

Fetomaternal outcomes in patients with Uterine Rupture managed at Bugando Medical Centre, Tanzania: 5-year review of cases

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Abstract

Background Uterine rupture is one of the major obstetric complications, associated with adverse fetal and maternal outcomes including hemorrhage, genital urinary injury, low Apgar scores, fetomaternal deaths. There is a paucity of data regarding uterine rupture and its consequences among pregnant women in Mwanza, Tanzania. As a result, it is difficult to know the magnitude of the problem and formulate appropriate measures to reduce its incidence. This study was thus conducted to determine the cumulative incidence, risk factors, fetal and maternal outcomes among women with uterine rupture managed at Bugando Medical Centre (BMC), Mwanza-Tanzania. Methods This was a 5-year (2013 to 2017) retrospective descriptive study of cases of uterine rupture at BMC. The case files were collected from medical records department and maternal demographic information, clinical presentation, risk factors, interventions and feto-maternal outcomes were extracted using a checklist. Data were analyzed using STATA software version 13. Results There were 37,763 deliveries within five years. Caesarean section accounted for a quarter (n=9,136) of these deliveries. During this period 81 cases of ruptured uterus were identified, making a cumulative incidence of 2.2 cases per 1,000 deliveries. Common risk factors for uterine rupture were history of previous caesarean section 54% (n=36), obstructed labor 37% (n=25), grandmultiparity 19.4% (n=13) and use of oxytocin 21% (n=14). Maternal case fatality rate in this study was 1.5% (n=1). More than half of cases had hysterectomy while about a third (n=25) had uterine repair without bilateral tubal ligation (BTL). Over 80% (n=55) of cases required blood transfusion. Sepsis developed in 21% (n=14) of cases and vesicovaginal fistula (VVF) in 12% (n=8). Perinatal case fatality rate was 72% (n=48). Out of the 24 babies who were born alive, 37.5% (n=9) had low Apgar scores and 20.8% (n=5) died before discharge. Conclusion The leading risk factor for uterine rupture seen was previous caesarean scar and obstructed labor associated with high perinatal case fatality rate. Improvement in monitoring of patients in labor is necessary to detect early features of uterine rupture, obstructed labour and fetal compromise. This will contribute to reduced incidence of uterine rupture and improve fetomaternal outcomes.

Background

Uterine rupture is one of the major obstetric catastrophic events which may be associated with severe hemorrhage, hysterectomy, genitourinary injury and maternal death [1-5]. According to World Health Organization (WHO), the incidence of uterine rupture is high and a serious problem in developing countries ranging from 0.1% to 1% [4]. The overall rate in developed countries is less than 0.1%, mainly due to rupture of scarred uterus [4, 6]. Several studies from Africa report an incidence ranging from 0.5-4.9% [2, 7-9]. A study done at Muhimbili National Hospital (MNH), Tanzania reported an incidence of 2.3 cases per 1,000 [1]. One of the risk factors of uterine rupture in developing countries is prolonged obstructed labor with high incidence of rupture of unscarred uterus [1, 4, 7]. Improved quality of obstetric care explains the difference observed between developed and developing countries in the incidence, type as well as outcomes of uterine rupture [7, 10]. Other risk factors for uterine rupture include multiparity, use of uterotonic drugs for induction or augmentation of labor, placenta percreta and manipulations such as

internal podalic version and breech extraction [11, 12]. In developing countries, uterine rupture is one of the important direct causes of maternal mortality accounting for 17.9% of maternal deaths due to direct causes in South Africa in 2008-2010 and 8.7% of all maternal deaths in a nation-wide study on maternal mortality and near-misses in Nigeria and 6.6% of all maternal deaths in the study done at MNH, Tanzania [1, 13, 14].

Uterine rupture is also associated with dismal fetal/neonatal outcomes including low Apgar scores and perinatal deaths of over 80% in studies done in developing countries [1, 4, 7]. Studies done in developed countries reported comparatively very low perinatal case fatality rates ranging from 5% to around 13.5% [5, 15, 16]. The study done at MNH; Tanzania reported a perinatal case fatality rate of 96.3% [1].

