

Uterine Rupture: Scarred versus Unscarred Uterus — Perspective from Low- and Middle-Income Countries.

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Abstract: In low- and middle-income countries (LMICs), where delayed referral, insufficient intrapartum surveillance, and limited emergency surgical capability continue to exacerbate maternal and neonatal risk, uterine rupture continues to be one of the most devastating obstetric crises. This retrospective analytical study, conducted at PIQSJIMS Gambat, reviewed 80 cases of uterine rupture from January 2019 to December 2023 (ERC#389). Patients were categorized into rupture of unscarred and scarred uteri, and cases with incomplete data or uterine dehiscence were excluded. Variables including hemorrhage, surgical intervention, ICU admission, cervical trauma, delivery outcomes, and maternal mortality were analyzed using Chi-square tests ($p < 0.05$). Results showed that massive bleeding (>1000 mL with shock) was more common in instances with scarred uterus, but major bleeding (500–1000 mL) was more common in unscarred uterine rupture. Uterine repair predominated in unscarred rupture, but subtotal hysterectomy was considerably greater in the scarred uterus group ($p=0.02$). Unscarred rupture was substantially correlated with cervical trauma ($p=0.01$). While dead-on-arrival cases were more common in unscarred ruptures ($p=0.014$), maternal mortality was considerably greater in women with scarred ruptures ($p=0.009$). There was a significant difference in delivery status across the groups ($p=0.006$). Hence, it is concluded that there are notable distinctions in the patterns of scarred and unscarred uterine rupture; scarred rupture is related with greater rates of surgical removal and death, whereas unscarred rupture is linked to pre-delivery diagnostic and cervical trauma. Reducing the incidence of uterine ruptures in LMICs requires improved intrapartum monitoring, prompt surgical preparedness, and robust referral networks.

Keywords: Uterine rupture, Scarred uterus, Unscarred uterus, Obstetric emergencies, Hysterectomy.

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Introduction

A rare but deadly obstetric complication, uterine rupture is defined by full-thickness separation of the uterine wall (endometrium, myometrium, and serosa) or a dehiscence that causes significant morbidity and death in both the mother and the fetus. Uterine rupture is a major cause of maternal mortality, hysterectomy, extensive bleeding, and perinatal loss in many low- and middle-income countries (LMICs), despite its low absolute incidence in high-income settings¹⁻².

Women with an unscarred (intact) uterus and those with a scarred uterus (generally from a previous cesarean section or other uterine surgery) are the two clinical categories that are often identified.



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These groupings have different processes, risk profiles, and programming consequences. Failure of a prior uterine scar during a trial of labor after cesarean (TOLAC) is the most common cause of uterine rupture in high-income settings, but in many LMICs, obstructed or prolonged labor, harmful augmentation/induction techniques, and delays in receiving definitive care continue to be major contributors to ruptures in unscarred uteri [1-3].

Hospital-based series and meta-analyses from LMICs report pooled prevalences from ~0.5% to several percent in high-risk facilities or regions (for example, pooled national estimates from Ethiopia ~2%), population-level estimates in high-income countries are usually well under 1 per 1,000 births. In addition to referral bias, poor monitoring, and varying denominators (institutional vs. population), this variability reflects actual epidemiologic disparities^{2,4}. Significantly, uterine rupture is associated with disproportionately high rates of maternal and perinatal case-fatality in LMICs. Numerous studies report significant rates of stillbirth or early newborn mortality following rupture, severe anemia, sepsis, and frequent hysterectomy [1,5].

The most well-known risk factor for rupture during childbirth is a previous transverse lower-segment cesarean scar. The pool of women at risk grows as cesarean delivery rates rise without corresponding improvements in safe intrapartum monitoring and referral systems; as a result, LMICs experiencing rapid increases in cesarean births may see a relative increase in scar-related ruptures. However, the absolute risk of scar rupture following one previous low transverse cesarean remains minimal when handled within structured pathways (sufficient selection for TOLAC, ongoing fetal monitoring, prompt surgical backup). Delays in diagnosis and transfer have different effects on perinatal and maternal outcomes for scar ruptures: delays exacerbate maternal bleeding and fetal hypoxia [5, 6].

When compared to scar-rupture in a monitored TOLAC situation, obstructed labor is still the most common proximal cause of rupture in unscarred uteri in many LMIC institution studies. These patients often arrive late, with severe uterine injury, more bleeding, and worse infant outcomes. Poor outcomes following unscarred rupture are frequently linked to obstructed labor, inadequate prenatal care, delayed referral, and restricted blood/blood-bank availability, according to case studies and audits from sub-Saharan Africa [1, 5, and 7].

