International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Makhija A et al. Int J Reprod Contracept Obstet Gynecol. 2022 May;11(5):1383-1390
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20221020

Original Research Article

Factors and outcome analysis of emergency peripartum hysterectomy in a tertiary care center catering to hilly terrain for a five-year period: a retrospective study

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Received: 22 March 2022
Accepted: 07 April 2022

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ABSTRACT

Background: Emergency peripartum hysterectomy (EPH) is a life-saving surgery associated with significant morbidity and mortality. In the state of Uttarakhand, due to the hilly terrain and poor ante-natal awareness, type 1 and 2 delay is expected in seeking health care. Thus, the present study was conducted in a tertiary care hospital to evaluate the incidence, risk factors, indications, and outcomes of EPH.
Methods: Medical records of 63 patients who underwent EPH from January 2015 to December 2019 were retrospectively analyzed for the patient characteristics, high risk factors, indications and type of hysterectomy and outcome.
Results: The incidence of EPH at our institute was 2.78 per 1000 deliveries. Most patients (89.89%) were referred cases. There were 4 home deliveries and 4 patients referred for obstructed labour. The average parity was 2.71±1.13. Thirty-four patients (53.97%) presented in the emergency department in shock. The leading indication was uterine atony (46.03%) followed by rupture uterus (26.98%) and placenta accreta spectrum (23.81%). All patients needed blood transfusion. Intensive care unit admission was required in 88.89%. The maternal mortality was 15.87%. All the three levels delays contributing to poor outcome were identified.
Conclusions: Uterine atony and rupture of non-scarred uterus due to obstructed labour were the prominent indications of EPH. Strengthening of referral system and timely referral of high-risk patients to a setup with facilities for management of high risk obstetric cases can play an important role in decreasing the incidence and morbidity and mortality of EPH.

Keywords: Peripartum hysterectomy, Uterine atony, Rupture uterus, Placenta accreta spectrum, Maternal mortality

INTRODUCTION

Emergency peripartum hysterectomy (EPH) is defined as a hysterectomy done at or within 24 hours of vaginal delivery or caesarean section for acute obstetric conditions unresponsive to conservative measures. It is performed as a life-saving measure and is associated with significant morbidity and mortality. The leading indications for EPH are uterine atony, rupture of uterus and placenta accreta spectrum.

In modern obstetrics, EPH complicates 1 per 1,000 deliveries.[1] There is considerable disparity in the incidence in different parts of the world, depending upon the standards of obstetric care. The rate of EPH has been reported to be ranging from 0.47 to 6.9 per thousand deliveries in India.[2-4]

Limiting the number of births through family planning services and increasing institutional deliveries have led to a decline in uterine rupture and atony, thereby reducing the need for EPH. With the availability of good uterotonic

drugs and blood products and the advent of advanced diagnostic modalities such as magnetic resonance imaging and procedures like hemostatic sutures and uterine artery embolisation, an obstetrician is well equipped to deal with life-threatening emergencies. Thus, a decrease in the rates of EPH is expected. However, rising caesarean section rates have led to placenta accreta spectrum (PAS) and scar rupture, thus, leading to an increase in EPH. A change in the prominent indication has been observed over the years and PAS has become the leading indication in the current scenario.[5]

Although advancements have occurred in obstetric management, not all centres are equipped to deal with such emergencies. Apart from blood bank facility and advanced intensive care unit, multimodal management with a team of skilled obstetrician, anesthetist, critical care physicians, and other trained staff is needed for the best outcome. Such facilities may not be available round the clock everywhere.

In the state of Uttarakhand, a significant part of the population resides in poorly accessible areas. Due to the hilly terrain, transportation facilities are poor, leading to type 2 delays in seeking medical help. Type 1 delay is also evident due to poor ante-natal awareness. Home deliveries are still a common practice. Thus, uterine atony and obstructed labour leading to uterine rupture may still play a leading role in maternal morbidity and mortality in this region.

