Peripartum hysterectomy audit at Port Shepstone Regional Hospital, South Africa: a five year review.

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Submitted in Partial Fulfilment of the Academic Requirement for the Degree of Masters in Obstetrics and Gynaecology (UKZN).

Declaration

I, Dr Phinzi Sibusiso Blessing, do hereby declare that the work on which this dissertation is based on is my own original work, under the supervision and mentorship of Dr M H Sebitloane. This dissertation has not been previously submitted to any other colleges.

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1. Approval from Postgraduate Education Committee, Nelson R Mandela School of Medicine, University of KwaZulu-Natal.

2. Approval from Biomedical Research and Ethics Committee, University of KwaZulu-Natal

Westville Campus.

3. Approval from Port Shepstone Hospital.

4. Approval from KZN Department of Health.

DEDICATION

I would like to dedicate this study to the following people who made this study to come to reality:

1. My wife Phefumlela Olwetu Phinzi for supporting, encouraging me throughout my studies and being the parent figure to our children while I was busy.

2. My family that has supported me throughout my studies and supported us through difficult times.

Appendices

A. Data sheet

B. Approval from Postgraduate Education Committee, UKZN.

C. Ethical clearance from BREC (Biomedical Research and Ethics Committee), University of KwaZulu-Natal.

D. Approval from management at Port Shepstone Hospital.

E. Approval from KZN Department of Health.

ABSTRACT

Background

Over the years the peripartum hysterectomy has become a life-saving procedure in cases of intractable postpartum haemorrhage or when medical and/or surgical conservative interventions have failed and in severe puerperal sepsis.

Aim

To audit the clinical management preceding peripartum hysterectomy and evaluate maternal and neonatal outcomes in patients who were done peripartum hysterectomy.

Material and Methods

The researcher developed a structured audit form based on specific types of pregnancy and delivery complications leading to peripartum hysterectomy. The medical records of 126 patients who had postpartum hemorrhage and 83 patients who had undergone peripartum hysterectomy from 1st January, 2010 to 31st December, 2014 (5 years), at Port Shepstone Hospital in Kwa-Zulu Natal were reviewed retrospectively. Maternal characteristics and details of the present pregnancy and delivery, hysterectomy indications, complications, postoperative complications, and maternal and neonatal outcomes were evaluated. A statistical package (SPSS version 24.0) was used to analyze the data.

Results

During the 5-year study period, a total of 17657 births occurred. There were 83 peripartum hysterectomy cases and 126 postpartum hemorrhage cases. The incidence for peripartum hysterectomy was 0.47% (4.7/1000 deliveries) and incidence for postpartum hemorrhage was 0.71% (7.1/1000 deliveries). In patients with PPH, post C/S peripartum hysterectomy incidence was 7.2/1000 C/S deliveries and post vaginal peripartum hysterectomy incidence was 0.65/1000 normal vaginal deliveries. There was a statistical significant relationship between peripartum hysterectomy and cesarean section delivery in the current pregnancy and previous cesarean delivery (p=0.0001 and p=0.01 respectively). Sixty two (49.2%) of 126 postpartum hemorrhage cases were unresponsive to conservative medical and surgical measures and required peripartum hysterectomy. Five patients with uterine rupture did not have any conservative management and proceeded to peripartum hysterectomy. Sixteen (19.3%) patients with sepsis were sent directly for peripartum hysterectomy.

The peripartum hysterectomy rate in our study was 4.7 per 1000 deliveries. This rate has been influenced by the demographic and clinical characteristics of the study population namely age (p=0.02), parity (p=0.003), previous C/S (P=0.01), cesarean section (P=0.001) and HIV infection (P=0.4) compared to patients not requiring peripartum hysterectomy. There was a significant difference in age (p=0.0001), parity (p=0.003) and gravidity (p=0.003) between PPH patients treated compared to those that were sent for hysterectomy with sepsis.

Uterine atony together with sepsis and uterine rupture were the leading cause of peripartum hysterectomy (86.7%). Total abdominal hysterectomy was the procedure of choice in 64 (77.1%) patients. Thirty percent (30%) of patients had one or more previous caesarean delivery. Fifty percent (50%) of patients who had peripartum hysterectomy were HIV positive.

After hysterectomy, 51 (61.4%) of women were admitted to the multidisciplinary intensive care unit. Sixty four (77.1%) patients required blood transfusion, 2(2.4%) women died and there were 31 (37.3%) perinatal deaths

Conclusion

In conclusion, the results demonstrated an incidence within the range reported in the literature for developing countries. Several risk factors namely age; parity, cesarean section and HIV infection were identified for peripartum hysterectomy. Peripartum hysterectomy is a lifesaving procedure associated with high morbidity and perinatal death rate.

Key words: Caesarean hysterectomy, peripartum hysterectomy, postpartum haemorrhage, total abdominal hysterectomy, subtotal hysterectomy.

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List of Abbreviations

PPH	Postpartum hemorrhage
PH	Peripartum hysterectomy
CS or C/S	Caesarean section
VBAC	Vaginal delivery following caesarean delivery
SD	Standard deviation
CTG	Cardiotocography
KZN	KwaZulu-Natal
NVD	Normal vaginal delivery
HDP	Hypertensive disorders of pregnancy
EPH	Emergency peripartum hysterectomy
WHO	World Health Organization
SMR	Saving Mothers Report
TOP	Termination of pregnancy

Definitions of terms

Peripartum hysterectomy is a major operation in which uterus is removed due to life threatening hemorrhage, during or immediately after abdominal or vaginal deliveries, and up to six weeks for puerperal sepsis, post abortal sepsis.

Postpartum haemorrhage is often defined as the loss of more than 500 ml or 1,000 ml of blood within the first 24 hours following childbirth.

Caesarean section is the delivery of a baby through a surgical incision in the mother's abdomen and uterus.

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Chapter 1: introduction

1.0 Introduction

In South Africa, obstetric hemorrhage is the second leading cause of maternal deaths at 14.8% and about 81% of these deaths are preventable (Saving Mothers Report, 2011-2013). Resuscitation was substandard in 22.3% of cases and more than 50% of obstetric hemorrhage occurred in women who had undergone caesarean delivery (Saving Mothers Report, 6th Triennial Report (2011-2013; National Department of Health, 2015). A large proportion of these were due to PPH and almost a third was associated with bleeding at, during and immediately following caesarean delivery (Fawcus et al., 2016). A significant proportion of these cases were associated with uterine atony (Fawcus et al., 2016).

Maternal mortality after C/S from postpartum hemorrhage was approximately 26.2% (Saving Mothers report, 2011-2013) which was high as compared to the two previous Saving Mother's Reports (2005-2007; 2008-2010) in all levels of care but worse in regional hospitals and district hospitals. Institutional maternal mortality rate for C/S (185.8/100,000) was three times higher as compared to normal vaginal delivery (66.6/100,000) (Saving Mothers Report, 2011-2013). Maternal deaths due obstetric hemorrhage increase with increasing parity and age (Saving Mothers Report, 2011-2013). In addition, peripartum hysterectomy proportion also increases with increasing parity (Rossi et al., 2012).

1.1 Peripartum hysterectomy

1.1.1 History

Peripartum hysterectomy is the removal of a uterus performed as an emergency or a scheduled surgical procedure at delivery or within 24 hours to six weeks of delivery of the fetus either vaginally or by caesarean section (Machado, 2011; Lee et al., 2012; Plauche et al., 1981). The first caesarean hysterectomy was first performed in animals (Sparic et al., 2012). Subsequently caesarean hysterectomy was performed in women with obstructive pelvic tumor (Sparic et al., 2012). The outcome was the death of the mother on the third day due to blood loss and a stillborn baby (Sparic et al., 2012). Later a planned caesarean hysterectomy was successfully performed to prevent postpartum hemorrhage and sepsis with both mother and baby survived (Sparic et al., 2012). Since then peripartum hysterectomy has become a vital procedure in obstetrics. The conditions reported to necessitate peripartum hysterectomy are abnormal placentation (e.g. placenta accreta), uterine atony, uterine rupture, leiomyomas, coagulopathy, laceration or rupture of a uterine vessel (Omole-Ohonsi, 2012; Rossi et al., 2013; Mesbah et al., 2013).

Obstetric hemorrhage is a common cause of maternal deaths in Africa and with limited published data it seems that hemorrhage is also an important cause of maternal near misses (Khan et al., 2006; Bates et al., 2008; Mesbah et al., 2013).

Peripartum hysterectomy is performed for postpartum hemorrhage where medical and surgical interventions have failed (Carvalho et al., 2012; Chester et al., 2016). It is also performed in cases of puerperal sepsis and early stage cervical cancer. In recent years, the need for caesarean hysterectomy have markedly being reduced due the development of uterotonics, antibiotics and the development conservative surgical procedures such as embolization techniques and of vessel ligation. These form important procedures in modern obstetric practice (Sparic et al., 2012). Other associated predisposing factors for peripartum hysterectomy include vaginal birth after caesarean section, primary or repeat caesarean section, abnormal placentation and multiple pregnancies (Rossi et al., 2010; Whiteman et al., 2006). The increase in postpartum hemorrhage during and after caesarean sections in South Africa is expected to increase the incidence of peripartum hysterectomy (Saving Mothers Report, 2011-2013).

1.1.2 Incidence of peripartum hysterectomy

There is considerable difference in the incidence of peripartum hysterectomy reported in studies done worldwide. This varies between 0.2/1000 to 6.2/1000 deliveries worldwide, but a higher incidence is seen commonly in low and middle income compared to high income countries (Omole-Ohonsi, 2012). The reported proportion of obstetric hysterectomy in different studies is listed in Table 1. In South Africa (SA), there is a wide variation in the incidence of peripartum hysterectomy amongst the different provinces probably because of different study periods.

High income countries such as the United States have a low incidence rate of approximately 0.77-2.28/1000 deliveries (Kwame-Aryee et al., 2007; SMR 2011). In low and middle income countries, peripartum hysterectomy incidence is high ranging from 2 to 6 per 1000 deliveries (Omole-Ohonsi, 2012). Higher peripartum hysterectomy incidence rates of 4.34/1000 (Kwame-Aryee et al., 2007), 6.2/1000 (Obiechina et al., 2012), 5.6/1000 (Omole-Ohonsi, 2012) deliveries have been reported in Ghana, Nigeria and Pakistan respectively. The reported South African peripartum hysterectomy incidence rates of 1.2/1000 deliveries (Sebitloane and Moodley, 2001) and 1.5/1000 (Shava et al., 1996) are some of the lowest incidence rates in the African continent.

High incidence in low and middle income countries might be the reflection of suboptimal obstetric care and patient load compared with high income countries.

Another factor that attributed to an increase in the frequency of peripartum hysterectomy may be the increase in the number of caesarean sections and the increase in the number of PPH cases referred in unstable conditions where the decision for hysterectomy is considered to be lifesaving.

Table1. Reported incidence of peripartum hysterectomy in different studies

Author	Country	Incidence
Parveen et al (2008)	India	0.31%
Rasul et al. (2016)	Pakistan	0.22%
Mesbah et al (2013)	Egypt	0.29%
Carvalho et al (2015)	Portugal	0.04%
Temizkan et al (2016)	Turkey	0.05%
Bhattacharyya and Mukherjee (2016)	India	0.09%
Umeora et al (2011)	Singapore	0.13%
Sikora-Szczęśniak et al (2016)	Poland	0.12%
Kalathiya et al (2016)	India	0.31%

1.1.3 Risk factors

The primary risk factor for peripartum hysterectomy is haemorrhage, most commonly associated with uterine rupture, retained placenta, morbidly adherent placenta or uterine atony (Bodelon et al. 2009; Howell et al. 2012). Other risk factors include placenta praevia, placental abruption, uterine infection, repeat caesarean section, increasing parity, increasing maternal age and obesity (Bodelon et al. 2009).

