

Maternal Outcome after Complete Uterine Rupture

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Abstract

Introduction Complete uterine rupture, a rare peripartum complication, is often associated with a catastrophic outcome for both mother and child. However, few studies have investigated large data sets to evaluate maternal outcomes after complete ruptures, particularly in unscarred uteri. This paucity of studies is partly due to the rarity of both the event and the serious outcomes, such as peripartum hysterectomy and maternal death. The incidence of uterine rupture is expected to increase, due to increasing cesarean section rates worldwide. Thus, it is important to have more complete knowledge about the immediate maternal outcome following a complete uterine rupture.

Objective To identify maternal outcomes and their risk factors following complete uterine ruptures.

Materials and Methods This was a population-based study using data from the Medical Birth Registry of Norway, the Patient Administration System, and medical records. Maternities with complete uterine rupture after start of labor in Norway during the period 1967–2008 (n = 247 births), identified among 2 209 506 women. Uterine ruptures were identified from both registries and further studied through a review of medical records. Only complete ruptures were included in analysis. The associations between maternal outcomes and demographic and labor risk factors were estimated. Odds ratios (ORs) were determined with crude logistic regressions for each risk factor. Separate multivariable logistic regressions were performed to calculate adjusted odds ratios and 95% confidence intervals (CIs).

Results We identified 88 (35.6%) healthy mothers, 107 (43.3%) severe postpartum hemorrhages without hysterectomy, 51 (20.6%) peripartum hysterectomies, and three (1.2%) maternal deaths. Peripartum hysterectomy decreased significantly in the last years of study. Unscarred uterine ruptures significantly increased the risk of peripartum hysterectomy compared to scarred uterine ruptures (AOR: 2.6; 95% CI: 1.3-5.3). Other risk factors that increased the risk of peripartum hysterectomy following rupture were: maternal age ≥ 35 years (AOR: 2.3; 95% CI: 1.1-5.0), parity ≥ 3 vs. parity 1-2 (AOR: 2.8; 95% CI: 1.2-6.7), and rupture detection after vaginal delivery (AOR: 2.2; 95% CI: 1.1-4.8).

Conclusion Unscarred uteri, older maternal age, parity ≥ 3 , and rupture detection after vaginal delivery showed the highest associations with the risk of peripartum hysterectomy after complete uterine rupture.

Keywords Complete uterine rupture, maternal outcome, peripartum hysterectomy, risk factors, scarred uteri, severe postpartum hemorrhage, unscarred uteri

Key message Ruptures in unscarred uteri carried more catastrophic maternal outcome, including hysterectomy, because they occurred increasingly outside the lower uterine segment and extended more beyond the cervix. This may indicate a delay in diagnosis due to a lower index of suspicion.

Introduction

Complete uterine rupture is a rare peripartum complication, often associated with catastrophic outcomes for both mother and child.¹ A scarred uterus, most commonly due to a previous cesarean delivery, substantially increases the risk of uterine rupture.^{1,2}

Few previous studies have described maternal outcomes after complete uterine rupture, most likely due to the rarity of the event. Most previous studies were based on registries that used international diagnostic codes that did not differentiate between complete and partial ruptures. Moreover, previous studies were focused on outcomes mainly in scarred uteri; few described the outcome in unscarred uteri. Several, but not all, observed that, compared to scarred uteri, in unscarred uteri, ruptures were associated with worse maternal outcomes, such as hysterectomy, severe postpartum hemorrhage, and maternal morbidity.³⁻⁷ Previously, we described the infant outcome after complete uterine rupture.⁸ Here, we focus on the maternal outcome.

To ensure a large sample, we collected data over 41 years from a population-based registry on women that experienced complete uterine ruptures after the start of labor. All medical records were reviewed for diagnostic accuracy. In Norway, all mothers with one previous caesarean delivery are offered a trial labor, unless there is an absolute contra-indication against vaginal delivery. Among women with previous cesarean sections, 64% underwent trial labors, and among these, 80% underwent vaginal births.⁹ We aimed to identify the maternal outcomes and their associated risk factors after a complete uterine rupture.