The burden and severity of uterine rupture in LMICs are primarily caused by gaps in antenatal risk identification (i.e., women with prior CS or risk factors are not counseled or planned appropriately), limited access to skilled birth attendance and continuous fetal monitoring, overuse and unsupervised use of uterotonics at peripheral sites, transport/transfer delays, a lack of ready surgical theaters, a shortage of blood products, and a lack of trained surgical teams. The lack of prenatal care, living in a rural location, having a lengthy or obstructed labor, and having had a previous cesarean section are all repeatable predictors of rupture in LMIC cohorts, according to meta-analyses and regional trend studies. Prevention and lowering the case-fatality burden depend on addressing these structural barriers [2, 4-5].

From the standpoint of public health in LMICs, prevention comprises: (1) enhancing prenatal identification and counseling for women who have had prior uterine surgery; (2) enhancing intrapartum monitoring and safe, evidence-based use of uterotonics at all levels; (3) guaranteeing prompt referral and transport systems; and (4) ensuring that receiving hospitals have access to operating rooms, blood transfusion capacity, and surgical expertise. Concurrently, preventable fatalities from both scarred and unscarred uterine ruptures can be decreased by facility-level audits and near-miss evaluations, as well as context-sensitive guidelines for TOLAC selection and labor augmentation [1, 6-7].

This study aims to assess the frequency, determinants, and preventive implications of uterine rupture in scarred versus unscarred uterus in a population belonging to a low-middle income country



Method

After receiving clearance from the institutional ethical review committee, this retrospective study was carried out at the Department of Obstetrics and Gynecology at Pir Abdul Qadir Shah Jeelani Institute of Medical Sciences (PIQSJIMS), Gambat (ERC#389). We examined every instance of uterine rupture that was documented between January 2019 and December 2023, a span of five years. Women who presented with or had an intraoperative diagnosis of uterine rupture were identified by looking through hospital records, including labor room registrations, emergency obstetric logs, operating theatre records, and patient files.

A total of 80 patients with comprehensive clinical data were included in the sample. Patients were divided into two categories based on their obstetric history: rupture of an unscarred uterus and rupture of a scarred uterus, which was defined as a uterus that had undergone a prior cesarean section or other uterine surgery. Unregistered patients who came straight to the emergency room and registered patients who enrolled for prenatal treatment at the institution. Patients with incomplete or missing critical clinical data, as well as cases of uterine dehiscence without full-thickness rupture, were not included. Maternal age, parity, gestational age at presentation, booking status, interpregnancy interval, and pertinent risk factors like prolonged or obstructed labor, induction or augmentation with oxytocin or prostaglandins, labor mismanaged by traditional birth attendants, traumatic events, or trial of labor after cesarean (TOLAC) were all recovered from the records. Additionally reviewed were clinical findings at presentation, fetal status, delivery status, location and extent of rupture, intraoperative management, type of surgery (hysterectomy or uterine repair), need for blood transfusion, ICU care, related injuries like broad-ligament or cervical tears, maternal morbidity, and maternal and perinatal mortality.

SPSS version 26 was used to analyze the data. Categorical variables were displayed as frequencies and percentages, and continuous variables as means with standard deviations. The Chi-square test for categorical variables and the independent Student t-test for continuous variables were used to compare the scarred and unscarred groups. Statistical significance was defined as a p-value of less than 0.05.

Results

40 cases of rupture in an unscarred uterus and 40 cases in a previously scarred uterus were among the 80 confirmed cases of uterine rupture that were examined during the five-year research period. Both groups' clinical traits, treatment, and results showed clear trends with statistically significant variations in several categories.

Major blood loss (500–1000 mL) was more common in women with an unscarred uterus (n=23) than in those with a scarred uterus (n=11), according to a study of hemorrhage severity. However, women with a scarred uterus (n=29) were more likely than those with an unscarred uterus (n=17) to experience severe bleeding surpassing 1000 mL linked to clinical shock. Even though these patterns show different hemorrhage profiles, the overall difference was not statistically significant (p=0.087).

The two groups' surgical care differed significantly. While women with a scarred uterus needed a subtotal hysterectomy more frequently (n=31 vs. n=13), uterine repair was considerably more common in the unscarred uterus group (n=27) than in the scarred group (n=9). Ruptures in scarred uteri were more severe and less susceptible to conservative repair, according to this statistically significant difference (p=0.02).

Eleven women with an unscarred uterus and five with a scarred uterus needed to be admitted to the intensive care unit (ICU); this difference was close to but not statistically significant (p=0.067).