Uterine rupture is one of the major obstetric complications that is associated with serious maternal complications like severe hemorrhage, hysterectomy, genitourinary injuries, sepsis and death [1]. It also leads to adverse fetal outcomes including low Apgar scores and fetal death [1, 4, 7, 17]. The incidence of uterine rupture in developing countries is relatively high ranging from 1 case per 1,000 to 1 case per 100 compared to developed countries where uterine rupture is rare at less than 1 case per 1000 deliveries [4, 6] [7]. In a study done at MNH in Tanzania, the incidence was reported to be 2.3 cases per 1000 deliveries, of which 67.4% were of unscarred uteri. Ruptured uterus accounted for 6.6% of all maternal deaths reported at that institution with maternal case fatality rate of 12.9% and perinatal case fatality rate of 96.3% [1]. The difference observed between developed and developing countries underscores the fact that good quality antenatal and intrapartum care can greatly reduce the incidence of uterine rupture and the complications associated with it [7, 10]. There is a paucity of data in Mwanza, Tanzania about the incidence, risk factors, feto-maternal outcomes and factors associated with maternal mortality among women with uterine rupture. As a result, it is difficult to know the magnitude of the problem and formulate appropriate measures to reduce its incidence and the complications associated with it. Therefore, this study was done to determine the cumulative incidence, risk factors, fetal and maternal outcomes among women with uterine rupture at BMC, Mwanza-Tanzania.

Methods

This was a retrospective descriptive study of confirmed cases of uterine rupture over a period of 5 years from January 2013 to December 2017 at Bugando Medical Centre (BMC), Mwanza Tanzania. BMC is a tertiary, consultant and teaching hospital for Catholic University of Health and Allied Sciences (CUHAS) located in the lake zone Northwestern Tanzania. It serves 8 regions with a population of about 13 million people as per 2012 national census. On average, there are about 25 deliveries per day at BMC some of which are referrals from Sekou-Toure Referral Regional Hospital and other hospitals located within Mwanza city. BMC also receives patients with obstetrics complications from all other nearby regions and districts sometimes directly or via Sekou-Toure Referral Regional Hospital.

The study was conducted by extracting required information from patients' case files at BMC medical records department. This was done after collecting patients' file numbers and other patients' information

from labor ward, theatre and postnatal ward records. Review of maternal mortality records at BMC was also done to compliment the information. All case files of patients who were admitted for labor and delivery at BMC at a gestation age of 28 weeks and above between 2013 – 2017 and had a diagnosis of ruptured uterus confirmed intraoperatively and managed at BMC were included in the study. Case files with inadequate information, defined as less than 70% of the required information from the check list, patients with diagnosis of ruptured uterus managed at other hospitals but referred to BMC for management of complications, patients who delivered at other health facilities even if diagnosis and primary surgery for ruptured uterus was later performed at BMC and Uterine rupture before 28 weeks of gestation were excluded from the study.

The required data were sourced from all patient case notes with the diagnosis of ruptured uterus whose initial surgery for ruptured uterus was done at BMC from January 2013 to December 2017 and met the inclusion criteria. Hospital numbers of patients' files with diagnosis of uterine rupture were searched in the Labour & Delivery register, operating theatre register, and postnatal ward register at BMC. The patients' file numbers were ultimately used to trace up patients' case notes at the BMC Medical Records department. For the purpose of this study, uterine rupture was defined as a separation of the uterine endometrium and myometrium whether involved the serosa but diagnosed as such by the attending surgeon.

Hospital numbers of babies delivered alive by mothers with ruptured uterus in the index pregnancy and admitted to the neonatal unit were sourced from neonatal unit admission registers and their case notes traced in the medical records department. The information of live babies who were not admitted was sourced from the files of their respective mothers.

A structured, pretested data collection tool in form of a Checklist was used to document the information from the respective patient case notes by the principle investigator. Information collected included: Socio-demographic characteristics, risk factors for uterine rupture such as obstructed labour, previous c-section scar, oxytocin use and high parity, physical findings on examination before patient was taken for surgery, intraoperative findings, surgical intervention, other interventions such as blood transfusion, short term fetomaternal outcomes.

Data from questionnaire were entered into Microsoft excel and analyzed using STATA version 13 statistical software. Categorical variables were summarized into frequencies and proportions (percent's) and continuous variables in mean \pm standard deviation, and median [interquartile range]. Cumulative incidence was calculated as a ratio of total number of uterine rupture cases per total number of deliveries at BMC during the past five years. Maternal case fatality rate was calculated as ratio of maternal death due to uterine rupture or complications following uterine rupture per total number of uterine rupture cases. Perinatal case fatality rate was calculated as a ratio of perinatal deaths (still births and early neonatal deaths) in patients with uterine rupture per total uterine rupture cases.

