Scientific Research Publishing

Open Journal of Obstetrics and Gynecology, 2025, 15(1), 44-54
https://www.scirp.org/journal/ojog
ISSN Online: 2160-8806
ISSN Print: 2160-8792

Prevalence and Factors Associated with Maternal Mortality during Uterine Rupture in the Gynecology-Obstetrics Department of Bouake University Hospital

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How to cite this paper: Yaya, S., Estelle, D.L., Alamun, A.I., Michele, M.-M.B., Georgie, M.C., Narcisse, K.K., Elysee, B.D.D., Sokhona, C., Anabelle, E.A., Opportune, Y.A.R., Sounkalo, C. and Yacouba, D. (2025) Prevalence and Factors Associated with Maternal Mortality during Uterine Rupture in the Gynecology-Obstetrics Department of Bouake University Hospital. *Open Journal of Obstetrics and Gynecology*, **15**, 44-54.
https://doi.org/10.4236/ojog.2025.151005

Received: December 13, 2024
Accepted: January 5, 2025
Published: January 8, 2025

Abstract

Introduction: Uterine rupture is certainly one of the most serious, as it immediately jeopardises the vital prognosis of the mother and foetus. It is a common obstetric tragedy in our delivery rooms in countries with limited resources, reflecting the poor quality of obstetric care and, consequently, an unmet obstetric need. **Methods:** This was a descriptive and analytical cross-sectional study with prospective data collection over a four-year period from 1 January 2020 to 31 December 2023 at the University Hospital Centre (CHU) of Bouaké, in the Obstetrics and Gynaecology Department. The variables studied were epidemiological characteristics, therapeutic aspects and factors associated with maternal. **Results:** The prevalence of uterine rupture was 0.63%. The average age was 32, with patients aged 35 and over accounting for 33.68%, married 44.21% and 70% not in education. Patients with uterine rupture had been evacuated in 85.26% of cases. Uterine rupture was diagnosed in 97.89% of cases during labour. Maternal lethality due to rupture was 15.79%. The causes of maternal death were dominated by haemorrhagic shock (53.33%). Factors statistically associated with death were age ≥ 35 years (OR: 3.14), duration of labour ≥ 12 hours (OR: 5.8), multiparity (OR: 19.04), admission delay beyond 2 hours (OR: 4.36), haemoglobin level ≤ 7 g/dl (OR: 36.84), coma or obnubilation (OR: 71.82), haemorrhagic shock (OR: 243.94) and occurrence of post-operative complications (OR: 76.45). **Conclusion:** The frequency of

uterine rupture remains significant in the department (0.63%), with maternal mortality still high (15.79%). The key to reducing uterine rupture and its consequences lies in timely referral and early, appropriate management.

Keywords

Factors Associated, Uterine Rupture, Maternal Mortality, Prevalence

1. Introduction

Maternal death is a worldwide public health problem, especially in developing countries where the maternal mortality rate remains very high. According to the World Health Organization (WHO), 303,000 women died worldwide in 2015 due to problems related to pregnancy or childbirth. Approximately 99% of these maternal deaths occurred in developing countries [1] [2]. In sub-Saharan Africa, the situation is alarming, where 66% of global maternal deaths occur and the probability that a young woman will one day die from a cause related to pregnancy or childbirth is 1 in 36 compared to 1 in 4,900 in developed countries [1] [3]. These high rates can be explained by several factors, including hemorrhages, high blood pressure and its complications, infections, dystocia, and complicated abortions. In Côte d'Ivoire, the maternal mortality rate remains high; in fact, according to DHS 2021, the maternal mortality ratio is estimated at 385 deaths per 100,000 live births [4]. Among the obstetric complications involved in maternal deaths, uterine rupture (UR) is certainly one of the most serious, as it immediately jeopardizes maternal and fetal life, constituting a common obstetric drama in our delivery rooms in countries with limited resources, demonstrating poor quality obstetric care and therefore constituting an unmet obstetric need [5]. Uterine rupture, with the hemorrhage it causes, is the main cause of maternal and fetal death in developing countries [6]. Nowadays, uterine rupture is exceptional in developed countries. The reported incidence of uterine rupture was 12 out of 36,000 births in developed countries and these occurred mainly in patients with healed uteri [7]. In developing countries, a maternal mortality rate of 11.26% and fetal mortality of 100% were noted in a study conducted from 1996 to 2001 at the University Hospital of Bouaké [8]. In the Republic of Côte d'Ivoire in general and particularly in Bouaké, we note little epidemiological data on the factors associated with maternal mortality during this very serious and much-feared obstetric pathology, hence the importance of this study.