Unscarred uterine ruptures had a considerably greater frequency of cervical trauma (n=28 vs. n=8; p=0.01), indicating that spontaneous or obstructed labor-related ruptures are more likely to result in considerable tissue injury.

Additionally, there were significant differences in delivery status amongst the groups. While undelivered ruptures were more prevalent in the unscarred group (n=28 vs. n=8), a greater percentage of women with a scarred uterus (n=32) had previously given birth at the time of rupture diagnosis than those with an unscarred uterus (n=12). This difference was statistically significant (p=0.006) and is consistent with the idea that unscarred uteri may rupture before birth due to blocked or poorly managed labor.

Results for maternal survival varied considerably as well. Women with a scarred uterus had a higher mortality rate (14 deaths versus 6 deaths in the unscarred group; p=0.009). Furthermore, two women in the scarred group and five in the unscarred group were brought to death without the possibility of intervention; this difference was statistically significant (p=0.014). Although the trend indicates later referral and delayed presentation among unscarred uterine rupture cases, our results show the severe and quick clinical deterioration linked to both forms of rupture.

When combined, the findings show that unscarred uterine ruptures were linked to greater rates of cervical damage, undeliverable ruptures, and fatal instances. On the other hand, ruptures in scarred uteri were linked to increased maternal mortality, more severe bleeding with shock, and considerably higher hysterectomy needs. The different processes and clinical trajectories of rupture in unscarred vs scarred uteri are highlighted by these patterns.

Table 1: Description of associated factors in scarred and unscarred patients.

Variables		Unscarred uterus (n=40)	Scarred Uterus (n=40)	P-Value
Hemorrhage	Major loss 500-1000 ml	23 (57.4%)	11 (27.5%)	0.087
	Massive loss >1000+ Shock	17 (42.5%)	29 (72.5%)	
Surgery	Repaired	27 (67.5%)	9 (22.5%)	0.02
	Subtotal Hysterectomy	13 (32.5%)	31 (77.5%)	
ICU care		11 (27.5%)	5 (12.5%)	0.067
Cervical Trauma		28 (70%)	8 (20%)	0.01
Delivery Status	Delivered	12 (30%)	32 (80%)	0.006
	Undelivered	28 (70%)	8 (20%)	
Mortality	Alive	34 (85%)	26 (65%)	0.009
	Expired	6 (15%)	14 (35%)	
Dead upon arrival without intervention		5 (12.5%)	2 (5%)	0.014

Discussion

Particularly in low- and middle-income countries (LMICs), where there are still gaps in prompt obstetric care and availability to surgical procedures, uterine rupture continues to be a catastrophic obstetric emergency linked to significant maternal and neonatal morbidity and death. The clinical outcomes of ruptures in unscarred and scarred uteri were examined in this study, and the results showed different patterns in morbidity and death that were in line with current worldwide data. While uterine ruptures in scarred uteri are frequently linked to prior cesarean sections, ruptures in unscarred



uteri are less common but typically more severe, appearing late and causing significant maternal impairment [8].

The results showed that, although this difference did not reach statistical significance, women with unscarred uterine rupture had a considerably greater probability of serious bleeding between 500 and 1000 mL than those with scarred uteri. On the other hand, women with scarred uteri were more likely to experience severe bleeding surpassing 1000 mL with shock. These patterns are consistent with the pathophysiology of rupture in damaged myometrium, where fast dehiscence during birth can result in severe bleeding and hemodynamic collapse [9]. Before definitive surgical care can be obtained, catastrophic hemorrhage is more likely in LMICs due to the burden of delayed referral, obstructed labor, and improperly managed labor augmentation [10].

A statistically significant correlation between the requirement for a hysterectomy and uterine scarring was found in surgical outcomes. Subtotal hysterectomy was more likely in women with scarred uteri ($p=0.02$), while repair was more common in women with unscarred rupture. These results support previous research showing that substantial rips and friable tissue make uterine regeneration in scarred areas difficult [11]. Furthermore, because of the possibility of recurrent rupture in subsequent pregnancies, the threshold for hysterectomy is frequently lower in women with prior cesarean scar rupture, particularly in situations where safe repeat delivery planning and long-term follow-up cannot be guaranteed, as is typical in LMIC settings [12].

Cervical damage was considerably more common in unscarred uterine rupture ($p=0.01$), which is consistent with the traditional mechanism of obstructed labor, in which cervicovaginal lacerations might result from overstretching and downward force. Conversely, there were less cervical extensions in scarred uterine ruptures, which tended to follow linear, predictable patterns along the prior scar [13]. Because cervical and lower-segment injuries are linked to higher blood loss and a greater requirement for intricate repair procedures, this distinction has significant therapeutic consequences for maternal outcomes.

