small cohort, showed moderate outcomes but did not outperform BIIAL followed by hysterectomy. A study in 2021 reported resection of placenta along with invaded myometrium en bloc as the resective-constructive surgery. They reported 81.5% efficacy of the procedure where placental invasion was into the upper, posterior bladder, with lower success rates in cases with deeper/parametrial invasion, low posterior bladder involvement and accompanying fibrosis.[22]

These findings align with recent literature emphasizing the benefits of pelvic devascularization prior to surgical excision in MAP cases. However, despite these advantages, the BIIAL procedure requires surgical expertise and may not be feasible in all settings, especially where trained personnel or institutional protocols are lacking. Timely antenatal diagnosis of morbidly adherent placenta, along with a well-planned surgery and a coordinated multidisciplinary approach can, no doubt, significantly lower maternal morbidity and mortality.[23] Further prospective studies are warranted to establish standardized protocols that optimize maternal outcomes while minimizing complications such as re-laparotomy and postoperative sepsis.

CONCLUSION

This study highlights the variability in clinical outcomes associated with different surgical approaches for managing morbidly adherent placenta during cesarean section. Among the interventions evaluated, those incorporating bilateral internal iliac artery ligation; either before or after hysterectomy, were associated with reduced intraoperative blood loss and improved hemostatic control. However, each surgical method carries distinct risks and benefits, underscoring the importance of individualized surgical planning based on patient condition, surgical expertise, and available resources.

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Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

SS & UG: Conception, study design, drafting the manuscript, approval of the final version to be published.

UU & SK: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Einerson BD, Gilner JB, Zuckerwise LC. Placenta Accreta Spectrum. Obstet Gynecol 2023; 142(1): 31-50. https://doi.org/10.1097/AOG.0000000000005229
2. Selby Chacko K, AlSubeaei RS, Sunil Nair S, Khalil Kazi N, Jeddy R. Maternal and Clinical Outcomes of Placenta Accreta Spectrum: Insights from a Retrospective Study in Bahrain. Life 2025; 15(6): 978. https://doi.org/10.3390/life15060978
3. Tahseen H, Khokhar S, Qurban S, Khurshid N, Tayyab M, Muneer N et al. Morbidly adherent placenta in patients with placenta praevia and fetomaternal outcomes. J Soc Obstet Gynecol Pak 2023; 13(2): 69-72.
4. Alves ALL, Silva LBD, Costa FDS, Rezende GC. Management of placenta accreta spectrum. Rev Bras Ginecol Obstet 2021; 43(9): 713-723. https://doi.org/10.1055/s-0041-1736371
5. Clark SL, Hankins GD. Preventing maternal death: 10 clinical diamonds. Obstet Gynecol 2012; 119(02): 360–364. https://doi.org/10.1097/AOG.0b013e3182411907

