WHO systematic review of maternal mortality and morbidity: the prevalence of uterine rupture

Objective To determine the prevalence of uterine rupture worldwide.

Design Systematic review of all available data since 1990.

Setting Community-based and facility-based reports from urban and rural studies worldwide.

Sample Eighty-three reports of uterine rupture rates are included in the systematic review. Most are facility based using cross-sectional study designs.

Methods Following a pre-defined protocol an extensive search was conducted of 10 electronic databases as well as other sources. Articles were evaluated according to specified inclusion criteria. Uterine rupture data were collected along with information on the quality of reporting including definitions and identification of cases. Data were entered into a database and tabulated using SAS software.

Main outcome measures Prevalence of uterine rupture by country, period, study design, setting, participants, facility type and data source.

Results Prevalence figures for uterine rupture were available for 86 groups of women. For unselected pregnant women, the prevalence of uterine rupture reported was considerably lower for community-based (median 0.053, range 0.016–0.30%) than for facility-based studies (0.31, 0.012–2.9%). The prevalence tended to be lower for countries defined by the United Nations as developed than the less or least developed countries. For women with previous caesarean section, the prevalence of uterine rupture reported was in the region of 1%. Only one report gave a prevalence for women without previous caesarean section, from a developed country, and this was extremely low (0.006%).

Conclusion In less and least developed countries, uterine rupture is more prevalent than in developed countries. In developed countries most uterine ruptures follow caesarean section. Future research on the prevalence of uterine rupture should differentiate between uterine rupture with and without previous caesarean section.

Background

Uterine rupture is tearing of the uterine wall during pregnancy or delivery. Rupture of a previously unscarred uterus is usually a catastrophic event resulting in death of the baby, extensive damage to the uterus and sometimes even maternal death from blood loss. The damage to the uterus is sometimes beyond repair and a hysterectomy is required.

Rupture of a previous caesarean section scar is frequently diagnosed on the basis of altered fetal heart rate pattern, vaginal bleeding, maternal tachycardia or unusual pain during labour. In most cases which occur in a hospital setting, timely laparotomy results in safe delivery of the baby and repair of the uterus. A recent review of uterine rupture limited to women with previous caesarean section in developed countries reported increased risk of uterine rupture and perinatal death for women undertaking trial of labour compared with elective repeat caesarean section. In a large, retrospective Canadian study, trial of labour following previous caesarean section was associated with increased risk of uterine rupture (by 0.56%), but fewer maternal deaths than elective caesarean section (1.6 vs 5.6 per 100,000). A systematic review found no randomised controlled trials comparing trial of labour with planned repeat caesarean section.

A major factor in uterine rupture is obstructed labour. Black African women have a high incidence of contracted pelvis. Juveniles in a population with a high incidence of contracted pelvis were found to be at high risk of obstetric complications. Other risk factors for uterine rupture include multiparity and particularly grand multiparity, the use of uterotonic drugs to induce or augment labour, placenta percreta and rarely intrauterine manipulations such as internal podalic version and breech extraction.

In less and least developed countries, uterine rupture is an important cause of maternal mortality, accounting for as many as 9.3% of maternal deaths in one Indian study. In the Second Report on Confidential Enquiries into Maternal Deaths in South Africa 1999–2001, ruptured uterus caused 6.2% of deaths due to direct causes and 3.7% of all deaths (1.9% due to rupture of an unscarred uterus and 1.8% due to rupture of a scarred uterus). Ruptured uterus was the only cause other than sepsis to have increased since the previous report, possibly due to the widespread
use of misoprostol in uncontrolled dosages for labour induction (misoprostol was identified as the cause in several cases). There have been reports of uterine rupture when misoprostol was used in dosages above 25 μg vaginally.11–13

No estimates exist to assess the magnitude of this potentially life-threatening condition. We conducted a systematic review of available data on the prevalence of ruptured uterus with an emphasis on the contexts in which the primary studies were conducted. The systematic review aimed at establishing the global prevalence of this problem.

