



Clinical Audit of Obstetric Hysterectomy in a Tertiary Care Centre: An Observational Retrospective Study

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Received: 6 October 2023 / Accepted: 27 May 2024
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Abstract

Purpose of Study The purpose of this study is to analyse the profile and characteristics of patients who may undergo obstetric hysterectomy, to study the intra-operative and post-operative complications of these patients and to increase the preparedness and reduce morbidity and mortality of patients undergoing obstetric hysterectomy.

Methods After taking approval of the IEC, data of patients who had consented to be a part of the study were collected and analysed.

Results Our study included 30 patients. Twenty-two patients underwent emergency obstetric hysterectomy, with abnormal placentation being the most common indication followed by post-partum haemorrhage. The most common postoperative complication was bladder injuries, and two out of 30 patients eventually succumbed in the post operative period.

Conclusion Most of the morbidity associated with OH is attributed to the indications for which OH is done rather than the procedure itself. The indication for obstetric hysterectomy has changed to abnormal placentation from uterine atony and rupture. Future studies and change in management practices should focus on reducing the rate of caesarean sections whenever possible with proper preoperative planning, designing appropriate labour unit protocols and setting up multi-disciplinary units to manage difficult cases.

Keywords Obstetric hysterectomy · Abnormal placentation · Rupture · Caesarean sections

Abbreviations

OH	Obstetric hysterectomy	DIC	Disseminated intravascular coagulation
PPH	Post partum hemorrhage	STH	Subtotal hysterectomy
EOH	Emergency obstetric hysterectomy	TH	Total hysterectomy
CS	Caesarean Section	ICU	Intensive care unit
AV MALFORMATION	Arteriovenous malformation		
MTP	Medical termination of pregnancy		
LSCS	Lower segment caesarean section		
I/V/O	In view of		

Introduction

Emergency obstetric hysterectomy (EOH) is the surgical removal of the uterus during a caesarean section, after vaginal delivery, or at any time throughout the puerperium. It is frequently undertaken when all other medical or surgical methods of managing obstetric haemorrhage have failed. Other reasons for EOH include adherent placenta, ruptured uterus, uterine inversion, puerperal sepsis caused by infective foci in the uterus and so on [1].

A near-miss event is defined as a woman who nearly died but survived a condition that occurs during pregnancy, childbirth or within 42 days of terminating a pregnancy [2]. EOH is correctly characterized as a near miss. It is important to study such events since they provide

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an insight into the standard of care provided and help to reduce maternal morbidity and mortality.

Obstetric hysterectomy was developed more than 200 years ago as a surgical procedure to treat life-threatening obstetric haemorrhage. Porro documented the first hysterectomy after a caesarean section in which both mother and baby survived, and the surgery is now known as the Porro operation [3].

Obstetric haemorrhage and uterine atony are the primary causes of maternal fatalities in third-world nations, followed by ruptured uterus and uterine infections. It is frequently a challenging decision that necessitates sound clinical judgement. Most operations are performed when the patient is too ill to tolerate the surgery or anaesthesia. The unanticipated nature of the procedure, as well as the desire to do it quickly, complicate issues. As a result, it is very important to identify patients that may require such management so that they can be referred time to tertiary centres. It is also important that tertiary centres should be prepared to manage such patients at any given point of time.

Aim

To assess patients undergoing obstetric hysterectomy and thus prepare an audit of indication, outcomes, complications, need for ICU admission and need for blood and blood products in a tertiary care centre.

Objectives

Primary Objectives

1. To study the clinical profile of the patients undergoing obstetric hysterectomy.
2. To determine the incidence of obstetric hysterectomy.
3. To study indication for obstetric hysterectomy.
4. To study maternal morbidity and mortality associated with obstetric hysterectomy.

Secondary Objectives

1. To study intraoperative and postoperative complications in cases of obstetric hysterectomy.
2. To study distribution of the cases by age and parity, demographic data.
3. To study the need for blood and blood products and need for intensive care unit admission and the average duration of hospital stay in view of time required for complete healing.

Inclusion Criteria

Hysterectomy performed for any indication following vaginal delivery or caesarean section, within a period of 42 days post partum, at our institute.

Exclusion Criteria

Patients or guardians not giving consent to participate in the study.

Study Design and Study Duration

It was an observational prospective study over a period of 2.5 years.

