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RISK FACTORS FOR RUPTURED UTERUS IN MULAGO HOSPITAL KAMPALA, UGANDA
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# RISK FACTORS FOR RUPTURED UTERUS IN MULAGO HOSPITAL KAMPALA, UGANDA

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## ABSTRACT

***Objective:*** **To determine the risk factors for ruptured uterus.**
***Design:*** **A case control study.**
***Setting:*** **Mulago Hospital labour wards, Kampala, Uganda.**
***Subjects:*** **Fifty two women with ruptured uterus were recruited between 15th November 2001 and 30th November 2002 and were compared with 500 mothers with normal delivery.**
***Results:*** **The predictors for ruptured uterus were low socio-economic (OR 2.5, 95% CI 1.2-7.1), residing more than ten kilometres from Mulago hospital (OR 6.7,95% CI 2.1-21.2). Delivery by Caesarean section in previous pregnancy (OR 22.3,95% CI 9.2-54.2) delivery of babies weighing more than 3500 grams (OR 2.4, 95% CI 1.2-7.2) and testing HIV positive (OR 3.2,95% CI 1.5-7.2).**
***Conclusion:*** **Uterine rupture is still common in our society and is associated with severe maternal morbidity and mortality. There is need for women to use maternity units during pregnancy and delivery, to monitor labour using a partograph and timely intervention of delivery will prevent uterine rupture.**

## INTRODUCTION

Ruptured uterus is the most devastating complication of obstructed labour to both the mother and the foetus (1-4). When the obstruction is not relieved in time, it will end in a ruptured uterus. In primigravidae the uterus will usually give up and may not rupture although some primigravidae have ruptured their uterii (5).

Uterine rupture can be spontaneous when there is no predisposing factor. It may be traumatic as a result of use of oxytocics for induction of labour or in manoeuvres like internal podalic version. It may also follow dehiscence of a scarred uterus after previous Caesarean section or myomectomy (2,3,6). Some authors have reported spontaneous rupture of uterus as the most common cause of ruptured uterus (7,8) but others have reported rupture of scarred uterus as the most common (8).

The causes of uterine rupture are obstructed labour, use of oxytocics and trauma (3,6,9). Rupture of uterus in a typical obstructed labour is due to excessive contraction of upper uterine muscles resulting into over stretching and thinning of the lower segment muscles. As the contraction of the uterine muscles continues to force the foetus through the obstruction, it exerts pressure on the thin lower uterine segment resulting into rupture of uterus.

The incidence of ruptured uterus varies from country to country and is common where maternity services are poor (6,9,10) and ranges from 1 in 157 deliveries to 1 in 865 deliveries (2,6,11-13), Other studies have reported a lower incidence in developed countries of 1 in1000 deliveries or less and majority occurring in women with previous scar (14).

The predisposing factors for ruptured uterus are maternal such as in prolonged labour or previous operations on the uterus. Foetal causes are malpresentation or malposition of the foetus, big baby and abnormalities of the foetus like hydrocephalus and hydropis foetalis. The mode of delivery can also lead to uterine rupture. This can occur during vacuum extraction or forceps delivery or use of fundal pressure during breech delivery.

Induction or augmentation of labour using oxytocics has been shown to predispose a woman to ruptured uterus (2-4,15).

In one study, women on oxytocics were three times more likely to develop uterine rupture compared to those who were not (4), and in another study it was four and halftimes more likely (15). In a population study of uterine rupture among women who delivered under an obstetrician or family doctor in consultation with the obstetrician in the province of Nova Scotia in Canada, augmentation and induction of labour contributed to 43% of complete rupture of the uterus and 40% of scar dehiscence in women who are on trial of scar (14). Other predictors of uterine rupture reported include increasing age and parity which may be as a result of uterine muscle scaring leading to weakening of uterine wall muscles and resulting in rupture during child birth (6).

With the increasing rate of Caesarean sections in developing countries and inadequate accessibility of emergency obstetric care, the rates of rupture of scarred uterus may be on the rise (6,9). Repeat Caesarean sections in Africa will increase the burden on maternal health services available (6,16). This may compromise the quality of maternity care and may increase maternal morbidity and mortality. The major objective of this study therefore was to study the risk factors of uterine rupture so as to reduce the maternal morbidity and mortality associated with this condition.