Caesarean section (C/S) is associated with increased incidence of peripartum hysterectomy compared to normal vaginal delivery (Whiteman et al., 2006). In the latest Saving Mothers Report, more than 50% of obstetric hemorrhage occurred in women who had undergone C/S delivery (SMR, 2011-2013). Maternal mortality after C/S from postpartum hemorrhage was three times higher as compared to normal vaginal delivery (185.8/100,000 compared to 66.6/100,000). This applies for the index pregnancy due to increased risk of postpartum hemorrhage associated with C/S (Fawcus and Moodley, 2011).

A systematic review of 981 cases of emergency postpartum hysterectomy, Rossi et al (2010) reported that of the women requiring emergency postpartum hysterectomy, 73.2% were delivered by caesarean delivery and 26.8 % delivered vaginally.

Worldwide increasing C/S rates is a growing problem that puts most women undergoing C/S at risk of losing their lives from postpartum hemorrhage especially in developing countries where obstetric care is suboptimal (Ononge et al., 2016; Holm et al., 2012).

Women with previous C/S are at increased risk of peripartum hysterectomy, either during vaginal birth after C/S or as a result of abnormal placentation (Whiteman et al., 2006; Obiechina et al., 2012). Multiple pregnancies are also a risk factor for peripartum hysterectomy due to the over-distended uterus, which may become atonic and result in postpartum hemorrhage, and the associated increasing incidence worldwide is due to the use of assisted reproductive techniques. Multiple pregnancies have a six fold increased risk of emergency peripartum hysterectomy (EPH) compared to singleton pregnancies which increases 24 fold in higher-order multiple pregnancies (triplets and beyond) (WHO, 2010).

Abruptio placenta with intrauterine fetal death and disseminated intravascular coagulopathy is also contributing to severe postpartum hemorrhage especially if delivery is by C/S for obstetric indication (Saving Mothers Report, 2011-2013). Obstructed labor with resultant uterine atony, rupture, puerperal sepsis and obstetric fistula is also risk factor for peripartum hysterectomy especially in developing countries. High parity and poor socio-economic status are some of risk factors for postpartum hemorrhage (Saving Mothers Report, 2011-2013).

1.1.4 Indications for peripartum hysterectomy

The indications for peripartum hysterectomy differs between low and middle income and high income countries. Earlier studies have reported that the most common indication for peripartum hysterectomy was hemorrhage due to uterine atony and uterine rupture (Lachman et al., 1985; Sebitloane and Moodley, 2001) while in high income, abnormal placentation is the major indication for emergency hysterectomy followed by uterine atony (Papoutsos et al, 2010; Imudia et al, 2010; Melendez et al, 2010; Rossi et al., 2010).

However, peripartum hysterectomy at times may not be sufficient to stop the bleeding especially if DIC is superimposed and hence some surgeons leave compression packs in the abdomen that are removed after 24-48hrs. Rossi et al (2012) reported that in 6% of cases, further procedures were necessary to stop the bleeding as emergency hysterectomy alone was not sufficient. Hysterectomy can be total, or often a subtotal procedure is performed.

1.2 Postpartum hemorrhage (as a major cause of EPH)

Postpartum hemorrhage (PPH) is still leading cause of maternal mortality all over the world (Naz et al., 2008; Tort et al., 2015). Recently, Snelgrove (2009) reported that postpartum hemorrhage accounts for a substantial proportion of maternal deaths in developing countries. In South Africa obstetric hemorrhage is a major cause of maternal mortality.

The 6th Saving Mothers Report (2011-2013) found that approximately 14.8% of deaths were due to obstetric hemorrhage. A large proportion of these were due PPH and almost a third were associated with bleeding at, during and immediately following caesarean delivery (Fawcus et al., 2015). Atonicity of the uterus in these maternal deaths occurred despite the use of standard prophylactic intravenous oxytocin.

Incidence of PPH generally is reported to be ranging from 3-10% (Fawcus and Moodley, 2013). The PPH incidence in Australia has been reported at 4.84% for elective C/S and 6.7% for emergency C/S, while Combs et al reported an incidence of 5.9% (Magann et al., 2005; Combs et al., 1991).

PPH incidence varies according to the definition used; amount of blood loss is the commonly used definition estimated at 1000ml post C/S and 500ml post normal vaginal delivery. Other definitions include change in hematocrit of more than 10%, need for blood transfusion.

A number of risk factors for postpartum hemorrhage have been reported. These include uterine atony, retained products of conception, precipitate or prolonged labor, fetal macrosomia, multiparity, coagulopathies, and previous primary postpartum hemorrhage (Oyelese and Ananth, 2010; Ononge et al., 2016). Postpartum hemorrhage is associated with major morbidity, prolonged hospital stay, high case fatality rate and massive blood transfusion.

Therefore it is important to study the incidence, identify risk factors, maternal morbidity associated with postpartum hemorrhage. It is also important to identify perinatal outcomes associated with postpartum hemorrhage and peripartum hysterectomy to complement the Saving Mothers report with the study of near miss opportunity. The study of peripartum hysterectomy and PPH will help to revise current guidelines and protocols for management of postpartum hemorrhage.

1.3 Complications of emergency peripartum hysterectomy

Peripartum hysterectomy is associated with a high rate of complications, mainly due to the need for massive blood transfusions, coagulopathy, and urinary tract injury (Kwee et al., 2006). Lau et al (1997) reported higher incidence of urinary tract injury in total abdominal hysterectomy than in subtotal hysterectomy.

However, others found no statistical significant difference in terms of urinary tract injury and morbidity between total peripartum hysterectomy and subtotal hysterectomy (Whiteman et al., 2006; Obiechina et al., 2012).The bladder is most frequently injured during obstetric procedures with incidences of 6.1% observed during obstetric procedures (Reynaldo et al., 2004), 1.8% during caesarean section (Reynaldo et al., 2004), and 1.5% during gynecological surgeries (Mendez, 2001).

Carley et al (2002) reported the incidence of bladder and ureter injuries were 0.58% and 0.36% respectively for abdominal hysterectomy. The figures were 1.86% and 0% for vaginal hysterectomy and 5.13% and 1.71% for total obstetric hysterectomy. The incidence of bladder injury increases with previous caesarean deliveries (Phipps et al., 2005).

The most severe complication of hemorrhage is maternal death, whose risk is estimated to be approximately 1 in 100,000 deliveries in developed countries and has been increasing. This risk is as high as 1 in 1,000 deliveries in developing countries (Carvalho et al., 2012). Maternal mortality rate associated with peripartum hysterectomy is relatively high at around 2.6% (Kwame-Aryee et al., 2007) to 5.6% (Sebitloane and Moodley, 2001). Peripartum hysterectomy is still applicable in modern obstetrics and all practicing obstetricians need to be competent in performing the procedure because of its life saving nature both in developed and developing countries.

Intervention radiology for uterine artery embolism for antenatal diagnosed abnormal placentation (placenta accreta, increta and percreta) is a safer option in developed countries or in countries where such procedure is available. Uterine balloon tamponade using condom catheter has shown success with no reported complications in resource limited countries for management of postpartum hemorrhage secondary to uterine atony, placenta previa, placenta accreta but further research is still required to ascertain safety and technique (Tindell et al., 2013). We therefore proposed to embark on a review of the records to establish the current incidence and factors leading to peripartum hysterectomies in our setting.

1.4 Aim

To audit the clinical management preceding peripartum hysterectomy and evaluate maternal and neonatal outcomes in patients who underwent peripartum hysterectomies in Port Shepstone Hospital.

1.4.1 Primary objectives

1. To determine the incidence and indications of peripartum hysterectomies in a semi-rural regional hospital.
2. To establish maternal outcomes for those women needing the procedure.

1.4.2 Secondary objectives

1. To determine the incidence of postpartum hemorrhage and establish common conservative measures employed in its management before peripartum hysterectomy.
2. To determine the association between HIV status and obstetric hemorrhage.
3. To determine perinatal outcomes in women who underwent peripartum hysterectomy

Chapter 2: Methodology

2.0 Study setting

This retrospective descriptive study was conducted at Port Shepstone, a regional referral hospital, located in Ugu district in KwaZulu-Natal Province, South Africa, and also serves some areas of the Eastern Cape Province (Bizana, Lusikisiki). There are 3 district hospitals (Murchison Hospital, St Andrews Hospital and GJ Crooks Hospital) and 2 community health centers (Gamalakhe and Turton) which conduct deliveries in the area (www.kznhealth.gov.za>chc). Ugu district has a population of 722484, with 90.63% Black African, 4.94% White, 3.42% Indian/Asian, 0.85% Colored and 0.16% other population groups (Census, 2011). It is a 260 bed hospital with ICU & high care facilities and provides 24hr obstetric and gynecological services with two consultants and two registrars, medical officers and interns.

2.1 Study period

The study period was from 1st January 2010 to 31st December 2014.

2.2Research Instrument and data collection

From the maternity records, I identified all files belonging to women who had experienced postpartum haemorrhage, as well as those who were noted to have undergone peripartum hysterectomy. I scrutinized all the labor ward delivery records, theatre and ICU records for the study period, to establish the total number of deliveries, identified postpartum hemorrhage and peripartum hysterectomy cases. Thereafter I retrieved files for all the identified cases of hysterectomies in order to extract the necessary information as per the data sheet.

Medical records of the patients, who had undergone peripartum hysterectomy despite of gestational age & neonatal outcome; and patients with postpartum hemorrhage between 1st January 2010 and 31st December 2014, in Port Shepstone Regional Hospital, following vaginal, assisted vaginal or caesarean delivery, were reviewed retrospectively. Hysterectomies done up to 42 days post-deliveries (e.g. for postpartum sepsis) were also be included to determine the exact incidence of hysterectomies following a pregnancy. During the study period I retrieved 230 files for suspected PPH and peripartum hysterectomy cases. Twenty one files were rejected for various reasons such as poor documentation. Seventeen suspected PPH files were rejected because no assessment of PPH was made and treatment received was not suggestive of PPH and 3 files were rejected because it was found that hystorotomy was done and not hysterectomy.

Information obtained from medical charts were recorded in a structured format and included demographic details, previous obstetric history, details of the current pregnancy and delivery, treatment modalities for postpartum haemorrhage, outcomes, indications for postpartum hysterectomy, outcomes of hysterectomy such as intraoperative and postoperative complications, duration of hospital stay, amount of blood transfused and neonatal outcomes.

Maternal complications such as maternal death and massive postpartum haemorrhage, urological, infectious, respiratory, renal, and thromboembolic complications were also checked.

Data was entered on a predesigned data sheet (see Appendix 1), and exported onto an EXCEL spreadsheet.

2.3 Inclusion criteria

All women who had postpartum haemorrhage and peripartum hysterectomy regardless of outcome were included. Peripartum hysterectomy (PH) done for post-abortal sepsis and PH done up to 42 days post-delivery were included.

2.4 Exclusion criteria

Women who were not pregnant and had gynaecological indications for hysterectomy were excluded from the study. Patients with PPH and peripartum hysterectomy done outside the study period were excluded from the study.