2. Patients and Methods

This was a cross-sectional study with a descriptive and analytical aim with prospective data collection over a period of four years from January 1, 2020 to December 31, 2023 at the University Hospital (UH) of Bouaké, in the Obstetrics and Gynecology Department. All patients with uterine rupture diagnosed before, during labour or in

the post-partum period during the study period and managed in the department were included. Not included were patients with uterine perforation, cervical tear, patients who arrived dead from uterine rupture, patients operated on for rupture and admitted for management of complications. All cases of uterine rupture were confirmed in the operating theatre during laparotomy. The data collection sources were the admission, delivery and operating room registers, the death register and then the patient files. The variables studied were the epidemiological characteristics (age, parity, ANC, etiological factors, origin of the patients), therapeutic aspects and factors associated with maternal deaths. The study was carried out with the authorization of the administrative authorities of the University Hospital of Bouaké. Confidentiality was respected by assigning an anonymous code to each survey form, so that no one could know the exact identity of the patients. Data entry and processing used Epi-Info7 software. Quantitative variables were expressed as means and extreme values and qualitative variables as proportions. The proportion analysis used the KHI2 or FISCHER test depending on the validity conditions. The ordds ratio (OR) was calculated and presented with its limits in the 95% confidence interval (95% CI) to assess the strength of the association between the variables studied and maternal mortality during uterine ruptures and the significance threshold was set at $p < 0.05$.

3. Results

3.1. Prevalence

During the study period, 190 cases of uterine rupture were recorded for 30,072 deliveries, representing a prevalence of 0.63%. This corresponded to 1 uterine rupture for 158 deliveries.

3.2. Socio-Epidemiological Characteristics

The mean age was 32 years +/− 6 with [range 18; 55 years], and patients aged 35 years and over represented 33.68% of cases. They were married (44.21%), not in school (70%) and housewives in 74.21% of cases. The mean number of ANC performed was 3 with [range 0; 6] and they had performed less than 4 ANC in 78.42% of cases. The mean parity was 3 parous +/−2 with [range 0 and 9 parous] and pauciparous represented 41.05% of patients. Patients with uterine rupture had been evacuated in 85.26% of cases (**Table 1** summarizes the socio-epidemiological characteristics).

3.3. Clinical Aspect

The mean gestational age was 39 weeks with [range 33 - 43 weeks] and ruptures occurred between [37 - 42 weeks] in 91.05%. The mean duration of labor was 8.9 hours +/− 2.74 hours [range 1 - 19 hours] with a duration of labor less than 12 hours in 89.47% of cases. The admission time was more than 2 hours in 78.95% of cases, with a notion of taking traditional oxytocin in order to accelerate labor in 55.79% of cases and the patients presented a state of hemorrhagic shock in

75.79% of cases. Fetal heart sounds were absent on admission in 166 patients (87.36%). During labor 97.89% of URs were diagnosed and in the postpartum, we found 4 cases or 2.11%. The site of the rupture was essentially segmental-corporeal in 74.21% of the 141 cases operated, segmental in 25.26% and corporeal in 0.53% cases. It was a complete rupture in all patients.

Table 1. Socio-epidemiological characteristics of patients with uterine rupture.