## MATERIALS AND METHODS

*Study design:* This was part of a case-control study of risk factors for severe maternal morbidity conducted in Mulago hospital Uganda between 15th November 2001 and 30th November 2002. The risk factors for uterine rupture were studied. The results of the case controlled study are reported elsewhere.

*Setting:* Mulago hospital labour wards.

*Study population:* Women who had come to deliver in Mulago hospital.

*Selection of cases and controls:* Cases were women who were pregnant or delivered after 24 weeks gestation up to puerperium and had ruptured uterus diagnosed both by clinical examination and at laparatomy. They were selected consecutively until the sample size was achieved. Controls were selected from women who had a gestation of 24 weeks or more who delivered live babies at Mulago hospital. Controls must have had a normal vaginal delivery to a singleton live baby, not had an episiotomy or tear of more than first degree, and had normal blood loss. Both cases and controls lived 15 km or less from the hospital.

The cases and controls were recruited daily. The controls were recruited using computer generated numbers, where two women were selected every day if they satisfied selection criteria.

The cases and controls selected were interviewed about their socio-demographic characteristics, social and family history, gynaecological, medical conditions and past and present obstetric performance. Those who were too sick their spouses or first relatives were interviewed and later when the patients improved were interviewed at discharge. At discharge or death the clinical record files were reviewed and information on management was extracted. All cases and controls had their blood examined for HIV using Determine test (Abbott Laboratories, Abbott Park, IL). This was an immunochromatographic test for qualitative detection of HIV-1/2. The test was performed by applying 50ul of serum to the test pad at the bottom of the strip.

*Analysis:* The data collected were checked, coded and double entered using Epi-Info 6.04 software. The data were cleaned and transferred to stata 8. The exposures of interest were socio-demographic factors, medical diseases, past and present obstetric performances and laboratory investigations.

*Univariate analysis:* The fifty two cases of ruptured uterus were compared with the 500 controls of normal delivery. The numbers and percentages of cases and controls at each level of exposure were presented. Chi square test was used to compare the proportions.

*Logistic regression:* Factors found to be of importance in univariate analyses were entered into a multivariate logistic regression model. Age was included in this model so as to be consistent with other studies. Logistic regression was used to establish the strength of association between exposure variables and ruptured uterus. Logistic regression uses the log odds ratio and all associations are presented as adjusted odds ratios with corresponding 95% confidence intervals. Odds ratio of greater than one represents an increased risk of rupture uterus in that exposure compared to base line category.

## RESULTS

The causes of the 52 cases of ruptured uterus were cephalo pelvic disproportion (33%) previous scar (37%) malpresentation of foetus (15%), big baby (10%), retained second twin (4%) and hydrocephalus (1%). There was no ruptured uterus due to oxytocic induction or augmentation. Six (12%) patients had ruptured uterus involving the bladder. The treatments offered were sub total hysterectomy in 44 (85%), repair of uterus and bilateral tubal ligation in five(10%), and repair of uterus only for three (6%).

Twenty one (40%) patients had puerperal infection post operatively which resulted in prolonged hospital stay. One (2%) patient had

developed vesico vaginal fistula at discharge. Out of 52 cases of ruptured uterus three died of haemorrhage and uraemic shock making case specific fatality of 6%. These 52 cases of ruptured uterus were compared to the 500 controls in the following analyses.

*Characteristics of cases and controls (Table 1):* Patients with ruptured uterus lived much further a way from hospital than the controls with 70% cases compared to 33% controls living more than five kilometres from Mulago hospital (P <0.00).

