Management Outcome of Uterine Rupture and Associated Factors in Yirgalem General and Teaching Hospital, Southern Ethiopia: A Cross-Sectional Study

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Research article

Keywords: Uterine rupture, Management outcome

Posted Date: August 22nd, 2019

DOI: https://doi.org/10.21203/rs.2.13383/v1

Abstract

Background Uterine rupture is dropped significantly in the developed world. However, it is still a major public health problem in developing countries including Ethiopia. The aim of this study was to assess management outcome of uterine rupture and its associated factors in Yirgalem General and teaching Hospital of southern Ethiopia. Methods An institution based cross-sectional study was conducted. All records of uterine rupture managed in Yirgalem general and teaching hospital between January 1, 2012, and December 30, 2017, were reviewed. Data were collected using a checklist. Descriptive statistics and logistic regression analyses were done. Results A total of 331 cases of mothers who managed for uterine rupture were included in the study. 235 (71%) of them had a poor management outcome. Wound site infection 131 (39.6%) and anemia 129 (39%) where the common post-operative complications. There were 13 (4%) maternal death and 320 (96.7%) neonatal death. Lack of antenatal care follow up (adjusted odds ratio (AOR) =2.2, 95% CI: 1.1-4.5), prolonged duration of labor more than 24hr (AOR=3.6; 95% CI: 1.7-7.4), patients presented with sepsis (AOR=2.9; 95% CI: 1.4-6.1), mothers who did not transfuse for blood during the case scenario (AOR=4; 95% CI: 2.1-7.9) and prolonged intra operative time (AOR=5.5; 95% CI: 2.8-10.8) were factors associated with poor management outcome of uterine rupture. Conclusion Poor management outcome of uterine rupture was high in the study area as compared to other studies. Lack of ANC follow up, longer duration of the surgical procedure, prolonged duration of labor, lack of blood transfusion and pre and postoperative complications are associated with poor management outcome. Therefore, proper ANC and early identification of the high-risk groups can prevent and decline the occurrence of uterine rupture and that enhance good outcome.

Background

Uterine rupture during pregnancy is the disruption of the uterine wall. It may happen to mothers with an intact gravid uterus or having a previous uterine scar [1]. The ruptured uterus may be complete or incomplete depending on whether it opens into the peritoneal cavity or not. It is complete if it is communicating with the peritoneal cavity directly, and incomplete if it is separated from the peritoneal cavity by the visceral peritoneum and therefore the fetus is extracted from the uterus into the abdominal cavity: and also the site of uterine rupture could be anterior, posterior or lateral these classifications are mandatory for the sake of a definitive management accordingly [2].

Worldwide in 2015 around 303,000 to half a million women die per annum due to complications of pregnancy and childbirth [3]. Among these uterine rupture accounts for about 8% of all maternal deaths. The majority of these cases occur in low-income countries; Sub-Sahara Africa bears over 90% of the burden of maternal death [4, 5]. Ethiopia is one of the least developed countries where maternal and perinatal mortality rates are still very high [6].

According to the World Health Organization (WHO), a systematic review of maternal mortality and morbidity; the prevalence of uterine rupture in developed countries was 0.92. However, in the least developed countries 1.9% in Central Africa, 18% in Burkina Faso and 28% in Ethiopia. Uterine rupture is

one of the major obstetric complications of labor and contributes significantly to maternal and prenatal mortality and morbidity [7]. The maternal mortality ratio in Ethiopia is one of the highest in sub-Saharan African [8]. In Mizan Aman, Ethiopia one of the major causes of maternal and perinatal mortalities is a rupture of the uterus [5].

In developing countries uterine rupture occurs as a usual problem following complications of directly oxytocin induction or augmentation, trial of labour after caesarean delivery due to unsupervised care, poor ANC follow up, prolonged labour, home delivery, teen-age pregnancy, multi-gravidity, low socioeconomic status, poor infrastructure and poor referral system; as all of these cases leading to the mothers and their fetus for the poor management outcome [9-11].

Uterine rupture occurs mostly on the outside of health facilities where the mother had not routine ANC follow up, but it be can happen within the health facility; due to delays in referral system, delays in seeking appropriate care in the onset of labour and delays of intervention due to lack of skilled human resources and negligence of health professionals that ultimately resulted on poor management outcome [10].

Like any other obstetric emergencies, maternal and fetal deaths occurring due to uterine rupture are occurring largely a result of in proper and delay management [12-17]. Overall, few studies were available nationally about management outcome of uterine rupture. Therefore, the aim of this study was to assess the management outcome of uterine rupture and its associated factors.

