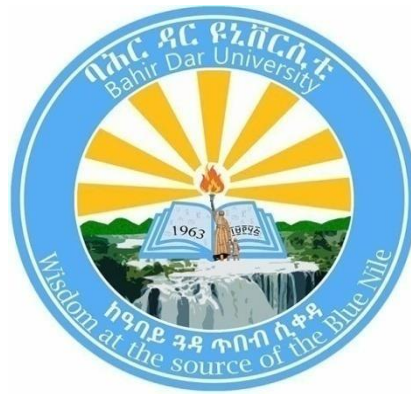2021-03

# Determinants of Uterine Rupture Among Women Who Gave Birth at Public Hospitals in Bahir Dar City, Northwest Ethiopia

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DETERMINANTS OF UTERINE RUPTURE AMONG WOMEN WHO GAVE BIRTH AT PUBLIC HOSPITALS IN BAHIR DAR CITY, NORTHWEST ETHIOPIA

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| Study Area | Bahir Dar |

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# ABBREVIATION /ACRONYMS

ANRS       Amhara National Regional State

ANC       Ante Natal Care

AOR       Adjusted Odd Ratio

C/D       Cesarean Delivery

CI       Confidence Interval

COR       Crude Odd Ration

CPD       Cephalo Pelvic Disproportion

C/S       Cesarean Section

EDHS       Ethiopian Demographic Health Survey

GA       Gestational Age

RH       Reproductive Health

SSA       Sub Sahara Africa

SVD       Spontaneous Vaginal Delivery

VBAC       Vaginal Birth after Cesarean section

WHO       World Health Organization

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# ABSTRACT

**Background:** Uterine rupture is a spontaneous tearing of the uterus during pregnancy or labor, resulting in serious obstetric complications. It is still a major and deadly public health problem causing maternal and neonatal mortality and morbidity in Ethiopia. Maternal mortality due to uterine rupture accounts for around 22.3%. However, there is a dearth of information about determinants of rupture of the uterine membrane in Ethiopia.

**Objective**: To assess determinants of uterine rupture among women who gave birth at Public hospitals in Bahir Dar city Northwest, Ethiopia 2020.

**Methods**: An institutional-based case-control study was conducted among 558 women (140 cases and 418 controls) from November 29 to December 24/2020. Participants were selected using a simple random sampling technique by using SPSS. We used the checklist to extract data from client's logbook and client's card. Data were entered, cleaned and coded using EpiData and exported to SPSS version 23 for analysis. Both descriptive and logistic regression analyses were performed. On bivariable analysis, variables with p-value <0.2 were kept in multivariable analysis. Variables with P-value <0.05 in the multivariable analysis were used to declare as statistically significant. The odds ratio (OR) with a 95% confidence interval (CI) was used to measure the strength of association.

**Result:** Multi variable analysis showed that, women from rural resident (AOR = 2.5; 95% CI: 1.31, 4.80)), women who had a history of previous cesarean section ((AOR = 3.3; 95% CI: 1.6, 6.47) and abortion (AOR = 2.56; 95% CI: 1.28, 5.13)) were more likely to experience rupture of uterine membrane. Besides, women who had one to two antenatal care visits (AOR = 7.3; 95% CI: 3.7, 14.3). Women who faced obstructed labor AOR =6.8; 95% CI: 2.89, 16.14) and Women with multiparity ((Primipara (AOR=8.3 95%CI: 2.8-24.6)**,** Multipara (AOR=10.9, 95% CI: 4.34-27.5)**,** grand multipara (AOR=4.3, (1.03-17.98) were more likely to experience rupture of uterine membrane.

**Conclusion and recommendation:** This study revealed that resident, number of antenatal care visits, obstructed labor, history of abortion, cesarean section, obstructed labor, and party were determinants of uterine rupture. Therefore, strengthening antenatal care service uptake may reduce uterine rupture. Moreover, more emphasis for care and support should be given to women who had a history of Cesarean section, abortion, women with multiparity, and rural women at any effort. **Keywords**: Uterine rupture, determinates, birth, Bahir Dar, Ethiopia.

# 1. INTRODUCTION

## 1.1 Background

Uterine rupture is the spontaneous tearing of the uterus during pregnancy and labor. It is a serious complication of pregnancy in which is occur during pregnancy or early labor(1). There are two main of types uterine rupture, this is complete(the uterine contents can escape in to the peritoneal cavity) and incomplete (the peritoneum overlying the uterus is intact)(2). Pressure builds as the baby moves through the mother's birth canal, this pressure can cause uterine rupture(3). The initial clinical features of uterine rupture are non-specific, the most common presenting symptom is sudden severe abdominal pain, which persists between contractions, shoulder tip pain and vaginal bleeding(4).

Uterine rupture contributes to both fetal and maternal mortality, serous morbidities and loss of fertility from a hysterectomy(5).The severity of fetal and maternal morbidity depends on the extent of uterine rupture. These serious obstetric complications, particularly in less and least developed countries(6).

The incidence is high due to socio economic factors, cultural practices and lack of access to antenatal and intra-partum care, poor obstetric care, few comprehensive emergency care facilities(7).Uterine rupture is still one of the major public health problems in developing countries that endanger the life of many mothers(8).

Ethiopia Federal Ministry of Health is providing curative health services to the community as one of the priorities. The number of governmental hospitals in the country has increased and improved comprehensive emergency obstetric care  and basic emergency obstetric care; it is also trying to change the cultural preference of home delivery through better transport, access to prenatal care, obstetric training and exempted service charges for laboring mothers (9).

Regardless of those active measures, uterine rupture is still a major and deadly public health problem in Ethiopia(10).Therefore this study intended to identify determinates  of uterine rupture among women who given birth at public hospitals in Bahir Dar city.

## 1.2 Statement of the problem

A uterine rupture is a rare event in a developed country. It is still one of the major public health problems in developing countries that endanger the life of many mothers(3). The prevalence uterine rupture tends to be lower in developed countries than developing countries. The prevalence rate of uterine rupture in developed country was 0.006 %(11).