Variables	Frequency (n)	Percentage (%)
Age (years)		
≤19	2	1.05
20 - 24	21	11.05
25 - 29	42	22.11
30 - 34	61	32.11
≥35	64	33.68
Occupation		
Housewife	141	74.21
Liberal function	33	17.37
Without profession	10	5.26
Student	6	3.16
Marital status		
Union	158	83.15
Bachelor	32	16.85
Level of study		
Not in school	133	70.00
Primary	50	26.32
Secondary	5	2.63
Superior	2	1.05
ANC		
0	5	2.63
1 - 3	144	75.79
≥4	41	21.58
Parity		
Nulliparous	5	2.63
Primiparous	31	16.32
Pauciparous	78	41.05
Multiparous	76	40
State of the uterus		

Continued

Healthy	148	77.89
Scar	42	22.11
Admission mode		
Evacuated	162	85.26
Coming by herself	28	14.74

3.4. Therapeutic and Prognostic Aspects

The patients had benefited from blood transfusion in 78.42% of cases. Surgical treatment consisted of hysterorrhaphy without tubal ligation in 55.26% of cases and hysterectomy in 21.05% of cases. The duration of the surgical procedure was between 2 and 4 hours in 88.42% of cases. The postoperative period was marked by complications in 51.05% of cases with parietal infection (36.67%) of cases and maternal lethality related to rupture which was 15.79%. The causes of maternal death were hemorrhagic shock (53.33%), coagulopathy (40%) and postoperative peritonitis (6.67%) and deaths occurred postoperatively in 56.66% of cases. The proportion of stillbirths was 89.47%. Therapeutic and prognostic aspects are presented in Table 2.

Table 2. Therapeutic and prognostic aspects of patients with UR.

Management and Prognosis	Staff (n)	Percentage (%)
Blood transfusion (n = 190)		
Yes	149	78.48
No	41	21.52
Surgical treatment (n = 188)		
Hysterorrhaphy without tubal ligation	105	55.86
Hysterorrhaphy with tubal ligation	43	22.87
Hysterectomy	40	21.27
Complications (n = 190)		
Yes	90	51.05
No	100	48.95
Type of complication (n = 90)		
Parietal infection	33	36.67
Hemorrhagic shock	20	22.22
Coagulopathy	20	22.22
Anemia	16	17.78
Peritonitis	8	8.89

Continued

Maternal death (n = 190)		
Yes	30	15.79
No	160	84.21
Time of death (n = 30)		
Preoperative	2	6.67
Per-operative	11	36.67
Postoperative	17	56.66
Fetal death (n = 190)		
Yes	170	89.47
No	20	10.53

3.5. Factors Associated with Death

Factors statistically associated with death were age ≥ 35 years with an odds ratio of 3.14, duration of labor ≥ 12 hours with an odds ratio of 5.8, multiparity with an odds ratio of 19.04, admission time beyond 2 hours with an odds ratio of 4.36, hemoglobin level ≤ 7 g/dl with an odds ratio of 36.84, coma or obtundation on admission with an odds ratio of 71.82, shock on admission with an odds ratio of 243.94, and the occurrence of postoperative complications with an odds ratio of 76.45. Complications statistically associated with death were hemorrhagic shock with an odds ratio of 118.5 and coagulopathy with an odds ratio of 31 (Table 3).

Table 3. Distribution of patients according to factors associated with death during UR.

Variables	Deceased	Alive	p-value	OR	IC 95%
Age					
≥35 years old	17	47	0.003	3.14	1.41 - 6.98
<35 years old	13	113			
Working hours					
≥12 hours	9	11	0.0001	5.8	2.15 - 15.66
<12 hours	21	149			
Parity					
≥4	16	60	<0.0001	19.04	6.39 - 56.78
<4	14	100			
Traditional oxytocic use					
Yes	18	66	0.06	2.13	0.96 - 4.73
No	12	94			