Methods

Study setting

The study was conducted in Yirgalem General and Teaching Hospital (YGTH) found in Yirgalem town, Sidama zone, which is located at about 318 Km and 45 km to the south of Addis Ababa, the capital of Ethiopia and Hawassa, the capital of SNNP region respectively. It provides health care service for more than 4.2 million people in Sidama zone and the surrounding area.

The hospital has seven departments and Gynecology and Obstetrics is one of the departments where laboring mothers are admitted, followed and managed accordingly. The Gynecology and Obstetrics department has 3 gynecologists, 4 general practitioners, and 18 midwives. The majority of cases are referred by neighboring district hospitals and health centers. The total number of deliveries in the six-year period (between January 1, 2012-and December 30, 2017) was estimated to be 13500. The hospital has a capacity to manage uterine rupture by performing operations of total abdominal hysterectomy, subtotal abdominal hysterectomy, and repair according to the extent of rupture in one major and one minor operation theater rooms.

Study population

All mothers card managed (admitted) with uterine rupture at Yirgalem General Teaching and General Hospital between January 1, 2012, and December 30, 2017.

Study design

An institutional based cross-sectional survey was conducted among mothers who had ruptured uterus records in the past six years who had managed at Yirgalem General and Teaching Hospital

Sample size and sampling techniques

All mothers card with uterine rupture managed between January 1, 2012, G.C and December 30, 2017, G.C were included. First obstetrics and operative records from obstetrics ward and major operation registry book in the operating room were reviewed to identify a mother who had managed for uterine rupture during the study period. A total of 345 patient cards was reviewed and 331 cards were fitted to the selection criteria. Then their cards have been retrieved from the card office. Finally, documents from patient cards were entered into a structured checklist.

Inclusion criteria

All mothers card who were managed for a uterine rupture with the complete documentation card. Patient with incomplete data (information) or patients whose card lost excluded from the study.

Data collection

A checklist was developed to recollect data that were pre-tested, which have socio-demographic variables, obstetric history and outcome of uterine rupture. The checklists were prepared in English. Data were extracted from patient record cards, registration books and operation theater cards available in the hospital by using checklist questionnaires by five teams of four data collectors and one supervisor. All data collectors and supervisors were selected using their previous experience in data collection, and being a nurse and midwife by profession. Prior to the start of data collection, 2 days of training were provided by the investigators for the data collectors and supervisor to orient and familiarize the teams with the study objectives and tools. Then the data collectors reviewed those who were fitted to the selection criteria cards of the uterine rupture managed mothers.

The quality of the data was assured by a properly designed data collection format. It was managed by appropriate supervision of data collectors. The questionnaires were pretested at YGTH from 2011 medical cards for those mothers who had the uterine rupture management and discussion held to improve the data collection tools. To ensure data quality we checked data completeness and consistency on a regular basis. The correctness of entered information were also checked by re-reviewing the patients' medical cards.

Data entry, analyses, and processing

The collected data were checked for errors, code, enters, clean, and analyze by SPSS version 20.0 statistical packages. No missing data were observed. Descriptive statistics (mean ± standard deviation, frequencies, and proportions) were used to summarize the socio-demographic characteristics of the study participants and logistic regression analysis were conducted to assess the risks of uterine rupture management outcome with a 95% CI and P-value 0.05 taken as the level of significance. The variables with a p-value less than or equal to 0.25 or unadjusted odds ratios show significant association was entered into the multivariate binary logistic regression. The goodness of fit was tested by the Hosmer-Lemeshow statistic which is not significant p-value >0.05 and omnibus test which is significant P-vales <0.001.

Operational definitions

Uterine rupture: Uterine rupture during pregnancy is the disruption of the uterine wall [1].

Management Outcome of uterine rupture: Is a maternal condition which ends up with survival, complications, or death after operative management for uterine rupture [11].

Stillbirth: The expulsion of a dead fetus and/or weighing at least 1kg with an absence of breathing, heartbeats, pulsation of the umbilical cord with a rupture uterus [5].

Good outcome: Those mothers with uterine rupture who survived and discharged after operative management for uterine rupture without any complication [18].

Poor outcome: Mothers with uterine rupture who did not survive or developed severe complications after operative management for uterine rupture [12].

Pelvic collection: is defined as an accumulation of toxic substances in the pelvic cavity that is manifested by high -grade fever more than 38 degrees Celsius, heart rate >90 beats per minute and respiratory rate >20 breaths per minute.

Results

Socio -demographic characteristics

During the six years of study, there were 345 cases of the ruptured uterus at Yirgalem general hospital. Of these, only 331 case notes were available for analysis. And a total of 331 patients managed with uterine rupture were retrieved. The remaining 14 cases were excluded from the study unit by the exclusion criteria; due to four cards lost from the card room and the rest ten cards had held grossly incomplete data.

