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Prevalence and Associated Factors of Uterine Rupture During Labor among Women Who Delivered in Debre Markos Hospital North West Ethiopia

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Abstract

Background: Uterine rupture causes high maternal and neonatal mortality in many rural setting in the world. Uterine rupture accounts for about 8% of all maternal deaths.

Method and Materials: Facility based cross sectional study design was employed to assess the prevalence and associated factors of uterine rupture. The data were abstracted from the cases registered during 2010 and 2014 in delivery registers, operating theater registers and patients' case files of obstetrics ward of Debre Markos Referral Hospital North West Ethiopia. A total of 880 cases were selected by using systematic sampling method.

Result: A sample size of 880 cases was selected after a review of 5-year patients' records (approx. 16,100 registered delivery cases) from Debre Markos Referral Hospital maternity ward. Among these selected cases, 854 (97.2%) cases were responded for the study. Prevalence of uterine rupture was identified in 81 (9.5%) cases. Factors associated with uterine rupture includes: attending ante natal care less than two visits (OR 2.5 95% CI 1.25-5.03), no use of partograph on follow up of labor (OR 7.29 95% CI 3.4-15.4), obstructed labor (OR 15.3 95% CI 7.54-31.1), living within >10 km of distance from the hospital (OR 5.26 95% CI 1.8-15.3), increase in one unit of maternal age (OR 8.15 95% CI 0.18-0.82), increase of one gravidity (OR 2.165 95% CI 1.6-2.9) and referred from other facilities (OR 6.5 95% CI 2.5-16.2).

Conclusion and Recommendations: Uterine rupture is one of the major causes of maternal morbidity and mortality in Debre Markos Referral Hospital in North West Ethiopia. Majority of uterine ruptures were occurred due to the obstructed labor. The hospital should build strong collaborative and integrative mechanisms with catchment of healthy facility and educative campaign to decrease prevalence of uterine rupture and its impact in the surrounding regions.

Keywords: Uterine rupture; Obstetric factors; Obstructed labor

Introduction

Uterine rupture means tearing of the uterine wall during pregnancy or delivery. Rupture of a previously unscarred uterus is usually a catastrophic event which results in death of the baby, extensive damage to the uterus and sometimes even maternal death can occur due to heavy blood loss. The damage to the uterus is sometimes beyond repair and in such cases; hysterectomy is required [1].

Worldwide, around 340,000 to half a million women die per annum due to complications of pregnancy and child birth. The majority of these cases occur in low income countries; Sub-Sahara Africa bears over 90% of the burden of maternal death [2]. Uterine rupture is one of the major obstetric complications of labor and contributes significantly to maternal and perinatal mortality and morbidity [3].

WHO systematic review of maternal mortality and morbidity: The prevalence of uterine rupture in developed countries was 0.92. However, in least developed countries viz., 1.9% in Central Africa, 18% in Burkina Faso and in 25% in Ethiopia [1]. In Ethiopia the top four causes of maternal mortality were obstructed labor and uterine rupture (36%), hemorrhage (22%), hypertensive disorders of pregnancy (19%) and sepsis/infection (13%) [4]. In Ethiopia 52.8% of deliveries were attended at home and the rest 48.2% institution delivery. Phase I delay (delay in decision to seek care) contributed about 25% of maternal deaths [5]. This, Federal Ministry of Health has initiated free maternity services at health center and hospital level recently [6].

Uterine rupture was the third common cause of death in Addis Ababa. Tikur-Anbessa hospital is prudent to improve availability, accessibility and utilization of the essential emergency obstetric care services to decrease maternal loss and to turn up the millennium development goal. Skilled attendance of labor coupled with early referral to the next higher level for better and timely intervention is equally important [7]. Several study from Africa and Asia shows that 75% of case of uterine rupture occurred in women with unscarred uterus obstructed labour being the most common cause [8].

A study conducted in Nigeria the main associated factors for uterine rupture were obstructed labour alone 23 (24.2%) and use of oxytocin in already obstructed labor 22 (23.1%), constituted oxytocin use 13 (13.7%), previous uterine scar 12 (12.6%) and intrauterine manipulation by traditional birth attendants 5 (5.3%) [9]. In studies from Nigeria, Ghana, Ethiopia, and Bangladesh, about 75% of cases of uterine rupture occurred in women with an unscarred uterus, with obstructed labor being the most common cause [10-12].