Globally, the incidence of uterine rupture during pregnancy was 0.07%  and 9.5% of  maternal death and 76.2% of perinatal death were due to uterine rupture(12).The prevalence of uterine rupture in Africa was 1.3%. Twelve to 25% of maternal mortality and 93% of perinatal mortality were due to uterine rupture(13, 14). In South Africa, ruptured uterus is responsible for 6.2% of deaths due to direct causes and 3.7% of all deaths(15).

In Ethiopia, the prevalence of uterine rupture was ranged from 2% to 14.7%(16, 17), maternal mortality due to uterine rupture accounts around 22.3%(18).In Amhara Regional Prevalence of uterine rupture was ranged from 5% to 14.7%(17, 19), of this 2.7- 9% of the mothers died due to uterine rupture(20, 21).

In the study area, the incidence of uterine rupture was 0.9% (1 in110).Women with uterine rupture are faced 97.4% for anemia, 7.7% for vesico-vaginal fistula and 2.7% for maternal death due to uterine rupture(20).

There are multiple factors for uterine rupture such as, use of uterotonic drugs, pervious C/S, multiparty, prolonged labor, lack of ANC, obstructed labor, post term , not use partograph and young age are enhance the occurrence of uterine rupture(22-24).

There has been a scarcity studies conducted to investigate determinants of uterine rupture in this study area and previous studies in the Amhara region cannot address history of abortion as the cause of uterine rupture.

Therefore, the aim of this study was to identify determinants of uterine rupture among women who gave birth at public hospitals in Bahir Dar city.

## 1.3 Significance of the study

The study focuses on determinants of uterine rupture in Bahir Dar city public hospitals. The result of this study will help to reduce the incidence of uterine rupture for laboring mothers inform regional health bureau, governmental and nongovernmental implementer, Bahir Dar administrative city hospitals and maternal health service provider/practitioners to identity evidence-based intervention to reduce maternal morbidity and mortality due to uterine rupture. This study serves as reference for other researchers interested to working on determinates of uterine rupture.

## 2. LITERATURE REVIEW

## 2.1 Determinants of uterine rupture

There are many determinant of uterine ruptures, these are related to obstetrics, methods of managements and follow up and socio demographic factors(24).Obstetrical factors including parity, obstructed labor, onset of labor, malpresentation, birth weight, history of abortion, duration of labor have all been reported to affect the risk of uterine rupture(21, 23, 24).

Factors related to management and follow up includes partograph use, methods of induction and augmentation, ANC status, referral from facility, instrumental delivery , destructive delivery, history of caesarian section, number of previous cesarean section, types of C/S, history of uterine rupture, inter-delivery interval are reported to affect the risk of uterine rupture(16, 24, 25).Factors related to socio demographic are age and residence have all been reported to affect the risk of uterine rupture(13, 26).

## 2.1.1 Socio-demographic factors

Age and residence were factors that determining uterine rupture in developed and developing countries(13, 26, 27). A study from Australia and Yemen  found 22%, 26% of women respectively  with uterine rupture were age of 30 to 49 years (14, 27).Study conducted in Nigeria and Uganda  shows that Most of uterine rupture were aged between 20-34 years(13,28).

Study conducted in Ethiopia shows that 31.2% –85% of women who had uterine rupture were in the age range of 19–35 (21,24,25,29,30).

Residence also another determinants of uterine rupture in Ethiopia.75.4% − 95.5% of woman with uterine rupture were rural residence (21,24,29,30).

## 2.1.2 Obstetric factors

Parity was factors that determining uterine rupture. In a study from India, 17.9% of emergency obstetric hysterectomy cases were caused by uterine rupture(31). In another study from India, Most common risk factor were multiparous greater than three(54%)(32). Among studies conducted in Middle East, a study from Yemen found the parity greater than five was a risk factors for uterine rupture(14).Studies  reviled that macrosomic baby (1.9%) were risk factor for uterine rupture(13, 33).

Studies in Ethiopia shows that 47% of woman with uterine rupture where multiparous woman (24, 34), whereas 85.7% of woman with uterine rupture were grand multipara(26). Other study also shows parity greater than two were associated with the presence of uterine rupture(20, 21, 26). And also multi gravida (38.6%) were highly associated with uterine rupture(24, 34).

Obstructed labor and prolonged labor was determining factor to uterine rupture, studies in Ethiopia shows that 30.7%- 89.3% of woman obstructed labor were develop uterine rupture and woman with Prolonged labor (52% to 54.7%) were develop uterine rupture(24, 34).

Different study's shows malpresentation were risk factors to uterine rupture. Twenty one percent to 83.3% of woman with malpresentation were develop uterine rupture(26).

## 2.1.3 Management and follow up related factors

Studies shows that methods of labor induction or augmentation, ANC follow-up status, partograph use, trial of instrumental delivery, destructive delivery, history of caesarian section and referral from facility were determining uterine rupture(13, 21, 24, 35, 36).

In study from India, most common risk factor was previous caesarean section (59.7%). 3.7% uterine rupture cases were due to two previous cesareans deliveries(32).

Intervals of pervious C/S were one determinant factors of uterine rupture. In a study from the United Kingdom, short interval since last C/S were risk factors for uterine rupture(37). In another study from London, 2.3% were due to an inter delivery interval of less than 18 months(38).

Pervious emergencies of C/S were not risk factors for uterine rupture(35).Where as other study show uterine rupture was lowest for elective pervious C/S (0.7/1000) and much higher when C/S was unplanned emergency C/S (7.1/1000)(36).

Findings from African countries, such as Nigeria, Uganda and Tanzania demonstrate much worse situation in the rate of uterine rupture. Of these, 40% of rupture occurred in unscarred uterus(28, 33). In Uganda, previous cesarean delivery(36%), were risk factor for uterine rupture(13, 33).

In southern Ethiopia; 87% of uterine rupture cases were occurred in unscarred uterus(39);where as 3.7% to 56.8% of uterine rupture case were due to previous caesarian section scar(20, 21, 26).