**Table1**

*Socio-demographic characteristics of cases of ruptured uterus and controls*

| Characteristic | Stratum | Cases No. (%) | Controls No. (%) | Crude Odds ratio (95% CI) | P-value |
|---|---|---|---|---|---|
| Distance from | 0-5 | 18 34.5 | 408 81.6 | 1.0 - | |
| home to Mulago | 6-10 | 22 44.5 | 81 16.2 | 2.9 1.5-5.6 | 0.00 |
| (Kms) | 11-15 | 13 24.5 | 11 2.2 | 8.6 3.8-19.3 | |
| Distance to nearest | 0-5 | 46 86.8 | 491 98.2 | 1.0 - | |
| health unit (Kms) | >5 | 7 13.2 | 9 1.8 | 8.3 3.0-23.3 | 0.00 |
| Age (years) | 14-19 | 5 9.4 | 155 31.0 | 0.1 0.0-0.4 | 0.00 |
| | 20-29 | 36 67.9 | 262 52.4 | 1.0 - | |
| | 30+ | 12 22.7 | 83 16.6 | 0. 0.6-1.9 | |
| Marital status | Married | 48 90.6 | 425 85.0 | 1.0 - | |
| | Single | 5 9.4 | 75 15.0 | 0.6 0.2-1.5 | 0.28 |
| Tribe | Bantu | 43 81.1 | 454 90.8 | 1.0 - | |
| | Nilotics | 10 18.9 | 46 9.2 | 2.4 1.1-5.0 | 0.00 |
| Religion | Protestant | 14 26.4 | 141 28.2 | 1.0 - | |
| | Catholic | 21 39.6 | 173 34.6 | 1.2 0.6-2.5 | |
| | Muslim | 13 24.5 | 160 32.0 | 0.8 0.4-1.8 | 0.82 |
| | Seventh day | 2 3.8 | 5 1.0 | 4.0 0.7-22.7 | |
| | Saved | 3 5.2 | 21 4.2 | 1.4 0.4-5.4 | |
| Education level of | No schooling | 5 9.4 | 22 5.0 | 0.8 0.4-1.4 | 0.24 |
| patient | Primary | 26 49.1 | 277 55.4 | 1.0 - | |
| | Secondary | 22 41.5 | 186 37.2 | 1.9 0.7-5.6 | |
| | College | 0 - | 15 3.0 | | |
| Patients job | Employed | 10 18.9 | 128 25.6 | 1.0 - | |
| | Peasant | 43 81.13 | 372 74.4 | 1.2 0.6-2.6 | 0.07 |
| Spouse job | Commerce | 9 17.0 | 205 41.0 | 1.0 - | |
| | Professional | 10 18.9 | 106 21.2 | 0.6 0.1-5.0 | |
| | Peasant | 23 64.1 | 189 37.8 | 0.7 0.1-5.2 | 0.89 |
| Type of house | Brick, plastered | 31 58.5 | 417 83.4 | 1.0 - | |
| | Brick only | 16 30.2 | 69 13.8 | 3.6 1.1-11.6 | |
| | Mud only | 6 11.3 | 14 2.8 | 2.8 1.4-5.3 | 0.00 |
| Need to request | Yes | 15 28.3 | 47 9.4 | 3.2 1.6-3.2 | 0.00 |
| permission to visit | No | 38 71.7 | 453 90.6 | 1.0 - | |

*Table 1 Continues*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Health unit/hospital | | | | | | | | |
| Who gives permission to attend health unit/hospital | Spouse | 13 | 92.1 | 42 | 88.5 | 1.0 | - | |
| | Other | 2 | 7.9 | 5 | 11.5 | 0.4 | 0.1-1.8 | 0.26 |
| Who pays for treatment | Self and spouse | 47 | 90.3 | 403 | 80.6 | 1.0 | - | |
| | Others | 5 | 9.7 | 97 | 19.4 | 1.8 | 0.8-4.2 | 0.07 |

The mean age for cases was 25.1(SD=4.7) and controls 23.4(SD=5.7). (P <0.003). Only 9% cases compared to 31% controls were below 20 years of age. Majority of the cases (81%) and controls (91%) were grouped as Bantus and Nilotics were in 20% cases and in 9% controls (P< 0.002).

The cases who lived in brick, plastered and iron or tiled roofed houses were 59% compared to the controls 83% and those who lived in mud with iron roof or no iron roof houses were 11% in the cases and 3% controls(P< 0.002). The mothers with ruptured uterus were more likely to ask for permission to visit a health unit compared to controls (p<0.00).