A 6-month prospective analysis of incidence, causes and outcome of obstructed labor in Jimma University specialized hospital obstructed labor contribute 45.1% for incidence of uterine rupture [13]. The main predictor of death from uterine rupture was a treatment delay of more than 12 h from the presumed time of rupture [14].

A case control study in Uganda predisposing factors for uterine rupture were previous cesarean section delivery (OR 5.3 95% CI 2.7-10.2), attending <4 antenatal visits (OR 3.3 95% CI 1.6-6.9), parity ≥5 (OR 3.67 95% CI 2.0-6.72), no formal education (OR 2.0 95% CI 1.0-3.9), use of herbs (OR 15.2 95% CI 6.2-37.0), self-referral (OR 6.1 95% CI 3.3-11.2) and living in a distance >5 km from the facility (OR 10.86 95% CI 1.46-81.03). There were 106 maternal deaths during the study period giving a facility maternal mortality ratio of 1,034/100,000 live births, there were 10 maternal deaths due to uterine rupture giving a case fatality rate of 12% [15]. Over the past decade, the maternal mortality ratio in Ethiopia has remained static at 676 per 100,000 live births, which equates to a lifetime risk of death from maternal complications of almost 4%. Uterine rupture and obstructed labour account for around 10% of these maternal deaths [16].

An 8-year retrospective description study of maternal death that occurred in Gynecology and Obstetrics ward at Jimma Hospital. Uterine rupture was a single commonest cause of maternal mortality accounts (33.2%). The case fatality rate of uterine Rupture was 11% in Jimma Specialized Hospital [14] and almost 5% in Aria Hospital [15]. Retrospective study in Yemen obstructed labor accounts 83% of uterine rupture, contracted pelvis 19%, previous surgery in 48%, oxytocine infusion in 42%. Grand-multiparty was in 65% and maternal age over 35 years in 50% [17].

It is possible to prevent most maternal deaths and disabilities with known and effective interventions, but this requires the right kind of information on why women are dying or facing lifelong disabilities. As many literatures conclude that uterine rupture is one of the causes for maternal death. But factors resulting uterine rupture differ from one literature to another. Specifically this study aimed to assess the prevalence uterine ruptured and associated factors during labor among women who delivered in Debre Markos hospital, North West Ethiopia.

Materials and Methods

Study area and study period

Debre Markos hospital is a public hospital found in East Gojam zone, which is located in Amhara regional administrative. It is 300 km North West of Addis Ababa. The hospital provides health service to more than 2.0 million populations. There were 100 health centers and two district hospitals in the catchment area of the referral hospital.

The hospital had 109 nurses, 1 emergency surgeon, 19 midwives and 1 gynecologist. There were 3,220 deliveries conducted per year from annual report of hospital, in obstetric ward. The study was conducted during March 1, 2015 and April 30, 2015. It was based on cross sectional study.

Population

- **Source of population:** All case notes of clients who received care for delivery in obstetric ward in Debre Markos Referral Hospital.
- **Study population:** All sampled case notes of clients who received care for delivery in Debere Markos referral hospital, from January 1, 2010 to December 31, 2014.
- **Inclusion criteria:** All case notes of delivery after 28 weeks of gestational age that were managed in obstetric case from January 1, 2010 to December 31, 2014.
- **Exclusion criteria:** Pregnancy terminated before 28 weeks of gestational age.
- **Sample size and sampling techniques:** Single population proportion formula was used to calculate sample size. The final sample size was 880 among 16,100 cases from Obstetrics ward registry book. The selection interval was 18 in the study. The first case was selected by lottery method from the first 18 cards. 880 study subjects were selected using systematic random sampling from 16,100 cases in serial order using the calculated interval.

Study variables

Dependent variable: Uterine rupture

Interdependent variables: Socio demography, maternal age, marital status and address.

Obstetrics factors included: ANC visit, gravida, parity, obstructed labor, induction/augmentation, partograph use during labor, referred from facility, obstetric procedure (instrumentation), fetal presentation and birth weight.

Data collection instrument and methods

Four data collectors who have diploma in midwifery and works in maternity ward of Motta hospital and one supervisor, who has BSc in midwifery was also recruited.

