The Pharma Innovation Journal 2015; 4(2): 97-101

www.ThePharmaJournal.com

The Pharma Innovation

ISSN: 2277- 7695
TPI 2015; 4(2): 97-101

www.thepharmajournal.com
Received: 08-03-2015
Accepted: 6-04-2015

**Atombosoba Ekine A**
Department of Obstetrics and Gynecology Niger Delta University Teaching Hospital, Okolobiri Bayelsa State, Nigeria

**Patrick Udoye E**
Department of Anatomical Pathology Niger Delta University Teaching Hospital, Okolobiri Bayelsa State, Nigeria

**Obaabo West**
Department of Radiology University of Port Harcourt Teaching Hospital, Port Harcourt Rivers State, Nigeria

**Correspondence:**
**Atombosoba Ekine A**
Department of Obstetrics and Gynecology Niger Delta University Teaching Hospital, Okolobiri Bayelsa State, Nigeria

# Determinants and Factors influencing the prevalence of uterine rupture in a tertiary rural hospital in the Niger Delta: A 5 years retrospective study in NDUTH, Okolobiri

**Atombosoba Ekine A, Patrick Udoye E, Obaabo West**

**Abstract**
**Background**: Good feto-maternal outcome in pregnancy is an indication of good obstetrics and socio-economic state of a country. Uterine rupture, although rare is often catastrophic and complicated with a high incidence of fetal and maternal morbidity and mortality, mostly in developing countries.
**Objective:** As a preventable condition, we intend to identify the incidence, role of sociodemographic variables and other risk causes in relation to fetomaternal outcome of ruptured uterus at our tertiary center.
**Methods:** This is a descriptive case conducted between January, 2009 and December, 2013 in the Niger Delta University Teaching Hospital, Okolobiri.
**Result:** The incidence of uterine rupture was 1.03% of the 2815 delivery. 82.76% of the patients were unbooked; Mean age was 27±6.8 std. years; the highest age group 30-39 years constitutes 48.28%. Abdominal massage were 72.41, TBA patronage was 86.21%. 58.62% were housewives, 75.86% were unemployed, and 86.21% were rural dwellers. Hysterectomy was done in 10.34%, bladder injury and repair was 58.62% (17), tubal ligation was done in 34.48%.Rupture of a previous scar was the commonest etiologic factor, 65.51%. Abdominal pain was commonest in 92.5% of cases. Still birth and maternal mortality were 82.76% and 6.89%% respectively.
**Conclusion:** Uterine rupture still remains a major obstetric challenge in this environment. The major obstacles we face are ignorance, and neglect of medical advice. The high level of attempted home deliveries by TBAs, abdominal massage practices, coupled with self-denials, all contribute to unnecessary delays before obstructed labor sets in. Therefore the need for a rigorous public enlightenment so as to ensure better antenatal care attendance is paramount.

**Keywords*:*** Socio-economic factors, cultural, Book status, Stillbirths and maternal mortality, Socio-demography.

## 1. Introduction

Uterine rupture in pregnancy is a rare obstetric condition, which may be catastrophic to mother and baby. It is complicated with a high incidence of fetal and maternal morbidity and mortality [1]. Rupture of previously scared uterus is more commonly encountered than spontaneous primary (unscarred) uterus [1, 2]. The rupture could cause serious damage; that could lead to the removal of the uterus, occasionally with serious bladder injury. Although an acute preventable obstetrics emergency, there is no specific case scenario for the ruptured uterus, since the classical features like: unusual labor pain, Vaginal bleeding, fetal distress, loss of contraction during labor, and maternal distress; could also be observed in other obstetrics pathological conditions. [1, 3] It is therefore mandatory to maintain high index of suspicion, when labor involves unbooked patients, grand multipara, or previously scarred uterus [2]. Some of the classical predisposing factors include; fetopelvic disproportion, congenital uterine anomalies, previous uterine myomectomy, multiparity, the number and type of previous cesarean deliveries, labor induction, uterine instrumentation, and uterine trauma all increase the risk of uterine rupture, whereas previous successful vaginal delivery and a prolonged interpregnancy interval after a previous cesarean delivery may confer relative protection[2,4]. In this environment outside those universally accepted risk factors, apparently the leading causes were obstructed labor, improper use of oxytocics in home delivery by Traditional Birth Attendants(TBAs), abdominal massage during pregnancy and labor, delays in making decision on seeking expert obstetrics care, poor antenatal care uptake, lack of ultrasound surveillance to determine uterine scars among others [1, 3, 5]; all as a result of poor socioeconomic conditions, socio-cultural values, uncontrolled fertility, illiteracy, ignorance, coupled with some form of