2.5 Statistical calculations and data validity

Data was entered into a computer database using Microsoft Excel and imported on SPSS and coded for statistical analysis was done using the software package SPSS 24 for Windows. Further frequencies and percentages were given as descriptive statistics. Data are presented as mean (SD), frequency and percentages. Continuous variables were grouped into categorical data then summarized as proportions and analysed by Chi-square or Fisher's exact test. P-values of less than 0.05 were considered significant. Confidence intervals, relative risk, risk ratios and p values were used for statistical validation and reliability of the data where applicable.

2.6 Regulatory Approval

Ethical clearance was obtained from BREC (Biomedical Research Ethics and Committees) with the reference (BE 387/13). University of KwaZulu-Natal, Postgraduate Education and Research Office, Nelson R Mandela, School of Medicine, University of KwaZulu-Natal, The Hospital Management of Port Shepstone Hospital and KZN, Department of Health also approved the study. The approval correspondences from different regulatory bodies are shown in annexure 2, 3, 4 and 5 respectively.

Chapter 3: Results

3.0 Results summary and flow diagram

During the 5 years of the study period, a total of 17,657 births occurred at Port Shepstone Hospital. The proportion of PPH was 7.1 per 1000 deliveries and peripartum hysterectomy was 4.7 per 1000 deliveries. There were 9,195 (52.1%) vaginal deliveries and 8,462 (47.9%) were CS deliveries. In PPH series, there were 77 (61.1%) PPH cases following caesarean delivery and 49 (38.9%) PPH cases after vaginal delivery. Figure 1 lists the patient population of the study.

Figure 1: Flow diagram shows the number of PPHs and number of peripartum hysterectomy following the different mode of delivery.

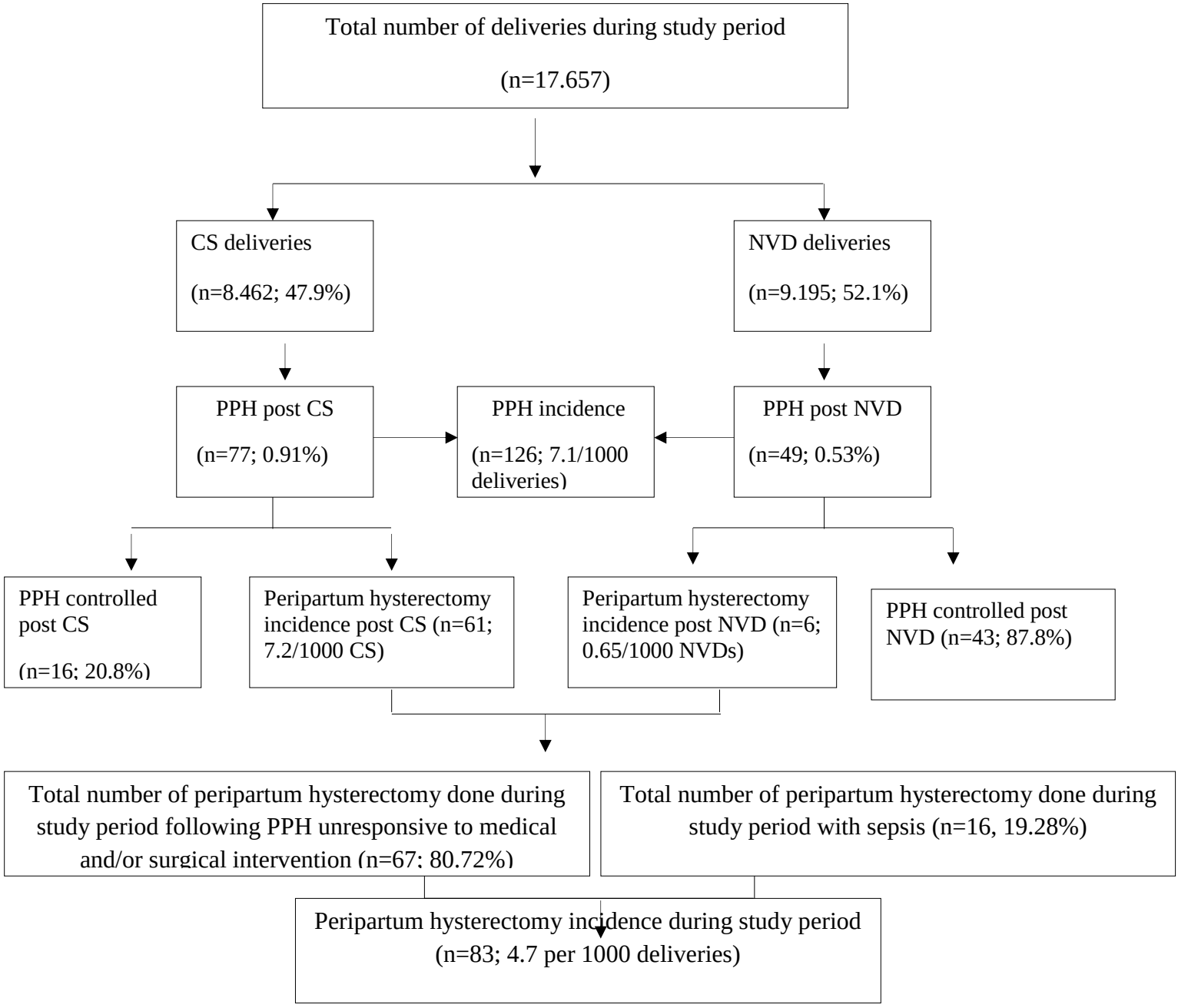

Table 2 also shows the number of PPH cases over the 5 years of study, as well as the number of peripartum hysterectomies.

Table 2: Number of PPH and PH cases identified during the five year study period

Year	Postpartum hemorrhage (n=126)	Peripartum hysterectomy (n=83)
2010	11	12
2011	8	18
2012	13	15
2013	41	21
2014	53	17

3.1 Postpartum hemorrhage

One hundred and twenty six patients experienced postpartum hemorrhage. Fifty nine (46.8%) PPH were controlled using medical and surgical interventions. Postpartum hemorrhage was controlled in 13 patients using medical intervention which entailed a combination of syntocinon (20units), syntometrine (5U oxytocin+ 0.5mg ergometrine), and misoprostol (600-800 µg); and 1 patient syntocinon and PGF2. In 45 patients, in addition to syntocinon and misoprostol surgical intervention was required which included manual evacuation of placenta, perineal and cervical tear repair. Table 3 shows the medical and surgical intervention used to control PPH.

Table 3: Perioperative initiatives taken before hysterectomy (n=59)

Intervention	No (%)
Medical intervention	
Syntocinon ,syntometrine, and misoprostol	13 (22%)
Syntocinon with PGF2	1 (1.7%)
Medical and/or Surgical intervention	
Syntocinon with B Lynch sutures	12 (20.3%)
Syntocinon with misoprostol and uterine artery ligation	25 (42.4%)
B Lynch sutures	2 (3.4%)
Syntocinon with misoprostol and uterine artery ligation	1 (1.7%)
Syntocinon with misoprostol and perineal tear repair	1 (1.7%)
Syntocinon with misoprostol and evacuation	4(6.8%)

Sixteen (20.8%) of the 77 PPH following C/S and 43/49 (87.8%) (p=0.0001) PPH after vaginal delivery were controlled using medical and/or surgical intervention. Postpartum hemorrhage was not controlled in 62 patients following medical and surgical interventions and required peripartum hysterectomy.

No medical and surgical interventions were attempted in 5 patients with ruptured uterus and required peripartum hysterectomy. Table 4 shows the medical and surgical intervention attempted to control PPH. Peripartum hysterectomies were done from 24 hours up to 42 days post-delivery.

Table 4: Medical and surgical interventions attempted to control PPH (n=62)

Intervention	No (%)
Medical intervention	
Syntocinon with misoprostol	7 (11.3%)
Syntocinon, syntometrine, misoprostol and PGF2	3 (4.8%)
Medical and Surgical intervention	
Syntocinon with misoprostol and uterine artery ligation	22 (35.5%)
Syntocinon with misoprostol and packing	1 (1.6%)
Syntocinon with misoprostol and PGF2 + B Lynch sutures	3 (4.8)
Syntocinon with misoprostol and B Lynch sutures	7 (11.3%)
Syntocinon with misoprostol and B Lynch sutures and uterine artery ligation	6 (9.7%)
Syntocinon, syntometrine, misoprostol+PGF2, B Lynch sutures +uterine artery ligation	2 (6.5%)
Syntocinon with misoprostol and uterine packing	2 (3.2%)
Syntocinon with misoprostol and packing and uterine artery ligation	1 (1.6%)
Syntocinon with misoprostol and tourniquet and uterine artery ligation	1 (1.6%)
Syntocinon with misoprostol and PGF2 and tourniquet	2 (3.2%)
Syntocinon with misoprostol and perineal tear repair	2 (3.2%)
Syntocinon with misoprostol and evacuation	1(1.6%)

One hundred and twenty six patients experienced postpartum haemorrhage. The mean age of the 126 PPHs patients was 26.3 ± 7.2 years. The youngest patient was 14 and the eldest 47 years. Age distribution among 126 patients who had PPH revealed that 24 (19.0%) were aged below 20 years, 34 (27.0%) were aged between 20-25 years, 37 (29.4%) were between ages 26-30 years, 18 (14.3%) were between 31-35 years and 13 (10.3%) were aged greater than 36 years. Most of the PPHs occurred in the age group 26-30 years. The mean gravidity was 2.45 ± 1.2 (range 1- 7). Distribution of PPHs patients according to age groups is shown in Figure 2.

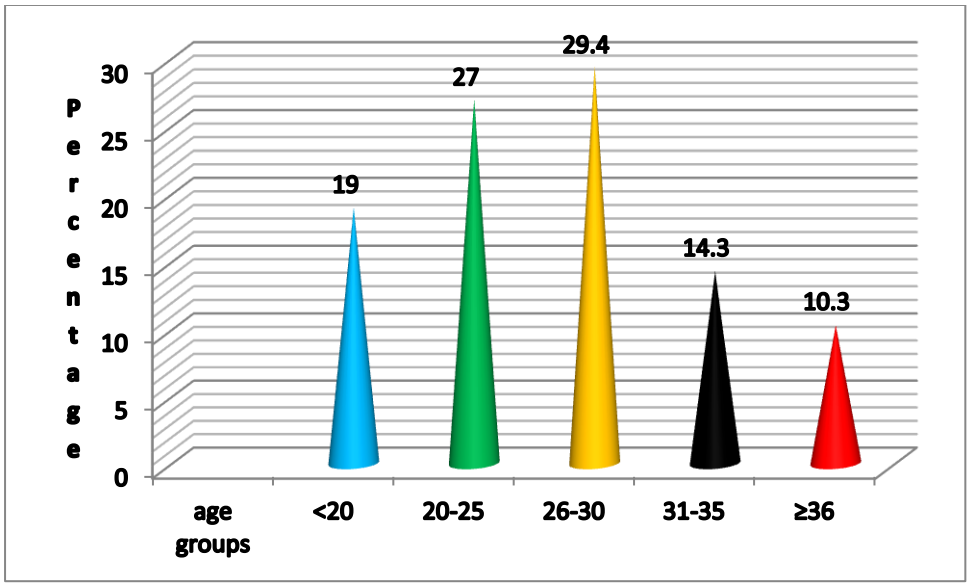

Figure 2: Distribution of PPH patients according to age groups

Among the PPHs patients, the mean parity of mothers was 1.4 ± 1.3 (range 0 – 6); 28 (22.2%) were para 0, 77 (61.1%) were between para 1 and 2, 20 (15.9%) were between para 3 and 4 and 1 (0.8%) were greater than para 4. Most of the PPHs occurred in the para 1-2. The distribution of PPHs patients according to parity groups is shown in Figure 3.

