

# Peripartum hysterectomy clinical characteristics and outcomes- a hospital based retrospective audit study

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## ABSTRACT

**Introduction:** The study aims to evaluate and report on the clinical characteristics, incidence, risk factors and associated complications of emergency and planned peripartum hysterectomy in a single training and research tertiary health care centre in Malaysia.

**Materials and Methods:** We conducted a 6-year retrospective cross-sectional study from the 1st January 2016 until 31st December 2021. Clinical, demographic characteristics, perioperative parameters, operative indications, blood loss, maternal/neonatal outcomes and complications were analysed. Patients were subdivided, analysed and studied in two subgroups- emergency hysterectomy (EH) and planned hysterectomy (PH).

**RESULTS:** There were 65 cases of peripartum hysterectomy out of total 100,567 deliveries, with a prevalence rate of 0.06%. Overall, the majority of patients were multiparous (96.9%), having previous caesarean scar (73.8%) or diagnosed with placenta praevia (75.4%). More than half of the total patients (61.5%) have both previous caesarean scar and concomitant placenta praevia. EH was carried out in 39(60%) patients while 26(40%) patients underwent PH. The only indication for surgery in the PH group (100%) was abnormal placentation while the most common indication for surgery in the EH group (53.8%) was postpartum haemorrhage related to abnormal placentation. Patients who underwent EH were more likely to have massive blood loss ( $p=0.001$ ), require ICU admissions ( $p=0.001$ ), have DIVC cycles transfused (mean [SD] regime: 1.35 [0.95] vs 0.54 [0.99];  $p=0.002$ ), have lower postoperative haemoglobin level (mean [standard deviation, SD] haemoglobin: 9.23g/l [SD1.8] vs. 10.8 g/l [SD1.86];  $p=0.001$ ) and have higher difference between pre/post operative haemoglobin level (mean [SD] haemoglobin difference: 1.78g/l [SD6.34] vs 0.32g/l [SD1.7];  $p=0.008$ ) compared to patients with PH. Red blood cell transfusion, operating time, length of stay, weight of babies and Apgar score between two groups showed no significant differences. A significant reduction of blood loss between the first and the second half duration of the study (mean [SD] blood loss: 6978 ml [SD 4999.45] vs. 4100ml [SD2569.48];  $p=0.004$ ) was also observed. In the emergency group, 'non-placental cause' EH required significantly more

red blood cell transfusion than 'placental cause' ( $p<0.05$ ) while in the PH group, no significant difference was observed between the occlusive internal iliac artery 'balloon' and 'no balloon' subgroup in terms of operating time, total blood loss or blood transfusion. Overall complications showed more cases of post operative fever and re-laparotomy in the EH group (18.4% vs. 7.6%) while urinary tract injuries including injuries to bladder and ureter occurred only in the PH group (9.4% vs. 0%).

**Conclusion:** The majority of peripartum hysterectomy cases are due to placenta accreta spectrum disorders. Planned peripartum hysterectomies have a lower morbidity rate compared to emergency hysterectomies. Therefore, early identification of placenta accreta spectrum disorders and timely planning for elective procedures are crucial to minimise the need for emergency surgery.

## KEYWORDS:

*Elective peripartum hysterectomy, emergency peripartum hysterectomy, placenta accrete spectrum*

## INTRODUCTION

Peripartum hysterectomy is regarded as the most dramatic life-saving surgical venture in obstetrics. It is accompanied by substantial morbidity and mortality risk has been quoted to be more than 25 times compared to non-obstetric hysterectomy.<sup>1</sup> When this procedure is performed an emergency setting, it is usually done as a final resort to manage acute life-threatening haemorrhage. Emergency hysterectomy (EH) represents the most challenging complication that any obstetrician will ever face and even in the hands of the most experienced, EH could still be a formidable procedure to perform. This is largely due to the technical and operative difficulties resulting from pregnancy changes such as enlarged uterine and ovarian vessels, friable pelvic tissue, distortion of the anatomy, intrusion of the placenta into other organs in placenta percreta cases and scarring from previous caesarean sections.<sup>2</sup> In an emergency situation, the patient is also likely to be seriously ill.<sup>2</sup>