self-denial of patients due to advice from some spiritual leaders assuring patient safety during labor, even with obvious signs of impending danger [3, 16]. It has been reported that, black African women have a high incidence of contracted pelvis, which is a risk factor for cephalopelvic disproportion (CPD) in pregnancy, a leading cause of obstructed labor (Cox. ML1963) [1, 6]. This assertion conforms to this studied population, where obstructed labor was the major cause of uterine rupture as from the data collected. Medical literatures have shown differences in the incidences of uterine rupture in accordance with the socioeconomic state of individual societies, and also between the developed and the developing countries [1, 7]. Studies done in the 80s and early 90s for some specific groups; like grand multiparous women, and rural communities in some part of the developing countries showed some staggering high incidence rate, reported in a study conducted in Nigeria 5.3% by Lawal *et al.* 1990, 18% in Burkina Faso by Zoundi *et al.* 1996 and 25% in Ethiopia by Gaym *et al.* 1997; whereas lower figures have also been reported, 0.37% in Nigeria by Ogunniyi *et al.* 1984, 0.21% in Madagascar by Andriamady *et al.* 1994 and 1.9% in the Central African Republic by Sepou *et al.* 1995 among the developing countries, while records of very low rate was reported 0.19% in USA by Magann *et al.* in 1983, 0.006% in USA by Miller *et al.* 1981, and 0.92% in France by Bouvier-Colle *et al.* 1980 in the developed nations were reported [1, 7, 8, 9]. A meta-analysis of pooled data from 25 studies in the peer-reviewed medical literature published from 1976-2012 indicated an overall incidence of pregnancy-related uterine rupture of 1 per 1,416 pregnancies (0.07%), as was reported by Gerard G Nahum 2011 [2]. It is evident that uterine rupture contributes immensely to a high rate of perinatal morbidity, maternal morbidity, intrapartum fetal wastage and maternal mortality in the world, most especially in the developing countries [1, 10, 11]. The role of antenatal care services, and routine use of ultrasound in modern obstetrics practice cannot be overemphasized, as high risk patient could be monitored not just for evaluating fetal general wellbeing, but to determine scar thickness, fetal attitude, lie, presentation and possibility of fetal macrosomia, an indication of possible uterine rupture which will become highly possible if the myometrium appears thin in the lower uterine segment(e.g. < 3mm in women with prior cesarean section). When this is observed the myometrium should be measured because this puts the woman at risk of uterine dehiscence or rupture. This is to enable the obstetrician plan the possible route of delivery and counsel patient concerning the necessary implications ahead [5, 10, 28]. This study is conducted to consider the role of sociodemographies, and patient's attitude towards modern health care services, emphasizing on those factors that are peculiar with this environment, to initiate ways of averting some of these unfortunate complications as a result of rupture of scarred and unscarred uterus of any kind in the Niger delta.

## 2. Material and Methods:

This is a descriptive study of pregnant women admitted and managed for uterine rupture between 1st. January 2009 and 31st. of December 2013 at the Department of Obstetrics and Gynecology, Niger Delta University Teaching Hospital, Okolobiri, Nigeria. A newly established tertiary health institution, located within the rural community in Bayelsa State. It covers the rural communities and also referrals from other institutions both public and private from the whole state. It is a teaching unit for specialist obstetricians and gynecologists in training, as well as undergraduate medical students of the Niger Delta University, college of medicine. This was approved by the Hospital Ethics Committee.

## 3. Collection of Data

All pregnant women admitted, who suffered uterine rupture in labor with or without known or underlying pathology during the study period with proper medical records were retrieved from medical archives. Patients who attended antenatal clinics in our department, those referred from other health institutions and those self-referred were enrolled in the study.

Excluded from the studies were those who delivered elsewhere. Clinical data included were socio-demographic details (age, marital status, residency, employment status, and education). Pregnancy characteristics such as (parity, mode of previous delivery) were included. Others are fetal outcome, booking status, history of abdominal massage, Traditional Birth Attendance uptake and fetomaternal outcome. Finally, questionnaire designed for the study was made and data were entered using the Epi info 7 version 1.4.0.