Women with prior uterine rupture were enhance the occurrence of uterine rupture, women who have experienced a pervious uterine rupture confined to the lower uterine segment are reported to have high incidence (6%) of recurrent uterine rupture with labor, those in whom the prior rupture involved the upper rate as high as 32%(40).

In a study from the United Kingdom, labor induction or augmentation was risk factors of uterine rupture (4). Induction with prostaglandin (54.2%) and oxytocin (44%) are risk factors of uterine rupture(35).Use of misoprostol in uncontrolled dosages (above 25ug) for labor induction were increase the risk of uterine rupture(6). In a study from Yemen, using uterotonic drugs for induction or augmentation of labor were risk factors for uterine rupture(14).

Attending ANC for less than 2 visits were also risk factors for uterine rupture(14). Other study shows that  attended ANC less than four (82.5) and referred from facility (49%) were predisposing factors for uterine rupture(13).

studies in Ethiopia found that women at increased risk of uterine rupture were those who did not have antenatal care during pregnancy(16, 21, 24, 25, 39), not using partograph(13, 16) had trial of instrumental delivery(21),had distractive delivery and referral from facility were positive associated with uterine rupture (26).

Despite multiple studies show that uterine rupture is the major causes of maternal and fetal mortality, risk factors resulting in uterine rupture were vary  across different studies, high lighting the need for contextually relevant understanding of determinants of uterine rupture in each setting. Thus, the aim of this study is to assess determinants of uterine rupture among women who gave birth at public hospitals in Bahir Dar city.

## 2.2 Conceptual Framework

The conceptual framework for determinants of uterine rupture in Bahir Dar city public hospitals. It was adapted from different literatures.
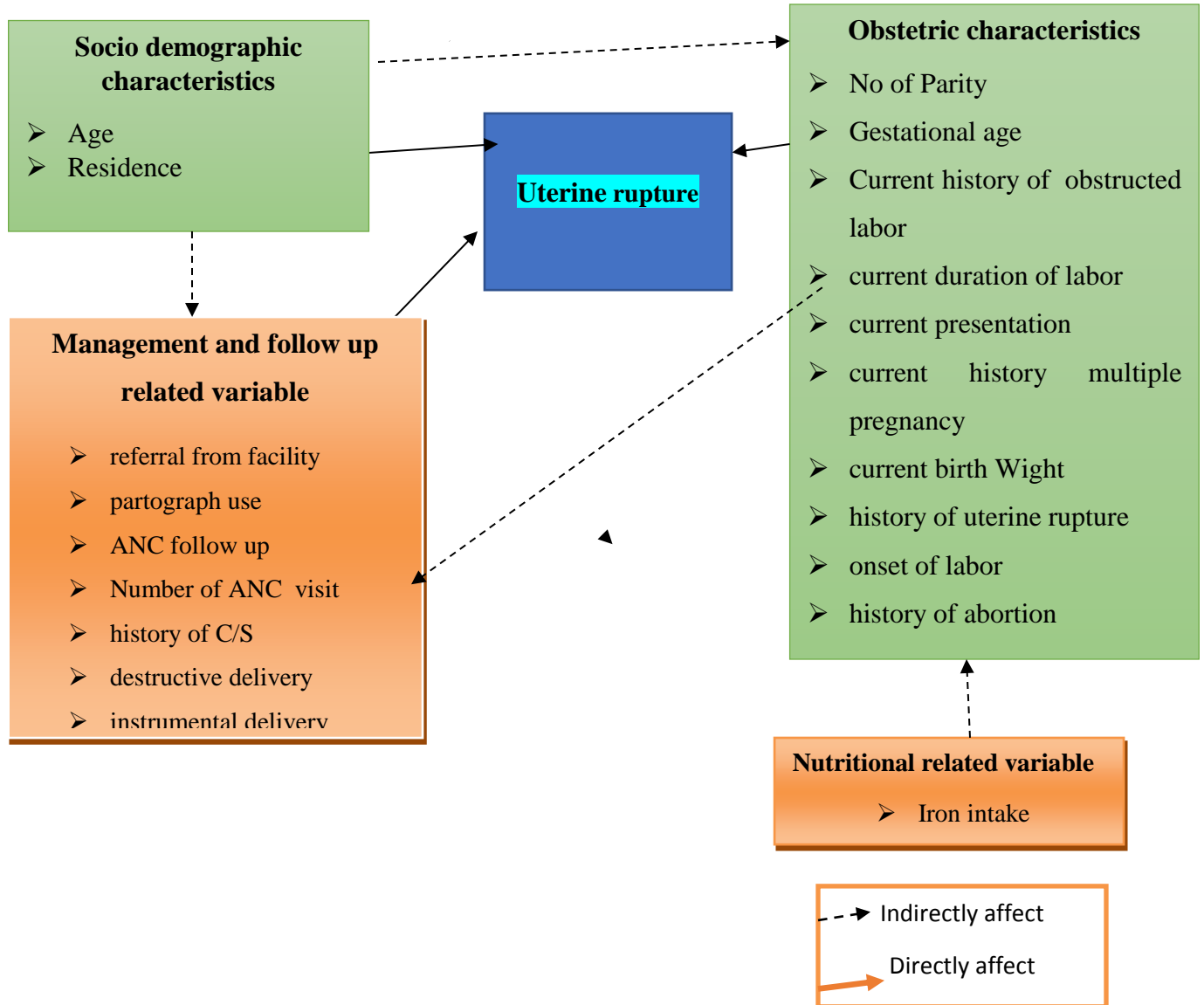


Figure 1. Conceptual framework for determinants of uterine rupture among women who gave birth at public hospitals in Bahir Dar city from 2017 to 2020 G.C.

# 3. OBJECTIVE OF THE STUDY

## 3.1General objective

To assess the determinants of uterine rupture among mothers who gave birth at Public hospitals in Bahir Dar city, Northwest Ethiopia 2020.