The mean age of the patients was 31.47 (SD ±5. 65) years with a range of 18 -40 years. Rural dwellers accounted for 280 (84.6%) and the urban for 51 (15.4%). (Table 1)

Obstetric profile of patients

The parity of the patients ranged from 1-11 with a mean of 4 (SD +2.75). Among the patients who were managed with uterine rupture, 170 cases (51.4%) were of Para II-IV, 132 (39.9%) cases were Para V and above and the remaining 29 (8.8 %) were primipara. Above half of the cases, 196 (59.5%) had no ANC follow up. The gestational age at the time of admission was ranged between 37-42 weeks in 258 (77.9%) and 73 (22.1%) were >42weeks of gestation. (Table 2).

Clinical features

The most common complaints of the patients were abdominal pain 301 (90.9%), followed by vaginal bleeding 280 (84.6%) and cessation of uterine contraction 265 (80.1%). The most common physical finding among patient with uterine rupture were absent fetal heartbeat 306 (92.2%), easily palpable fetal parts 292 (88.2%), followed by confounding the diagnosis of shock 248 (74.9%) and sepsis 149 (45%). Almost for all (100%) of patient hemoglobin before the operation was done; 172 (52%) of patients were with hemoglobin in the range of 7-10mg/dl Cause of uterine rupture.

The most common cause of uterine rupture among patient with uterine rupture was Cephalo-pelvic disproportion 167 (50.5%) followed by malpresentation and imposition 140 (42.3%), previous uterine scar 62 (18.3%). (Table 4).

Intra and postoperative condition

Among patient with uterine rupture; 285 (86.1%) were a complete uterine rupture. The common site of rupture was anterior and lower segment 266 (80.4%) of patients followed by left lateral rupture 33 (10%) of patients. There were 12 (3.6%) of cases with bladder rupture. Intraoperatively the procedures take 1hr to 4hrs (mean= 1.94&SD =0.89). Blood was not transfused for about half of the cases 167 (50.5%) of cases.

Management of uterine rupture and management outcome

In this study almost half of uterine rupture cases 164 (49.55%) subtotal abdominal hysterectomy was performed; followed by 115 (34.74%) total abdominal hysterectomy. (Figure 1).

The most common postoperative complications observed in the uterine rupture cases were wound site infection 131 (39.6%), anemia 129 (39%) and pelvic collection 112 (33.8. Among the 331 uterine rupture managed in Yirgalem general hospital during the study period, only 96 (29%) cases had no complication. (Table 5).

Maternal and Neonatal Outcome

There were 13 (3.9%) of maternal death, majority 8 (61.5%) of patients were died of with multiple organ failure secondary to septic shock and 5 (38.5%) of patients died with cardio respiratory arrest secondary to hypovolemic shock. (Figure 2) Regarding the overall outcome of mothers, 235 (71 %) had a poor outcome, 224 (67.7%) of patients were staying in the hospital for 8-30 days.

There were 320 (96.7%) of neonatal death, of these neonatal deaths 310 (93.7%) were freshly dying and 10 (3.3%) of them were macerated. (Figure 3).

Factors associated with the poor management outcome of uterine rupture

Binary logistic analysis shows; rural residence, uterine rupture mothers who had not attended ANC follow up, mothers who were stayed in labor for more than 24 hours, duration of hospital stay before operation above 4 hours, intra-operative duration greater than 2 hours, Patient presented with sepsis (septic shock), Complete uterine rupture, Patient who were not transfused with blood, and hemoglobin level <7mg/dl at admission had significant associations with the poor (unfavorable) management outcome of uterine rupture.

In a multivariate logistic regression analysis after controlling the effects of other variables which showed to have a significant association in bivariate analysis, five were found to have a statistically significant association with the poor management outcome of uterine rupture. These are; ANC, duration of labor >24hours, the presence of sepsis, not transfused blood and intraoperative duration >2hours.

The result revealed that mothers who did not attend any ANC follow up during their pregnancy has a poor management outcome of uterine rupture than those who were attending ANC (AOR=2.21; 95% CI: 1.1,4.5) and duration of labor more than 24 hours has a strong association with the poor management outcome of uterine rupture (AOR=3.6; 95% CI: 1.7, 7.4). The odds of patients presented with sepsis were 3 times poor management outcome of uterine rupture than their counters (AOR=2.9; 95% CI: 1.4, 6.1). Mothers who did not transfuse with blood have 4 times poor outcome than who were transfused (AOR=4; 95% CI: 2.1, 7.9). Prolonged surgical procedures > 2hrs (AOR=5.5; 95%CI: 2.8, 10.8) has statistically associated with the poor management outcome of uterine rupture. (Table 6).