The study was approved by the joint CUHAS/BMC Research and Ethics committee with a clearance certificate number CREC/260/2017. Permission to conduct this study was granted by the BMC

administration to collect and use files from BMC records department with a letter reference number AB.317/440/01 PART K/46. Consent (written or verbal) from individual women was not sought because the study did not include personal contact between the data collector and individual women [20]. Moreover, confidentiality was maintained throughout the study which ensured that the patient's information in the patients' records file was not exposed to other individuals than the principle investigator and was strictly used for the purpose of the study only as approved by the ethical committee. The final data were also kept anonymous.

Results

During the five-year period from January 2013 to December 2017, there was a total of 37,763 deliveries at BMC, 24% (n = 9,136) of which were by caesarean section. There were 81 cases of ruptured uterus during this period. However, the available case files for analysis were 67 (82.7%). The cumulative incidence of uterine rupture was 2.2 cases per 1,000 deliveries.

Description of the study population

As shown in *Table 1*, majority of the study population were aged between 20 – 39 years (98.5%). The mean age was 29.5 (\pm 5.3) years. Women with unscarred uteri constituted 46% (n=31) of the cases. Most of them were para 1 – 4 (79%). Around 63% (n=42) were managed primarily at BMC while 37% (n=25) were referrals from other facilities. The leading referral diagnosis was obstructed labor 14 cases followed by abruptio placenta 6 cases, placenta previa 3 and fetal distress alone 2 cases. No case was referred with a diagnosis of ruptured uterus.

Cumulative incidence of uterine rupture

As shown in *Table 2*, the incidence of uterine rupture at BMC was lowest in 2017 at 1.6 per 1000 deliveries and highest in 2016 at 4 per 1000 deliveries. The overall incidence (5-year cumulative incidence) was 2.2 per 1000 deliveries.

Short term fetal outcomes among cases with Uterine rupture

As shown in *Table 3*, There were 64.2% (n=43) of the newborns from mothers with uterine rupture were fresh stillbirth (FSB) and 37.5% (n=9) of those who were born alive had low Apgar scores (less than 7 in the 5th minute). Five babies (20.8%) out of those who were born alive died and the documented cause of death in all of them was birth asphyxia. The total perinatal deaths in this study were 71.6% (n= 48).

Short term maternal outcomes among cases with uterine rupture

As shown in *Table 4*, there was only 1 maternal death in the cases studied and 98.5% (n = 66) of the cases were reported to have been discharged home alive. This death occurred in 2013 making overall case fatality rate of 1.5%.

The patient was referred from Sekou-Toure regional hospital (about 3 Km from BMC) with a diagnosis of Abruption placenta. She was 30 years old, gravida 4 para 3 at term and all prior deliveries were by spontaneous vaginal delivery (SVD). She presented with vaginal bleeding with abdominal pain and cessation of fetal movements for 1 day. At BMC, she was found to be pale, with blood pressure of 100/60 mmHg and was also diagnosed to have Abruption placenta with dead fetus in active phase of labor. She was augmented with oxytocin 2.5IU and was also started on intravenous crystalloids. At 2200 hrs (3 hrs and 35 minutes from initial assessment) she was reported to have increased vaginal bleeding and persistent severe abdominal pains with features of peritonitis. A provisional diagnosis of ruptured uterus was made which was confirmed intraoperatively as posterior lower segment uterine rupture with hemoperitoneum about 1.5 liters and a 3.8 Kgs fresh still birth baby partly protruding into the peritoneal cavity. Sub-total hysterectomy was done and received a total of 3 units of blood which were started intraoperatively. Her preoperative hemoglobin level was 9.2 g/dl. The operation was done about 20 minutes after clinical diagnosis was made but 12 hours post-surgery, she was re-operated due to continued internal bleeding. She recovered from anesthesia and was sent to adult intensive care unit (AICU) for observation and was brought back to postnatal ward on day 2. While in the ward she developed features of sepsis despite being on antibiotics (ceftriaxone and metronidazole) and she had burst abdomen on day 5 post previous re-operation and was re-operated again. This time she did not recover from anesthesia and she was resent to AICU where she was maintained on mechanical ventilator and continued the same antibiotics and was given 2 more units of blood. On the second day in AICU she was still on mechanical ventilator, was afebrile but had unstable blood pressure (BP) ranging from 70-84/35-47mmHg and saturation of 81% to 83%. She was managed unsuccessfully and died on the same day. She was also newly diagnosed to be HIV positive and had persistent cough while in the ward before the second re-operation. She was suspected to have pneumocystis pneumonia (PCP) and was put on high dose cotrimoxazole which she had used for 5 days before her death.