Sampling Technique

Universal sampling technique was used. As this is an observational study, no intervention was done to change the course of management or treatment of the patient.

Sample Size

Based on the data of 6 months from January 2017 to June 2017, sample size was calculated by using app Epi info with stat calc is 24 by taking 95% confidence limit.

The outcome of study was tabulated and analysed on the basis of simple percentage, mean, median and mode. Sample size was increased from 24 to 30 after the approval of ethics committee keeping in mind the increasing trends of obstetric hysterectomy.

Methodology

The study was carried out in the department of obstetrics and gynaecology at a tertiary care centre from July 2018 to September 2019 (14 months). All procedures were carried out in accordance with the ethical standards of the Institutional Ethics Committee (EC 27/2018) and with the Helsinki Declaration of 1975, as revised in 2008. The STROBE guidelines for reporting observational studies were followed for this study. Consent to use data in this study was taken preoperatively for elective obstetric hysterectomies, postoperatively for emergency cases and from blood relatives for the two cases where mortality occurred. A special emphasis was made on indications, maternal clinical profile, pathology, maternal morbidity and complications, risk factors associated with the surgery. The age distribution and parity incidences were studied in detail. Maternal mortality and morbidity associated with procedure were analysed. All

the cases of hysterectomy for any indication during pregnancy, labour and puerperium were included. The study also included hysterectomies done for complications following pregnancy termination, such as perforation and sepsis. Type of surgery performed whether subtotal or total obstetric hysterectomy, any additional surgical procedure viz internal iliac artery ligation, postoperative complications associated were studied, analysed and tabulated.

Statistical Analysis

Data were entered into Microsoft Excel 2018, and the analysis was conducted using Graph Pad Instant Software V3.0. Age details of the patient were expressed as mean and median along with patient distribution by age-groups. Medical history of the patients was analysed followed by placental abnormalities and other pregnancy details as descriptive statistics. Obstetric hysterectomy details were expressed descriptively including details of nature of hysterectomy, the indications, timing during pregnancy as well as complications. Status of mortality was also expressed descriptively.

Results

Incidence of Obstetric Hysterectomy (OH) in the Study period

The incidence of OH in our study following vaginal deliveries was 0.51/1000 vaginal deliveries and that following caesarean section was 4.3/1000 sections (Table 1)

Demographic Details

- (a) Age: A total of 30 patients were enrolled in the study. The mean age of the enrolled patients was 31.2 years,

with a median age of 31 years. The minimum age recorded in the study was 24 years while the maximum age was found to be 43 years.

On assessing the distribution of patients by age-groups, it was found that majority of the patients belonged to the age group of 31–35 years (10/30, 33.33%). Nine patients (30%) belonged to the 26–30 years age group.

- (b) Gravida Status of the Patients in the study:

In the study, 28 of the 30 enrolled patients were multi-gravida (93.33%) while two patients were primigravida. Out of 28 multigravida participants, six had no history previous caesarean section or any other uterine surgery, whereas 22, i.e. 73.33%, had history of previous caesarean section.

- (c) Elderly gravida (> 35 years): On evaluating the age status of the patients, it was found that 7 (23.33%) of the 30 enrolled patients were elderly gravida while the remaining 23 patients (76.66%) were below 35 years of age. Out of the seven elderly gravida, two patients had unscarred uteri.

- (d) History of caesarean section

Out of the 30 enrolled patients, 22 (73.33%) had a history of one or more LSCS before while eight of the 30 patients had unscarred uterus (26.67%).

Elective vs Emergency Obstetric Hysterectomy

In the study, it was found that majority of the OH cases were emergency (22/30, 73.33%) while the rest were elective (8/30, 26.67%). Out of the 30 patients, 24 who underwent OH in antenatal period, out of these 16 of the patients underwent the procedure in the 3rd trimester (16/24, 66.67%), whereas seven underwent OH in the 2nd trimester while a single patient underwent OH in the first trimester. All the patients who underwent OH procedure in the 1st trimester underwent elective surgery, while all patients who underwent procedure in the 2nd trimester underwent five EOH, and two were elective surgery. Majority patients operated upon in the 3rd trimester underwent emergency procedure underwent emergency OH, and five underwent elective OH.