The sample registration system 2015-2017 noted a decline of 6.2% in the maternal mortality rate of India. The state of Uttarakhand was ranked eighth among the Indian states, recording 89 deaths/100000 live births. Obstetric haemorrhage was the most typical cause of maternal death. EPH, done as a last resort surgery for intractable obstetric haemorrhage, has been considered a maternal near-miss event. The study of such events can provide an understanding of the burden of the problem and the standard of care in the state.

With this background, the present study was conducted to evaluate the incidence, risk factors, indications and outcomes of EPH in a tertiary centre of Uttarakhand. This would highlight the lack of availability and efficient utilisation of antenatal services, the need to identify avoidable risk factors, and organization health care services to reduce maternal morbidity and mortality.

METHODS

The present retrospective study was done in the obstetrics and gynaecology department of a tertiary care hospital in the Garhwal region of Uttarakhand from January 2015 to December 2019. Approval from the institutional review board was obtained. All the patients who underwent EPH or were referred to the institute after EPH during the study period were included. Patients who underwent hysterectomy before 20 weeks of gestation were excluded.

A total of sixty-three patients were included in the study. Medical case records of the patients were evaluated, and information was gathered regarding the demographic profile, high-risk factors, mode of delivery, the indication and type of hysterectomy and the associated morbidity and mortality.

The data were analyzed using SPSS software version 22.0. For categorical variables, data was compiled as frequency and percentage. For continuous variables, data were calculated as mean ± standard deviation.

RESULTS

Patient characteristics

The mean age of patients was 28.35±3.71 years (range 20 to 39 years). Most women (58.73%) were in the 20-29 years age group. The mean parity was 2.71±1.13 (range 1-6). Seven patients (11.11%) were booked, and 56 (88.89%) were referred, patients. Thirty-three patients (52.38%) were delivered elsewhere (Table 1).

Table 1: Distribution of demographic parameters of the patients, (n=63).

Parameters	N	Percentages (%)
Age (in years)		
<20	0	0.00
20-29	37	58.73
30-39	26	41.27
≥40	0	0.00
Parity		
1	7	11.11
2	22	34.92
3	22	34.92
4	8	12.70
≥5	4	6.35
Booking status		
Booked at our institute	7	11.11
Booked elsewhere	36	57.14
Unbooked patients	20	31.75
Place of delivery		
Our institute	30	47.62
Other hospital	29	46.03
Home	4	6.35
Patients referred after cesarean hysterectomy	3	4.76

Table 2 shows the clinicopathological characteristics. Twenty-seven patients (42.86%) had at least one previous cesarean delivery. No patient had undergone hysterotomy, myomectomy or manual removal of the placenta. Five patients had pre-eclampsia, two had jaundice, and one patient each had a large fibroid uterus, HCV reactive status, positive dengue serology, pacemaker in-situ, succenturiate placental lobe, polyhydramnios, gestational diabetes mellitus and pre-labour rupture of membranes. Delivery was vaginal in 27 patients (42.86%), by cesarean

section in 26 (41.27%) and by laparotomy in case of the ruptured uterus in 10 cases (15.87%).

Thirty-four patients (53.97%) presented in the emergency department in shock. The mean interval between delivery to hysterectomy was 2.59±5.7 hours for deliveries occurring at our institute (excluding cesarean hysterectomies and hysterectomy for secondary post-partum haemorrhage). The mean interval for patients referred to us after delivery was 11.70±15.49 hours.

Operative details

The operative details are listed in Table 3. Twenty-two patients (34.92%) underwent a total hysterectomy, and 41 patients (65.08%) had a subtotal (supracervical) hysterectomy. The commonest indication was uterine atony (46.03%). This group included patients with placenta previa without morbid adherence. Other causes of uterine atony were polyhydramnios, large uterine fibroid and placental abruption.

Rupture uterus was present in 17 cases (26.98%). The commonest site of rupture in the scarred uterus was the previous uterine scar with/without extensions. The lateral uterine wall was the commonest site in an unscarred uterus, seen in 7 of 9 cases. Broad ligament hematoma was associated in 8 cases and cervical or vaginal lacerations in 11. Of the 15 cases of PAS, 13 had previous cesarean sections (four had one, six had two, and three had previous cesarean sections), and 11 cases had previous cesarean sections with placenta previa.