Discussion

This study shows that out of the total study subjects, the poor management outcome of uterine rupture for the mothers 217 (71%) was still high and remains one of the serious obstetrics complications and catastrophic condition. Failure to attend ANC follow up, prolonged duration of labor more than 24hour, presence of sepsis, prolonged duration of the surgical procedure and not available blood transfusion are statistically significant associated factors.

Overall, 71% of mothers who had a history of uterine rupture developed poor management outcome. This finding was similar to a study conducted at the Mendefera zonal Hospital and higher than a study done in Suhul general hospital and in Belgium (15%) [7,9,17]. On the other hand, it is lower when a study conducted at a Sultana Zanana hospital India [11]. This variation could be due to a delay of health-seeking behavior of the patient, poor quality of health care service, shortage of blood and blood products for transfusion, prolonged operating time due to professional technical skill problems and the suitable fulfillment of infrastructures and socio-demographic deference.

It is obvious that maternal morbidity and mortality increases in the case of uterine rupture. During this period there were 13 maternal deaths occurred in this hospital after having performed obstetric hysterectomy due to the causes of heavy vaginal bleeding that leads to hypovolemic shock, lack of blood transfusion, patients they develop sepsis before and after the operation for sake of improper care faced to multiorgan failure. This result is almost comparable with a study done in Debremarikos Hospital [18]. But it is below the study done in Shasemene Hospital [19]. The main reason for this might be a difference in the timely diagnosis of uterine rupture and the adequacy of the resuscitation of patients.

In this study prolonged labor/obstructed labor was statistically significantly associated factors in the poor management outcome of uterine rupture. The possible explanations could be like the labor became more prolonged uterine muscle become exhausted, stretched, loses its strength and unable to resist a strong uterine contraction and finally end up with rupture; then the patient starts to bleed, develop shock and different post rupture complications and the fetus become distressed even death. This finding is consistent with the studies conducted in Suhul General Hospital at Tigrai, Mizantepi Hospital, and Nnamdi Azikiwe University Teaching Hospital Nnewi, Southeast Nigeria [7,12,13].

This study showed those mothers who had no antenatal care (ANC) follow up are at risks of developing poor management outcome. ANC follow up is crucial for early identification of risky pregnancies, it has a pivotal role in averting the sequel of obstetric-related management tragedies of uterine rupture. The possible reasons may be mothers who have no ANC follow-up are more likely laboring at home for a longer duration of time due to lack of awareness of institutional delivery, after developed danger obstetrics complications they come to the institution, ultimately it is difficult to manage them which leads to increase maternal mortality and morbidity. This finding is in line with a study done at Suhul General Hospital in Tigray [14].

A statistically significant association was also seen between the duration of the surgical procedure >2 hours and poor management outcome of uterine rupture. The main reason might be due to prolonged surgical procedure the patient losing a lot of blood may lead to interpretive cardiovascular collapse and postoperative anemia, risk of blood transfusion, disseminated intravascular coagulation, and because of patient exposed for a long time to anesthesia drugs which predispose to the patient for aspiration pneumonia and other drug side effects. In addition to this, professionals may be lack of experience and skill leading thus this take too long hours. The same result was reported from a study conducted at the University of Pakistan teaching hospital [15].

The study also revealed that a lack of blood availability is a statistically significant association with the poor management outcome of uterine rupture. This association due to the fact that, obstetrics is a bloody business and when blood is not available for the ruptured hemodynamically compromised patients indeed they suffered from pre, intra and postoperative complications, prolonged hospital stay, anemia, and its complications leads to the patient for cardiac, respiratory and renal insufficiency and delay of wound healing. This finding is congruent with a study conducted in Medical college of India [16].

Another statistically associated factor was the presence of sepsis. A mother who has had a history of sepsis more likely to develop complications and multiple organ dysfunctions related to uterine rupture due to the reason of infection-related hypotension and unbalanced inflammatory response [1,11]. In this study 96 (29%) had developed sepsis and of which 80 (83.3%) had an unfavorable management outcome. A similar finding was reported from a study done at Muhimbili National Hospital, in Tanzania by 2012, 81.2% of sepsis patients had a poor management outcome. 20 The possible explanations for this association could be patients who had sepsis were at high risk of developing multiorgan failure, due to aggressive immune-mediated organ injury leading to severe septic shock and then death. They are also susceptible to another severe disease, hypothermia, and leucopenia [1,11].

The result of this study was obtained only from reviewing of the patients' medical cards and not supported by observation and interviewing of the patients and Poor documentation of patient cards and files was one of the challenges of the study.