On the other hand, planned hysterectomy (PH) allows surgeons to prepare for the operation well ahead of time and

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allows optimisation of patients pre-operatively. Planned peripartum hysterectomy was mostly performed in the past for uterine fibroids, malignancy and for sterilisation purpose. However, in recent years most cases consist of placenta accreta spectrum (PAS) and uterine atony.<sup>3,5</sup> Although many studies show a reduction in blood loss, PH may still present a high complication rate due to the complex nature and surgical demands specific to the indications in this group.<sup>6</sup> Briery et al., in his study concluded that PH allows surgeons to prepare for safe surgical procedures and to prevent morbidities with no increase in intra-/postoperative complications.<sup>7</sup> A study by Oge et al. in 2022 asserted that peripartum hysterectomies, when planned and conducted by an experienced team, demonstrated a lower need for transfusions and yielded improved neonatal outcomes in comparison to their emergency counterparts.<sup>3</sup> However, some of these findings were contradictory.

Data comparing these outcomes in Malaysia are lacking. Therefore, the objective of this study was to evaluate the incidence, risk factors, outcomes, complications of peripartum hysterectomy cases and compare outcomes among emergency and PH in one of the main public tertiary hospitals in Malaysia. The study is anticipated to suggest timely interventions to improve the quality of care in women at risk of peripartum hysterectomy.<sup>8</sup>

## MATERIALS AND METHODS

This was a retrospective cross-sectional study on all patients who underwent either emergency or planned peripartum hysterectomy in our centre over a 6-year period. Hospital Sultanah Nur Zahirah is the only tertiary hospital in the state of Terengganu. It has the highest number of hospital births in Malaysia, handling close to 18,000 deliveries annually. Peripartum hysterectomy is defined as hysterectomy performed after 22 weeks of pregnancy, within 24 hours of the delivery of the baby. From the 1st January 2016 until 31st December 2021, medical records of all the patients who underwent peripartum hysterectomy were retrieved from the computerised hospital information system and patients who fulfilled the criteria were recruited into the study.

PH patients consisted of patients who were antenatally diagnosed with PAS by ultrasound and/or magnetic resonance imaging (MRI) during the study period. These patients were screened based on at least two risk factors including concomitant placenta praevia and previous caesarean scar. A single dedicated team managed all the PH cases while EH cases were managed by the on-call team of the day. All hysterectomy specimens were sent for histopathological examination.

Demographic parameters, preoperative variables, operative indications, operating time, blood loss/transfusion, maternal and neonatal outcomes and complications were reviewed. The patients were further divided into the emergency and planned hysterectomy group and the outcomes were compared according to this categorisation. The definition of massive blood loss is bleeding that exceeds 2500 ml.<sup>9</sup> Patients in the EH group were further divided into subgroups 'placental' or 'non-placental' cause based on final

histopathological diagnosis. The patients in the PH group were categorised into 'balloon' and 'no balloon' subgroups depending on preoperative placement of occlusive balloon in the internal iliac artery.

Data analysis was performed using IBM SPSS (Statistical Package for Social Science) Version 27.0. Numerical variables were presented as means and standard deviations (SD) whereas categorical data were presented as frequencies and percentages. Statistical tests were done according to the aims of the study. Depending on the type of dependent variables, independent t test or chi square test were selected accordingly.

This study was approved by the Ministry of Health Medical Research Ethics Committee and the National Medical Research Registry (NMRR ID-23-01171-PUD).

## RESULTS

A total of 100,567 deliveries were recorded during the study period with a caesarean section rate of 21.78% comprising 21,905 cases. A total of 65 patients were identified to have undergone peripartum hysterectomy with a prevalence rate of 0.06%. EH contributed to 60% (39 cases) of the cases while 26 cases (40%) were planned cases (PH).