**Methods**

This study is a part of a bigger systematic review undertaken by the UNDP/UNFPA/WHO/World Bank Special Programme of Research, Development and Research Training in Human Reproduction (HRP), Department of Reproductive Health and Research at the World Health Organization (WHO) to obtain prevalence/incidence data on maternal mortality and a range of morbidities including uterine rupture. The methodology of the systematic review
followed an a priori protocol and involved an extensive search of all relevant published/unpublished data. The methodology of the systematic review and the search strategy have been described elsewhere. In brief, we searched 10 electronic databases, WHO regional databases, internet and reference lists, contacted experts in the field and hand-searched
relevant articles in the WHO Library. Criteria for inclusion of studies in the review were as follows: inclusion of data relevant to pre-defined conditions, specified dates for data collection period, including data from 1990 onwards, sample size >200 and a clear description of methodology.

A data extraction instrument was used to extract data from included studies. This instrument includes 48 items distributed in five modules, three of which were relevant to this analysis. Modules were designed to collect information on (i) the general study-level characteristics such as design, population, setting, (ii) outcomes and (iii) quality assessment of morbidity reports. Reporting of definitions and of the procedures used for diagnosis was part of the quality assessment. We did not assign quality scores to articles but preferred to present available information on variables regarded as quality components (including reporting of definitions, case-identification criteria and characteristics of setting and participants).

Nearly 65,000 reports were screened initially by titles and/or abstracts of which more than 4500 were retrieved for full-text evaluation. More than 2500 of these were included in the review. Data extracted were entered into a specifically constructed database and tabulated using SAS software.

Table 1. Facility-based studies of the prevalence of uterine dehiscence in specific clinical populations (identified in the column ‘participants’), by the UN development classification of country.