6. Horng, HC, Lai MJ, Chang WH, Wang PH. Placenta accreta spectrum (PAS) and peripartum hysterectomy. Taiwan J Obstet Gynecol 2021; 60(3): 395–396. https://doi.org/10.1016/j.tjog.2021.03.001
7. D'Souza DL, Kingdom JC, Amsalem H, Beecroft JR, Windrim RC, Kachura JR, et al. Conservative management of invasive placenta using combined prophylactic internal iliac artery balloon occlusion and immediate postoperative uterine artery embolization. Can Assoc Radiol J 2015; 66(2): 179-184. https://doi.org/10.1016/j.carj.2014.08.002
8. Kostov S, Kornovski Y, Watrowski R, Slavchev S, Ivanova Y, Yordanov A. Internal Iliac Artery Ligation in Obstetrics and Gynecology: Surgical Anatomy and Surgical Considerations. Clin Pract 2023; 14(1): 32-51. https://doi.org/10.3390/clinpract14010005
9. Nieto-Calvache AJ, Vergara-Galliadi LM, Rodriguez F, Ordonez CA, Garcia AF, Lopez MC, et al. A multidisciplinary approach and implementation of a specialized hemorrhage control team improves outcomes for placenta accreta spectrum. J. Trauma Acute Care Surg 2021; 90(5): 807–816. https://doi.org/10.1097/TA.0000000000003090
10. Liu X, Wang Y, Wu Y, Zeng J, Yuan X, Tong C, et al. What we know about placenta accreta spectrum (PAS). Eur J Obstet Gynecol Reprod Biol 2021; 259: 81-89. https://doi.org/10.1016/j.ejogrb.2021.02.001
11. Rhee C, Dantes R, Epstein L, Murphy DJ, Seymour CW, Iwashyna TJ, et al. Incidence and trends of sepsis in US hospitals using clinicals vs claims data, 2009-2014. JAMA 2017; 318(13): 1241-149. https://doi.org/10.1001/jama.2017.13836
12. Abdelhafez MMA, Ahmed KAM, Mohd Daud MNB. Placenta Accreta Spectrum: A Current Literature Review. J Diag Med Sonog 2023; 39(6): 599-613. https://doi.org/10.1177/87564793231185059
13. Rehan S, Tabassum H, Tufail S, Nawaz Q, Mushtaq N, Khan AA. Maternal factors and complications associated with morbidly adherent placenta: an experience at a tertiary care hospital in Pakistan. Pak Armed Forces Med J 2023; 73(3): 866-869. https://doi.org/10.51253?pafmj.v73i3.9113
14. Zhang LL, Wang WH, Hou YL. Analysis of the risk factors for massive hemorrhage in pernicious placenta previa and evaluation of the efficacy of internal iliac artery balloon occlusion. Int J Womens Health 2022; 14(1): 1769-1776. https://doi.org/10.2147/IJWH.S379965
15. Zhou M, Chen M, Zhang L, He GL, He L, Wei Q, et al. Severe adverse pregnancy outcomes in placenta praevia and prior caesarian delivery. J Sichuan Univ 2017; 48(5): 783-787.
16. Joshi VM, Otiv SR, Majumder R, Nikam YA, Shrivastava M. Internal iliac artery ligation for arresting postpartum hemorrhage. Br J Obstet Gynaecol 2007; 114(3): 356-361. https://doi.org/10.1111/j.1471-0528.2006.01235.x
17. Madhubala M. Bilateral internal iliac artery ligation, a rational choice of surgery in placenta previa: a hospital-based retrospective study on prevention of hysterectomy and control of postpartum hemorrhage. J Obstet Gynaecol India 2019; 69(6): 535–540. https://doi.org/10.1007/s13224-019-01258-8
18. Nabhan AE, Abdel Qadir YH, Abdelghafar YA, Kashbour MO, Salem N, Abdelkhalek AN, et al. Therapeutic effect of internal iliac artery ligation and uterine artery ligation techniques for bleeding control in placenta accreta spectrum patients: A meta-analysis of 795 patients. Front Surg 2022; 9: 983297. https://doi.org/10.3389/fsurg.2022.983297
19. Mohamed AH, Mohammed BA, Yousef KM. The role of bilateral internal artery ligation in minimizing blood loss prior to caesarian hysterectomy in patients with abnormally invased placenta. Al-Azhar Int Med J 2024; 5(2); 313-320. https://doi.org/10.58675/2682-339X.2272
20. Kingdom JC, Hobson SR, Murji A, Allen L, Windrim RC, Lockhart E, et al. Minimizing surgical blood loss at cesarean hysterectomy for placenta previa with evidence of placenta increta or percreta: the state of play in 2020. Am J Obstet Gynecol 2020; 223(3): 322–329. https://doi.org/10.1016/j.ajog.2020.01.044
21. Saleem U, Arif N, Ahmed RQ. Surgical Strategies in Placenta Accreta Spectrum; A Quasi-experimental study. Pak Armed Forces Med J 2024; 74(1): 108-112. https://doi.org/10.51253/pafmj.v74i1.11098
22. Abbas RA, Nassar AH. Placenta Accreta Spectrum: Conservative Management and Its Impact on Future Fertility. Maternal Fetal Med 2021; 3(4): 263–267. https://doi.org/10.1097/FM9.0000000000000077
23. Shahab U, Naqvi Z. Maternal factors and complications associated with morbidly adherent placenta. J Surg Pakistan 2017; 22(3): 105-108.http://doi.org/10.21699/jsp.22.3.9