Sepsis complicated 20.9% (n = 14) of the cases (*Table 4*). All had been operated by residents/registrar. Sepsis was also observed more in patients who presented with severe anemia (Hemoglobin<7 g/dl), 50% (n=7) compared to those with mild or moderate anemia, 36% (n=5) and no anemia, 14% (n=2). It was also seen more in patients who underwent hysterectomy than not, 79% (n= 11) versus 21% (n=3). Proportion of patients who developed sepsis was similar in those with obstructed labor and without obstructed labor (50%, n= 7). 13 out of the 14 patients who had sepsis had hospital stay of more than 7 days.

About 15% (n=10) required re-laparotomy. The reasons for re-laparotomy were; peritonitis(sepsis) in six cases and continued internal bleeding in four cases. The re-laparotomy was more common in those who had obstructed labor, 60% (n=6), those who underwent hysterectomy, 90% (n=9) (*Table 4*).

Genitourinary fistula (all were VVF), complicated 12% (n=8) of the cases and occurred more to those who had obstructed labor than not at 75% (n=6) to 25% (n= 2). It was also seen more in those who underwent sub-total hysterectomy than uterine repair at 75% (n=6) vs 25% (n=2) (*Table 4*).

Out of the 67 patients studied, 82% (n=55) were given blood transfusion, where 38.2% (n = 21) were given 1-2 units of blood and 61.8% (n=34) were given 3 or more units of blood. Nine women (13.4%) required AICU admission where 5 stayed in AICU for 1 day and 4 stayed for 2 days. Overall range of hospital stay was 2 days to 65 days with a median of 7 [IQR 4 – 10] days. About half of the patients stayed in the hospital for a maximum of 7 days while 24% (n = 16) were admitted for over a week to 2 weeks. Out of the remaining 17 cases, five had hospital stay of more than a month.

Surgical interventions

More than half of the patients, 58.2% (n=39) had sub-total hysterectomy and 82% (n=32) of them were aged below 35 years. About 37% (n = 25) underwent uterine repair without BTL and 4.5% (n=3) had repair of the uterus with BTL done (*Table 4*). Most of the patients (84%) were operated within less than 1 hour since the diagnosis of uterine rupture or impending uterine rupture.

Common risk factors for uterine rupture present among patients managed for ruptured uterus at BMC.

Previous caesarean section was the most common risk factor identified and was present in 53.7% (n = 36) of the cases. Out of these, 77.8% (n=28) had one previous scar, 19.4% had 2 scars and 2.8% (n=1) had 3 previous scars. The second important risk factor seen was obstructed labor in 37.3% (n = 25) where 64% (n=16) were referrals and 87.5% (n=14) of the referrals were from Sekou-Toure Regional Hospital. Other risk factors seen in these patients were oxytocin use for induction or augmentation, 21.9% (n = 14) and grand multiparity 19.4% (n=13) (*Table 5*). Out of the 36 cases with previous scar, 6 were also grand multipara, 1 was grand multipara with features of obstructed labor, 4 had features of obstructed labor and none of them was augmented or induced. Nine patients who had augmentation with oxytocin were also later diagnosed with obstructed labor. Of the grand multipara patients, 3 were on augmentation with oxytocin.

Discussion

Uterine rupture is a catastrophic obstetric complication that contributes to significant maternal and fetal adverse outcomes including death, especially in developing countries [4, 21]. The main reason is prolonged delays in receiving appropriate care and limited clinical resources including personnel, supplies and equipment [21]. Several studies in Sub-Saharan Africa have reported significant contribution of uterine rupture to overall maternal deaths ranging from 6.6% to around 18% and perinatal case fatality rate of around 74% to 92% [1, 4, 13, 22]. The gravity of this complication was also seen in our study especially for perinatal deaths and maternal morbidity.