Overall, the majority of patients were multiparous (96.9%), having previous caesarean scar (73.8%) or diagnosed with placenta praevia (75.4%). More than half of the total patients (61.5%) have both previous caesarean scar and concomitant placenta praevia. In the PH group, 16 (65%) patients had preoperative internal iliac artery balloon occlusion (IIABO) performed by visiting interventional radiologists while another 10 patients underwent elective operation without IIABO.

From the perspective of diagnosis, out of the total of 47 PAS patients, 39 patients fulfilled the screening criteria and were screened for PAS during the pregnancy while eight patients were not screened. Correct diagnosis was made in 84.6% (33/39) patients. The remaining 15.4% (6/39) patients proved to have placenta accreta (4/6) and placenta increta (2/6) on the final histological diagnosis. In the EH group, one fifth of patients (7/33) who were already diagnosed with PAS and planned for PH, developed bleeding or contraction before the elective date necessitating emergency operation.

We subsequently conducted a sub analysis to review the cases in the emergency and planned peripartum hysterectomy groups. The most common indication for hysterectomy in both EH and PH was abnormal placentation with 53.8% and 100% cases respectively (Table I). Histologically, placenta accreta is the most common abnormal placentation in EH (47.6%) while placenta percreta is the most common abnormal placentation in PH (57.7%) leading to hysterectomy. The next common indication for EH was uterine atony (20.5%) and ruptured uterus (10.3%) (Table I).

There was no significant difference in age, parity, gestational age and baseline haemoglobin level between two groups (Table II). In the EH group, only eight patients underwent

**Table I: Indications for peripartum hysterectomy**

	<b>Emergency hysterectomy (EH) n=39 [n (%)]</b>	<b>Planned hysterectomy (PH) n=26 [n (%)]</b>	<b>Overall n=65 [n (%)]</b>
<b>Placenta accreta spectrum (PAS):</b>			
Accreta	10(25.6)	2(7.7)	12(18.5)
Increta	8(20.5)	9(34.6)	17(26.2)
Percreta	3(7.7)	15(57.7)	18(27.7)
<b>Total PAS*</b>	<b>21(53.8)</b>	<b>26(100)</b>	<b>47(72.3)</b>
<b>Uterine atony</b>	<b>8(20.5)</b>	<b>0(0)</b>	<b>8(12.3)</b>
<b>Uterine rupture</b>	<b>4(10.3)</b>	<b>0(0)</b>	<b>4(6.2)</b>
<b>Others:</b>			
Extensive cervical tear	1(2.6)	0(0)	1(1.5)
Cervical tear and atonic uterus	1(2.6)	0(0)	1(1.5)
Extended tear	1(2.6)	0(0)	1(1.5)
Broad ligament haematoma	1(2.6)	0(0)	1(1.5)
Bleeding post emergency myomectomy	1(2.6)	0(0)	1(1.5)
Placenta praevia	1(2.6)	0(0)	1(1.5)
<b>Total others:</b>	<b>6(15.4)</b>	<b>0(0)</b>	<b>6(9.2)</b>

