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# Fetomaternal Mortality and the Associated Factors in Pregnant Women with Uterine Rupture

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## ABSTRACT

Disruption of all uterine layers in pregnant women can lead to rupture of the uterus. Although it is a rare complication, fetal as well as maternal outcomes can be disastrous. Delay in the diagnosis and management is the reason for adverse outcomes owing to the rare and unexpected nature of the complication. **Objective:** To determine fetomaternal mortality and its associated factors in pregnant women with uterine rupture. **Methods:** Total 89 cases with diagnosed ruptured uterus of pregnant women were selected via nonprobability consecutive sampling. Age, body mass index, and gestational age were documented. Outcome variables were fetal and maternal mortality, wound infection, hemorrhage, and hysterectomy. Baseline factors were compared on the basis of fetal or maternal mortality to determine the responsible factors. **Results:** Mean age of the patients was 31.15±3.83 years. Mean gestational age was 30.32±3.50 weeks, and median parity was 3. Mean BMI was 26.56±1.49 kg/m2. Of all the patients, 34 (38.2%) had a positive history of cesarean section. Wound infection was observed in 38 (42.7%) of the patients. Maternal and fetal mortality occurred in 22 (24.7%) and 59 (66.3%) patients, respectively. **Conclusions:** Fetal and maternal mortality were high among the patients with a ruptured uterus. Maternal mortality was related to high maternal age and parity, while fetal mortality was related to gestational age and maternal BMI. A previous cesarean section was related to both maternal and fetal demise.

## INTRODUCTION

Uterine rupture is a rare but life-threatening complication involving the complete disruption of the uterine wall, with serious maternal and fetal consequences. Its prevalence is 1.35% in Ethiopia [1], with an increasing trend in recent years [2]. Risk factors include advanced maternal age, previous cesarean section or uterine surgery, labor induction with oxytocin or prostaglandins [3], post-term pregnancy, short interpregnancy interval, macrosomia, single-layered uterine closure, trial of labor after cesarean (TOLAC), multiple cesarean sections, adenomyomectomy [4], and abdominal or laparoscopic myomectomy. Complications include severe hemorrhage requiring blood transfusion or hysterectomy, bladder injury, fetal distress, preterm birth, stillbirth, and maternal death [5-7]. Delay in the diagnosis and management is the reason for adverse outcomes owing to the rare and unexpected nature of the complication. Whatever the cause may be, no single risk factor is clinically reliable enough to predict the risk of antepartum or intrapartum rupture of the uterus. An increase in the trend of rupture of both scarred and unscarred uteri during gestation has been observed over the previous forty years. Studies have been conducted to compare fetomaternal outcomes in patients with rupture of scarred uterus against those with rupture of unscarred

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uterus. The outcomes were worse for both mother and fetus in the patients with rupture of an unscarred uterus. Niazi *et al.* conducted a study and observed 19.17 % wound infection rate, 9.17 % maternal mortality, and 56.67 % fetal mortality in cases of ruptured gravid uterus [8]. Desta *et al.* studied cases of ruptured gravid uterus and observed 98.3 % fetal mortality and 6.6 % maternal mortality [9]. Fetal mortality was 69.8% in patients in a study conducted by Shaikh [10]. The results in the above-mentioned studies vary to a great extent, requiring further study of cases with a diagnosis of ruptured uterus. Assessment of factors leading to rupture of the uterus and maternal as well as fetal outcomes is required to devise prevention and management plans of uterine rupture.

This study aimed to determine local population and the patients with definitive diagnosis of uterine rupture in order to assess the fetomaternal outcomes and their associated factors, which will further help to timely diagnose or even prevent the disastrous events.