Continued

Gestational age					
≥42 weeks	3	13	0.721	1.26	0.34 - 4.71
<42 weeks	27	147			
Admission deadline					
≥2 hours	28	122	0.035	4.36	0.99 - 19.16
<2 hours	2	38			
Interbirth interval					
<2 years	3	10	0.435	1.67	0.43 - 6.45
≥2 years	27	150			
Hemoglobin level					
≤7 g/dl	28	57	<0.0001	36.84	4.87 - 278.89
>7 g/dl	1	75			
Level of consciousness					
Obsessed or coma	23	7	<0.0001	71.82	23.07 - 223.58
Normal	7	153			
State of shock					
Yes	29	17	<0.0001	243.94	31.22 - 906.21
No	1	143			
Post-operative evolution					
Complications	29	44	<0.0001	76.45	10.11 - 578.35
Simple	1	116			
Type of complications					
Hemorrhagic shock	18	2	<0.0001	118.5	24.54 - 572.08
Coagulopathy	15	5	<0.0001	31	9.89 - 97.17
Anemia	3	13	0.722	1.25	0.33 - 4.71
Peritonitis	1	7	1	0.75	0.09 - 6.37
Surgical site infection	8	25	0, 143	1.96	0.79 - 4.9

4. Discussion

In order to contribute effectively to the reduction of maternal mortality in pregnant women with uterine rupture at the University Hospital of Bouaké, we conducted this prospective study in the obstetrics and gynaecology department. It enabled us to describe the sociodemographic and clinical characteristics of pregnant women, to determine the prevalence of uterine rupture and to identify the factors associated with mortality during uterine rupture. The limitations of

this study could be information bias due to the method of collecting data from the respondents using a self-administered questionnaire and the impossibility of verifying the information provided.

The prevalence of 0.63%, corresponding to 6 uterine ruptures for 10 deliveries. Our result is close to that of Huyghe *et al.* [9] in the Central African Republic who noted 0.6%. On the other hand, our result is higher than that of Gueye *et al.* [10] who found a prevalence of 0.2%, and lower than those of Fané *et al.* in Mali [11] and Imen *et al.* [12] in Tunisia who noted 3.7% and 2.173% respectively. In developed countries, UR is exceptional. Sheng *et al.* [13] in China noted a prevalence of 0.02%. The disparity between industrialized and developing countries can be explained, on the one hand, by limited access to health facilities and, on the other hand, by the poor organization of the referral and evacuation system, as well as the insufficient quality of care, which are particularly notable in Africa.

The patients were young with an average age of 32 years +/− 6. Patients aged 35 years and over accounted for a third (33.68%) of cases. Our result is close to that of Fané *et al.* in Mali [11] who noted an average age of 30 years with patients aged over 35 years representing 44.2% of cases. Also Kitenge *et al.* [14] in the Democratic Republic and Belinga *et al* [15] in Cameroon noted a similar result with an average age of 29.5 years and 30.98 years respectively. This result could be explained by the fact that this age corresponds to the period when reproductive activity is intense. According to Hochler *et al* [16], women aged 35 years or overrun almost 3 times the risk of uterine rupture. Pauciparous and multiparous women represented 41.05% and 40.0% respectively. This high frequency of pauciparous and multiparous women can be explained by the early marriage in Africa and the high multiparity of often young women [5]. 21.58% of cases of uterine rupture occurred on a scarred uterus. This result is similar to that of Kitenge *et al.* [14] who noted a history of cesarean section in 20.9% of cases. Indeed, the uterine scar is the weak link of the myometrium, which, subjected to the stress of contractions, can suddenly rupture. However, in our study, more than 3/4 of uterine ruptures occurred on healthy uteri. This could be explained by the use of traditional oxytocic during labor. Indeed, in our study, the onset of labor was spontaneous, but accelerated by the use of traditional oxytocics in more than half (55.79%) of the cases, unlike the studies of Kitenge *et al.* [14] and Huyghe *et al.* [12] who noted that the onset of labor was spontaneous in 90.7% and 75% of the cases respectively. The indiscriminate use of traditional oxytocics to accelerate labour is a common practice in our context, with harmful consequences for the health of mothers and newborns. These products are used without any study of the dose or route of administration. The use of these products, combined with other risk factors such as abdominal pressure at full dilation in the event of insufficient expulsive effort, trauma following certain obstetric procedures and delayed diagnosis of certain dystocies, could explain the frequency of spontaneous ruptures. The patients had performed less than 4 ANCs in 78.42% of the cases. For Fane *et al.* [11] and Gueye *et al.* [10] the patients had not performed ANC in