## 4. Result

A total of 2815 deliveries and 29 ruptured uteri were recorded during the 5 years study period. This gives an overall incidence of 1 uterine rupture for every 97 deliveries, 26 (89.66%) of the rupture occurred outside our hospital. In the patients 15 (51.72%) had previous scar, while among them 3 (10.34%) had more than one previous scar, and 14 (48.28%) were unscarred patients. There was no significant difference between the two groups as regards the incidence of uterine rupture with a ratio of 1.1:1. The age of the patients varies between 17 and 40 years, with highest age range between 30-39 years, with the mean age of 27±6.8 sd . Majority had primary and secondary education 8 (27.59%) and 13 (44.83%) respectively, 6 (20.69%) had no formal education. Occupationally, majorities were full housewives 17 (58.62%) and marriage frequency was 21 (72.41%). The sociodemographics of the patients is shown in Table 1. Socio-cultural and other medical risk factors influencing the incidence of the uterine rupture are shown in Table 2. Majority of the patients 25 (86.21%) were rural inhabitants, 25 (86.21%) were either referred or came independently from the TBAs, 21 (72.41%) in the process had abdominal massage or manipulation before presenting, 26 (89.66%) had more than two days delay after the onset of labor before presentation, while 13 (44.83%) were grand multiparous women. Gestational age was between 37-42, the mean gestational age was 39 ±1.3 weeks, 24 (82.76%) were unbooked, 24 (82.76%) were stillbirths given a rate of 1 in every 117 deliveries and those born alive 4 (13.79%) had low Apgar score meanwhile 20 (68.97%) of the stillbirth occurred among the unbooked patients. Table 3 illustrates the role of established medical risk factors, 6 (20.69%) had previous caesarean section and obstructed labor, prolonged labor with or without scar were 9 (31.03), use of misoprostol with or without scar were 7 (24.14%) while 18 (62.07%) had abdominal massage, with other forms of interventions prior to the onset of the uterine rupture. Fetomaternal negative outcome was demonstrated in Table 4, of which 9 (31.03%) produced symptoms such as (abdominal pain, bleeding per vaginam, no fetal movement and contraction), anemia was present ín 26 (89.66%), Sepsis ín 20 (68.96%), bladder injuries were 17 (58.62%), PPH was present in 22 (75.86). Also, table 4 show some of the operative procedures as a result of the uterine rupture, uterine repair alone was in 9 (31.03%) cases, uterine and bladder repair were 7 (24.14%), uterine repair with bilateral tubal ligation with or

without bladder repair was 10 (34.48%), hysterectomy was done in 3 (10.34%), repeat operation due to total wound breakdown was 3 (10.34%). Transfusion was required in 27 (93.10%), all patients received antibiotics treatment, mortality was 2 (6.89%), the two death occured in the unbooked group. The mean fetal weight was 3894±464 Kg, mean blood unit transfused was 2.65±1.3 units, the average hospital stay was 11±5 days.

**Table 1:** Socio-demographics of Patients (n=29)

| AGE | Frequency | Percent | Cum. Percent |
|---|---|---|---|
| **17-19** | 3 | 10.34% | 10.34% |
| **20-29** | 11 | 37.93% | 48.27% |
| **30-39** | 14 | 48.28% | 96.55% |
| **40-49** | 1 | 3.45% | 100.00% |
| **Education** | | | |
| **No formal** | 6 | 20.69% | 20.69% |
| **primary** | 8 | 27.59% | 48.28% |
| **secondary** | 13 | 44.83% | 93.12% |
| **Tertiary** | 2 | 6.89% | 100.00% |
| **Occupation** | | | |
| **Student/ Applicant** | 2 | 6.89% | 6.89% |
| **Trader** | 3 | 10.34% | 17.23% |
| **Civil servant** | 2 | 6.89% | 24.12% |
| **Farmer** | 5 | 17.24% | 41.36% |
| **House wife** | 17 | 58.62% | 100.00% |
| **Maritalstatus** | | | |
| **Divorced** | 2 | 6.89% | 6.89% |
| **Married** | 21 | 72.41% | 79.31% |
| **Single** | 6 | 20.69% | 100.00% |