## METHODS

This descriptive case series study was conducted in the Department of Obstetrics and Gynecology, Mollah Bakhsh Hospital DHQ Sargodha, from July 1st, 2021 to December 31st, 2021. Ethical approval was taken from the hospital review board (IRB letter # UOS/SMC/3095), before the commencement of study. Total 89 patients were selected as per sample size calculated from reference study which documented 69.8% fetal mortality and we expected 20% decrease in the incidence at 95% confidence interval and a power of the study 80% [10]. Women with a confirmed diagnosis of ruptured uterus who were 18-40 years old, with a singleton pregnancy and gestational age of 20 weeks or more as per LMP were included in the study. USG was done using Siemens Acuson S3000 to look for uterine rupture, and the diagnosis was verified by intraoperative findings, i.e., fetus was lying inside the abdominal cavity instead of the uterine cavity. Patients with a diagnosis of pre-eclampsia, eclampsia, placenta previa, and antepartum hemorrhage were excluded from the study. Patients were selected by nonprobability consecutive sampling, as this technique helped us to collect the required sample population within the time frame of the study. Selection bias was limited as it was a single-group descriptive case series and did not require any randomization. Informed written consent was taken after explaining the purpose of the study to the patients and their attendants, and confidentiality of data was ensured. All the baseline data, including age, body mass index, parity, history of cesarean section, and gestational age, were documented (data collected from hospital records). All the patients were managed and underwent surgery as per the protocols of the department, i.e., after stabilization, necessary laboratory investigation, and proper arrangement of blood transfusion. A senior consultant gynecologist with a minimum of three years post-fellowship experience was supervising the whole management. Intermittent or continuous electronic fetal monitoring was done till the baby was delivered. Fetal mortality was documented. Fetal mortality was labelled if the baby died before complete expulsion of the fetus. Wound infection was documented if there was erythema of more than 1 cm around wound edges and there was sero-sanguinous discharge present at 6th day postoperatively. Maternal mortality was labelled if the death of the mother occurring during the six postpartum weeks. Information was collected using the phone number provided on patient files. Wound infection and maternal mortality were documented. The researchers themselves collected all the data on a specified Proforma. All the data was entered in IBM SPSS version 27.0 and analyzed. Means and standard deviations were calculated for continuous variables such as age, BMI, and gestational age; while nominal data were calculated as numbers and percentages, and included parity, history of cesarean section, fetal mortality, hysterectomy, wound infection, and maternal mortality. N = p0q0 {z1-α/2 + z1-β sqrt (p1q1/p0q0}/(p1-p0)2. Patients were divided into two groups based on maternal and fetal mortality, and all the baseline data were compared between the groups to analyze which factors contributed more towards such disastrous outcomes. Shapiro-wilk test was applied to assess the normal distribution of data. Student's t-test was applied to compare the continuous variables such as age, GA, parity, and BMI, while nominal data such as wound infection, fetal and maternal mortality were compared by applying chi square test. Binary logistics were applied to assess the correlation of age, gestational age, BMI, parity with maternal and fetal mortality, where correlation with cesarean section history was assessed by $x^2$ test. The p≤0.05 was considered statistically significant.0

## RESULTS

Total 89 patients were included in the study with a mean age of 31.15 ± 3.83 years. Mean gestational age was 30.32 ± 3.50 weeks, and median parity was 3. Mean BMI was 26.56 ± 1.49 kg/m2. Of all the patients, 34 (38.2 %) had a positive history of cesarean section. Wound infection was observed in 38 (42.7 %) of the patients. Maternal and fetal mortality occurred in 22 (24.7 %) and 59 (66.3%) patients, respectively. Data was compared on the basis of maternal mortality. Mean age was 35.18 ± 4.68 years in the mortality group, which was significantly higher (p<0.002) than that in the survivors (29.83 ± 2.33 years). Gestational age was 30.63 ± 3.80 weeks and 30.22 ± 3.42 weeks in the mortality and survivor groups, respectively, with no statistically significant difference (p=0.634). Mean parity was 3.54 ± 1.65

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in the mortality group, which was significantly higher (p=0.007) as compared to 2.44 ± 0.94 in the survivors. BMI was 26.68 ± 1.21 kg/m$^2$ and 26.52 ± 1.58 kg/m$^2$ in the deceased and survivors, with no statistically significant difference (p=0.623). The history of cesarean section was positive in 63.6% of the mothers who died and 29.9% of the mothers who survived, and the difference was statistically significant (p=0.005). Incidence of wound infection was 72.7% and 32.8% in the mortality and survivor groups, respectively (p=0.001). Incidence of fetal mortality was 72.7% and 64.2% in the maternal mortality and survivor groups, respectively, with the difference not being statistically significant (p=0.462) (Table 1).