Materials and Methods

Design and study population

This was a retrospective population- based study including rupture cases identified in the whole pregnant population in Norway in the period 1967-2008. In our

two earlier papers on trends and risk factors for complete uterine ruptures, we included a validated population from 22 of all 48 maternity units in Norway, between 1967-2008.^{10,11} In the current study we included the whole pregnant population of all 48 units, thus enlarging the sample of complete uterine ruptures. To determine whether potentially misdiagnosed cases affected the reliability of our results, we repeated our analysis among the 163 complete ruptures identified previously in the fully validated population. We found that the results were similar regarding risk factors for different maternal outcomes following complete uterine ruptures. Therefore, we concluded that potentially misdiagnosed cases did not influence the study results.

All uterine ruptures after the start of labor were identified through diagnostic codes in the Medical Birth Registry of Norway (MBRN; 1967-2008, from all 48 maternity units in Norway) and the Patient Administration System (PAS; 1970-2008, from 21 units only). Established in 1967, the MBRN contains information on all births in Norway after 16 weeks of gestation. Midwives attending a birth complete and send a standardized MBRN form within 7 days after delivery. The PAS is a local registry at each maternity unit that maintains records of all diagnoses for in-patients.

In the MBRN, prior to 1999, the internal code was 71 for uterine rupture; from 1999 to the present, diagnostic codes were O710 and O711, based on the 10th revision of the International Classification of Diseases (ICD).¹² In the PAS, uterine rupture was identified by the ICD-8 code¹³ 956 (1967-1978); ICD-9 codes¹⁴ were 6650 and 6651 (1979-1998); and ICD-10 codes were O710 and O711 (1999-2008).¹² These codes did not specify rupture type. The type of rupture (complete or partial) was identified in the medical records; the definition of complete rupture was the rupture of all uterine wall layers, including the serosa and amniotic membranes.

All births with a uterine rupture identified after the start of labor were identified by the first author visiting maternity units in Norway and reviewing the medical records

of mothers. Only those with complete ruptures were included in the study ¹⁵. The Regional Ethics Committee (2010/1609–4) and the Data Inspectorate of Norway approved the study.

Variables:

Outcome measures

The four maternal outcome measures, each categorized as “Yes” or “No”, included healthy mother, severe postpartum hemorrhage without hysterectomy, peripartum hysterectomy and maternal death. “Healthy mother” was defined as a mother who did not develop severe complication after rupture; neither had she required admission to the Intensive Care Unit. “Severe postpartum hemorrhage without hysterectomy” was defined as postpartum blood loss ≥ 1500 ml within 24 h of delivery or a blood transfusion within 24 h postpartum, regardless of the amount of blood loss, without hysterectomy. “Peripartum hysterectomy” was defined as the surgical removal of the uterus performed at the time of delivery, or up to 42 days postpartum, excluding hysterectomy due to cancer. “Maternal death” was defined as the death of a woman during pregnancy or within 42 days of pregnancy termination, from any cause related to, or aggravated by, pregnancy or its management, but not from accidental or incidental causes.

Risk factors (explanatory variables)

We investigated all relevant potential risk factors, although we presented only those which were statistically significant. These risk factors included: the time period of birth, categorized as the 1st period (1967-1977), 2nd period (1978-1988), 3rd period (1989-1999), and 4th period (2000-2008) (reference); uterine wall integrity, categorized as scarred (reference) and unscarred; maternal age, categorized as <35 and ≥ 35 years; parity, categorized as para 1-2 (reference), para 0, and para ≥ 3 ; antepartum fetal death, defined as an intrauterine death before labor started; onset

of labor, categorized as spontaneous onset (reference) and induced onset; prolonged 2nd stage of labor (from complete cervical dilatation to infant delivery), where 'prolonged' was defined in nulliparous women as >2 h (without epidural) and >3 h (with epidural); or in multiparous women as >1 h (without epidural) and >2 h (with epidural); manipulation at birth, including procedures like internal podalic version or breech extraction with fundal pressure or other manipulative procedure to deliver the infant vaginally; and postpartum detection of rupture, defined as a rupture detected via laparotomy after vaginal delivery.

Periods of births were included as management of labor changed over the years, especially regarding fetal heart monitoring.