*Past and present obstetric performance (Table 2):* The factors that were associated with rupture of the uterus were being on labour for more than 18 hours in the previous delivery (P <0.021), delivery by Caesarean section in previous pregnancy (P < 0.001), referral from a lower health unit (P <0.001), delivery of a baby weighing over 3500 grams (P <0.02) and being HIV positive (P <0.003). Being a primigravidae was protective (P<0.021).

**Table 2**

*Characteristics of past and current pregnancy outcome of ruptured uterus and controls*

| Characteristic | Stratum | Cases No. | (%) | Controls No. | (%) | Crude Odds ratio (95% CI) | | P-value |
|---|---|---|---|---|---|---|---|---|
| Labour lasting more than 18hours | Yes | 14 | 30.4 | 77 | 22.0 | 2.0 | 1.0-3.8 | 0.02 |
| | No | 32 | 69.6 | 273 | 78.0 | 1.0 | - | |
| Still birth | Yes | 5 | 10.9 | 25 | 7.1 | 0.9 | 0.3-2.4 | 0.81 |
| | No | 41 | 89.1 | 325 | 92.9 | 1.0 | - | |
| Previous Caesarean section | Yes | 19 | 41.3 | 15 | 4.0 | 18.7 | 7.7-40.9 | 0.00 |
| | No | 27 | 58.7 | 335 | 96.0 | 1.0 | - | 0.00 |
| Current pregnancy | | | | | | | | |
| Number of pregnancy | 1 | 7 | 13.2 | 150 | 30.0 | 0.3 | 0.1-0.7 | 0.00 |
| | 2-4 | 40 | 75.5 | 237 | 47.4 | 1.0 | - | |
| | 5-14 | 6 | 11.3 | 113 | 22.6 | 0.5 | 0.2-1.3 | |
| Birth spacing In months | 1-36 | 27 | 59.6 | 216 | 61.9 | 1.0 | - | |
| | 37-60 | 8 | 17.0 | 91 | 26.0 | 0.7 | 0.3-1.6 | 0.04 |
| | >60 | 11 | 23.4 | 43 | 12.1 | 2.0 | 1.0-4.4 | |
| Attended antenatal care | Yes | 48 | 90.6 | 485 | 97.0 | 1.0 | - | |
| | No | 5 | 9.4 | 15 | 3.0 | 3.4 | 1.2-9.7 | 0.02 |
| Referral from other centres | Yes | 27 | 50.9 | 84 | 16.8 | 5.1 | 2.9-9.3 | 0.00 |
| | No | 26 | 49.1 | 416 | 83.2 | 1.0 | - | |
| Use of partograph | Yes | 1 | 1.9 | 44 | 8.8 | 1.0 | - | 0.11 |
| | No | 51 | 98.1 | 456 | 91.2 | 0.2 | 0.0-1.5 | |
| Length of labour First stage in hours | ≤18 | 12 | 23.1 | 435 | 87.2 | 1.0 | - | 0.00 |
| | >18 | 40 | 76.9 | 65 | 12.8 | 22.2 | 10.6-47.6 | |

*Table 2 Continues*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sex of baby | Female | 25 | 47.2 | 252 | 50.2 | 1.0 | - | |
| | Male | 28 | 52.8 | 248 | 49.6 | 1.1 | 0.6-1.9 | 0.10 |
| Birth weight | < 2500 | 3 | 5.9 | 13 | 2.6 | 1.1 | 0.3-3.7 | 0.02 |
| in kilograms | 2500-3500 | 28 | 54.9 | 317 | 63.4 | 1.0 | - | |
| | >3500 | 20 | 39.2 | 170 | 34.0 | 2.2 | 1.2-4.0 | |
| Laboratory results | | | | | | | | |
| HIV status | Negative | 43 | 81.1 | 455 | 91.0 | 1.0 | - | |
| | Positive | 10 | 18.9 | 45 | 9.0 | 2.4 | 1.1-4.2 | 0.03 |
| Syphilis | Negative | 46 | 86.8 | 454 | 90.8 | 1.0 | - | |
| | Positive | 7 | 13.2 | 46 | 9.2 | 1.5 | 0.6-3.5 | 0.94 |

*Adjusted odds ratio for risk factors for ruptured uterus:* Table 3 presents a summary of the adjusted odds ratios for factors found to be independently significantly related to the outcome. The factors used for adjustment are presented as footnotes.