**Table 2:** Socio-cultural and previous obstetrics history of patients (n=29)

| RESIDENCE | Frequency | Percent | Cum. Percent |
|---|---|---|---|
| **Rural** | 25 | 86.21% | 86.21% |
| **Urban** | 4 | 13.79% | 100.00% |
| **TBA** | | | |
| **No** | 4 | 13.79% | 13.79% |
| **Yes** | 25 | 86.21% | 100.00% |
| **Abdominal massage** | | | |
| **No** | 8 | 27.59% | 27.59% |
| **Yes** | 21 | 72.41% | 100.00% |
| **Delay** | | | |
| **≤ 24 hours** | 3 | 6.89% | 6.89% |
| **≥2 day** | 26 | 89.66% | 100.00% |
| **No.of delivery** | | | |
| **0** | 3 | 10.34% | 110.34% |
| **1-2** | 5 | 17.24% | 27.58% |
| **>2** | 8 | 27.59% | 55.17% |
| **≥5** | 13 | 44.83% | 100.00% |
| **Gestational age** | | | |
| **37-40** | 21 | 72.41% | 72.41% |
| **≥41** | 8 | 27.59% | 100.00% |
| **Booking Status** | | | |
| **Unbooked** | 24 | 82.76% | 82.76% |
| **Booked** | 5 | 17.24% | 100.00% |
| **Apgar score** | | | |
| **0** | 24 | 82.76% | 82.76% |
| **1-6** | 4 | 13.79% | 86.21% |
| **>6** | 1 | 6.89% | 100.00% |

**Table 3:** Medical risk factor found in the patients (n=29)

| Obstetrics Risk factors | Frequency | Percent | Cum. percent |
|---|---|---|---|
| **1 Previous cs.+ obstructed lab.+Abd. massage** | 6 | 20.69% | 20.69% |
| **2 previous cs+ prolonged labor** | 2 | 6.89% | 27.59% |
| **Previous uterine rupture** | 2 | 6.89% | 34.47% |
| **Grand multipara+cs+ abd. massage** | 2 | 6.89% | 41.37% |
| **Prolonged obstr.labor+Oxytocics+ Abd.massage** | 5 | 17.24% | 58.61% |
| **Misoprostol+Oxytocics+ Abd. massage** | 5 | 17.24% | 75.85% |
| **Previous 1.cs+Oxytocics** | 2 | 6.89% | 82.74% |
| **Previous 1 cs+Misoprostol** | 2 | 6.89% | 89.63% |
| **2 previous cs+oxytocics** | 1 | 3.45% | 93.08% |
| **Prolonged obst.labor+ grandmultiparal+Abd.massage** | 2 | 6.89% | 100.00% |

**Table 4:** Presenting symptoms and management of patients (n=29)

| Symptom on presentation | Frequency | Percent | Cum. Percent |
|---|---|---|---|
| **Abdominal pain only+PROM** | 4 | 13.79% | 13.79% |
| **Abdominal pain+Bleeding pervaginam+No fetal movement and contraction** | 9 | 31.03% | 44.82% |
| **Abdominal pain+no contraction+fetal movement** | 8 | 27.59% | 72.41% |
| **Haemodynamically unstable +feverish** | 5 | 17.24% | 89.81% |
| **Fainting episodes and feverish** | 3 | 10.34% | 100.00% |
| **Maternal complication** | | | |
| **anemia** | 26 | 89.65% | 00.00% |
| **sepsis** | 20 | 68.97% | 00.00% |
| **bladder injury** | 17 | 58.62% | 00.00% |
| **PPH** | 22 | 75.86% | 00.00% |
| **Wound breakdown** | 5 | 17.24% | 00.00% |
| **Complications and management** | | | |
| **Uterus repair alone** | 9 | 31.03% | 31.03% |
| **Uterus +bladder repair** | 7 | 24.14% | 55.17% |
| **Uterus repair +tubal lig.** | 3 | 10.34% | 65.51% |
| **Uterus repair+bladder repair +tubal lig.** | 7 | 24.14% | 89.65% |
| **Hysterectomy** | 3 | 10.34% | 100.00% |
| **Reoperation** | 3 | 10.34% | 00.00% |
| **Transfusion.** | 27 | 93.10% | 100,00% |
| **Antibiotic treatment** | 29 | 100.00% | 100.00% |
| **Maternal Mortality** | 2 | 6.90% | 00.00% |