Statistical analysis

Outcome incidences were obtained from frequency tables. Cross tabulation and logistic regression models were used to measure associations between different demographic and labor risk factors and maternal outcomes. Factors that were significant in bivariate analyses were included in separate multiple regression models, adjusted for demographic factors (maternal age, parity, unscarred uterus, and periods of birth). The level of significance was set to $P < 0.05$. All analyses were performed with SPSS, version 21 (Chicago, IL, USA).

Results

There were 247 (0.1/1000) complete uterine ruptures among all pregnant women in Norway (N=2 209 506 pregnant women) during 1967-2008. Ruptures occurred in 82 unscarred (33.2%) and 165 scarred uteri (66.8%). Among women with scarred uteri, 155 had one previous cesarean delivery, three had two previous cesarean deliveries, five had a previous salpingectomy after an extra-uterine pregnancy, and two had myomectomy scars. Five women had placenta accrete, and of these, four required a

hysterectomy. All complete ruptures resulted in 88 (35.6%) healthy mothers with no severe complication or ICU admission, 107 (43.3%) severe postpartum hemorrhages without a hysterectomy, 51 (20.6%) hysterectomies, and 3 (1.2%) maternal deaths where two of them had hysterectomy (Figure 1). Among all mothers with severe postpartum hemorrhages and hysterectomies, 12 developed other serious complications, including cardiac, cerebral, renal, and respiratory complications, but did not die. The three maternal deaths occurred in the 1st period (1967-1977), and all had unscarred uteri and a high parity. The ruptures in all three were large outside the lower segment, in posterior wall, or anterior and lateral wall, with extension to parametrium or bladder wall. All were detected postpartum after vaginal delivery associated with manipulation at birth due to arm prolapse or internal podalic version or breech extraction with fundal pressure. One was managed medically without hysterectomy despite shock signs. All three died due to cardiac arrest or acidosis due to severe postpartum hemorrhage.

Over half (56.3%) of complete ruptures were located in the lower uterine segment, while the remaining were outside the lower uterine segment (Table 1). In general, ruptures outside the lower segment were significantly negatively associated with healthy mothers (OR: 0.2; 95% CI: 0.1-0.4), and positively associated with a hysterectomy (OR: 2.4; 95% CI: 1.3-4.5) (not shown in tables).

Table 2 and 3 show the factors that were associated with increased peripartum hysterectomy and severe postpartum hemorrhage following complete uterine rupture. There were significantly more hysterectomies following ruptures taking place in 1967-1977 vs 2000-2008 (7.9- fold increase), when they occurred in unscarred uterus vs scarred uterus (2.6-fold increase), when mothers were older or with parity ≥ 3 , and when ruptures were detected postpartum after vaginal delivery. There was a significantly larger percentage of severe postpartum hemorrhage without a hysterectomy when ruptures occurred in primiparas vs para 1-2 (3.8-fold increase), when there was an antepartum fetal death (5.4-fold

increase), when the 2nd stage of labor was prolonged, and when manipulation at birth was required

Figure 2 shows that the majority of ruptures occurred outside the lower uterine segment in unscarred uteri (79.3%) and within the lower uterine segment in scarred uteri (73.3%). Table 4 shows the characteristics of mothers with ruptures in scarred and unscarred uteri. Ruptures in unscarred uteri occurred 11.2 times more frequently outside the lower uterine segment compared to ruptures in scarred uteri. Ruptures outside the lower segment in unscarred uteri occurred mostly in the anterior and posterior corpus and the lateral side, involving the broad ligament. Ruptures extended beyond the cervix in 63.4% of unscarred uteri, compared to only 28.5% of scarred uteri (OR: 4.4; 95% CI: 2.5-7.6). The risk of hysterectomy significantly increased when the rupture extended beyond the cervix (OR: 5.7; 95% CI: 2.8-11.3) (not shown in table). Compared to women with scarred uteri, mothers with unscarred uteri displayed significantly higher frequencies of para 0 or para 3+, long oxytocin stimulation times, prolonged 1st and 2nd stages, manipulations at birth, and ruptures detected postpartum (Table 4). Moreover, women with unscarred uterine ruptures displayed significantly higher frequencies of vaginal bleeding, pre-shock signs, and drops in hemoglobin prior to diagnosis. On the other hand, they had significantly lower percentage of acute abdominal pain presentation or detected cardiotocographic (CTG) abnormalities, compared to those with scarred uterine ruptures. Furthermore, unscarred uterine ruptures were significantly associated with serious complications such as cardiac, cerebral, renal or respiratory complication, even after adjusting for the time period of birth.