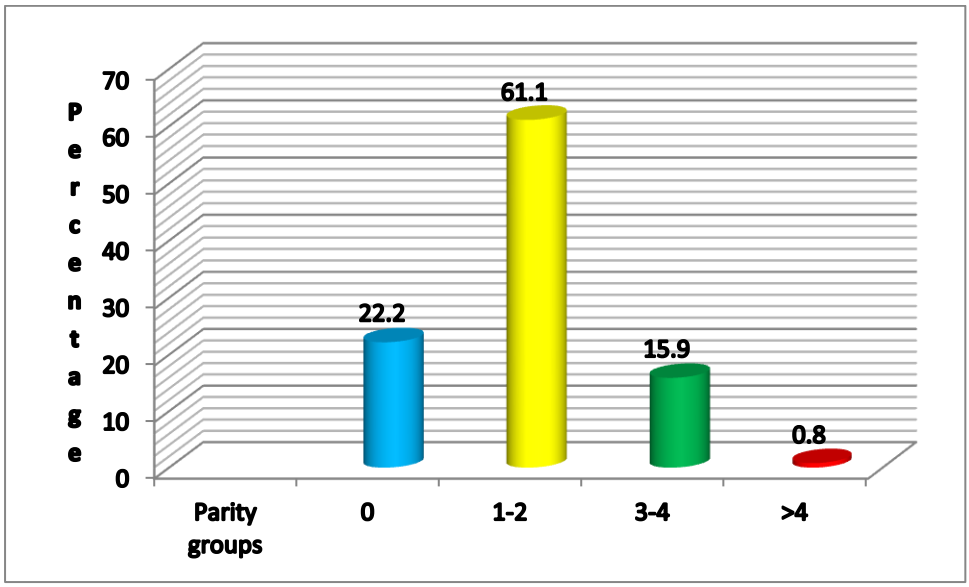

Figure 3: The distribution of PPH patients according to parity groups.

3.1.1 Predisposing factors for PPH

The common predisposing factors identified for PPH in our study are listed in Table 5.

Table 5: Predisposing factors for PPH

Variable	Number (%)
Caesarean section	64 (50.8%)
Previous Caesarean section	30 (23.8%)
HIV	60 (47.6%)
Antenatal complications	
Hypertension	18 (14.3%)
Abruption placentae	25 (19.8%)
Hypertension with Abruptio placenta	13 (10.3%)

3.1.2 Maternal and neonatal outcome in PPH patients

There were 2 (1.4%) maternal deaths and 44 (30.1%) perinatal deaths. Maternal and neonatal outcomes in PPH patients are shown in Table 6.

Table6. Maternal and neonatal outcomes in PPH patients

	Number (%)
Maternal death	2 (1.4%)
Perinatal outcome	
Alive	102 (69.9%)
Stillbirths	18 (12.3%)
Macerated stillbirth	22 (15.1%)
Early neonatal death	4 (2.7%)

3.1.3 Comparison of demographic and clinical characteristics of PPH patients treated

There was no statistical significant difference in the comparison of the different variables between PPHs group successfully managed and those that were not. Table 7 lists the comparison between the different variables and their statistical significance.

Table 7: Comparison of demographic and clinical characteristics of PPH patients treated

Variable	Successful management (n=59)	Failure to manage (n=62)	p value
Age (years)	27.3 ± 7.2	27.2 ± 6.9	0.9
Parity	1.53 ± 1.3	1.58 ± 1.2	0.8
Gravid	2.53 ± 1.3	2.61 ± 1.2	0.6
HIV+	27	33	0.4
Hypertension	6	12	0.1

3.1.4 Demographic and clinical characteristics of patients with sepsis and who underwent peripartum hysterectomy.

There was a significant difference in mean age (27.2 ±6.9 vs 18.6±2.9; p=0001), mean parity (1.58 ±1.2 vs 0.5±0.9; p=0.001) and mean gravidity (2.6 ±1.2 vs 1.5 ±0.9; p=0.001) between peripartum hysterectomy patients derived following failure to control PPH patients compared to those that were sent directly for hysterectomy with sepsis. Four (25%) patients with sepsis were HIV positive and 4 (25%) were hypertensive.

3.2 Peripartum hysterectomy

Sixty seven post-partum hemorrhage patients were unresponsive to medical and/or surgical intervention and these patients required peripartum hysterectomies (Table 3). A further 16 patients presented with septic shock, 11 following caesarean sections and 6 had post-abortal sepsis due to illegal termination of pregnancy. Eight of the 16 patients were given antibiotic prophylaxis. All 16 patients underwent peripartum hysterectomy. No medical and surgical intervention was attempted in 5 patients with ruptured uterus and required peripartum hysterectomy.

A total of 83 patients required peripartum hysterectomy resulting in a peripartum hysterectomy incidence of 0.47% (4.7 per 1000 deliveries) in 5 years. Peripartum hysterectomy for PPH was performed in 67 patients with a peripartum hysterectomy incidence of 3.79/1000 deliveries in 5 years. Of the 67 peripartum hysterectomies, 6 (8.9%) were performed after vaginal deliveries with peripartum hysterectomy incidence of 0.065% (0.65/1000 NVDs), and 61 (91.1.4%) were performed. after C/S deliveries resulting in peripartum hysterectomy incidence of 0.72% (7.2/1000 C/S deliveries). According to management protocol for PPH at Port Shepstone Hospital, medical and surgical interventions were used in an attempt to control postpartum haemorrhage and, therefore, avoid peripartum hysterectomy.

3.3 Demographic details of the patients who underwent peripartum hysterectomy

Sixty nine (83.1%) women were booked for antenatal care, 14(16.9%) were unbooked with 8 (9.6%) presenting for the first time in labor. Eighty two (98.8%) women had singleton pregnancies and 1 (1.2%) twin pregnancy.

The mean age (SD) of the 83 mothers who underwent peripartum hysterectomy was 27.4 ± 7.5 years. The youngest patient was 14 and the eldest 47 years. Age distribution among 83 patients who underwent peripartum hysterectomy revealed that 14 (16.9%) were aged below 20 years, 18 (21.7%) were aged between 20-25 years, 29 (34.9%) were between ages 26-30 years, 9 (10.8%) were between 31-35 years and 13 (15.7%) were aged greater than 36 years.

Peripartum hysterectomy occurred more common in the 26-30 year age group. Distribution of peripartum hysterectomy patients according to age groups is shown in Figure 4. The mean gravidity (SD) was 2.67 ± 1.3 (range 1- 5).

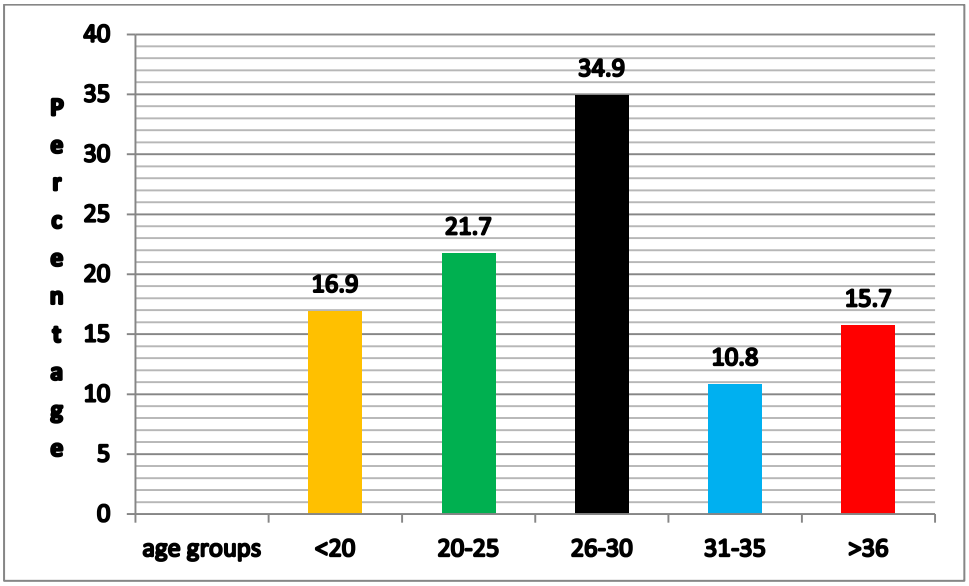

Figure4. Distribution of peripartum hysterectomy patients according to age groups

Table 8: Demographic data of patients undergoing peripartum hysterectomy

Variable	n=83
Age (years)	
Mean ± SD	27.4±7.5
Range	14- 47
Gravidity	
Mean ± SD	2.67 ± 1.3
Parity	
Mean ± SD	1.69 ± 1.3
Area of residency	
Neighboring and outlying areas	83(100.0%)
Antenatal care	
Booked	69 (83.1%)
Unbooked	14(16.9%)
Presenting first time in labor	8 (9.7%)
Occupation	
Self-employed	9 (10.8%)
Employed	3 (3.6%)
Unemployed	62 (74.7%)
Student	9 (10.8%)
Religion	
Christian	80 (96.4%)
Other (Hindu)	3 (3.6%)

Among the patients, the mean parity (SD) of mothers 1.69 ± 1.3; 15 (18.1%) were para 0, 49 (59%) were between para 1 and 2, 17 (20.5%) were between para 3 and 4 and 2 (2.4%) were greater than para 4. Most of peripartum hysterectomy occurred in para 1 – 2. The distribution of peripartum hysterectomy patients according to parity groups is shown in Figure 5.

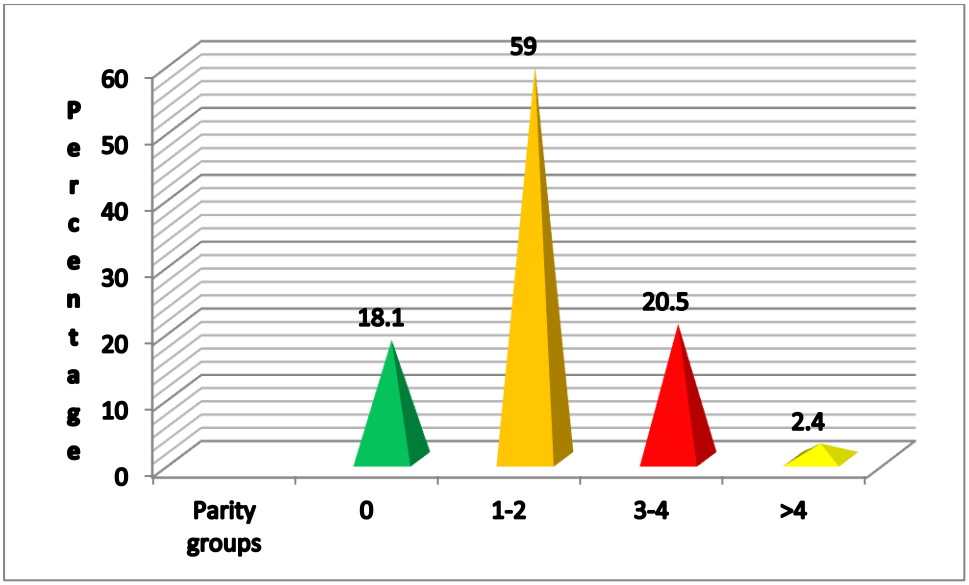

Figure5. Distribution of peripartum hysterectomy patients according to parity groups

3.4 Patient residency

All patients were from neighboring and outlying areas (n=83). There were 54 (65%) patients that were delivered in Port Shepstone hospital. Time interval from time of admission to hospital to time of treatment initiation at Port Shepstone Hospital was 164.8±93.4 minutes (n=22). There was no difference between the two time periods (p=0.48). The interval between the incident to time of arrival at Port Shepstone Hospital was 148.3±74.9 minutes (n=20).