**Table 3**
*Risk factors for ruptured uterus*

| Variable | Stratum | Cases No. (%) | Controls No. (%) | Crude odds ratio (95% CI) | Adjusted odds ratio (95%CI) | P-value |
|---|---|---|---|---|---|---|
| Distance from home | 0-5 | 18 34.0 | 333 66.0 | 1.0 | 1.0 - | 0.00 |
| to Mulago (Km) | 6-10 | 22 41.5 | 139 27.8 | 2.9 1.5- 5.6 | 2.0 1.0- 4.2[a] | |
| | 11-15 | 13 24.5 | 28 5.6 | 8.6 3.8-19.3 | 6.7 2.1- 21.2[a] | |
| Age (years) | 14-19 | 5 9.4 | 155 31.0 | 0.1 0.0-0.4 | 0.1 0.0-0.4[a] | 0.00 |
| | 20-29 | 36 67.9 | 262 52.4 | 1.0 - | 1.0 - | |
| | 30+ | 12 22.7 | 83 16.6 | 0.9 0.6-1.9 | 0.8 0.4-1.8[a] | |
| Tribe | Bantu | 42 80.8 | 454 90.8 | 1.0 - | 1.0 - | 0.01 |
| | others | 10 19.2 | 46 9.2 | 2.4 1.1-5.0 | 2.4 1.0- 5.4[a] | |
| Type of house | Brick, plastered | 31 58.5 | 417 82.6 | 1.0 - | 1.0 - | 0.05 |
| | Brick only | 16 30.2 | 69 14.6 | 3.6 1.1- 11.6 | 2.5 1.2-7.1[a] | |
| | Mud only | 6 11.3 | 14 2.8 | 2.6 1.4- 5.3 | 2.00.5-7.4[a] | |
| Requesting for | Yes | 38 71.70 | 453 90.6 | 1.0 - | 2.5 1.2-5.4[a] | 0.02 |
| permission to visit | No | 15 28.3 | 47 9.4 | 3.2 1.6-3.2 | 1.0 - | |
| health unit | | | | | | |
| Who pays for | Self and spouse | 47 90.3 | 460 92.0 | 1.0 - | 2.2 1.1- 4.3[a] | 0.01 |
| treatment | Others | 5 9.7 | 40 8.0 | 1.8 0.8-4.2 | 1.0 - | |
| Previous labour | Yes | 14 30.4 | 77 22.0 | 2.0 1.0-3.8 | 2.3 1.5 - 4.9[a] | 0.07 |
| lasting more than | No | 27 69.6 | 273 78.0 | 1.0 - | 1.0 - | |
| 18hours | | | | | | |
| Previous Caesarean | Yes | 19 41.3 | 15 1.0 | 18.6 7.7-40.9 | 22.3 9.2-54.2[a] | 0.00 |
| section | No | 27 58.7 | 355 99.0 | 1.0 - | 1.0 - | |
| Number of | 1 | 7 13.2 | 150 30.0 | 0.3 0.1- 0.7 | 0.1 0.1-0.5 [a] | 0.00 |
| pregnancies | 2-5 | 40 75.5 | 272 54.4 | 1.0 - | 1.0 - | |
| | 6-14 | 6 11.3 | 78 15.6 | 0.52 0.21-1.27 | 0.6 0.3-1.3 [c] | |