Indications of Obstetric Hysterectomy

Out of the 30 hysterectomies, abnormal placentation was the most common indication accounting for 18 (60%) of the total hysterectomies followed by postpartum

Table 1 Incidence of Obstetric Hysterectomy (OH) in a study period

Parameters assessed	Number of patients
Total Live births	13,649
Total Vaginal Deliveries	7707
Total number of LSCS	5942
Total number of OH	30
Number of post-vaginal delivery OH	4
Number of post-LSCS OH	26
Incidence of OH per 1000 deliveries	2.20
Incidence of OH per 1000 normal vaginal deliveries	0.51
Incidence of OH per 1000 caesarean section	4.3

Table 2 Types and frequency abnormal placentation

Indication	Number of Patients with H/O > 1 LSCS (%)	Number of patients with H/O one LSCS (%)
Placenta Previa (21) [2 in unscarred uterus]	14 (46.67%)	5 (16.67%)
Placenta Increta (8)	6 (20%)	2 (6.67%)
Placenta Percreta (7)	5 (16.67%)	2 (6.67%)
Placenta Accreta (1)	0	1 (3.33%)
Adherent Placenta (3)	3(10%)	0

Table 3 Postpartum haemorrhage status

Status	Number of patients (%)
Total number of patients with Postpartum haemorrhage	6 (20%)
Scarred Uterus	5 (83.33%)
Unscarred Uterus	1 (16.66%)
Primigravida	1 (16.66%)
Multigravida	5 (83.33%)

One patient who underwent EOH had placenta percreta but classical CS was done and placenta was left in situ, on day 12, post-CS patient had secondary PPH for which she underwent EOH. Hence, although there are 19 cases of abnormal placentation in one of the above described case, indication is PPH

haemorrhage in 6 (20%), uterine rupture in 5 (16.66%) and uterine AV malformation in 1 (3.3%) patient.

(a) Abnormal Placentation

The most common placental abnormality detected in the study was placenta previa, noted in 21 out of 30 patients (70%). Eight patients had Placenta Increta, seven patients had Placenta percreta while one patient had placenta accreta (Table 2).

(b) Postpartum haemorrhage

Six out of 30 patients underwent hysterectomy due to post partum haemorrhage, one out of which was an unscarred uterus (Table 3).

(c) Uterine ruptures and rents

Out of the enrolled patients, 5 (16.67%) patients in the study suffered from uterine rupture four of these patients suffered from uterine rupture, while one patient suffered from uterine sepsis with rent (Table 4).

Table 4 Uterine rupture and rent status

Status	Number of patients (%)
Total number of patients with Uterine rupture or sepsis with rent	5 (16.67%)
Unscarred uterus	4 (80%)
Scarred uterus	1 (20%)
Primigravida	1 (20%)
Multigravida	3. (80%)

Table 5 Details of Interventions in this study (n = 30)

Details of management	Number of patients (total n = 30)
Total obstetric hysterectomy	23
Subtotal obstetric hysterectomy	7
B/L Internal Iliac artery ballooning	5 (3 electives, 2 emergency)
B/L Iliac artery ligation	3 (1 elective, 2 emergency)

Multifoetal Gestation

In our study, 2 of the 30 patients (6.67%) had multifoetal gestation in this study, while the remaining 28 patients had singleton gestation (93.33%).

Out of the two patients with multifoetal gestation, both had unscarred uterus, one had post-caesarean section PPH and other one had uterine rupture.

Management Details of Enrolled Patients

In our study, 23 (76.67%) of the patients underwent total OH while 7 (23.33%) other patients underwent subtotal OH. Five of the patients, i.e. 16.67%, underwent bilateral internal iliac artery embolization while 3 (10%) patients underwent bilateral internal iliac artery ligation. In the study, 27 of the 30 patients (90%) had an ICU admission, and rest three were on high-density unit bed in postoperative ward. Eight patients (26.67%) were administered uterotonic drugs, and all the patients received blood transfusion (Table 5)

Complications of Obstetric Hysterectomy

The most common intraoperative complication noted during OH procedure was urinary bladder injury (9/30 patients, 30%) followed by haemorrhagic shock (4/30 patients, 13.33%). Other intraoperative complications included DIC, bladder adhesions and rectus muscle haematoma (Table 6).