Conclusions

This study revealed that the majority of mothers with uterine rupture managed in Yirgalem General and Teaching Hospital had a poor management outcome. Lack of ANC follow up, longer duration of the surgical procedure, prolonged duration of labor, lack of blood transfusion and pre and postoperative complications are associated with poor management outcome. Therefore, the government and other responsible bodies should give much attention for Proper ANC follow up offered by health profession for any pregnant mother from early pregnancy till delivery, thus that can facilitate early identification of high-risk mothers and survival of patients after uterine rupture depends on the time interval between rupture and interventions and the availability of blood products for transfusion. The intraoperative management should be shortened by the trained health professional in order to get for a successive and effective outcome.

Abbreviations

AOR: Adjusted Odds Ratio

ANC: Antenatal Care

SNNPR: Southern Nation Nationalities People Region

YGTH: Yirgalem General and Teaching Hospital

Declarations

Ethics approval and consent to participate

Approval of this study was given by the research and the ethics committee of the School of Public Health and the Institutional Review Board of the College of Medical and Health Sciences at Hawassa University. Permission to undertake this study was also obtained from Yirgalem general hospital administrative director then an official letter was sent to the card room from the chief clinical service officer of the hospital. Since this study was undertaken from secondary data, there is no mother who was interviewed face to face and the accordingly consent waiver was requested and granted from the aforementioned IRB. To keep the privacy of the mother's history, the name of the mothers was not included in the study; rather code was given for each card.

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

Funding

No funding was received for this research.

Author contributions

HH, AG and KT were involved in the conception and design of the study, data collection, data supervision, data processing, cleaning, analysis and interpretation of the results, and developing the manuscript and gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

Acknowledgments

The authors would like to thank Hawassa University, College of Medicine and Health Sciences for supporting financially to carry out this research. We are thankful to Yirgalem General and Teaching Hospital, Obstetrics and Gynecology department, office of the Medical Director and Operation staff. Lastly, the authors would like to thank the data collectors and card office workers, without whom this study could not have been conducted.

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Tables

Table1 Socio-demographic characteristics of patients who were managed for uterine rupture in Yirgalem general and teaching hospital ,Sidama Zone, southern Ethiopia, ,2017

Variables (N=331).	Category	Frequency (N)	Percent (%)
Age (Years)	<20	14	4.2
	20-24	19	5.7
	25-29	81	24.5
	30-34	93	28.1
	= >35	124	37.5
Place of residence	Rural	280	84.6
	Urban	51	15.4

Table 2 Obstetric profile of patients who were managed for uterine rupture in Yirgalem general and teaching hospital, Sidama Zone, southern Ethiopia, 2017

Variables(N=331).	Category	Frequency (N)	Percentage (%)
Gestational age in weeks	37-42	258	77.9
	>42	73	22.1
Parity	Primipara	29	8.8
	2-4	170	51.4
	>= 5	132	39.9
Duration of labor	<12hrs	24	7.3
	12-24hrs	151	45.6
	>24hrs	156	47.1
Mother came by referral	Yes	154	46.5
	No	177	53.5
Duration of hospital stay before operation in hrs.	<4hrs	184	55.6
	>=4hrs	147	44.4
ANC follow up	Yes	134	40.5
	No	197	59.5

Table 3 Clinical features of patients who were managed for uterine rupture in Yirgalem general and teaching hospital , Sidama Zone, southern Ethiopia, 2017

Variables (N=331).	Category	Frequency (n)	Percent (%)
Clinical features	Abdominal pain	301	90.9
	Vaginal bleeding	280	84.6
	Cessation of uterine contraction	265	80.1
Physical findings	Absent fetal heart beat	306	92.2
	Easily palpable fetal parts	292	88.2
	Shock	248	74.9
	Sepsis	149	45

Table 4 Causes of uterine rupture in Yirgalem general and teaching hospital , Sidama Zone, southern Ethiopia, 2017

Variables (N=331)	Frequency (n)	Percent (%)
Causes		
CPD	167	50.5
Malpresentation	140	42.3
Previous uterine scar	62	18.7
Instrumental delivery	23	6.9
Augmentation and Induction	23	6.9
Destructive delivery	5	1.5

Table 5 Post-operative complication of mothers managed with uterine rupture in Yirgalem general and teaching hospital , Sidama Zone, southern Ethiopia, 2017

Variable	Category	Frequency (N)	Percent (%)
Complication	Wound site infection	131	39.6
	Anemia	129	39
	Pelvic collection	112	33.8
	Pneumonia	47	14.2
	Urinary tract infection	36	10.9
	Vesico-vaginal fistula	7	2.1
	No complication	96	29

Table 6 Factors associated with poor management outcome of uterine rupture at Yirgalem general and teaching hospital , Sidama Zone, southern Ethiopia, 2017