A total hysterectomy was done at our institute for a patient with uncontrolled bleeding following an intra-cesarean myomectomy done at the referring hospital. Another patient underwent a subtotal hysterectomy for secondary PPH three weeks post-delivery. Among the patients who underwent unilateral salpingo-oophorectomy, reason was cited as infundibulopelvic ligament hematoma in one case.

Injury to the urinary tract was seen in 9 cases (14.28%). In all the cases operated at our institute, it was a bladder injury, which was repaired primarily. One patient who underwent EPH elsewhere was found to have an inadvertent ligation of one ureter. One patient had a small bowel injury.

Postoperative course

Table 4 summarizes the postoperative course. Intensive care unit (ICU) admission was required for 88.89%. Ventilatory support was needed in 84.13% and ionotropic support in 80.10%. Blood transfusion was done in all patients. Thirty-nine patients (61.90%) received more than four units of packed red blood cell (PRBC) transfusion. The mean number of PRBC transfused was 6.10±3.53 units (range 2-22 units). The mean number of fresh frozen plasma units transfused was 5.87±4.74 (range 0-25 units). The mean number of platelet units transfused was 3.95±4.71 (range 0-22 units). Six patients (9.52%) underwent transfusion of cryoprecipitate (mean 3.67±0.82 units). The mean duration of ICU stay was 2.84±2.72 days.

Eleven patients underwent re-laparotomy. Febrile illness was the commonest morbidity seen in 17.46%. Urologic morbidity included acute kidney injury needing dialysis, urinary tract infections, urinary retention, hematuria and prolonged catheterization (>7 days). Twelve patients had gastrointestinal complications (seven patients had paralytic ileus, and five had an ischemic liver injury). Pulmonary complications included pleural effusion, pneumonia and transfusion-related acute lung injury (TRALI). The central nervous system was affected in four patients, of which one was diagnosed with pituitary apoplexy.

The mean duration of hospital stay was 10.65±5.48 days. There were ten deaths (15.87%). Seven patients died due to multi-organ failure and irreversible shock within 12-36 hours of hospital admission. Two patients died due to disseminated intravascular coagulation, one on the 7th and the other on the 11th postoperative day. One patient died due to sepsis on the 19th postoperative day.

Neonatal outcome

Table 5 shows the neonatal outcome. The gestational age at delivery ranged from 25 to 41 weeks. The mean gestational age was 36.53±3.60 weeks. The mean birth weight was 2595.22±832.13 grams. Apgar score was <7 at 5 minutes in 3 (7.69%) babies and <7 at 10 minutes in none. There were 21 (33.33%) stillbirths and 2 (3.17%) early neonatal deaths.

Table 2: Distribution of clinico-pathological characteristics of the patients, (n=63).

Clinico-pathological characteristics	N	Percentages (%)
High risk factors		
Placenta Previa without morbid adherence	14	22.22
Placenta accreta spectrum	8	12.70
Previous cesarean delivery	27	42.86
Previous one	16	
Previous two	7	
Previous three	4	
Previous curettage	11	17.46
Obstructed labour	4	6.35
Others	15	23.81

Continued.

Clinico-pathological characteristics	N	Percentages (%)	
Induction of labour	7	11.11	
Mode of delivery			
Vaginal	27	42.86	
Cesarean	26	41.27	
Emergency, (n=26)	*19*	*73.08*	
Elective, (n=26)	*7*	*26.92*	
Laparotomy for ruptured uterus	10	15.87	
Cesarean hysterectomy	13 (+3 elsewhere)	25.40	
Presentation in shock	34	53.97	
Clinical parameters	**Mean±s.d.**	**Median**	**Range**
Hemglobin at admission (g/dl)	7.93±2.42	7.91	2.17-13.04
PCV at admission (%)	24.71±6.35	25.98	6.26-38.64
Interval between delivery and hysterectomy (hours)			
For patients who delivered at our institute excluding cesarean hysterectomies and secondary PPH (n=16)	2.59±5.77	0.5	0.5-23
For patients delivering elsewhere/ at home (n=30)	11.70±15.49	6	1-72
For patients who underwent EPH elsewhere (n=3)	Immediate (cesarean hysterectomy)		

Table 3: Operative details.