Discussion

Main findings

Our sample of 247 uterine ruptures showed outcomes of 88 (35.6%) healthy mothers, 107 (43.3%) severe postpartum hemorrhages without

hysterectomies, 51(20.6%) peripartum hysterectomies and three maternal deaths. The risk of a peripartum hysterectomy after a complete uterine rupture was significantly more common in the first than in the last study period. A hysterectomy after a uterine rupture was also significantly associated with unscarred uteri, older maternal age, high parity, and a postpartum detection of a rupture after vaginal delivery. Ruptures in unscarred uteri mainly occurred outside the lower uterine segment and more frequently extended beyond the cervix, compared to ruptures in scarred uteri. Severe postpartum hemorrhage without a hysterectomy was significantly associated with antepartum fetal death, manipulation at birth, and a prolonged 2nd stage.

Strengths and limitations

This study had several strengths. To date, our cohort was the largest to be included among studies on maternal outcomes after a complete uterine rupture, particularly regarding the number of unscarred uteri, which increased the precision of our results. Moreover, the first author reviewed and extracted all relevant information from the medical records, which increased the validity of our results and ensured the differential diagnosis of complete vs. partial ruptures. Thus, we could accurately identify the studied outcomes and risk factors. In addition, our sample represented the entire Norwegian pregnant population; thus, we avoided a selection bias.

Nonetheless, this study did have some limitations. First, we may have missed additional ruptures that were not recorded in the MBRN, because only 21 units were included in the PAS search, as mentioned in the methods section. We found however that the results were similar regarding risk factors for different maternal outcomes following complete uterine ruptures in both the previously fully validated sample of 163 ruptures^{10,11} and in our current larger sample of 247, that was partially validated. Therefore, we concluded that potentially misdiagnosed cases would not influence the study results. Another potential study limitation was that the cases were collected from different periods of time. Therefore, we performed

a sensitivity analysis to test the association between different risk factors among ruptures that occurred only in the 4th period of the study (2000-2008; results not shown). Those results indicated that when we only included cases in the most recent period, the effects of different risk factors on maternal outcomes were similar to those identified for the entire study period.

Interpretation

Our hysterectomy rate (20.6%) following a complete uterine rupture was similar to those reported previously, by Charach et al¹⁶, who found 34 hysterectomies (20.7%) following 164 complete uterine ruptures, and Ofir et al, who found that 26.2% of 42 complete ruptures were followed by hysterectomies.¹ The latter study also reported that severe postpartum hemorrhages occurred in 50% of ruptures, similar to our rate (43.3%). They did not find any maternal deaths, similar to most studies in high-income countries conducted in recent decades. Our deaths mainly occurred in earlier decades. However, one maternal death was reported in a retrospective study conducted in California in 1983-1992,¹⁷ and two maternal deaths among 159 ruptures were reported in the UK in 2004-2014.¹⁸ On the other hand, maternal mortality ranged from 1% to 13%, in reports from low-income countries.^{19,20}

An emergency peripartum hysterectomy is known to be associated with severe maternal morbidity in 26.5 to 31.5% and mortality in 4.8% of cases.²¹ A hysterectomy is necessary after uterine rupture, when the damage to the uterus is beyond repair, or when intractable bleeding requires a lifesaving procedure. However, a recent study showed that some hysterectomies could have been avoided with early and sufficient rupture repair.²²

We found that the rate of hysterectomies after uterine ruptures declined over time. This finding was consistent with Charach et al,¹⁶ who found that a peak rate of 75%, in 1989, declined to a nadir of 0% during 2007-2008 and 2010-2011. Our decline in hysterectomy rates with time indicated that better management had been achieved through early and sufficient rupture repairs and increased use of uterine compression

sutures. In addition, this may reflect advances in anesthesiologists experience in dealing with acute obstetric emergencies, and increasing general trend of obstetricians to preserve fertility and spare the uterus in recent years.