Variables	Poor management outcome of uterine rupture		COR(95%CI)	AOR(95%CI)	P-Value
	Yes (%)	No (%)			
Residence					
Urban	25(48%)	27(52%)	1	1	
Rural	210(76%)	69(24%)	3.3(1.8-6)*	1.5(0.67-3.5)	>0.05
Duration of hospital stay before operation					
<4 hour	95(56%)	77(44%)	1	1	
=>4 hour	140(88%)	19(12%)	6(3.4-10.5)*	1.7(0.8-3.5)	>0.05
Type of uterine rupture					
Complete	216(76%)	69(24%)	4.5(2.33-8.41)*	1.76(0.8-3.9)	>0.05
Incomplete	19(42%)	27(58%)	1	1	
Hemoglobin level					
<7gm/dl	56(91.8%)	5(8.2%)	5.7(2.2-14.7)*	2(0.6-6.7)	>0.05
=>7gm/dl	179(66.3%)	91(33.7%)	1	1	
ANC					
Yes	67(50.00%)	67(50.00%)	1	1	
No	168(85.23%)	29(14.72)	5.8(3.5-9.7)*	2.21(1.1-4.5) *	0.029
Sepsis					
Yes	133(89.3%)	16(10.7%)	6.5 (3.6-11.8)*	2.89(1.4-6.1) *	0.005
No	102(56%)	80(44%)	1	1	
Duration of lab or in hr.					
>24 hr.	137(87.7%)	19(12.3%)	5.67(3.2-9.9)*	3.56 (1.7-7.4) *	0.001
<24 hr.	98(56%)	77(44%)	1	1	
Blood transfused					
Yes	99 (60.4%)	65 (39.6%)	1	1	
No	136 (81.4 %)	31 (18.6%)	2.9(1.7-4.7)*	4 (2.1-7.9) *	0.000
Surgery length					
=>2hrs	179(87.7%)	25(12.3%)	9.1(5.2-15.5)*	5.5(2.8-10.8) *	0.000
<2hrs	56(44%)	71(56%)	1	1	