Parameters	Overall, (n=63)		Total hysterectomy group, (n=22)		Subtotal hysterectomy group, (n=41)	
Indications of hysterectomy	**N**	**%**	**N**	**%**	**N**	**%**
Uterine atony	29	46.03	13	59.09	16	39.02
Placenta previa without morbid adherence	3		1		2	
Retained placental bits	2		2		0	
Placental accreta spectrum (PAS)	15	23.81	3	13.64	12	29.27
Scarred uterus	13		2		11	
Unscarred uterus	2		1		1	
Rupture uterus	17	26.98	5	22.73	12	29.27
Scarred uterus	8		3		5	
Unscarred uterus	9		2		7	
Others	2	3.17	1	4.54	1	2.44
Mean duration of hysterectomy, (minutes) (n=60)	156.27±22.81		162.04±22.87		153.17±22.44	
Mean estimated blood loss, (millilitres) (n=60)	2046.83±520.69		2036.36±475.89		2052.44±548.86	
Additional surgical procedures						
Injury to the urinary tract and repair	9	14.28	2	9.09	7	17.07
Bladder injury	8		1		7	
Inadvertent ureteric ligation	1		1		0	
Internal iliac ligation	16	25.40	4	18.18	12	29.27
Hemostatic suture (B Lynch/Cho square)	4	6.35	1	4.54	3	7.32
Salpingo opherectomy	7	11.11	3	13.64	4	9.76
Others	1	1.59	0	0.00	1	2.44

Table 4: Post-operative course.

Parameters	N	Percentages (%)
ICU admission	56	88.89
Ventilatory requirement for >48 hours	5	7.94
Ionotopic requirement for > 48 hours	5	7.94
Re-laparotomy	11	17.46
For persistent hemorrhage	8	
To remove packs placed for hemostasis	2	
To remove necrotic ovarian pedicle	1	

Continued.

Parameters	N		Percentages (%)
Transfusion of blood products			
PRBC > 4 units	39		61.90
Fresh frozen plasma >4 units	22		34.92
Post-operative morbidity			
Febrile illness	11		17.46
Thrombotic morbidity	4		6.35
Disseminated intravascular coagulation	6		9.52
Wound morbidity including wound gape	8		12.70
Genitourinary	7		11.11
Acute kidney injury needing dialysis	3		4.76
Gastro-intestinal	12		19.05
Pulmonary	8		12.70
Central nervous system	4		6.35
Post-partum depression	1		1.59
Maternal mortality	10		15.87
Duration of (days)	**Mean ± SD**	**Median**	**Range**
ICU stay	2.84±2.72	2	0.5-14
Hospital stay	10.65±5.48	11	0.5-26

Table 5: Neonatal outcome.

Clinical characteristics	Number	Percentages (%)
Gestational age at delivery (n=43) (Weeks)		
<32	3	6.98
32-36	14	32.56
>36	26	60.46
Mean ± SD	36.53±3.60	
Median	37	
Range	25-41	
Birth weight (n=37) (gm)		
<1500	3	8.11
1500-2500	13	35.14
>2500	21	56.75
Mean ± SD	2595.22±832.13	
Median	2700	
Range	450-4200	
Sex, (n=48)		
Male	23	47.92
Female	25	52.08
Perinatal mortality, (n=63)		
Stillborn	21	33.33
Early neonatal death	2	3.17
Apgar score, (n=39) (min)		
<7 at 1	5	12.82
<7 at 5	3	7.69
<7 at 10	0	0.00

DISCUSSION

Emergency peripartum hysterectomy (EPH) is a life-saving measure to control post-partum haemorrhage (PPH), done when conservative methods have failed. EPH, a near-miss event, can be considered a marker of a country's women's health status. Our study is the largest series of EPH cases reported in the literature and the first of its kind from the state of the Uttarakhand.