\*PAS, Placenta accreta spectrum

**Table II: Demographic data, mode of delivery, perioperative parameters and outcomes**

	<b>Emergency hysterectomy (EH) n=39 [mean (SD)]</b>	<b>Planned hysterectomy (PH) n=26 [mean (SD)]</b>	<b>p-value</b>
<b>Demographic data</b>			
Age (years)	35.52(5.19)	36.12(4.75)	0.637
Parity	3.78(1.45)	3.77(1.44)	0.890
Mean gestation (weeks)	36.23(3.17)	35.19(1.96)	0.141
<b>Mode of delivery</b>			
Vaginal	8(20.5)	0(0)	0.014*
Caesarean	31(79.5)	26(100)	
<b>Neonatal outcome</b>			
Birth weight (grams)	2652.71(58.07)	2500.90(453.3)	0.308
Apgar score @ 1 min	7.76(1.95)	8.04(1.91)	0.59
Apgar score @ 5 mins	8.58(1.60)	8.48(1.75)	0.83
<b>Perioperative parameters</b>			
Pre-operative haemoglobin(g/dl)	10.99(1.76)	11.09(1.29)	0.794
Red blood cell transfusion (pints)	5.82(3.49)	3.96(5.52)	0.101
Postoperative haemoglobin (g/dl)	9.23(1.81)	10.8(1.86)	0.001*
Difference pre/postoperative Hb (g/dl)	1.78(2.27)	0.32(1.70)	0.008*
Duration of hospital stay (days)	7.84(6.34)	7.84(5.87)	1.00
Temperature (°Celsius)	37.42(0.47)	37.27(0.19)	0.148
Transfusion of DIVC cycles*	1.35(0.95)	0.54(0.99)	0.002*
<b>Blood loss n (%)</b>			
≥2.5 litres	37(94.9)	15(57.7)	
<2.5 litres	2(5.1)	11(42.3)	
N	39	26	
Chi square		13.48	
P			<b>0.001*</b>
Prevalence ratio (95%CI)		1.64(1.17-2.31)	
<b>ICU n (%)</b>			
ICU admission	29(74.4)	6(23.1)	
No ICU admission	10(25.6)	20(76.9)	
N	39	26	
Chi square		16.51	
P			<b>0.001*</b>
Prevalence ratio (95%CI)		3.22(1.56, 6.66)	

\*DIVC defined as transfusion of six units cryoprecipitate, four units fresh frozen plasma and four units platelets)

**Table III: Comparing planned hysterectomy (PH); with or without balloon tamponade and emergency hysterectomy (EH); placental or non-placental cause**

	Planned Hysterectomy (PH)				T	df	p
	Balloon		No balloon				
	n	Mean SD	N	Mean SD			
Operating time (minutes)	17	150.12(47.53)	9	186.22(91.45)	-1.33	24	0.194
Blood loss (ml)	17	3000(3200)	9	2500(12500)	-0.83	-	0.403
Blood transfusion (pints)	17	2.53(2.74)	9	6.67(8.22)	-1.47	8.95	0.176
	Emergency Hysterectomy (EH)				T	df	p
	Placental cause		Non placental				
	n	Mean SD	N	Mean SD			
Operating time (minutes)	23	247.00(243.16)	16	318.7(275.06)	-0.85	37	0.396
Blood loss (ml)	23	6500(4000)	16	5250(4625)	-	-	0.877
Blood transfusion (pints)	23	5.00(2.58)	16	7.19(4.12)	-2.03	37	0.049*

**Table IV: Pattern of estimated blood loss in 1st half and 2nd half of the 6 years study duration**

Year	N	Estimated blood loss [mean (SD)]	T	p-value
2016-2018	37	6978.38(4999.45) ml	3.015	0.004*
2019-2021	28	4100.00(2569.48) ml		

**Table V: Intraoperative and postoperative complication**

No	Complications	Planned Hysterectomy (PH) (n=26)	Emergency Hysterectomy (EH) (n=39)	% of total cases
1	Post operative fever	3	8	16.9
2	Re-laparotomy	2	4	9.2
3	Bladder injury	4	0	6.1
4	Ureteric injury	2	0	3.1
5	Vascular injury	1	1	3.1
6	Intra-abdominal sepsis	0	1	1.5
7	Deep vein thrombosis	1	0	1.5
8	Splenic injury	0	1	1.5
9	Pulmonary embolism	0	1	1.5
10	Transfusion related acute lung injury (TRALI)	0	1	1.5

vaginal deliveries while the majority of patients (79.5%) had caesarean deliveries which culminated into hysterectomies due to intractable haemorrhage (Table II).

Patients in the emergency group EH had significantly lower postoperative haemoglobin level, higher difference between pre/post operative haemoglobin level and higher DIVC cycles transfusion rate compared to the patients in the planned group PH (p value <0.05) (Table II). However, there was no significant difference in duration of hospital stay, red blood cell transfusion and postoperative fever. There were no cases of maternal mortality found in both the groups during the study period.