*Note: *p<0.05.*

Abbreviations: COR, crude odds ratio; AOR, Adjusted odds ratio

Figures

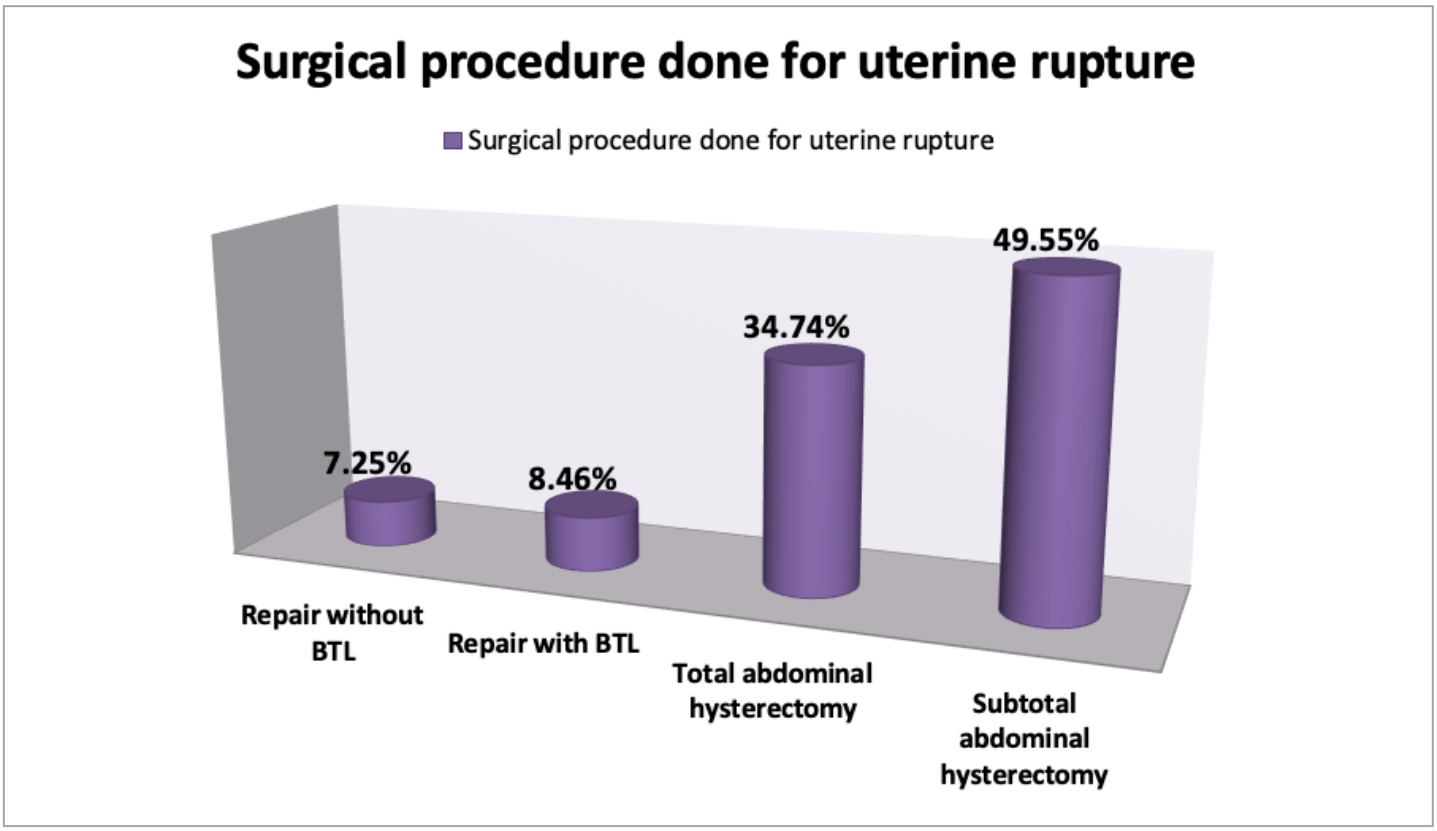

Figure 1

Surgical procedure done for uterine rupture in Yirgalem general and teaching hospital , Sidama Zone, southern Ethiopia, 2017.