The overall data collection process was coordinated and facilitated by the principal investigator. Structured checklist was used to collect data from delivery registers, operating theatre registers and patients' case file. The questionnaires were adapted from Uganda, those other researchers used for similar purpose [18].

Operational definitions and definitions of terms

Augmentation of labor: Facilitating the existing labor using at least one is used; oxytocic drug such as (prostaglandin, misoprostol).

Induction of labor: Initiation of labor before onset of labor by using at least one; trans cervical catheter, oxytocic drug such as (prostaglandin, misoprostol).

Gravidity: The total number of pregnancies (normal or abnormal).

Maternal mortality rate: Number of maternal death in given period per 100,000 women of a reproductive age during the same time period.

Obstetric fistula: Fistulas form between the urinary bladder and the rectum or the vagina secondary to injury of childbearing from prolonged and obstructed labor.

Obstetric procedure: Instrumentation (forceps use), Intrauterine manipulation (external cephalic version, internal podalic version, breech extraction, shoulder dystocia, manual extraction of placenta), fungal pressure.

Obstructed labor: Failure of decent of fetal part despite of adequate contraction due to combinations of the abnormalities often interacts to produce dysfunctional labor and prolonged labor such as cephalopelvic disproportion and failure to progress fetal part.

Parity: Total number of delivery that occur after 20 weeks of gestational age.

Uterine rupture during labor: Tearing of the uterine wall either partially or complete during pregnancy and labor occurred after 28 weeks of gestational age, due to Obstetric case diagnosed either clinically and later confirmed at laparotomy.

Method of Data Analysis

Quantitative data

EPI-Data Statistical software version 3.1 & SPSS version 16 were used for data entry and analysis. After organizing and cleaning the data, important characteristics of study subjects were recorded. The data were expressed in percentages, graphs, means and standard deviations to all variables that are related to the objectives of the study. Univariate analysis was done to describe some characteristics of study subjects.

Chi-square (χ^2) and cross tabulation was done to see association, between the independent variables and the dependent variable. P value at 0.05 consider statistically significant and candidate to the multi variable logistic regression model. Finally, multivariate analysis using forward stepwise binary logistic regression technique was done to evaluate independent effect of each variable on uterine rupture by controlling the effect of others.

Data quality assurance

To assure the quality of data, properly designed data collection instruments was adapted. Training was given for data collectors and supervisors by the principal investigator. Everyday all of the collected data was reviewed and checked for completeness and relevance by the supervisors and principal investigator.

The questionnaires were pre-tested before the actual data collection days on 5% of the sampled obstetrics case records in Motta district hospital obstetrics ward which is not selected for the study area, inline to this during data collection supervisors checked the delivery registers.

Ethical considerations

Ethical clearance letter was obtained from ethical review committee of Jimma University, College of Public Health and Medical Science and a formal letter also obtained from Jimma University department of Nursing and Midwifery and was submitted to Debre Markos Referral Hospital and permission of hospital was obtained from hospital administrative.

Results

The 5-year period of record review in Debre Markos Referral Hospital Maternity ward indicated the 16,100 deliveries were conducted. Among these 880 cases was selected for the study with 97.1% (854) response-rate. The mean maternal age was 28 years with SD 7.2 and 528 (61.8%) of the study subjects were age between 20 years to 34 years. Majority 542 (63.5%) of the pregnant women lived >10 km from the hospital, 311 (36.5%) of them lived within distance of 10 km from the hospital and distribution of marital status 661 (77.4%) were married, 122 (14.3%) divorced.

Regarding the distribution of mode of delivery in the hospital, 491 (57.49%) of delivery were spontaneous vaginal delivery, 206 (24.12%) was instrumental delivery, 123 (14.4%) cesarean section delivery and 34 (3.98%) were destructive delivery (such as decapitation, craniotomy, evisceration and cleidotomy).

The prevalence of uterine rupture among women delivered in Debre Markos hospital was 81 (9.5%) and 773 (90.5%) were free from this catastrophic event. Among 81 of the patients faced rupture, 74.5% of the uterine rupture cases were para gravid less than five and 25.5% of them were grand multi para.