There were no differences in the neonatal outcomes between the two groups with the mean birth weight of 2652.71gm (SD58.07) in the EH group and 2500gm (SD453.3) in the PH group (Table II). There was also no significant difference between the APGAR score of these babies at 1 minute and 5 minutes of life. There were no cases of perinatal mortality during the study period in both groups.

Significantly more patients in the EH group suffered from massive blood loss as compared to patients in the PH group (p=0.001) and majority of them also required postoperative intensive care unit (ICU) admissions (p=0.001) (Table II).

When operating time, blood loss and blood transfusion were compared between subgroups of patients in EH and PH, non-placental cause EH required more blood transfusion (p<0.05) and cases of PH with balloon (IIABO) on average showed more blood loss but did not reach statistically significant difference (Table III).

We also looked into comparing the estimated intraoperative blood loss for patients who underwent peripartum hysterectomy between the years 2016-2018 and the years 2019-2021 and found a significant reduction of blood loss between two groups (Table IV). The mean blood loss in the first 3 years was 6978.38 ml (SD 4999.45) while the mean blood loss for the last 3 years was 4100 ml (SD2569.48).

Regarding overall complications, there were more cases of postoperative fever and re-laparotomy in the EH group (18.4% vs. 7.6%) while urinary tract injuries including

injuries to bladder and ureter occurred only in the PH group (9.4% vs. 0%) (Table V).

## DISCUSSION

The overall prevalence rate of peripartum hysterectomy in our study was 0.6 for every 1000 deliveries. The rate for EH was lower at 0.38 for every 1000 deliveries. In the developed countries, the rate is generally less than 1 per 1000 deliveries while in the developing countries the rate between 1.5 to 6.9 per 1000 deliveries has been quoted.<sup>10-16</sup> A comprehensive meta-analysis involving almost 8000 women with peripartum hysterectomy worldwide has demonstrated an inverse correlation between the prevalence of peripartum hysterectomy and income setting whereby higher prevalence was associated with decreasing income setting and vice versa.<sup>4</sup>

We believe that the results of our study are reflective of other public hospitals in Malaysia. Our study demonstrated that the most common indication for peripartum hysterectomy were cases of abnormal placentation or PAS. This contrasts with a local study by Rachagan & Sivanesaratnam conducted a few decades ago, which identified uterine rupture and uterine atony as the most common indications for obstetric hysterectomy, a finding that was corroborated by international studies from the same period.<sup>17-20</sup> The decline in hysterectomy for these cases may be due to the advent of pharmacological and non-pharmacological therapeutics in producing efficient oxytocic drugs, balloon and suture tamponades, and also advanced radiological intervention. However, consistent with the global increase of caesarean section rate, the incidence of PAS disorders resulting in peripartum hysterectomy had increased accordingly. Other recent studies demonstrated similar findings.<sup>3,13,21</sup>

Our study demonstrated that fewer morbidities associated with planned as compared to emergency surgeries, consistent with other studies.<sup>3,7</sup> Massive blood loss is less likely to occur in planned cases. Mendoza et al. studied elective versus emergency peripartum hysterectomy exclusively in PAS cases and his team found lower blood loss in elective cases compared to emergency cases.<sup>22</sup> Echoing this, a study by Briery et al. conducted over 15 years ago, found that patients who underwent emergent caesarean hysterectomy were more likely to experience higher blood loss and require red cell transfusion.<sup>7</sup> However, in his study, most planned cases comprised of uterine fibroids and most emergency cases comprised of uterine atony.<sup>7</sup> Recent study by Oge et al. showed a similar cohort of patients like ours in the elective group but majority of his emergency cases were cases of atonic uterus (57.1%).<sup>3</sup> On the contrary, most of our emergency cases (53.8%) were PAS cases.