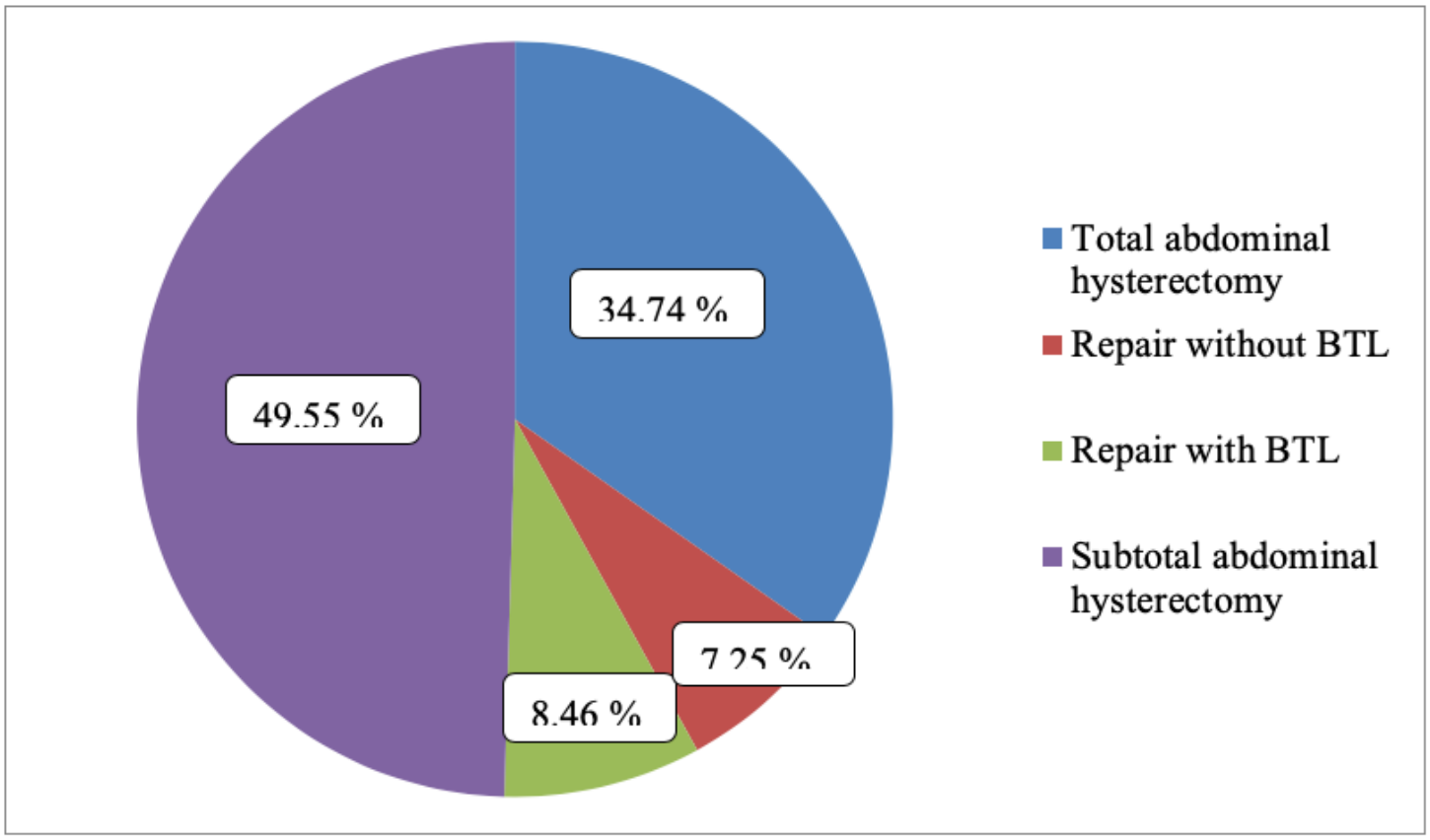

Figure 2

Maternal outcomes of uterine rupture in Yirgalem general and teaching hospital, Sidama Zone, southern Ethiopia, 2017.

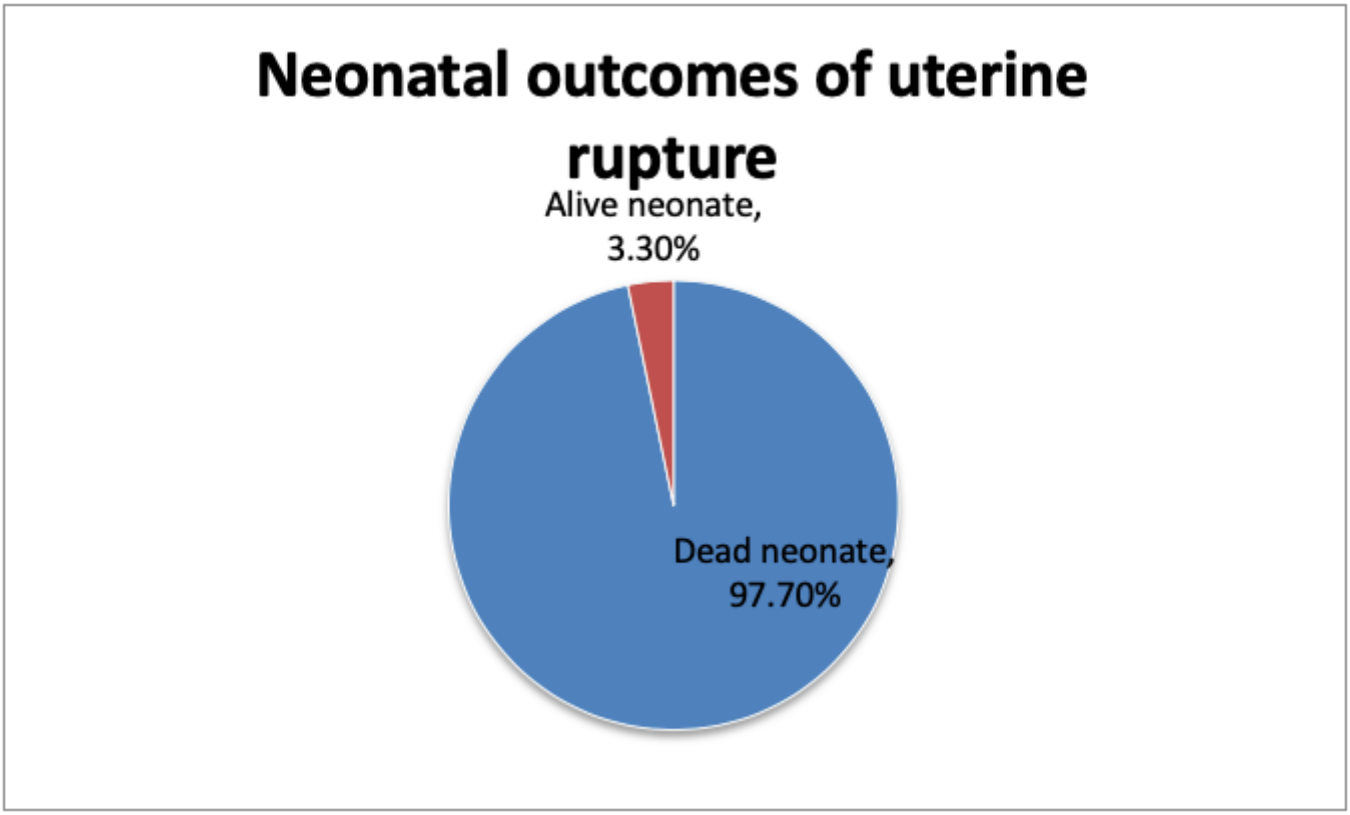

Figure 3

Neonatal outcomes of uterine rupture in Yirgalem general and teaching hospital, Sidama Zone, southern Ethiopia, 2017.