## 5. Discussion

Traditional beliefs, socio-cultural, socioeconomic status and lack of good educational empowerment has contributed immensely to the prevalence of some of the preventable medical emergencies in the society; Among the emergencies is the uterine rupture which still stands as a, catastrophic event, with a high fetomaternal mortality and morbidity. It may also impair the reproductive health of the woman, which may lead to family disintegration in the sub-Saharan region where much emphasis is laid on family size of a man [1, 3, 11, 12].) It is usually expected to occur in an environment where obstetric care is inadequate, whereby most deliveries are conducted by an unskilled birth attendant or unsupervised [6, 13, 18]. During this study we recorded an incidence rate of 1.03% of uterine rupture, which was similar to other studies done in the other parts of the country; 1.0% reported by Ezegwui *et al.* 2005 in the University Teaching Hospital, Enugu, Nigeria, 1.4% reported by Ameh *et al.* 1985 and 1.14% reported by Alam *et al.*. [11, 18] There were also lower incidences in other studies done in the developing countries such as 0.62% reported by Mbamara SU *et al.* in 2012,in Nigeria, 0.84% reported by Balde MD *et al.*. In Guinea [11, 23, 27]. The result from this study shows that uterine rupture still stands a major obstetrics challenge as compared to studies carried out in the developed countries which reports incidence rates as low as 0.08% in Australia, 0.023% in Ireland and 0.006% reported by Miller *et al.* 1981 in USA [1, 18, 19]. The issue of patient attitude towards health care services demands close attention, as it is noteworthy that, majority of the patients were unbooked 82.76% (n=24), closely similar to result from Mbamara SU *et al.* , Rizwan N *et al.*, and Ezegwui HU *et al.*, but slightly higher than reports from Dattijo LM *et al.* [14, 18]. It has also shown some correlation with the perinatal outcome of the patients as majority of the stillbirths 72.4% (n=21) of the 79.31% (n=24) occurred in the unbooked patients, which is similar to studies done in other centers [14, 18]. Maternal morbidity and mortality were also more associated with the unbooked group, with all the maternal mortality, two (6.78%) occurring in the same group, [15, 16] (however the maternal mortality incidence would have been higher, since some of these patients were already dead before arrival in hospital, and were only diagnosed through autopsy ) which is lower than results reported by Rizwan N *et al.* in India, and 13.8% reported by Esike COU *et al.* in Nigeria, and 20.9% reported by Balde MD *et al.* from Guinea. Meanwhile, a study in the Netherland reported zero maternal mortality by Zwart JJ *et al.* in 2009. [19, 20, 26,] Globally the overall maternal mortality as a result of uterine rupture ranges between1%-13% [17, 18, 19]. The role of parity in this study was not equivocal, in contrast to the general belief, that uterine rupture is a condition for the grand multiparous women, whereas we recorded a higher incidence of uterine rupture within the low parity ≤ 3 representing 15 (51.72%), and the high parity ≥ 4 representing 12 (41.38%) of the total patients [16, 21]. There were 4(13.79%) cases involving the nulliparous patients, this outcome is similar to study done by Mbamara SU *et al.* in the Southern region of Nigeria, where the prevailing circumstances, and socio-cultural life is interlinked [18, 23]. One of the major social issues affecting health care deliveries in this part of the country and generally in the developing world, is the constant issue of different levels of delay before a patient receives the much needed attention; there are several factors contributing to the delays principally; such as lack of good transport system, poverty, ignorance, illiteracy, delays in taking decisions, trial of labor at TBAs before presentation, late referrals, roles of some churches [18, 19, 25]. In this study average duration of labor before presentation in our center was ≥ 2 days in 26 (89.66%), only in 3 (10.34%) that we did not encounter any form of delay. Other constraints constantly affecting good obstetrics outcome in the developing countries is the big gap between the socio-economic welfare between the urban, and the rural dwellers, such as availability of good health care infrastructures, road, poverty, as it takes most of the patients very lengthy, and frustrating journey to arrive in the center. Majority of the patients were rural inhabitants in this study 25 (86.21%), which may have contributed to some of the delays encountered. It is worthy to note that, there is some degree of shift as regards the causes of uterine rupture, as in our study a combination of several factors were also involved; such as the delay in presentation at the medical facility, delay in decision making by the family, low antenatal uptake, parity, excessive abdominal massage, and manipulations, injurious use of oxytocics by the TBAs and other unskilled personnel. Unlike in other studies where scarred uterus, VBAC, prolonged obstructed labor and the use of misoprostol and other oxytocics were regarded as the major risk factors for the condition. In this study the mean age of patients was 27±6.8 sd. years lower than other studies. [17, 18] Whereas the average hospital stay was 11±5 days, and an average of 2.655±1.35 liters of blood was transfused. It was observed that, 17 (58.62%) of the patients at least had ≥ 1 previous scarred uterus, while 10 (34.48%) had no previous uterine scar, 2 (6.89%) had previous ruptured uterus in their history, However 2(6.89%) had trial VBAC before rupture occurred [24]. Among the maternal complication and management, repair of scar alone was 9 (31.03%), repair with bilateral tubal ligation was 7 (24.14%).