The mean age was 28 years, 50 (61.7%) were age between 20 years to 34 years, 25 (30.9%) greater than 35 years and the rest 6 (7.4%) were age not more than 19 years. The trends of prevalence of uterine rupture in the 5-years period from 2010 to 2014 in Debre Markos hospital, which was 22.5%, 21.5%, 19.4%, 18.7%, 18.3% in 2010, 2011, 2012, 2013, 2014 respectively (Figure 1).

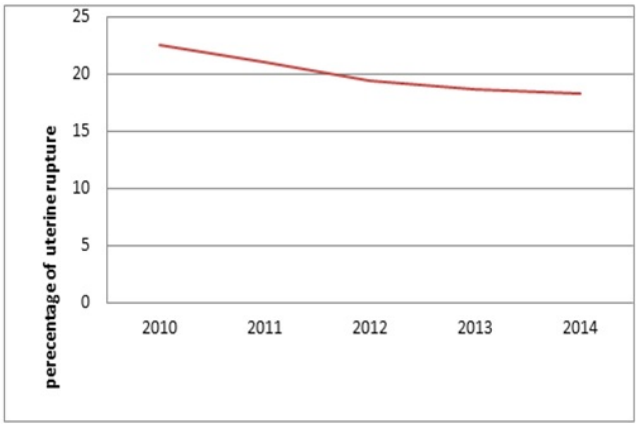

Figure 1: Trends of prevalence of uterine rupture from 2010 to 2014 among woman who gave birth in Debre Markos hospital (n=81).

Maternal Complication	Occurrences of Uterine rupture (n=81)	
	Number	Percent (%)
Bladder rupture	13	16.0
Vesicovaginal fistula	10	12.30
Severe blood loss (blood transfusion at least two unit of blood	72	88.8
Rectovaginal fistula	5	6 .10
Admitted blood pressure <=90/60 mmHg	61	75.3
Total abdominal hysterectomy	42	51.8
Subtotal abdominal hysterectomy	19	23.6
Repair of uterus	20	24.6
Maternal death	3	18.8

Table 1: Maternal complication of uterine rupture in Debre Markos hospital from January 2010 to December 2014, (n=81).

Concerning maternal complications resulted from uterine rupture: Total abdominal hysterectomy 42 (51.8%), subtotal hysterectomy 19 (23.4%) and uterine repair 20 (24.6%) from 81 uterine rupture cases 72 (88.8%) required at least one units of blood transfusion, 10 (12.3% face vesico vaginal fistula and maternal mortality accounts 3 (18.8) among women with rupture of gravid uterus (Table 1).

Factors associated with occurrence of obstetric uterine rupture

Partograph use during labor, augmentation or induction, obstetric procedure, referred from facility; fetal presentation and fetal birth weight had association with occurrence of uterine rupture (Table 2).

Variable	Category	Occurrence of Uterine rupture (n=81)	
		Number	Percent (%)
Pantograph use during labor	Yes	15	18.5
	No	66	81.5
Augmentation or induction	Yes	16	19.7
	No	65	80.3
Obstetric procedure	Yes	22	27.2
	No	59	72.8
Referred from facility	Yes	73	90.1
	No	8	9.9
Fetal presentation	Vertex	21	25.9
	Breach	8	9.9
	face	27	33.3
	brow	25	30.9
Fetal birth weight Mean=2.89, (SD=0.58)	<=2.5 kg	12	15.5
	2.5 kg to 3.9 kg	55	66
	>=4 kg	15	18.5

Table 2: The distribution of obstetric care service and fetal factor with occurrence of uterine rupture who delivered in Debre Markos from hospital January 2010 to December 2014 (n=81).

Attending ANC less than two visits had 2.5 odds of having uterine rupture. Non-use of partograph had 7.29 odds of having uterine rupture.

We came to obstructed labor had 15.32 odds of having uterine rupture. Living in distance >10 km from the hospital had 5.26 odds of having uterine rupture.

When we come to maternal age an increase by one unit resulted in 0.815 odds of uterine rupture.

Regarding gravidity, an increase by one unit resulted in 2.16 odds of uterine rupture. Whereas referred from facility had 6.49 odds of having uterine rupture (Table 3).