Incidence of uterine rupture

In this study, the incidence of uterine rupture is higher than in developed countries, which is less than 0.1% (1 case per 1,000) according to a WHO systematic review in 2005 [4]. However, our findings are in keeping with findings of the systematic review which showed that in low-income countries, uterine rupture

was more prevalent compared to developed countries [4]. This difference between developed countries and low-income countries, may be due to the differences in quality of obstetric care and other social-cultural and economic factors such as healthcare seeking behavior in a given society, infrastructural constraints, personnel, equipment and supplies in health facilities. However, the incidence in our study is lower than that reported in most other African countries (0.5% - 5%) but similar to a study done at MNH, Tanzania. This may partly be related to free provision of antenatal care (ANC) services in Tanzania in which ANC attendance is approximately 98% in which awareness towards possible danger signs and complication readiness is made [23]. The association between incidence of uterine rupture and low attendance or utilization of antenatal care services has been reported in studies done in several parts of Africa and many authors stressed the potential benefit of regular antenatal care attendance in reducing the incidence of uterine rupture [11, 17, 24-27].

Maternal outcomes

In our study, one fifth of the cases developed sepsis which led to prolonged hospital stay (stay of more than 7 days) in 13 of the 14 cases. Likewise, sepsis was associated with a 9-fold increased risk of re-laparotomy (OR=9.18, CI 2.1 - 39.9 and p-value of 0.003). At BMC most patients post caesarean section are routinely discharged on the 3rd day although a few do stay for 7 days and post caesarean section sepsis was shown to be 11%, almost half that reported in our study [28]. Therefore, ruptured uterus means much more morbidity and cost to the patient as well as the hospital and the community. Our findings are almost similar to studies done in MNH-Tanzania and Sudan where sepsis developed in 18% and 17% of the cases respectively [1, 29]. However, in some other studies sepsis was less common than in our study, 10% - 13% in Nigeria and Northwest Ethiopia while it was higher in studies done in Uganda, 34% - 40% [7, 12, 15]. This variability may be due to differences in patient presentations and co-morbidities, use of prophylactic antibiotics, adherence to infection-prevention control, experience of surgeons performing the procedure and methodological differences between studies [21, 28].

Eight cases (12%) developed VVF in this study compared to 6% in a study done at MNH, Tanzania and 2% - 5% in studies done elsewhere [1, 7, 30, 31]. Ten cases (15%) in this study required re-laparotomy, six were due to peritonitis and/or burst abdomen and four were due to continued internal bleeding. Slightly different findings were reported in studies done in Niger delta in Nigeria (10.3%) and in a tertiary care center in Turkey (11.5%) [26, 32]. The different rates of these complications in different studies may probably be related to patient presentation, site and extent of rupture and degree of distortion of the pelvic anatomy, surgical intervention, experience of the surgeon and presence of risk factors for development of sepsis or delay of wound healing like anemia or prolonged obstructed labor. As seen in our study, most of those who developed either VVF or required re-laparotomy presented with obstructed labor and most of them underwent hysterectomy and were operated by residents /registrars than obstetricians. However, obstructed labor was the only factor that had statistically significant association with VVF development in patients studied and none of the aforementioned factors showed significant statistical association with increased re-laparotomy risk in our study although this could be due to small sample size and low rates of these complications.

In this study there was one maternal death. This is equivalent to case fatality rate of 1.5% similar to a study done in UK which reported a case fatality rate of 1.3% [33]. This is contrary to other studies done in Africa where maternal case fatality rates were reported to be high, 6% - 16% [1, 3, 12, 34]. Several factors have been shown to affect maternal outcomes in cases of uterine rupture. These include; patient status on presentation, prompt diagnosis, adequate resuscitation, timely surgical intervention, availability of blood for transfusion as well as whether or not the rupture occurred in scarred uterus [24, 35-37]. The low maternal case fatality rate in our study may probably be due a higher proportion of ruptures in patients with previous uterine scar than unscarred uteri [37]. Moreover, most patients (84%) were operated within less than 1 hour of diagnosis of uterine rupture or impending uterine rupture, as it was shown in a study done in Ile-Ife, Nigeria that delay of 1hr or more was associated with increased maternal case fatality rates [36]. Likewise, adequate resuscitation with intravenous fluids was done and blood for transfusion was available to all patients who needed it intraoperatively and postoperatively. Only 12% of patients in this study presented with hypovolemic shock which was shown to be associated with maternal death in patients with uterine rupture in a study done in Northwest Ethiopia [24]. However, all were successfully resuscitated with intravenous fluids and intraoperative blood transfusion and they all survived.