*Table 3 continues*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Birth spacing (months) | 1-36 | 28 | 59.6 | 195 | 61.9 | 1.0 | - | 1.0 - | 0.02 |
| | 37-60 | 8 | 17.0 | 82 | 26.0 | 0.7 | 0.3- 1.6 | 0.9 0.4-2.0 [C] | |
| | >60 | 11 | 23.4 | 38 | 12.1 | 2.0 | 0.9- 4.4 | 3.4 1.4- 8.1 [C] | |
| Antenal care | Yes | 48 | 90.6 | 485 | 97.0 | 1.0 | - | 1.0 - | 0.00 |
| attendance | No | 5 | 9.4 | 15 | 3.0 | 3.4 | 1.2-9.7 | 4.7 1.6-13.7 [C] | |
| Referral | Yes | 27 | 50.9 | 84 | 16.8 | 5.1 | 2.9-9.3 | 3.4 1.8- 6.8 [C] | 0.00 |
| | No | 26 | 49.1 | 416 | 83.2 | 1.0 | - | 1.0 - | |
| Bleeding in labour | Yes | 20 | 37.7 | 6 | 1.2 | 49.8 | 18.7-98.4 | 27.9 10.6-120.3 [C] | 0.00 |
| | No | 33 | 62.3 | 493 | 98.8 | 1.0 | - | 1.0 - | |
| Length of labour first | ≤18 | 12 | 23.1 | 435 | 87.2 | 1.0 | - | 1.0 - | 0.00 |
| stage in hours | >18 | 40 | 76.9 | 65 | 12.8 | 22.2 | 10.6-47.6 | 32.1 4.6-165.4 [C] | |
| Birth weight (grams) | < 2500 | 3 | 5.9 | 35 | 7.0 | 1.1 | 0.3-3.7 | 1.7 0.46-6.0 [C] | 0.05 |
| | 2500-3500 | 28 | 54.9 | 350 | 70.0 | 1.0 | - | 1.0 - | |
| | >3500 | 20 | 39.2 | 115 | 23.0 | 2.2 | 1.2-4.0 | 2.4 1.2-4.7 [C] | |
| HIV status | Negative | 43 | 81.1 | 455 | 91.0 | 1.0 | - | 1.0 - | 0.02 |
| | Positive | 10 | 18.9 | 45 | 9.0 | 2.4 | 1.1- 4.2 | 3.2 1.5-7.2 [C] | |

[a] Adjusted for age, type of house, the distance from home to Mulago hospital, permission to attend health unit, and person paying for hospital upkeep and transport.

[C] Adjusted for age, type of house, the distance from home to Mulago hospital, permission to attend health unit, and person paying for hospital upkeep and previous length of labour and previous delivery by Caesarean section.

The teenagers were associated with less risk of developing ruptured uterus compared to those aged twenty to twenty nine years (OR 0.1,95% 0.0-0.4). The women who lived between over ten and fifteen kilometres from Mulago hospital had seven times greater risk of developing ruptured uterus.(OR 6.7, 95% CI 2.1-21.2), while those who lived between just over five and ten kilometres were associated with twice the risk of developing ruptured uterus (OR 2.0, 95%CI 1.0-4.2).

There are two major tribal grouping in Uganda the Bantu and Nilotics. The study showed Nilotics were associated with increased risk of developing ruptured uterus (OR 2.4, 95% CI 1.0-5.4). Patients with previous history of prolonged labour (over 18 hours) were associated with the risk of developing ruptured uterus (OR 2.3, 95% CI 1.5-4.9). Those who had delivered by Caesarean section in previous pregnancy were associated with increased risk of ruptured uterus (OR 22.3, (95% CI 9.2-54.2).

The primigravidae were at a less risk of getting ruptured uterus (OR 0.2, 95% CI 0.1-0.5). The patients who were referred were associated with an increased risk of getting ruptured uterus(OR 3.4, 95% CI 1.8 - 6.8). The women who delivered babies weighing more than 3500grammes were more likely to have ruptured uterus (OR 2.4,95% CI 1.2-4.7).

The women who tested HIV positive were associated with an increased risk of getting ruptured uterus (OR 3.2,95% CI 1.5-7.2). Other factors independently associated with ruptured uterus were requesting for permission to visit a health unit(OR 2.5,95% CI 1.2-5.4), birth spacing of more than 60 months (OR 3.4, 95% CI 1.4-8.1), non attendance of antenatal care (OR 4.7, 95% CI 1.6 -13.7), first stage of labour of more than 18 hours (OR 3.2,95% CI 4.6-165.4) and bleeding during the present pregnancy(OR 27.9,95% CI 10.6-120.3).

## DISCUSSION

Uterine rupture is one of the most serious obstetric emergencies which carry serious consequences to the mother and foetus. It is one of the main causes of maternal death in sub-Saharan Africa (6).