Bladder injuries and repair was done in 7 (24.14%) and hysterectomy was performed in 3 (10.34%). Majority of the patients showed signs of infection and sepsis in 20 (68.97%), anemia was recorded in 26 (89.66%), while 23 (79.31%) of the patients presented with PROM., Obstructed labor + oxytocics was recorded in 11 (37.93%), while 9 (31.03%) presented with CPD+ the use of oxytocics [10, 26, 27]. The use of drugs by unskilled birth attendants is a serious problem, which necessitates strong political will in the country, as drugs are being sold to anyone irrespective of the position in the health care system, though there are governmental regulations as to how to dispense drugs by the counter, yet the regulatory bodies' activities are questionable. Finally in contrast to several other studies, the main determinant of the uterine rupture and its incidental effects of fetomaternal outcome in this study, sociodemographies inclusive were the trado-cultural values of the society; such as the high preference for home deliveries most likely by unskilled birth attendants (TBAs, Herbalist, Spiritualist etc), unnecessary abdominal massage during the pregnancy, delays in presentation as a result of fear of another surgery, transportation, cost, lack of ambulance services in the rural communities where majority reside, all this coupled with ignorance, illiteracy, the role of the man in decision making, and sometimes beliefs in Divine interventions as being preached in some spiritual churches found everywhere in the society [13].

## 6. Conclusion

Uterine rupture, could be abated with the provision of maternal health care, competent skilled personnel, encouragement of good health policies, eradication of illiteracy, reduction of

poverty and denouncing some of our cultural practice, would enable us meet the Millennium Development Goals (MDGs 4-5).

**7. Acknowledgement**
We thank and acknowledge all the teaching staff of the department of Obstetrics and Gynecology NDUTH, and the staffs of the hospital records department, for making data available. Conflict of interest: There was no conflict of interest