**Table 1:** Comparison of Data on Basis of Maternal Mortality

| Variables | Maternal Mortality | | p-value |
|---|---|---|---|
| | Yes (n=22) | No (n=67) | |
| Age, Years | 35.18 ± 4.68 | 29.83 ± 2.33 | <0.001 |
| Gestational Age, Weeks | 30.63 ± 3.80 | 30.22 ± 3.42 | 0.634 |
| Parity, Number | 3.54 ± 1.65 | 2.44 ± 0.94 | 0.007 |
| BMI, kg/m$^2$ | 26.68 ± 1.21 | 26.52 ± 1.58 | 0.623 |
| Previous Cesarean Section | 14 (63.6 %) | 20 (29.9 %) | 0.005 |
| Wound Infection | 16 (72.7 %) | 22 (32.8 %) | 0.001 |
| Fetal Mortality | 16 (72.7 %) | 43 (64.2 %) | 0.462 |

*Data are presented as mean ± standard deviation, and number (percentages)

Data were also compared on the basis of fetal mortality. Mean age of the mothers was 31.42 ± 4.01 years in the fetal mortality group and 30.63 ± 3.47 years in the survivors (p=0.361). Gestational age was 28.98 ± 2.61 weeks in the fetal mortality group, which was significantly lower (p<0.001) than that of the live babies (32.96 ± 3.56 weeks). Mean parity was 2.71 ± 1.16 in the fetal mortality group with no statistically significant difference (p = 0.939) as compared to 2.73 ± 1.41 in the survivors group. BMI was 26.81 ± 1.42 kg/m$^2$ and 26.06 ± 1.53 kg/m$^2$ in the deceased and survivors, respectively, being significantly higher in the former group (p=0.030). The history of cesarean section was positive in 47.5% of the mothers in the fetal mortality group and in 20.0 % of the mothers of the fetal survivor group; the difference was statistically significant (p=0.012). Incidence of wound infection was 52.5 % and 23.3 % in mothers of fetal mortality and survivor groups, respectively (p=0.008). Incidence of maternal mortality was 27.1% and 20.0 in the fetal mortality and survivor groups, respectively, with no statistically significant difference (p=0.462) (Table 2).

**Table 2:** Comparison of Data Based on Fetal Mortality

| Variables | Fetal Mortality | | p-value |
|---|---|---|---|
| | Yes (n=59) | No (n=30) | |
| Age, Years | 31.42 ± 4.01 | 30.63 ± 3.47 | 0.361 |
| Gestational Age, Weeks | 28.98 ± 2.61 | 32.96 ± 3.56 | <0.001 |
| Parity, Number | 2.71 ± 1.16 | 2.73 ± 1.41 | 0.939 |
| BMI, kg/m$^2$ | 26.81 ± 1.42 | 26.06 ± 1.53 | 0.030 |
| Previous Cesarean Section | 28 (47.5 %) | 6 (20.0 %) | 0.012 |
| Wound Infection | 31 (52.5 %) | 7 (23.3 %) | 0.008 |
| Fetal Mortality | 16 (27.1 %) | 6 (20.0 %) | 0.462 |

*Data is entered as mean ± standard deviation, and number (percentages)

Maternal age and previous cesarean section had a positive correlation with maternal mortality (p-value <0.001 and 0.005, respectively), whereas gestational age, BMI, and previous cesarean section had a positive correlation with fetal mortality (p-value <0.001, 0.045, and 0.012, respectively) (Table 3).

**Table 3:** Significant Pearson correlation of variables with maternal and fetal mortality

| Variables | OR | p-value |
|---|---|---|
| **Maternal Mortality** | | |
| Age, Years | 1.596 | <0.001 |
| Previous Cesarean Section | 0.243 | 0.005 |
| **Fetal Mortality** | | |
| Gestational Age, Weeks | 0.277 | <0.001 |
| BMI, kg/m$^2$ | 1.491 | 0.045 |
| Previous Cesarean Section | 0.277 | 0.012 |

## DISCUSSION

In the current study, 89 patients were included, in the study of whom 34 (38.2 %) had a positive history of cesarean section. Wound infection was observed in 38 (42.7 %) of the patients. Maternal and fetal mortality occurred in 22 (24.7 %) and 59 (66.3%) patients. Mean age and parity were significantly higher in the maternal mortality group (p<0.002 and p = 0.007, respectively). Significantly higher ratio of expired patients had a history of previous cesarean section, i.e., 63.6% as compared to 29.9% among the survivors (p=0.005). Wound infection was observed in 72.7% and 32.8% in the mortality and survivor groups, respectively (p=0.001). Fetal mortality was significantly higher in lower gestational age (p<0.001). Higher BMI of the mothers and previous cesarean section contributed more to fetal mortality (p=0.030 and p=0,012, respectively). Mothers of 52.5% of still births developed wound infection (p=0.008). There was a significant correlation of age and previous cesarean section with maternal mortality, whereas a significant correlation of low gestational age, BMI, and no history of previous cesarean section was observed with fetal mortality. Maternal mortality in the current study was 24.7%, which was different from the rates observed in other studies 6.6% [11], 6.5% [12], 2.5% [13], 87.5% in unscarred and 39.1% in scarred uteri [14], and 11.94% [15]. A study by Abrar *et al.* [16] reported 21% maternal mortality, results close to those observed in the current study. Gibbins *et al.* [17] observed 65% of the