# 4. METHODS AND MATERIALS

## 4.1 Study area

The study was conducted in Bahir Dar city administration. It is located 565 km Northwest of Addis Ababa. There are three public (one primary and two specializations) hospitals in Bahir Dar city. These are Felege Hiwot comprehensive specialized hospital, Tibebe Giwon Specialized hospital and Addisalem primary hospital. These hospitals together serve more than five million catchment populations and serve as a referral site for neighboring health centers and district hospitals. All these public hospitals provide gynecologic and obstetric care. Averagely there are about 9,853 deliveries per year in this hospitals, among these 35%  are caesarian deliveries(41).

## 4.2 Study design and study period

Institutional Based unmatched case-control study was conducted from September 2017 to August 2020. The data was collected from 29/11/2020 to 24/12/2020.

## 4.3 Populations

### 4.3.1 Source population

All women who gave birth in the last three years (from September 2017 to August 2020) at public hospital in Bahir Dar city.

### 4.3.2 Study population

All women who gave birth last three years (from September 2017 to August 2020) at public hospital and experienced uterine rupture as case.

All women who gave birth in the last three years (from September 2017 to August 2020) at public hospital and didn't experience uterine rupture as control.

## 4.4 Eligibility criteria

### 4.4.1 Inclusion criteria

All women who gave birth in the last three years (from September 2017 to August 2020) at public hospital in Bahir Dar city experienced uterine rupture and registered on registration book as case.

All women who gave birth in the last three years (from September 2017 to August 2020) at public hospital in Bahir Dar city cannot experienced uterine rupture and registered on registration book as control.

### 4.4.2 Exclusion criteria

All women who gave birth in the last three years (from September 2017 to August 2020) at public hospital in Bahir Dar city with incomplete obstetric records were excluded.

## 4.5 Sample size determination

The sample size for these study determined by using Epi- info version 7.1 considering the main factor for uterine rupture based on previous literature conducted in Ethiopia (23).On the assumption of power 80%, confidences interval 95%, control to case ratio 3 to 1, proportions of control exposed 23.2% and proportions of case exposed 36 %. Accordingly, a total sample size of 558 women (140 cases and 418 controls) including in the study.

Table 1: sample size determination for determinants of uterine rupture who gives birth at public hospitals in Bahir Dar city during September 01, 2017 to August 2020 G.C.

| Factors | CI (%) | Power (%) | Percentage of control exposed | Percentage of cases exposed | Odds Ratio | Control to case ratio | Sample size | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Cases | Controls |
| Residence >10 KM(42) | 95 | 80 | 61 | 81.1 | 2.74 | 3 | 61 | 182 |
| Attending ANC(42) | 95 | 80 | 40.8 | 63.3 | 2.5 | 3 | 57 | 170 |
| Malpresentation(24) | 95 | 80 | 5.34 | 15.9 | 3.34 | 3 | 93 | 277 |
| Labor induction/augmentation (23) | 95 | 80 | 23.2 | 36 | 1.86 | 3 | 140 | 418 |

## 4.6 sampling methods and procedure

The sampling frame was developed based on the client's medical registration number recorded on the logbooks in the labor wards and operating rooms over the 3 years from September 2017 to august 2020. Using this frame, case and control were selected by simple random technique using SPSS. The samples will allocate proportionally based on the last three years of case and controls. Incomplete woman's cards (that didn't fulfill our questionnaires) will skip and the next card was considered.

**Table 2:** proportional allocation of sample size for determinants of uterine rupture in Bahir Dar city public hospitals.

| No | Health institutions name | No of case reported in last 3 years | No of controls reported in last 3 years | Allocated sample for case | Allocated sample for control |
|---|---|---|---|---|---|
| 1 | F.H.C.S.H | 128 | 13,685 | 97 | 210 |
| 2 | T.G.S.H | 15 | 6210 | 12 | 95 |
| 3 | Addsalem H. | 41 | 7320 | 31 | 113 |
| 4 | Total | 184 | 27,215 | 140 | 418 |

The allocated sample calculated by using the formula N1*n/N

FHSRH= Felege Hiwot comprehensive and specialized hospital

TGSH= Tibebe Giwon specialized hospital

## 4.7 Data Collection tool and Procedures

The data were collected by trained data collectors. The data were collected through structured data extraction tool, it developed by reviewing different literatures and check logbook and client's card for the availability of each variable. Three BSC midwifes were assign for data collection. Data was extracted from both the logbooks and the client cards which had been recorded over the 3 years.

## 4.8 Data Quality Assurance

Before data extraction, training was provided for Data collectors carefully on data extraction tool. Close supervision was made daily basis to ensure completeness and consistency of each tool. Daily data entry and cleaning were made carefully to avoid potential errors during analysis stages to assure data quality.

## 4.9 Study variables

### 4.9.1 Dependent Variables

Uterine rupture (yes, no)

### 4.9.2 Independent variables

**Socio demographic characteristics variables**

   Age, residence

**Nutritional variable**

> ➢ Iron intake during pregnancy

**Obstetric variables**

Parity, current obstructed labor, current duration of labor, current presentation, current of multiple pregnancy, history of abortion, number of children current birth Wight, gestational age, onset of labor, history of pervious uterine rupture.

**Management and follow up related variables**

ANC status, number of ANC visits, methods of induction or augmentation, follow with induction protocol, Partograph use, instrumental delivery, destructive delivery, history of C/S, number of cesarean deliveries, interval between previous C/S, types of pervious C/S, referral from health facility.

## 4.10 Data Processing and Analysis

Data were cleaned, coded and entered to EpiData and exported to SPSS version 23 for further analysis. Descriptive statistics such as mean, and percentage were performed. Both bivariate and multivariate logistic regression analyses were employed. Variables with a p-value of 0.2 and below in the simple binary logistic regression analysis were included in the multiple binary logistic regression analysis. The final fitted model was assessed for multicollinearity using

Pearson correlation coefficients and VIF. Goodness of fit using the Hosmer–Lemenshow test. The level of association on multivariable analysis was determined based on the 95% CI and p-value. That variable who's P-value less than 0.05 were considered as statistical significance.

## 4.11 Operational definition

**Case definition**: Cases were defined as, all women who give birth at public hospitals in Bahir Dar identified as having a uterine rupture with complete or partial separation of the wall of the uterus.