The causes of ruptured uterus in our study were: cephalo pelvic disproportion (33%), previous scar (37%), malpresentation of the foetus (15%), big baby (10%) and others (5%) and are similar to reported causes in other developing countries (3,6,13). Six (12%) of patients had uterine rupture involving the bladder and this was similar with what was reported in Ethiopia and Nigeria of 14% (9).

The majority of controls were young and below thirty years of age. Teenage women were associated with less risk of developing ruptured uterus and so was nulliparity. In primigravidae when mechanical obstruction to labour occurs, the uterine contractions gradually weaken and stop but in multigravidae contractions continue until delivery or rupture of the uterus (17). But some women reported to be primigravidae (13.2%) ruptured their uterii in this study. Other studies have reported similar findings (6,8,11,12).

The further the patient lived away from Mulago hospital the more likely to develop ruptured uterus. Indeed those who lived between more than ten and fifteen kilometres had seven fold greater risk of developing ruptured uterus. Over 50% cases of ruptured uterus were referred to Mulago hospital and this was associated with thrice the risk of developing ruptured uterus after adjusting for confounders. These patients laboured outside the hospital and when they had failed then were referred to Mulago hospital. It is possible that the patients were referred earlier but the lack of transport component in referral system delayed their arrival at the hospital in time. This was similar to results from Mbale regional hospital in Uganda (18) and in Ghana (19). This may also suggest that peripheral maternity units' quality of care was low and referred patients when already in obstructed labour.

The patients who lived in low quality houses and those who couldn't afford to pay for their upkeep in hospital had doubling risk of developing ruptured uterus. This was similar to what was reported that low education status and low socio-economic status were risk factors for ruptured uterus (9).

Women who gave a history of previous labour lasting more than 18 hours were associated with twice the risk of developing ruptured uterus after adjusting for confounders. This was likely to be associated with previous scar because women labouring for more than 18 hours were more likely to have delivered by Caesarean section. The main draw back with such information is the recall and measurement bias of 18 hours in labour. Indeed patients who delivered by Caesarean section in previous pregnancy had twenty two fold greater risk of developing ruptured uterus after adjusting for confounders. This result was similar to what Lao and Leung (20) found of thirty times greater risk in a previous scar. Many studies have reported increased risk of ruptured uterus in previous Caesarean section scar (1,7,10,13). Some authors have demonstrated , increased risk of rupture with increasing number of Caesarean sections.

Birth spacing of more than five years was associated with thrice the risk after adjusting for confounders of ruptured uterus. The possible explanation for this could be that those women who had previous Caesarean section could have had puerperal infection had some degree of sub fertility and when they got pregnant the scar was weak and ruptured. Puerperal infection or puerperal fever is associated with a weak Caesarean scar (15), however studies done on trial of scar have found a short interval of less than 18 months associated with three times increased risk of ruptured uterus (15) but this was not demonstrated in the study because of small numbers of mothers with previous scar in that category.

In this study women who did not attend antenatal clinics were associated an increased risk of five times of developing ruptured uterus compared to those who had antenatal care after adjusting for confounders. Similar results have been reported in Kenya (6) , Ethiopia (2) and in Nigeria (9).

Women who delivered babies weighing more than 3500 grams were associated with twice the risk of having ruptured uterus compared to those who delivered 2500 to 3500 grams. Big babies cause obstructed labour and when delivery is not terminated in time results into ruptured uterus.

HIV was associated with thrice the risk of uterine rupture after adjusting for confounders. The possible reason is that the cases were asymptomatic HIV in the previous delivery by Caesarean section and could have had poor uterine wound healing due to sub-clinical infection and in the present pregnancy the uterus ruptured because of scar weakness. This is a possible reason but we didn't have information of the patient's previous HIV status. This finding needs to be investigated further in this era of HIV, however current thinking is that HIV positive women are best delivered by Caesarean section.

In conclusion uterine rupture is still common in our society and is associated with severe maternal morbidity and mortality. There is need for women to use maternity units during pregnancy and delivery to monitor labour using a partograph and timely intervention of delivery will prevent uterine rupture.

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