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mothers with primary uterine rupture had maternal morbidities. Blood loss and transfusion rate were also higher among the cases, with 35% of the cases undergoing hysterectomy. Fetal mortality and other neurological complications occurred in 40% of the cases. Primary uterine rupture occurred in 63% of the cases when delivered vaginally as compared to 9% with cesarean delivery. Al-Zirqi *et al.* [14] observed no perinatal mortality in patients with partial uterine rupture. The current study showed 66.3% fetal mortality. Astatikie *et al.* [11] observed 98.3% stillbirths in all the patients who had uterine rupture, and the rate was very much higher than that of the current study. Uterine rupture occurred in 2.44% of the study population, and 5.8% of the patients with uterine rupture developed vesico-vaginal fistula. Abbas AM *et al.* [12] observing 67.8% fetal mortality, which was very close to that observed in the current study. Rottenstreich *et al.* [18] concluded from their study that the delay in the diagnosis of uterine rupture was significantly associated with poor maternal outcome in terms of a higher morbidity rate. Multivariate analysis showed delayed diagnosis to be associated with hysterectomy (OR=4.90, 95% CI). Tan *et al.* [19] studied 48 cases of uterine rupture in Singapore and observed 25% fetal mortality. However, they observed no maternal death. Another study conducted by Chang *et al.* [20] also studied risk factors and observed previous cesarean and multiparity in 59% and 83% of the cases, results higher than those of the current study. In their study, there was 16% perinatal fetal mortality. Sharon *et al.* [13] observed a previous cesarean in 45% of the patients, results close to those observed in the current study. Cesarean proceeded to hysterectomy in 27% of the cases. Incidence of fetal mortality was 33.3%, which was about half of the incidence observed in the current study. A study was conducted in Nigeria by Adegbola *et al.* [15], and they observed 46.28% patients had a history of previous cesarean section, results similar to the current study. However, they observed 79.1% fetal mortality rate, which was much higher than the current study. Abrar *et al.* [16] observed 21% maternal mortality and 91.4% perinatal fetal mortality, results significantly higher than those observed in the current study. The differences between current findings and other studies may be due to variations in the study populations (e.g., maternal age, parity, history of cesarean section), healthcare settings, and management protocols (labor monitoring, induction practices, timing of the surgical intervention). Additionally, study design, sample size, and operational definitions may have contributed to observed discrepancies. Despite multiple studies on uterine rupture, there is considerable variation in reported maternal and fetal outcomes, and limited local data evaluating the factors associated with the mortality in patients with a confirmed diagnosis of uterine rupture. Existing literature inadequately examines the combined impact of maternal, obstetric, and perioperative factors on fetomaternal outcomes, particularly in low-resource hospital settings. This gap necessitates region-specific studies to inform timely diagnosis, prevention, and management strategies. The high fetomaternal mortality associated with the uterine rupture highlights the need for early identification of high-risk patients, intrapartum monitoring, and timely surgical intervention, particularly in patients with advanced age, high parity, increased BMI, and previous cesarean section. Public health measures should emphasize dropping unnecessary cesarean deliveries, implementing antenatal risk screening, improving referral systems, and ensuring the availability of emergency obstetric and blood transfusion services. Future research should focus on prospective, multicenter studies to validate risk factors, develop predictive models for early detection, and assess the efficiency of preventive and management approaches to reduce the incidence of uterine rupture and its associated morbidity and mortality.

## CONCLUSIONS

Maternal and fetal mortality rates were markedly elevated in patients who experienced uterine rupture. Maternal mortality was related to high maternal age and parity, while fetal mortality was related to gestational age and maternal BMI. A previous cesarean section was related to both maternal and fetal demise.

## Authors Contribution

Conceptualization: AA, NS, SS
Methodology: SS
Formal analysis: NS
Writing and Drafting: AG, ZA
Review and Editing: AG, AA, NS, SS, ZA, RZ

All authors approved the final manuscript and take responsibility for the integrity of the work.

## Conflicts of Interest

All the authors declare no conflict of interest.

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