The incidence of EPH has been reported to be 0.24 to 8.7 per 1000 deliveries.[6] In India, it ranges from 0.47 to 6.9 per thousand deliveries.[2-4] In the present study, the incidence of EPH for deliveries occurring at our institute was 2.78 per 1000 deliveries. The overall incidence could not be calculated, as only 47.62% of patients had delivered at our institute. The others were referred to us after delivery or after EPH was done elsewhere. However, the incidence seems higher in this region due to the patients

reaching the referral center in an extremely unstable condition, giving no time to apply conservative measures.

Our study revealed that only 11.11 % of patients were booked at our institute. The number of booked patients in previous studies from India ranged from 5-50%.[2-4] The rate of EPH has been reported to be significantly higher among unbooked patients.[7] Additionally, no mortality was observed in booked patients in the present study.

The risk factors leading to EPH include multiparity, multiple pregnancies, age >30 years, history of cesarean delivery and recent cesarean delivery.[1,6,8-10] The distance travelled by the patient before reaching the tertiary center, the skill and judgement of the medical staff at primary and secondary care levels, the condition of the patient at the time of admission, presence of diagnostic facilities like magnetic resonance imaging, availability of intensive care unit, interventional radiology and blood bank facilities may influence the conduct of EPH in referral centers, as in our study. Uterine artery embolization has been shown to avert hysterectomy in 72% of cases and is a less morbid alternative.[11,12]

In this study, the average parity was 2.71±1.13, similar to previous studies.[2,4,8] A study from Kuwait reported higher mean parity of 5.8.[13] In our study, twenty-seven patients (42.86%) had at least one previous cesarean delivery. Of these, placenta accreta spectrum (PAS) was seen in 13 patients (48.15% of all previous cesarean cases) and scar rupture in 8 patients (29.63% of all previous cesarean cases). Overall, PAS was seen in 15 patients (23.81%) and ruptured uterus in 17 (26.98%). However, the leading indication for EPH in our study was uterine atony seen in 46.03%, similar to previous studies.[14-16] In contrast, other studies show PAS as the commonest cause.[1,2,4,6,17,18] A recent study highlighted this change in the prominent indication over time, with PAS contributing to most cases.[5] However, atonic PPH and ruptured uterus remain the commonest causes in developing countries like ours.

Previous studies and meta-analyses have shown that cesarean delivery is associated with increased EPH risk.[1,3,4,8,19] A study found the rate of EPH to be three times more common with cesarean delivery than vaginal delivery.[20] In the present study, however, the number of patients delivering vaginally and through cesarean section was similar.

Most patients in the present study underwent a subtotal hysterectomy. No significant difference was observed in the duration of surgery (p=0.0711) or blood loss (p=0.452) between total and subtotal hysterectomy groups. The same has been noted by other authors.[4,13] However, recently a study preferred subtotal hysterectomy due to significantly lesser blood loss.[21] The final choice of surgery depends on the patient's clinical status and the surgeon's experience.

In this study, 17.46% developed a febrile illness. Urinary tract injury was seen in 14.28%. All patients needed a blood transfusion. The mean number of PRBC transfused was 6.10±3.53 units, like in other studies.[18,22] ICU admission was required for 88.89%. Similar observations are made by Kwee et al.[23] In the present study, relaparotomy was required in 17.46%. The commonest indication for relaparotomy was to control persistent haemorrhage, followed by removal of packs placed for hemostasis during EPH, similar to other studies.[13,18] One of the patients was operated on postoperative day 16 to remove a necrotic ovarian pedicle. Such delayed complications needing operative management are extremely rare, and sepsis may have a role to play. The average hospital stay was 10.65±5.48 days higher than recently noted.[22] However, Indian studies report a longer duration of hospital stay.[2,4]

Overall fetal loss was 36.51%. Most of these (47.62%) were due to uterine rupture. The same has been previously reported.[1,14,24] Maternal mortality in this study was 15.87%. Studies from India report the rate to be 10-19.44%.[2-4] A meta-analysis reports the mortality to be 5.2 per 100 EPH and reveals it is higher in poorer settings.[1] The commonest reasons for mortality in our study were irreversible shock and DIC. Amongst the ten mortalities, seven patients had been delivered elsewhere and were referred to us for the management of PPH. The mean delay between delivery and hysterectomy in these patients was 10.57 hours. The delay in obtaining definitive treatment is highlighted by 53.97% of the patients who presented in the emergency in shock.