<table>
<thead>
<tr>
<th>Study</th>
<th>Country and period</th>
<th>Study design</th>
<th>Setting</th>
<th>Participants</th>
<th>Cases</th>
<th>Sample size</th>
<th>Prevalence (%)</th>
<th>Facility type</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Developed</strong></td>
<td></td>
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</tr>
<tr>
<td>Bouvier-Colle et al.</td>
<td>France 1991–1992</td>
<td>Cross sectional</td>
<td>Unknown</td>
<td>Obstetric patients being treated in intensive care</td>
<td>4</td>
<td>435</td>
<td>0.92</td>
<td>Intensive care unit</td>
<td>Case notes</td>
</tr>
<tr>
<td>Miller et al.</td>
<td>USA 1983–1994</td>
<td>Cross sectional</td>
<td>Unknown</td>
<td>Without previous caesarean</td>
<td>10</td>
<td>168,491</td>
<td>0.006</td>
<td>2°</td>
<td>Case notes</td>
</tr>
<tr>
<td>Rogers et al.</td>
<td>USA 1992–1997</td>
<td>Cross sectional</td>
<td>Unknown</td>
<td>Pregnant women with injuries</td>
<td>3</td>
<td>372</td>
<td>0.81</td>
<td>Trauma centres</td>
<td>Case notes</td>
</tr>
<tr>
<td>Magann et al.</td>
<td>USA 1992–1997</td>
<td>Cohort</td>
<td>Mixed</td>
<td>Mostly black women, with intrauterine fetal demise</td>
<td>1</td>
<td>522</td>
<td>0.19</td>
<td>3°</td>
<td>Prospective data collection</td>
</tr>
<tr>
<td><strong>Less developed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ogunniyi et al.</td>
<td>Nigeria 1981–1990</td>
<td>Cross sectional</td>
<td>Unknown</td>
<td>Women having assisted delivery</td>
<td>1</td>
<td>271</td>
<td>0.37</td>
<td>2°</td>
<td>Case notes</td>
</tr>
<tr>
<td>Udama et al.</td>
<td>Nigeria 1987–1996</td>
<td>Cross sectional</td>
<td>Unknown</td>
<td>Women with obstructed labour</td>
<td>129</td>
<td>672</td>
<td>19</td>
<td>3°</td>
<td>Case notes</td>
</tr>
<tr>
<td>Weibeizahn et al.</td>
<td>Venezuela 1991–1993</td>
<td>Cross sectional</td>
<td>Unknown</td>
<td>Hypertensive women Obstetric hysterectomy</td>
<td>5</td>
<td>818</td>
<td>0.61</td>
<td>2°</td>
<td>Case notes</td>
</tr>
<tr>
<td>QueSnel García Benitez et al.</td>
<td>Mexico 1985–1990</td>
<td>Cross sectional</td>
<td>Unknown</td>
<td>Previous caesarean with macrosomic infants</td>
<td>31</td>
<td>675</td>
<td>4.6</td>
<td>2°</td>
<td>Case notes</td>
</tr>
<tr>
<td>Aboulfalah et al.</td>
<td>Morocco 1994–1998</td>
<td>Cohort</td>
<td>Unknown</td>
<td>Grand multiparae (4 or more)</td>
<td>12</td>
<td>228</td>
<td>5.3</td>
<td>3°</td>
<td>Case notes</td>
</tr>
<tr>
<td>Lawal</td>
<td>Nigeria 1993–1997</td>
<td>Cross sectional</td>
<td>Mixed</td>
<td>Grand multiparae (5 or more)</td>
<td>13</td>
<td>617</td>
<td>2.1</td>
<td>3°</td>
<td>Case notes</td>
</tr>
<tr>
<td>Odukogbe et al.</td>
<td>Nigeria 1987–1994</td>
<td>Cross sectional</td>
<td>Mixed</td>
<td>Grand multiparae (6 or more)</td>
<td>6</td>
<td>1514</td>
<td>0.40</td>
<td>2°</td>
<td>Case notes</td>
</tr>
<tr>
<td>Maymon et al.</td>
<td>Israel 1986–1994</td>
<td>Cross sectional</td>
<td>Unknown</td>
<td>Grand multiparae (6 or more)</td>
<td>12</td>
<td>12,296</td>
<td>0.10</td>
<td>3°</td>
<td>Case notes</td>
</tr>
<tr>
<td>Pereira et al.</td>
<td>Mexico 1998–1999</td>
<td>Cohort</td>
<td>Urban</td>
<td>Adolescents</td>
<td>1</td>
<td>296</td>
<td>0.34</td>
<td>3°</td>
<td>Case notes</td>
</tr>
<tr>
<td><strong>Least developed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Andriamady et al.</td>
<td>Madagascar 1998</td>
<td>Cross sectional</td>
<td>Mixed</td>
<td>Deliveries with premature ROM</td>
<td>9</td>
<td>4232</td>
<td>0.21</td>
<td>3°</td>
<td>Case notes</td>
</tr>
<tr>
<td>Zoundi</td>
<td>Burkina Faso 1996</td>
<td>Cross sectional</td>
<td>Mixed</td>
<td>Deliveries complicated with obstructed labour</td>
<td>44</td>
<td>242</td>
<td>18</td>
<td>2°</td>
<td>Case notes</td>
</tr>
<tr>
<td>Gaym</td>
<td>Ethiopia 1990–1999</td>
<td>Cohort</td>
<td>Mixed</td>
<td></td>
<td>234</td>
<td>945</td>
<td>25</td>
<td>3°</td>
<td>Case notes</td>
</tr>
</tbody>
</table>

ROM = rupture of membranes; ob/gyn = obstetric/gynaecological.
Because of considerable heterogeneity of results, no formal meta-analysis was performed. Studies were grouped according to the clinical criteria for inclusion in the study and the UN classification of the country (developed, less developed or least developed). Raw data from all the included studies were tabulated and reported, and summary statistics reported as median values and range of percentages. This allows readers to have information on the spread of results, without studies with large sample sizes dominating the summary statistics.

Results

A total of 83 reports of studies providing 86 data sets for uterine rupture rates are included in the systematic review. All except nine were facility based, mainly from secondary and tertiary institutions and using cross-sectional study designs. Data sources were mainly case records in facility-based studies whereas special database or registries were used in population-based studies. Only 24 studies reported a definition for uterine rupture.