3.5 Occupation

Most of our patients 71 (85.5%) were unemployed which included 9 students. Among those women who were employed, 9 (8.5%) were self-employed and 3 were working elsewhere.

3.6 Religion

Eighty (96.4%) were Black South African females that followed the Christian faith while the remaining 3 (3.6%) were Asian that followed the Hindu faith.

3.7 Index delivery

3.7.1 Labor onset

Labor was induced in 3 (3.6%) patients and in the remaining 76 (91.6%) labor onset was spontaneous. The indication for induction in 3 patients were post-dates (n=1), termination of pregnancy (n=1) and abruption (n=1). The inducing agent was misoprostol.

Table 9: Labor onset (n=3)

	n (%)
Spontaneous	76 (91.6)
Induced	3 (9.9)
Indication for induction (n=3)	
Post-dates	1 (33.3)
Termination of pregnancy	1 (33.3)
Abruption	1 (33.3)
Drugs used for induction (n=3)	
Misoprostol	3 (92.86)

3.7.2 Labor monitoring with partogram, CTG, & Labor augmentation

Labor monitoring with partogram was done in 37 (44.6%) patients and not done in 46 (55.4%) patients. CTG monitoring was done in 43 (51.8%) patients and not performed in 40 (48.2%). In 13 (30.2%) of the 43 patients who had CTG monitoring revealed fetal compromise. Monitoring of patients postpartum took place in 45 (54.2%) patients. Labor augmentation took place in 9 (10.8%) and not done in 70 (84.3%) patients.

3.7.3 Mode of delivery

In the peripartum hysterectomy group there were 78 deliveries and 5 septic miscarriages. Eleven (14.1%) were vaginal deliveries of which 2 (18.2%) were assisted vaginal delivery. Sixty seven (85.9%) were caesarean deliveries of which 4(6%) were elective caesarean delivery.

Table 10: Mode of delivery

Mod e of delivery	Number	Percentage
Vaginal (n=11)		
Normal vaginal delivery	9	11.5
Assisted vaginal delivery	2	2.6
Caesarean deliveries (n=67)		
Elective	4	6
Emergency	63	76

Cesarean section rate in our study was 47.9% and over 5 year period has been increasing see table 11.

Table 11: Yearly caesarean rate at Port Shepstone Hospital for the 5 year study period

Year	Number of deliveries	Number of CS	CS rate
2010	3942	1782	45.2%
2011	4273	1943	45.5%
2012	3453	1763	51.1%
2013	2962	1594	53.8%
2014	3047	1400	45.9%

3.7.4 Indication for caesarean deliveries

Indications for caesarean deliveries are shown in Table 12. Fetal distress (20.6%), abruption (35.4%) and cephalopelvic disproportion (16.9%) were common indications for caesarean deliveries.

Table 12: Indication for caesarean deliveries

Indications	Number	Percentage
Emergency (n=63)		
Fetal distress	15	22.3
Cephalopelvic disproportion	10	14.9
Refused VBAC in labor	4	6
Previous caesarean delivery x2	2	3
Placenta previa	4	6
Eclampsia	1	1.5
APH: Abruptio	9	13.4
APH: Uterine rupture	13	19.4
Breech presentation	3	4.5
Twin delivery	1	1.5
Preterm premature rupture of membrane	1	1.5
Elective CS (n=4)		
Previous CS x1	4	6

3.8 Indications for peripartum hysterectomy

The main indications for the procedures were uterine atony (43/83; 51.8%), rupture uterus (13/83; 15.7%), multiple uterine fibroid (3/83; 3.6%), placenta accrete (5/83; 6.0%) and uncontrolled bleeding not specified (3/83; 3.6%). The different indications for peripartum hysterectomy are shown in Table 13.

Table 13: Summarizing the different indications for peripartum hysterectomy

Indications for peripartum hysterectomy	n=83
• Postpartum hemorrhage due to:	
-Uterine rupture	13 (15.7%)
-Uterine atony	43 (51.8%)
-Multiple Uterine fibroids	3 (3.6%)
-Placenta accreta	5 (6.0%)
-Unspecified bleeding	3 (3.6%)
• Puerperal sepsis	11(13.3%)
• Post abortal sepsis	5(6%)

3.9 Blood transfusion

Sixty four (77.1%) patients had blood transfusion. The mean number (SD) of units of blood transfused was 4.1 ± 2.2 units. There was no difference in the blood transfusion rates between HIV positive and HIV negative pregnant women (3.53 ± 1.6 vs 3.54±2.2; p=0.9).

3.10 Previous C/S (n=26)

Total of 26 out of 83 (31.3%) peripartum hysterectomy patients had a caesarean delivery in the previous pregnancies and the number of previous C/S were as follows: with 20 (76.9%) having had one previous caesarean section and 6 (23.1%) having had two previous caesarean sections.

3.11 Hemoglobin

Hemoglobin levels post-delivery. The Hb levels post deliveries are shown in Table14. Twelve (18.8%) patients experienced severe anemia. Fifty four (65.1%) patients used haematinics during the course of pregnancy.

Table 14: Hb levels at delivery (n=64)

Hb level	n (%)
➢ 10 g/dl	43 (67.2)
➢ 8 – 9 g/dl	9 (14.1)
➢ 6 – 7 g/dl	11 (17.2)
➢ ≤ 5 g/dl	1 (1.6)

3.12 HIV status

Forty one patients (49.2%) of the PH patients were HIV-positive. Of these, 39 (95.1%) were on ARV treatment are documented in Table 15. In two cases ART treatment was unknown. The mean (SD) CD4 count was 397.8 ± 192.7 (range: 84-1223). The median CD4 count was 371.0. Thirty had a CD4 count <350 when they first presented for antenatal care.

Table 15: Antiretroviral therapy in PH patients (n=39)

	n (%)
Dual therapy from 28 weeks	2 (5.1)
Dual therapy from 14 weeks	1 (2.6)
HAART	36 (92.3)

3.13 Antenatal complications

Hypertensive complications of pregnancy and antepartum hemorrhage were the major antenatal complications and are listed documented in Table 16.

Table 16: Antenatal complications (n=37)

	n (%)
Hypertensive complications of pregnancy	5 (15.5)
Antepartum hemorrhage	21 (17.6)
Hypertension with antepartum hemorrhage	9 (9.2)
Mitral valve replacement	1 (0.7)
Tuberculosis	1 (0.7)

3.14 Surgeons who performed the procedure

Peripartum hysterectomies were performed by senior clinicians as follows: Consultant performed 40(48.2%), chief medical officer 37 (44.6%), registrar 1(1.2%) and medical officer 1 (1.2%).

The clinical position of the surgeon who performed the procedure was unknown in 4 (4.8%) of the cases. Total hysterectomy was done in (64/83; 79.4%), while the subtotal type was done in the rest of cases (19/83; 20.6%).

3.15 Other surgical interventions at the time of hysterectomy

Other surgical intervention following peripartum hysterectomy included drains left in situ (n=10/83; 12%) and abdominal packs (n=9/83; 10.8%).

3.16 Post procedure complications

Postpartum hysterectomy is associated with high complication rates. Complications experienced by patients following peripartum hysterectomy either done total abdominal hysterectomy or subtotal hysterectomy are listed in Table 17. Twenty nine (76.3%) experienced complications following total abdominal hysterectomy while 9 (23.7%) following subtotal hysterectomy. However, there was no increased risk of complications when comparing total (29/64 or relative risk=2.2) versus subtotal hysterectomies, (9/19, or relative risk =2.1)

Table 17: Post procedure complications (n=38)

Complications	Number (%)
One complication	
Bladder injury	4 (4.8%)
Ureteral injury	1 (1.2%)
Bowel injury	1 (1.2%)
DIC	1 (1.2%)
Wound sepsis	6 (7.2%)
Puerperal sepsis	1 (1.2%)
Febrile illness	2 (2.4%)
Massive transfusion	14 (16.9%)
More than one complication	
Bladder and ureteral injury	1(1.2%)
Wound sepsis and ureteral injury	1 (1.2%)
Bladder injury with bowel injury	1 (1.2%)
Wound sepsis with pulmonary embolism	1 (1.2%)
Bladder injury with febrile illness	1 (1.2%)
Puerperal sepsis and febrile illness	1 (1.2%)
Bladder injury and massive transfusion	1 (1.2%)
Bowel injury and wound sepsis	1 (1.2%)

3.17 Further surgical procedures required following peripartum hysterectomy

Sixteen (19.3%) patients required pelvic packing with abdominal packs to achieve hemostasis after peripartum hysterectomy. Twenty patients (34.9%) required further surgical procedure following peripartum hysterectomy. Further surgical procedure required following peripartum hysterectomy are listed in Table 18.

Table 18: Further surgical measures taken after hysterectomy (n=31)

Further surgical procedure	n (%)
Pelvic packing	16 (19.3%)
Washout	4 (4.82%)
Bladder repair	6 (7.2%)
Secondary wound closer	3 (3.6%)
Removal of packs and washout	2 (2.4%)
Removal of packs	14(16.9%)

3.18 Intraoperative and postoperative details

Peripartum hysterectomies were associated with significant morbidity. A total of 51 women (61.4%) required intensive care admission, the mean stay time being (3.7± 2.6) days.

Table 19: Intraoperative and postoperative details

	n=83
Type of hysterectomy	
Total	64 (77.1%)
Subtotal	19 (22.9%)
Mean blood transfusion (units) ± SD	4.1 ± 2.2
Maternal admission to ICU	51(61.4%)
Mean stay in ICU (days) ± SD	3.7±2.6

3.19 Maternal outcomes and neonatal outcomes

There were two (2.4%) cases of maternal deaths. There were 82 singleton pregnancy and one twin pregnancy. There were 31 (37.3%) perinatal deaths. Neonatal outcome is shown in Table 20.

Table 20: Neonatal outcome (n=31)

Neonatal outcome	Number (%)
Alive	53 (63.1)
Fresh stillbirths	16 (19.0)
Macerated stillbirths	12 (14.3)
Early neonatal death	3 (3.6)

Comparison of demographic and clinical profile of patients who underwent PH and non PH patients

There was a significant difference in age (p=0.02), parity (p=0.003), previous CS (p=0.01), cesarean section (p=0.001) and HIV infection (p=0.4) between patients who underwent peripartum hysterectomy compared to patients who did not have peripartum hysterectomy.