Surgical intervention

In this study, approximately two thirds of the patients underwent hysterectomy. Majority were relatively young aged below 35 years which may have a significant negative psychosocial impact on these patients due to, not only, loss of fertility potential but also loss of menstruation [21]. However, subtotal hysterectomy was shown, in a review by Thakur et al in 2001, to be associated with less maternal morbidity such as sepsis and need for re-laparotomy and also less mortality than uterine repair, which might have influenced the decision by some surgeons at BMC [38]. However, several other factors might have influenced the type of surgical intervention such as the location and extent of the uterine tear, surgeon experience and hemodynamic stability of the patient [11]. As concluded in a review by Walsh et al in 2007, there is insufficient evidence to recommend either hysterectomy or repair of the uterus as standard surgical management of uterine rupture [39]. Expectedly, studies done elsewhere, show a great variability in surgical intervention, others reporting higher hysterectomy rates while others report higher uterine repair rates [1, 7, 26, 34, 40, 41]. Although uterine repair without BTL carries a significant risk of subsequent uterine rupture, excellent pregnancy outcomes can be achieved with appropriate care including strict delivery by caesarean section (elective or immediate in case premature labor starts) [42-44]. It is therefore an option that should be considered whenever possible in patients who desire future pregnancies [43]. In our study, repair of the uterus without BTL was done in approx. one thirds of patients which is similar to studies done elsewhere [7, 26, 45]. Some other studies reported even a higher proportion of patients, 56 - 70% underwent uterine repair without BTL [3, 29].

Fetal outcomes

Adverse fetal outcomes are also a common finding in patients with ruptured uterus. However, there is a great variability in the rates of these outcomes such as perinatal deaths in different studies. As shown in

this study, perinatal case fatality rate was high compared to developed countries where reported perinatal case fatality rate is 5% to 14% [5, 13, 22]. However, our findings were lower than in studies done elsewhere in Africa where perinatal case fatality rate ranged from 80% to 100% [2, 7, 33, 34]. Differences in patient presentation (early/late presentation), quality of care at health facilities including prompt diagnosis and surgical intervention, prompt referrals, newborn resuscitation, proper management of babies with birth asphyxia including presence of well-equipped and functioning neonatal intensive care units may partly explain the variability observed [1, 21]. At BMC, there is a well-functioning neonatal intensive care unit which is relatively adequately equipped and staffed, however most of the babies in this study were stillbirth which could therefore not change the perinatal case fatality rate. The high still-birth rate may be a proxy to severity of the disruption of fetal-placental unit at diagnosis or intervention in the cases in this study [21]. Several studies have reported that continuous electronic fetal monitoring in women on trial of scar may improve both maternal and fetal outcomes by detecting early signs of fetal compromise such as bradycardia, repetitive variable decelerations and/or late decelerations associated with uterine rupture, hence prompting early intervention. Most common features detected are [46, 47]. Absence of cardiotocography (CTGs) at our facility for monitoring of labor in high risk patients may have contributed to delays in diagnosis of fetal compromise and the hence the observed high perinatal case fatality rate.

Risk factors for uterine rupture

In this study, the leading risk factor for uterine rupture seen was history of previous caesarean section followed by obstructed labor, use of oxytocin for induction or augmentation of labor and grand multiparity. As in other study, a study done at Lagos university teaching hospital in Nigeria, reported previous uterine scar as the leading risk factor for uterine rupture followed by obstructed labor and injudicious use of oxytocin [2]. These risk factors for uterine rupture had been reported at varying proportions in different studies [1, 17, 34, 48]. However, according to a systematic review by WHO and a review of uterine rupture in resource-poor settings by Berhe et al in 2014, the main risk factor for uterine rupture in developing countries was prolonged obstructed labor [4, 21]. The increasing rate of caesarean section may have contributed to increased proportion of uterine scar as a leading risk factor among patients with uterine rupture as seen in our study. Example in Tanzania, caesarean section rate has increased from 3% in 2004/2005 to 6% in 2015/2016 [23].

There were few limitations to this study which included missing files and incomprehensive documentation in the available files. For example, in most files there was no documentation of the indication for prior caesarean section, no information on other uterine surgeries such as myomectomy or uterine evacuations which may contribute to increased risk for uterine rupture. Also, physical examination findings were not well documented in most files, information about birthweight of the babies was missing in some files, operative notes were very deficient in most files and estimated blood loss was rarely documented in most of the files. Moreover, the referral letters in the referred patients lacked a lot of necessary information including duration of labor and specific interventions done to the patients before the referral. Finally, the study was able to determine only short term fetomaternal outcomes based on the recorded information in patients' case files only, long term psychosocial impact could not be assessed.