The most common postoperative complication witnessed in the study after OH was febrile morbidity and wound infection, both seen in 12 patients each (40%). Other postoperative complications seen were urinary tract infections (three

Table 6 Postoperative complications of obstetric hysterectomy

Complication	Number of patients (%)
Febrile morbidity	12 (40%)
Wound infection	12 (40%)
UTI	3 (10%)
Bladder adhesion	2 (6.67%)
Bowel adhesion	1 (3.33%)
Paralytic ileus	1 (3.33%)
Septicaemia	1 (3.33%)
Bladder rent	1 (3.33%)
Acute renal failure	1 (3.33%)
Urinary tract obstruction with haematuria	1 (3.33%)

patients), bladder adhesions (two patients) and septicaemia, paralytic ileus, acute renal failure, bowel adhesion and urinary tract obstruction with haematuria (one patient each).

Status of Maternal Mortality

In our study, two of the 30 patients died after obstetric hysterectomy (6.67%)

Discussion

The landscape of obstetric hysterectomy (OH) is undergoing a dramatic shift, evident in both the indications for performing the procedure and its frequency. In our study including 13,649 deliveries between July 2017 and September 2019, OH was performed in 0.22% (2.2/1000) of deliveries, with a caesarean section rate of 43.53%. This incidence of EOH (0.43%) is considerably higher than reported in Columbia (0.08%) and the US (0.06%) [4, 5]. Our findings align with studies conducted in Nigeria (0.51%), China (0.22%), Pakistan (0.27%) and India (0.52%) [6–9]. This disparity can likely be attributed to the nature of our study population: a centrally located urban centre managing a higher proportion of pre-booked deliveries within a hospital setting, alongside a significant number of referred cases.

The observed correlation between EOH and caesarean delivery in our study (0.43% vs. 0.05%) reflects findings from China (90.1% vs. 6.5%), Turkey (0.078% vs. 0.016%) and other centres in India (0.79% vs. 0.24%) [7, 9, 10]. This undeniable link carries significant societal implications. Empowering the public with knowledge concerning the long-term morbidity associated with caesarean sections could potentially reduce unnecessary caesarean deliveries and ultimately save lives. It also underscores the importance of maintaining a high threshold for caesarean sections and

encouraging both patients and practitioners to prioritize vaginal birth after caesarean section (VBAC) whenever feasible.

The rising trend in OH observed within our study population regarding age and parity can likely be ascribed to the increased prevalence of caesarean sections and the heightened risk of postpartum haemorrhage (PPH) associated with high parity. Similar observations were documented in prior studies conducted in Nigeria, China and India [6, 11, 13, 14].

Our study included 30 hysterectomies, eight of which were elective procedures undertaken for reasons such as aberrant placentation and arteriovenous malformation (AVM) identified following dilatation and curettage (D&C). The elective nature of these procedures allowed for meticulous planning, including blood product cross-matching, potential uterine artery embolization, on-call urologist and surgical team and so forth. Additionally, these elective procedures were performed under the supervision of qualified surgeons and anaesthesiologists, significantly enhancing patient outcomes. This success was facilitated by the timely identification and referral of at-risk patients.

Abnormal placentation emerged as the most prevalent reason for OH in our study, accounting for 70% of cases. Most patients underwent OH concurrently with their caesarean section. However, the literature does discuss alternative treatment options for focally adherent placenta, such as expectant management or methotrexate therapy [15]. Accordingly, one patient with focal placenta percreta underwent a traditional caesarean section, with the placenta left in situ. Unfortunately, a secondary PPH necessitated an emergency OH 12 days post operatively. Notably, all patients with abnormal placentation had a history of prior caesarean section. This underscores the critical importance of placental localization and adherence evaluation for all patients with anterior or low-lying placentae who have undergone a previous caesarean section.

As previously mentioned, abnormal placentation (70%) was the most common indication for OH, followed by uterine atony (20%) and uterine rupture (16.67%). This trend reflects a shift observed in most developing countries, where atony was traditionally the leading cause of EOH, with placental causes now assuming a growing significance, mirroring trends in developed nations. Studies conducted at other tertiary care centres in India and Turkey corroborate atonic postpartum hemorrhage as the most frequent indication for EOH [9, 10, 14].