Ideally, all the PAS cases should be identified during pregnancy to allow for planned elective operations. In our study, our screening protocol successfully detected 84.6% of PAS cases, but it's crucial to note that six undiagnosed cases led to severe complications. These included total blood loss exceeding 5 l, high morbidity, two instances requiring relaparotomy, one bladder injury, and ICU admissions for all the affected cases. In each of these situations, the attempted

removal of the placenta increased morbidity, as evidenced in the study by Ellar et al.<sup>23</sup> Adherent placenta can be diagnosed with the use of ultrasound with a sensitivity of 89.5%, as reported by Esakoff et al.<sup>24</sup> Similarly, a large systematic review in 2013 involving 3,707 pregnancies noted an average sensitivity of 90.72% (95%CI 87.2, 93.6).<sup>25</sup> Interestingly in one study where the investigators were blinded to the clinical risk factors of PAS, the diagnostic sensitivity of ultrasound was reduced to 53.5%.<sup>26</sup> The cases which were misdiagnosed were mainly of the least invasive form of PAS. It is not surprising therefore to observe that most of our elective cases were cases of placenta praevia and most of our emergency cases were cases of placenta accreta.

Our current screening protocol mandates detail sonographic assessment by a senior maternal foetal medicine (MFM) consultant to exclude PAS in patients with both previous caesarean scar and concomitant placenta praevia.<sup>27</sup> A total of eight patients in our study were not screened for PAS as they had only a single risk factor. While it's not feasible to screen all patients, one should look for evidence of PAS even during a routine ultrasound examination. MRI on the other hand has an excellent diagnostic accuracy in identifying the depth and the topography of placental invasion.<sup>28</sup> The threshold to request for MRI examination should be low in cases with doubtful ultrasound findings.

The current guideline from RCOG is to deliver patient with PAS at 35+0 to 36+6 weeks in the absence of preterm delivery risk while ACOG recommends delivery between 34+0 to 35+6 weeks.<sup>29,30</sup> Pettit et al., in 2019 found that one third of the cases of placenta accreta diagnosed prenatally in his study were still delivered in an unplanned manner.<sup>31</sup> Our experience showed that despite already being diagnosed, one fifth (7/33) of the cases underwent emergency operation before the elective date. Most cases (5/7) had bleeding or went into labour after 34 weeks. The overall neonatal outcome at 34 weeks in most major centres throughout the country is excellent.<sup>32</sup> Among the proposed strategies to reduce emergency cases is the consideration of earlier delivery of PAS cases at 34 weeks, yet this decision should be individualised, considering factors such as previous antepartum haemorrhage, shortened cervical length, preterm premature rupture of membranes (PPROM), and the presence of uterine contractions.

Subgroup analysis in our study showed that non placental cause EH required more blood transfusion than placental cause EH ( $p < 0.05$ ) despite lesser blood loss. Non placental cause EH include cases of ruptured uterus and cervical tear amongst other causes which could cause torrential bleeding in a short time interval. Anticipating such complication could have resulted in overzealous resuscitation. Conversely, cases of PH with occlusive balloon showed more blood loss on average although the difference did not reach statistical significance. This could be due to the fact that majority of cases selected for pre-operative IIABO were the more severe degree of placental invasion e.g., placenta praevia.

One interesting observation in this study is a significant reduction in massive blood loss as observed in the last three years. This trend is related to an emphasis on

multidisciplinary management planning, availability of better and more advanced resuscitative equipment, initiation of massive transfusion protocol (MTP), and practice of early administration of antifibrinolytics during haemorrhage.

The strengths of this study include having the same dedicated team who managed all planned hysterectomies, and all cases were managed in only one tertiary centre. Despite analysing 6 years of data, the study has several limitations. These include a small sample size, the retrospective design of the study, and crucially, the diverse indications for surgery and varying severity of PAS cases in both planned and emergency situations. These differences, particularly in the clinical context of the cases, may have influenced the outcomes and should be considered when interpreting the results.

### CONCLUSION

In conclusion, planned peripartum hysterectomies markedly reduce morbidity compared to emergency procedures. Early detection of placenta accreta spectrum disorders coordinated care involving an experienced team, multi-disciplinary approach and the adoption of massive transfusion protocols are all crucial to minimising morbidity and enhancing patient outcomes in peripartum hysterectomies.

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### CONFLICT OF INTEREST

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