Variable	Uterine Rupture		OR (95% CI)		P-Value
Categories (N=854)	Yes	No	Crude	Adjusted	
Attending ANC					
Lesst than two	60	312	4.10 (2.4-67)	2.50 (1.25-5.03)	0.007
Greater than two	21	452	1	1	
Partograph use					
Yes	15	510	1	1	0.0001
No	66	263	8.50 (4.7-15.2)	7.29 (3.4-15.4)	
Obstructed labor					
Yes	65	119	22.3 (12.5-39.9)	15.32 (7.54-31.1)	0.0001
No	16	654	1	1	
Referred from facility					
Yes	73	434	7.10 (1.89-8.78)	6.49 (2.5-16.2)	0.001
No	8	339	1	1	
Resident >10 km from hospital					
Yes	66	477	2.74 (1.53-4.8)	5.26 (1.8-15.3)	0.02
No	15	296	1	1	
Maternal age Mean=28			1.026 (0.7-1.0)	0.815 (0.18-0.82)	0.001
Gravidity Mean=3.8			1.285 (1.2-1.42)	2.16 (1.6-2.9)	0.0001

Table 3: Logistic regression result of factor associated with uterine rupture among women delivered in Debre Markos hospital from January 2010 to January 2014 (N=854).

Discussion

Among 880 sampled cases there were 81 uterine rupture cases making an incidence of 1:200 which is similar with a study done in Uganda, but lower than the incidence in Ghana which were 1:124, Ethiopia which were 1:100, and higher in study in Tanzania which were 1.2:500 delivers [1,12,18]. This was high incidence of uterine rupture than Tanzania. The possible justification could be poor obstetric care, poor accessibility to the few available Comprehensive Emergence Obstetric Care (CEmOC) facilities in the zone.

Among 81 of the patients faced rupture 74.5% of the uterine rupture cases were para gravid less than five and 25.5% of them were grand multi para. This is similar with the study conducted in Tanzania [8].

In this finding 65 (80.2%) uterine rupture were due to obstructed labor has agreement in reports from, Ghana, Ethiopia and Bangladesh indicated that about 75% of cases of uterine rupture were associated with unscarred uterus [1]. Obstructed labor can cause up to 93% uterine rupture in Ethiopia [17] and 68.5% in Uganda which is highly

contributing factor and most prevalent than a study done in Nigeria it accounts 24.5% [9]. Possible reason might be different in health policy of the country and service availability especially comprehensive Emergence Obstetric Care.

Attending ANC less resulted in 2.5 odds of having uterine rupture. Non-use of partograph had 7.29 odds of having uterine rupture. We came to obstructed labor had 15.32 odds of having uterine rupture. Living in distance >10 km from the hospital had 5.26 odds of having uterine rupture. Whereas referred from facility had 6.49 odds of having uterine rupture. This is similar with a study in western Uganda from which, predisposing factor for uterine rupture were; <4 antenatal visits living in a distance >5 km from the facility, parity >5. No partograph follow up and labor referred from other facility [15].

As high as 88.8% of women with uterine rupture in this study-required blood transfusion, 90.1% of them were referred from facility. This is similar to study in Tanzania [8]. All cases of uterine rupture need blood transfusion. This is due to the poor hemodynamic state in which the patients arrived and the high prevalence of anemia in pregnancy, which necessitates comprehensive emergency obstetric care, is very essential to save maternal life. In addition, the other explanation is low utilization of the available modern health services like ANC even if it is free service in national level.

Maternal age is one factor which causes uterine rupture. On this study an increase in one unit of age, resulted 0.815 odds of uterine rupture. Regarding gravidity is the other factor responsible for uterine rupture. An increase in one unit caused 2.16 odds of uterine rupture. This finding is congruent with the study conducted in Yemen [14].

In conclusion uterine rupture is one of the major causes of maternal morbidity and mortality in Debre Markos Referral Hospital in North West Ethiopia. The prevalence was still high, even it appears to decrease over the last ten years period from national figure of Ethiopia.

There were various predisposing factors associated with ruptured uterus although many patients had more than one etiologic factor, the most frequent factor was obstructed labor, living >10 km from hospital maternal age, multi parity and non-attending ANC, no partograph follow up and delay referral had contribution for occurrence of uterine rupture in this hospital. Currently the free delivery package introduced by the government of Ethiopia it attempts at addressing the issue despite of financial barrier but the high cost of transportation and the poor state of road network really has great impact on the effectiveness of this intervention.