Given the rarity of uterine ruptures, few studies have described the clinical features and outcomes of uterine ruptures in women with an unscarred uterus. We found 37.8% hysterectomy following ruptures in unscarred uteri vs 12.1% following those in scarred uteri. Barger et al³, consistent with our results, found that hysterectomies were significantly more frequent after ruptures in unscarred (36.1%) vs. scarred uteri (5.0%). In addition, they reported that severe morbidity was associated with ruptures three times more frequently in unscarred uteri compared to scarred uteri.

Gibbins et al⁷ found that, after ruptures, hysterectomy rates were 35% in 20 unscarred uteri vs. 2.4% in 126 scarred uteri. Additionally, consistent with our findings, they found higher maternal morbidity after ruptures in unscarred vs. scarred uteri. In the Netherlands, Zwart⁴ studied uterine ruptures (183 scarred/27 unscarred uteri) with results similar to ours, although they found lower hysterectomy rates (24.0% in unscarred vs. 6% in scarred uteri). However, a study in Israel²³ found no increased maternal morbidity and no difference in hysterectomy rates after uterine ruptures in 27 unscarred uteri vs. 26 scarred uteri. Researchers have speculated that the increased morbidity in women with unscarred uteri may be due to the increased vascularity at the rupture site and a tendency among providers to delay treatment due to the low index of suspicion in the absence of a surgical history. However, the lack of a confined weak area, such as a previous incision, increases the risk that the tear might involve vital, adjacent organs, which could lead to more serious complications. We found that ruptures in unscarred uteri occurred most frequently in the corpus uteri and the lateral side, and that they more frequently extended beyond the cervix. These rupture types are surgically more challenging to repair, and most likely contributed to the increased number of serious maternal outcomes, compared to ruptures in scarred uteri. Similarly, Ofir et al²³ found that compared to scarred uteri, in unscarred uteri, ruptures more frequently extended to the cervix and beyond. However, in their study,

the main site of rupture was the lower segment in both scarred and unscarred uteri; this might explain why, in contrast to our findings, they did not find a difference in maternal morbidity or hysterectomy rates between the two groups.

We found that prolonged labor and postpartum detection of ruptures were significantly more frequent in unscarred uteri than in scarred uteri. This finding indicated a delay in management after a suspected rupture, which resulted in higher rates of decompensation and shock. We also found that manipulations at birth and longer oxytocin times occurred more frequently in unscarred uteri than in scarred uteri. Similarly, Gibbins et al⁷ also found that postpartum detection of ruptures after vaginal delivery and use of oxytocin occurred more frequently in unscarred uteri than in scarred uteri. Consistent with our findings, previous studies generally showed that the risk of peripartum hysterectomy increased with older maternal age and multiparity.^{24,25} The association of decreased hysterectomy with primiparas in our study may reflect the general attitude among obstetricians to preserve fertility in this group. We also found that hysterectomies were associated with a rupture detected postpartum, which indicated a delay in diagnosis or management. A previous study showed that antepartum fetal death increased the risk of uterine rupture.¹⁰ In our study, we found an increased rate of severe postpartum hemorrhage following a rupture among women with antepartum fetal deaths. We may speculate here that there was a delay in diagnosis and management as the fetal heart was absent. CTG is an important parameter during labor, and can serve also as one of important signs of fetal hypoxia due to uterine rupture. Obstetricians tend to avoid cesarean sections when the infant is dead. This might also contribute to increased rupture rate and severe bleeding following rupture in such cases.

Conclusion

Ruptures in unscarred uteri carried more catastrophic maternal outcome, including hysterectomy, because they occurred increasingly outside the lower uterine segment and extended more beyond the cervix. This may indicate a delay in diagnosis due to a lower index of suspicion.

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Disclosure of interests

The authors declare that they have no conflicts of interests.