All three levels of delays contributing to poor outcomes were identified. Delay 1 (delay in the decision to seek care) was due to the low social status of women, lack of understanding of complications and risk factors in pregnancy and financial issues. Delay 2 (delay in reaching care) was due to the geography of this region and difficulty in obtaining transportation. Delay 3 (delay in receiving adequate health care) was due to inadequate essential and emergency obstetrics care and inadequate referral systems. Of the 33 patients referred for PPH, only 3 (9.09%) had intra-uterine packing done. Further, we noted four home deliveries and another four patients referred for obstructed labour. The outcome depends upon the care received at the primary and secondary levels, timely blood replacement and initiation of medical management.

EPH has been found to be avoidable in 24% of cases and potentially avoidable in another 30%.[25] Having attended antenatal care has been shown to be protective.[1] Since the year 2017, the focus of the government of India has shifted to detecting risk factors to prevent maternal death rather than finding the cause of death.[26] Early antenatal booking and identification of risk factors, the anticipation of complications, and early referral of high-risk patients to centers equipped to deal with life-threatening emergencies are needed to reduce morbidity and mortality. Contraceptive counselling and advice to limit the family size are equally important.

CONCLUSION

The incidence of EPH in tertiary centers in the state of Uttarakhand seems to be higher due to patients reaching the center in extremely unstable conditions. The prominent indications were uterine atony and rupture of the non-scarred uterus due to obstructed labour. Regular antenatal check-ups, institutional deliveries, timely identification of risk factors and referral of high-risk patients to setups with high-risk obstetric units can play an important role in decreasing the incidence and the morbidity and mortality of EPH. Strengthening of referral system is necessary to avoid delays in seeking definitive care.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Van den Akker T, Brobbel C, Dekkers OM, Bloemenkamp KW. Prevalence, Indications, Risk Indicators, and Outcomes of Emergency Peripartum Hysterectomy Worldwide: A Systematic Review and Meta-analysis. Obstet Gynecol. 2016;128(6):1281-94.
2. Sharma B, Sikka P, Jain V, Jain K, Bagga R, Suri V. Peripartum hysterectomy in a tertiary care hospital: epidemiology and outcomes. J Anaesthesiol Clin Pharmacol. 2017;33(3):324.
3. Parveen M, Manjeet K, Anju G. Peripartum hysterectomy-A five year study. J Obstet Gynecol India. 2008;58:504-6.
4. Agrawal S, Yadav R, Raghunandan C, Dhingra S, Kaur H. Peripartum hysterectomy in a teaching hospital in India. Asian Journal of Medical Sciences. 2013;4(1):5-9.
5. Pan XY, Wang YP, Zheng Z, Tian Y, Hu YY, Han SH. A Marked Increase in Obstetric Hysterectomy for Placenta Accreta. Chin Med J (Engl). 2015;128(16):2189-93.
6. Machado LS. Emergency peripartum hysterectomy: incidence, indications, risk factors and outcome. N Am J Med Sci. 2011;3(8):358.
7. Nwobodo E, Nnadi D. Emergency obstetric hysterectomy in a tertiary hospital in sokoto, Nigeria. Ann Med Health Sci Res. 2012;2(1):37-40.
8. Sikora-Szczęśniak DL, Szczęśniak G, Szatanek M, Sikora W. Clinical analysis of 52 obstetric hysterectomies. Ginekol Pol. 2016;87(6):460-6.
9. Awan N, Bennett MJ, Walters WA. Emergency peripartum hysterectomy: A 10-year review at the Royal Hospital for Women, Sydney. Aust N Zeal J Obstetr Gynaecol. 2011;51(3):210-5.