Table21: Comparison of demographic and clinical profile of patients who underwent PH and non PH patients

Variable	PH	Non PH	P value
Age	27.4±7.5	24.7±6.5	0.02
Parity	1.69±1.3	1.08±1.03	0.003
Previous CS	30	7	0.01
CS	67	9	0.0001
HIV +	41	23	0.4

CHAPTER 4: DISCUSSION

4.0 Discussion

4.1Postpartum Haemorrhage

According to the protocol at Port Shepstone Hospital, medical and surgical interventions are used in an attempt to control postpartum haemorrhage and, therefore, avoid peripartum hysterectomy. The proportion of PPH was 7 per 1000 deliveries or 0.7%. PPH post C/S was 0.91% and post NVD was 0.5%. The PPH proportion in our study was low as compared to one reported in Australia by Magann et al, they found PPH incidence post C/S of 4.84% (n=4836) and PPH proportion post emergency C/S was 6.75%. While Combs et al found a post C/S PPH proportion of 6.75%. This might be related to the poor documentation of complications such as PPH at C/S when there are no extra surgical measures done and poor estimation of blood loss at C/S.

There was a linear increase in the number of PPHs occurring in women from age group less than 20 years and peaked in the 26-30 year age group and subsequently there was a linear decrease with minimum number of PPHs occurring in the ≥ 36 age group. In addition, majority of the PPHs occurred in women with para 0 and in para 1-2. Together the two groups constituted about 92.9% of the total population. This is similar to 2008-2010 saving mothers' report in which about 71% of women who died from PPH were having parity of 0-2.

Our findings are different from many studies in the literature with PPH being more common in high parity and age more than 35yrs. These figures might be affected by our study population with low parity, 58% being in para 1-2 group, 89.7% in the age group < 35yrs, and about 55% (between age 21-30yrs). The success rate following medical and surgical intervention for PPH was 49% and remaining 51% required hysterectomy.

In our study, 58 (96.7%) of the 60 HIV positive PPH patients were taking HAART for their infection. The HIV positive patients were about 60 (47.6%) in the PPH group which is higher than HIV prevalence in KZN and Ugu 40.1% and 41.1% respectively (National Antenatal Sentinel HIV prevalence survey, 2013). Furthermore, it was noted that the risk of obstetric hemorrhage was higher among HIV positive women taking HAART compared to those not taking HAART. This is similar finding to the study by You et al, 2016. In an earlier study, the increased risk of postpartum hemorrhage in HIV positive pregnant women has been reported (Chweneyagae et al., 2012). HIV infected women formed a large proportion of women who died from obstetric hemorrhage (Saving Mothers Report, 2011- 2013; National Department of Health, Pretoria).

It has been reported that blood transfusion rates are higher in HIV positive pregnant women (Bloch et al., 2015). In our study, there was no difference in the blood transfusion rates between HIV positive and negative pregnant women.

Obstetric hemorrhage is the second leading cause of maternal mortality at 14.8% and more than 50% of the deaths were associated with bleeding during and post caesarean delivery (SMR, 2011-2013).
Caesarean section is also associated with high case fatality rate of 1.89deaths/1000 caesarean deliveries as compared to 0.67 deaths/1000 vaginal deliveries (Fawcus, 2015). Caesarean section rate of 47.9% is high in our study as compared to the national C/S rate of 22.7% and 27.8% for the KZN province. C/S rate in the hospital is on the increasing trend from 2010 (45.2%), with the highest rate in 2013 (53.8%). However, the C/S rate in South Africa has also been increasing from about 14% since 2005 to about 22.7% in 2015 (Massyn et al, 2015). C/S rate is an indicator of access to essential obstetric care. Ugu district has a high C/S rate in KZN, and ranks the third in the country at 37.5%. Murchison hospital in Ugu district is also on list of the district hospitals with high C/S rates at 43.2% (Massyn et al, 2015).
The exact reason for this high rate is unknown; however the use of continuous electronic fetal monitoring in low risk patients increases the number of primary C/S for fetal compromise. It is common practice to place a patient to a CTG monitoring due to nursing staff shortage and interpret CTG tracing as pathological without scalp pH testing. This practice increases C/S rate without improving neonatal outcome. Vaginal birth after C/S (VBAC) is offered but rarely taken by patients in our institution. The counselling is offered and they are required to sign an informed consent for VBAC, which I think decreases the uptake as compared to verbal informed consent. Secondly some patients change their minds during process of VBAC due to pain and our institution does not offer epidural analgesia during labor.

Most cases with PPH after C/S 61(84.4%) were difficult to control with medical and surgical conservative measures as compared to PPH cases after normal vaginal delivery 6(27.7%). Therefore caesarean sections should be done when medically indicated to improve maternal or fetal condition as high C/S rates more than 10% do not offer any benefit to reduce perinatal and maternal morbidity, but increases complications such as PPH, puerperal sepsis and morbid placental adherence in future pregnancies(www.who.int). However, the WHO statement of 2015 advises that C/S should be offered in women in need rather than focusing at specific rates.

Peripartum hysterectomy incidence after C/S is high in our study being 7.2/1000 C/S deliveries and after vaginal deliveries it is 0.65/1000 NVDs which is similar finding to the study done in Ireland which peripartum hysterectomy rate of 0.008/ 1000 after vaginal deliveries as compared to 1.6/1000 after caesarean sections (Fawcus and Moodley, 2013). Therefore cesarean sections are associated with high peripartum hysterectomy as compared to normal vaginal delivery. Main indications being uncontrolled PPH and puerperal sepsis post cesarean section.

4.2Peripartum Hysterectomy

There is considerable variability in the proportion of peripartum hysterectomy among countries and institutions within the same country and for different study periods. The incidence of peripartum hysterectomy in this study was 4.7 per 1000 deliveries, case fatality rate of 2.4%, and perinatal death rate of 37.3%. Peripartum hysterectomy incidence of 4.7 per 1000 deliveries is higher than the rates of 0. 2 to 2.7 per 1000 deliveries reported from high income countries (Knight 2007; Kwee et al., 2006). It is, however, within the rates reported in other studies from low and middle income countries which range from 2 to 9 per 1000 deliveries (see table1 and table 22).

The incidence of peripartum hysterectomy observed at our site is influenced by referred patients from surrounding district hospitals requiring emergency peripartum hysterectomy. Peripartum hysterectomy incidence of 4.7/1000 deliveries may be due to the high caesarean section rate(47.9%) demonstrated in this study, as the rate of caesarean sections is tightly linked to the peripartum hysterectomy rate (Stivanello et al., 2010; Whiteman et al., 2006).

Another important association in our study was the high rate of HIV infection among women with postpartum hemorrhage and subsequently PH. About 50% of our patients were HIV positive and it has been observed that HIV infected women are more prone to uterine atony and postpartum hemorrhage (SMR. 2011-2013). Therefore, the upward trend in peripartum hysterectomy rate observed in our study might reflect changes in the predisposing factors described above, especially the increased rate of caesarean delivery and HIV infection.

Secondly, the emergency peripartum hysterectomy incidence at our site may be related to the time period for peripartum hysterectomy. We included all hysterectomies which were done up to 42 days post-deliveries which allowed inclusion of puerperal sepsis and post abortal sepsis contributing about 19.3% to the total number of EPH. Other studies have used different time period for peripartum hysterectomy resulting in lower incidence (Rossi et al., 2010).

Earlier studies included hysterectomy performed within 24 hours of delivery (Demirci et al., 2011; Glaze et al., 2008), hysterectomy performed within 24 hours of delivery to discharge at the same hospital (Wandabwa et al., 2013; Bateman et al., 2012; Stivanello 2010), a hysterectomy performed

within 3 days of delivery (Tadesse et al., 2011), hysterectomy performed within 4 weeks of delivery (Bodelon et al., 2009) or a hysterectomy performed within 6 weeks of delivery (Kwame-Aryee et al., 2010). Furthermore, some studies only included hysterectomy performed for uncontrolled haemorrhage (Demirci et al., 2011; Obiechina et al., 2012; Karayalcın et al., 2011; Awan et al., 2011) and excluded cases of sepsis (Sakse et al., 2007). These inclusion criteria based on the varying time period make it difficult to compare incidences because complications related to sepsis and delayed haemorrhage following a short time period after delivery is used, incidences may be underestimated.

Post abortal sepsis accounted for 5(6%) cases of our peripartum hysterectomies. Two were due to illegal termination of pregnancy resulting in septic shock and our institution does not offer termination of pregnancy services, hence patients without funds might resort to the illegal route.
Illegal TOPs may be due to unwanted pregnancy at advanced gestational age, lack of knowledge regarding emergency contraceptive methods and accessibility of TOP services.

Puerperal sepsis accounted for 11(13.3%) peripartum hysterectomies and all of them were post CS delivery. CS is a known risk factor for puerperal sepsis and it should be included during counselling of women for CS delivery. Jonson et al, 2012 found 34/ 272(12.5%) patients developed puerperal sepsis but most with wound infection and only 4/272(1.5%) required admission. The follow up was only for 14 days with potential of missing cases that come back with severe sepsis and there was high loss to follow up. The Sixth Saving Mothers Report (2011-2013) showed that both puerperal and post abortal accounted for 9.5% of maternal deaths and in our study it formed a significant portion of the peripartum hysterectomies 19.3%.

Earlier peripartum hysterectomy studies performed in different provinces in our country differed with the indications of peripartum hysterectomy. A study performed in Mthatha in Eastern Cape Province showed similar trend to our study that uterine atony, puerperal sepsis and secondary postpartum haemorrhage made up 57% of the indications with uterine atony being the most common (Wandabwa et al., 2013). In a retrospective medical records review of cases from Durban in KwaZulu-Natal, uterine rupture and sepsis made up 56% of the indications with uterine rupture being predominant (Sebitloane and Moodley, 2001) and a study from Pretoria in Gauteng province reported that uterine rupture together with puerperal sepsis accounted for 33% of cases with uterine rupture being the leading indication (Shava et al., 1996). The most common indications for peripartum hysterectomy in South Africa include uterine atony, uterine rupture and puerperal sepsis; which is similar to our findings with uterine atony being the most common indications see Table 20.

Table 22: Comparison of peripartum hysterectomy studies conducted in South Africa

Authors	Study duration	Incidence	Indications for peripartum hysterectomy (%)
Van Vuuren and Cluver, 2016	2009-2014	2.27/1000 deliveries	Sepsis (39.7%), Uterine atony (15.9%), morbidly adherent placenta (13.9%), uterine tears (9.3%), placenta previa (4.6%), unclassified (4%)
Wandabwa et al., 2013	2007-2009	9.5/1000 deliveries	Uterine atony (30.2%), puerperal sepsis (27%), ruptured uterus (23%), DIC (9.5%), Placenta accreta (6.3%), Ca cervix (1.6%)
Uzoho N, 2012	2003-2008	0.25/1000 deliveries	Uterine atony (21.7%), uterine rupture (20%), abruptio placentae (19%), postpartum sepsis (17.5%), placenta previa (15%),
Sebitloane and Moodley, 2001	1993-1998	1.2/1000 deliveries	Uterine rupture (32.4%), uterine atony (30.9%), sepsis (23.9%), placental abnormalities (12.7%).
Shava et al., 1996	1993-1995	1.5/1000 deliveries	Ruptured uterus (35.9%), puerperal sepsis (33.3%), PPH (10.3%)

A recent study from Cape Town showed that sepsis, uterine atony and morbidly adherent placenta formed the bulk (65.6%) of the indications with sepsis being the most common (van Vuuren and Cluver, 2016).

In another audit of peripartum study performed at the Pietermaritzburg complex of hospitals, uterine atony, bleeding abruption placentae, placentae previa, and uterine rupture following induction and extension of uterine incision into the uterine arteries comprised 87.9% of the indications for peripartum hysterectomy (Uzoho, 2012).