Contribution to authorship

IAZ designed the study and collected, analyzed and interpreted the data, and wrote the paper. SV, AKD contributed to the study design, interpretation of the data, and editing and revising the paper. All authors are responsible for the integrity of the data and accuracy of the analysis, and all approved the final report.

Details of ethics approval

The Regional Ethical Committee for Medical Research and the Norwegian Data Inspectorate approved the study.

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Table 1. Rupture sites in all uteri (N=247)

Rupture site	N	%
Lower segment	139	56.3
Anterior corpus	42	17.0
Posterior corpus	23	9.3
Vertical scar	16	6.5
Anterior and posterior corpus	11	4.5
Lateral wall/broad ligament	11	4.5
Fundus	5	2.0
Total	247	100

Table 2. Association between demographic risk factors and maternal outcome after complete uterine ruptures (N=247 pregnant women)

Risk factors	Healthy mother		Hysterectomy		Severe PPH without hysterectomy	
	No (%)	AOR [§] (95%CI)	No (%)	AOR [§] (95%CI)	No (%)	AOR [§] (95%CI)
Periods of birth						
2000-2008 (n=121)	56 (46.3)	1	11 (9.1)	1	54 (44.6)	1
(reference)						
1967-1977 (n=61)	5 (8.2)	0.1 (0.03-0.2)	27 (44.3)	7.9 (3.5-17.6)	28 (45.9)	1.1 (0.6-1.9)
1978-1988 (n=20)	8 (40.0)	0.7 (0.3-2.0)	5 (25.0)	3.3 (1.1-10.9)	7 (35.0)	0.6 (0.2-1.8)
1989-1999 (n=45)	19 (42.2)	0.8 (0.4-1.6)	8 (17.8)	2.2 (0.8-5.7)	18 (40.0)	0.8 (0.4-1.6)
Unscarred uterus						
No (n=165)	78 (47.3)	1	20 (12.1)	1	67 (40.6)	1
Yes (n=82)	10 (12.2)	0.2 (0.1-0.4)	31 (37.8)	2.6 (1.3-5.3)	40 (48.8)	1.5 (0.8-2.7)
Maternal age (y)						
<35 (n=178)	70 (39.3)	1	28 (15.7)	1	79 (44.4)	1
≥35 (n=69)	18 (26.1)	0.6 (0.3-1.1)	23 (33.3)	2.3 (1.1-5.0)	28 (40.6)	0.9 (0.5-1.7)
Parity:						
Para 1-2 (n= 187)	81 (43.3)	1	28 (15.0)	1	78 (41.7)	1
Para 0 (n=16)	2 (12.5)	0.6 (0.1-3.2)	2 (12.5)	0.3 (0.1-1.6)	12 (75.0)	3.8 (1.1-13.0)
Para 3+ (n=44)	5 (11.4)	0.3 (0.1-0.7)	21 (47.7)	2.8 (1.2-6.7)	17 (38.6)	0.8 (0.4-1.7)

[§]Adjusted for periods of birth. AOR: Adjusted odds ratio. PPH: postpartum hemorrhage

Table 3. Association between labour risk factors and maternal outcome after complete uterine ruptures (N=247 pregnant women).

Labor risk factors	Healthy mother		Hysterectomy		Severe PPH without hysterectomy	
	No (%)	AOR [§] (95%CI)	No (%)	AOR [§] (95%CI)	No (%)	AOR [§] (95%CI)
Antepartum fetal death						
No (n=238)	87 (36.6)	1	50 (21.0)	1	100 (42.0)	1
Yes (n=9)	1 (11.1)	0.2 (0.1-1.4)	1 (11.1)	0.5 (0.1-4.4)	7 (77.8)	5.4 (1.1-27.2)
Onset of labor						
Spontaneous (n=148)	62 (41.9)	1	28 (18.9)	1	58 (39.2)	1
Induced (n=99)	26 (26.3)	0.5 (0.3-0.8)	23 (23.2)	1.2 (0.6-2.6)	49 (49.5)	1.5 (0.9-2.5)
Prolonged 2nd stage*						
No (n=156)	69 (44.2)	1	27 (17.3)	1	59 (37.8)	1
Yes (n=91)	19 (20.9)	0.4 (0.2-0.8)	24 (26.4)	0.8 (0.4-1.9)	48 (52.7)	1.9 (1.1-3.4)
Manipulation at birth						
No (n= 215)	86 (40.0)	1	41 (19.1)	1	87 (40.5)	1
Yes (n=32)	2 (6.3)	0.1 (0.03-0.7)	10 (31.3)	0.7 (0.2-1.9)	20 (62.5)	2.6 (1.1-5.8)
Postpartum diagnosis						
No (n=172)	80 (46.5)	1	24 (14.0)	1	68 (39.5)	1
Yes (n=75)	8 (10.7)	0.2 (0.1-0.4)	27 (36.0)	2.2 (1.1-4.8)	39 (52.0)	1.6 (0.8-2.9)