**Control definition**: Controls were defined as woman who gave birth with any mode of delivery but had not suffered from a uterine rupture.

## 4.12 Ethical Considerations

The ethical clearance was received from Bahir Dar University College of medicine and health science Institutional Review Board (IRB). Official permission to cascade data collection was handled over from respective local authorities including Amhara regional state health bureau, Bahir Dar city administration health office and each public hospitals in study area.

## 4.13 Dissemination and Communication of the result

Result of the study will be submitted and presented to the School of Public Health, Department of Reproductive Health and Population Study. It will also be submitted to relevant authorities and institutions in the study area. It will also be communicated in scientific conference and will be sent for publication to a relevant scientific journal.

# 5. RESULT

## 5.1 Socio Demographic Characteristics of Study Participants

A total of 140 cases and 418 controls participated in this study with 100% response rate. Fifty eight (41.4%) respondents from cases and 231(55.3%) respondents from controls were in the age range of 17–27 years. Ninety-five (67.9%) respondents from cases and 127(30.7%) respondents from controls were from a rural residence (Table 3).

Table 3: Socio demographic characteristics of mothers who give birth at public hospitals in Bahir Dar city during September 01, 2017 to August 2020 G.C.

| Characteristics | | Cases number (%)n=140 | Controls number (%)n=418 | Total number (%)N= 558 |
|---|---|---|---|---|
| Maternal age | 17-27 | 58(41.4%) | 231(55.3%) | 289(51.8%) |
| | 28-38 | 81(57.9%) | 167(39.9%) | 248(44.4%) |
| | 39-49 | 1(0.7%) | 20(4.8%) | 21(3.8%) |
| Residence | Urban | 45(32.1%) | 291(69.6%) | 336(60.2%) |
| | Rural | 95(67.9%) | 127(30.4%) | 222(39.8%) |

## 5.2 Obstetrics characteristics of study participants

In this study, 97(69.3%) respondents from cases and 122(29.2%) respondents from controls were multipara. Thirty-eight (27.1%) respondents from cases and 65(15.6%) respondents from of controls had a history of abortion. One hundred nine (77.9%) respondents from cases and 372(89%) respondents from controls started labor spontaneously. One hundred six (97.1%) respondents from case and 415(99.3%) from control were labor duration extends to less than 24 hours. One hundred one (72.1%) respondents from cases and 306(73.2%) respondents from controls were at 37-42 weeks of gestational age. Obstructed labor was seen in 64(45.7%) respondents from cases and 56(13.4%) respondents from controls, while 44(31.4%) respondents from cases and 15(3.6%) respondents from controls were face presentation. Eight (5.7%) respondents from case were having history of previous uterine rupture. One hundred thirty-two (94.3%) respondents from case and 351(84.4%) respondents from control were birth weight of

newborn range from 2.5 to 4 kg. Three (2.1%) respondents from cases and 13(3.1%) respondents from controls had greater than 4 kg of new born. One hundred one (79.3%) respondents from cases and 47(11.2%) respondents from controls were still birth. Twelve (8.6%) respondents from cases and 21(5%) respondents from controls were multiple pregnancies (Table 4).

Table 4: Obstetrics characteristics of mothers who give birth at public hospitals in Bahir Dar city during September 01, 2017 to August 2020 G.C.

| Characteristics | | Cases number (%) n=140 | Controls number (%) n=418 | Total number (%) n=558 |
|---|---|---|---|---|
| Parity | Nulipara | 12(8.6%) | 168(40.2%) | 180(32.3%) |
| | Primipara | 23(16.4%) | 114(27.3%) | 137(24.5%) |
| | Multipara | 97(69.3%) | 122(29.1%) | 219(39.2%) |
| | Grand multipara | 8(5.7%) | 14(3.4%) | 22(4%) |
| History of abortion | Yes | 38(27.1%) | 65(15.6%) | 103(18.5%) |
| | No | 102(72.9%) | 353(84.4%) | 455(81.5%) |
| GA in week | <37 | 29(20.7%) | 92(22%) | 121(21.7%) |
| | 37-42 | 101(72.2%) | 306(73.2%) | 407(72.9%) |
| | >42 | 10(7.1%) | 20(4.8%) | 30(5.4%) |
| Onset Labor | Spontaneously | 109(77.9%) | 372(89%) | 481(86.2%) |
| | Induced | 31(22.1) | 46(11%) | 77(13.8%) |
| Presentation | Face | 44(31.4% | 15(3.6%) | 59(10.6%) |
| | Breech | 18(12.9%) | 24(5.8%) | 42(7.5%) |
| | Vertex | 77(55%) | 361(86.3%) | 438(78.4%) |

| | | | | |
|---|---|---|---|---|
| | Shoulder& brow | 1(0.7%) | 18(4.3%) | 19(3.5%) |
| Obstructed labor | Yes | 64(45.7%) | 56(13.4%) | 120(21.5%) |
| | No | 76(54.3%) | 362(86.6%) | 438(78.5%) |
| Multiple pregnancy | Yes | 12(8.6%) | 21(5%) | 33(5.9%) |
| | No | 128(91.4%) | 397(95%) | 525(94.1%) |
| Duration of labor (hr) | <=24 | 136(97.1%) | 415(99.3%) | 551(98.7%) |
| | >=25 | 4(2.9%) | 3(0.7%) | 7(1.3%) |
| Birth weight | <2.5 kg | 5(3.6%) | 53(12.7%) | 58(10.4%) |
| | 2.5 kg-4 kg | 132(94.3%) | 352(84.2%) | 484(86.7%) |
| | >=4kg | 3(2.1%) | 13(3.1%) | 16(2.9%) |

## 5.3 Management and follow up related characteristics

Thirty nigh percent of cases were occurred on the time from September 2019 to august 2020 and 26.4% were in September 2018 to august 2019. Sixty-five (46.4%) of case had complete rupture while 48(34.3%) were ruptured on upper uterine segment. Seventy three (52.1%) of uterine rupture were managed by repaired only followed by 49(35%) of total abdominal hysterectomy. Fifty-three (38.4%) cases and 11(2.6%) control were affected by severe anemia while 11(8%) cases and 5(1.2%) controls developed infection. Fifty-three (38.4%) of cases and 390(93.3%) of controls mothers were stable after gave birth.