The difference of this study from others was many factors assessed whether they might be associated with uterine rupture and found multiple factors significantly associated to uterine rupture.

This study will help the Ethiopian government and other concerned stakeholders to address the causes of maternal death since it is identified the common factors associated with uterine rupture which is one of among the major causes of maternal morbidity and mortality.

- The Investigators recommend the following based on the study findings.
- Promote ANC in the hospital as well as health facility
- Empowerment of the teenagers through education and delaying first pregnancy
- Increase utilization of partograph during labor in the hospital as well as in other health facility
- Promotion of early referral system and feedback.

Limitations of the Study

Since the study is facility based all factors associated with uterine rupture might not be identified, especially factors resulted maternal death at community level before the mother reach health facility. Additionally since the collected data were secondary some of the variables might be missed.

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References

1. Hofmeyr GJ, Say L, Gulmezoglu AM (2005) WHO Systematic Review of Maternal Mortality and Morbidity: the Prevalence of Uterine Rupture. BJOG 112: 1221-1228.
2. Adeoye IK, Onayade AA, Fatusin AO (2013) Incidence, determinants and perinatal outcomes of near miss maternal morbidity in Ile-Ife Nigeria: a prospective case control study. BMC Pregnancy Childbirth 13: 93.
3. World Health Organization, UNICEF, UNFPA The World Bank (2010) Trends in maternal mortality 1990 to 2008, Estimates developed by WHO, UNICEF, UNFPA and the world bank. Geneva: WHO Press, Switzerland.
4. Berhan Y, Berhan A (2014) Causes of maternal mortality in Ethiopia: A significant decline in abortion related mortality. Ethiop J Health Sci 24: 15-28.
5. International Federation of Gynecology and Obstetrics (2012) The Ethiopian Society of Obstetricians and Gynecologists facility-based Maternal Death and Near Miss Reviews in Ethiopia August.
6. (2014) Federal Democratic Republic of Ethiopia Ministry of Health Quarterly Health Bulletin.
7. Dereje N, Nebiyu M (2009) Review of maternal death in Jimma university specialized hospital. Ethiop J Health Sci 19: 9-12.
8. Kidanto HL, Mwampagatwa I, van Roosmalen J (2012) Retrospective analysis of uterine rupture cause complication and management outcome Muhimabli national Hospital Dares salaam Tanzania. J Health Res 14: 1-5.
9. Ibrahim SM, Umar NI, Garba NA, Bukar M (2014) HA3A Reappraisal of Ruptured Uterus in a Suburban Referral Hospital, North-Eastern Nigeria. Int J Med Appl Sci 3: 299-308.
10. van den Akker T, Beatrice M, James I, van Roosmalen J (2009) Using audits to reduce the incidence of uterine rupture in a Malawian district hospital. Int J Gynaecol Obstet 107: 289-294.
11. Mukasa PK, Kabakyenga J, Senkungu JK, Ngonzi J, Kyalimpa M, et al. (2013) Uterine Rupture in a Teaching Hospital in Mbarara, Western Uganda, Unmatched Case-control study. Reproduct Health 10: 29.
12. Kadawa I (2010) Rupture Uterus prevalence, predisposing factors and outcome among delivered woman in rural Uganda. Singapore Med J 51: 35-38.
13. Abdella A (2010) Maternal Mortality Trend in Ethiopia. Ethiop J Health Dev 24: 115-122.
14. Shimelis F, Segni H, Alemseged F (2010) Incidence Causes and Outcome of Obstructed Labour at Jimma University Specialized Hospital, Ethiop J Health Sci 20: 145-151.

15. Alemayehu W, Ballard K, Wright J (2012) A Ten Year Retrospective Case Record Analysis Primary repair of Obstetric Uterine Rupture in Aira Hospital a Lutheran German Missionary Hospital in Rural West Wollega, Ethiopia.
16. Yifru B, Asres B (2014) Perinatal Mortality Trends in Ethiopia. Ethiop J Health Sci. 24: 29-40.
17. Dhaifalaha BI (2006) Uterine rupture during pregnancy and delivery among women attending the Al-thawra hospital in Sana'a City Yemen. Republic Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub. 150: 279-283.
18. Fofie CO, Baffoe P (2010) A Two-year Review of Uterine Rupture in a Regional Hospital. Ghana Med J 44: 98-102.