[§]Adjusted for demographic factors in separate models. *Also adjusted for the onset of labor. AOR: Adjusted odds ratio. PPH: postpartum hemorrhage

Table 4.Characterstics of mothers with ruptures in scarred and unscarred uteri

Characteristics	Scarred uterine ruptures (n= 165)	Unscarred uterine ruptures (n=82)	OR (95 % CI)
Demographics			
Periods of birth			
1967-1977	23 (13.9)	38 (46.3)	5.3 (2.9-9.9)
1978-1988	10 (6.1)	10 (12.2)	2.1 (0.8-5.4)
1989-1999	30 (18.2)	15 (18.3)	1.1 (0.5-2.0)
2000-2008	102 (61.8)	19 (23.2)	0.2 (0.1-0.3)
Maternal age ≥ 35 y	44 (26.7)	25 (30.5)	1.2 (0.6-2.1)
Parity			
Parity 0	2 (1.2)	14 (17.1)	16.7 (3.7-75.8)
Parity 1-2	140 (84.8)	47 (57.3)	0.6 (0.2-0.7)
Parity 3+	23 (13.9)	21 (25.6)	2.1 (1.1-4.1)
Labor factors			
Total oxytocin duration ≥ 6 h	32 (19.4)	29 (35.4)	2.3 (1.2-4.1)
Prolonged 1st stage	97 (58.8)	59 (72.0)	1.8 (1.1-3.2)
Prolonged 2nd stage	46 (27.9)	45 (54.9)	3.1 (1.8-5.4)
Manipulation at birth*	13 (7.9)	19 (23.2)	3.5 (1.6-7.5)

Presentation			
Postpartum detection	33 (20.0)	42 (51.2)	4.2 (2.4-5.7)
Vaginal bleeding	39 (23.6)	36 (43.9)	2.5 (1.4-4.4)
Hemoglobin drop	19 (11.5)	28 (34.1)	3.9 (2.0-7.7)
Preshock-shock	32 (19.4)	41 (50.0)	4.2 (2.3-7.4)
Abdominal pains	110 (66.7)	42 (51.2)	0.5 (0.3-0.9)
CTG changes: detected	127 (77.0)	53 (64.6)	0.5 (0.3-0.9)
CTG changes: not detected	35 (21.2)	23 (28.0)	1.4 (0.8-2.6)
CTG changes: Unknown	3 (1.8)	6 (7.3)	4.3 (1.1-17.5)
Rupture characteristics			
Blood intra-abdominally	89 (53.9)	62 (75.6)	2.6 (1.5-4.7)
Outside lower segment	42 (26.7)	65 (79.3)	11.2 (5.9-21.2)
Extended beyond cervix	47 (28.5)	52 (63.4)	4.4 (2.5-7.6)
Serious complications**	3 (1.8)	9 (11.0)	6.6 (1.7-5.3)

*Internal podalic version or breech extraction with fundal pressure or other manipulative procedure to deliver the infant vaginally **Serious complications included severe cardiac, cerebral, renal, and respiratory complications. CTG: Cardiotocography.

Figure legends

Figure 1. Maternal outcomes in percentages after complete uterine ruptures (N=247 pregnant women). Values above each bar indicate the percentage of patients in that group. *Hysterectomies included two out of the three total deaths. Consequently, the total percentage is more than 100%.

Figure 2. Rupture sites in percentages in scarred and unscarred uteri. Values above each bar indicate the percentage of patients in that group.