Hysterectomy for uterine rupture was performed in 20% of cases, with 80% involving an unscarred uterus. This aligns with findings from a Turkish study [16]. However, Nigerian data indicate a starkly different picture, with uterine rupture accounting for 93.2% of cases, followed by atonic postpartum haemorrhage (2.7%), puerperal sepsis (2.7%) and morbidly adherent placenta (1.4%) [12]. The widespread reliance on spiritual churches as a primary point of contact for childbirth

in Nigeria likely contributes to the significant number of uterine rupture cases observed, owing to prolonged labour caused by delayed referrals from such facilities. Korejo et al. reported that uterine rupture was seen in 47.1% of cases, 28.9% for uterine atony and 17.4% for placental reasons. About 74% of all uterine rupture cases had an unscarred uterus [14]. The main indication for the procedure was ruptured uterus (93.2%), and the majority of the patients (95.9%) had subtotal hysterectomy in a Nigerian study [12].

The predominant indication for emergency peripartum hysterectomy was abnormal placentation (placenta previa/accreta) which was noted in 45–73.3%, uterine atony in 20.6–43% and uterine rupture in 11.4–45.5%.

In our study, 23 patients underwent total obstetric hysterectomies, and seven underwent subtotal abdominal hysterectomies but the difference was not statistically significant. In our study most common indication for subtotal hysterectomies was adhesions, posteriorly with the bowel or anteriorly with the bladder. Subtotal hysterectomy (STH) was the most commonly performed surgical procedure in the postpartum emergency in other studies as well [13–18]. According to these studies, STH was more beneficial, in terms of operating time and limiting the amount of blood loss, than TH in critically ill women undergoing an emergency procedure. The women who underwent TH had higher transfusion requirements, but there were no statistically significant differences between TH and STH in terms of the incidence of bladder injury, pelvic haematoma, wound infection, DIC, acute renal insufficiency, intra-abdominal bleeding, pneumonia, cardiac ischaemia, neonatal death, or maternal death. A previous study reported that the rate of ureteric injury from surgery was higher in women undergoing TH than in those undergoing STH. Wright et al. [19] and Gungorduk et al. [20] reported higher re-exploration rates after STH, but Ozden et al. [16] reported higher re-exploration rates after TH.

There were two maternal mortalities noted out of 30 (6.6%). Maternal mortality in our series is towards the lower end of the range when compared to other countries such as China, Nigeria, etc. [21–23]. This could probably be explained by the fact that most of our cases were planned electively.

The important thing at the time of performing the hysterectomy is to note if the abnormal placenta has been removed in its entirety. Besides this, adhesions, time of surgery and injury to vital organs such as bowel/bladder are important factors in determining the extent of hysterectomy.

Limitations and Recommendation

The major limitation of this study was its small sample size as it is not a very commonly performed procedure. The study

was also limited in that the data collected were from a single institution.

Conclusion

Obstetric hysterectomy is a lifesaving procedure and a gold standard in cases of placenta percreta and increta and should not be delayed. The most common indication for obstetric hysterectomy in our study was abnormal placentation, and most of the patients had good outcome with few requiring ICU stay. Future studies and change in management practices should focus on reducing the rate of caesarean sections whenever possible with proper preoperative planning, designing appropriate labour unit protocols and setting up multi-disciplinary units to manage difficult cases.

Author Contribution All authors contributed to the study conception and design. Material Preparation, data collection and analysis were performed by the first 2 authors. First draft of the manuscript was written by Dr Kavita Yadav and Dr Akriti Saxena and critically reviewed by Dr Harshada Thakur and Dr Kimaya Mali. All authors read and approved the final manuscript.

Funding The authors declare that no funds, grants or other support were received during the preparation of this manuscript.

Declarations

Conflict of interest The authors have no financial or non-financial interests to disclose.

Informed Consent Consent to use data in this study was taken pre-operatively for elective obstetric hysterectomies, post-operatively for emergency cases and from blood relatives for the two cases where mortality occurred.

Ethical Approval All procedures were carried out in accordance with the ethical standards of the Institutional Ethics Committee (EC 27/2018) and with the Helsinki Declaration of 1975, as revised in 2008.

References

1. Say L, Souza JP, Pattinson RC. WHO working group on maternal mortality and morbidity classifications. Maternal near miss—towards a standard tool for monitoring quality of maternal health care. *Best Pract Res Clin Obstet Gynaecol.* 2009;3:287–96.
2. Joseph KS, Rouleau J, Kramer MS, Young DC, Liston RM, Basket TF. Maternal health study group of the canadian perinatal surveillance system. Investigation of an increase in postpartum haemorrhage in Canada. *BJOG.* 2007;114(6):751–9.
3. Sparić R, Kadija S, Hudelist G, Glisić A, Buzadzić S. History of caesarean hysterectomy. *Acta Chir Iugosl.* 2012;59(1):9–12.
4. Owolabi MS, Blake RE, Mayor MT, Adegbulugbe HA. Incidence and determinants of peripartum hysterectomy in the metropolitan area of the District of Columbia. *J Reprod Med.* 2013;58(3–4):167–72.