**8. References**

1. WORLD Health Organization Systematic review of Maternal Mortality and Morbidity: the prevalence of uterine rupture, RJOG: an international Journal of Obstetrics and Gynecology, September 2005; 112:1221-1228
2. Nahum GG, Pham KQ. Uterine Rupture in Pregnancy. (Online) 2011 (Cited). Available from URL: http://emedicine.medscape.com/article/275854, 15 Jan 2008
3. Guise JM, McDonagh MS, Osterweil P, Nygren P, Chan B, Helfand M. Systematic review of the incidence and consequences of uterine rupture in women with previous caesarean section. BMJ 2004; 329:1-7.
4. Kieser KE, Baskett TF. A 10 year population-based study of uterine rupture. Obstet Gynecol 2002; 100(4):749-753.
5. Rozenberg P, Goffinet F, Philippe HJ, Nisand I, Echographic measurement of of the inferior uterine segment for assessing the risk of uterine rupture. J Gynecol Obstet Biol reprod (Paris) 1997; 26(5):513-519.
6. Cox ML. Contracted pelvis in Nigeria. J Obstet Gynecol Br Emp 1963; 70:487-494.
7. Bouvier-Colle MH, Ancel PY, Varnoux N*, et al.* Intensive care of pregnant and puerperal women. Characteristics of patients and health management structures. J Gynecol Obstet Biol reprod (Paris) 1997; 26(1):47-56.
8. Miller Da, Goodwin TM, Gberman RB, Paul RH. Intrapartum rupture of the unscarred uterus. Obstet Gyecol 1997; 89(5pt1):671-673.
9. Magann EF, Chauhan SP, Bofill JA, Waddell D, Rust OA, Morrision JC. Maternal morbidity and mortality associated with intrauterine fetal demise: five – year experience in a tertiary hospital. South Med J 2001; 94(5):493-495.
10. Beazley JM. Maternal injuries and complications, In: Whifield CR (ed) Dewhurst's textbook of Obstetrics and Gynecology for post graduates, 5th.edn. Black Sciences, Oxford, 1995, 417-426.
11. Ezegwui HU, Nwogu-Ikojo EE. Trends in uterine rupture in Enugu, Nigeria. J Obstet Gynaecol 2005; 25:260-2.
12. Plaut MM, Schwartz ML, Lubarsky SL. Uterine rupture associated with the use of misoprostol in the gravid patient with a previous cesarean section. Am J Obstet Gynecol 1999; 180(6Pt1):1535-42. [Medline].
13. Umezuluike CC, Feyi-Waboso PA. Ruptured uterus in a primigravida by a traditional birth attendant: a case report. Trop J Obstet Gynecol 2003; 22(2):83–84.
14. Dattijo LM, Umar NI, Yusuf BM, Ruptured uterus in Azare, North Eastern Nigeria; Jos Journal of Medicine, 2007, 5(2).
15. Umeora OUJ, Ejikeme BN, Egwuatu VE. Contribution of ruptured uterus to maternal mortality in rural southeast Nigeria. Trop J Obstet Gynecol 2005; 22(2):184–188.
16. Lawal AN, Pregnancy outcome in grandmultiparous women in Lagos University Teaching hospital (LUTH). West Afr J Nurs 2000; 11(1):53-60.
17. Zoundi O, Grossesse et accouchement chez la grande multipare: à propos de 242 cas colliges en 1996 a la maternite du CHN-YO de Ouagoudou Burkina Faso [dissertation]. RESAR, 1998.
18. Mbamara SU, Obiechina NJA, Eleje GU, an analysis of uterine rupture at the Nnamdi Azikiwe University Teaching Hospital Nnewi, Southeast Nigeria, Nigerian Journal of Clinical Practice, 2012, 15(4).
19. Rizwan N, Abbasi RM, Uterine rupture, frequency of cases and fetomaternal outcome, Journal of Pakistan Medical Association, April 11, JPMA 2011; 61:322.
20. Zwart JJ, Ricter JM, Ory F, de Vries JI, Bloemenkamp KW, van Roosemalen J, uterine rupture in the Netherlands: A nationwide population-based cohort study. BJOG 2009; 11(6):1069-78.
21. Malik HS. Frequency, predisposing factors and fetomaternal outcome in uterine rupture. J Coll Physician Surg Park 2006; 16:472-5.
22. Bashiri A, Burstein E, Rosen S, Smolin A, Sheiner E, Mazor M. Clinical significance of uterine scar dehiscence in women with previous cesarean delivery: prevalence and independent risk factors. J Reprod Med 2008; 53:8-14.
23. Gaym A. Obstructed labor at a district hospital. Ethiop Med J 2002; 40(1):11-18.
24. Caughey AB, Shipp TD, Repke JT *et al.* Rate of uterine rupture during a trial of labor in women with one or two prior cesarean deliveries. Am J Obstet Gynecol 1999; 181(4):872-6. [Medline].
25. Orji EO, Fasuba OB, Onwudiegu U, Dare FO, Ogunniyi SO. Decision-intervention interval in ruptured uteri in Ile-Ife, Nigeria. East Afr Med J 2002; 79(9):496-498.
26. Esike COU, Umeora OUJ, Eze JN, Igberase GO, Ruptured uterus: the unabating obstetrics catastrophe in south eastern Nigeria. Archives of Gynecology; 05/2011;283(5):993-7.DOI:10,1007/s00404-010-1488-z [PubMed]
27. Balde MD, Breitbach GP, Bastert G, Uterine rupture-an analysis of 81 cases in Conakry Guinea , International Journal of Gynecology & Obstetrics 1990;32(3):223-7. DOI 10,1016/0020-7292(90)90349-P [PubMed]
28. Diagnostic ultrasound 4th. Edition by Carol MR *et al.*, Publishers-Elsevier, Mosby, 2011, 1045.