There was a significant difference in the groups' delivery status at the time of rupture, with a greater percentage of women in the group with damaged uteruses having already given birth ($p=0.006$). Scar dehiscence frequently happens in the second stage of labor or right after delivery, which is consistent with patterns shown in recent research where labor advancement causes abrupt scar failure [10]. However, ruptures in unscarred uteri were more commonly identified before to birth, typically during obstructed labor, fetal distress, or maternal collapse.

In line with data from recent African and South Asian cohorts that reported death rates two to four times higher in scarred uterus rupture, maternal mortality was considerably higher among women with scarred uterine rupture ($p=0.009$) [14]. This might be due to the speed at which bleeding occurs, difficulties in getting safe anesthetic, and delays in making surgical decisions. The unscarred group also had a larger percentage of women who arrived deceased before any intervention ($p=0.014$), underscoring delayed identification and transport—factors firmly anchored in LMIC health system constraints [15]. Inadequate intrapartum monitoring, lack of emergency transportation, societal constraints, and poor birth preparation all commonly lead to delayed diagnosis, which lets issues worsen and eventually result in irreparable shock.

Across both groups, the need for ICU care reflected the severity of maternal compromise, although no statistically significant difference emerged. This aligns with LMIC realities where ICU availability is limited, and critically ill obstetric patients are often stabilized in general wards due to resource constraints [16].

Due to resource limitations, critically sick obstetric patients are frequently stabilized on general wards, which is consistent with LMIC reality where ICU capacity is restricted [17-18].



Overall, the results show that whereas scarred and unscarred uterine rupture have different etiologies and clinical patterns, both types are nonetheless potentially fatal. The high prevalence of hysterectomy, severe bleeding, and significant maternal death highlight the critical need for better intrapartum surveillance, risk assessment, prompt surgical intervention, and bolstering obstetric emergency infrastructure. Uterine rupture in LMICs may be avoided with improved facility preparedness, early detection of labor anomalies, safe cesarean procedures, and thorough postpartum follow-up to advise women about future pregnancy risks, according to global evidence [19-20].

Recommendations

Reducing the incidence of uterine rupture in LMICs requires improving maternal health services. The first step in improving intrapartum monitoring is to make sure that trained birth attendants are always available, and partograph-based labor surveillance is used to identify obstructed labor early. To reduce hazardous or inappropriate attempts that might cause rupture, facilities should have standardized protocols for handling prior cesarean deliveries, including explicit instructions for trial of labor after cesarean (TOLAC). The percentage of women who arrive in critical condition or dead on arrival can be decreased by implementing community-based initiatives to enhance birth readiness, emergency transport access, and early referral routes.

Upgrading surgical capacity at district-level hospitals, guaranteeing the availability of blood transfusion services, necessary obstetric equipment, and qualified obstetric surgeons capable of prompt repair or hysterectomy should be the main goals of health system strengthening. Response to rupture can be greatly enhanced by simulation-based emergency obstetric training. To prevent recurrence, postpartum counseling about early prenatal care, facility delivery, and birth spacing is essential for women with cesarean scars. Lastly, ongoing audit mechanisms, such as maternal near-miss and mortality evaluations, should be incorporated into national health policy in order to monitor uterine rupture trends and provide information for quality improvement programs designed for settings with limited resources.

Conclusion

This study emphasizes the persistent burden of maternal morbidity and death in LMICs by highlighting notable disparities in clinical presentation and outcomes between ruptures in unscarred and scarred uteri. Unscarred uterine rupture more often entailed cervical trauma and pre-delivery diagnosis, whereas scarred rupture was linked to higher mortality and a larger need for hysterectomy. These results highlight the need for safer surgical techniques, better obstetric surveillance, and prompt emergency response systems. Reducing the catastrophic effects of uterine rupture requires improving maternal healthcare delivery, especially in the areas of labor management and cesarean section monitoring.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was collected after receiving clearance from the institutional ethical review committee, this retrospective study was carried out at the Department of Obstetrics and Gynecology at Pir Abdul Qadir Shah Jeelani Institute of Medical Sciences (PIQSJIMS), Gambat (ERC#389)

HUMAN AND ANIMAL RIGHTS

No animals were used in this study. The study on humans was conducted in accordance with the ethical rules of the Helsinki Declaration and Good Clinical Practice.



CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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