10. Olamijulo JA, Abiara OE, Olaleye OO, Ogedengbe OK, Giwa-Osagie F, Oluwole OO. Emergency obstetric hysterectomy in a Nigerian teaching hospital: a ten-year review. Nig Q J Hosp Med. 2013;23(1):69-74.
11. Juneja SK, Tandon P, Mohan B, Kaushal S. A change in the management of intractable obstetrical hemorrhage over 15 years in a tertiary care centre. Int J Appl Basic Med Res. 2014;4(1):S17-9.
12. Vandenberghe G, Guisset M, Janssens I. A nationwide population-based cohort study of peripartum hysterectomy and arterial embolisation in Belgium: results from the Belgian Obstetric Surveillance System. BMJ Open. 2017;7(11):e016208.
13. Wani RV, Abu-Hudra NM, Al-Tahir SI. Emergency peripartum hysterectomy: a 13-year review at a tertiary centre in Kuwait. J Obstetr Gynecol India. 2014;64(6):403-8.
14. Chawla J, Arora D, Paul M, Ajmani SN. Emergency Obstetric Hysterectomy: A Retrospective Study from a Teaching Hospital in North India over Eight Years. Oman Med J. 2015;30(3):181-6.
15. Chibber R, Al-Hijji J, Fouda M, Al-Saleh E, Al-Adwani AR, Mohammed AT. A 26-year review of emergency peripartum hysterectomy in a tertiary teaching hospital in Kuwait-years 1983-2011. Medical Principles and Practice. 2012;21(3):217-22.
16. Tahmina S, Daniel M, Gunasegaran P. Emergency Peripartum Hysterectomy: A 14-Year Experience at a Tertiary Care Centre in India. J Clin Diagn Res. 2017;11(9):QC08-11.
17. Demirci O, Tuğrul AS, Yılmaz E, Tosun Ö, Demirci E, Eren YS. Emergency peripartum hysterectomy in a tertiary obstetric centre: nine years evaluation. J Obstetr Gynaecol Res. 2011;37(8):1054-60.
18. Danisman N, Baser E, Togrul C, Kaymak O, Tandogan M, Gungor T. Emergency peripartum hysterectomy: experience of a major referral hospital in Ankara, Turkey. J Obstetr Gynaecol. 2015;35(1):19-21.
19. Edgar K, Unger H, Yao S, Love CD. Peripartum hysterectomy–the edinburgh experience. Archives of Disease in Childhood: Fetal and Neonatal Edition. 2011;96(1).
20. Christopoulos P, Hassiakos D, Tsitoura A, Panoulis K, Papadias K, Vitoratos N. Obstetric hysterectomy: a review of cases over 16 years. J Obstetr Gynaecol. 2011;31(2):139-41.
21. Zhang Y, Yan J, Han Q. Emergency obstetric hysterectomy for life-threatening postpartum hemorrhage: A 12-year review. Medicine (Baltimore). 2017;96(45):e8443.
22. Chen J, Cui H, Na Q, Li Q, Liu C. Analysis of emergency obstetric hysterectomy: the change of indications and the application of intraoperative interventions. Zhonghua fu chan ke za zhi. 2015;50(3):177-82.
23. Kwee A, Bots ML, Visser GH, Bruinse HW. Emergency peripartum hysterectomy: a prospective study in The Netherlands. Eur J Obstetr Gynecol Reproductive Biol. 2006;124(2):187-92.
24. Abasiattai AM, Umoiyoho AJ, Utuk NM, Inyang-Etoh EC, Asuquo OP. Emergency peripartum

hysterectomy in a tertiary hospital in southern Nigeria. Pan Afr Med J. 2013;15:60.
25. Colmorn LB, Krebs L, Langhoff-Roos J, NOSS study group. Potentially Avoidable Peripartum Hysterectomies in Denmark: A Population Based Clinical Audit. PLoS ONE. 2016;11(8):e0161302.
26. Kansal A, Garg S, Sharma M. Moving from maternal death review to surveillance and response: A paradigm shift. Indian J Public Health. 2018;62(4):299.

Cite this article as: Makhija A, Pati B, Upreti P. Factors and outcome analysis of emergency peripartum hysterectomy in a tertiary care center catering to hilly terrain for a five-year period: a retrospective study. Int J Reprod Contracept Obstet Gynecol 2022;11:1383-90.