One hundred one (72.1%) of cases and 395(94.5%) controls have ANC follow up. Sixty (42.9%) of the case and 347(83%) of controls have 3 & 4 ANC visits. Nine (6.4%) cases and 17(4.1%) of control mothers were managed with destructive delivery. Sixty-six (15.8%) of controls and 13(9.3%) of cases were managed by instrumental delivery. The study revealed that 34(23.7%) of cases and 70(16.7%) of control has history of cesarean section. Thirty two (94.1%) cases and 68(97.1%) controls of pervious cesarean section which was done in emergency cases. Thirty-

three (97.1%) cases and 59(84.3%) controls were had vaginal birth after caesarian section. Eighteen (62.1%) cases and 18(38.3%) of controls was used oxytocin to induce labor. In 21(72.4%) cases and 10(21.3%) controls, induction protocols were not followed (Table 5).

Table 5: Management and follow up related characteristics of mothers who give birth at public hospitals in Bahir Dar city during September 01, 2017 to August 2020 G.C.

| Characteristics | | Cases number (%) | Controls number (%) n=418 | Total number (%) n=558 |
|---|---|---|---|---|
| ANC Visit | Yes | 101(72.1%) | 395(94.5%) | 496(88.9%) |
| | No | 39(27.9%) | 23(5.5%) | 62(11.1%) |
| Numbers of ANC visits | 0 | 39(27.8%) | 23(5.5%) | 62(11.1%) |
| | 1-2 | 41(29.3%) | 48(11.5%) | 89(16%) |
| | 3-4 | 60(42.9%) | 347(83) | 407(72.9%) |
| Iron intake during pregnancy | Yes | 96(68.6%) | 390(93.3%) | 486(87.1%) |
| | No | 44(31.4%) | 28(6.7%) | 72(12.9%) |
| Managed with destructive delivery | Yes | 9(6.4%) | 17(4.1%) | 26(4.7%) |
| | No | 131(93.6%) | 401(95.9%) | 532(95.3%) |
| Managed with instrument delivery | Yes | 13(9.3%) | 66(15.8%) | 79(14.2%) |
| | No | 127(90.7) | 352(84.2%) | 479(85.8%) |
| History of C/S | Yes | 34(23.7%) | 70(16.7%) | 104(18.5%) |

|  |  |  |  |  |
|---|---|---|---|---|
|  | No | 106(76.3%) | 348(83.3%) | 454(81.5%) |
| Types of pervious C/S | Elective | 2(5.9%) | 2(2.9%) | 4(3.8%) |
|  | Emergency | 32(94.1%) | 68(97.1%) | 100(96.2%) |
| Intervals of pervious C/S | < 2 years | 3(8.8%) | 8(11.4%) | 11(10.6%) |
|  | >=2 years | 31(91.2%) | 62(88.6%) | 93(89.4%) |
| Managed with VBAC | Yes | 33(97.1%) | 59(84.3%) | 92(88.5%) |
|  | No | 1(2.9%) | 11(15.7%) | 12(11.5%) |
| Induction with | Oxytocin | 18(62.1%) | 18(38.3%) | 36(47.4%) |
|  | Misoprostol | 10(34.5%) | 8(17%) | 18(23.7%) |
|  | Balloon catheter | 1(3.4%) | 21(44.7) | 22(28.9%) |
| Follow with induction protocol | Yes | 8(27.6%) | 37(78.7%) | 45(59.2%) |
|  | No | 21(72.4%) | 10(21.3%) | 31(40.8%) |
| Partograph use | Yes | 57(40.7%) | 211(50.5%) | 268(48%) |
|  | No | 83(59.3%) | 207(49.5%) | 290(52%) |
| Refer from health facility | Yes | 114(81.4%) | 277(66.3%) | 391(70.1%) |
|  | No | 26(18.6%) | 141(33.7%) | 167(29.9%) |

## 5.5 Determinants of uterine rupture

On bivariate logistic regression analysis number of ANC visits, onset of labor, parity, referral, history of C/S, instrumental delivery, having ANC follow up, obstructed labor, history of abortion, fetal presentation, residence, partograph use during labor were candidate variables for multivariate analysis at p-value less than 0.2. In the model development process the existence of multi co-linearity was assessed using Pearson correlation coefficients. The result of the assessment showed that there was strong co-linearity between ANC follow up and number of ANC visits (0.84), residence and referral (0.92), age and parity (0.98) and presentation and obstructed labor (1.2) as a result we exclude ANC follow up , referral, age and presentation from multivariable model.

Hosmer-Lemenshow test was used to assess a goodness of fit test of the model adequately fits the data, since the value of the Hosmer-Lemenshow goodness-of-fit test statistical significance value was 0.109. The model was fitted for the given variables.

Accordingly, women's residence, history of CS scar, obstructed labor, number of ANC follow up visits, history of abortion and parity found to be significantly associated with the odds of having uterine rupture (p-value $< 0.05$) (Table 6).

The odds of being experienced uterine rupture among women from rural resident was 2.5 higher as compared to women from urban resident (AOR = 2.5; 95% CI: 1.31, 4.80).

Women who had a history of caesarian section had 3.3 times higher odds of being experienced uterine rupture compared to their counter parts(AOR = 3.3; 95% CI: 1.6, 6.47). Women who had history of abortion had 2.56 times higher odds of being experienced uterine rupture compared to their counterpart (AOR = 2.56; 95% CI: 1.28, 5.13).

The odds of being uterine rupture among women who were has one to two ANC follow up visit was 7.3 higher as compared to women were has three to four ANC follow up visits (AOR = 7.3; 95% CI: 3.7, 14.3).Women who had obstructed labor were 6.8 times higher odds of being experienced uterine rupture as compare to woman's were has no obstructed labor (AOR =6.8 ; 95% CI: 2.89, 16.14).The odds of being uterine rupture among Multipara women were 10.9 times higher as compared to Nulipara women's (AOR=10.9; 95% CI: 4.34-27.5).