5. Bodelon C, Bernabe-Ortiz A, Schiff MA, Reed SD. Factors associated with peripartum hysterectomy. *Obstet Gynecol*. 2009;114(1):115–23.
6. Nwobodo E, Nnadi D. Emergency obstetric hysterectomy in a tertiary hospital in sokoto, Nigeria *Ann Med Health Sci Res*. 2012;2(1):37–40.
7. Pradhan M, Yong S. Emergency peripartum hysterectomy as postpartum hemorrhage treatment: incidence, risk factors, and complications. *JNMA J Nepal Med Assoc*. 2014;52(193):668–76.
8. Korejo R, Nasir A, Yasmin H, Bhutta S. Emergency obstetric hysterectomy JPMA. *J Pakistan Med Assoc*. 2012;62(12):1322–5.
9. Juneja SK, Tandon P, Mohan B, Kaushal S. A change in the management of intractable obstetrical hemorrhage over 15 years in a tertiary care center. *Int J Appl Basic Med Res*. 2014;4(Suppl 1):S17–9.
10. Tapisiz OL, Altinbas SK, Yirci B, Cenksoy P, Kaya AE, Dede S, Kandemir O. Emergency peripartum hysterectomy in a tertiary hospital in Ankara, Turkey: a 5-year review. *Arch Gynecol Obstet*. 2012;286(5):1131–4.
11. Zhang Y, Yan J, Han Q, Yang T, Cai L, Fu Y, Cai X, Guo M. Emergency obstetric hysterectomy for life-threatening postpartum hemorrhage: a 12-year review. *Med (Baltimore)*. 2017;96(45):e8443.
12. Machado LS. Emergency peripartum hysterectomy: incidence, indications, risk factors and outcome. *N Am J Med Sci*. 2011;3(8):358–61.
13. 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.
14. Tong SY, Tay KH, Kwek YC. Conservative management of placenta accreta: review of three cases. *Singapore Med J*. 2008;49(6):e156–9.
15. Demirci O, Tugrul AS, Yilmaz E, et al. Emergency peripartum hysterectomy in a tertiary obstetric center: nine years evaluation. *J Obstet Gynaecol Res*. 2011;37:1054–60.
16. Ozden S, Yildirim G, Basaran T, et al. Analysis of 59 cases of emergent peripartum hysterectomies during a 13-year period. *Arch Gynecol Obstet*. 2005;271:363–7.
17. Kwee A, Bots ML, Visser GH, et al. Emergency peripartum hysterectomy: a prospective study in The Netherlands. *Eur J Obstet Gynecol Reprod Biol*. 2006;124:187–92.
18. Bateman BT, Mhyre JM, Callaghan WM, Kuklina EV. Peripartum hysterectomy in the United States: nationwide 14 year experience. *Am J Obstet Gynecol*. 2012;206(1):63.e1–8.
19. Wright JD, Devine P, Shah M, Gaddipati S, Lewin SN, Simpson LL, Bonanno C, Sun X, D'Alton ME, Herzog TJ. Morbidity and mortality of peripartum hysterectomy. *Obstet Gynecol*. 2010;115(6):1187–93.
20. Gungorduk K, Yildirim G, Dugan N, et al. Peripartum hysterectomy in Turkey: a case-control study. *J Obstet Gynaecol*. 2009;29:722–8.
21. Obiechina NJ, Eleje GU, Ezebialu IU, et al. Emergency peripartum hysterectomy in Nnewi, Nigeria: a 10-year review. *Niger J Clin Pract*. 2012;15:168–71.
22. Abasiattai AM, Umoiyoho AJ, Utuk NM, et al. Emergency peripartum hysterectomy in a tertiary hospital in Southern Nigeria. *Pan Afr Med J*. 2013;15:60.
23. Akintayo AA, Olagbuji BN, Aderoba AK, et al. Emergency peripartum hysterectomy: a multicenter study of incidence, indications and outcomes in Southwestern Nigeria. *Matern Child Health J*. 2016;20:1230.

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