36.06% and 30.8% of the cases respectively. In the study of Huyghe *et al.* [9], no difference was noted between non-participation in antenatal consultations and the occurrence of UR. However, ANC should be encouraged, given that they constitute opportunities for early screening of UR risk factors. The diagnosis of uterine rupture was made per partum in 97.89% of cases. This result is close to that of Imen *et al* [12], Huyghe *et al.* [9] and Kitenge *et al.* [14] who noted respectively 72.7%, 78.1% and 100% of cases. The lesion was complete in 100% of cases with the location of the lesion being segmento-corporeal in 74.21% of cases. Fané *et al.* [11] noted 79.1% complete UR; in 51.59% the lesion was located at the level of the lower segment and segmento-corporeal in 32.22% of cases. Kitenge *et al.* [14], as well as Imen *et al.* [12] also noted complete ruptures in respectively 79.1% and 80% of cases. The higher frequency of complete uterine ruptures in our study would be related to the delay in admission of patients who for the most part stay several hours, even several days, by unqualified personnel ignoring the contraindications of vaginal delivery and abusing the use of oxytocics. Surgical treatment was conservative in 77.89% of cases. However, there was a high rate of hysterectomy in 21.05% of cases. The rate of hemostasis hysterectomies varies in the literature in cases of complete ruptures. Kitenge *et al.* [14] in their study noted conservative treatment in 95.3% of cases and hysterectomy in 4.6% of cases. For Huyghe *et al.* [9], surgical treatment was conservative in 93.33% of cases and hysterectomy in 6.67% of cases. The high rate of hysterectomy in our context could be explained by the extent of uterine lesions (100% complete UR) as well as the occurrence of major complications such as hemorrhagic shock (20.62%) and coagulopathy in 20.62% of cases.

Our maternal death rate of 15.79% is similar to that reported by Baldé *et al.* [5], who noted a rate of 14.6%. This high rate could be explained by the late evacuation of patients and the precarious state of patients upon admission. As for the fetal prognosis, it was poor with a stillbirth rate of 89.47% similar to that reported in the African literature [9]-[11]. Factors statistically associated with death were age ≥ 35 years (OR = 3.14), duration of labor ≥ 12 hours (OR = 5.8), multiparity (OR = 19.04), admission time beyond 2 h (OR = 4.36), hemoglobin level ≤ 7 g/dl (OR = 36.84), coma or obtundation on admission (OR = 71.82), shock on admission (OR = 243.94) and the occurrence of postoperative complications (OR = 76.45). These complications were hemorrhagic shock (OR = 118.5) and coagulopathy (OR = 31). According to Belinga *et al.* [15], when the arrival time was more than 4 hours after the referral, it multiplied by 20.8 the risk of death by uterine rupture. In addition, compared to survivors, patients who died during uterine ruptures were between 11 and 20 times more likely to have presented agitation and/or obtundation [15]. Also, shock and coagulopathy multiplied by 12 and 162 times respectively the probability of dying during uterine rupture [15].

5. Conclusions

The frequency of uterine ruptures remains significant in the department (0.63%)

with maternal mortality still high (15.79%). The factors statistically associated with death were age ≥ 35 years, duration of labor ≥ 12 hours, multiparity, admission time beyond 2 hours, coma or obtundation on admission, shock on admission and the occurrence of postoperative complications.

Almost all of these uterine ruptures and complications could be avoided by: raising awareness among pregnant women, improving the management of obstetric emergencies, increasing access to health facilities and ensuring that gynaecologists and obstetricians are properly assigned throughout the country.

Authors' Contribution

All authors participated intellectually in the preparation and revision of the manuscript before its submission.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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