Table 6: determinants of uterine rupture among mothers who give birth at public hospitals in Bahir Dar city for delivery service during September 01, 2017 to August 2020 G.C.

| Characteristics | Uterine rupture | | COR [95%CI] | AOR [95%CI] |
| | Yes | No | | |
| --- | --- | --- | --- | --- |
| **Residence** | | | | |
| Rural | 95(67.9%) | 127(30.4%) | 4.8(3.23-7.36) | **2.5 (1.31-4.80) *** |
| Urban | 45(32.1%) | 291(69.6%) | 1 | 1 |
| **Numbers of ANC visits** | | | | |
| 0 | 39(27.8%) | 23(5.5%) | 9.6 (5.3-17.1) | **3.2(1.28-8.2) *** |
| 1-2 | 41(29.3%) | 48(11.5%) | 5. 3 (3.2- 8.7) | **7.3 (3.7-14.3)*** |
| 3-4 | 60(42.9%) | 347(83) | 1 | **1** |
| **Managed with instrument delivery** | | | | |
| Yes | 13(9.4%) | 66(15.8%) | 0.5(0.29-1.03) | 0.34(0.12- 0.97) |
| No | 127(90.7) | 352(84.2%) | 1 | 1 |
| **History of C/S** | | | | |
| Yes | 34(23.7%) | 70(16.7%) | 1.6(0.97-2.47) | **3.3(1.6-6.47) *** |
| No | 106(76.3%) | 348(83.3%) | 1 | 1 |
| **Obstructed labor** | | | | |
| Yes | 64(45.7%) | 56(13.4%) | 5.4(3.5-8.41) | **6.8(2.89-16.14) *** |
| No | 76(54.3%) | 362(86.6%) | 1 | 1 |

**Onset of labor**

| | | | | |
|---|---|---|---|---|
| Induced | 31(22.1) | 46(11%) | 2.3(1.39-3.8) | 1.49(0.57-3.92) |
| Spontaneously | 109(77.9%) | 372(89%) | 1 | 1 |

**History of abortion**

| | | | | |
|---|---|---|---|---|
| Yes | 38(27.1%) | 65(15.6%) | 2.02(1.28-3.19) | **2.56(1.28 - 5.13)\*** |
| No | 102(72.9%) | 353(84.4%) | 1 | 1 |

Partograph use

| | | | | |
|---|---|---|---|---|
| Yes | 57(40.7%) | 211(50.5%) | 1 | 1 |
| No | 83(59.3%) | 207(49.5%) | 1.49(1.01-2.19) | 0.67(0.37 - 1.23)\* |

**Parity**

| | | | | |
|---|---|---|---|---|
| Nulipara | 12(8.6%) | 168(40.7%) | 1 | 1 |
| Primipara | 23(16.4%) | 114(26.8%) | 2.9(1.38-6.05) | **8. 3 (2.8-24.64)\*** |
| Multipara | 97(69.3%) | 122(29.2%) | 11.11(5.89-21.31) | **10.9(4.34 -27.5) \*** |
| Grand multipara | 8(5.7%) | 14(3.3%) | 8.05(2.8-22.94) | **4.3 (1.03- 17.98)\*** |

**\*\*\*p value <0.05 significantly associated with uterine rupture**

# 6. **DISCUSSION**

This study identified that uterine rupture was significantly associated with rural residency, presence of CS scar, having less than and equal to two ANC visit, history of abortion, obstructed labor and multiparty.

This study revealed that resident was significantly associated with rupture of uterine membrane. The odds of being experienced uterine rupture among rural women were higher compared to urban women. The finding of this study was consistent with previous studies conducted in DebreMarkos, Adama, Sihire and Yemen (14, 20, 23,30). This might be due to lack of access to nearby health institution in rural residential areas. As a result, the higher chance of uterine rupture for women from rural residents may be due to delays in the process of getting obstetric cares and poor transportation facility.

Women who had a history of cesarean section had more odds of experiencing rupture of uterine membrane compared to have no history of cesarean section. This finding was supported with other studies done in DebreMarkos, Dessie, Adama, United Kingdom, London, and India (20,23,25,33,34,36),where as this study was contradict with study done in Nekemit and Tanzania (38,39).The possible reason might be due to previous cesarean scar would have decreases the elasticity of uterus and more exposed to rupture during labor and delivery.

This study revealed that number of ANC follow up visits were significantly associated with rupture of uterine membrane. The odds of being experienced uterine rupture among women who had one to two ANC follow-up visits was higher as compared to those having three to four ANC follow up visits. This finding is in line with study in DebreMarkos and Yemen (14, 20). This might be due to not having full antenatal care visits during pregnancy leads to poor awareness to identify problems during labor and delivery, sign of labor and time of arrival to health facility during labor can cause home delivery with low birth preparedness and complication readiness. So, it results uterine rupture.

Obstructed labor was significantly associated with rupture of uterine membrane. The odds of being experienced uterine rupture among women who had obstructed labor were higher as compared to those counterparts. This finding was consistent to studies conducted in Dessie and Yirigalem (5, 40). It may be due to the fact that those women who have obstructed labor have a

delay in seeking care with a hypertonic uterine contraction, so uterus and other urinary tract organs compressed by the presenting part of the fetus for extended time, it results uterine rupture.

Abortion was significantly associated with uterine rupture; the odds of being experienced uterine rupture among women who had history of abortion were higher as compared to those who had no history abortion. It is may be due to woman has an instrument inserted into the cervix to access the uterus to expel the fetus or in case of surgical abortion can cause scar in the area, this scar also has a chance to decrease elasticity of the uterus, it results uterine rupture.

Additionally, number of birth (parity) was significantly associated with uterine rupture. The odds of being experienced uterine rupture among multiparous, grand multiparous and primiparous mothers were higher as compared to those nulliparous mothers. This finding was comparable to studies in Dessie and Nekemit (26,39). It may be number of births increases the uterus may be decreases its elasticity and this lack of elasticity may leads to uterine rupture.