In other studies performed in developed countries, the common indications for hysterectomy were abnormal placentation (39.5%), uterine atony (23.3%), and uterine rupture (23.3%) and hemorrhage during c/s -11.6% (Rahman et al., 2008). Abnormal placental adherence and uterine atony comprised

85% of the indications for peripartum hysterectomy (Kayabasoglu et al., 2008) and placental pathology accounted for 44.4% of indications for hysterectomy (Sikora-Szczęśniak et al., 2016).

The most common indication for hysterectomy was uterine atony (43.5%), followed by morbidly adherent placenta (26%) and uterine rupture (21.7%) which made up 73.9% of indications for hysterectomy (Kalathiya et al., 2016).
The commonest indication for peripartum hysterectomy was uterine rupture 57.6% (Bassey and Akani, 2014). Common indications of emergency peripartum hysterectomy were placenta previa in 61%, uterine atony in 23%, and uterine rupture in 15% (George et al., 2016). Uterine rupture was the leading indication (69.4%) for peripartum hysterectomy (Nkwo et al., 2016).

In this study, significant risk factors for peripartum hysterectomy were young age, low parity caesarean delivery, and HIV infection. There was a linear increase in the number of peripartum hysterectomy occurring in women from age group less than 20 years, group 20 - 25years and majority in the 26-30 year age group and subsequently there was a linear decrease with least occurring in the ≥ 36 age group. Together the three groups constituted about 73.5% of the total population. Interestingly, this is in direct contrast to what obtained in other centers (Mathe, 2008; Javed and Tahir, 2010; Alsayali and Baloul, 2000) where most of the patients in those series were above thirty years of age. Majority (52.7%) of the patients in this study were of low parity (para 1 and 2) which is at variance with most studies (Nwobodo and Nnadi 2010; Omole-Ohonsi and Olayinka, 2012, Obiechina et al., 2012) but is in accordance with other studies (Abasiattai et al., 2013; Kashani and Azarhoush., 2012). Together the two groups that is para 0 and para 1 – 2 constituted about 77.1% of the total population.

For decades, uterine atony had been the leading cause for peripartum hysterectomy (Barclay, 1970; Stanco et al., 1993). There has been a change in the indications for peripartum hysterectomy with sepsis, uterine rupture and placental abnormalities gaining importance (Angkawanich, 2016; van Vuuren and Cluver, 2016; Flood et al., 2009). This change might be due to the introduction of new pharmacologic agents and conservative surgical techniques that help to treat uterine atony more effectively.

Recently, carbetocin which has a longer duration of effect has been has been registered in South Africa for the prevention of PPH associated with CS. Although carbetocin is currently used in the private sector, its use in the public sector is precluded by its high cost. Given the high incidence of PPH associated with the high number of maternal deaths associated with abdominal delivery we believe that carbetocin should be considered particularly in view of the fact that the prevalence of HIV is high in South Africa and it has been observed that HIV infected women are more prone to

PPH (Saving Mothers Report, 2011-2013). In addition, Intravenously administered carbetocin has a half-life of approximately 40 minutes (Sweeney et al., 1990) around 4-10 longer than that reported for oxytocin (Ryden G, Sjoholm 1969; Fabian et al.,1969; Chard et al., 1970). Carbetocin side effect profile compares favorably with oxytocin and other uterotonics (Rath, 2009; Sergio Rosales-Ortiz et al., 2014; Meshykhi et al., 2016). Carbetocin reduces the need for additional uterotonics at caesarean delivery.

The use of carbetocin would halve the number of additional oxytocic agent required (Rath, 2009). Another option is tranexamic acid. Recently there have been reports suggesting that tranexamic acid, an anti-fibrinolytic agent used widely in surgery to prevent clot lysis in order to prevent surgical bleeding may be of use in cases of postpartum hemorrhage. Evidence for the use of tranexamic acid in bleeding associated with CS was limited to observational studies. There is evidence from woman trial that early administration of tranexamic acid reduces mortality by 1.5% (155/10,036) versus 1.9% (191/9983) with risk ratio of 0.81(95% CI 0.65-1, p=0.045). Hysterectomy was not reduced by tranexamic acid administration with risk ratio of 0.97 at 95% CI 0.81-1.09, p=0.65(Shakur H, Roberts I, Fawole B et al., 2017).

Maternal death rate and the causes of death following peripartum hysterectomy are variable. The maternal mortality rate in our audit was 2.4% acceptable and cause of death was pulmonary embolism and hemorrhagic shock. Van Vuuren and Cluver (2016) reported a maternal death rate of 4% (6/150) and the cause of death was sepsis in 5 cases and hypovolemic shock in 1 case while Wandabwa et al (2013) reported a maternal death rate of 19% and cause of death was hypovolemic shock due to haemorrhage in 4 cases, septic shock four cases and acute renal failure in three normotensive cases and one acute renal failure due to eclampsia (Wandabwa et al., 2013). Bhattacharyya and Mukherjee (2016) reported 9 maternal deaths (11.1%). These deaths were due to DIC following acute blood loss in four, hypovolemic shock in three, septicemia in one and renal failure in one.

In contrast, in the high income countries where several series of peripartum hysterectomies are reported without any maternal deaths (Daslalakis et al., 2007), figures from low and middle income countries are rather high.

There is conflicting reports on the use of the type of hysterectomy. In our study, most commonly performed surgical procedure in our review was total abdominal hysterectomy 64 (77.1 %) while 19 (22.9%) had subtotal hysterectomy. Our findings are in concordance with other studies (van Vuuren and Cluver, 2016). In contrast, subtotal hysterectomy was preferred in other studies (Bhattacharyya and Mukherjee, 2016; Abasiattai et al., 2013; Wandabwa et al., 2013). However, there was no increased risk of complications when comparing total (29/64 or relative risk=2.2) versus subtotal hysterectomies, (9/19, or relative risk =2.1) . The high rate of total abdominal surgery probably is due to the patients done hysterectomy for puerperal sepsis, uterine rupture and being clinically &

hemodynamically stable. In our series blood transfusion, bladder injury, and intensive care admission was high. Puerperal sepsis and post abortal sepsis; uterine rupture and placenta accreta might be the conditions that favor total abdominal hysterectomy.

The overall postoperative complication rate of 45.8% was observed in our series of patients. There was no difference in the complication rate between total abdominal hysterectomy group compared to the subtotal hysterectomy group (2.2% (64/29) vs 2.1% (19/9).

The most common complications were bladder injury, blood transfusion and wound sepsis occurring singly or together with other complications. Other complications included febrile illness, ureteral injury and bowel injury.

Therefore subtotal hysterectomy should be the operation of choice for emergency peripartum hysterectomy. Uzoho, 2012 reported wound infection and hemorrhage the most common complications which comprised 61% of the complications, others were bladder injury and renal failure.

It was important to note that about 17% of our patients less than 20 years of age had peripartum hysterectomy with a permanent loss of future childbearing opportunities. Most (59%) of our patients were of low parity (1-2) and with perinatal death rate of 36.9%. This implies some of the young women in the study will have no children in future and the experience of perinatal loss might have a negative psychological impact. Therefore a decision to embark to a hysterectomy should be last resort and UK guidelines recommend that the decision should be made by a senior physician or ideally by two senior physicians. It is further recommended that the procedure is performed by experienced surgeon (Banks C, Paterson A. et al, 2011).

It is important to note that about half of the hysterectomies were performed by medical officers and this is not limited to our study as some studies in Tanzania and Malawi clinical officers and medical officers were trained to do subtotal hysterectomy with good outcomes(Pereira C et al, 2011; Chilopora G et al, 2007). Therefore it is important for the decision to embark into a hysterectomy to be taken after discussion with a consultant when such a procedure is going to be done by a medical officer. Maternal deaths and morbidity resulting from massive hemorrhage can be reduced if subtotal hysterectomy can be performed in district hospitals by trained senior medical officers when required. But currently this cannot be achieved with the shortage of experienced stuff as evidenced by the findings of the sixth saving mothers report" maternal deaths due to lack of appropriately trained doctors (15.6%) and nurses (8.8%)".

The perinatal mortality rate in our study was 37.3% following peripartum hysterectomy and was lower to findings from low and middle income countries (Abasiattai et al., 2013; Gbadebo et al., 2008; Rabiu et al., 2010).

4.4 Maternal outcome and fetal outcomes

There were two (2.4%) cases of maternal deaths. Maternal mortality in our series is comparable to the recent studies performed in South Africa, 2 deaths (1.6%) Uzoho in Pietermaritzburg, 6 deaths (4.3%) in Cape Town by Van Vuuren and less than 12 deaths (19%) by Wandabwa in Mthatha.

The first maternal death was a self-referred 30 year, HIV positive with a CD4 count of 500 on ART, multigravida whose labor onset was spontaneous. Labor progress was monitored with partogram and fetal condition monitored with electronic fetal monitoring (CTG) which revealed fetal compromise.

A caesarean section was performed for fetal distress and it was complicated by uterine atony. She received utero-tonic drugs, syntocinon and misoprostol. Furthermore, uterine ligation was performed without success. She developed pulmonary embolism post-hysterectomy and after ICU discharge. She was transferred out of ICU to the general postnatal ward where she died of pulmonary embolism despite thrombo-prophylaxis during the ICU stay.

The second death was a 33-year-old multigravida with a history of previous caesarean section, who did receive antenatal care, was referred from an outlying hospital to Port Shepstone Hospital.

She was HIV positive with a CD4 count of 180, on ART. Her Hb on admission was 6-7 g/dl. Labor onset was spontaneous. A caesarean section was performed for abruption and previous C/S.

At caesarean section uterine atony was observed. She was given utero-tonic drugs namely syntocinon and misoprostol. Furthermore, uterine compression sutures and uterine artery ligation were performed without success. Patient had developed disseminated intravascular coagulopathy; pelvic packs were left in situ. She had a bladder injury at the time of hysterectomy which was repaired. She died from irreversible hemorrhagic shock after she had received 4 units of packed red blood cells and fresh dried plasma and platelets, and inotropes during her ICU admission. The contributing factor in this case was administrative (transport problem). She was referred to Port Shepstone Hospital from the outlying hospital and arrived at Port Shepstone Hospital 5 hours and 20 minutes later already in DIC. The delays caused by ambulance services in transporting women with obstetric problems during emergency situations may increase the incidence of obstetric complications.

Perinatal death rate in our study was 37.3%, which is higher than the national perinatal death rate of 20.7%, KZN perinatal death rate of 21.1%, and 23.3% in Pietermaritzburg (Massyn et al, 2015, Uzoho 2016). The causes of still births were the abruptio placenta with intrauterine death and uterine rupture, in most cases were referred from surrounding district hospital.

4.1 Limitations and advantages

The main limitation of the study was the retrospective nature of the study with poor documentation, files missing and 3 cases excluded from the study as hysterectomy could not be confirmed. Post-partum hemorrhage was difficult to identify from labor ward records as this was not reported as adverse event especially when there is no blood transfusion and medical management by midwives was successful. Poor documentation of estimated blood loss at caesarean section and medical management of PPH by the surgeons, as drugs are administered by anesthetic team. Comprehensive data for PPH was obtained from 2013 and 2014 in labor ward register as it was included as adverse event.

The strength of our study is that it brings a comprehensive overview on peripartum hysterectomy over a 5 years period. In addition, we included all hysterectomies performed up to 42 days following delivery which enabled us to identify cases of puerperal and post abortal sepsis.

4.2 Conclusion

In conclusion, our results demonstrated several risk factors for peripartum hysterectomy and the proportion of peripartum hysterectomy is within the range reported in the literature.