Conclusions

The cumulative incidence of uterine rupture was relatively low compared to other studies in developing countries. Moreover, there were low maternal case fatality rate, but high perinatal morbidity and mortality related to uterine rupture. However, uterine rupture was associated with high rates of adverse maternal outcomes such as hysterectomy, maternal sepsis, VVF, re-laparotomy and need for blood transfusion. The main risk factors for uterine rupture identified in this study were previous caesarean scars, obstructed labor, injudicious use of oxytocin and grandmultiparity.

Improvement in proper monitoring of patients in labor is necessary to detect early features of obstructed labor, uterine rupture and fetal compromise. This will contribute to reduced incidence of uterine rupture and improve fetomaternal outcomes. Again, availability of blood products is critical in managing patients with uterine rupture with regular emphasis on documentation completeness of patients' information is crucial for evaluation, monitoring and improvement of various obstetric practices.

Abbreviations

AICU- Adult Intensive Care Unit, ANC- Antenatal Care, BMC- Bugando Medical Centre, BTL- Bilateral Tubal Ligation, CUHAS- Catholic University of Health and Allied Sciences, MNH- Muhimbili National Hospital, VVF- Vesico-vaginal Fistula, WHO- World Health Organization.

Declarations

Ethics approval and consent to participate

Ethical review and approval were sought and obtained from a Joint CUHAS and BMC Research and Publication Committee. No consent to participate was sought in this study.

Competing interests

Authors declare that they have no competing interests. All data generated or analyzed during this study are included in this article.

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Author's contributions

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Tables

Table 1: Characteristics of the study population

Variable	Frequency (n)	Percent (%)
Age		
20 - 29	34	50.75
30 - 39	32	47.75
40+	1	1.50
Parity		
0	1	1.50
1 - 4	53	79.10
> 4	13	19.40
Gestational Age		
30 - 36	2	3.00
37 - 40	57	85.00
41 - 42	8	12.00
Referral status		
Referred from other facility	25	37.30
Primarily managed at BMC	42	62.70

Table 2: Incidence of uterine rupture among pregnant women who came for delivery from year 2013 to 2017

Year	Total Deliveries per year(n)	Caesarean section (n)	Caesarean section rate (%)	Ruptured Uterus (RU) (n)	Incidence of RU (per 1000)	Deaths related to RU
2013	8099	1309	16.2	22	2.7	1
2014	10755	2207	20.5	13	1.2	0
2015	4432	1269	28.6	7	1.6	0
2016	6314	2031	32.2	26	4.1	0
2017	8163	2320	28.4	13	1.6	0
Total	37763	9136	24.2	81	2.2	1

Table 3: Short term Fetal Outcomes among cases with uterine rupture

Variable	Frequency (n)	Percent (%)
Born Alive	24	35.8
<u>Apgar score at 5th minute</u>		
≥ 7	15	62.5
< 7	9	37.5
Discharged alive	19	79.2
Died before discharge	5	20.8
<u>Cause of death documented</u>		
Birth asphyxia	5	100.0
Others	0	0.0
Still birth (FSB)	43	64.2
Total Perinatal Deaths	48	71.6

Table 4: Short term Maternal Outcomes and Surgical interventions among cases with uterine rupture

Variable	Frequency (n)	Percent (%)
<i>Mortality</i>		
Discharged Alive	66	98.5
Died	1	1.5
<i>Morbidity/Complications</i>		
Need for Blood transfusion	55	82.1
Sepsis	14	20.9
Genitourinary fistula (VVF)	8	11.9
Re-laparotomy	10	14.9
<i>Surgical intervention</i>		
Uterine repair with BTL	3	4.5
Uterine repair without BTL	25	37.3
Sub-TAH	39	58.2
<i>AICU Admission</i>		
Yes	9	13.4
No	58	86.6
<i>Days in AICU</i>		
1	5	86.6
2	4	44.4
<i>Hospital stay (in days)</i>		
≤ 3	7	10.5
4 - 7	34	50.8
8 - 14	16	23.9
> 14	10	14.9

Table 5: Risk factors for uterine rupture present in patients complicated with Ruptured Uterus managed at BMC.

Variable	Frequency (n)	Percent (%)
Previous caesarian section	36	53.7
Obstructed labor	25	37.3
Oxytocin use	14	20.9
Grand multiparity	13	19.4