## 7. **LIMITATION OF THE STUDY**

The data was collected from logbook and medical records, in which data on some socio-demographic and gynecological factors information were incomplete. Because of incompleteness cannot assess these variables. The case was diagnosed by the allocated professionals in facility and it was may be   missed diagnosed.

## 8.  **CONCLUSION**

This study revealed that rural resident, having one and two  antenatal care visits, obstructed labor, history of abortion, having caesarean section and multiparty were determining of uterine rupture.

## 9. RECOMMENDATIONS

Based on the study findings, the following recommendations are made:

**For Health Bureaus**

- Improve the availability of transportation (Ambulance) between the health facilities.

**For health care provider**

- Appropriate labor monitoring to reduce cesarean delivery, proper auditing on the appropriateness of CS and Provide education about risks of uterine rupture for clients who have history of pervious caesarian section.
- HEW (health extension workers) follow pregnant women's continuation of ANC until complete follow up visit.
- Strengthen family planning counseling and service utilization to prevent the occurrence of abortion and limit number of birth.

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## 11. ANNEXS

## 11.1 Data extraction tool

| ID | | _____ | |
|---|---|---|---|
| No | Variables | Categories | Remark |
| 1. | Uterine rupture | 1. Yes <br> 2. No | |
| 2. | Time of rupture in month and year | _dd/mm/y_____ | |
| 3. | Types of rupture | 1. Complete rupture <br> 2. Incomplete rupture | |
| 4. | Site of uterine rupture | 1. upper uterine segment <br><br> 2. lower uterine segment <br><br> 3. Posterior <br><br> 4. Lateral <br><br> 5. fundal | |
| 5. | Types of surgical procedure | 1. Total abdominal hysterectomy <br> 2. sub Total abdominal hysterectomy <br> 3. Repaired only <br> 4. Repaired with bilateral tuba ligation | |
| 6. | Duration of surgery | ……………… in min | |
| **Socio-demographic characteristics** | | | |
| 7. | Age | ...............................(in years) | |
| 8. | Residence | 1. Rural <br> 2. Urban | |

| **Nutritional characteristics** | | | |
|---|---|---|---|
| 9. | Iron intake during pregnancy | 1. Yes <br> 2. No | |
| 10. | Duration of iron intake | ………………… Month | |
| 11. | Last HGB level | …………… | |
| **Obstetrics characteristics** | | | |
| 12. | Gravid | ……………….. | |
| 13. | Parity | ……………………….. | |
| 14. | Number of children | _____ | |
| 15. | History of abortion | 1. Yes <br> 2. No | |
| 16. | If yes to Q12, number of abortion | ………………. | |
| 17. | Gestational age during birth | --------------------weeks | |
| 18. | History of pervious uterine rupture | A. Yes <br> B. No | |
| 19. | If yes to Q14, pervious site of uterine rupture | A. rupture on Lower uterine segment <br> B. rupture on upper uterine segment | |
| 20. | Onset of labor | A. Spontaneous <br> B. Induced | |
| 21. | Duration of labor | …………………hrs | |
| 22. | Presentation | A. Vertex <br> B. Face <br> C. Breech <br> D. Shoulder | |

| | | E. Brow | |
|---|---|---|---|
| 23. | obstructed labor for this birth | 1. Yes<br>2. No | |
| 24. | multiple pregnancy in this birth | 1. Yes<br>2. No | |
| 25. | Birth outcome | 1. Live birth<br>2. Still birth | |
| 22. | birth weight for this birth | …………………….. | |
| **Management and follow up related** | | | |
| 22 | Have ANC follow up for this pregnancy | 1. Yes<br>2. No | |
| 23 | Number of ANC visits | ………………….. | |
| 24 | Partograph use for this birth | A. Yes<br>B. No | |
| 25 | If the labor is induced methods of induction for this birth | A. With oxytocin<br>B. With misoprostol<br>C. With balloon catheter | |
| 26 | Follow with induction protocol for this birth | 1. Yes<br>2. No | |
| 27 | have a history of Destructive delivery for this birth | A. Yes<br>B. No | |
| 28 | Have instrumental delivery for this birth | A. Yes<br>B. No | |
| 29 | Have History of C/S | 1. Yes<br>2. No | |
| 30 | If yes Q 29, number of cesarean section | ………………………….. | |
| 31 | Site of last cesarean section | 1. Lower uterine segment<br>2. Upper uterine segment | |

| 32 | Types of pervious C/S | 1. Elective<br>2. Emergency | |
|----|----------------------|----------------------------|---|
| 33 | Intervals of pervious C/S | ……….years | |
| 34 | Have trail of VBAC for this birth | 1. Yes<br>2. No | |
| 35 | Currently refer from other health facility | A. Yes<br>B. No | |
| 36 | Maternal outcomes | 1. Blood transfusion with whole blood<br>2. severe anemia<br>3. wound infection<br>4. re laparotomy<br>5. Complete wound dehiscence<br>6. Death<br>7. stable<br>8. other | |

# Declaration form

I the under signed declared that this is my original work that has been never presented in this or any other any other university and that all the resources and materials used for the research have been fully acknowledged.

**Principal investigator**

Name: **Belaynesh Chanie**

Signature _____

Date _____

**Advisors**

Name: Dr. Tizta T. (PhD, Assistant prof.)

Signature_____

Date _____

Name: Yibeltal A.  (MPH/RH, Assistant prof.)

Signature _____

Date _____

Examiner's approval form

**Approval of Dissertation/thesis for defense result**

We here by certify that we have examined this thesis entitled determinants of uterine rupture among women who gave birth at public hospitals in Bahir Dar city by Belaynesh Chanie. We recommend and approve the thesis a partial fulfillment of the requirement for the degree of master of public health in Reproductive health

Board of Examiners

_____          _____          _____

External examiner's name                Signature                        Date


_____          _____          _____

Internal examiner's name                Signature                        Date


_____          _____          _____

Chair person's name                       Signature                        Date