4.3 Recommendations

1. To decrease the number of unnecessary C/S performed as the risk of puerperal sepsis, PPH and EPH is high after C/S.
2. Emergency peripartum hysterectomy should be included in the consent for women who are planned to have cesarean section.
3. This was study was confined to black women; we have a diverse population it is important to determine the proportion of PPH and PH in other racial groups.
4. PPH can be studied among different hospitals and compared.
5. Puerperal sepsis need to be included in the national department of health register.
6. Study to identify common pathogens in puerperal sepsis in our setting and also guide antibiotic treatment according culture and sensitivity results
7. Further studies are needed to evaluate the long-term trends in the peripartum hysterectomy rate, psychological impact of EPH with loss of fertility on young women and the effects of HIV infection on the peripartum hysterectomy rate.
8. Family planning services including termination of pregnancy.

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Chapter 6: Annexures

Annexure 1: Data sheet

Demographic data

Study no.:……

Age:……

Parity :……

Referred/ Inpatient(reason for admission).....

Self-referral…....

From other institution: No/Yes if yes Name……

Interval between time of incident to time of arrival at PSH…….. (Mins)

Interval between arrival at PSH to time of treatment…..... (Mins).

Occupation : Unemployed=1, Self-employed=2, Employed=3

Religion: Jehovah's Witness=1, Christian=2, others=3

Index delivery:

NVD / VBAC or C/S

If NVD or VBAC

Labor onset: Spontaneous=1 / Induced=2

If induced: Indication... (1=postdates; 2=PPROM; 3=PIH, 4=other).

Agent used.....

Appropriate dose used? (YES =1; No=2).....

Labor duration Onset..... Delivery..... Interval..... (Hours)

Labor augmentation: NO=1 / Yes=2

Appropriate dose (YES=1/ NO=2).....

Labor appropriately monitored with partogram: No=1 /Yes=2

CTG monitoring: No=1 / Yes=2

Complications picked up from CTG:

-fetal compromise=1, if fetal compromise further management……

- Suspicious trace=2, further management for suspicious trace……..

Complications of delivery:

Monitoring postpartum: YES =1/ NO=2, if 2 elaborate……

Mode of delivery: Normal vaginal delivery=1

Assisted vaginal delivery: Vacuum=2 /Forceps=3

C/SIndication …..... Elective=4/ emergency=5

Post-delivery complications &management

If PPH:

Following NVD=1

Causes of PPH: Genital tract trauma=1, atony =2 others=3 specify.....

Following Vacuum=2, Indication for vacuum:……..

Causes of PPH: Genital tract trauma=1, atony=2, others=3 specify.....

Following Forceps=3, Indication:……

Causes of PPH: Uterine trauma=1, atony=2, others =3 specify.....

If elective C/S=4, Indication for c/s: refused VBAC=1; Prev c/s≥2=2; placenta previa=3; obstructive vaginal warts=4; other=5, if 5 specify

If emergency C/S=5: indication for c/s: FD=1; CPD=2; refused VBAC in labor=3; Prev c/s>=2 in labor=4; placenta previa =5; abruption=6; HPT or eclampsia=7; other=8, if 8 specify……

Indication for Hysterectomy: bleeding from placental bed =1 / uterine atony=2 / injury to uterine vessels=3; failure of medical therapy + conservative surgery=4; other=5, if 5 specify……

What medical measures were taken before Peripartum Hysterectomy:

Syntocinon=1 / misoprostol=2 / PG F2alpha=3 / B Lynch suture=4 / tourniquet=5; packing =6, other=7…

Conservative surgical measures used: B lynch =1/uterine artery ligation=2/balloon tamponade=3; others=4, if 4 specify……..

Other relevant history:

Past obstetric history& surgical history

Previous C/S Yes=1 / No=2

If yes, x1=1; x2=2; x3 or more =3

Myomectomy Yes=1/No=2

Manual removal of placenta Yes=1 / No=2

Evacuation of the uterus Yes=1 / No =2

Antenatal history

Booking status: Booked=1 Unbooked=2

Singleton =1 / twins=2

Antenatal U/S Yes=1/No=2

Hemoglobin level at delivery: Hb >10=1, Hb 8-9=2, Hb6-7= 3, Hb<=5=4

Hematinics use during pregnancy: Yes=1 /No=2

HIV status Positive=1/ Negative=2/ Unknown=3

If HIV +ve: CD 4 count …...../Unknown or N/A

: AZT=1 /dual therapy from 28weeks=2 / Dual therapy from 14weeks=3 / HAART=4

Other obstetric Complications:

Hypertension = 1, antepartum hemorrhage=2; other=3, if 3 specify…….. ..

If hysterectomy due to puerperal sepsis:

Number of days post-delivery:_____

Mode of delivery: NVD=1 / C/section=2 / post abortion =3

Respiratory failure=1.....Renal failure=2.....Septic shock=3.....

Procedure:

Peripartum hysterectomy

Surgeon: Consultant=1/Chief medical officer=2/Registrar=3/Medical officer=4

Technique: Total abdominal hysterectomy =1/Subtotal Hysterectomy=2

Other surgical interventions:

- drain left in situ=1; abdominal packs=2; internal iliac artery ligation=3

Complications: Bladder injury=1/ureteral injury=2 / bowel injury=3 /DIC=4

Wound sepsis=5/puerperal sepsis=6/ febrile illness=7 /Pulmonary Embolism=8 /Massive transfusion=9 /fistula=10

Further surgery: Removal of packs=1; washout=2; ureter repair=3; bladder repair=4; secondary wound closure=5

Need for ICU : No=1 / Yes=2

ICU admission duration:…..... (Days)

Maternal Outcome: Discharged=1 / Transferred to another hospital=2

reason.....

Demised=3

Perinatal outcome: Alive =1/ SB=2/MSB=3 ENND=4

If alive: baby 5min APGAR=……

Annexure 2

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

19 August 2014

Dr Phinzi Sibusiso Blessing
P.O Box 92964
Mount Frere
5090
phinzi@yahoo.com

Dear Dr Blessing

PROTOCOL: Peripartum hysterectomy audit at Port Shepstone Regional Hospital, South Africa.
REF: BE387/13

EXPEDITED APPLICATION

A sub-committee of the Biomedical Research Ethics Committee has considered and noted your application received on 07 November 2013.

The study was provisionally approved pending appropriate responses to queries raised. Your responses received on 11 August 2014 to queries raised on 23 June 2014 have been noted by a sub-committee of the Biomedical Research Ethics Committee. The conditions have now been met and the study is given full ethics approval and may begin as from 19 August 2014.

This approval is valid for one year from **19 August 2014.** To ensure uninterrupted approval of this study beyond the approval expiry date, an application for recertification must be submitted to BREC on the appropriate BREC form 2-3 months before the expiry date.

Any amendments to this study, unless urgently required to ensure safety of participants, must be approved by BREC prior to implementation.

Your acceptance of this approval denotes your compliance with South African National Research Ethics Guidelines (2004), South African National Good Clinical Practice Guidelines (2006) (if applicable) and with UKZN BREC ethics requirements as contained in the UKZN BREC Terms of Reference and Standard Operating Procedures, all available at http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx.

BREC is registered with the South African National Health Research Ethics Council (REC-290408-009). BREC has US Office for Human Research Protections (OHRP) Federal-wide Assurance (FWA 678).

The sub-committee's decision will be **RATIFIED** by a full Committee at its meeting taking place on **09 September 2014.**

We wish you well with this study. We would appreciate receiving copies of all publications arising out of this study.

Yours sincerely

Professor D.R Wassenaar
Chair: Biomedical Research Ethics Committee

Annexure 3

RESEARCH OFFICE
BIOMEDICAL RESEARCH ETHICS ADMINISTRATION
Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604769 - Fax: 27 31 260-4609
Email: BREC@ukzn.ac.za
Website: http://research.ukzn.ac.za/Research-Ethics/Biomedical-Research-Ethics.aspx

20 March 2017

Dr Phinzi Sibusiso Blessing
P.O Box 92964
Mount Frere
5090
phinzi@yahoo.com

Dear Dr Blessing

PROTOCOL: Peripartum hysterectomy audit at Port Shepstone Regional Hospital, South Africa. REF: BE387/13

RECERTIFICATION APPLICATION APPROVAL NOTICE

Approved:	19 August 2016
Expiration of Ethical Approval:	18 August 2017

I wish to advise you that your application for Recertification dated on **22** February 2017 for the above protocol has been **noted and approved** by a sub-committee of the Biomedical Research Ethics Committee (BREC) for another approval period. The start and end dates of this period are indicated above.

If any modifications or adverse events occur in the project before your next scheduled review, you must submit them to BREC for review. Except in emergency situations, no change to the protocol may be implemented until you have received written BREC approval for the change.

This approval will **be ratified** by a full Committee at its meeting taking place on 11 April **2017.**

Yours sincerely

Mrs A Marimuthu
Senior Administrator: Biomedical Research Ethics

Annexure 4

UNIVERSITY OF KWAZULU-NATAL

16 April 2014

Dr MH Sebitloane
Department of Obstetrics & Gynaecology
School of Clinical Medicine

Dear Dr Sebitloane

PROTOCOL: "Peripartum hysterectomy audit in Port Shepstone Hospital, South Africa". *SB Phinzi student number 213572230*

The School of Clinical Medicine has approved the abovementioned study.

Please note:

- The School of Clinical Medicine must review any changes made to this study.
- The study may not begin without the approval of the Biomedical Research Ethics Committee.

May I take this opportunity to wish the student every success with the study.

Yours sincerely

Dr V Singaram
Acting Academic Leader: School Research

CC. Dr SB Phinzi

Biomedical Research Ethics Committee
Westville Campus

Postgraduate Education Administration
Medical School Campus

Postal Address: Private Bag 7, Congella, 4013, South Africa
Telephone: +27(0)31 260 4495 **Facsimile:** +27(0)31 260 4723 **Email:** mbokazi@ukzn.ac.za **Website:** www.ukzn.ac.za

Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

Annexure 5

health

Department:
Health
PROVINCE OF KWAZULU-NATAL

PORT SHEPSTONE REGIONAL HOSPITAL
Private Bag X5706, PORT SHEPSTONE 4240
11 Bazley Street, PORT SHEPSTONE 4240
TEL: 039 688 6208
FAX: 039 682 1514
melinda.cranzi@kznhealth.gov.za
www.kznhealth.gov.za

Reference: 2/7
Enquiries: Mr. GBC Khawula
Telephone: (039) 688 6208

13th November 2013

Chairperson: Research Committee
KZN Department of Health
Private Bag 9051
PIETERMARITZBURG
3200

RE: PERMISSION FOR RESEARCH TITLED: PERIPARTUM HYSTERECTOMY AUDIT IN PORT SHEPSTONE HOSPITAL

OBJECT

To grant permission for Dr SB Phinzi to do audit on peripartum hysterectomy at Port Shepstone Regional Hospital.

SUPPORTING DOCUMENTS

Appended hereto is documentation received supporting the audit.

OFFER OF SUPPORT

This office wishes to inform that the proposed audit to be conducted by Dr SB Phinzi is wholly supported. There are no financial implications.

RECOMMEDATION

In view of Dr SB Phinzi request I recommend the necessary authority be granted by the Research Committee for Dr SB Phinzi to continue with his audit.

Submitted for your attention and further action.

Yours sincerely

ORIGINAL DOCUMENT AVAILABLE ON REQUESTFSIGNED BY CEO

MR GBC KHAWULA
CHIEF EXECUTIVE OFFICER