Figure 1 (and Table S1, available online as supplementary material) shows the prevalence estimates for uterine rupture. We used medians and ranges to summarise results for different categories of data sets. Figures 2 and 3 (and Tables S2 and S3, available online as supplementary material) show the characteristics of and the prevalence rates in population- and facility-based studies, respectively. Within the tables, we categorised studies according to the development status of the country in which they are conducted. Reports of women with previous caesarean section are presented in Fig. 4 (and Table S4 available online as supplementary material). Groups with specific risk factors such as multiple pregnancy, specific health problems and women undergoing assisted delivery and obstetric hysterectomy are presented separately in Table 1.

For unselected pregnant women, the prevalence of uterine rupture reported was considerably lower for population-based (median 0.053, range 0.016–0.30%) than for facility-based studies (median 0.31, range 0.012–2.9%). The prevalence tended to be lower for countries defined by the United Nations as developed than the less or least developed countries. It is difficult to be sure of the extent to which women with previous caesarean section contributed to these numbers, and the proportion with previous caesarean section may have varied considerably between populations studied. Only one report gave a prevalence for women without previous caesarean section, from a developed country, and this was extremely low (0.006%, Table 1).

For women with a previous caesarean section, around 1% of women had a ruptured uterus.

The reports of groups of women with specific clinical characteristics (Table 1) have not been aggregated, as the characteristics varied between studies and aggregation would not be meaningful. The prevalence ranged between 0.006% for women without previous caesarean section from a developed country and 25% for women with obstructed labour in a least developed country.

Discussion

Uterine rupture is a serious obstetric complication, with high morbidity and mortality, particularly in less and least developed countries. With ready access to obstetric care including caesarean section for obstructed labour, rupture of the unscarred uterus should be rare. The prevalence of uterine rupture in women with previous caesarean section is of considerable importance in calculating the long term risks associated with primary caesarean section.

For developed countries, the data available indicate that the prevalence of uterine rupture for women with previous caesarean section is in the region of 1%, whereas for women without previous caesarean section, based on one large report, it is extremely rare (<1 per 10,000). Overall, the rates are below 1 per 1000. Efforts to reduce morbidity and mortality from uterine rupture should be focussed on reducing primary caesarean section rates and optimising care for women with previous caesarean section.

For less and least developed countries, uterine rupture is a more prevalent and serious problem. The most important shortcoming of the data available is the lack of differentiation between uterine rupture with and without previous caesarean section. Overall, most rates ranged between 0.1% and 1%. Reports from Nigeria, Ghana, Ethiopia and Bangladesh indicated that about 75% of cases of uterine rupture were associated with unscarred uterus. Maternal mortality ranged between 1% and 13%, and perinatal mortality between 74% and 92%. Reduction of the prevalence of rupture of unscarred uterus requires the following: reduction of unwanted pregnancies, particularly for women of high parity; accessibility of obstetric services including caesarean section for obstructed labour; where conventional caesarean section facilities are not accessible, innovative solutions such as symphysiotomy or caesarean section with local analgesia should be considered; and guidelines to ensure that misoprostol for labour induction is used in safe dosages.

Conclusions

This systematic review summarises recent data available on the prevalence of uterine rupture worldwide. In developed countries, the main problem relates to uterine rupture following caesarean section. In less and least developed countries, uterine rupture is more prevalent and the consequences more serious. Innovative strategies are needed to address the problem. Future research on the prevalence of uterine rupture should differentiate between uterine rupture with and without previous caesarean section.
Acknowledgement

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Supplementary material

The following supplementary material is available for this article online:

Table S1: The prevalence of uterine rupture expressed as median value and range of the percentages.

Table S2: Population-based studies of the prevalence of uterine rupture in general pregnant populations, by the UN development classification of country.

Table S3: Facility-based studies of the prevalence of uterine rupture in general pregnant populations, by the UN development classification of country.

Table S4: Population- and facility-based studies of the prevalence of uterine rupture in women with previous caesarean sections, by the UN development classification of country.

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References


